NON-PUBLIC?: N
ACCESSION #: 8712030173

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Perry Nuclear Power Plant, Unit 1 PAGE: 1 of 4

DOCKET NUMBER: 05000440

TITLE: Reactor Scram and HPCS Injection Caused by Loss of Feedwater
Flow Due to Improper Transfer of Station Loads
EVENT DATE: 10/27/87 LER #: 87-072-00 REPORT DATE: 11/25/87

OPERATING MODE: 1 POWER LEVEL: 051

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION
50.73(a)(2)(iv), OTHER Special Report

LICENSEE CONTACT FOR THIS LER:
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SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: On October 27, 1987 at 0637, following an improper transfer of station loads, a reactor scram occurred due to a reactor water level of less than Level 3 (plus 177.7 inches above top of active fuel (TAF)). In addition, Nuclear Steam Supply Shutoff System isolations, as well as High Pressure Core Spray and Reactor Core Isolation Cooling System initiations occurred due to a reactor vessel level of less than Level 2 (plus 129.8 inches above TAF).

The cause of the event was personnel error. When transferring station loads from the Startup Transformer to the Auxiliary Transformer, a control room operator inadvertently de-energized the Hot Surge Tank low level trip logic, resulting in a loss of feedwater to the reactor vessel.

Corrective actions to prevent recurrence include disciplinary action for the operator involved in this event and implementation of an engineering design change to increase the reliability of Hot Surge Tank low level trip logic.

Submittal of this report also meets the requirements for Technical Specification 3.5.1, Action g, Special Report for Emergency Core Cooling System actuation and injection into the Reactor Coolant System.

(End of Abstract)

On October 27, 1987 at 0637, a reactor scram occurred due to a reactor pressure vessel (RPV) level of less than Level 3 (plus 177.7 inches above top of active fuel (TAF)). Prior to the event, the plant was in Operational Condition 1 (Power Operation), with power being increased for continuation of startup testing activities. Reactor thermal power was approximately 51% of rated; reactor pressure was approximately 940 psig.

At the time of the scram, control room personnel were transferring station loads (Busses L11 and L12) from the Startup Transformer to the unit Auxiliary Transformer following generator synchronization. At 0637, the operator transferred Bus L11 by procedure. When attempting to change the status flag for breaker L1006 (startup supply breaker for Bus L11), he operated the wrong control switch, causing breaker L1009 (startup supply breaker for Bus L12) to trip. Bus L12 and all dependent loads were de-energized, including the Hot Surge Tank (HST) low level trip logic. This caused the running Reactor Feed Booster Pumps (RFBP) to trip, resulting in a trip of running Reactor Feed Pump Turbines (RFPT), and a loss of feedwater flow to the reactor.

Within four seconds, the control room operators re-energized Bus L12 from the Auxiliary Transformer. RFBP's A, C, and D, and the Motor Feed Pump (MFP) automatically started as designed; however, the limited capacity of the MFP and the rate of response of the Feedwater Control System were not sufficient to recover from the decrease in reactor vessel level. Reactor water level reached Level 3, causing a reactor scram and a transfer of both Reactor Recirculation System (RR) (AD) pumps to slow speed. In response to plant conditions, plant operators entered Plant Emergency Instruction (PEI-B13) "Reactor Pressure Vessel Control", and the reactor mode switch was placed in shutdown.

At 0638, the High Pressure Core Spray (HPCS) (BG) and Reactor Core Isolation Cooling (RCIC) (BN) Systems automatically initiated with injection into the RPV, when level reached Level 2 (plus 129.8 inches above TAF). The Level 2 signal also caused initiation of the Redundant Reactivity Control System (RRCS), resulting in a trip of both Reactor Recirculation Pumps, and an Alternate Rod Insertion (ARI) signal. In addition, a Balance of Plant (BOP) isolation and Reactor Water Cleanup System (RWCU) (CE) isolation were initiated by the Nuclear Steam Supply Shutoff System (NSSSS) (JM). Injection continued until RPV Level 8 (plus 219.5 inches above TAF) was reached at 0641. The Level 8 signal caused the HPCS injection valve to close, the RCIC system to shutdown, and the Motor Feed Pump to trip. Minimum reactor vessel reached during this event was approximately 114 inches above TAF. This was the third HPCS injection cycle to date and the injection nozzle usage factor

is currently less than 0.70.

All safety systems were returned to normal post-scram status by 0700. Reactor level control was then placed in automatic, and recirculation pumps were started in slow speed.

