TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

October 30, 1981

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Ms. Adensam:

| | | |
|---|---|---|
| In the Matter of the Application of | ) | Docket Nos. 50-390 |
| Tennessee Valley Authority | ) | 50-391 |

By letter dated November 17, 1980 from R. L. Tedesco to H. G. Parris, TVA was requested to provide information concerning inservice inspection of pressure isolation valves at Watts Bar Nuclear Plant.

Enclosed is the requested information. This NRC request has been given the designation of question 112.38 as discussed with the NRC project manager. Also enclosed are revised responses to questions 212.13, 212.18, and 212.74 to reflect the new TVA response to question 112.38.

If you have any questions concerning this matter, please get in touch with D. P. Ormsby at FTS 858-2682.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

M. R. Wisenburg
Nuclear Engineer

Sworn to and subscribed before me
this 30th day of Oct. 1981
Bryant M. Lowery
Notary Public
My Commission Expires 4/4/82

Enclosure

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U.S. NUCLEAR REGULATORY COMMISSION

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ENCLOSURE

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2

RESPONSES TO NRC QUESTIONS

112.38 Question
(212.74)
(212.13) As a result of our review of your application regarding inservice inspec-
(212.18) tion of pressure isolation valves, we require the following information:

Provide a list of pressure isolation valves included in your testing program with four (4) sets of piping and instrumentation diagrams which clearly show the reactor coolant system isolation valves. Also, discuss in detail how your leak testing program conforms to the staff position.

Staff Position

There are several safety systems connected to the reactor coolant pressure boundary that have design pressure below the rated reactor coolant system (RCS) pressure. There are also some systems which are rated at full reactor pressure on the discharge side of pumps but have pump suction below RCS pressure. In order to protect these systems from RCS pressure, two or more isolation valves are placed in series to form the interface between the high pressure RCS and the low pressure systems. The leak tight integrity of these valves must be ensured by periodic leak testing to prevent exceeding the design pressure of the low pressure systems thus causing an inter-system LOCA.

Pressure isolation valves are required to be category A or AC per IWV-2000 and to meet the appropriate requirements of IWV-3420 of Section XI of the ASME Code except as discussed below.

Limiting Conditions for Operation (LCO) are required to be added to the technical specifications which will require corrective action i.e., shutdown or system isolation when the final approved leakage limits are not met. Also surveillance requirements, which will state the acceptable leak rate testing frequency, shall be provided in the technical specifications.

Periodic leak testing of each pressure isolation valve is required to be performed at least once per each refueling outage, after valve maintenance prior to return to service, and for systems rated at less than 50% of RCS design pressure each time the valve has moved from its fully closed position unless justification is given. The testing interval should average to be approximately one year. Leak testing should also be performed after all disturbances to the valves are complete, prior to reaching power operation following a refueling outage, maintenance and etc.

The staff's present position on leak rate limiting conditions for operation must be equal to or less than 1 gallon per minute for each valve (GPM) to ensure the integrity of the valve, demonstrate the adequacy of the redundant pressure isolation function and give an indication of valve degradation over a finite period of time. Significant increases over this limiting valve would be an indication of valve degradation from one test to another.

Leak rates higher than 1 GPM will be considered if the leak rate changes are below 1 GPM above the previous test leak rate or system design precludes measuring 1 GPM with sufficient accuracy. These items will be reviewed on a case by case basis.

The Class 1 to Class 2 boundary will be considered the isolation point which must be protected by redundant isolation valves.

In cases where pressure isolation is provided by two valves, both will be independently leak tested. When three or more valves provide isolation, only two of the valves need to be leak tested.

Provide a list of all pressure isolation valves included in your testing program along with four sets of Piping and Instrument Diagrams which describe your reactor coolant system pressure isolation valves. Also discuss in detail how your leak testing program will conform to the above staff position.

112.38 RESPONSE

Valves which separate high pressure reactor coolant system (RCS) piping from lower pressure piping and components associated with the safety injection (SIS), residual heat removal (RHRS), and upper head injection (UHIS) systems will be tested to assure each valve's leak tightness during each plant startup. The maximum time between tests will not exceed the interval between refueling outages. The permanently installed test systems will normally be used for leak tightness verification.

Technical Specifications

Limiting conditions for operation (LCO), which will specify corrective action when leakage limits are met, and surveillance requirements, which will specify leak rate testing frequency, will be included in the technical specifications.

Test Frequency

Pressure isolation valves (PSIV) shall be tested at a frequency equal to that of containment isolation valves (CIV's) since both types of valves have an identical function (i.e., limiting leakage). The testing frequency specified for CIV's (at each refueling) is reasonable to verify minimal leakage rates and has long been accepted by NRC, even though the valve may change position hundreds of times during the year. The function of CIV's is to limit leakage of radioactive fission products while PSIV's are used to limit the possibility of inter-system LOCA's, etc., which could endanger low-pressure systems. Therefore, it is reasonable to specify the same leakage testing frequency for PSIV's as for CIV's. Watts Bar will test PSIV's for leakage at each refueling and following maintenance which could affect leak tightness with operational checks showing correct valve position after each disturbance of the valve.

