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NORTHERN STATES POWER COMPANY

MINNEAPOLIS, MINNESOTA 55401

November 8, 1978

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

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

Additional Informmation Concerning
The Prairie Island Fire Protection Program

On September 13, 1978 and September 19, 1978, Northern States Power Company received from the NRC Staff, requests for additional information concerning the fire protection program at the Prairie Island Nuclear Generating Plant. The information requested was provided in draft form to the NRC inspection team at the beginning of the fire protection inspection which took place the week of October 16, 1978.

The purpose of this letter is to transmit the additional information requested by the Staff. The information provided in the attachment is substantially the same information made available to the NRC inspection team during their site visit.

Please contact us if you have any questions relating to the information we have provided.

L. O. Mayer

L O Mayer, PE
Manager of Nuclear Support Services

LOM/DMM/deh

cc: Director IE-III
G Charnoff

Attachment

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Attachment to letter dated November 8, 1978
L O Mayer, NSP, to Director of NRR, USNRC

PRAIRIE ISLAND NUCLEAR GENERATING STATION
UNITS 1 & 2

Request for Additional Information

8. Provide a revised list of equipment required for achieving hot shutdown considering the following shutdown fuctions:

   1. Placing the reactor in subcritical condition and maintaining the reactor subcritical indefinitely.

   2. Bringing the reactor to hot shutdown conditions and maintaining it at hot shutdown for an extended period of time (i.e., longer than 72 hours) using only normal sources of cooling water.

   3. Maintaining the reactor coolant system inventory indefinitely using only normal sources of makeup water.

   4. Bringing the reactor to cold shutdown conditions within 72 hours.

   Primary system makeup and boration capability should be considered when developing the list of equipment required for hot shutdown.

   RESPONSE

   Equipment required to place and maintain reactor in subcritical condition or hot shutdown

   a. Steam Generator (SG) safety valves

   b. 2 cooling water (CL) pumps

   c. CL to component cooling (CC) heat exchanger valves:

      MV-32145
      MV-32146
      MV-32160
      MV-32161
      CV-31381
      CV-31411
      CV-31383
      CV-31384

   d. SG Level indication

e. Auxiliary feedwater pump (AFWP) and associated valves

Valves: Unit 1	Unit 2
MV-32333	MV-32336
or MV-32335	or MV-32345
MV-32243	MV-32249
MV-32239	MV-32384
MV-32382	MV-32247
or MV-32242	or MV-32248
MV-32381	MV-32246
MV-32238	MV-32383

f. 1 CC pump per unit and associated valves.

Valves: Unit 1	Unit 2
MV-32120	MV-32122
MV-32121	MV-32123
CV-31202	CV-31215
CV-31252	CV-31253
MV-32095	MV-32130

g. Pressurizer level indication

h. 1 charging pump per unit

i. Letdown flow path

Unit 1	Unit 2
CV-31226	CV-31230
CV-31255	CV-31279
CV-31326	CV-31347
CV-31339	CV-31430
CV-31203	CV-31216
CV-31204	CV-31217
CV-31205	CV-31251
CV-31330	CV-31422
CV-31210	CV-31222
CV-31333	CV-31424
MV-32199	MV-32210
MV-32166	MV-32194

j. 1 boric acid (BA) storage tank per unit
1 BA transfer pump per unit

and heat tracing ET 40, 30B, 19, 23, 30A for Unit 1
ET 22, 24, 31, 43 for Unit 2

or

1 refueling water storage tank (RWST) per unit and associated valves

Valves: Unit 1	Unit 2
MV-32060	MV-32062
MV-32061	MV-32063

k. Pressurizer heaters

l. Pressurizer pressure indication

m. SG power operated relief valves:

Unit 1	Unit 2
31089	31102
or 31084	or 31107

n. 121, 122, 123, 124 or 125 air compressor

Reactor Makeup Sources

Charging pumps or Safety Injection (SI) pumps may be used.

