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June 25, 1990

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

Subject: McGuire Nuclear Station Unit 1
Docket No. 50-369
Licensee Event Report 369/90-15

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 369/90-15 concerning Technical Specification 3.0.3 being entered because of inoperable Power Range Nuclear Instrumentation. This report is being submitted in accordance with 10 CFR 50.73(a)(2)(i)(B). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Tony L. McConnell/gs

T.L. McConnell

DVE/ADJ/cbl

Attachment

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NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
McGuire Nuclear Station, Unit 1	0 5 0 0 0 3 6 9	1 OF 1 7

TITLE (4) Technical Specification 3.0.3 Was Entered For Inoperable Power Range Nuclear Instrumentation During Power Escalation Because Of A Management Deficiency

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)
0 5	2 4	9 0	9 0	0 1 5	0 0	0 6	2 5	9 0	N/A	0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	8 7	20.402(b)	20.405(c)	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, NRC Form 366A)
		20.405(a)(1)(iii)	X 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
Alan Sipe, Chairman, McGuire Safety Review Group	AREA CODE 7 0 4 — 8 7 5 - 4 1 8 3

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	

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 May 24, 1990, power escalation was occurring on Unit 1. At 1023 that day, Technical Specification 3.0.3 was entered because more than one power range nuclear instrumentation (PRNI) channel exceeded the 5 percent deviation (non-conservative) between Best Estimate Thermal Power and indicated excore detector power. Instrumentation and Electrical (IAE) personnel calibrated the PRNIs as specified by procedure IP/0/A/3007/17, NIS Power Range Calibration to Best Estimate Thermal Power. Technical Specification 3.0.3 was exited at 1037 when calibration was complete on the PRNIs. Unit 1 was in Mode 1 (Power Operation) at approximately 84 percent at the time of the event. This incident is assigned a cause of Management Deficiency resulting from inadequate direction on how to manage power mismatch during power maneuvers. Operations personnel will assume the responsibility for adjusting the Power Range Detectors during power maneuvers, at the discretion of the Shift Supervisor. IAE personnel will continue to calibrate the detectors following refueling outages and during normal surveillances. Appropriate procedures and training will be developed and implemented to accomplish this.

EVALUATION:

Background

The purpose of the Out-of-Core Instrumentation System [EIIS:IG] (Excore Detectors) is to monitor Reactor [EIIS:RCT] Core leakage neutron flux and generate appropriate trips and alarms [EIIS:ALM] for various phases of Reactor Operations. The outputs of the three ranges (source, intermediate, and power) of detectors [EIIS:DET] are used to limit the maximum power output of the reactor within their respective ranges and are used as inputs to monitor neutron flux from a completely shutdown condition up to 118 percent of full power. There are four dual section uncompensated ionization chamber assemblies for the power range detectors (Excore Detectors). These assemblies are installed vertically at the four corners of the core and located equidistant from the reactor vessel at all points and, to minimize neutron flux pattern distortions, within one foot of the reactor vessel. Each power range detector provides two signals corresponding to the neutron flux in the upper and in the lower sections of a core quadrant.

Technical Specification 3.3.1, Table 3.3-1, requires that three out of four channels of Power Range Nuclear Instrumentation (Excore Detectors) must be operable during Mode 1 and Mode 2 (Startup).

Technical Specification 4.3.1.1 requires that a channel calibration be performed daily on the Power Range Neutron Flux High Setpoint. This is to be performed by comparison of calorimetric (reactor thermal power best estimate, based on secondary and/or primary heat balances) to excore power (based upon nuclear power levels from excore instrumentation) when the unit is above 15 percent Rated Thermal Power (RTP). Excore channel [EIIS:CHA] gains are to be adjusted to make indicated excore power consistent with indicated calorimetric power whenever this comparison reveals an absolute difference of more than 2 percent between the two. This deviation is called power mismatch.

The Technical Specification Interpretation for Table 4.3.1, sections 2 and 13 dated April 7, 1989, states that an adjustment of the Excore Detectors gains to the calorimetric power is required if the absolute difference is greater than 2 percent. This is required for the unit at steady state conditions to maintain channel operability. During power maneuvers or changes in rod position, a +/- 5 percent difference is acceptable to maintain channel operability. Should the +/- 5 percent difference be exceeded, the affected power range channel(s) must be declared inoperable. It should be the intent to limit rod motion and/or power maneuvers so that the +/- 5 percent transient limit is not inadvertently exceeded. Recalibration to return to the +/- 2 percent steady state difference limit may be delayed for up to 4 hours once stable conditions are reached to allow various parameters to reach equilibrium or near equilibrium conditions.

