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DESCRIPTION:
Ltr re our 4-4-74 ltr & their 4-26-74 submittal, furnishing additional information regarding "Prompt Relief Trip System"........

ENCLOSURES:

DO NOT REMOVE

ACKNOWLEDGED

PLANT NAME: Monticello

FOR ACTION/INFORMATION 5-16-74 GC

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Regulatory Docket File

NSP

NORTHERN STATES POWER COMPANY

MINNEAPOLIS, MINNESOTA 55401

May 13, 1974

Mr. Dennis L Ziemann
Chief
Operating Reactors Branch #2
Directorate of Licensing
Office of Regulation
U S Atomic Energy Commission
Washington, DC 20545

Dear Mr. Ziemann:

MONTICELLO NUCLEAR GENERATING PLANT
Docket No. 50-263 License No. DPR-22

Response to April 4, 1974 Letter on Prompt
Relief Trip System

On April 26, 1974, we reported the status of the Prompt Relief Trip (PRT) system installation in a letter entitled, "Preliminary Response to April 4, 1974 Letter on Prompt Relief Trip System." The following is our response to the remaining information requested in your April 4, 1974 letter.

AEC Comment: "We have not completed our evaluation but our preliminary review of the engineering drawings for the proposed design and installation of the PRT system in the Monticello plant has revealed that the design criterion 'no more than one safety relief valve will be inadvertently actuated' is not met. A single event in the PRT cabinet can inadvertently actuate more than one safety relief valve."

Response: The PRT design criterion referenced is drawn from Page A-3 of our January 23, 1974 submittal entitled, "Permanent Plant Changes to Accomodate Equilibrium Core Scram Reactivity Insertion Characteristics." This criterion is satisfied in the present design.

In a cabinet of this type where cabling is routed to a long terminal board (or a series of small terminal boards), a single failure or event must be considered to be non-selective. This means that fire, flooding, mechanical damage, dropped tools and other "one motion" events cannot be assumed to effectively re-wire the panel. Any such event cannot provide selective multiple-jumper effects.

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Responses (Continued)

The PRT cabinet is designed such that PRT-A channel occupies the left-hand side of the cabinet and PRT-B on the right-hand side; a barrier separates the channels in accordance with IEEE 279.

Each PRT channel is equipped with a 108 connection terminal board for input and output wires. Terminal number 107 is the 125 VDC supply; terminals 48, 54, 60, 66, 73, 79, 85, and 91 are outputs to the relief valve solenoids. Normal PRT action would be effected by energizing these terminals with 125 VDC via the relays. Should two or more of the eight terminals (48, 54, 60, 66, 73, 79, 85, 91) short to the 125 VDC terminal (107), the criterion would be violated and more than one valve would be actuated. Even though the terminals are widely spaced, the shorting of them could indeed be effected by a single event. However, such widespread short circuiting action could not avoid other wires and terminals. Terminals 49, 55, 61, 67, 74, 75, 80, 81, 86, 87, 92, 93, and 108, all immediately adjacent to the eight "shorting" terminals, are connected to the negative side of the 125 VDC bus. If any one of these negative terminals is shorted to an energized output terminal (48, 54, etc.) the PRT power supply fuses would blow, thereby totally de-energizing that PRT channel. The remaining PRT channel would remain fully operational.

Because the terminals that must be shorted for multiple valve operation are widespread while the de-energizing termials are adjacent, no credible shorting event can be postulated that would short the one set without shorting to the other.

Other terminals with the same type spacing and inter-relay shorts to power could also cause multiple valve openings; however, these require even more difficult wire selections and have not been listed. Similarly, single events involving multiple wire conduits and trays must be considered non-selective.

AEC Question: "1. State the consequences of spurious or inadvertent trip (actuation) of the PRT system concurrent with the following events:

a. Loss of coolant accident.
b. Steam line break accident.
c. Loss of offsite power.
d. Identify other accidents and transients for which inadvertent or spurious trip was analyzed."

Response: General Electric is responding to an April 26, 1974 letter from V A Moore, USAEC to J A Hinds, General Electric which asks for information closely related to the above topic. In response to the question above, an inadvertant trip of the full PRT cannot occur; the design criteria limits single-failure-caused events to the trip of one relief valve. Because the

Responses (Continued)

inadvertant opening of one relief valve requires a single failure, any accident occurring concurrently would proceed with a full complement of engineered safeguards equipment. As such, the single failure in the PRT system would be beneficial; the blowdown through the relief valve would be fully compensated by the total availability of the ECCS. A complete blowdown would not result from the inadvertant actuation; the blowdown would only proceed until the timer ran out or until reaching the low pressure set point. The loss of offsite power (loss of auxiliary load) and spurious trip (one valve) were analyzed and discussed in the January 23, 1974 submittal.

AEC Question 1, Continued: "Also, justify a PRT system whose functional response affects the reactor core and the reactor coolant pressure boundary in ways similar to the Automatic Depressurization System but does not incorporate the same protective permissives such as the ac interlocks."

Response: The PRT and ADS should not be considered to be similar because they perform different functions. The PRT is designed to respond to abnormal operational transients which are classified as "upset" conditions. The ADS is designed to respond to accident situations classified as "emergency" conditions. The probability of the two types of events and the consequences of their occurrence differ by several orders of magnitude.

Analyses of upset events are provided in all FSAR's; the consequences of these events and the system action (such as PRT) associated with them are within the normal operational boundaries associated with plant operation. Events classified as "emergency" are also analyzed in the FSAR's but fall within the accident boundaries defined by 10 CFR 100.

The level of protection provided in the form of permissives is commensurate with the event classification and consequences for both PRT and ADS.

This relationship was discussed at length in the February and March meetings among representatives of Northern States Power, General Electric and the AEC Staff.

