VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

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United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

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Docket Nos. 50-280
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License Nos. DPR-32
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Gentlemen,

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
INSERVICE TESTING PROGRAM
REQUEST FOR ADDITIONAL INFORMATION
ACCUMULATOR CHECK VALVE TESTING

Our October 11, 1994 submittal provided changes to the third ten-year interval inservice testing program for Surry Units 1 and 2. This submittal included a revision to Relief Request V-26 which deals with test methodology for the Safety Injection System accumulator discharge check valves. During a November 22, 1994 telephone conference call with Virginia Power, the NRC staff requested additional information regarding the piping configuration and the difficulties associated with testing the accumulator discharge check valves. This information is provided in the attachment to this letter.

If you have any additional questions, please contact us.

Very truly yours,

James P. O'Hanlon

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Senior Vice President-Nuclear

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ADDITIONAL INFORMATION TO SUPPORT RELIEF REQUEST V-26

Two check valves in series are located on the safety injection accumulator discharge lines. During normal operation, one of the valves in series must be tightly closed to prevent leakage from the high pressure reactor coolant system (RCS) to the accumulator. The normal differential pressure across the check valves during plant operation is approximately 1600 psid (i.e., 2235 psig RCS pressure and 650 psig Accumulator pressure). A typical piping configuration is shown in Figure 1.

In the previous inservice testing (IST) programs, the downstream valves were identified as the isolation valves and were therefore subject to back seat testing. The valves closest to the accumulator were considered as backup valves and were not subject to back seat testing.

Testing experience has shown that a water hammer can be produced when testing the downstream valve. The back seat tests are performed when the plant is in the heatup phase following a cold shutdown or refueling outage. Using Figure 1 as a reference, the test configuration for the "B" accumulator discharge check valve consists of closing the 12" motor operated isolation valve 1-SI-MOV-1865B and opening the 3/4" valve 1-SI-HCV-1850D. With the RCS at an elevated pressure, a flow path from the check valve to the refueling water storage tank (RWST) is created to measure any back leakage through the check valve (1-SI-130). Flow is measured using the flow indicator 1-SI-FI-1942.

The test that produced the water hammer event was initially performed with the RCS less than 1000 psig. Excessive leakage was identified for the "B" and "C" accumulator check valves, 1-SI-130 and 1-SI-147 respectively. Due to past experience, it was decided to re-test the valves at an RCS pressure above 1000 psig. The higher pressure normally causes the check valve to seat more tightly.

Valve 1-SI-130 was then tested at the higher pressure. After valve 1-SI-HCV-1850D was opened to establish a flow path to the RWST, the test personnel waited until the flow indication at 1-SI-FI-1942 settled to zero. After the test was declared satisfactory, the accumulator discharge line was returned to it's normal configuration by closing 1-SI-HCV-1850D and opening 1-SI-MOV-1865B. When 1-SI-MOV-1865B was reopened the indicated water level in the "B" accumulator was observed to decrease approximately 3% (0.63% by volume).

A similar test procedure was followed and completed satisfactorily for the "C" accumulator discharge check valve (1-SI-147). After the back seat test for valve 1-SI-147, the indicated water level in the "C" accumulator dropped approximately 25% (5.3% by volume) and various annunciators alarmed when the motor operated isolation valve 1-SI-MOV-1865C was opened.

A Root Cause Evaluation of the event for the "B" accumulator revealed that the water in the 12" piping between check valve 1-SI-130 and isolation valve 1-SI-MOV-1865B was at an elevated temperature and pressure due to the RHR system configuration. Note in Figure 1 that the RHR system discharges to the RCS via the safety injection

line between the check valves. The "C" accumulator has the same configuration. The water began flashing to steam when valve 1-SI-HCV-1850D was opened creating an atmospheric vent path, which forced water out of the 12" line into the RWST. This process continued until the flow indication at 1-SI-FI-1942 settled to zero. By the time 1-SI-HCV-1850D was closed, a substantial steam bubble was created in the 12" line. Therefore, when the relatively cold accumulator water (<100°F) was introduced to the volume with the opening of 1-SI-MOV-1865B, the steam bubble collapsed creating a hydraulic transient. The same series of events occurred during the testing of 1-SI-147 on the "C" accumulator but a more significant hydraulic transient occurred. A walkdown of the system revealed no damage to the discharge piping or support structures.

Various ways to eliminate the water hammer were investigated. After closing 1-SI-HCV-1850D, 1-SI-MOV-1865B could be opened slowly to gradually fill the volume. However, 1-SI-MOV-1865B is a 12" gate valve with very poor low flow control. A small change in stem location translates to a large change in flow area. 1-SI-MOV-1865B cannot be relied on to preclude water hammer events.

The piping could be allowed to cool after RHR operation. However, this cooldown period would delay startup. Furthermore, there is presently no installed temperature instrumentation to determine when the piping is sufficiently cool that it would be safe to open the MOV.

