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

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
30 Day Special Report (SR-00-002-00) on the Lifting of Low Temperature Overpressure Protection Relief Valves

Gentlemen:

Attached is Special Report Number SR-00-002-00 for Waterford Steam Electric Station Unit 3. This report describes an event where one or both Shutdown Cooling Low Temperature Overpressure Protection (LTOP) relief valves lifted and discharged approximately 50 gallons to the containment sump. This condition is being reported pursuant to Technical Specifications 3.4.8.3.d and 6.9.2. This letter does not contain commitments.

Should you have any questions regarding the attached report, please contact David Madere at (504)-739-6481.

Very truly yours,

Everett P. Perkins Jr.

E.P. Perkins, Jr.
Director
Nuclear Safety Assurance

EPP/DCM/rtk
Attachment

cc: E.W. Merschoff, NRC Region IV, N. Kalyanam, NRC-NRR, J. Smith, A.L. Garibaldi, N.S. Reynolds, NRC Resident Inspectors Office

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Attachment 1
Special Report
SR-00-002-00

Waterford 3 SES
Special Report
SR-00-002-00

Problem Statement:

In mode 5 with the Reactor Coolant System in solid plant operation, manual operator action was taken to raise Reactor Coolant System pressure. Operator action was based on indication from a Pressurizer Pressure instrument that was undergoing calibration by Instrumentation & Control Maintenance personnel. Incorrect manual operator action to raise Reactor Coolant System Pressure resulted in reaching the lift setpoint of the Low Temperature Overpressure Protection relief valves, SI-406A&B.

Technical Specification 3.4.8.3, Action d, requires submittal of a special report to the Nuclear Regulatory Commission within 30 days following flow through a Low Temperature Overpressure Protection relief valve due to a Reactor Coolant System pressure transient.

Event Narrative:

Initial Plant Conditions:

On October 17, 2000 Waterford 3 plant conditions were as follows: Mode 5, Reactor Coolant System (RCS) temperature approximately 170°F, the Reactor Coolant System and pressurizer solid (system completely filled with water), Reactor Coolant Pumps 1A and 2A operating, Steam Generator Chemical Cleaning in progress, and Reactor Coolant System pressure being maintained at approximately 345 psia by manual operator control of the Letdown System Backpressure Control Valves controller with two Chemical and Volume Control system charging pumps in operation. Additional monitoring of Primary System pressure was being provided by a computer point graph trend on a Plant Monitoring Computer screen on Control Panel 3. The pressure band on this trend was set at 340 psia to 350 psia with a 1 second update frequency (actual primary system pressure band was 325 psia to 375 psia).

Reactor Coolant System overpressure protection was provided by having both Shutdown Cooling System suction relief valves for Low Temperature Overpressure Protection (SI-406A&B) aligned for service.

Sequence of Events:

On October 17, 2000 at approximately 0900, Instrumentation & Control (I&C) Maintenance personnel brought a package to the control room to perform calibration of Pressurizer pressure control channel Y. The Secondary Nuclear Plant Operator and Control Room Supervisor reviewed the package and a shift brief with the control room staff was conducted to ensure that all pressurizer control channel selector switches were selected to control channel X. Part of the brief addressed that the calibration package contained a statement that the control channel X indication could also be affected at times during the calibration. The calibration task for control channel Y started at approximately 0945.

At approximately 1000 two additional I&C technician crews brought calibration packages for Pressurizer pressure wide range transmitters for Safety Channel A and Safety Channel C to the Control Room. Calibration of Safety Channel Pressurizer pressure transmitters required operations to perform Technical Specification Checklists for both channels and the Control Room Supervisor discussed applicable Technical Specification actions with the staff. The two I&C crews went and set up equipment and began calibration at approximately 1040.

At 1105 the Secondary Nuclear Plant Operator noticed that pressurizer pressure channel X recorder indication was changing in the control room. The control room operators believed that this condition was due to I&C calibration associated with pressurizer pressure control channel Y but wanted to verify that the condition was expected. The Secondary Nuclear Plant Operator went behind the control boards to verify with I&C that the condition was expected for their calibration.

At 1115 the Primary Nuclear Plant Operator (PNPO) was in the process of taking his midday set of Technical Specification logs. The Control Room Supervisor was on the phone addressing a shift field operators concern with discharging a Liquid Waste Condensate Tank with the Liquid Waste System Radiation Monitor out of service. The Shift Manager was on the phone discussing outage activities with the Work Management Center.

At 1117, the PNPO noticed that Reactor Coolant System pressure appeared to be decreasing based on the Plant Monitoring Computer point trend. He stated that pressure was dropping and requested a peer check to make an adjustment on the Letdown Backpressure Controller. A peer check was obtained from a licensed operator that was in the Control Room to support Steam Generator Chemical Cleaning activities (management expectation for a peer check at Waterford 3 is correct train, correct component). The PNPO made an initial small adjustment to the letdown backpressure controller in order to raise RCS pressure. He looked at his computer trend and pressure was continuing to drop so he made a larger adjustment to raise pressure and requested help from the Control Room Supervisor (CRS).

