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April 4, 1996

Re: Indian Point Unit No. 2
Docket No. 50-247
LER 96-03-00

Document Control Desk
US Nuclear Regulatory Commission
Mail Station PI-137
Washington, DC 20555

The attached Licensee Event Report 96-03-00 is hereby submitted in accordance with the requirements of 10 CFR 50.73.

Very truly yours,

Attachment

cc: Mr. Thomas T. Martin
Regional Administrator - Region I
US Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Mr. Jeffery Harold, Project Manager
Project Directorate I-1
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US Nuclear Regulatory Commission
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NRC FORM 366 (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WTH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

# LICENSEE EVENT REPORT (LER)

| FACILITY NAME (1) | DOCKET NUMBER (2) | PAGE (3) |
|---|---|---|
| Indian Point Unit No. 2 | 0 5 0 0 0 2 4 7 | 1 OF 04 |

TITLE (4)

Direct Generator Trip due to Pilot Wire Feeder Protection

| 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 0 0 0 |
| 0 3 | 0 5 | 9 6 | 9 6 | - 0 0 3 | - 0 0 | 0 4 | 0 4 | 9 6 | | 0 5 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) | | | |
|---|---|---|---|---|---|
| N | | 20.402(b) | 20.405(c) | X 50.73(a)(2)(iv) | 73.71(b) |
| POWER LEVEL (10) | | 20.405(a)(1)(i) | 50.36(c)(1) | 50.73(a)(2)(v) | 73.71(c) |
| 1 0 0 | | 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) | 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 |
|---|---|
| James Maylath, Senior Engineer | AREA CODE 9 1 4 7 3 4 - 5 3 5 6 |

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

| CAUSE | SYSTEM | COMPONENT | MANUFAC-TURER | REPORTABLE TO NPRDS | | CAUSE | SYSTEM | COMPONENT | MANUFAC-TURER | REPORTABLE TO NPRDS | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | J E | H S | W 1 2 1 | N | | | | | | | |
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| 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 March 5, 1996, with the unit operating at 100% power, an electrical generator trip occurred due to the false actuation of a back-up pilot wire relay associated with the generator output feeder. The generator trip initiated a main turbine trip, which in turn initiated a reactor trip. As expected, the sudden loss of electrical load caused by the direct generator trip resulted in a main turbine and generator overspeed of approximately 120%. Subsequent to the trip, motor driven auxiliary boiler feedwater pump 23 failed to automatically start when the steam generator levels reached the automatic start setpoint for the auxiliary feedwater pumps. Motor driven auxiliary boiler feedwater pump 21 automatically started as designed and fed steam generators 21 and 22. Steam driven auxiliary boiler feedwater pump 22 automatically started as designed and was manually aligned to feed steam generators 23 and 24. A defective component of a switch in the control circuit of auxiliary feedwater pump 23 caused the failure of the pump to start. This switch component and similar switch components in other safeguards equipment control circuits were inspected and replaced as necessary. Upon completion of the switch repairs and inspections, post trip review and Station Nuclear Safety Committee reviews, a reactor and plant restart was performed.

PLANT AND SYSTEM IDENTIFICATION:

Westinghouse 4-Loop Pressurized Water Reactor

IDENTIFICATION OF OCCURRENCE:

Direct Generator Trip due to Pilot Wire Feeder Protection

EVENT DATE:

March 5, 1996

REPORT DUE DATE:

April 4, 1996

REFERENCES:

Significant Occurrence Report (SOR) 96-206

PAST SIMILAR OCCURRENCE:

LER 95-016

DESCRIPTION OF OCCURRENCE:

On March 5, 1996 at 0604 hours, with the unit operating at 100% power, an electrical generator trip occurred due to the actuation of a back-up pilot wire relay associated with the generator output feeder. The generator trip initiated a main turbine trip, which in turn initiated a reactor trip. As expected, the sudden loss of electrical load caused by the direct generator trip resulted in a main turbine and generator overspeed. The maximum recorded speed of the main turbine was 2240 rpm.

Subsequent to the trip, motor driven auxiliary boiler feedwater pump 23 failed to automatically start when the steam generator levels reached the automatic start setpoint for the auxiliary feedwater pumps. Motor driven auxiliary boiler feedwater pump 21 automatically started as designed and fed steam generators 21 and 22. Steam driven auxiliary boiler feedwater pump 22 automatically started as designed and was manually aligned to feed steam generators 23 and 24 (steam driven auxiliary boiler feedwater pump 22 requires manual action to align feeds to the steam generators). This manual action was accomplished within 4 minutes of the trip, and sufficient inventory was maintained in the steam generators at all times.

All other equipment operated properly, and the plant was safely brought to a hot shutdown condition.

