

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)
McGuire Nuclear Station - Unit 1DOCKET NUMBER (2)
0 5 0 0 0 3 6 9 1 OF 5TITLE (4)
Safety Injection Bistable Disabled to Prevent Spurious Actuation

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	1	2	1	8	5	8	5	0	0	3	0	0	0	0	0	0
0	1	2	1	8	5	8	5	0	0	3	0	0	0	0	0	0

OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)														
1		20.402(b)		20.406(e)		50.73(a)(2)(iv)		73.71(b)								
		20.406(a)(1)(i)		50.36(a)(1)	X	50.73(a)(2)(v)		73.71(c)								
POWER LEVEL (10)	1 0 1 0	20.406(a)(1)(ii)		50.36(a)(2)		50.73(a)(2)(vi)		OTHER (Specify in Abstract below and in Text, NRC Form 366A)								
		20.406(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(vii)(A)										
		20.406(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(vii)(B)										
		20.406(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)										

LICENSEE CONTACT FOR THIS LER (12)
NAME
Scott Gewehr - LicensingTELEPHONE NUMBER
AREA CODE
7 0 4 3 7 3 - 7 5 8 1

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC

SUPPLEMENTAL REPORT EXPECTED (14)
YES (If yes, complete EXPECTED SUBMISSION DATE) ☐ NO ☒EXPECTED SUBMISSION DATE (15)
MONTH DAY YEAR

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

On January 20, freezing temperatures in the area of McGuire Nuclear Station caused instrument lines to freeze and send erroneous signals to the Reactor Protection System, thus creating a likelihood of a spurious trip. Steam Generator "A" main steam line pressure transmitters began failing low and sending erroneous signals to the low pressure steam line isolation and safety injection circuits. Due to the record demand for electricity because of the cold, a course of action was developed to prevent an unnecessary reactor trip. At about 0400 on January 21, the NRC Regional Administrator was notified of Duke's plan to jumper a failed channel of the process control system, in order to disable the output to the Reactor Protection System. The jumper was installed, and additional weatherization was added to the exterior doghouse area where the instrument freezing problems were occurring. After the weatherization was complete the temperature in the doghouse rose enough to remove the potential for freezing, and at about 0700 the jumper was removed, and the Regional Administrator was notified that the unusual situation was under control.

The health and safety of the public were not affected.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

FACILITY NAME (1) McGuire Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 3 6 9	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		8 5	— 0 0 3	— 0 0	0 2	OF	5

TEXT (If more space is required, use additional NRC Form 366A's) (17)

INTRODUCTION: On January 20, 1985, an arctic airmass moved into the Carolinas causing temperatures to fall below -4°F in the McGuire area. The sub-zero temperatures caused the Unit 1 instrument impulse lines on the steam generator (S/G) "A" Main Steam Line pressure transmitters to freeze and give erroneous signals to the Reactor Protection System (RPS) Low Pressure Steam Line Isolation and Safety Injection (S. I.) circuits.

Station personnel began formulating corrective actions to prevent a unit trip during this time of record electrical demand. Space heaters were set up in exposed areas and various methods to thaw the frozen lines were attempted.

Appropriate station and corporate management personnel were contacted and informed of the situation. A plan was made to jumper the bistable on one failed instrument channel to the "normal" condition while the instruments were thawed and returned to service. This action would change the low pressure steam line isolation and S. I. logic from a 2 out of 3 (2/3) to a less conservative 2/2 logic.

The Vice President of Nuclear Production notified the Nuclear Regulatory Commission Regional Administrator (Region II) of the station circumstances and the planned corrective action.

The jumper was installed on the bistable circuit from 0430 to 0700 on January 21, 1985 until the instrumentation was determined to be operable and adequately protected from freezing.

Unit 1 was in Mode 1 at 100% power during these events.

This incident is classified as an unusual service condition, due to the extremely low ambient temperatures. A design deficiency also contributed to this incident due to inadequate area heating and weatherizing in the exterior doghouse structure where the main steam instrument lines are located.