Shortly thereafter both the loop 1 and the loop 2 Shutdown Cooling System Relief Valve Active annunciators were received. When the annunciators alarmed the CRS was in the process of going to the aid of the PNPO. The CRS noticed that the computer trend on Control Panel 3 (CP-3) indicated dropping pressure, which conflicted with the Control Panel 8 (CP-8) high pressure annunciators. The Control Room Supervisor (CRS) and PNPO checked narrow range pressure indicators on CP-4 and CP-2 and determined that primary system pressure was actually above 400 psia. The PNPO, at the direction of the CRS, adjusted the letdown backpressure regulator in order to lower RCS pressure, stopping the pressure rise and restoring RCS pressure to the expected band based on narrow range pressure indicators.

Follow-up investigation by the shift determined that the primary pressure computer point that was being trended was from Safety Channel A, a Wide Range pressure transmitter which was being calibrated by I&C. The slow pressure drop that the PNPO noticed was the technician slowly bleeding off pressure on the transmitter in accordance with their maintenance procedure.

Follow-up actions taken:

A Nuclear Auxiliary Operator (NAO) and a System Engineer were dispatched to the Containment to check for signs of discharge from either of the Low Temperature Overpressure Protection relief valves, SI-406A&B. The Containment inspection was inconclusive since these relief valves discharge through hard piping into the Containment Sump.

Plant Information (Waterford 3 computer program used for plant system monitoring) trends of RCS pressure, Volume Control Tank level, Containment Sump level, letdown back-pressure and letdown flow from 1100 to 1130 timeframe were compared. All four channels of RCS pressure (ones not under calibration) showed a rapid rise at 1117 from approximately 345 psia to 424-432 psia. Pressure then remained constant for approximately one minute at that level, then quickly returned to the normal band. At the same time, Chemical and Volume Control System Volume Control Tank level dropped approximately 1.4% (57 gallons) then remained constant thereafter and Containment Sump level rose from 3.46 feet to 3.48 feet (50 gallons).

Based on changes in Volume Control Tank level and Containment Sump level, at least one Low Temperature Overpressure Protection Relief valve lifted for a very short period of time. At 1658 on 10/17/00 when the shift verified these level changes, Technical Specification 3.8.4.3 was entered.

As an additional follow-up action Operations and Engineering personnel entered containment and used pyrometer readings from the relief valve tailpieces to verify that both LTOP valves were closed. Discharge tailpiece contact pyrometer readings indicated that both LTOP valves were seated without noticeable seat leakage. Additional closure verification was performed by using computer trending information to verify that Volume Control Tank and Containment Sump levels were not changing due to LTOP relief valve leakage.

After completion of the dayshift on October 17, 2000 at 1830 an Improving Operator Performance Event Debrief was conducted with the operating dayshift control room staff to determine the sequence of events and causal factors resulting in this event.

Effect on SDC System suction line relief valves on the transient:

The SDC system relief valves functioned as designed. The system over-pressure transient was mitigated through the lifting of the relief valve(s). The opening of the valve(s) also activated the control room annunciator as designed notifying the Operations staff of the condition. The valve(s) reseated as designed once pressure was reduced to normal operating range.

Root Cause Determination:

Analysis of this event was performed by using *Barrier Analysis, Taproot ®* and *Performance Improvement International (PII)* root cause techniques. Previous industry occurrences and current industry practices and guidelines were evaluated and factored into determination of root and contributing causes.

Root Cause #1: Worker Practices: Self-checking not applied to ensure expected response.

Manipulation of the Chemical and Volume Control System backpressure regulating valve controller is the desired method to maintain primary system pressure with the primary system in solid conditions. Action taken by the board operator would have been the correct action for an actual pressure transient/perturbation. However, the operator based his actions on a single indication of pressurizer pressure that was being trended on the Plant Monitoring Computer instead of using multiple indications to take action and verify that actions taken were correct. When additional alarms associated with primary pressure actuated the operator was prompted to look at additional indicators and took action to reduce pressure based on evaluation of these additional indications.

Root Cause #2: Written Communications: No procedure/policy/programmatic guideline in place for primary system instrumentation work activities during solid primary plant pressure control conditions.

During solid primary plant conditions on October 17, 2000 maintenance activities (loop calibrations) were being performed on three different sets of pressurizer pressure instrumentation when the operator error occurred. Allowing these multiple maintenance items to occur on instrumentation necessary for primary pressure monitoring resulted in creating a trap for the board operator. Benchmarking correspondence was conducted with other utility pressurized water reactors to determine good industry practices/plans for work activity control during solid primary plant conditions. The majority of facilities contacted have guidelines in place in a plant policy/procedure/work document to provide specific work guidance and limitations during solid primary plant conditions.

