NON-PUBLIC?: N
ACCESSION #: 9011070036
LICENSEE EVENT REPORT (LER)

FACILITY NAME: PLANT HATCH, UNIT 1 PAGE: 1 OF 5

DOCKET NUMBER: 05000321

TITLE: MAIN TURBINE HIGH VIBRATION IN AUTOMATIC REACTOR SCRAM
EVENT DATE: 10/06/90 LER #: 90-020-00 REPORT DATE: 10/26/90

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 022

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: STEVEN B. TIPPS, MANAGER NUCLEAR SAFETY AND COMPLIANCE, HATCH

TELEPHONE: (912) 367-7851

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: IT COMPONENT: VR MANUFACTURER: L130
REPORTABLE NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On 10/6/90, at approximately 0337 CDT, Unit 1 was in the Run mode at approximately 536 CMWT (approximately 22 percent of rated thermal power) and decreasing as part of a scheduled shutdown to support maintenance on a Recirculation pump seal. At that time, a Main Turbine trip occurred on high vibration and a full Reactor Protection System actuation and Recirculation pump trip were initiated on Turbine Stop Valve (TSV) closure.

A second RPS actuation and a Primary Containment Isolation System Group 2 isolation occurred per design when reactor vessel water level decreased to Reactor Low Water Level 3. Reactor feedwater pumps restored and maintained reactor vessel water level and the Turbine Bypass Valves automatically controlled reactor pressure.

Causes of the event include a valve malfunction, a less than optimal design of TSV closure scram bypass pressure switches, and a failed Central Processing Unit (CPU) board.

Corrective actions include changing a valve motor operator torque switch setting, replacing a CPU board, and evaluating replacement of the pressure switches.

END OF ABSTRACT

PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor
Energy Industry Identification System codes are identified in the text as (EIIS Code XX)

SUMMARY OF EVENT

On 10/6/90, at approximately 0337 CDT, Unit 1 was in the Run mode at approximately 536 CMWT (approximately 22 percent of rated thermal power) and decreasing as part of a planned shutdown to support maintenance on a Recirculation pump (EIIS Code AD) seal. At that time, a Main Turbine (EIIS Code TA) trip occurred on high vibration and a full Reactor Protection System (RPS, EIIS Code XX) actuation and Recirculation pump trip were initiated on Turbine Stop Valve (TSV) closure.

A second RPS actuation and a Primary Containment Isolation System (PCIS, EIIS Code JM) Group 2 isolation occurred per design when reactor vessel water level decreased to Reactor Low Water Level 3. Reactor feedwater pumps (EIIS Code SK) restored and maintained reactor vessel water level and the Turbine Bypass Valves (EIIS Code JI) automatically controlled reactor pressure.

Causes of the event include a valve malfunction, a less than optimal design of TSV closure scram bypass pressure switches, and a failed Central Processing Unit (CPU) board.

Corrective actions include changing a valve motor operator torque switch setting, replacing a CPU board, and evaluating replacement of the pressure switches.

DESCRIPTION OF THE EVENT

On 10/6/90, at approximately 0337 CDT, Unit 1 was in the Run mode at approximately 536 CMWT (approximately 22 percent of rated thermal power). A scheduled reactor shutdown was in progress in order to perform maintenance on the shaft seal for Recirculation System pump 1B31-C001B. The reactor had been at approximately 22 percent of rated thermal power for approximately 30 minutes to support performance of procedure 34SV-C51-001-1S, "SRM Functional Test." At this time, the main turbine tripped on high vibration (setpoint = 12 mils). The turbine trip resulted in a full RPS actuation and trip of both Recirculation pumps on TSV closure.

The main turbine vibration had begun a slow increase approximately 30 minutes before the trip occurred as indicated on control room recorder 1N38-R900. However, when vibration exceeded the high vibration alarm setpoint of 7 mils, about 20 minutes before the trip, no alarm was received. Thus, there was no audible signal to alert the operators to the increasing turbine vibration. As a result, the operators were unaware of the increasing vibration and the need for mitigating action.