BACKGROUND: The exterior doghouse structure contains the main feedwater and main steam piping to "A" and "D" steam generators. The reinforced concrete doghouse structure protects the main steam isolation valves and piping entering and leaving the containment structure. The structure is ventilated to allow adequate release of steam in the event of a feedwater or steam line break within the structure.

This ventilation has created problems in the past with instrument lines freezing in extremely cold conditions. In 1982 a reactor trip occurred (LER 369/82-07) when the steam line pressure transmitters froze and failed low. Several corrective actions from this event have reduced the freezing problems in the exterior doghouse. These corrective measures were:

- a) Two 25 KW electric heaters were installed to help maintain the ambient temperature above freezing.
- b) A station cold weather checklist was written to insure that exposed instrumentation and equipment is adequately protected from the seasonal elements.

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- c) A roll down fabric cover was added to the upper ventilation openings to keep out cold air during winter months.

The exterior doghouse also has two summer ventilation air openings to help cool the area in the warmer seasons. These vent openings were not furnished with a permanent means to be closed in the winter months.

The construction of the exterior doghouse does not provide an efficient means of freeze protection. The most vulnerable area is along the exterior concrete wall surfaces. The S/G "A" main steam line is located next to this wall and the instrument lines from this piping are attached directly to the concrete wall.

The instrument impulse lines are normally filled with water from condensed steam. The pressure sensed at the main steam line is transmitted through the water to the transmitters located in the auxiliary building. The normal response for a pressure transmitter with a freezing impulse line is for the output to increase. For the transmitter to fail low, there would have to be a leak between the "freeze plug" and the transmitter.

EVALUATION: On January 21, 1985, the temperature in the McGuire Nuclear Station area dropped below -4°F as a cold front moved through the Carolinas. The extremely cold temperatures affected many of the station secondary systems. The two most critical systems affected were the main steam line pressure instrumentation located in the Unit 1 exterior doghouse, and the main feedwater flow instrumentation located on the auxiliary building roof.

The steam pressure and flow transmitter instrument lines are installed in the main steam line from each steam generator. The steam flow and pressure signals are fed into reactor protection and feedwater control systems to 1) control feedwater flow to each steam generator, 2) close the main steam isolation valves in case of a rupture in the main steam lines between the S/Gs and the turbine stop valves and 3) open the S/G PORVs and/or condenser dump valves in the case of overpressure. The main steam isolation valves will close on high decreasing steam line pressure rate of change as well as the fixed low pressure setpoint.

The steam pressure transmitters began failing on January 20, 1985 at 2348. A temperature sensor is located in the exterior doghouse structure and provided a computer alarm as the temperature dropped to 34.5°F at 2258. The lowest recorded doghouse temperature during this event was at 0037 as the temperature momentarily dropped to 18°F. This drop was attributed to the opening of the entrance door as equipment was being moved into the structure. The average doghouse temperatures during the early stages of this event were in the mid 20's.

All of the steam pressure instrument failures were on the S/G "A" steam line. The instrument lines from the S/G "A" steam line are attached to the interior of the doghouse concrete wall. The heat applied to the instrument lines during the thawing attempts was quickly dissipated into the concrete and steel structure.

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Two 25 KW electric space heaters are located in the exterior doghouse and were operating as intended. The heat loss from the structure by air flowing in the lower vent openings and heat loss through the concrete walls negated any contribution from these heaters. Additional oil fired heaters were brought in to add heat to the structure and insulation was removed from a portion of main feedwater piping to allow some heat to escape into the room. The lower ventilation openings were temporarily closed with plywood and reinforced plastic to stop the air infiltration.

At 0130 the Ch I and Ch IV instrumentation were both inoperable due to freezing. This situation exceeded the Technical Specification limits for the number of inoperable channels. The Duty Shift Engineer notified the Operations Unit 1 Coordinator and the Nuclear Production Duty Engineer of the station situation.