Charging pumps:

a. Flow from charging pump to reactor coolant system (RCS)

1. seal injection flow path
2. CV-31198
3. VC-7-10

b. Suction supply

1. Blender - requires

Reactor makeup water (RM) pump
BA transfer pump
Heat tracing - ET 3C, 19, 23, 30A, 30B, 30C, 41, 42

2. RWST - requires following valves

Unit 1	Unit 2
MV-32060	MV-32062
MV-32061	MV 32063

SI Pumps:

Allow RCS pressure to sag to 2000 psig by turning off heaters and operating pressurizer power operated relief valves (POR)

a. 2 CL pumps
b. CC pump
c. Valves:

Unit 1	Unit 2
MV 32079	MV-32182
or	or
MV-32080	MV-32183
MV-32162	MV-32190
or	or
MV-32163	MV-32191
MV-32073	MV-32176
MV-32070	MV-32173
or	or
MV-32068	MV-32171

d. 1 SI pump per unit

<u>Additional Equipment Required to go to Cold Shutdown</u>

a. RCS temperature indication
b. Accumulator isolation valves

Unit 1	Unit 2
MV-32071	MV-32174
MV-32072	MV-32175

c. 1 RHR pump per unit

Valves: Unit 1	Unit 2
MV-32164 & 32165	MV-32192 & 32193
or 32230 & 32231	or 32232 & 32233
MV-32066	MV-32169
CV-31237	CV-31240
CV-31236 or 311235	CV-311238 & 31239

d. CC supply valves to RHR pumps

Unit 1	Unit 2
MV-32093 or 32094	MV-32128 or 32129

9. Discuss the role of the charging pumps in achieving hot shutdown.

RESPONSE

The charging pumps have three functions in achieving hot shutdown. First, they provide a means of adding boric acid to the core. Second, they supply makeup water to the reactor coolant system (RCS). Third, they supply seal flow to the reactor coolant pumps (RCP's).

10. Discuss the role of the component cooling water system and the cooling water system in achieving hot shutdown.

RESPONSE

The cooling water (CL) system's role in achieving and maintaining hot shutdown consists of:

1) Maintains component cooling (CC) system at less than 95°F
2) Provides a secondary source of make up to the steam generators
3) Provides cooling water to:

   a) Containment coolers
   b) Lube-oil system on aux feedwater pumps
   c) Chiller units
   d) Diesel generators (only on loss of offsite power)
   e) Air compressors

The CC system's role in achieving hot shutdown consists of:

1) Maintain a backup thermal barrier for reactor coolant pumps
2) Cool letdown flow (seal water and normal letdown)
3) Provide cooling for reactor coolant pump motors

11. Discuss any limitations for cooling the main coolant pump seals and thermal barriers that exist during hot shutdown conditions.

RESPONSE

Two separate methods are provided for cooling the RCP seals and radial bearing. Either of the methods is capable of providing adequate cooling for the seals and bearing. These methods are:

1) Injection System - Three charging pumps are provided on each unit, with one normally in service providing flow adequate to protect the seals and radial bearing from overheating.

2) Thermal Barrier - Component cooling, at approximately 40 gpm, is provided to the thermal barrier to protect the seals and radial bearing from overheating in the event seal injection is lost.

12. Discuss the function of the startup neutron channel in achieving hot shutdown.

RESPONSE

The source range channels do nothing in achieving hot shutdown. They are not required for hot shutdown operation (Table TS.3.5-2 of the Technical Specifications).

13. Discuss the role of the boric acid pumps and associated valves and tanks in maintaining hot shutdown conditions for an extended period of time.

RESPONSE

The boric acid pumps, valves, and tanks serve two basic functions in the maintenance of hot shtudown. First, they supply concentrated acid to the charging pump suction, which is then injected into the RC system. Second, they supply concentrated acid to the blender, which is blended with reactor makeup water and injected into the RC system. This makes up for RC leakage and letdown flow that is routed to the holdup tanks.

14. Discuss the need for pressurizer heaters in achieving hot shutdown.

RESPONSE

The pressurizer heaters and sprays are needed to maintain the reactor coolant system pressure during insurges and outsurges while reducing load to hot shutdown. Failure to provide the heaters for pressure control would result in minimal operator inconveience and no damage to the reactor coolant system while achieving hot shutdown.

