Distribution
Docket
ORB #3
Local PDR
NRC PDR
TIppolito
SSheppard
RBevan
Attorney, OELD
OI&E (3)
DEisenhut
TBAbernathy
JRBuchanan
ACRS (16)

AUGUST 7 1978

Docket No. 50-263

Northern States Power Company
ATTN: Mr. L. O. Mayer, Manager
Nuclear Support Services
414 Nicollet Mall - 8th Floor
Minneapolis, Minnesota 55401

Gentlemen:

During the review of the E. I. Hatch Unit 2 nuclear power plant (Docket No. 50-366), the NRC Staff identified certain specific deficiencies in the design of the voltage regulator system of the motor generator sets which supply power to the reactor protection system, as follows:

(1) there were potential undetectable single component failures which could adversely affect the operability of the reactor protection system; and

(2) there is a postulated sequence of component malfunctions initiated by an earthquake which could adversely affect the operability of the reactor protection system.

Both of these deficiencies are described in greater detail in attachment (2) to this letter, which is an extract from the Hatch 2 Safety Evaluation Report (NUREG-0411).

We determined in the course of the Hatch 2 review that the safety problems associated with the postulated single failure could be remedied by additional surveillance; specifically, by assuring that the output voltage of each reactor protection system motor-generator is checked to be within ± 10% of the nominal value, approximately every eight hours. Requirements for such surveillance were imposed as part of the Hatch 2 Technical Specifications (Attachment 3).

Accordingly, provided the surveillance set forth in Attachment 1 is carried out, there is reasonable assurance that a facility using a system such as that used at Hatch 2 can be operated without endangering public health and safety.

For Hatch 2, the licensee requested and was granted an exemption from seismic design requirements for the period necessary to obtain and install qualified components.

CC

OFFICE						
SURNAME	9102110409 780807 PDR ADOCK 05000263 P PDR					
DATE						

NRC FORM 318 (9-76) NRCM 0240 ☆ U. S. GOVERNMENT PRINTING OFFICE: 1976 — 626-624

Our records show that your reactor protection system power supply system is of the same general design as that at Hatch 2. However, it is not clear from such information whether the components actually installed at your facility have the same qualification as those used at Hatch 2. Moreover, it is not completely clear that system interaction for your systems will have the same adverse characteristics as that identified at Hatch 2.

For these reasons, you are hereby requested, pursuant to 10 CFR § 50.54(f), to evaluate your reactor protection system power supply in light of the information set forth in Attachment 2 to determine: whether there is potential for undetected single failures to adversely affect the reactor protection system, and whether there is a potential for the postulated sequence of events initiated by an earthquake which could adversely affect the reactor protection system. Your report should be filed within 60 days of the date of this letter. If you identify any necessary or desirable facility modifications or Technical Specification changes, proposals to implement such modifications or changes should accompany your report.

In the interim, promptly upon receipt of this letter, you should commence surveillance of the reactor protection system power supply as set forth in Attachment 1 hereto. Such surveillance should be continued until otherwise directed or authorized by NRC.

Sincerely,

Original signed by

Thomas A. Ippolito, Chief
Operating Reactors Branch #3
Division of Operating Reactors

Enclosures:
1. Surveillance Program
2. Extract from Safety Evaluation Report
3. Extract from Hatch 2 Technical Specifications

cc w/enclosures:
See next page

OFFICE	ORB #3	ORB #3				
SURNAME	Kevan:mjf	Ippolito				
DATE	8/ \ /78	8/ 1 /78				

cc
Gerald Charnoff, Esquire
Shaw, Pittman, Potts and
Trowbridge
1800 M Street, N. W.
Washington, D. C. 20036

Arthur Renquist, Esquire
Vice President - Law
Northern States Power Company
414 Nicollet Mall
Minneapolis, Minnesota 55401

Mr. L. R. Eliason
Plant Manager
Monticello Nuclear Generating Plant
Northern States Power Company
Monticello, Minnesota 55362

Russell J. Hatling, Chairman
Minnesota Environmental Control
Citizens Association (MECCA)
Energy Task Force
144 Melbourne Avenue, S. E.
Minneapolis, Minnesota 55414

Mr. Kenneth Dzugan
Environmental Planning Consultant
Office of City Planner
Grace Building
421 Wabasha Street
St. Paul, Minnesota 55102

Sandra S. Gardebring
Executive Director
Minnesota Pollution Control Agency
1935 W. County Road B2
Roseville, Minnesota 55113