During this event, entry into the Emergency Plan was required due to HPCS initiation with flow to the RPV. An Unusual Event was declared at 0653 and terminated at 0720. All notifications were completed as required.

All plant equipment functioned as designed during this event; however, the following conditions were identified during the event recovery:

1. The response of the Motor Feed Pump on the Startup Level Controller was too slow to provide significant contribution to feedwater flow for level restoration. The slow response was due to a controller ramp rate limiter which is functional during the transfer of flow control modes. Although the limiter, which is adjustable, functioned as designed, an engineering evaluation has been initiated to determine if the response time could be decreased, to provide a quicker response while still allowing a smooth transfer of level control modes.

2. The Reactor Recirculation System Flow Control Valves locked up as a result of power loss to portions of the recirculation flow control circuitry when Bus L12 was de-energized. The necessary resetting of system circuitry was not addressed in any operating instruction. System Operating Instruction "Reactor Recirculation System (Unit 1)" (SOI-B33), has been revised to direct the operators to reset this circuitry when necessary.

3. The plant operators improperly restored power to Bus L12 after the inadvertent de-energization. Operating instructions require all electrical loads to be disconnected from the bus prior to re-energization. In this event, the operator immediately re-energized the bus in an attempt to prevent any transient on the plant. A quantitative analysis of the bus transient provided adequate assurance that bus re-energization did not occur during transient conditions which could have caused damage to connected components. The operator involved was counseled regarding his lack of caution and failure to comply with approved procedure.

The Manager, Perry Plant
perations Department, granted permission for plant
startup on October 27, 1987. The plant entered Operational Condition 2 (Startup) at 2236.

The cause of the loss of Bus L12 was inattention to detail on the part of the operator performing the transfer operation. Both the proper breaker control switch and the switch which was erroneously operated are clearly identified both on the control room panel and in the operating instructions. The switches are located approximately six inches apart on the panel. The root cause of the unexpected Reactor Scram and HPCS initiation which followed is insufficient reliability of the Hot Surge Tank low level trip logic. With this logic being supplied by a single 120 VAC instrumentation bus (K-1-A), the plant is susceptible to a complete loss of feedwater flow to the vessel on any occurrence which would cause an interruption of power. This may result in unnecessary challenges to safety systems, including the Reactor Protection System and the Emergency Core Cooling Systems.

A design change effecting the necessary changes was in progress, but not yet implemented at the time of this event. The need for this design change was identified during completion of design changes implemented in response to a previous event. This previous event, in which the reactor was shutdown due to inadvertent actuation of a Hot Surge Tank Level Switch, was documented in LER-87-012.

A loss of feedwater flow at 100% of rated power has been analyzed as discussed in Chapter 15 (Section 15.2.7) of the Perry Final Safety Analysis Report (FSAR). The analyzed transient results in a reactor scram at Level 3, and the trip of the recirculation system and initiation of HPCS and RCIC at Level 2. The Level 3 Scram trip function meets single failure criteria. During the events of October 27 all plant conditions were within the envelope of the FSAR analysis, and all plant systems responded as designed to maintain the plant in a safe condition. This event, therefore, is considered to have no safety significance.

Corrective actions being taken to prevent recurrence of this and similar events are as follows:

1. The inattention to detail on the part of the operator who performed the erroneous switching operation has resulted in individual counseling by plant management as well as disciplinary action.

2. Design modifications, initiated prior to this event, are in progress to improve the reliability of Hot Surge Tank low level trip logic. These design changes will prevent a loss of control power

to the logic from initiating a complete loss of feedwater flow.

Submittal of this report also meets the requirements for Technical Specification 3.5.1, Action g, Special Report for Emergency Core Cooling System actuation and injection into the Reactor Coolant System.

Energy Industry Identification System Codes are identified in the text as (XX).

ATTACHMENT # 1 TO ANO # 8712030173 PAGE: 1 of 1

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Murray R. Edelman PERRY NUCLEAR POWER PLANT
Sr. Vice President
Nuclear

November 25, 1987
PY-CEI/NRR-0753 L

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

Perry Nuclear Power Plant
Docket No. 50-440
LERs 87-072-00 and 87-073-00

Dear Sir:

Enclosed are Licensee Event Reports 87-072-00 and 87-073-00 for the Perry Nuclear Power Plant.

Very truly yours,
/s/ A. Kaplan for
Murray R. Edelman
Senior Vice President
Nuclear Group
MRE:njc
Enclosure: LERs 87-072-00 and 87-073-00
cc: T. Colburn
K. Connaughton

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