If the heaters are lost, heat loss from the pressurizer and bypass spray would result in subsequent decay in reactor coolant system pressure. To maintain the reactor coolant pump net positive suction head, and prevent steam formation in locations other than the pressurizer, the reactor coolant system would also have to be cooled.

15. Describe any manual valve operations needed to achieve hot shutdown, considering a loss of offsite power.

RESPONSE

The operating procedure for station blackout was made available to the NRC inspection team during their visit.

In general, motor operated valves will be powered from on-site power following a loss of off-site power.

16. Discuss the source and capacity of makeup feedwater during extended hot shutdown operations when using the atmospheric steam dump valve.

RESPONSE

Plant Equipment:

a. Three condensate tanks of 150,000 gallons each.
b. Water treating system consists of two trains, each with a capacity of 200,000 gallons.
c. Each unit has two auxiliary feedwater pumps (one electric and one steam) with a capacity of 200 gpm each.

Sequence of Events:

a. On Trip - one of two feedwater pumps stay on line
b. Steam generator level control for first hour or so after trip is by feedwater pump operation
c. After the feedwater heaters and associated piping have cooled, an auxiliary feedwater pump is started for steam generator level control and the main feedwater pump is stopped
d. At this time in the cooldown, the water demand is approximately 75 gpm
e. Two condensate tanks of 300,000 gallons would give 66 hours supply
f. Supply from one demin train (200,000 gals) would provide an additional 44 hours
g. Second train would supply additional 44 hours
h. A train can be regenerated in 8 hours, so it's conceivable the plant could stay in the mode of using demin trains indefinitely
i. The ultimate backup would be use of river water through the cooling water system

17. Provide drawings at the start of the site visit scheduled for October 16-20, which show actual separation distance of redundant cables required for safe shutdown that are located in the same fire zone.

RESPONSE

All available drawings showing cable separation were made available to the NRC inspection team during their visit.

18. Identify any equipment required for safe shutdown that is subject to spurious operation as a result of a fire. Particular attention is directed to valves and valve position indicators. Discuss the effects on safe shutdown of such spurious operation.

RESPONSE

During a fire, most of the components listed in question 8 are subject to spurious operation. As a result, no specific pieces of equipment are assumed operable from the control room, and field operation will be specified.

19. Describe the function of the instrument and station air system in achieving and maintaining both hot shutdown and cold shutdown conditions. Identify any fire areas which contain components or piping of the air system and air operated valves whose position must change for shutdown. Verify that the loss of the air system will not prevent shutdown operations.

RESPONSE

The station air system has no function in shutting down the plant.

During hot shutdown, instrument air is required to support the following functions:

a. Maintain charging pump speed above minimum and control charging rate
b. Control blending flow
c. Control RC letdown
d. Control SG pressure below the main steam safety valve setting
e. Maintain CC temperature control

To achieve cold shutdown, the air system is required to support the following additional functions:

RHR flow control

The fire zones that have air system piping or air operated valves are 1, 31, 32, 58, 59, 60, 68, 71, 72, 73, 74, and 75

The essential shutdown functions can be performed without instrument air.

20. Provide a list of remotely operated valves, with their fail positions, in safe shutdown systems.

RESPONSE

The list of valves is contained in question 8. The motor valves (MV) fail as is. Control valves will fail in the following manner. FO means fail open, and FC means fail closed. VCT indicates return to volume control tank.

CV-31381	/ CV-31202	FO
CV-31411	/ CV-31252	FC
CV-31383	/ CV-31215	FO
CV-31384	/ CV-31253	FC
CV-31226	/ CV-31230	FC
CV-31255	/ CV-31279	FC
CV-31326	/ CV-31347	FC
CV-31339	/ CV-31430	FC
CV-31203	/ CV-31216	FO
CV-31204	/ CV-31217	VCT
CV-31205	/ CV-31251	VCT
CV-31330	/ CV-31422	FC
CV-31210	/ CV-31222	FC
CV-31333	/ CV-31424	VCT
CV-31089	/ CV-31102	FC
CV-31084	/ CV-31107	FC

21. Provide a failure analysis which verifies that a single failure does not impair the primary and backup fire suppression capabilities. The analysis should include consideration of failures in the suppression system, the fire detection system or the power sources for such systems.

