NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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TITLE (4)

Undetected Unblocking of Safety Injection Actuation Signal While at Low Pressure Condition, Due to Faulty Bistable, Resulted in Inadvertent Safety Injection Actuation Signal

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 NAME	DOCKET NUMBER
10	31	97	97	-- 005	-- 00	12	01	97	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	6
POWER LEVEL (10)	000

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
	20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
	20.2203(a)(2)(ii)		20.2203(a)(4)	X	50.73(a)(2)(iv)		OTHER
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
John T. St. Martin - Technical Assistant	(716) 771-3641

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
B	JE	JS	F180	NO						

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 15 single-spaced typewritten lines) (16)

On October 31, 1997, at approximately 1640 EST, the plant was in Mode 6 with the reactor coolant system being maintained at a temperature of 80 degrees F, and the reactor cavity filled to greater than 23 feet. The plant was shut down for refueling. An inadvertent automatic Safety Injection Actuation occurred.

Immediate corrective action was to monitor the automatic start of engineered safety features components and secure unneeded equipment.

The underlying cause of the inadvertent automatic Safety Injection Actuation was an undetected faulty bistable circuit board. During the performance of a periodic test, this faulty bistable caused the Safety Injection Actuation signal to be inadvertently unblocked with pressurizer pressure less than the setpoint for Safety Injection Actuation.

Corrective action to preclude repetition is outlined in Section V.B.

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TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

I. PRE-EVENT PLANT CONDITIONS:

On October 31, 1997, the plant was in Mode 6 with the reactor coolant system (RCS) being maintained at a temperature of approximately 80 degrees F, and the reactor cavity filled to greater than 23 feet. Both residual heat removal (RHR) pumps were operating, and fuel movement was on hold. Two service water (SW) pumps were operating. The plant was shut down for refueling. Performance Monitoring technicians were conducting periodic test procedure PT-32.1 (Plant Safeguard Logic Test A or B Train). Testing of the "B" train was started at approximately 1606 EST.

As part of the conduct of procedure PT-32.1, simulated signals are inserted to provide normal relay states for miscellaneous signals. Prior to inserting these signals, individuals from Performance Monitoring and Instrument and Control (I&C) verified that indications were appropriate on the Main Control Board, in safeguards racks in the Relay Room, and in protective racks in the Control Room. I&C technicians then performed these simulations in accordance with procedure PT-32.1. I&C connected non-powered transmitter simulators to three pressurizer (PRZR) pressure channel test injection jacks (for channels P-429, P-430 and P-431). Test injection switches for P-429 and P-430 were taken to the test position and simulator output was checked for the desired output.

II. DESCRIPTION OF EVENT:

A. DATES AND APPROXIMATE TIMES OF MAJOR OCCURRENCES:

- October 31, 1997, 1606 EST: Performance Monitoring starts procedure PT-32.1 for "B" train.
- October 31, 1997, 1640 EST: Event date and time.
- October 31, 1997, 1640 EST: Discovery date and time.
- October 31, 1997, 1643 EST: Safety Injection Actuation and Containment Isolation signals are reset.
- October 31, 1997, 1649 EST: Containment Ventilation Isolation signal is reset.
- October 31, 1997, 1700 EST: Pre-event refueling shutdown conditions are restored.

B. EVENT:

On October 31, 1997, the plant was in Mode 6 with the RCS being maintained at a temperature of approximately 80 degrees F, and the reactor cavity filled to greater than 23 feet. The plant was shut down for refueling.

The Safety Injection (SI) Actuation Signal (SIAS) is provided with a block signal which prevents a SIAS from occurring for Low PRZR Pressure. SIAS was blocked, which is the normal configuration when PRZR pressure is intentionally reduced below the SIAS setpoint during plant shutdown conditions.

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At approximately 1640 EST, I&C technicians took the third channel (P-431) test injection switch to the test position. Immediately after the switch was in the test position, simulator output was observed to be approximately 30 milliamperes, which simulates pressure above the unblock setpoint of 1992 PSIG. This resulted in unblocking SIAS from Low PRZR Pressure. This also resulted in SI actuation on Low PRZR Pressure.