Mr. Steve Gadler
2120 Carter Avenue
St. Paul, Minnesota 55108

Anthony Z. Roisman
Natural Resources Defense Council
917 15th Street, N. W.
Washington, D. C. 20005

The Environmental Conservation Library
Minneapolis Public Library
300 Nicollet Mall
Minneapolis, Minnesota 55401

Attachment 1

Surveillance Program

(1) The output voltage and current of each reactor protection system motor-generator set shall be logged once per shift;

(2) A motor-generator set shall be removed from service if the output voltage is not within ±10% of its nominal valve and cannot be adjusted to fall within this band;

(3) The protective over-voltage and under-voltage relays and the under-frequence relay shall be calibrated initially at least once every six months, and after an operating basis earthquake. The tripping logic and the generator output breaker shall be functionally tested as a part of the calibration of these relays. The voltage setpoints shall be within the range specified in Requirement (2) above and the frequency setpoint shall be greater than or equal to 57 Hertz; and

(4) A protection system functional test shall be conducted upon discovery of a condition beyond the limits of Requirement (2) above. This test shall include all Class 1E loads which are connected to the buses.

Attachment 2

Extract From Safety Evaluation Report

Related to Operation of E. I. Hatch Nuclear Plant,

Unit 2, Docket 50-366, June 1978

The design of the Hatch Unit 2 reactor protection system power supply is essentially the same as that of previously-licensed BWR reactors. The protection system power supply consists of two high-inertia alternating current motor-generator sets.

During our review of the Hatch Unit 2 operating license application, we questioned the adequacy of protection afforded Class IE reactor protection system against possible sustained over-voltage or under-voltage conditions from the non-Class IE reactor protection system power supply. Specifically, we questioned the capability of the reactor protection system power supply to accommodate (1) postulated single failures and (2) the effects of earthquakes without jeopardizing the capability of the reactor protection system to perform its intended safety function.

Criterion 21 of the General Design Criteria requires in part that the redundancy and independence designed into the reactor protection system be sufficient to assure that no single failure results in loss of the protection function. In applying the single failure criterion to a specific design, we assume that all potential undetectable failures are in their failed mode (Appendix 7A of the Standard Review Plan) before the occurrance of the postulated detectable single failure which (in a system meeting the single criteri) will not disable the protection function. Fo' the Hatch Unit 2 reactor protection system power supply, a single undetected failure of an output voltage sensor for either motor-generator set could be postulated that would allow the generator output voltage to remain outside the voltage rating (range) of the connected Class IE loads. Such an abnormal voltage, resulting from a possible failure in the motor-generator set voltage regulating circuitry, if persisting for a sufficient time, could result in damage to the reactor protection system components with the attendant potential loss of capability to scram the plant.

IEEE Standard 379-1977, "IEEE Standard Application of the Single-Failure Criterion to Nuclear Power Generating Station IE Systems," provides that an otherwise undetectable failure may be deemed detectable by means of appropriate surveillance and/or testing. To ensure that failure of the non-Class IE reactor protection system power supply will not cause adverse interaction to the Class IE reactor protection system, the following requirements will be included in the Technical Specifications to ensure the timely detection of failures due to sustained over-voltage or under-voltage conditions:

(1) The output voltage and current of each reactor protection system motor-generator set shall be logged once per shift;

(2) A motor-generator set shall be removed from service if the output voltage exceeds 132 volts AC or is less than 108 volts and cannot be adjusted to fall within this band;

(3) The protective over-voltage and under-voltage relays and the under-frequency relay shall be calibrated before initial plant startup, at least once every six months, and after an operating basis earthquake. The tripping logic and the generator output breaker shall be functionally tested as a part of the calibration of these relays. The voltage setpoints shall be within the range specified in Requirement (2) above and the frequency setpoint shall be greater than or equal to 57 Hertz; and

(4) A protection system functional test shall be conducted upon discovery of a condition beyond the limits of Requirement (2) above. This test shall include all Class IE loads which are connected to the buses.

We conclude that these Technical Specification requirements will ensure the timely detection of failures due to sustained over-voltage or under-voltage conditions. We also conclude that with these Technical Specification requirements, the reactor protection system power supply conforms to the provisions of IEEE Standard 379-1977 and, therefore, satisfies the applicable requirements of Criterion 21 of the General Design Criteria.

