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HL-1182
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July 10, 1990

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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PLANT HATCH - UNIT 1
NRC DOCKETS 50-321
OPERATING LICENSE DPR-57
LICENSEE EVENT REPORT
MANUAL SCRAM AND NOTIFICATION OF UNUSUAL
EVENT DUE TO FIRE IN OFFGAS SYSTEM

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 the unanticipated actuation of some Engineered Safety Features (ESFs). This event occurred at Plant Hatch - Unit 1.

Sincerely,

W. G. Hairston, III

JJP/ct

Enclosure: LER 50-321/1990-012

c: (See next page.)



IE22
1/1

c: Georgia Power Company
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Mr. J. D. Heidt, Manager Engineering and Licensing - Hatch
NORMS

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

NRC Form 366A (9-83)

U.S. NUCLEAR REGULATORY COMMISSION

# LICENSEE EVENT REPORT (LER)

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TITLE (4)
MANUAL SCRAM AND NOTIFICATION OF UNUSUAL EVENT DUE TO FIRE IN OFFGAS SYSTEM

| EVENT DATE (5) | | | LER NUMBER (6) | | | REPORT DATE (7) | | | OTHER FACILITIES INVOLVED (8) | |
|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | DAY | YEAR | YEAR | SEQ NUM | REV | MONTH | DAY | YEAR | FACILITY NAMES | DOCKET NUMBER(S) |
| | | | | | | | | | | 0 5 0 0 0 |
| 9 0 | 0 6 | 1 0 | 9 0 | 0 1 2 | 0 0 | 0 7 | 1 0 | 9 0 | | 0 5 0 0 0 |

| OPERATING MODE (9) | 1 | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (11) | | | |
|---|---|---|---|---|---|
| POWER LEVEL | 0 2 5 | 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) |
| | | 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 | |
| Steven B. Tipps, Manager Nuclear Safety and Compliance, Hatch | 912 | 367-7851 |

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

| CAUSE | SYSTEM | COMPONENT | MANUFAC-TURER | REPORT TO NPRDS | | CAUSE | SYSTEM | COMPONENT | MANUFAC-TURER | REPORT TO NPRDS | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |

| SUPPLEMENTAL REPORT EXPECTED (14) | | EXPECTED SUBMISSION DATE (15) | MONTH | DAY | YEAR |
|---|---|---|---|---|---|
| YES(If yes, complete EXPECTED SUBMISSION DATE) | X NO | | | | |

ABSTRACT (16)


On 6/10/90 at approximately 0826 CDT, Unit 1 was in the Run mode at an approximate power level of 609 CMWT. At that time, a procedurally controlled manual scram was directed by management to allow for termination of Offgas system flow to facilitate full investigation and resolution of offgas operational problems. The Group 2 Primary Containment Isolation System valves isolated and an automatic Reactor Protection System actuation was received on low level due to the expected void collapse as a result of the manual scram. Level was restored using the "B" Reactor Feedwater Pump. The Offgas system problems resulted in a reduction of hydrogen and oxygen recombination and an eventual hydrogen ignition in the carbon adsorber beds. At 1331 CDT, it was confirmed combustion was taking place and, at 1338 CDT, a Notification of Unusual Event (NUE) was declared for a fire lasting longer than 10 minutes (after discovery). The Offgas system was purged with nitrogen for several days. Exhaustive testing was completed at approximately 1315 CDT on 6/16/90 demonstrating the fire was extinguished and the NUE was terminated at 1325 EDT.

The cause of the fire in the Offgas system was component malfunction due to a combination of component failure, discrepancies in as-built equipment configuration, and less than adequate system operating procedures.

Corrective actions for this event include replacement of failed components, correcting equipment configuration, and revisions to procedures.

