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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE INSERVICE TESTING PROGRAM AND REQUEST FOR RELIEF

VIRGINIA ELECTRIC AND POWER COMPANY

SURRY POWER STATION UNITS 1 AND 2

DOCKET NOS.: 50-280 AND 50-281

1.0 INTRODUCTION

The Code of Federal Regulations, 10 CFR 50.55a, requires that inservice testing (IST) of certain ASME Class 1, 2, and 3 pumps and valves be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable addenda, except where specific written relief has been requested by the licensee and granted by the Commission pursuant to 10 CFR 50.55a(f)(6)(i) or where the alternative has been authorized pursuant to 50.55a(a)(3)(i) or (a)(3)(ii). In requesting relief, the licensee must demonstrate that: (1) the proposed alternative provides an acceptable level of quality and safety; (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance is impractical for its facility. The NRC guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable IST Programs," provided alternatives to the Code requirements determined to be acceptable to the staff.

10 CFR 50.55a authorizes the Commission to grant relief from or approve alternatives to ASME Code requirements upon making the necessary findings. The NRC staff's findings with respect to granting or not granting the relief requested or authorizing the proposed alternatives as part of the licensee's IST Program are contained in this Safety Evaluation (SE).

This SE covers relief requests V-27 for Surry Power Station, Units 1 and 2 as described in Virginia Electric and Power Company's letter dated October 8, 1992. The licensee's program is based on the requirements of Section XI of the ASME Code, 1983 Edition through the Summer of 1983 Addenda.

2.0 RELIEF REQUESTS V-27

The licensee has requested relief from ASME Code Section XI, Subsection IWV-3520, "Tests for Check Valve," requirements to exercise safety injection system check valves every three months during plant operation. The valves for which relief is requested are located in the safety injection system high and low head injection flow paths and are listed in Table G of Relief Requests V-27.

2.1 BASIS FOR RELIEF

Open Test Discussion

The valves on the high head pump injection paths cannot be partial- or full-stroke exercised to the open position during power operation because flow through these valves would thermal shock the injection system and cause unnecessary plant transients. Flow cannot be established in the valves on the low head pump injection paths because the low head safety injection pumps do not develop sufficient head to overcome reactor coolant system (RCS) pressure.

During cold shutdown, exercising the high head injection path valves with flow could cause a low temperature overpressurization of the RCS and force a safety system to function. Because of the large flow rate (3000 gpm) produced by the low head injection pumps, exercising the low head injection path valves during cold shutdowns when the reactor head is bolted in place presents the risk of filling the pressurizer and overflowing through a pressure operated relief valve into the pressurizer relief tank. Therefore, it is impractical to exercise the high or the low head injection path valves with flow quarterly or during cold shutdowns. The valves listed in Table G are on the high and/or the low head injection paths.

Close Test Discussion for 1/2-SI-79, 82, 85, 241, 242 and 243

To individually verify closure for valves 1/2-SI-79, 82, 85, 241, 242 and 243, the piping must be vented upstream and a local backseat test performed. These valves are located inside the containment and would require a subatmospheric containment entry to perform the backseat test if the reactor is above 200 F. Therefore, it is impractical to perform a closure test every quarter.

These valves are designated as pressure isolation valves. Technical Specification Table 4.1-2A requires that periodic leakage testing on each of these valves be accomplished prior to entering power operation condition after each time the plant is placed in the cold shutdown condition for refueling and after each time the plant is placed in cold shutdown condition for 72 hours if testing has not been accomplished in the proceeding 9 months.

According to IWV-3522, "Full-stroke exercising during cold shutdowns for all valves not full-stroke exercised during plant operation shall be on a frequency as follows: for intervals of three months or longer, exercise during each shutdown; for intervals of less than three months, full-stroke exercise is not required unless three months have passed since the last shutdown exercise." However, it is not the intent of the IST Program to delay startup from cold shutdowns in order to complete testing. As stated in Section 4.2 of this IST Program, "Valve testing shall commence not later than 48 hours after reaching cold shutdown and continue until complete or the unit is ready to return to power. Completion of the valve testing is not a prerequisite to return to power. Any testing not completed at one cold shutdown should be performed during the subsequent scheduled cold shutdowns to

meet the Code specified testing frequency." This position is supported by paragraph ISTC 4.2.2 (g) in the ASME Code-1990 that states in part, "it is not the intent of this Subsection to keep the plant in cold shutdown to complete cold shutdown testing."

However, if the first cold shutdown came more than 9 months after the last test, Technical Specifications (TS) would require that the test be completed regardless of the delay to plant startup. In this respect, the TS frequency is more conservative than the IST Program required frequency. Also, a local leakage test provides a better measure of the condition of the valve seats than does a standard backseat test. When compared to the Code requirements for a backseat test performed every cold shutdown, the combination of the TS-required test frequency and leakage testing is an alternative that provides an acceptable level of quality and safety.