Criterion 2 of the General Design Criteria requires in part that systems important to safety, such as the reactor protection system, be designed to withstand the effects of earthquakes. The Hatch Unit 2 reactor protection system is a Class IE system, hence it is seismic Category I. The reactor protection system power supply, however, is not seismically qualified. We have determined that a sequence of events initiated by an earthquake can be postulated which could result in damage to the reactor protection system components with the attendant potential loss of capability to scram the plant. This sequence of events includes (a) the occurrence of an earthquake that would cause the undetected failure of a voltage sensor, (b) the failure of the motor-generator set resulting in abnormal output voltage, (c) persistence of the abnormal output voltage undetected by visual observation and surveillance testing for a time sufficient to damage reactor protection system components, and (d) failure of these components in such a manner that results in loss of scram capability (instead of in the fail-safe mode).

Therefore, we require that, prior to startup following the first scheduled refueling outage, the applicant install a Class IE system approved by us capable of de-energizing the reactor protection system power supply when its output voltage exceeds or falls below limits within which the equipment being powered from the power supply has been designed and qualified to operate continuously and without degradation. With such a system, the reactor protection system power supply design will be in conformance with the applicable requirements of Criterion 2 of Appendix A to 10 CFR Part 50. The operating license will be conditioned accordingly.

Extract from Hatch 2 Technical Specifications

ELECTRICAL POWER SYSTEMS

3/4.8.2 ONSITE POWER DISTRIBUTION SYSTEMS

A.C. DISTRIBUTION - OPERATING

LIMITING CONDITION FOR OPERATION

3.8.2.1 The following A.C. distribution system buses, inverters and motor-generator (MG) sets shall be OPERABLE with breakers open between redundant buses:

a. 4160 volt Essential Buses 2E, 2F and 2G,

b. 600 volt Essential Buses 2C and 2D,

c. 120/208 volt Essential Cabinets 2A and 2B,

d. 120/208 volt Instrument Buses 2A and 2B,

e. A.C. inverters 2R44-S002 and 2R44-S003, and

f. If in service, Reactor Protection System instrumentation MG sets 2A and 2B.

APPLICABILITY: CONDITIONS 1, 2 and 3.

ACTION:

a. With one of the above required A.C. distribution system buses or inverters inoperable, restore the inoperable bus or inverter to OPERABLE status within 8 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

b. With two or more of the above required A.C. distribution system buses or inverters inoperable, restore at least all except one of the inoperable buses and inverters to OPERABLE status within 2 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

c. With RPS instrumentation MG set 2A and/or 2B voltage outside the range of 108 to 132 VAC, demonstrate the OPERABILITY of all equipment which could have been subjected to the abnormal voltage for all Class 1E loads connected to the associated bus(es) by performance of a CHANNEL FUNCTIONAL TEST or CHANNEL CALIBRATION, as required, within 24 hours.

d. With RPS instrumentation MG set 2A and/or 2B inoperable, restore the inoperable MG set(s) to OPERABLE status within 30 minutes or remove the inoperable MG set(s) from service.

A.C. DISTRIBUTION - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.8.2.2 As a minimum, the following A.C. distribution system buses, inverters and motor-generator (MG) sets shall be OPERABLE:

a. Two 4160 volt Essential Buses, 2E, 2F and/or 2G,

b. One 600 volt Essential Bus, 2C or 2D,

c. One 120/208 volt Essential Cabinet, 2A or 2B,

d. One 120/208 volt Instrument Bus, 2A or 2B,

e. A.C. inverters 2R44-S002 and 2R44-S003*, and

f. If in service, Reactor Protection System instrumentation MG sets 2A and 2B.

APPLICABILITY: CONDITIONS 4 and 5.

ACTION:

a. With less than the above required A.C. distribution system buses and inverters OPERABLE, suspend all operations involving CORE ALTERATIONS, irradiated fuel handling, positive reactivity changes or operations that have the potential of draining the reactor vessel. The provisions of Specification 3.0.3 are not applicable.

b. With RPS instrumentation MG set 2A and/or 2B voltage outside the range of 108 to 132 VAC, demonstrate the OPERABILITY of all equipment which could have been subjected to the abnormal voltage for all Class 1E loads connected to the associated bus(es) by performance of a CHANNEL FUNCTIONAL TEST or CHANNEL CALIBRATION, as required, within 24 hours.

c. With RPS instrumentation MG set 2A and/or 2B inoperable, restore the inoperable MG set(s) to OPERABLE status within 30 minutes or remove the inoperable MG set(s) from service.

SURVEILLANCE REQUIREMENTS

4.8.2.2 At least the above required A.C. distribution system buses, inverters and MG sets shall be determined OPERABLE per Specifications 4.8.2.1.1 and 4.8.2.1.2.