The Control Room operators immediately responded to the inadvertent SI actuation. They responded to Main Control Board annunciator D-19 (Pressurizer Lo Press SI 1750 PSIG). They confirmed that automatic SI actuation had occurred and verified that all operable engineered safety features (ESF) components functioned properly. No immediate actions were required for the RCS, since the reactor cavity level remained stable. The Control Room operators referred to emergency operating procedures E-0 (Reactor Trip or Safety Injection) and ES-1.1 (SI Termination) for guidance in securing and restarting equipment.

Both RHR pumps continued to operate, and the two selected SW pumps started. The "A" emergency diesel generator (EDG) started and did not energize any busses, since all safeguards busses remained energized from off-site power. All other operable ESF components were also observed to function properly, with the exception of valve position for air-operated valve AOV-5392 (instrument air to containment isolation valve). The valve position indicated both open and closed. However, subsequent investigation confirmed that the valve did, in fact, travel to the fully closed position.

Due to plant conditions, many ESF components were not operable at the start of this event. The "B" EDG was inoperable for periodic manufacturer inspection and overhaul. All three SI pumps were rendered inoperable. Therefore, the "B" EDG did not start and no SI pumps started. No injection flow from the SI pumps to the RCS occurred.

I&C removed the safeguards train DC supply fuses to prevent a re-occurrence of SI actuation. I&C then commenced trouble-shooting for the cause of the SI actuation.

Subsequent root cause analysis revealed that, prior to this activity, there had been a fault in bistable circuit board PC-430 E/F. This undetected fault resulted in the bistable de-energizing. A de-energized output results in both a 1/3 Unblock SI signal and a 1/3 Low PRZR Pressure SI signal. The SIAS for Low PRZR Pressure was automatically unblocked as soon as a second channel (the P-431 simulated signal) was simulated above the unblock setpoint, since a first channel (failed channel P-430) was already inserting an unblock signal. Simulated PRZR pressure (as measured by channel P-429) was below the setpoint for automatic SIAS (thus inserting a 1/3 Low PRZR Pressure SI signal). The faulted channel P-430 was also inserting a 1/3 Low PRZR Pressure SI signal. This 2/3 SI signal was blocked until the P-431 simulator output was inserted. At that instant, the 2/3 signal was unblocked, resulting in automatic SI actuation from 2/3 Logic for PRZR pressure less than 1750 PSIG. Automatic SI actuation caused automatic actuation of CNMT Isolation (CI) and CNMT Ventilation Isolation (CVI).

C. INOPERABLE STRUCTURES, COMPONENTS, OR SYSTEMS THAT CONTRIBUTED TO THE EVENT:

Trouble-shooting by I&C identified that bistable PC-430 E/F had a blown fuse, which caused its outputs to be de-energized. No output from this bistable (de-energized state) provides a 1/3 Unblock SI and 1/3 Low PRZR Pressure SI signal.

D. OTHER SYSTEMS OR SECONDARY FUNCTIONS AFFECTED:

None

E. METHOD OF DISCOVERY:

This event was immediately apparent due to numerous Main Control Board Annunciator alarms in the Control Room.

F. OPERATOR ACTION:

The Control Room operators responded to the Annunciator alarms. They diagnosed that automatic SI actuation had occurred, and verified that all operable ESF components functioned properly. They observed the dual position indication for AOV-5392 and confirmed that Instrument Air to CNMT had been properly isolated.

The Control Room operators reset the SIAS and CI and CVI signals. Unneeded equipment was secured. All CI valves and CVI components (which changed position due to the SI actuation) were returned to their positions prior to the event. Pre-event conditions were restored.

Subsequently, the Control Room operators notified higher supervision and the NRC. The Shift Supervisor notified the NRC per 10CFR50.72 (b) (2) (ii), non-emergency four hour notification, at approximately 1946 EST on October 31, 1997.

G. SAFETY SYSTEM RESPONSES:

All safety systems and components that were operable responded as designed, except that the valve position indication for AOV-5392 indicated both open and closed. All other operable ESF components were observed to function properly after the automatic SI actuation. This included autostart of two SW pumps and the "A" EDG.

