

LICENSEE EVENT REPORT (LER)

Form Rev. 2.0

Facility Name (1)

Docket Number (2)

Page (3)

Quad Cities Unit One

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Title (4)

Manual scram taken during reactor startup when reactor water level increased following unplanned opening of all main turbine bypass valves due to an inadequate procedure.

Event Date (5)

LER Number (6)

Report Date (7)

Other Facilities Involved (8)

Month Day Year

Year

Sequential

Revision

Month

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Facility

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Docket Number(s)

Month Day Year

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TEXT Energy Industry Identification System (EIS) codes are identified in the text as [XX]

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2511 Mwt rated core thermal power.

EVENT IDENTIFICATION: Manual scram taken during reactor startup when reactor water level increased following unplanned opening of all main turbine bypass valves due to an inadequate procedure.

A. CONDITIONS PRIOR TO EVENT:

Unit: One
Reactor
Mode: 3

Event Date: August 25, 1996
Mode Name: Startup
Event Time: 0448
Power Level: 004%

This report was initiated by Licensee Event Report 254\96-017

STARTUP (3) - In this position, the reactor protection scram trips, initiated by condenser low vacuum and main steamline isolation valve closure are bypassed, the low pressure main steamline isolation valve closure trip is bypassed and the reactor protection system is energized, with IRM and APRM neutron monitoring system trips and control rod withdrawal interlocks in service.

B. DESCRIPTION OF EVENT:

On 11/18/95, Interim Procedure (IP) 95-1010 of QCGP 1-1, Normal Unit Startup, was approved adding a method to perform High Pressure Coolant Injection (HPCI) [BJ] and Reactor Core Isolation Cooling (RCIC) [BN] post-maintenance turbine overspeed testing prior to reaching 150 psig reactor pressure when Technical Specification required testing would be performed. The change consisted of using the turbine bypass valves associated with the Electro-Hydraulic Control (EHC) [JI] system to control reactor pressure below 150 psig. Step F.4.p. of the IP stated: "If RCIC/HPCI low pressure testing will be performed prior to 150 psig, then prior to 140 psig verify pressure regulator 1(2) A/B Press setpoint is set to maintain reactor pressure < 150 psig." Although the low end of the EHC pressure regulator scale is 150 psig, it was thought that pressure could be controlled slightly below 150 psig by depressing the "decrease" button on the pressure regulator lowering the setpoint slightly below 150 psig. At this point pressure could be held at approximately 140 psig to complete the testing. Operations requested Training to model this method on the Control Room simulator and the successful performance was used to validate the IP. The IP was successfully used to conduct testing for the Unit 2 startup.

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Unit 1 prior-to-startup training was provided to Operations personnel on the IP reissued as IP 96-0100 in May of 1996. The instructor who was responsible for coordinating the startup training discovered control below 150 psig is possible because of the calibration limitations for the affected pressure transducers. The "A" and "B" EHC pressure transducers for the turbine throttle have inherent inaccuracies at the lower input pressures. At a zero (0) psig input pressure, the "A" and "B" EHC pressure transducers transmit output pressures of 3.4 and 67.4 psig, respectively. At 150 psig input pressure, the "A" and "B" EHC pressure transducers transmit output pressures of 140.7 and 189.9 psig, respectively.

The simulator training was set up so that the bypass valves would begin opening between 130 and 140 psig. In this training the EHC pressure transducer calibration data was not effectively communicated to some crews and some of the Operations personnel questioned how it was possible to control pressure below scale. A procedure revision was submitted and approved on 7/25/96 as IP 96-0144 which added "Verify Pressure Regulator, 1(2) A/B Press Setpoint is set at 150 psig (low end of scale). If it is not at 150 psig, then depress the decrease button until it is set at 150 psig." and "Verify bypass valves come open and pressure is being controlled automatically by the EHC system before reactor pressure reaches 140 psig." Some Operators, including those who were involved with this revision, perceived that the method used would actually lower the setpoint to a motor stop below the end of the scale but not lower than 130-135 psig.

On 8/24/96 at 1415 hours, Unit 1 reactor startup commenced, in accordance with IP 96-0144. At approximately 1645 hours, the Unit 1 NSO performed step F.4.p, lowering the pressure set point as directed by the procedure. After reaching the low end of the scale at 150 psig on the EHC setpoint controller, the NSO continued to depress the decrease button for an additional 10-15 seconds to ensure himself that the setpoint was lowered below 150 psig based upon the rate of decrease prior to reaching the low end of the scale.

On 8/25/96 at approximately 0440 hours, the Unit 1 Supervisor had stopped control rod withdrawal for heatup at approximately 110 psig reactor pressure to investigate why the RCIC low pressure isolation signal had not cleared and to allow main condenser vacuum to be established prior to turbine bypass valve operation which was expected at greater than 130 psig. The mechanical vacuum pump was being used to establish vacuum and the main condenser dropped below 23 inches Hg backpressure. Pressure switches PS 1-5600-110, 111, 112 sense condenser vacuum and prevent the turbine bypass valves from opening unless there is adequate backpressure in the main condenser. IP 96-0144 included a caution from the original procedure, "If EHC pressure regulator [PC] setpoint is less than reactor pressure with condenser backpressure < 23 inches Hg, then turbine bypass valves will open." Although the bypass valve permissive was understood by the operators and noted in the procedure as being satisfied at 23 inches Hg backpressure (7 inches Hg vacuum), 23 inches applies with backpressure increasing. When backpressure is being lowered, the permissive is made up between 22 inches and 21 inches Hg backpressure when the contacts of all three pressure switches will open (reset).