Close Test Discussion for 1/2-SI-88, 91, 94, 238, 239 and 240

Individual valve closure cannot be verified for valves 1/2-SI-88, 91, 94, 238, 239 and 240. There are no drains between the valve pairs 1/2-SI-88 and 1/2-SI-238, 1/2-SI-91 and 1/2-SI-239, and 1/2-SI-94 and 1/2-SI-240. To verify closure for each pair of valves, a subatmospheric containment entry must be made and a local backseat test performed if the reactor is above 200°F. Therefore, it is impractical to perform a closure test every quarter.

In lieu of performing a backseat test on each pair of valves every cold shutdown, Surry Power Station proposes performing a local leakage test on each of the three pairs of valves and comparing the leakage of each pair to a limit. This test will be performed on the same test frequency as the pressure isolation valves discussed above (i.e., per TS Table 4.1-2A). If the subject limit is exceeded, both valves in the pair will be subject to inspection, repair or replacement. Note that there is no specified permissible accident leakage limit for these valves. Therefore, these valves are Category C. When compared to the Code requirements for a backseat test performed every cold shutdown, the combination of the test frequency described in TS Table 4.1-2A and leakage testing is a alternative that provides an acceptable level of quality and safety.

Close Test Discussion for 1/2-SI-235, 236 and 237

To verify closure for valves 1/2-SI-235, 236 and 237, a subatmospheric containment entry must be made and a local backseat test performed if the reactor is above 200°F. Therefore, it is impractical to perform a closure test every quarter.

In lieu of performing a backseat test on each of these valves every cold shutdown, Surry Power Station proposes performing a local leakage test and comparing the leakage of each valve to a limit, and performing this test on the same test frequency as the pressure isolation valves discussed above (i.e., per TS Table 4.1-2A). Note that there is no specified permissible accident leakage limit for these valves. Therefore, these valves are Category C. When compared to the Code requirements for a backseat test performed every

cold shutdown, the combination of the test frequency described in TS Table 4.1-2A and leakage testing is an alternative that provides an acceptable level of quality and safety.

2.2 ALTERNATE TESTING PROPOSED

Alternate Testing to the Open Position

There is no installed instrumentation that can measure individual flow rates for valves 1/2-SI-79, 82, 85, 88, 91, 94, 238, 239, 240, 241, 242 and 243. Clamp on ultrasonic flow instrumentation will be used to verify full flow through the hot leg safety injection valves 1/2-SI-88, 91, 94, 238, 239 and 240 each reactor refueling.

Using low head pump flow, the cold leg injection valves 1/2-SI-79, 82, 85, 241, 242 and 243 will be acoustically monitored for the disk striking the back seat every reactor refueling. The data will be analyzed to show that the disk struck the back seat, which verifies that the disk stroked to the full-open position.

The remaining valves 1/2-SI-224, 225, 226, 227, 228, 229, 235, 236 and 237 will be full-stroke exercised with flow every reactor refueling.

Alternate Testing To the Closed Position

Valves 1/2-SI-79, 82, 85, 241, 242 and 243 will be tested to the closed position per the requirements of TS Table 4.1-2A.

The valve pairs 1/2-SI-88 and 1/2-SI-238, 1/2-SI-91 and 1/2-SI-239, and 1/2-SI-94 and 240 will be locally tested for leakage to confirm that the valve pairs provide isolation for the three hot leg injection paths. The local leakage tests will be performed at the frequency required by TS Table 4.1-2A. Individual valve verification to the closed position is not possible with the current line configurations.

Valves 1/2-SI-235, 236, and 237 will be locally tested for leakage to confirm that the valves are in the closed position. The local leakage tests will be performed at the frequency required by TS Table 4.1-2A.

The remaining valves 1/2-SI-224, 225, 226, 227, 228, and 229 need only to open to perform their safety function. No credit is taken for valves 1/2-SI-224, 225, 226, 227, 228, and 229 to close because isolation for the safety injection flow paths is provided by the upstream and downstream valves. For each of these valves, there are normally closed motor-operated valves located upstream and two check valves in series located downstream. The upstream and downstream valves are tested for closure.

2.3 EVALUATION

The valves listed in Table G of Relief Requests V-27 are safety-related check valves in the safety injection system and in various combinations are located in the high and low head pump systems, RCS hot and cold legs and containment

penetration flow paths. The licensee has requested relief from Code requirements to exercise the valves every three months during plant operation. In the alternative tests the licensee proposes to open exercise the valves during refueling outages and verify closure by leakage testing either individual valves or valve pairs per testing requirements similar to those in the plant TS and at the TS Table 4.1-2A frequency.

OPEN EXERCISING

It is not practical to open-flow test these valves during plant operation since flow through the high head pump flow path would allow cold flow into the RCS causing unnecessary reactivity transients and possible thermal shock to the safety injection system. The low head pumps cannot overcome RCS pressure and therefore, flow cannot be established in the low head flow path during power operation. It is also impractical to exercise these valves during cold shutdown since high head injection flow could cause a low temperature overpressurization of the RCS and using the high volume low head pumps risks filling and overflowing the pressurizer when the reactor vessel head is in place.