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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 6/10/90 at approximately 0826 CDT, Unit 1 was in the Run mode at an approximate power level of 609 CMWT (approximately 25% of rated thermal power). At that time, a manual scram was directed by management as part of a planned, procedurally controlled fast reactor shutdown. The manual scram allowed for termination of Offgas system (EIIS Code WF) flow to allow for full investigation and resolution of Offgas operational problems. The Primary Containment Isolation System (PCIS EIIS Code JM) Group 2 valves isolated and an automatic Reactor Protection System (RPS EIIS Code JC) actuation was received on low level due to the expected void collapse as a result of the manual scram. Level was restored using the "B" Reactor Feedwater Pump (RFP EIIS Code SJ). The Offgas system problems, which started on 6/9/90, resulted in a reduction of hydrogen and oxygen recombination, leading to hydrogen concentrations greater than 4% and an eventual hydrogen ignition in the carbon adsorber beds. At 1331 CDT, analysis of Offgas system samples confirmed combustion was taking place in the Offgas system and, at 1338 CDT, a Notification of Unusual Event (NUE) was declared for a fire lasting longer than 10 minutes (after discovery) within the plant protected area. To conservatively assure the fire was extinguished and the carbon adsorber would not re-ignite the Offgas system was purged with nitrogen for several days. Exhaustive testing was completed at approximately 1315 CDT on 6/16/90 demonstrating the fire was extinguished and the NUE was terminated at 1325 CDT.

The cause of the hydrogen ignition and fire in the Offgas system carbon adsorber beds was component malfunction due to a combination of component failure, discrepancies in as-built equipment configuration, and less than adequate system operating procedures.

Corrective actions for this event included replacement of failed components, correcting the as-built equipment configuration as required, revisions to procedures, and a planned review to determine if any preventive maintenance procedures are needed.

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DESCRIPTION OF EVENT

On 6/9/90 at approximately 0025 CDT, Unit 1 was in the Run mode at an approximate power level of 853 CMWT (approximately 35% of rated thermal power). At that time, the "B" Offgas Preheater, 1N62-B001B, and the "B" Catalytic Recombiner 1N62-A001B, were in service with both hydrogen analyzers, 1N62-N009A and B, downscale indicating hydrogen and oxygen recombination in the Offgas system was occurring per design.

Operations personnel began increasing power to 1218 CMWT (approximately 50% of rated thermal power) as part of normal startup activities. About five minutes after beginning the power increase (0030 CDT), the "B" Recombiner temperatures started to decrease and the hydrogen analyzers' recorder pens showed a slow, but steady increase in hydrogen levels. At approximately 0108 CDT, power reached 1218 CMWT. Operations personnel recognized that problems existed in the Offgas system and therefore held power at 1218 CMWT while they investigated.

On 6/10/90 at approximately 0238 CDT, Operations personnel began reducing power to 901 CMWT per Management's direction due to the continued deterioration of Offgas system performance and the ongoing activities to resolve the performance problems. Power was reduced to approximately 901 CMWT (approximately 37% of rated thermal power) by 0316 CDT. At approximately 0620 CDT, Offgas system parameters appeared to be improving due to corrective actions taken.

At approximately 0725 CDT while still at 37% rated thermal power, changes occurred in several Offgas system operating parameters: Offgas system flow spiked full-scale on recorder 1N62-F604 then began to decrease, both hydrogen analyzer recorders went full-scale (greater than 5%), a point on multipoint carbon adsorber vessel temperature recorder 1N62-R613 went full scale (greater than 150 deg. F), and system pressure began to decrease. In response to these unexpected changes in system parameters, Operations personnel at 0730 CDT began to further decrease power to remove a Steam Jet Air Ejector (SJAE EIIS Code SH) from service and thereby decrease offgas flow.

At this point it was recognized that the option of manually scramming the reactor to allow for cessation of offgas flow may need to be implemented. At 0826 CDT, it was apparent carbon adsorber vessel temperatures were not decreasing as expected and, in fact, were continuing to increase. At this point, the unit was manually scrammed in accordance with the Fast Reactor Shutdown procedure to stop offgas flow with reactor power at approximately 25% rated thermal power.

Immediately following the scram, reactor water level decreased as expected due to void collapse resulting from the decrease in reactor power. Water level decreased to approximately zero inches relative to instrument zero (approximately 517 inches above the top of the active fuel) before being

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recovered by the "B" RFP. No Emergency Core Cooling Systems (ECCS) injected automatically or manually as they were not needed to recover or control water level. An automatic scram signal and a Group 2 PCIS signal were received when water level decreased to 12.3 inches above instrument zero. Group 2 isolation valves closed per design.