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At 0447:52 hours, the "bypass valve open" alarm sounded when the permissive was made up when the last pressure switch reset. An extra NSO adjacent to the 901-7 panel observed the Bypass valve indications and announced that all the bypass valves were open. The pressure dropped from the initial reactor pressure of 115 psig, the bypass valves cycled, and another NSO positioned himself to scram the reactor as reactor water level increased. Intermediate Range Monitor (IRM) [IG] detected neutron flux remained stable throughout the transient. At 0448:08 hours, a manual reactor scram was inserted as ordered by the Unit 1 Supervisor at 43 inches of reactor water level increasing. Scram criteria had been set at 44 inches in the preshift briefing and the operators inserted the manual scram within 16 seconds of receiving the bypass valve open alarm. The last bypass valve closed when reactor pressure dropped below 100 psig.

C. APPARENT CAUSE OF EVENT:

The root cause of this event is an inadequate procedure. Although the operators misunderstood the activity and how the pressure setpoint was never actually below 150 psig, their actions were in accordance with the procedure as stated. The methodology in the procedure did not ensure the condenser vacuum permissive was established before lowering the setpoint. The effective control range being implemented in the procedure would vary according to the Unit throttle pressure calibration data and could conceivably change with setpoint drift. Operators do not routinely have access to the calibration data which would be necessary to determine when the bypass valves would open with the method described in this procedure. Subsequent to the event, the actual value of the EHC pressure setpoint (with the adjustment at the lower stop) was measured to be approximately 155 psig. This is within the system tolerance requirements and is consistent with the observed performance.

When the methodology was initially approved on 11/18/95, the procedure approval was based on the premise that pressure setpoint could actually be lowered below 150 psig which was then reinforced with the successful performance during the Unit 2 startup. The validation simulator conditions on 11/18/95 included having condenser vacuum established prior to lowering the pressure setpoint which was not a required but a normally expected condition. The potential significance of the pressure transducer calibration data was not realized until May, 1996, well after the method was successfully used on Unit 2.

A contributing cause of this event is inadequate training. Although the throttle pressure calibration data was presented to Training by Systems Engineering, the instructor responsible for disseminating this information did not ensure the methodology for conducting the low pressure testing was effectively communicated to other instructors and all Operations crews. The Operations personnel involved in the event believed they had maintained a sufficient margin below the pressure setpoint to prevent the opening of the bypass valves if they stayed below 120 psig.

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D. SAFETY ANALYSIS OF EVENT:

The safety significance of this event is minimal. The Unit was in Startup, no automatic trips were challenged, and IRM flux remained stable through the transient. The Unit Supervisor ordered a manual reactor scram at 43 inches of reactor water level increasing as established in the preshift meeting.

E. CORRECTIVE ACTIONS:

Corrective Actions Completed:

1. Interim procedure IP 96-0152 replaced IP 96-0144 on 8/25/96 revising the control method to ensure the condenser backpressure bypass permissive is satisfied prior to lowering the setpoint into a control range. This procedure was successfully used to perform the post-maintenance tests of the HPCI and RCIC turbines.
2. The responsible Training Department instructor was counselled on the need to ensure all applicable information is communicated when briefing other instructors or providing training.
3. A review of the procedure approval and validation for this event determined no change to the procedure approval and validation process is warranted.

Corrective Actions to be Completed:

1. Licensed Operator lesson plans will be revised to ensure the details of the 8/25/96 event and pressure transducer calibration data affecting the EHC system are presented in initial training by 12/31/96. (Training - NTS #2541809601701)
2. The 8/25/96 event will be presented to Operators and Engineers in retraining by 12/31/96. (Training - NTS #2541809601702)
3. QCGP 1-1, Normal Unit Startup, will be revised to ensure the condenser backpressure bypass permissive is satisfied prior to lowering the EHC setpoint into a control range. This revision will be completed by 11/01/96. (Operations - NTS #2541809601703)
4. The 8/25/96 event will be tailgated with the Training Department by 12/31/96 emphasizing the instructor's responsibility to communicate such discovered information in training materials to ensure thorough and consistent training. (Training - NTS #2541809601704)

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F. PREVIOUS EVENT:

A search conducted for LER's in the last two years which involved procedural deficiencies impacting the Operations Department revealed the following events:

LER 254/95-06, "The 1A RPS relays had not been tested prior to the mode switch being moved to Refuel due to an inadequate written communication".

LER 254/96-06, "Technical Specification 3.0.A was incorrectly invoked, due to procedural and operator knowledge deficiencies on Technical Specification requirements, when Primary to Secondary Containment flowpaths were established during local leak rate testing".

Neither LER 254/95-06 nor LER 254/96-06 were precursors to the current event as their procedural and knowledge deficiencies involved specific Technical Specifications as opposed to equipment operational characteristics.

G. COMPONENT FAILURE DATA:

Not Applicable.