Clamp on ultrasonic flow instrumentation will be used to verify full flow through the hot leg safety injection flow path valves 1/2-SI-88, 91, 94, 238, 239 and 240 and cold leg safety injection flow path valves 1/2-SI-79, 82, 85, 241, 242 and 243 will be acoustically monitored to verify the full disk stroke. The remaining relief request valves 1/2-SI-224, 225, 226, 227, 228, 229, 235, 236 and 237 will be full-flow exercised.

Therefore, based on (1) the valves being located inside the containment, (2) the limited access, (3) the lack of instrumentation, (4) the radiation environment and ALARA considerations, and (5) the significant effort required to establish temporary test setups during each cold shutdown, the proposed alternative tests that demonstrate exercising valves to the open positions during refueling outages are the only practical method and frequency of testing.

In rulemaking to 10 CFR 50.55a effective September 8, 1992, (See 57 Federal Register 152, 34666), the 1989 Edition of ASME Section XI was incorporated in paragraph (b) of § 50.55a. The 1989 Edition provides that the rules for IST of valves are as specified in OM-10, "Inservice Testing of Valves in Light Water Reactor Plants." The staff imposed no limitations to OM-10 associated with testing valves during cold shutdown. Section 50.55a ¶ (f)(4)(iv) provides that IST of valves may meet the requirements set forth in subsequent editions and addenda that are incorporated by reference in ¶ (b) of § 50.55a, subject to the limitations and modifications listed, and subject to Commission approval. Portions of Editions or addenda may be used provided that all related requirements of the respective Editions or addenda are met. OM-10, Paragraphs 4.3.2.2 (e), states: "if exercising is not practicable during plant operation or cold shutdown, it may be limited to full stroke during refueling outages." Therefore, relief is no longer required to extend the test frequency from quarterly or during cold shutdown to during refueling outages. Whether all related requirements are met is subject to NRC inspection.

CLOSURE VERIFICATION

Valves 1/2-SI-79, 82, 85, 241, 242 and 243 are identified as pressure isolation valves (PIVs) in the plant TS and require leakage testing during startup from each cold shutdown which is 72 hours or greater in length, provided they were not tested in the previous 9 months. If more than 9 months have passed since the last test, the valves must be tested regardless of a plant startup delay. These valves are inside containment and inaccessible during plant power operations. Leakage testing these valves per the plant TS Table 4.1-2A requirements and frequency, proposed by the licensee, provide an acceptable level of quality and safety and is authorized pursuant to 10 CFR 50.55a(a)(3)(i).

Valves 1/2-SI-235, 236, and 237, are located in the safety injection system high head pump cold leg flow path. These valves are not identified as PIVs in the plant TS; however, in lieu of conducting a closure verification on each of these valves every cold shutdown, the licensee proposes to perform a local leakage test at the same test frequency as the PIVs. The licensee intends to establish a leakage limit and compare the test results to the limit for taking corrective action. The alternative to perform the leakage tests per testing requirements similar to those in the plant TS Table 4.1-2A and at the TS frequency provides an acceptable level of quality and safety and is authorized pursuant to 10 CFR 50.55a(a)(3)(i).

Each valve pair, 1/2-SI-88 and 238, 1/2-SI-91 and 239, and 1/2-SI-94 and 240 consists of two check valves in series with no intermediate instrumentation or provisions for individual valve closure testing. Meeting the Code requirement for individual valve testing is not practical with the existing pipe configuration. Imposition of the Code requirements would result in a significant burden on the licensee due to the plant modifications that would be required. The licensee proposes to perform local leakage tests on each pair of valves per the TS Table 4.1-2A frequency and, in the event of an unsatisfactory test, the licensee proposes both valves be treated as a failed valve, subject to inspection, repair or replacement and the "Corrective Action" requirements of paragraph IWV-3523 of Subsection IWV of the ASME Boiler and Pressure Vessel Code. Based on the findings that testing per the Code requirement is impractical due to limited access and limited provisions for valve isolation and test connections and that the proposed alternative provides adequate assurance of operational readiness, relief for these valves is granted pursuant to 10 CFR 50.55a(f)(6)(i).

The licensee has determined that inside containment penetration valves 1/2-SI-224, 225, 226, 227, 228 and 229 have no safety-related closure function. The licensee states that no credit is taken for closure of these valves since there is a normally closed motor-operated valve located upstream and two designated safety-related check in series located downstream of each valve.

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TABLE G

Valve	Category	Class	Function
1/2-SI-88, 91 1/2-SI-94, 238 1/2-SI-239, 240	C	1	Safety Injection to RCS Hot Legs
1/2-SI-235 1/2-SI-236 1/2-SI-237	C	1	High Head Safety Injection to RCS Cold Legs
1/2-SI-241 1/2-SI-242 1/2-SI-243	AC	1	Low Head Safety Injection to RCS Cold Legs
1/2-SI-224, 225 1/2-SI-226, 227	C	2	High Head Safety Injection Check Valve at Containment Penetrations
1/2-SI-228, 229	C	2	Low Head Safety Injection Check Valves at Containment Penetrations
1/2-SI-79, 82, 85	AC	1	Safety Injection to RCS Cold Legs