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September 23, 1992

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: McGuire Nuclear Station Unit 2
Docket No. 50-370
Licensee Event Report 370/92-10

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report 370/92-10 concerning a Reactor Trip as a result of an equipment failure. This report is being submitted in accordance with 10 CFR 50.73 (a) (2) (iv). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

T.C. McMeekin

TLP/bcb

Attachment

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Washington, D.C. 20555

Mr. P.K. Van Doorn
NRC Resident Inspector
McGuire Nuclear Station





IE22
1/1

# LICENSEE EVENT REPORT (LER)

| FACILITY NAME(1) | DOCKET NUMBER(2) | PAGE(3) |
|---|---|---|
| McGuire Nuclear Station, Unit 2 | 05000 370 | 1 OF 8 |

TITLE(4) Unit 2 Experienced A Reactor Trip/Turbine Trip As A Result Of An Equipment Failure

| EVENT DATE(5) | | | LER NUMBER(6) | | | REPORT DATE(7) | | | OTHER FACILITIES INVOLVED(8) | |
|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | MONTH | DAY | YEAR | FACILITY NAMES | DOCKET NUMBER(S) |
| | | | | | | | | | N/A | 05000 |
| 08 | 24 | 92 | 92 | 10 | 0 | 09 | 23 | 92 | | 05000 |

| OPERATING MODE(9) | 1 | THIS REPORT IS SUBMITTED PURSUANT TO REQUIREMENTS OF 10CFR (Check one or more of the following)(11) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| POWER LEVEL(10) | 100% | | 20.402(b) | | 20.405(c) | X | 50.73(a)(2)(iv) | | 73.71(b) |
| | | | 20.405(a)(1)(i) | | 50.36(c)(1) | | 50.73(a)(2)(v) | | 73.71(c) |
| | | | 20.405(a)(1)(ii) | | 50.36(c)(2) | | 50.73(a)(2)(vii) | | OTHER (Specify in Abstract below and in Text) |
| | | | 20.405(a)(1)(iii) | | 50.73(a)(2)(i) | | 50.73(a)(2)(viii)(A) | | |
| | | | 20.405(a)(1)(iv) | | 50.73(a)(2)(ii) | | 50.73(a)(2)(viii)(B) | | |
| | | | 20.405(a)(1)(v) | | 50.73(a)(2)(iii) | | 50.73(a)(2)(x) | | |

LICENSEE CONTACT FOR THIS LER(12)

| NAME | TELEPHONE NUMBER | |
|---|---|---|
| | AREA CODE | |
| Terry L. Pedersen, Manager, McGuire Safety Review Group | 704 | 875-4487 |

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT(13)

| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NPRDS | | CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NPRDS | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AS | HBC | ICNTRL | W120 | YES | | | | | | | |
| | | | | | | | | | | | |

| SUPPLEMENTAL REPORT EXPECTED(14) | | EXPECTED SUBMISSION DATE(15) | MONTH | DAY | YEAR |
|---|---|---|---|---|---|
| | YES (If yes, complete EXPECTED SUBMISSION DATE) | X NO | | | |


ABSTRACT (Limit to 1400 spaces, i.e. approximately fifteen single-space typewritten lines (16)

On August 24, 1992, at 1002 46, while operating in Mode 1 (Power Operation) at 100 percent power, Unit 2 experienced a Reactor Trip/Turbine Trip on Overtemperature Delta Temperature (OTDT). The initiating event was the loss of Main Generator excitation caused by a failed indicating lamp in the circuit for the Generator Field Breaker. The contacts on the indicating lamp base shorted electrically during an attempt to change the lamp. This caused the Field Breaker to open which caused the anticipatory protection circuit to pick up and; therefore, the Generator Power Circuit Breakers (PCBs) to open, initiating a full load rejection. Runback from the load rejection was not successful. No load conditions were achieved in approximately 30 minutes. This event has been assigned a root cause of Equipment Failure, due to failure of the indicating lamp associated with the circuit for the Generator Field Breaker. The indicating lamp and associated switch were replaced and appropriate measures will be taken to evaluate use of a different type lamp in an attempt to prevent recurrence of this problem.

EVALUATION:

Background

The Overtemperature Delta Temperature (OTDT) trip is one of nineteen Reactor [EIIS:RCT] trip inputs associated with the Reactor Protection (IPE) System [EIIS:JC]. It protects the core against Departure from Nucleate Boiling (DNB) and causes the Reactor to trip when 2 out of 4 channels [EIIS:CHA] exceed the setpoint. The OTDT trip setpoint is variable depending on the average Reactor Coolant temperature (T-ave), Pressurizer [EIIS:PZR] pressure, and axial flux difference (AFD). The setpoint provides protection against DNB over a range of temperatures and pressures. The OTDT trip setpoint is continuously calculated by solving an equation given in Technical Specification (TS) Table 2.2-1, Reactor Trip System Instrumentation Trip Setpoints.