ANALYSIS OF OCCURRENCE:

This report is being made because an actuation of the Reactor Protection System (RPS) occurred on March 5, 1996. This actuation is reportable under 10 CFR 50.73(a)(2)(iv). The extent of the turbine and generator overspeed was determined to be within design limits as specified by Westinghouse and General Electric, the respective manufacturers, and as expected for the plant conditions at the time of the event. The manual action to align steam driven auxiliary boiler feedwater pump 22 to feed steam generators 23 and 24 was performed by the operators in accordance with emergency operating procedure ES 0.1, "Reactor Trip Response." This action maintained sufficient inventory in steam generators 23 and 24.

CAUSE OF OCCURRENCE:

The cause of the generator trip was the actuation of a back-up pilot wire relay HCB/87L2 associated with the generator output feeder to Buchanan Substation. A fault occurred on an offsite 345kv transmission line between Buchanan and Sprain Brook Substations. Offsite relay protection cleared this fault as designed. The HCB pilot wire relays (2 relays located at Buchanan Substation and 2 relays located at Indian Point 2) are designed to provide protection between Buchanan Substation and the Indian Point 2 generator by opening the 345kv output breakers for the unit and tripping the generator. Since the fault was located outside the protection boundary of the HCB pilot wire relays, the HCB/87L2 relay should not have actuated with the proper clearing of the above fault. The redundant HCB/87L1 relay did not actuate for this offsite transient.

The failure of motor driven auxiliary boiler feedwater pump 23 to automatically start was due to a defective starwheel component in the "Local/Remote" switch in the pump control circuit. This switch is located in the Auxiliary Boiler Feedwater Pump Building.

CORRECTIVE ACTIONS:

An investigation of the misoperation of the HCB/87L2 relay was done. A number of items which could have had an impact on the pick-up current of this relay were investigated. In examining the pilot wire circuitry it was discovered that a modification to install jumpers on contacts, that had been installed at other company locations, had not been done. Tandem relay pick-up values prior to this discovery tended to vary on the Buchanan to Indian Point 2 tests for the pilot wire circuitry. After the installation of the modification, the relays operated as expected for numerous test applications. However, other considerations, such as repetitive cycling (current applications) and variations of the overall pilot wire loop impedance which may also account for the in pick-up current variance were considered. Thus, it cannot be concluded with certainty that the lack of the contact jumper modification was the cause of the relay misoperation.

The failure of auxiliary boiler feedwater pump 23 to start was traced to a "Local/Remote" switch. The "Local/Remote" switch for auxiliary boiler feedwater pump 23 was found to have a broken starwheel (the starwheel is designed to provide position-maintaining detents for the switch contacts). This type

CORRECTIVE ACTIONS (continued):

of switch, the "W2," had been the subject of Westinghouse Technical Bulletin No. NSD-TB-74-10, dated September 9, 1974. The bulletin stated that "W2" switch starwheels made of a material called "Texin," which is a urethane, had a tendency to fail. Westinghouse recommended that these starwheels be replaced with starwheels made of nylon. In early 1975, an inspection was made of all "W2" switches at Indian Point 2. "Texin" starwheels were identified as being light tan to dark brown in color. Acceptable nylon starwheels were white or black in color. A modification was prepared and subsequently implemented to replace the tan or brown starwheel components.

The 1975 inspection identified the starwheels for the switches on the motor driven auxiliary boiler feedwater pumps as being white. Thus, they were believed to be made of nylon and were not replaced. On March 5, 1996 the failed starwheel of the switch for auxiliary boiler feedwater pump 23 was found to be an orange-tan color. All other switches which were identified as white in the 1975 inspection were then inspected. 13 of these switches were found to have orange-tan starwheels. The 13 switches found with the orange-tan starwheels are located in the 480V Switchgear Room. These included the "Local/Remote" switches for the fan cooler units and the service water pumps except for service water pump 26. The starwheels on service water pump 25 and on fan cooler unit 21 were also found to be broken. These defective starwheels did not render service water pump 25 or fan cooler unit 21 inoperable. Auxiliary boiler feedwater pump 21 was found to have a black starwheel. The remaining switches were identified as containing starwheels of acceptable material.

The starwheel in the "Local/Remote" switch for service water pump 26 had been found to be broken following a failure of the pump to manually start during testing in late 1995. The pump did start when the "Local/Remote" switch was exercised with the broken starwheel. The broken starwheel was replaced, and an inspection of the remaining service water pump "Local/Remote" switches was done. None of the remaining switches were found to be broken, and the broken starwheel was considered to be a random isolated event. The broken starwheel for service water pump 26 was an orange-tan color.

The reason for the 13 starwheels being orange-tan after they were identified as being white in the 1975 inspection is unknown. It is possible that the shade of tan observed may have been mistaken for white due to the lighting in the areas of these switches.

Two of the orange-tan starwheels and one black and one white starwheel were sent to an independent laboratory for analysis. The laboratory confirmed that the orange-tan starwheels were composed of a urethane ("Texin" is a urethane) and the black and white starwheels were nylon. All of the safety related components utilizing "W2" switches were inspected and all susceptible starwheels were replaced, such that no "Texin" starwheels remain in safety applications. This work was completed prior to restart of the unit.