NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

# LICENSEE EVENT REPORT (LER)

| FACILITY NAME (1) | DOCKET NUMBER (2) | PAGE (3) |
|---|---|---|
| EDWIN I. HATCH, UNIT 1 | 0 5 0 0 0 3 2 1 | 1 OF 0 6 |

TITLE (4)
GROUND CONDITION TRIPS MAIN GENERATOR AND TURBINE AND RESULTS IN REACTOR SCRAM

| 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 | 1 5 | 8 7 | 8 7 | — 0 0 2 | — 0 0 | 0 2 | 1 6 | 8 7 | | 0 5 0 0 0 |
| | | | | | | | | | | 0 5 0 0 0 |

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

| OPERATING MODE (9) | 1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POWER LEVEL (10) | 0 9 9 | | 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, 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 (AREA CODE) |
|---|---|
| Raymond D. Baker, Nuclear Licensing Manager - Hatch | 4 0 4 5 2 6 - 7 0 1 6 |

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 1/15/87 at approximately 1800 CST, Unit 1 was in the run mode at an approximate power of 2423 MWt (99 percent of rated thermal power). At that time, the main generator (TB) tripped and the main turbine (TA) tripped on closure of the main turbine stop valves. The closure of these valves is a scram input to the Reactor Protection System (RPS) (JC). A full reactor scram occurred without any complications. As a result of a low reactor water level condition caused by the scram, a Primary Containment Isolation System (PCIS) (JM) valve group 2 isolation also occurred.

The event was caused by the trip of the main generator ground fault detector. The trip of this device occurred due to the combination of a loose wire and a conductive film on the outside of the wire's insulation.

Corrective actions for this event included: 1) performing an engineering analysis of the event, 2) testing the main turbine trip circuitry, 3) cleaning and tightening of generator components, 4) meggering of the main generator field, and 5) formulating recommendations for additional preventative maintenance.




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A. REQUIREMENT FOR REPORT

This report is required per 10 CFR 50.73 (a)(2)(iv), because an unplanned actuation of the Reactor Protection System (RPS) (JC) and an Engineered Safety Feature (ESF) occurred.

B. UNIT(s) STATUS AT TIME OF EVENT

Unit 1 was in the run mode at an approximate power level of 2423 MWt (approximately 99 percent of rated thermal power).

C. DESCRIPTION OF EVENT

On 1/15/87 at approximately 1800 CST, the main generator (TB) tripped and the main turbine (TA) tripped on the closure of the main turbine stop valves. The closure of these valves, when reactor power is greater than 30 percent of rated thermal power, is a scram input to the RPS. A full reactor scram occurred without complications. At the time of the scram, the two reactor recirculation pumps (AD) tripped, as required, because the turbine tripped when reactor power was greater than 30 percent of rated thermal power.

Closure of the turbine stop valves caused the reactor vessel pressure to increase to approximately 1083 psig. At this pressure, the Safety Relief Valves (SRVs) (JE) began to lift. During this event the following SRVs lifted: 1B21-F013 A, B, C, D, G, H, and K. Reactor pressure was subsequently controlled using the Electrohydraulic Control (EHC)(TG) system regulating the main turbine bypass valves.

The initial pressure transient caused the voids in the reactor core to collapse and sensed vessel water level decreased to approximately +7.9 inches above instrument zero. This resulted in a Primary Containment Isolation System (PCIS) (JM) valve group 2 isolation. The PCIS isolation occurred at an approximate water level of +11.2 inches above instrument zero. The closure of the PCIS group 2 valves was an ESF actuation and was normal for the sensed vessel level decrease.

At approximately 1805 CST, vessel water level had increased, due to the operation of the reactor feedwater pumps (SJ), to +29 inches above instrument zero. Operations personnel tripped the reactor feedwater pump "B" at that time. The feedwater pump remained idle for the remainder of the event.

At approximately 1810 CST, operations personnel re-started reactor recirculation pump (AD) "A". Reactor vessel water level was approximately +39.8 inches above instrument zero. The "B" recirculation pump was restarted at approximately 1825 CST.

After the initial vessel water level drop to +7.9 inches, vessel level was maintained between approximately +31 inches and +48 inches above instrument zero. By 1855 CST, the reactor water level was stabilized at approximately +38 inches above instrument zero.

Suppression pool water level and temperature were noted by operations personnel (since the SRVs discharged to the suppression pool). The highest suppression pool water level recorded was 148 inches and the highest temperature was 84°F.

No high pressure emergency systems were used to maintain reactor water level, nor were any needed. After the main turbine stop valves closed and the transient started, the course of the transient was as expected.

D. CAUSE OF EVENT

Plant engineering personnel determined the root causes of this event are: 1) a loosely secured wire connecting the main generator's positive field brush rigging and a voltage signal transducer, combined with 2) a highly conductive film on the outside of the wire's insulation. These two factors provided a current flow path to the main generator's frame. A current flow of 15 ma to ground is sufficient to trip the main generator ground fault detector.