At this point, one concern of Duke management was the critical need for power for both the Duke Power service area and neighboring utilities. The loss of McGuire Unit 1 would have caused an approximate loss of 755 MWe to the Duke service area and another 395 MWe which was being supplied to neighboring utilities. The result of this loss could have led to activation of load management controls and/or possible area power losses.

At 0156, station personnel had returned the Ch IV instrument to service and the Technical Specification requirement to bring the unit to Mode 3 was no longer applicable.

At 0214 the Ch I instrument was thawed and returned to service at which time the Ch IV instrument failed again. This time the pressure transmitter failed low giving one channel of the required 2 of 3 S.I. signal.

After the second freeze failure of the Ch IV instrumentation, station Operations personnel were concerned that the Ch I instrument might fail low again which would actuate an S.I., tripping the Unit 1 reactor. Corporate and Station personnel reviewed the available corrective actions and decided on a contingency plan to avoid an unnecessary loss of unit due to erroneous signals.

The plan was to remove the trip function from the bistable of the Ch IV instrument loop. The Ch IV loop was chosen because of its already high failure rate and apparent vulnerability to freezing. The jumper would allow the associated indications and circuits to remain operable for control operator use while disabling only the steam line isolation signal.

The remaining two bistables (Ch I and Ch II) were to remain available to provide low steam line pressure protection with a 2 of 2 logic instead of the 2 of 3 normal logic. These instruments were also susceptible to freezing. The control room operators were to give special attention to monitoring these and other system parameters and provide added human protection while the Ch IV bistable was out of service.

The Vice President of Nuclear Production notified the Nuclear Regulatory Commission (NRC) Regional Administrator of the critical system load demand, station situation, and contingency plan. With a verbal understanding of the situation, the Administrator

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concurrent with the concept of the contingency plan and a follow-up communication was requested for the following morning.

The jumper was placed by IAE supervisory personnel at 0430 and the Ch IV instrumentation placed back in service.

The exterior doghouse temperature was brought under control with the added heat sources at approximately 0445 as the S/G "A" main steam pressure transmitter thawed and returned to service naturally as the room warmed.

IAE personnel observed the operations of the Ch IV instruments and the doghouse temperature until 0700 when the jumper was removed from the Ch IV bistable and the system returned to service.

The following morning the Vice President of Nuclear Production contacted the NRC Regional Administrator and informed him that the station situation was under control and that bistable had been placed back in service.

CORRECTIVE ACTION:

Additional temporary space heating and doghouse opening covers were added to the doghouse. A jumper was installed for about 2½ hours to defeat the trip function of the channel IV bistable until the freezing problem was solved. As a long-term solution, permanent dampers will be installed on the lower doghouse ventilation openings, and the possibility of remounting the instrument impulse lines will be examined. Long-term solutions will be in place by next winter for both units.

SAFETY ANALYSIS:

The purpose of the main steam pressure instrumentation protective circuitry is to initiate an Engineered Safety Features (ESF) actuation and reactor trip in the event of a main steam line rupture. The reactor trip is anticipatory to degraded primary system parameters which would follow a steam line break incident.

The installation of the jumper on the Ch IV bistable changed the ESF logic to a 2/2 automatic actuation. With Ch II and Ch III operable, a steam line break would still have initiated an S.I. and reactor trip. The increased awareness of the control operators to the various system parameters provided additional confidence for safe reactor operation.

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

DUKE POWER COMPANY

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HAL B. TUCKER
VICE PRESIDENT
NUCLEAR PRODUCTION

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February 20, 1985

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

Subject: McGuire Nuclear Station, Unit 1
Docket No. 50 369
LER 369/85-03

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 369/85-03 concerning an Intentionally Bypassed Reactor Protection System Input which is submitted in accordance with §50.73 (a)(2)(v). This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

H.B. Tucker

Hal B. Tucker

SAG/mjf

Attachment

cc: Dr. J. Nelson Grace, Regional Administrator
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