VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

April 8, 1994

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

Serial No.: 94-167
SPS/RCB/ETS R5
Docket No.: 50-280
License No.: DPR-32

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNIT 1
RESPONSES TO QUESTIONS REGARDING UNRESOLVED ITEMS
NRC INSPECTION REPORT NO. 50-280/94-02

Your March 7, 1994 letter forwarded the findings of the Nuclear Regulatory Commission (NRC) inspection conducted by Mr. M. W. Branch from January 2 through February 5, 1994. Two Unresolved Items were identified in the inspection report. Additional information and current status on these items are attached. Future updates will be provided to the NRC Resident Inspector.

If you have any further questions, please do not hesitate to contact us.

Very truly yours,

J. P. O'Hanlon

for W. L. Stewart

Attachment

cc: Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N. W.
Suite 2900
Atlanta, Georgia 30323

Mr. M. W. Branch
NRC Senior Resident Inspector
Surry Power Station

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ATTACHMENT

RESPONSES TO QUESTIONS REGARDING

UNRESOLVED ISSUES

(IR 50-280/94-02)

UNRESOLVED ITEM (URI) 50-280/94-02-02
"REVIEW REACTOR VESSEL LEVEL PROBLEM"

Event

Level in the Unit 1 reactor vessel unexpectedly decreased from 18.0 feet to 16.5 feet at approximately 1040 hours on February 1, 1994.

Immediate Corrective Action

- o Operating personnel promptly restored vessel level to the desired value of 18.0 feet.
- o A team consisting of Operations Department management and engineering personnel was organized to investigate the event.

Investigation Results

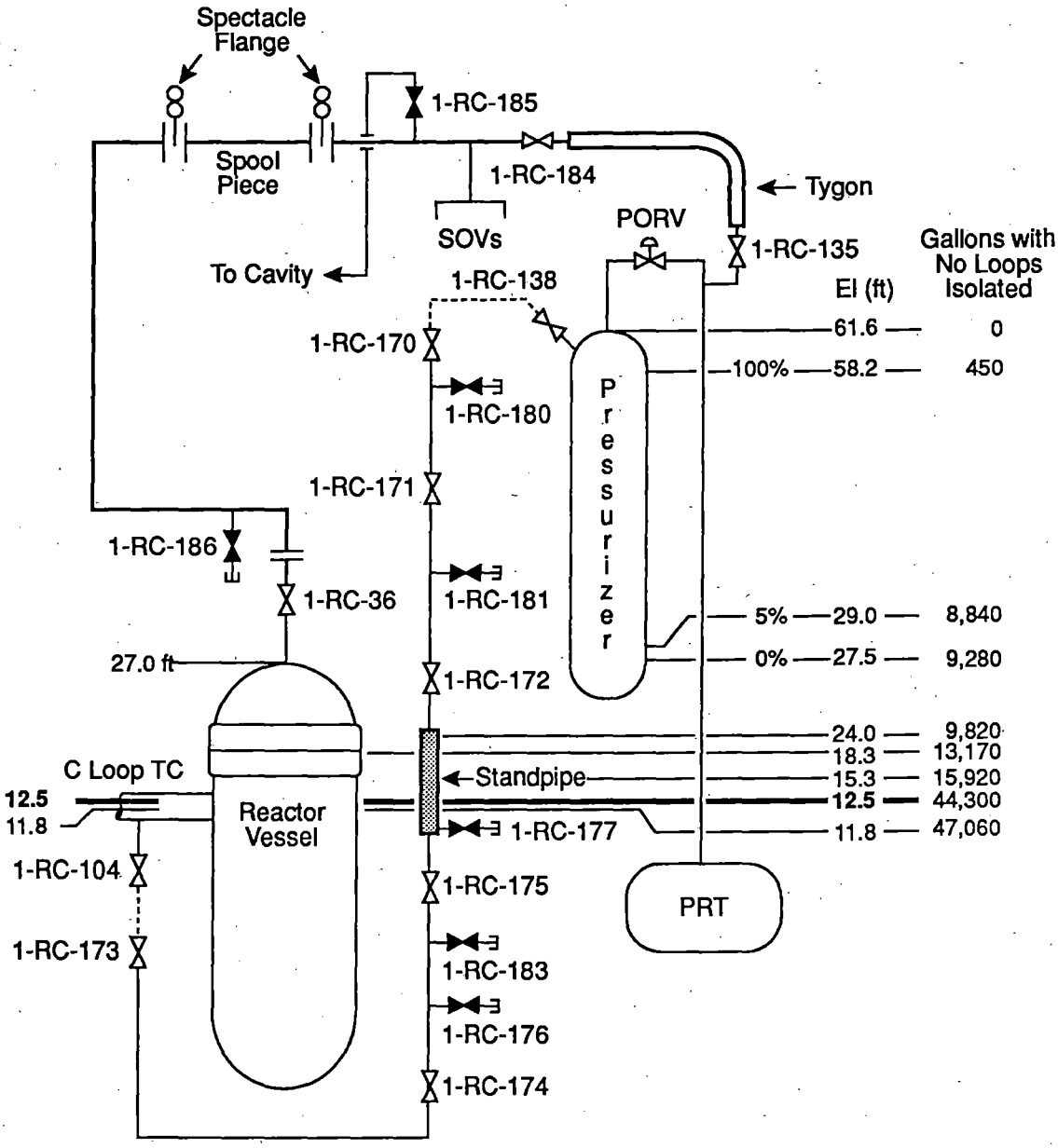
- o Background:
  - The change in Reactor Coolant System (RCS) level was detected at the standpipe installed in a line connecting the "C" Cold Leg of the RCS to the void space in the pressurizer. This permanent hard-piped system was installed in 1990 in response to Generic Letter 88-17, "Loss of Decay Heat Removal," dated October 17, 1988. In addition to the Generic Letter requirements to have the hard-piped level system in service for entry into reduced inventory conditions, the system is placed in service when it becomes necessary to reduce RCS inventory below the range of the pressurizer level instrumentation. An additional connection is made to the top of the pressurizer from the reactor vessel head vent valve. By equalizing pressures in these two lines, an accurate determination of RCS level may be obtained. (See attached drawing.)
  - The spool piece between the spectacle flanges in the line leading from the top of the pressurizer had been removed on January 31, 1994 to permit installation of the Refueling Cavity Seal Ring. The upstream (reactor vessel side) of the line was open to the containment and the downstream side was blanked.
- o Findings:
  - The lowest actual reactor vessel level was 16.5 feet which is 1.2 feet above reduced RCS inventory conditions identified in Generic Letter 88-17.
  - The reactor vessel was pressurized to a value calculated to be 0.7 psi greater than the pressurizer, which was vented to containment. The differential pressure was most likely caused by a vent line restriction and is discussed below.
  - Shortly after this event, the vent line spool piece was replaced and vessel level was raised and lowered several times to check seal table leakage. Stand pipe level indication responded normally, demonstrating that the differential pressure problem no longer existed. No additional problems with standpipe level