These root causes were determined as a result of an evaluation of the event by plant personnel. The review involved reviewing the first hit circuitry of the main turbine supervisory equipment (JJ), meggering the main generator field and associated components, and examining the main generator wiring.

The first hit circuitry of the main turbine supervisory equipment indicated that the main turbine trip was initiated by a generator protective relay (1N51-K751) trip. Relay 1N51-K751 senses a generator field ground condition. The relay will respond to current flows of approximately 15 ma as measured between the generator field and ground.

Maintenance personnel meggered the generator field and its associated components. During the meggering process maintenance personnel determined that a wire, from the generator's positive field brush rigging to the transducer which provides a field voltage signal to the switch yard fault recorder, was not securely fastened. When that wire was moved (wiggled), the generator field showed a "hard ground" on the megger instrument. Subsequent testing with the megger instrument failed to show any other "hard ground" conditions. However, whenever the wire was moved, the megger instrument reading was affected to the extent that it indicated a current path to ground was present.

A further examination of the loose wire showed the following:

1. The outside of the generator positive field brush rigging to transducer wire was coated with what appeared to be a mixture of fine carbon dust and oil.
2. The back surface of the wire lug was blackened.
3. Paint on the main generator frame showed some discoloration where the wire was in contact with the main generator frame.

Based on the above findings, it was concluded the a current path to ground of sufficient strength (15 ma) caused the ground fault condition.

E. ANALYSIS OF EVENT

The ground detection device functioned correctly (in response to a perceived ground condition) to protect the main generator. The actuation of this protective device resulted ultimately in the actuation of the RPS by a turbine stop valve closure scram signal.

The turbine stop valve closure scram signal anticipates the pressure, neutron flux, and heat flux increase that could result from rapid closure of the turbine stop valves. Closure of the turbine stop valves with the reactor at power, can result in a significant addition of positive reactivity to the core as the reactor pressure rise collapses steam voids. The turbine stop valve closure scram signal initiates a scram earlier than either the neutron monitoring system or the reactor high pressure scram signals. With a reactor trip setting of less than or equal to 10 per cent of valve closure from full open, the scram limits the heat flux on the fuel to acceptable thermal hydraulic limits.

Although the reactor high pressure scram signal, in conjunction with the pressure relief system, is adequate to preclude overpressurizing the nuclear system, the faster scram associated with the turbine stop valve closure scram signal assures that reactor vessel overpressure limits will not be exceeded.

The Plant Hatch Unit 1 Technical Specifications on thermal limits are designed to protect the nuclear core from just such an event, even if the bypass valves had failed to open. The transient analyses performed to develop the thermal limits were performed with conservative end-of-cycle control rod positions and axial power profiles, effectively bounding the operating conditions prior to this event.

From the above information, it is concluded that the event had no nuclear safety significance.

F. CORRECTIVE ACTIONS

The corrective actions for this event included performing an engineering evaluation of this event, as described in other sections of this LER. Plant technicians tested the main turbine trip circuitry and found it to be satisfactorily calibrated.

The main generator positive field brush wire was cleaned, tightened, and re-routed so it would not contact the generator frame. The generator field was subsequently meggered again, and no indications of a ground path were detected.

Plant engineering personnel are presently formulating recommendations which will include preventative measures to minimize the recurrence of this balance of plant turbine trip.

G. ADDITIONAL INFORMATION

1. FAILED COMPONENT(s) IDENTIFICATION

No components failed in this event.

2. PREVIOUS SIMILAR EVENTS

An event similar to the one described in this LER was reported in LER 50-321/1987-001 (dated 1/1/87).

LER 50-321/1987-001 reported an event where a spurious ground fault signal or spurious electrical noise induced a voltage transient in the main turbine electrohydraulic control system. This resulted in a trip of the main turbine backup overspeed device which tripped the main turbine and resulted in a reactor scram.

The corrective actions for that event included: 1) performing an engineering evaluation, and 2) testing the main turbine backup overspeed circuitry. No abnormalities were detected and the event was evaluated as a spurious actuation.

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Manager Nuclear Safety
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SL-1979
0166C

February 16, 1987

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

Attached is Licensee Event Report 50-321/1987-002. This report meets the reporting requirement of 10 CFR 50.73(a)(2)(iv).

Sincerely,

L. T. Gucwa

LGB/lc

Enclosure

c: Georgia Power Company
Mr. J. P. O'Reilly
Mr. J. T. Beckham, Jr.
Mr. H. C. Nix, Jr.
GO-NORMS

Nuclear Regulatory Commission
Dr. J. N. Grace, Regional Administrator
Mr. P. Holmes-Ray, Senior Resident Inspector - Hatch

IE22
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