UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

APR 9 1975

Northern States Power Company
ATTN: Mr. Leo Wachter
Vice President
Power Production and System
Operation
414 Nicollet Mall
Minneapolis, Minnesota 54401

Docket No. 50-263
Docket No. 50-282
Docket No. 50-306

Gentlemen:

The attached preliminary account of the Browns Ferry fire is forwarded to you for information. We hope it will assist you in planning and training activities.

Sincerely yours,

Gaston Fiorelli, Chief
Reactor Operations Branch

Enclosure:
As stated

bcc: Central Files
IE Files
PDR
Local PDR
J. G. Keppler
A. Roisman
OGC, Beth, P-506A

BROWNS FERRY FIRE 3/22/75

A. The following safety features and critical instrumentation functioned initially and throughout the fire, including the cooldown period for Unit 1.

SAFETY FEATURES

1. All safety valves
2. Safety Relief Valves (all operable on auto, only 4 on manual)
3. Reactor Protection System. (prevents any rod withdrawal)
4. Control rod drive pumps. (Pumps water into the reactor vessel)
5. Emergency Electrical Power (3 of 4 diesel generators, on manual control only)
6. Reactor (Primary) Containment
7. Reactor Building Vent System
8. Two of the 8 Reactor Containment (Drywell) Coolers.
9. Liquid Poison reactor shutdown system.

INSTRUMENTATION

1. Reactor Vessel Pressure
2. Reactor Water Level
3. Radiation monitoring system (Partial)
4. Stack effluent radiation monitor and radwaste effluent radiation monitor.
5. One Half of Rod Position Indication System

B. The following safety features and critical instrumentation functioned initially and throughout the fire, including the cooldown period for Unit 2.

SAFETY FEATURES

1. All Safety Valves
2. All Safety Relief Valves (auto controls)
3. Reactor Protection System
4. Control Rod Drive Pumps
5. Emergency Electrical Power (3 of 4 diesel generators, on manual control only, these are same as ones listed above)
6. High Pressure Coolant Injection System
7. Reactor Core Isolation Cooling System
8. One of the Two Core Spray Systems (there are 2 pumps in each system)
9. Low Pressure Coolant Injection System (2 of 4 pumps)
10. Reactor (Primary) Containment
11. Reactor Building Vent System
12. 2 of the 4 pumps in the Residual Heat Removal System (one needed for shutdown cooling)
13. Reactor Containment (Drywell) Coolers
14. Liquid Poison Reactor Shutdown System

INSTRUMENTATION

1. Reactor Vessel Pressure
2. Reactor Water Level
3. Rod monitoring System.

4. Stack effluent radiation monitor and radwaste effluent radiation monitor.
5. Rod Position Indication System
6. Nuclear Instrumentation
7. Suppression Chamber level and temperature
8. Drywell pressure and temperature

C. The following features and control instrumentation were inoperative all or part time during the incident for Unit 1.

SAFETY FEATURES

1. All auto and remote control of the Emergency Core Cooling System
2. Manual control of all except 4 relief valves

INSTRUMENTATION

1. All nuclear Instrumentation
2. Suppression chamber level and temperature
3. Drywell pressure
4. One Half of the rod position indication system. (lost after it had been verified that all rods were in following the scram)
5. Area radiation monitors in the vicinity of the fire
6. Reactor building continuous air monitor and area monitor.
7. Turbine building continuous air monitor.

D. The following safety features were inoperative all or part time during the incident for Unit 2.

1. Two of the four pumps in the residual heat removal system. (the system was functional)
2. One of the two core spray systems (there are two pumps in each system)
3. Manual Control on all relief valves during part of the time.

E. The Unit 1 reactor was cooled during the incident as follows:

12:51 p.m. - The reactor was scrammed manually. The high pressure coolant injection system (HPCI) and the reactor core isolation cooling system (RCIC) started automatically. The normal water sources which include 3 feedwater pumps and the control rod drive pumps were operating. Since the flow of all the normal water sources was more than necessary, all of the above were shutdown except one feedwater pump and the control rod drive pumps.

1:03 p.m. - The main steam isolation valves closed and could not be reopened. These valves shut off steam flow to the feedwater pumps, which are turbine driven, leaving only the control rod drive pumps operable. By this time control of the HPCI and RCIC systems had been lost and they could not be restarted. It was necessary to depressurize the reactor in order to use the condensate booster pumps (350 psi output pressure) for core cooling and to maintain reactor level. This was done manually using the safety relief valves 4 of which were controllable.

During the depressurization the reactor water level dropped from the normal level of about 200 inches above the fuel to 46 inches above the fuel. (The large drop in level was due to the steam released through the relief valves while bringing the system down from operating temperature to the saturation temperature at 350 psi.) When the booster pumps were started the water level was restored to 200 inches above the fuel.

1:30 a.m. - Suppression pool cooling by the residual heat removal system was established.

4:10 a.m. - Normal shutdown cooling of the reactor was established using the residual heat removal system. Part of the residual heat removal system continued to be used to cool the suppression pool as necessary.

F. The Unit 2 reactor was cooled during the incident as follows:

1:00 p.m. - A reactor scram (shutdown) and main steam isolation valve closure occurred simulataneously. Since this shuts off steam to the feedwater turbines, the reactor core isolation cooling (RCIC) system and the high pressure coolant injection system (HPCI) were started manually (Note: The RCIC system alone can provide the necessary water to maintain the normal level. The HPCI system, which is driven by reactor steam, was used, in this instance, only as a means of venting steam.) There was no difficulty controlling water level in this reactor at any time.

2:00 p.m. - The reactor was depressurized to 350 psi through relief valves to the suppression pool. (One of the relief valves was suspected to be stuck open during part of this time.

3:00 p.m. - Suppression pool cooling was started using the residual heat removal system.

4:00 p.m. - A condensate and booster pump was put into use suppling required makeup water to the reactor. Shortly after this, cooling of the reactor using the residual heat removal system was started.

G. Additional means of cooling both reactors were available (if cooling described in E and F above had failed) as follows:

1. Two additional condensate booster pumps were available. If the one was lost, the other two were available for reactor makeup. The operators could also have dropped pressure to under 150 psig and used one or more of three condensate pumps.

2. As a last resort river water is available by use of two service water pumps. Although control power was lost, the two valves are located in the reactor building in a place where manual operation is possible if needed.

   If offsite power had been lost, the condensate booster pump would be momentarily lost while manual transfer switches were thrown to the emergency diesel generators.

   Three emergency diesel generators were available, and were kept on running standby.