NSP

NORTHERN STATES POWER COMPANY

MINNEAPOLIS, MINNESOTA 55401

May 30, 1980

Director of Nuclear Reactor Regulation
U s Nuclear Regulatory Commission
Washington, DC 20555

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
Docket No. 50-282 License No. DPR-42
50-306 DPR-60

Information on Implementation of
10 CFR Part 50, Appendix J

In a letter dated April 11, 1980 from Mr A Schwencer, Chief, Operating Reactors Branch #1, Division of Operating Reactors, USNRC, we were requested to provide information related to implementation of the containment penetration testing requirements of 10 CFR Part 50, Appendix J.

The information requested by Mr Schwencer is provided in the enclosure to this letter. Please contact us if you have any questions related to the information we have provided.

L.O. Mayer

L O Mayer, PE
Manager of Nuclear Support Services

cc: J G Keppler
G Charnoff

Enclosure

LOM/DMM/jh

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Enclosure

Director of NRR
May 30, 1980

Northern States Power Company Response to Request for Additional Information, Prairie Island Station Units 1 and 2, Implementation of 10CFR50, Appendix J Containment Leakage Testing

Item 2.1 Fan Coil Isolation Valves

NSP stated that Fan Coil Unit isolation valves are in systems "sealed" from containment atmosphere. To justify an exemption from type C testing requirements of Appendix J for these valves, provide the following information.

1. A description of how the system is sealed (e.g., safety class system designed to remain full of water following a postulated LOCA).

2. A description of how the seal integrity is verified (e.g., hydrostatic test to demonstrate that the system will remain full of water for 30 days following a postulated LOCA).

3. A discussion of how the "sealed" system will function to prevent atmospheric leakage.

Response

Fan coil units inside containment are provided with water from the plant cooling water system when they are operating in their safeguards mode. Portions of the cooling water system serving the fan coil units are free from single failures, designed as Class I seismic, and are missile protected. Cooling water system pressure exceeds maximum postulated containment accident pressure. There is no potential for leakage of radioactive material out of the containment via the cooling water system.

The cooling water supply lines to the fan coil units are provided with a check valve inside containment and a manual motor operated gate valve outside containment. Return lines are provided with a manual motor operated gate valve inside and outside containment.

In the event of accident, the cooling water supply and return isolation valves remain open to satisfy their safeguards function. In the event of a fan coil unit or associated piping rupture the containment manual isolation valves would be closed to prevent the entry of non-borated water into containment. Pressure against the closed isolation valves is maintained by 1/2-inch equalizing lines. The water supply for this "seal" is provided by the cooling water system pumps (3 motor driven and 2 diesel driven) which take suction from the Mississippi River.

Response (continued)

A lapse of integrity of the cooling water system piping or fan coil units inside containment would be indicated immediately by an increase in containment unidentified leak rate. Leakage would also be evident during bi-weekly inspections of the containment. System pressure tests are conducted in accordance with the Prairie Island ASME Code Section XI Inservice Inspection and Testing Program at least once each inspection interval (10 years).

Item 2.2 Extrapolation of Airlock Door Seal Leak Test Results

The request for exemption from testing the airlock door seals at a reduced pressure within three days after being used is acceptable for operating reactors. However, the test results at this reduced pressure must be extrapolated to full pressure to determine the acceptability of the test. Submit a description of the extrapolation method you propose to use.

Response

The Prairie Island Technical Specifications require airlock door leakage to be less than the design leakage of the door seals reported by NSP in Supplement No. 1 to the Initial Unit No. 1 Reactor Containment Building Leak Rate Test Report. The value reported was an arbitrary 1 cc/min/lineal inch of resilent seal at test pressure (P_t = 10psig). There is no need to correct leakage from test pressure to peak accident pressure (P_a) since the leakage acceptance criterion is not stated in terms of full pressure.

An attempt to clarify this issue was made in NSP's Prairie Island License Amendment Request dated August 7, 1975. Refer to Exhibit A, Item 1(c). No action has been taken on this request by the NRC Staff.

If extrapolation were necessary, the following method could be used. If P_t is the gauge test pressure used and P_a is the gauge pressure the test results are to be corrected to, a conservative factor to apply to the leakage measured at P_t would be P_a/P_t.

Item 2.3 Direction of Test Pressure

NSP stated that there is no assurance that the testing of certain valves in a direction opposite to that of their safety function will produce results equivalent to or more conservative than results obtained from testing in the direction of the post-accident pressure. In that case, testing in the direction of the post-accident pressure will be required.

However, should these valves be analyzed such that you can provide a basis for determining that reverse direction testing will produce results equivalent to or more conservative than testing in the direction of the safety function, reverse direction testing would be acceptable. If a basis for justification of continued testing in the reverse direction cannot be provided, submit a plan of action to conform with the requirements of Appendix J, including a schedule for the accomplishment of the plan.

Response

Table 1 lists the containment penetration leakage tests which are conducted in the reverse direction.

Testing of blind flanges involves pressurizing the piping between the inboard and outboard flanges. The inboard flange is pressurized in the reverse direction. This is a conservative test since test pressure acts to unseat the inboard flange. Testing of airlock overall leakage is, for the same reason, a conservative test since the inner door is pressurized in the reverse direction which tends to open the door.

Testing globe valves in the reverse direction is acceptable if this results in applying pressure under the seat. Testing butterfly valves in the reverse direction is also acceptable if they are constructed for sealing in either direction. Reverse direction testing should also pressurize the valve stem seal (if any) or the integrity of the stem seal should be verified in some other manner. This position is consistent with the requirements of IWV-3423 of Section XI of the ASME Boiler and Pressure Vessel Code, 1977 Edition, Summer 1978 Addenda, which is used in conducting the inservice inspection program valve leakage tests. Testing gate valves in the reverse direction is generally unacceptable.