AEC Question 2: "State your justification for a PRT design that is actuated unnecessarily each time a loss of Reactor Protection System Voltage occurs."

Response: The simultaneous loss of both reactor protection system power supplies will not unnecessarily actuate the PRT system unless the plant is operating at greater than 70% of rated power.

Responses (Continued)

The circuit diagrams reviewed at the February and March meetings show that both reactor protection system power supplies must fail (double failure) to cause inadvertant PRT actuation via the RPS. The failure of one RPS supply will not actuate PRT.

A loss of off-site power would result in the loss of both RPS MG sets and a trip of the PRT. This, however, would be the correct PRT action; loss of off-site power (analyzed with loss of auxiliary power in the January 23, 1974 submittal) causes a turbine trip which, by design, causes a PRT actuation.

AEC Question 3: "Submit a Failure Mode Effects Analysis for the PRT system. Specifically address the consequences of a single failure to (1) cause spurious PRT actuation and (2) prevent PRT actuation."

Response: In accordance with the PRT Design Criteria, no single failure in the PRT system is capable of (1) causing a spurious PRT actuation or (2) preventing PRT actuation.

Except for PRT cabinet events discussed above, (the validity of this type event being classified as a single failure remains in question) only one PRT-controlled safety/relief valve is capable of spurious actuation or inability to operate as a consequence of a single failure. The effects of such events have been analyzed and reported in the January 23, 1974 submittal. In this regard, IEEE 279 and 379 have been applied in the design.

A formal Failure Mode Effects Analysis is underway. Because of the extent of the required analysis, at least three months will be required for completion.

AEC Question 4: "Submit the results of the environmental and seismic qualification tests of equipment employed in the PRT system. Include the environmental qualification of the cabling and qualification of terminals located within the drywell or other regions where a high energy line break could occur."

Response: All components, equipment, and cabling employed in the PRT systems are qualified to the same standards as the equivalent materials used in the RPS. Because the RPS meets the necessary environmental and seismic standards, the PRT satisfies the same standards. In particular, the following IEEE codes have been met for the PRT system equipment: 279, 308, 323, 338, 344, 379.

Selection of equipment for the PRT system was made from sources for which satisfaction of these codes has been previously documented.

AEC Question 5: "The on-line testability provisions proposed by GE merely represent a continuity test and are not acceptable. Since PRT is a new system, the Regulatory Guide 1.22 recommendations should be considered in its design."

Response: The PRT system is intended to mitigate the consequences of "upset" conditions that are serious events that lie within the design envelope of the plant. On-line testing of the PRT would result in effects that, while acceptable from a design standpoint, are not desirable from an operational standpoint.

The testability designed into the PRT verifies the logic and operability of all components except operation of the safety/relief valve solenoids; however, solenoid continuity is verified. Solenoid operability is verified at the safety/relief valve following valve maintenance and at each major refueling outage. Valve operability is verified by manually opening the valve when the reactor is pressurized following valve maintenance or a major refueling outage. Our March 1, 1974, proposed Technical Specification changes discuss surveillance testing in detail.

The combination of the PRT test and manual relief valve actuation verify total system functional capability in a manner that satisfies the intent of Regulatory Guide 1.22 without introducing undue operational inconviencies.

AEC Question 6: "Since full opening of five or six relief valves for short time intervals is necessary following some abnormal operating transients to stay within fuel thermal design limits, describe the methods that are to be used by NSP to ascertain that the system has operated according to design and that the relief valves passed sufficient steam following each PRT activation and before returning to power, i.e., what assurance will be provided prior to returning to power that the core has not violated a design limit?"

Analyses presented in our January 23, 1974 submittal shows that the design limits will not be violated for the most severe operational transient postulated. The analyses assume numerous conservatisms; the transients as analyzed, appear much more severe than anticipated in reality. On March 1, 1974, we proposed Technical Specifications for the PRT system surveillance requirements which are designed to assure a high level of reliability comparable to other similar plant systems. Through the use of redundant channels and a thorough surveillance test program, we have sufficient assurance that the PRT system will operate properly when required and that no design limits will be exceeded during a transient.

Responses (Continued)

The safety limit of most interest, is the minimum critical heat flux ratio. Since there is no means of measuring MCHFR directly, we are presently required by Technical Specification 2.1.C.1 to demonstrate through indirect means, that the limit was not exceeded during a transient. We are presently preparing a Technical Specification change request to incorporate the "primary sensor" concept approved for recently licensed BWR's. We plan to submit this Technical Specification change request prior to implementing and taking credit for the PRT system.

In the normal scram recovery process, numerous charts and logs are reviewed to assure that safe conditions exist for the return to power. The sequence of events log from the plant process computer, is especially useful at these times. While the plant process computer is not a safety grade data retrieval system, it is a very useful operator's tool for reviewing and analyzing events surrounding the scram. Sufficient instrumentation is available to monitor critical parameters verifying Technical Specification compliance for return to power following a scram, in the event of a process computer outage simultaneous with a plant transient. The PRT system is designed to hold open six safety/relief valves for five seconds or until reaching the low pressure setpoint following a turbine stop valve closure or control valve fast closure at elevated power levels. The relief valves should continue to stay open only if reactor pressure is above the reset setpoint. The reactor pressure transient can be re-constructed from data collected. Pressure switches at the valve discharge have been added as inputs to the Monticello process computer to indicate the time of opening and closing of each of each of the 8 safety/relief valves. Analyses of this information will tell the operator how each valve has responded to the transient.

Yours very truly,

L. O. Mayer

L O Mayer, PE
Director of Nuclear Support Services

LOM/MHV/lh

cc: J G Keppler
G Charnoff
Minnesota Pollution Control Agency
Attn. E A Pryzina