RESPONSE

The fire system consists of three pumps plus cross over piping from the cooling water system. Two pumps are assigned to normal fire duty - one electric and one diesel. The third pump is normally used for screen wash duty, but when the isolation valve between screen wash and fire header is opened, the screen wash function is automatically isolated.

The plant is circled with a 10" pipe loop with yard valves providing sectional control. A 10" plant header is provided and it has sectional valves to isolate turbine/auxiliary buildings east/west and north/south.

Power supplies to equipment are as follows:

1. Motor driven fire pump - 480 volt non-safeguard bus (incorrectly listed as a safeguards supplied load in earlier submittal)
2. Diesel driven - dual loop battery starting. Controller and battery charger powered by DC panel 117 (a safeguard bus).
3. Screen wash pump - 4160 volt - Bus 23 from 2M or 1R transformers.
4. Detection system is powered from non-interruptable panel 116 which in turn is powered from safeguard bus 16.

22. Describe the means provided to prevent lightning from initiating fires which could damage safety-related equipment. Describe the means provided to prevent lightning from damaging the fire protection system.

RESPONSE

Lightning strikes to date have all been to secondary plant equipment or the plant substation. The major plant buildings were analyzed for and are protected against strikes by rods and grounding systems. Safeguards and fire protection equipment is located within the reinforced concrete areas of the main plant and the screenhouse.

23. Identify any safety-related systems or their auxiliaries which are interlocked to and could be disabled by operation of a fire fighting system.

RESPONSE

Crossovers between the cooling water system and fire systems are fitted with check valves and isolation valves. Seven of the eight valves are normally closed with the eighth, a 3" line in the screenhouse, open under Shift Supervisor control. Normally the plant has operated with this valve open. Operation of the fire system would have no effect on the cooling water system with this one valve open.

24. Identify the areas containing combustible liquids that are not provided with floor drains. Describe the drainage path and provisions for containing or diverting the combustible liquid in those areas without drains. In those areas with drains, state the capacity and location of the drain reservoirs and describe the provisions to prevent the spread of flammable liquid fires via the drain system in areas which may jeopardize safety-related equipment.

RESPONSE

Originally the D/G rooms had floor drains, but because of the possibility of chromates used in the diesel cooling system reaching the circulating water system and river, the lines were plugged.

Sumps are provided of approximately 3800 cu ft around each diesel. Over flowing of the sump would allow water to run out doors to the service building sumps.

The cable spreading room and auxiliary building drains go to the aireated drain tank located in a large concrete enclosed sump below the ground level of the auxiliary building. The aireated tank has a 600 gallon capacity. Two pumps of 20 gpm each, pump from the tank to the waste holdup tank which has a capacity of 25000 gallons. If the tank over-flows, two additional 20 gpm pumps are provided to take suction from the sump and pump it to the holdup tank.

Battery and safeguard bus rooms do not have drains. Water would run out of the doors ending up in the turbine room sump. Water used in the control room would seep into the area below the false floor. When this area is filled, it would run out of the doors to the turbine room sump. Level in the turbine room sump is controlled by two 250 gpm pumps which discharge to the circulating water system. From the diesel cooling water pump rooms, water can flow to the strainer room which has drains, or to a trench (9" x 9" x 48"), which drains to the screenhouse intake.

25. Provide the results of an analysis which shows that the fire barrier penetration seals for pipe penetrations and ventilation ducts are adequate to prevent the spread of smoke fire through the barrier considering the combustible loading and possible air pressure differential.

RESPONSE

Flamemastic and thermal insulating wool (TIW) seals are used for all penetrations of rated walls and are considered adequate. A study of ventilation ducts through fire zone walls has been completed. In several areas where dampers were installed for one unit, they were not installed in the other. Purchase orders for engineering, purchase, and installation of dampers for deficient areas have been written. Depending on the contractor's schedule, we expect to have these dampers installed shortly after the first of the year.