Technical Specification 3.0.3 is required to be entered when the unit is operating in a condition that exists when a Limiting Condition for Operation is not met except as provided in the associated Action Requirements. It requires that within one hour action shall be initiated to place the unit in a mode in which the specification does not apply by placing it, as applicable, in:

a. at least Hot Standby within the next 6 hours,

b. at least Hot Shutdown within the following 6 hours, and

c. at least Cold Shutdown within the subsequent 24 hours.

Description of Event

Power escalation was in progress on Unit 1 on May 24, 1990 following the completion of a refueling outage. Operations personnel contacted IAE personnel and requested the calibration of the PRNIs. IAE personnel arrived in the Control Room [EIIS:NA] at 0949. The power mismatch at that time was approximately 2-3 percent. When IAE personnel began adjusting the PRNI channels, the power mismatch was approximately +4 percent. Operations personnel stated that the power mismatch reached approximately +4.7 percent and they secured the power escalation. When the power escalation was secured, steam pressure increased. This affected the Best Estimate Thermal Power and three PRNIs exceeded the +5 percent power mismatch limit which resulted in the entry into Technical Specification 3.0.3. IAE personnel continued the calibration. Operations personnel added boric acid from the Boric Acid Tank [EIIS:TK] directly into the Reactor Coolant [EIIS:AB] system through valve [EIIS:V] 1NV-265, Emergency Borate Valve. This action restored the power mismatch to within the required +/- 5 percent range. Technical Specification 3.0.3. was exited at 1037.

The IAE personnel observed the PRNI channels and successfully completed the calibration as required by procedure IP/0/A/3007/17, NIS Power Range Calibration to Best Estimate Thermal Power.

Conclusion

During power changes, deviations between PRNI indicated power and reactor thermal power are an expected occurrence. Control rod [EIIS:ROD] insertion causes the PRNIs to experience a greater decrease in neutron flux relative to the corresponding decrease in thermal power. This phenomenon is "rod shadowing".

Operations personnel performing the power escalation stated IAE personnel arrived in the Control Room to perform the calibration of the PRNIs within a reasonable amount of time. Prior to beginning procedure IP/0/A/3007/17, NIS Power Range Calibration to Best Estimate Thermal Power, IAE personnel must verify the working copy of the procedure with the control copy. The next required action is to ensure the initial conditions of the procedure have been met. This includes ensuring the Operator Aid Computer [EIIS:CPU] (OAC) Thermal Output Program is functioning satisfactorily, verifying the correct unit and component per the work request, obtaining as found thermal power reference data, calculating a five minute average for Best Estimate Thermal Power, requesting certain manipulations of the controls by the Reactor Operator and verifying certain bistable indicator lamps. After these items are complete, the actual calibration can begin. IAE personnel stated when they started the actual calibration (adjusting the gain potentiometer) power mismatch was at approximately +4 percent.

Operations personnel were continuing to monitor power mismatch while IAE calibrated the PRNIs. Operations personnel stated that when the power mismatch reached approximately +4.7 percent, the load increase was secured. Once the load increase was secured, steam pressure increased and the power mismatch exceeded the +5 percent limit. Power mismatch was greater than 5 percent for less than 10 minutes (reference page 7 of 7). Operations personnel stated they added boric acid to compensate for the steam pressure increase. They also stated the rods could have been inserted to compensate for the steam pressure increase. Either of these means is acceptable.

This event is assigned a cause code of Management Deficiency resulting from inadequate direction on how to manage power mismatch during power maneuvers. Procedure OP/1/2/A/6100/03, Controlling Procedure for Unit Operation, contains general information pertaining to limiting power mismatch to +/- 5 percent. The procedure requires IAE personnel to be placed on Standby (IAE personnel are informed that a power change will be made and are prepared to report to the Control Room) whenever power changes will be made.

PRNI calibration can be performed without the unit in steady state conditions. However, there is no guidance as to what the best action to take is to prevent exceeding the power mismatch. At greater than or equal to 90 percent, Operations personnel are required to secure power changes until the PRNIs can be calibrated.

An Operating Experience Program (OEP) Data Base search was conducted for the previous 24 months for Technical Specification violations with a root cause or contributory cause code of Management Deficiency due to inadequate direction. This search revealed 10 LERs which documented events involving different equipment and administrative controls. The corrective actions were specific to those 10 events. Therefore, this event is not considered recurring.