All control rods traveled full in as a result of the full RPS actuation. Approximately 41 seconds after the RPS actuation, reactor pressure vessel water level decreased due to void collapse to approximately 12.3 inches above instrument zero (approximately 176.3 inches above the top of the active fuel). At this level (Reactor Water Low Level 3), a second RPS actuation and an isolation of the PCIS Group 2 valves occurred per design.

The reactor feedwater pumps provided adequate makeup to restore and maintain reactor vessel water level. The minimum reactor vessel water level reached during the transient was approximately 10.5 inches above instrument zero (approximately 174.5 inches above the top of active fuel.) The Turbine Bypass Valves automatically controlled reactor vessel pressure; the maximum pressure reached during the transient was 980 psig.

By 0352 CDT, reactor parameters had stabilized and the RPS actuation was reset.

At approximately 0511 CDT, the NRC was notified of the event pursuant to 10 CFR 50.72.

CAUSE OF THE EVENT

The most probable cause of the main turbine vibration was a thermal imbalance of the steam supplies to the two low pressure (LP) turbines.

Following the scram, a walkdown of the Moisture Separator Reheater (MSR, EIIS Code SB) system revealed that the steam supply valve (1N38-F101A) for the second stage of the 'A' and 'B' MSRs was partially open. The steam supply valve for the second stage of the 'C' and 'D' MSRs, valve 1N38-F101B, was found to be fully closed. The valves are designed to close automatically at approximately 20 percent power and apparently did receive a closure signal prior to the onset of increasing turbine vibration. However, by design, both valves receive the closure signal from the same sensor and should close together. With one valve partially open and the other closed, the temperatures of the two steam supplies to the LP turbines were not equal. This difference in steam supply temperatures was, in the opinion of the turbine vendor (General Electric), sufficient to induce vibration in the LP turbine rotor and cause the turbine trip.

The evaluation of the MSR system performance concluded that valve 1N38-F101A failed to close potentially due to its motor operator torque switch being set too low resulting in the valve "torquing out" before it fully closed. The torque switch was found to be set at the low end of the manufacturer's specified range. The switch setting was increased at the manufacturer's recommendation and subsequent testing showed that the valve would close as required. Testing performed on the valve and its associated initiation logic identified no additional problems.

The design intent of the RPS is such that a full RPS actuation is not required to occur on TSV closure when operating below 30 percent rated thermal power. This is because main steam flow at approximately 30 percent power is within the capability of the turbine bypass valves. In this event, however, the logic which senses reactor power less than 30 percent (main turbine first stage pressure) and automatically bypasses the TSV scram signal did not actuate. Thus, without this bypass in effect, closure of the TSVs resulted in a full RPS actuation and trip of both Recirculation pumps.

The cause of the automatic RPS actuation on TSV fast closure at less than 30 percent reactor power is a less than optimal design of the scram bypass switches, 1C71-N003A, B, C and D. These switches are intended to bypass the RPS inputs from the Turbine Control Valve (TCV) fast closure and TSV closure signals below 30 percent reactor power (correlated to main turbine first stage pressure) as power is increasing. This logic allows for a turbine trip without a corresponding reactor scram during low power periods of plant startup. The design of the switches is such that they have a wide, fixed "dead band" and do not reset on decreasing reactor power until approximately 18 to 20 percent of rated thermal

power. Consequently, upon decreasing power, the TCV/TSV scram bypass will not actuate until approximately 18 to 20 percent of rated thermal power. This increases the potential for an unnecessary, automatic scram.

The cause of the Turbine High Vibration annunciator not alarming was a failed central processing unit (CPU) board in the Turbine Vibration Recorder 1N30-R900.

REPORTABILITY ANALYSIS AND SAFETY ASSESSMENT

This report is requi
ed per 10 CFR 50.73(a)(2)(iv) because an unplanned
actuation of the RPS and an Engineered Safety Feature (ESF) occurred. Specifically, automatic RPS actuations occurred on TSV fast closure and low reactor vessel water level. Also, a PCIS Group 2 isolation occurred on low reactor vessel water level.

