



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DEC 28 1990

MEMORANDUM FOR: Thomas M. Novak, Director
Division of Safety Programs
Office for Analysis and Evaluation
of Operational Data

FROM: Jack E. Rosenthal, Chief
Reactor Operations Analysis Branch
Division of Safety Programs
Office for Analysis and Evaluation
of Operational Data

SUBJECT: HUMAN FACTORS STUDY REPORT - QUAD CITIES 2
(10/27/90)

On October 27, 1990, at 3:59 p.m., Quad Cities Unit 2 scrambled on a hi-hi intermediate range scram signal, because the operator withdrew control rods to increase reactor pressure without recognizing the need to follow the normal procedures for re-establishing reactor criticality. Quad Cities 2 was preparing to restore the plant following an aborted special turbine torsional test and return to power operations. At about 1% power, an operator was inserting control rods to reduce reactor pressure so that the turbine bypass valves would close and test equipment could be removed from the EHC system, when the reactor went subcritical. When the system pressure continued to decrease below the desired level, the operator withdrew rods to increase pressure, but the reactor scrambled on a hi-hi intermediate range scram signal. This event occurred because the operator was monitoring reactor pressure rather than reactivity.

As part of the AEOD program to study the human factors aspects of operational events, a team was sent to the site October 31. The team leader was Gene Trager of AEOD; other team members were Barry Kaufer of AEOD, and Orville Meyer and Mark Parrish of Idaho National Engineering Laboratory. The team was at the site for two days and gathered data from discussions, plant logs, strip chart recordings, and interviews of plant operators.

Enclosed is the report prepared by INEL of the results of the team's human factors study. Specific human performance aspects of this event are addressed in this memorandum.

Task Awareness

There was a low level of awareness that the operations required to support the special test might require special attention. Operations personnel were not sufficiently aware that careful reactivity management would be necessary during installation and removal of the special test equipment to avoid either subcriticality or short startup periods.

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Shift Organization and Command and Control

The shift organization consisted of a shift engineer (SE; SRO), who had overall responsibility for operations, a shift control room engineer (SCRE; degreed SRO/STA) who directs control room operators and activities for both units, nuclear station operators who are the licensed control room operators, and shift foremen (SF; SROs) who report to the SE and who direct equipment operators for inplant activities. The shift organization was not effective in preventing this event.

A contributor to this event was the difficulty experienced by the SE and SCRE in managing operations in support of the special test. During shift change there were many people in the control room in the vicinity of the SCRE's desk monitoring the test, and the SCRE finally asked them to leave the control room. When the decision was made to return the unit to power operation, the SE and SCRE were both surprised, as they had expected to go to cold shutdown to repair intermediate range monitoring equipment. They were both involved in reinerting the drywell (to meet a technical specification time limit) and returning the EHC system to service. The combination of these factors may have been distracting. The SE realized that the SCRE was busy, but he did not return to the control room until the time the scram occurred.

The SCRE did not monitor and direct the activities of the unit NSO in controlling reactor power, because he was busy with other things. Unfortunately, the NSO thought he was being watched, as he reduced power unnecessarily until the reactor was subcritical, and then quickly pulled control rods to increase pressure.

Procedures

The procedure governing operations from power operation to hot standby did not have cautions regarding the possibility of high rod and notch worths and the need for special reactivity management. In addition, when the procedure was first performed on Shift 1 the operators were unwilling to sign off a step regarding subcriticality, because it was unclear. However, they accepted the step as completed when it was signed off by an operating engineer. Furthermore, the Shift 3 unit NSO did not use a new copy of the procedure, but referred to the copy that had been signed off by Shift 1.

Communications

There was a low level of communications among station operators prior to the event. The SCRE directed the unit NSO to take certain action, but he did not verify that his instructions were understood nor that the actions were taken.

Training

While operating the plant in a hot standby condition is rare at this site, no special training was requested for performing this special test and there was no simulator drill, classroom instruction, or "read only" instructions for the control room operators. Furthermore, maintaining the reactor in a hot standby condition was part of initial licensed operator training, but was not part of the requalification program.

Use of Operating Experience Information

Operating experience information was not fed back prior to and during this event. An SRO had been assigned to review a previous reactivity management event that occurred at LaSalle in 1990, but no information on the significance of the event relative to Quad Cities was given to the operators. Similarly, high notch worth was experienced and understood by Shift 1, but this information was not recorded nor passed on to Shift 3.

This event emphasizes the need for careful planning, increased awareness, training, proper review and use of procedures, and good communications, when a plant is placed in a non-typical mode of operation due to special testing or other unusual conditions.

This report is being sent to Region III for appropriate distribution within the region.

Original signed by

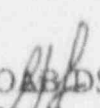
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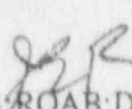
Enclosure: As stated

cc: Richard L. Bax, Station Manager
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