Contributing Cause #1: Work Organization Planning: Duties not well distributed among personnel.

On the day the error occurred many outage tasks were being managed by shift supervision. Dealing with these tasks resulted in inadequate oversight of on-shift workers in the control room. Shift supervision must manage tasks and workload such that worker oversight is maintained. When workload becomes excessive shift supervision must prioritize efforts and refer personnel to the Work Management Center. The correct place for outage task management is in the Work Management Center. It is desirable for the on-shift Shift Manager to be involved with outage task status and planning. However, he still needs to maintain his oversight role for shift operations. The focus of the Control Room Supervisor needs to be shift oversight and supervision for the control room staff and other shift personnel.

Contributing Cause #1: Verbal Communications: Pre-job brief not completed (information missing)

When Wide Range Pressurizer pressure transmitters for Safety Channels A and C were removed from service for calibration the shift control room staff only discussed the Technical Specification Checklist information and Technical Specification implications. The shift did not discuss system effects/response due to calibration of these transmitters. Had the shift conducted a more detailed and complete briefing, crew members would have had an opportunity to recognize that the computer trend for primary pressure on CP-3 was going to be affected.

Corrective Actions:

Corrective actions have been entered into the Waterford 3 Corrective Action program. The following summarizes corrective actions.

Immediate Corrective Actions (all completed):

- Recovered Reactor Coolant System pressure to within band and stable.
- Conducted a board walkdown to verify indications for plant parameters in expected bands and no adverse effects from pressure rise to LTOP setpoint.
- Operations personnel performed walkdowns of both Safeguards Rooms (ECCS areas) to verify no equipment/component damage.
- Operations personnel inspected pinhole leak on SI-137B weld and verified that leakage had not increased.
- Operations and System Engineering personnel inspected both Low Temperature Overpressure Relief valves. Inspection included taking temperature readings on the downstream tailpieces to ensure that neither valve was leaking by its closed seat.
- Briefed Senior NRC resident.
- Temporarily relieved Primary Nuclear Plant Operator. Operator remained in the control room and assisted in subsequent task performance. Operator was relieved of PNPO watch for the rest of the shift as a precautionary measure to remove a worker from an error likely situation.
- The Control Room staff conducted a shift brief immediately after the error to refocus the shift crew.
- Using the Plant Information (PI) program determined that one or both LTOP relief valves lifted. Entered Technical Specification 3.8.4.3.d.
- Verified that Reactor Coolant System pressure remained within Reactor Coolant Pump Operating curves at all times during the event.
- Performed human performance panel debrief (Root Cause 1)
- Sent electronic message to other EOI Operations Managers describing event
- Operations Management performed a Human Performance Standown with Operations personnel. One item Operations Management stressed was that the Control Room staff's primary function was to monitor the plant while the Work Management Center should be focusing on outage tasks. (Root Cause 1, Contributing Cause 1, Contributing Cause 2)

- Operations Management realigned Operations Shift Outage Managers location from the Work Management Center to the Control room (Shift Managers Office) to assist the on-shift manager and reduce outage related workload on the shift manager. (Contributing Cause 1)

- By use of plant communications tools, placed a sitewide emphasis on preserving control room supervision plant command and control by limiting low value communications to/from the Control Room. (Contributing Cause 1)

- Contacted other pressurized water reactors to determine methods/guidelines for solid plant pressure control and control of maintenance activities while in solid plant conditions.

- Conducted conference call with all EOI operations managers in which details of error debrief and event sequence was discussed.

- Performed bench testing of Train A LTOP (SI-406A) in accordance with normal outage testing plan (bench testing of one LTOP is performed each outage). Bench testing as found lift pressure for SI-406A was normal (408 psig, no seat leakage)

Long Term Corrective Actions:

1. Reinforced expectation with operations personnel that multiple plant indications and system response should be considered when taking actions that effect plant operations and plant equipment. (Root Cause 1) - complete

2. For the remainder of Refuel 10 and during subsequent reactor startup, Operations Management will actively coach control room personnel on the use of multiple board indications and effective management of supervisory workload. (Root Cause 1, Contributing Causes 1 and 2) - open

3. Evaluate and develop policy/procedure guidance to address management of primary plant instrumentation work activities during solid plant conditions. (Root Cause 2) - open

4. Change/Revise Operations Policy #10, Operations Countdown to Refueling Outage, to add steps to inform site personnel of the need to send outage related communications and tasks to the Work Management Center instead of the Control Room. (Contributing Cause 1) – open

5. Training to initiate a Training Request to add simulator training to Operations Training to include solid plant pressure operations (instrument and component failures as well as normal solid plant ops should be addressed). (Root Cause 1) - open