indication were experienced during the remainder of the outage. No similar events have been observed on the Unit 2 standpipe installation.

- o Cause Evaluation:
  - Three possible sources of vent line restriction were considered. They were:
    - > A loop seal or crimp in the vent line - walkdowns in the field did not identify any such configuration.
    - > Solidified boric acid - some dried boric acid accumulation was noted on the piping's exterior surfaces, so this possibility existed.
    - > A disk to stem separation within the head vent valve - subsequent testing proved that the valve's internals were intact.
  - A restriction in the reactor vessel vent line allowed pressure in the reactor vessel to become slightly greater than that existing in the pressurizer.
  - Since the spool piece connecting the reactor vessel vent valve piping and the pressurizer had been removed, the restriction was in the upstream, or reactor vessel, side of the vent line.
  - The restriction in the vent line also could have prevented complete removal of the gases from the reactor vessel head. After the restriction cleared and the spool piece was reinstalled, the raising and lowering of vessel level could have facilitated the transport of entrapped gases, possibly including hydrogen, to the pressurizer. This hydrogen source could have been a contributor to the hydrogen burn which occurred on February 3, 1994. (See discussion which follows.)
- o Conclusions:
  - At the beginning of the event, standpipe indication was not accurately representing reactor vessel level. Thus, when pressures between the reactor vessel and containment equalized, standpipe level dropped.
  - The source of the head vent line blockage was not definitely determined.
  - When the obstruction in the vent line cleared, either because of a change in pressure or temperature or some other reason, pressures in the system equalized and proper level indication was restored.

Actions to Prevent Recurrence

- A Station Level I Project has been assigned to further evaluate this event and the similar one which occurred in 1992. This evaluation will include engineering review of the installations in both units, comparison between the two installations, and appropriate corrective actions. These actions will be completed prior to the start of the next refueling outage, currently scheduled for the first quarter of 1995. The Unit 2 standpipe level indication may be placed into service during a mini-outage being planned for June, 1994. If the standpipe is required, reviews of the Unit 2 installation will be completed and any appropriate actions will be taken prior to placing the system in service.



NOTE: The valve designators are for location only.
They **DO NOT** indicate valve position.

Graphics No:KM47F

HEAD VENT AND STANDPIPE DIAGRAM

UNRESOLVED ITEM (URI) 50-280/94-02-03
"EVALUATION OF PRESSURIZER HYDROGEN BURN"

Event

Indications of a hydrogen burn in the pressurizer vessel occurred at approximately 0238 hours on February 3, 1994. This event was described in voluntary Licensee Event Report S1-94-001-00 dated March 4, 1994.