The Protective Relaying (ERD) system [EIIS:EA] has numerous protective relaying schemes that serve as guardians to the Main Generators [EIIS:GEN], the main and auxiliary transformers [EIIS:XFMR], and the output circuits to the switchyards. Generator breakers [EIIS:52] make it possible to isolate the generator and each of its two independent output circuits from each other. This arrangement permits the ERD system on each unit to be divided into three distinctive zones of protection. These zones are designated as Zone G, Zone A, and Zone B.

Zone G includes the Main Generator Bus [EIIS:IPBU], and the two Generator Power Circuit Breakers (PCBs) [EIIS:41]. Zone G loss of generator field or excitation protection is provided by the Loss Of Field Relay 40 [EIIS:40] and by the Anticipatory Loss Of Field Protection Scheme. The relay operates on current received from the current transformers [EIIS:XCT] on the 24 thousand volt (KV) generator bus and from voltage received from the associated unit relay potentiometer. When excitation is lost and reactive power is drawn into the unit, the Loss Of Field Relay 40 will pick up and initiate the Generator Lockout Relays [EIIS:86] to isolate Zone G and shut down the respective unit. The Anticipatory Loss Of Field Protection Scheme senses one PCB closed and the corresponding Generator Field Breaker open. If such a situation occurs the circuit will then cause the PCBs to open. Indication for the Generator Field Breaker closure on the Main Control Board [EIIS:MCBD] also provides monitoring of the operation of the Trip Coil [EIIS:CL] associated with the Generator Field Breaker. The indicating lamp is in series with the trip coil and a short across the lamp base will cause the trip coil to energize.

Description of Event

On August 24, 1992, at approximately 0730, an Operations (OPS) Reactor Operator (RO) responsible for day shift operations of Unit 2, noted the indicating lamp for closed

indication of the Generator Field Breaker, was not illuminated on the Main Control Board for Unit 2. Control Room [EIIS:NA] personnel were busy at that time so the RO decided to wait until a quieter time to change the lamp. At 1000, the RO attempted to change the lamp. The first attempt was unsuccessful because the lamp removal tool slipped from the lamp. On the second attempt the breaker associated with the indication opened at 1002:36. At the same time the Unit 2 PCBs opened and the Unit 2 Condensate (CM) System [EIIS:KA] went to the full load rejection mode.

Consequently, a Unit 2 Turbine Generator Runback occurred due to the load rejection. The runback attempt was unsuccessful and an OTDT Reactor Trip occurred at 1002:46, which caused the Turbine [EIIS:TRB] to trip.

OPS Control Room personnel entered procedure EP/2/A/5000/01, Reactor Trip Or Safety Injection, to stabilize the unit. Following the trip Steam Generator (SG) [EIIS:SG] levels fell below required setpoints and the Motor [EIIS:MO] Driven Auxiliary Feedwater (CA) [EIIS:BA] Pumps [EIIS:P] started, restoring SG level to the no load value within 30 minutes. All other systems responded properly to the transient, and the plant was stabilized within 30 minutes of the Reactor Trip. The required 4 hour notification was made to the NRC at 1126, in accordance with procedure RP/0/A/5700/10, NRC Immediate Notification Requirements.

An investigation of the problem with the Generator Field Breaker Control Switch Indicator [EIIS:33], was conducted by Instrumentation And Electrical (IAE) personnel. This investigation revealed that the electrical contacts on the indicator lamp had become separated from the lamp base in the socket of the indicator. Therefore, when the RO had attempted to remove the indicating lamp the electrical contacts had shorted together causing the Trip Coil for the Generator Field Breaker to energize and thereby trip the breaker. This in turn caused the protective relaying for the Main Generator to open the PCBs, initiating a full load rejection. The runback attempt from the full load rejection was unsuccessful, and the unit tripped on OTDT. Subsequently, IAE personnel replaced the entire head of the control switch with a new head. It was also noted that there were no insulating rubber grommets present in the old control switch head. These rubber grommets would not have prevented the failure as noted in this event, but are an aid in preventing possible shorting of the indicating lamp contacts to the case of the control switch during removal or installation of lamps.

A meeting was held with McGuire Nuclear Station (MNS) Management, Engineering, IAE, OPS, and Safety Assurance personnel to discuss investigation and recovery activities associated with the trip. As a result, MNS Management personnel concluded that no outstanding problems were present to prevent unit restart. On August 25, 1992, at 0330, Unit 2 returned to Mode 1 (Power Operation).