The OEP Data Base was searched for events dealing specifically with the power mismatch problem itself. Three LERs and one Special Report were found. LER 370/89-04 had a cause of Deficient Procedure. The corrective actions added steps in the Operating Procedure to have IAE personnel on standby to calibrate the power range detectors whenever power is increased or reduced. Also, the OAC alarm setpoint for power mismatch was changed from a +/- 4 percent to a +/- 3 percent value. LER 369/89-13 was an overpower incident resulting from computer points being locked out and causing the power range detectors to be miscalibrated. LER 370/90-04 involved exceeding +/- 5 percent limit after a 50 percent Main Turbine Runback. Corrective actions for this event included changing the OAC alarm setpoint for power mismatch from a +/- 3 percent to a +/- 2 percent value with a re-alarm feature every 1/2 percent. Special Report 2-M89-0067 described a computer lockout problem that caused indicated power mismatch to reach 5 percent. In addition, LER 369/90-16 is presently being prepared. LER 369/90-16 describes exceeding +/-5 percent power mismatch during power escalation. The problem with power mismatch exceeding the Technical Specification limits is considered recurring.

This event is not Nuclear Plant Reliability Data System (NPRDS) reportable.

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

CORRECTIVE ACTIONS:

Immediate: Operations personnel added boric acid to the Reactor Coolant System.

Subsequent:

1) IAE personnel completed calibration of the power range detectors in accordance with the NIS Power Range Calibration to Best Estimate Thermal Power.

3) Prior to planned load increases and/or decreases following this event, Operations personnel held discussions with appropriate Shift Supervisors to emphasize the need to remain within the +/- 5 percent limit.

Planned:

1) This event will be covered in a Shift Supervisor's meeting with a representative from each shift.

2) Operations personnel will assume the responsibility for adjusting the Power Range Detectors during power maneuvers, at the discretion of the Shift Supervisor. IAE personnel will continue to calibrate the detectors following refueling outages and during normal surveillances. Appropriate procedures and training will be developed and implemented to accomplish this.

3) Operations personnel will enhance procedure OP/1,2/A/6100/03, Controlling Procedure For Unit Operation.

SAFETY ANALYSIS:

The excore power range neutron detectors are arranged and located such that two detectors measure core leakage neutron flux for one quadrant. Each quadrant of detectors and their associated circuitry comprise one channel, for a total of four PRNI channels. The Power Range High Neutron Flux Trip (High Setpoint) function utilizes a 2-out-of-4 logic.

The Control Rods (RCCA) in Control Bank D are positioned more closely to the excore detectors than the other RCCAs in the RCCA Banks. A condition called "rod shadowing" results since the rods are physically close to the detectors. The flux seen by the detector is not representative of total core flux. If the rods are being withdrawn, the detectors indicate more neutrons. This results in a positive mismatch and is conservative with respect to the reactor trip setpoint which is 109 percent. However, if the rods are being inserted from the point at which they were calibrated, the detectors indicate fewer neutrons. This results

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in a negative mismatch and is nonconservative with respect to the reactor trip setpoint. This phenomenon commonly occurs during power reductions in which Control Bank D is partially inserted.

On October 14, 1985, Station Management requested that the Design Engineering Reactor Transient Analysis Group (DE RTAG) in the General Office better define the requirements related to calorimetric/excore detector mismatch. The RTAG performed a detailed review of trend data and identified and quantified various causes of the calorimetric/excore mismatch. The main cause is the positioning of Control Bank D in front of the excore detectors. A Technical Specification interpretation was developed based on the review conducted by the DE RTAG. The interpretation stated "a tolerance of +/-5 percent is acceptable during power maneuvers or changes in rod position if the plant will be returned to the previously steady state conditions within a reasonable time period". In addition, the interpretation stated, "The allowable degree to which the excore detectors may overestimate power (as indicated by calorimetric measurements) is determined by operational concerns relative to spurious trips and the reset functions associated with certain permissives. The allowable underestimation of power by excore detectors is limited by available margins to 5 percent." The interpretation was issued on July 28, 1986. A revision was issued on April 7, 1989.

All accident analyses in Chapter 15 of the Final Safety Analysis Report (FSAR) which are mitigated by the power range high neutron flux trip setpoint have been evaluated to a +/- 5 percent transient mismatch. Results of transients exceeding +/-5 percent power mismatch may be bounded by the acceptance criteria for the FSAR; however, these events have not been analyzed by the DE RTAG.

A number of events have been postulated which could result in reactivity and power distribution anomalies. The analysis performed in FSAR Section 15.4.3.2 analyzes the effects and consequences of dropped RCCAs banks and statically misaligned rods. The most severe misalignment situations with respect to Departure from Nucleate Boiling Ratio (DNBR) at significant power levels arise from cases in which one RCCA is fully inserted, or where bank D is fully inserted with one RCCA fully withdrawn. Multiple independent alarms, including a bank insertion limit alarm, alert the operator well before the postulated conditions are approached. These alarms were available during this event. The bank can be inserted to its insertion limit with any assembly fully withdrawn without the DNBR falling below the limit value.

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

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