The RPS and PCIS provide timely protection against the onset and consequences of conditions that could threaten the integrity of the fuel barriers and the nuclear steam process barrier. The PCIS provides timely protection against the release of radioactive materials to the environment by isolating primary containment systems in the unlikely event of an accident. In this event, RPS and PCIS functioned as designed. An RPS actuation was initiated by closure of the TSVs which resulted in all controls rods being fully inserted. A second RPS actuation was initiated by decreasing reactor water level below Level 3. No control rod movement occurred since all rods were already fully inserted. The low reactor water level signal also initiated an isolation of the PCIS Group 2 valves. The appropriate PCIS valves isolated. Reactor vessel water level was maintained by the reactor feedwater pumps and did not decrease below approximately 174.5 inches above the top of the active fuel during the event. Reactor vessel pressure was maintained below 980 psig by the Turbine Bypass Valves. Had the event occurred at a higher reactor power, the same systems would have responded in a similar way to mitigate the consequences of the transient.

Based on the above information, it is concluded that this event had no adverse impact on nuclear safety. This safety assessment is applicable to all power levels.

CORRECTIVE ACTIONS

The torque switch setting of the motor operator for valve 1N38-F101A was found to be set at the lower end of the manufacturer's specified range.

The torque switch setting was increased at the manufacturer's recommendation and testing was performed to ensure the valve would close as required. Testing was performed on the valve and its associated initiation logic with no further problems identified.

Inspections of the 'A' low pressure turbine were performed since indicated vibration was greatest in this section of the turbine. An analysis of the bearing lubricating oil was also performed. No unusual amounts of babbitt fines existed in the oil. The last stage buckets of the turbine were inspected and no problems were identified. During the subsequent startup activities, turbine vibration was monitored and no problems were noted.

An evaluation will be performed concerning potential replacement of the TCV/TSV scram bypass pressure switches with switches that exhibit more sensitive reset characteristics. The Unit 2 switches are of a similar design and will also be evaluated.

The CPU board of recorder 1N38-R900 was replaced and the recorder was returned to service.

ADDITIONAL INFORMATION

No systems other than the Main Turbine, MSR System, RPS, PCIS, Recirculation System, and the Feedwater System were affected by this event.

Turbine vibration has occurred on both Hatch units in the past and is, in fact, being aggressively investigated per management direction. No previous similar events have occurred, however, in the past two years in which turbine high vibration has resulted in an automatic scram.

FAILED COMPONENT IDENTIFICATION:

MPL (Plant Index Identifier): 1N38-R900
Manufacturer: Leeds and Northrup
Model Number: Recorder: 250, CPU Board: 043075
Type: CPU Board to Recorder 1N38-R900
EIIS Code: VR
Root Cause: X
Reportable to NPRDS: No

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October 26, 1990

U.S. Nuclear Regulatory Commission
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PLANT HATCH - UNIT 1
NRC DOCKET 50-321
OPERATING LICENSE DPR-57
LICENSEE EVENT REPORT
MAIN TURBINE HIGH VIBRATION
RESULTS IN AUTOMATIC REACTOR SCRAM

Gentlemen:

In accordance with the requirements of 10 CFR 50.73(a)(2)(iv), Georgia Power Company is submitting the enclosed Licensee Event Report (LER) concerning main turbine high vibration resulting in an automatic reactor scram. This event occurred at Plant Hatch - Unit 1.

Sincerely,

W. G. Hairston, III

SJB/eb

Enclosure: LER 50-321/1990-020

c: (See next page.)

c: Georgia Power Company
Mr. H. L. Sumner, General Manager - Nuclear Plant
Mr. J. D. Heidt, Manager Engineering and Licensing - Hatch
NORMS

U.S. Nuclear Regulatory Commission, Washington. D.C.
Mr. F. Rinaldi, Acting Licensing Project Manager - Hatch

U.S. Nuclear Regulatory Commission. Region II
Mr. S. D. Ebneter, Regional Administrator
Mr. L. D. Wert, Senior Resident Inspector - Hatch

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