Also, immediately following the scram, the SJAE was isolated and offgas flow was stopped. Inspections of Offgas system piping and components, in the Waste Gas Treatment Building, were performed immediately after the sudden changes in Offgas system operating parameters and again after the manual scram. They revealed some white-gray smoke near the ceiling above the adsorber vessels, discolored paint on the carbon adsorber vessels and vessel piping, and some chipped and cracked concrete grouting around some I-beams supporting the adsorber vessels (whether the discolored paint and chipped grouting had resulted specifically from this event could not be conclusively determined). At this point, however, it was not apparent that carbon in the adsorber vessels was smoldering. Indications were the system had overheated from a hydrogen ignition.

As a precaution, Management ordered a nitrogen purge of the Offgas system to be established. Operations personnel entered abnormal operating procedure 34AB-OPS-038-1S, "Control of Sustained Combustion in the Off Gas System." A nitrogen purge was established per this procedure at approximately 1025 CDT; purge flow was established at 12 scfm. Also, General Electric Offgas system experts as well as Architect Engineer (AE) personnel were contacted to provide engineering support in evaluating the Offgas system operational problems.

At approximately 1301 CDT and again at 1331 CDT, samples were taken from the Offgas system and analyzed. Both samples indicated high levels of combustion products (carbon monoxide at greater than 1400 ppm and carbon dioxide at about 2.4%); therefore, at 1338 CDT, an NUE was declared for Unit 1, per the Plant Hatch Emergency Plan, for a fire continuing greater than ten minutes (after discovery) within the protected area, specifically in the Offgas system's carbon adsorber beds. Notification was made to state and local authorities via the Emergency Notification Network at approximately 1344 CDT and to the NRC via the Emergency Notification System ("red phone") at approximately 1345 CDT.

On 6/11/90, at approximately 0145 CDT, a nitrogen truck arrived on site and Offgas system nitrogen purge flow was increased to approximately 70 scfm using the truck as the nitrogen source. General Electric system experts as well as AE personnel assisted in the development of a special purpose procedure to conservatively demonstrate that the fire was extinguished and the carbon adsorber would not re-ignite. On 6/14/90 at approximately 1500 CDT, the exhaustive testing per the special purpose procedure 42SP-061390-0L-1-1S, "Off Gas Air Purge", was begun. Testing was completed at approximately 1315 CDT on

6/16/90 at which time it was conclusively determined that the fire was extinguished and the carbon adsorber would not re-ignite. The NUE was terminated at 1325 CDT and the appropriate notifications made.

CAUSE OF THE EVENT

The cause of the isolation of the PCIS Group 2 valves and scram signal on low level was the initiation of a manual scram. The manual scram was directed by Management to allow termination of Offgas system flow and thereby facilitate more effective identification and correction of the continuing Offgas system operational problems.

The cause of the hydrogen ignition and fire in the Offgas system carbon adsorber vessels was inadequate recombination of hydrogen and oxygen. The inadequate recombination was the result of the offgas flow not being properly heated and dried due to preheater malfunction.

Failure of both the "A" and "B" Offgas Preheater Condensate Return Pumps (CRP) caused condensate level in the preheaters to increase resulting in flooding of the preheaters. Due to flooding, the preheaters could not properly heat and dry the offgas flow. Because the flow was not properly heated and dried, water reached the in-service recombiner causing a reduction in hydrogen and oxygen recombination. This resulted in hydrogen concentrations greater that 4% in the Offgas system. It appears ignition occurred when gasses heated by recombination in the "A" Recombiner reached the hydrogen in the offgas piping downstream of the water separator.

The cause of the preheater CRPs' failure to perform their function was component malfunction due to a combination of component failure, discrepancies in as-built equipment configuration, and less than adequate system operating procedures. The pump discharge pressure control valves could no longer perform their function due to internal valve erosion. The two discrepancies in as-built equipment configuration consisted of a gate valve, instead of the required needle valve, serving the function of controlling the flow of subcooled condensate to the "B" CRP inlet jet housing and the incorrect installation of the manual air vent valve on the "A" CRP's air separator. Review of system design and maintenance documentation indicated the gate valve had been in place since original equipment installation. It could not be identified conclusively when the incorrect installation of the manual air vent valve had occurred. Finally, less than adequate system operating procedures resulted in the steam trap bypass valves on the suction line of the CRP's being used to establish correct CRP inlet pressure values and also lacked guidance for actions to be taken if the Offgas system hydrogen concentration levels exceeded 4%.