The piping downstream of the flow indicator could be isolated and the acceptance criteria be based on pressure increase. This method is used at North Anna. However, Surry has a relief valve on the 3/4" line that opens at 700 psig. This relief valve can lift before the check valve is properly seated. North Anna does not have a similar relief valve in their piping configuration.

During the telephone conference call of November 22, 1994, the NRC staff noted that UFSAR Section 6.2.2.2.1 states, "During normal operation, each accumulator is isolated from the reactor coolant system by two check valves in series." This sentence could be interpreted to mean that the safety analysis takes credit for both check valves functioning to provide isolation. However, only one of the two valves is necessary to provide isolation during power operations and the valves have no safety function to close during accident conditions. To avoid confusion, the sentence in the UFSAR was changed to read, "During normal operation, each accumulator is isolated from the reactor coolant system by two check valves in series, only one of which is required for isolation."

This UFSAR change was processed in accordance with Title 10, Code of Federal Regulations, Part 50.59 and our Safety Evaluation program, and approved by the Station Nuclear Safety and Operating Committee.

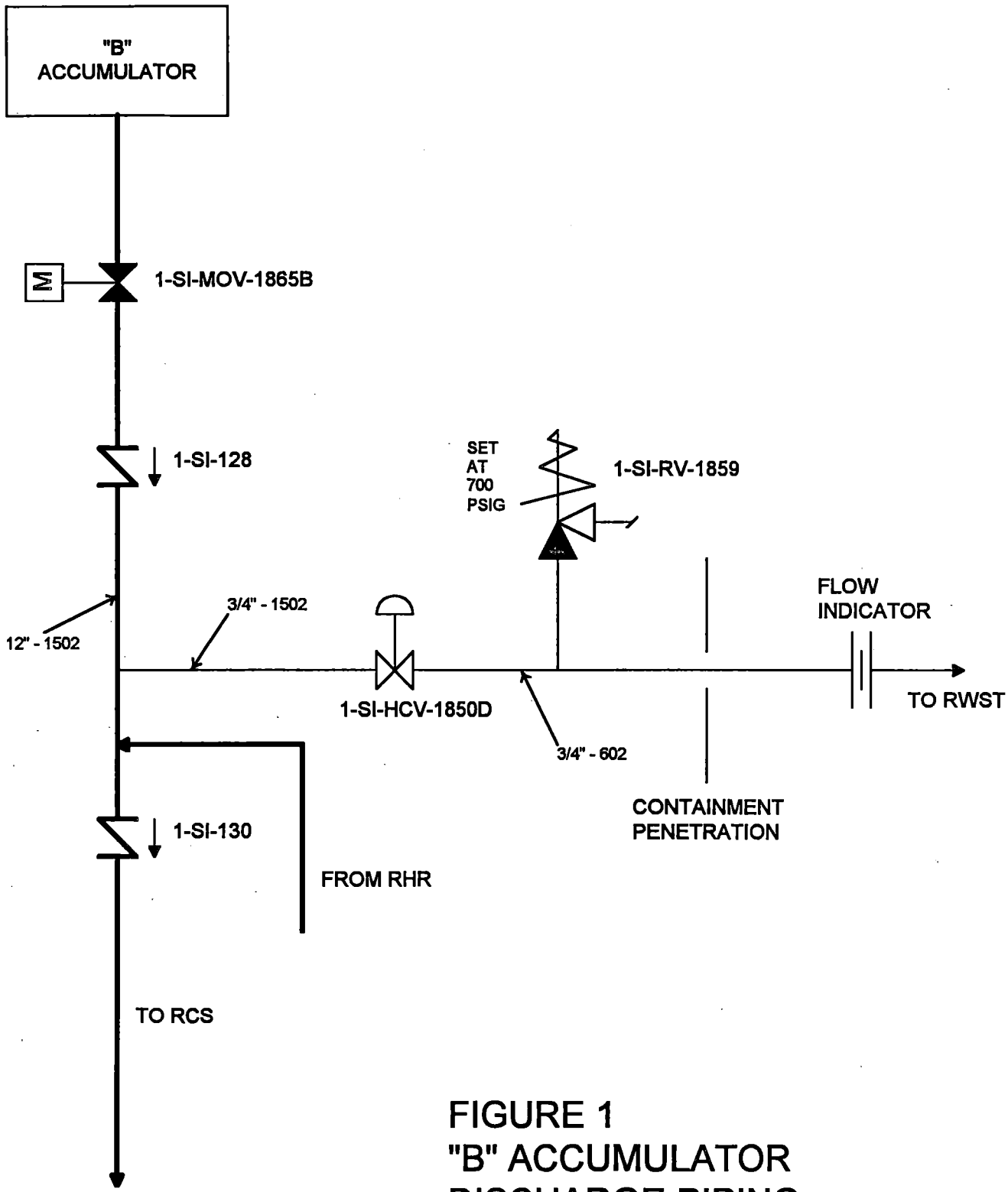

FIGURE 1
"B" ACCUMULATOR
DISCHARGE PIPING