Each of the penetrations tested in the reverse direction will be reviewed to determine if it meets the above criteria. Procedure changes or modifications will be made to allow testing in the direction of post-accident pressure if they are found to be feasible. This review will be completed prior to the conduct of the 1981 refueling outage type B and Type C tests.

Table I Containment Penetrations Tested With Differential Pressure in Reverse Direction

Penetration No. (Unit 1 Designation)	Description	Type Valve or Barrier
9	Hot leg to RHR inboard isolation valves	Motor operated gate valve (2)
10	RHR inlet	Motor operated gate valves (3)
11	Letdown inboard isolation valves	Control (globe) valves (3)
17	Loop B Sample inboard isolation valve	Control (globe) valve
18	Fuel transfer tube	Blind flange with double gasket
19	Service air	Blind flange
20	Instrument air inboard isolation valve	Control (globe) valve
25A	Containment purge exhaust inboard valve	Air operated butterfly valve
25B	Containment purge supply inboard valve	Air operated butterfly valve
28A	Safety injection inboard isolation valves	Motor operated gate valves (4) Control (globe) valves (2)
31	Nitrogen to accumulators inboard isolation valves	Control (globe) valves (3)
35	SI test line inboard valves isolation	Control (globe) valves (4)
41A & 42B	Containment inboard vacuum breaker valves	Air operated butterfly valve
42B	Containment inservice purge supply inboard isolation valve	Air operated butterfly valve
42C & 42F	Steam heat	Blind flanges (6)

Table 1 (continued)

Penetration No. (Unit 1 Designation)	Description	Type Valve or Barrier
43A	Containment inservice purge exhaust inboard isolation valve	Air operated butterfly valve
48	Low head safety injection inboard isolation	Motor operated gate valve
49B	Demineralized water	Blind flanges (2)
Airlocks	Airlock inner door	Double gasketed door

Item 2.4 Water Testing of Isolation Valves

NSP stated that the Technical Specifications at Prairie Island Station permit a large number of isolation valves to be hydrostatically tested in lieu of the pneumatic testing required by Appendix J and that where hydrostatic testing is utilized, an appropriate air/water correlation factor is applied. This approach is theoretically acceptable if a justification for the validity of the air/water correlation can be provided. However, since the leakage involved is generally quite low and also since the leakage path characteristics are essentially unpredictable, it is extremely difficult to correlate water leakage to equivalent air leakage accurately. To date, no acceptable correlation has been demonstrated in this area.

Nevertheless, hydrostatic testing of these valves may be acceptable where the system is designed to remain intact and liquid-filled following a postulated loss-of-coolant accident. For these systems, testing with water as a medium is more appropriate than testing with air on nitrogen since it more closely approximates the post-accident environment. If hydrostatic testing is to be employed, justification must be provided that the available fluid inventory is sufficient to maintain a water seal on the isolation valves during and following an accident based on the leakage-rate limit of the test.

Response

The Prairie Island Technical Specifications currently allow water tests of the following penetrations:

RHR Supply and Return
Charging Line
Reactor Coolant Pump Seal Supply and Return
Safety Injection
Containment Spray
Containment Sump ECCS Suction
Low Head Safety Injection

All of these lines will remain water filled and intact outside containment following a loss of coolant or steam line break accident. Present practice is to apply an air/water leakage scaling factor of approximately 60. This scaling factor effectively limits the permitted water leakage to a total of a few liters/min to permit the overall containment penetration leakage rate criterion to be satisfied. Leakage rates of this magnitude do not raise serious questions concerning available makeup inventory of any of the systems involved.

Item 2.5 Draining of Systems for Type A Test

Item 4 of Table 1, concerning Appendix J, Section III.A.1(d), states:

> The primary system is vented to the containment atmosphere, but coolant is not drained to expose systems communicating with the primary system to the air test pressure. Each system is, however, subjected to Type C test if practicable.

Item 2.5 (continued)

Although you indicated in your submittal that this item does not comply with Appendix J, no request for exemption has been submitted. Review the affected systems and submit requests for exemption, along with justification for each request, where the following requirements of Section III.A.1(d) of Appendix J are not satisfied:

1. Systems required to be drained to the extent necessary to assure exposure of the containment isolation valves to containment air test pressure and to assure they will be subjected to the post-accident differential pressure.

2. Valves required to be Type C tested.

Response

Section III.A.1(d) of Appendix J requires "...portions of the fluid systems that are part of the reactor coolant pressure boundary and are open directly to the containment atmosphere under post-accident conditions and become an extension of the boundary of the containment shall be opened or vented to the containment atmosphere prior to and during the test. Portions of closed systems inside containment that penetrate containment and rupture as a result of a loss of coolant accident shall be vented to the containment atmosphere". We believe this requires the draining and venting of those systems inside containment which may communicate with the post-accident atmosphere either through design or due to failure of non-seismic or non-missle protected piping. Systems designed for the accident environment (such as the seismic, missile protected fan coil units and the secondary side of the steam generators) need not be drained and vented.

Section III.A.1(d) does not require systems which are normally operating and filled with water following an accident to be vented to the containment. Type C tests of isolation valves in these systems are required, however.

Prairie Island does not conform to the requirements of Section III.A.1(d) since many of the isolation valve tests are performed using water and not air as required by Section III.C of Appendix J. As discussed in item 2.4, however, we believe water tests are more appropriate for these isolation valves. Also, as discussed earlier, tests are performed in some cases with pressure applied in a direction opposite to post-accident pressure. The validity of this testing will be reviewed as noted in our response to item 2.3.