Conclusion

This event has been assigned a cause of Equipment Failure, due to failure of an indicating lamp associated with the circuit for the Generator Field Breaker.

The contacts on the indicating lamp had become separated from the lamp base while in the socket of the control indicator switch. When the RO attempted to remove the defective lamp, the contacts shorted together causing the Trip Coil for the Generator Field Breaker to energize and the breaker to trip. The protective relaying for the Main Generator then caused the PCBs to open. This initiated a full load rejection. Subsequently, IAE personnel replaced the head of the control switch and indicating lamp as directed by work order 92063962. The indication was then functionally verified to operate correctly. Component Engineering and Electrical Engineering personnel will evaluate the feasibility of changing to a different type lamp in Cutler Hammer type indicating switches at MNS in an attempt to prevent recurrence of this problem. Also, Safety Assurance personnel generated a memorandum to all McGuire OPS, IAE, and Chemistry personnel to emphasize the need for caution and attention to detail whenever attempting to change indicator lamps in Cutler Hammer switches.

The McGuire units were originally designed with the intent of having the ability to survive a full load rejection without a Reactor Trip. However, the OTDT setpoints are extremely sensitive in nature and survival of such a runback from full load rejection would be doubtful based on the rate of change of Tave and the present penalty setpoints for OTDT. Survival without a Reactor Trip after a load rejection of any level would require every piece of equipment to be available and to operate properly to mitigate the consequences of the load rejection. When the Full Load Rejection Signal was received during this event, all Steam Dump To The Condenser [EIIS:COND] Valves [EIIS:V] opened as required; however, only 4 of the 8 Atmospheric Steam Dump Valves [EIIS:RV] opened because 4 were removed from service prior to the trip. This inhibited removal of adequate amounts of steam as required to facilitate reduction of heat load after the Turbine trip.

Investigation revealed that the Atmospheric Steam Dump Valves had been removed from service for maintenance and had been tagged out for an extended period of time awaiting scheduling and completion of the maintenance. Also, it was discovered that these valves have been removed from service in the same manner for prolonged periods in the past while awaiting completion of maintenance. The maintenance activities had been prolonged because of several different problems with these valves. These included awaiting parts and materials needed for maintenance, awaiting vendor support to facilitate maintenance, and concerns with personnel safety while working on the valves. The goal has always been to achieve quality operation by having zero leakage from the valves. This has proven to be difficult to achieve. There was no policy or directive that specifically addressed

removing these specific valves from service; therefore the valves were managed and controlled under the generic station policies for equipment removal and restoration. Having these valves out of service in this manner reduces the probability of surviving load rejections at any level. As a result, personnel from OPS, Work Control, and Maintenance have agreed on a policy of not removing these valves from service while the unit is operating unless the problem is judged to be severe. If removed from service, OPS personnel agreed to isolate the entire valve header to facilitate personnel safety during maintenance activities. Additionally, Maintenance and Work Control personnel have agreed, once the valves have been removed from service, to work on a 24 hour a day schedule to repair the problem and return the valves to service. This policy should increase the availability of the Atmospheric Steam Dump Valves to aid in the mitigation of future load rejection everts and increase the probability of survival without a Reactor Trip.

A review of the Operating Experience Program (OEP) Database for the 24 months prior to this event revealed 7 Reactor Trips caused by Equipment Failure. None of these events involved a failure of the ERD system or a failed indicating lamp; therefore, this event is not considered recurring. However, the number of Reactor Trips due to Equipment Failures has shown an increasing trend which has been brought to the attention of MNS Management personnel. Additionally, LER 370/91-10 documented a Reactor Trip resulting from a possible Design, Manufacturing, Construction/Installation Deficiency. During this event, a positive leg ground existed on the Main Feedwater (CF) System [EIIS:SJ]. Change out of an indicating lamp on the Control Board for indication of the position for a valve [EIIS:V] being tested during slave relay [EIIS:RLY] testing resulted in an additional ground due to lack of the insulating grommet and, ultimately, led to a Reactor Trip. That event pointed out a problem with indicating lamp replacement in control switches such as the one involved in this event. Corrective actions taken for the previous event addressed evaluation of the control switches in use on the Main Control Board. At that time, no problem was discovered with the indicating lamps deteriorating, or coming apart in the socket. Therefore, even though a problem was noted with control switches such as the one involved in this event, no previous corrective actions taken would have prevented this event from occurring.

This event is Nuclear Plant Reliability Data System (NPRDS) reportable because of the failed indicating lamp in the circuit for the Generator Field Breaker.

There were no personnel injuries, radiation overexposures, or uncontrolled releases of radioactive material as a result of this event.

CORRECTIVE ACTIONS:

Immediate: 1) OPS Control Room personnel implemented procedure EP/2/A/5000/01, Reactor

Trip Or Safety Injection.