We have been unable to locate qualification test results for the flamemastic-TIW seals in use at Prairie Island.

26. Provide the results of an analysis that shows that curbed areas surrounding combustible liquid tanks (can hold the contained liquid) plus the quantity of water required for extinguishment of a fire involving the combustible liquid.

RESPONSE

The only areas in the plant which have curbed restrictions around combustible liquid tanks are the oil storage room and the turbine oil reservoir tanks. These areas drain to a concrete underground vault, designed to handle the contents of the tanks and the water from the deluge spray system installed to protect them.

The only safeguard areas with combustible liquid tanks are the diesel generator and diesel cooling water pump rooms. The diesel generator rooms have sumps of greater capacity than the day tanks, and the diesel cooling water pump rooms have drains.

27. Identify all piping containing flammable gas or combustible liquid which is routed through areas containing safety-related equipment, safety-related cables or though which personnel must pass to reach safety-related equipment for local operation. Provide an analysis to show that a fire involving the liquid or gas will not prevent safe shutdown or result in the loss of function of a safety-related system.

RESPONSE

One oxygen (3/4") and one hydrogen line (1") pass from the gas house through the east end of the turbine building into the auxiliary building through fire zone 58 and part of 73. Pipes are routed over walkways in pipe runs and not over equipment or cables used for normal shutdown. The hydrogen line is fitted with a security (high flow) shut off, the oxygen line is a low volume, low pressure supply to recombiner system that has a manual emergency shut off in a separate fire zone. The importance of isolating these pipes, due to a fire or other plant problems, is stressed in operator training classes on the gas system.

28. Describe the means provided to automatically and/or manually stop the transfer of diesel oil from the bunker tanks to all diesel fuel day tanks in the event of a fire in the area housing the day tank, or through which the fuel oil transfer piping is routed.

RESPONSE

The pump selector switches are located within each diesel room, but at the opposite end of the room from the day tanks. If entry into the room was not possible, the pumps can be stopped by opening breakers in a different fire zone, or the isolation valves from the storage tanks can be closed. Storage tanks are located underground outside the main plant. All piping is underground until it reaches the diesel room.

29. In all the areas where manual fire fighting is proposed as either primary or backup means of suppression, describe the methods which would be used for heat and smoke removal using either fixed or portable air handling equipment. If the plant HVAC systems are proposed for such service, provide design data to show that these systems are rated for the conditions (temperature and capacity) required when used for this service.

RESPONSE

The turbine building has roof exhaust fans as well as smoke hatches that are fitted with automatic releases. The probability of losing both the turbine room supply and vent fans is very small due to the very light or non-existant combustible loading in their immediate areas.

The auxiliary building has no automatic venting hatches. The installed ventilation equipment, although not designed for heat and smoke removal, has the capability to function in that mode. It is the opinion of vendor and plant personnel that this equipment will function in an emergency, and operate until there is damage to the equipment, most probably a bearing failure. There are dual auxiliary building normal exhaust fans. Loss of one fan would not affect the other resulting in a single operating fan exhausting the entire auxiliary building.

30. Describe the manner in which fire and smoke are prevented from spreading from areas via the normal and emergency ventilation systems in all parts of the plant areas. Describe the location, acutation method and fire ratirg of dampers used for fire and smoke control in both air supply and return air systems. Describe the details of interlocks for ventilation system shutdown or mode change that can be utilized for fire and smoke control.

RESPONSE

It is assumed that during a fire in the auxiliary building, the ventilation system will be shut down or isolated in affected areas. During this period smoke will spread to other areas on the same level as well as upper levels where stairways are not enclosed. The ventilation system can be started up and run as necessary once the fire is under control.

The safeguard rooms in the turbine building are or will be fitted with dual 1-1/2 hour rated fire dampers. Once the dampers are actuated, portable fans will be used for smoke removal. There are no automatic interlocks provided in this design.

31. Identify the areas where ventilation system power supplies or controls are located within the areas they serve. Provide the basis for leaving ventilation systems power and control cables within the area they serve.

RESPONSE

Ventilation system power cables and controls are located near their associated fans in areas of the plant with trivial fire loading.