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REPORTABILITY ANALYSIS AND SAFETY ASSESSMENT

This event is reportable per 10 CFR 50.73(a)(2)(iv) because an unplanned actuation of the RPS and an Engineered Safety Feature (ESF) occurred. Specifically, an isolation of PCIS Group 2 valves and an RPS actuation occurred on low level due to the expected void collapse due to a manual scram. The manual scram was directed by Management as part of a planned, procedurally controlled fast reactor shutdown. This was a conservative measure to allow termination of Offgas system flow and thereby facilitate more effective identification and correction of the continuing Offgas system operational problems.

The Offgas treatment system is designed to reduce the gaseous radwastes from the plant to provide reasonable assurance that the release of radioactive materials in gaseous effluents will be kept As Low As Reasonably Achievable (ALARA). The Offgas system uses a high-temperature catalytic recombiner to recombine radiolytically dissociated hydrogen and oxygen from the offgas. After cooling (to approximately 130 deg. F) to strip the condensibles and reduce the volume, the remaining noncondensibles (principally kyptons, xenons, and air) are delayed in the holdup system. The gas is cooled to 45 deg. F and reheated to 74 deg. F for humidity control before reaching the adsorption bed. The charcoal adsorption bed, operating in a constant-temperature vault, selectively adsorbs and delays the xenons and kryptons from the bulk carrier gas (principally air). This delay on the charcoal permits the xenon and krypton to decay in place. The Offgas system piping and equipment are designed to contain any explosion which has a reasonable probability of occurring.

A radiation monitor at the recombiner outlet continuously monitors radioactivity release from the reactor and, therefore, continuously monitors the degree of fuel leakage and input to the charcoal adsorbers. This radiation monitor is used to provide an alarm on high radiation in the offgas. A radiation monitor is also provided at the outlet of the charcoal adsorbers to monitor continuously the release rate from the adsorber beds. This radiation monitor is used to isolate the Offgas system on high radioactivity to prevent treated gas of unacceptably high activity from entering the main stack.

In this event, problems in the Offgas system resulted in hydrogen concentration levels above 4% and, eventually, a hydrogen ignition in the system's piping. The unit was manually scrammed in response to increasing carbon adsorber vessel temperatures. However, gaseous radioactive releases never approached Technical Specifications limits.

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The Offgas system piping and equipment remained intact per its design as described above; therefore, offgas did not escape the system boundary. In addition, the Offgas system's radiation monitoring system remained operable throughout this event. Any problems or damage adversely affecting the system's treatment abilities would have resulted in the termination of releases from the system before the violation of release limits. Based on this, it is concluded the health and safety of the public were not affected by this event. The above analysis is applicable to all reactor power levels.

CORRECTIVE ACTIONS

The as-built Offgas system equipment configuration was corrected as required by replacement of referenced gate valves with needle valves and assuring correct installation of the manual air vent valve. The CRP discharge pressure control valves, 1N62-F140A and B, were replaced with new valves of the same type. CRP 1N62-C536B was disassembled, inspected, and repaired as necessary. These actions were completed by 6/17/90.

Procedure 34SO-N62-003-1S was revised to remove the requirement to adjust the Steam Trap Bypass Valves to establish pump inlet pressure. Procedure 34AB-OPS-038-1S was revised to add a section to give specific guidance governing actions which are to be taken if hydrogen concentration levels exceed 1% and 4%. Applicable annunciator response procedures for Offgas system annunciators contained in procedure 34AR-N62-901-1S, "ARP's For Control Panel 1N62-P600, Alarm Panel 1," were revised to refer the operator to procedure 34AB-OPS-038-1S. These revisions were effective 6/15/90.

A review of Unit 1 Offgas system vendor recommendations and operating experience will be performed by 8/31/90 to determine whether preventive maintenance procedures for any Offgas system components need to be developed.

Unit 2 Offgas system design was reviewed and determined to have a different design such that it was not susceptible to the identified causes of the Unit 1 Offgas system malfunctions.

ADDITIONAL INFORMATION

There have been no previous similar events recently in which Offgas system problems led to Unit 1 scramming either automatically or manually.