III. CAUSE OF EVENT:

A. IMMEDIATE CAUSE:

The immediate cause of the inadvertent automatic SI actuation was from 2/3 logic from Low PRZR Pressure with SIAS unblocked.

B. INTERMEDIATE CAUSE:

The intermediate cause of automatic SIAS being unblocked was simulating the signal for PRZR channel P-431 SI Unblock to be above the unblock setpoint with a concurrent undetected fault in channel P-430.

C. ROOT CAUSE:

The underlying cause was faulty bistable circuit board PC-430 E/F on channel P-430, which functions to provide 1/3 Unblock SI signals and 1/3 Low PRZR Pressure SI signals. In both cases, the bistable de-energizes to provide this function. The bistable's supply fuse had blown and caused both signal outputs to go to zero. This caused the safety system to see a 1/3 signal for unblocking and for initiating SI. When channel P-431 was simulated, the output was greater than the unblock setpoint, so SIAS was unblocked from both P-430 (faulted) and P-431 (simulated).

This event is NUREG-1022 Cause Code (B), "Design, Manufacturing, Construction/Installation".

IV. ANALYSIS OF EVENT:

This event is reportable in accordance with 10 CFR 50.73, Licensee Event Report System, item (a) (2) (iv), which requires a report of, "Any event or condition that resulted in a manual or automatic actuation of any engineered safety feature (ESF)". The inadvertent automatic SI actuation is an automatic actuation of an ESF.

An assessment was performed considering both the safety consequences and implications of this event with the following results and conclusions:

There were no operational or safety consequences or implications attributed to the inadvertent automatic SI actuation because:

- The plant was in Mode 6 (refueling shutdown mode) with high head SI pumps rendered inoperable. The RHR system was aligned for decay heat removal, and steam generator (SG) nozzle dams were in place.

- Plant conditions precluded any over-pressure condition. The head was removed from the reactor and the reactor cavity was filled to greater than 23 feet. All SI pumps were inoperable and the Refueling Water Storage Tank was not aligned to the suction of the RHR pumps. There was no addition of water inventory to the RCS. RCS temperature continued to be maintained stable via the RHR system. Therefore, reactivity was not affected by RCS temperature changes.

- The SW system and Component Cooling Water system remained in service during this event, providing adequate cooling to the RCS and Spent Fuel Pool.

- The RHR cooling capability remained in service and RCS integrity was maintained. Therefore, heat removal from the reactor was assured.

Based on the above, it can be concluded that the public's health and safety was assured at all times.

V. CORRECTIVE ACTION:

A. ACTION TAKEN TO RETURN AFFECTED SYSTEMS TO PRE-EVENT NORMAL STATUS:

- I&C decreased the simulated output for P-431 to below the SI unblock setpoint, thus terminating the SI Unblock logic, and allowing the Control Room operators to again block SIAS.

- The SIAS, CI, and CVI signals were reset. Unneeded equipment was secured.

- All CI valves and CVI components (which changed position due to the SI actuation) were returned to their positions prior to the event. Pre-event conditions were restored.

B. ACTION TAKEN OR PLANNED TO PREVENT RECURRENCE:

- A method to visually indicate SI Unblock status from PRZR pressure will be evaluated.

- The faulty bistable circuit board was replaced with a like for like replacement, and calibrated and tested satisfactorily.

- CPI-TRIP TEST-5.20 (Reactor Protection System Bistable Trip Test/Calibration for Channel 2 (White) Bistable Alarms) was completed for all Channel 2, Rack 1 bistables to check for proper operation and to verify there were no other bistables with similar faults. No other faulty bistables were identified.

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VI. ADDITIONAL INFORMATION:

A. FAILED COMPONENTS:

None

B. PREVIOUS LERs ON SIMILAR EVENTS:

A similar LER event historical search was conducted with the following results: no documentation of similar LER events with the same root cause at Ginna Station could be identified. However, the following LERs were similar events with different root causes:

- LER 84-006
- LER 85-004
- LER 89-003
- LER 95-003

C. SPECIAL COMMENTS:

None