Subsequent: 1) IAE personnel investigated the problem and replaced the Generator Field Breaker Control Switch Head and indicating lamp as directed by work order 92063962. The indication for the Generator Field Breaker was functionally verified to be operable.

2) A meeting was held with MNS Management, Engineering, IAE, OPS, and Safety Assurance personnel to discuss investigation and recovery activities associated to the trip prior to restart of the Unit. As a result, MNS Management personnel determined that no outstanding problems were present to prevent restart.

3) OPS, Work Control, and Maintenance personnel developed a policy governing control of work activities associated with the Atmospheric Steam Dump Valves during Power Operation.

4) A meeting was held to discuss possible corrective actions to resolve problems with indicator lamp replacement in Cutler-Hammer Control Indicating Switches. Attendees included personnel from the Safety Assurance, OPS, IAE, Component Engineering, Mechanical Engineering, and Electrical Engineering Groups.

5) Safety Assurance personnel generated a memorandum to all McGuire OPS, IAE, and Chemistry personnel emphasizing the need for caution and attention to detail whenever attempting to change indicator lamps in Cutler Hammer switches.

6) OPS personnel agreed to replace any grommets found missing on Main Control Board switches when changing indicator lamps.

Planned: 1) Component Engineering and OPS personnel will evaluate the use of a different type of removal tool to remove and replace indicator lamps in Cutler Hammer control switches.

2) Component Engineering personnel will conduct an evaluation of indicating lamps in Cutler Hammer Control Switches in conjunction with Electrical Engineering and OPS personnel.

3) Electrical Engineering personnel will evaluate the circuit designs for circuits such as the one involved in this event to determine if circuit

changes are needed.

SAFETY ANALYSIS:

Prior to the unit trip, when the Unit 2 Main Generator Breakers opened, the Unit 2 CM system moved to the full load rejection mode as required. The Unit experienced a Reactor Trip on an OTDT signal. This Reactor Trip input protects the core against DNB and causes the Reactor to trip when 2 out of 4 channels exceed the setpoint. During this trip the setpoints for OTDT were exceeded which resulted in the Reactor Trip. The fact that 4 of the 8 Atmospheric Steam Dump Valves were tagged out reduced the capability to dissipate steam during the load rejection; therefore, reducing the ability to remove heat load. However, this did not affect the end result since the OTDT setpoint would have been exceeded anyway. From a standpoint of Reactor safety, the Unit responded in a conservative manner. All required systems and components functioned as designed to mitigate the consequences of this event.

Following the Reactor Trip, SG levels fell below required setpoints and the CA system started automatically as designed and provided additional feedwater flow, as necessary, to all 4 SGs to assist in returning SG water level to normal. All primary and secondary system parameters necessary for a safe shutdown were at or approaching no-load conditions approximately 30 minutes after the trip. The Reactor Coolant (NC) system [EIIS:AB] Power Operated Relief Valves (PORVs) and Code Safety Valves did not open and were not challenged.

This Reactor Trip presented no hazard to the integrity of the NC or Main Steam system [EIIS:SB]. There were no radiological consequences as a result of this event.

Therefore, the health and safety of the public were not affected by this event.

Additional Information

Sequence Of Events:

PR - Personnel Recollection
ER - Events Recorder
PTR - Post Trip Review Report
SRO - Unit 2 Senior Reactor Operator's Logbook

| Date | Time | Event |
|---|---|---|
| 08/24/92 | 0730 | 0?; RO noted that the indicating lamp for closed indication of |

Breaker 41, Generator Field Breaker, was not illuminated. (PR)

1000 OPS NO attempted to change the indicating lamp. (PR)

1002:36 Unit 2 Generator Field Breaker opened. (ER, PTR)

Unit 2 PCBs opened. (ER, PTR)

Unit 2 CM system entered a full load rejection mode. (ER)

1002:37 A Unit 2 Turbine runback from full load rejection was initiated. (ER)

1002:46 Unit 2 experienced a Reactor Trip on OTDT. (ER, PTR)

OPS Control Room personnel entered procedure EP/2/A/5000/01, Reactor Trip Or Safety Injection, to stabilize the unit. (SRO)

1002:49 OPS Control Room personnel manually exercised the Reactor Trip Breaker. (ER)

1004:41 SG levels fell below the required level setpoints and the Motor Driven NA Pumps automatically started to restore SG level. (ER, PTR)

1126 OPS Control Room personnel made the required 4 hour notification to the NRC in accordance with procedure RP/0/A/5700/10, NRC Immediate Notification Requirements. (PR, SRO)

08/25/92 0330 Unit 2 returned to Mode 1 (Power Operation). (SRO)