Immediate Corrective Action

- o Operating personnel immediately evacuated containment and reviewed applicable Technical Specifications, Emergency Procedures, and Administrative Procedures.
- o A walkdown of containment was performed and, other than the charring of the foreign material exclusion (FME) covers installed in place of the Pressurizer Safety Valves, conditions were found to be normal.
- o A Root Cause Evaluation Team was appointed to investigate the event.

Investigation Results

- o Background:
  - The Reactor Coolant System (RCS) is routinely degassed prior to the conduct of any maintenance which will breach a system boundary. During the degassification process, the pressurizer steam space is simultaneously sprayed down and vented to scrub dissolved hydrogen gas from the RCS. After the desired RCS hydrogen concentration of <5.0 cc/Kg is reached, the degassification lineup is secured and the RCS is cooled down and depressurized. During this evolution, the steam bubble in the pressurizer is collapsed, and the system is taken solid by overfilling the pressurizer into the Pressurizer Relief Tank (PRT) via the Power Operated Relief Valves (PORV). A nitrogen blanket is then placed on the PRT, and the pressurizer is drained to the desired level as dictated by plant conditions and any evolutions planned or in progress.
  - Upon completion of draining, the PRT can be vented to the containment atmosphere or the process ventilation subsystem. In this case the tank was vented to the process ventilation subsystem.
- o Findings:
  - When the welders began their job on the pressurizer piping, the following conditions existed:
    - > A containment purge was in progress, creating a slightly negative pressure inside containment which varied depending upon the position of the containment access doors.

> The primary safety valves were removed, venting the pressurizer to containment via mesh FME covers over the openings. The PRT side of the safety valves were blanked.

> The PRT was vented to the process ventilation subsystem.

- Prior to making the initial tack weld, the area had been purged with argon gas for approximately twenty minutes. The weld site was sampled and found to have less than 1% oxygen present. The first tack weld was accomplished without incident. Before starting the second weld, the area was purged for approximately ten minutes and sampled. The result obtained was also less than 1% oxygen, and the welder proceeded with his task. In this instance, however, evidence of a hydrogen burn occurred as the welding arc was struck.

- No evidence of structural damage was discovered

o Cause Evaluation:

- Along with the reactor coolant system, a second possible source of the hydrogen mixture was the PRT.

- The opening of a containment access door just prior to the second welding evolution caused a positive pressure perturbation in containment. This perturbation caused movement of gases within the reactor coolant system, which was open to containment at the time, and displaced the combustible mixture from the pressurizer volume to the vicinity of the welding site. The volume displaced was sufficient to overcome the affects of the argon purge, and the welder's arc ignited the mixture.

o Conclusions:

- The hydrogen burn occurred because the precautions taken for the job failed to achieve a stable welding atmosphere free from combustible gases.

- The event occurred because, during the work planning and organization process, it was determined that certain work controls were not necessary, specifically:

> During a typical welding operation, the affected area is isolated to assure that any required purge flow will not be disturbed or interrupted by unexpected pressure changes. In this case, the system was open from the pressurizer to the PRT via the PORV.

> The presence of a potentially flammable mixture was not considered a probability because of the degassing and purging which had been conducted. Also, the pressurizer safety valves had been removed, creating a vent path from the pressurizer to the containment. Therefore, the procedures did not identify the need to sample for explosive gas mixtures nor identify the potential for the presence of such a mixture in the pressurizer

piping or PRT. Rather, the procedures direct precautionary controls when necessary.

- The purge established for the welding was swept away from the weld area when a containment door was opened.

Actions to Prevent Recurrence

The following action items were identified in the Root Cause Evaluation and are being pursued in accordance with the station's corrective action program.

o Completed items include:

- Checking/calibrating pressurizer level instruments.

- Examining pressurizer, piping, nozzles, and hangers for damage. No damage was found.

- Examining PORV block valves. No damage was found.

- Revising safety valve removal procedures.

- Revising various procedures to:
  > identify systems which may include explosive mixtures (e.g., hydrogen in RCS/CVCS Systems),
  > check identified systems for explosive mixture prior to beginning work,
  > isolate pipe or vessel, if possible,
  > identify sampling instrumentation, and
  > identify types of purge gases.

- Evaluating the need to include warning of explosive mixture in a Work Order. Procedures referenced in the work order provided appropriate guidance.

- Updating pre-job briefs to address sampling of systems for explosive mixtures.

o Ongoing items include:

- Including explosive mixture sampling requirements in various training programs.

- Alerting industry to event via the INPO Network.

- Procuring explosive meters calibrated specifically for H_2/O_2 mixtures.

- Reviewing degassification procedure and turnover criteria for maintenance on systems which contain potentially explosive mixtures.

The corrective actions necessary prior to any further welding or other "hot work" on primary piping systems are scheduled to be completed by May 31, 1994. Other planned corrective actions will be completed by September 30, 1994.