Acceptance Criteria

Acceptance for any single check valve will depend on demonstrating its capability to fully protect its connected, low pressure system from an overpressure transient in the rare event that the valve's redundant counterpart experiences gross leak tightness failure. This will assure that the normal, primary system charging capability is not challenged by such a failure and the plant can proceed with an orderly shutdown. Small leaks will be corrected at the earliest opportunity.

A leak rate acceptance criteria of 9 gal/min will be employed. This value, as chosen, should not result in undue forced outages, and, it is well within any limits required to ensure plant safety because (1) it is only 5% or less of the overpressure protection relief capacity for the low pressure systems which would come close to exceeding pressure boundary design safety margins if subjected to full RCS pressure, (2) it is 15% or less of relief capacity for low pressure systems which have a high enough design pressure to preclude their gross failure when exposed to full RCS pressure, and (3) the leak rate is low enough to have negligible effect on the normal charging system and no effect on a normal shutdown capability, and (4) it is within the permanently installed leak test measurement capability. Further, although a potential leak rate of this magnitude (resulting from gross failure of a redundant check valve) is not desirable, it is not unsafe and would be detected earlier than a small leak, reducing the time of plant operation without the benefit of double check valve protection.

Basis For Categorization

Table Q112.38-1 identifies those valves considered to be pressure isolation valves and includes the appropriate ASME Section XI categorization. The following paragraphs are the basis for this categorization.

1. PSIV - Accumulator Check Valves

   The Safety Injection System (SIS) accumulators are isolated from reactor coolant system pressure by two check valves in series. Only the first check valve in series need be monitored by a seat-leakage test. Leakage past the second check valve will be monitored by observation of the level in the accumulator which is alarmed and has control room monitors. TVA feels that this represents the most reasonable approach to monitoring these valves for pressure isolation. The affected valves are 1-63-622, 1-63-623, 1-63-624, and 1-63-625.

2. PSIV - Hot Safety Injection Leg Check Valves

   These SIS pump discharge lines are isolated from reactor coolant system pressure by two check valves in series and a normally closed motor-operated gate valve. In order to overpressurize the lines in question, failure of all three components is required. While the scenario of leakage past two check valves is possible, although not probable, the scenario of leakage past two check valves and a normally closed gate valve is extremely unlikely. In addition, the relief valves in the SIS are designed to relieve the maximum probable leakage past the two check valves back to the reactor sump. These two points taken together allow Watts Bar to exclude these valves from pressure isolation testing. The affected valves are 63-543, 63-545, 63-547, 63-549, 63-558, and 63-559.

3. PSIV - Safety Injection Cold Leg Check Valves

These SIS pump discharge lines are protected from RCS pressure by two check valves and a pressure relief valve. The relief valves, which drain back to the reactor sump, are sized to relieve the maximum probable leakage through the check valves. The first check valve in each valve train is also a PSIV for the accumulator valve trains and, as such, would be seat leak tested.

Failure of all three valves would be required to overpressurize the pump discharge lines.

TVA feels that adequate safeguards, therefore, exist to ensure against overpressurization of the pump discharge lines. Accordingly, the second check valve in each valve train (63-551, 63-553, 63-555, and 63-557) need not be tested for seat leakage.

4. PSIV - Residual Heat Removal Cold Leg Check Valves

The RHR pump discharge lines are protected from RCS pressure by two check valves and a pressure relief valve. The relief valves, which drain back to the reactor sump, are sized to relieve the maximum probable leakage through the check valves. The first check valve in each valve train is also a PSIV for the accumulator valve trains and, as such, would be seat leak tested.

Failure of all three valves would be required to overpressurize the pump discharge lines.

TVA feels that adequate safeguards, therefore, exist to ensure against overpressurization of the pump discharge lines. Accordingly, the second check valve in each valve train (63-632, 63-633, 63-634, and 63-635) need not be tested for seat leakage.

5. PSIV - Boron Injection Check Valves

The boron injection tank, associated piping, and valves are designed for a pressure of 2,800 psig compared to a RCS design pressure of only 2,580 psig. The valve train from the RCS to the centrifugal charging pumps includes a check valve at each hot leg injection line and a check valve in the manifold line (63-581) followed by two normally closed gate valves in parallel. The BIT (FCV-63-25 and 63-26) has two normally closed gate valves in parallel after the BIT at the centrifugal and recriprocating charging pump discharge lines (FCV-63-39 and 63-40).

TVA feels that the BIT and associated piping and valves downstream of the charging pump discharge lines isolation valves (FCV-63-39 and 63-40) do not require pressure isolation. Further, the charging pump discharge lines are adequately protected from overpressurization by the normally closed gate valves and check valves in series. Accordingly, check valves 63-581, 63-586, 63-587, 63-588, and 63-589 need not be seat leak tested for pressure isolation function.

6. PSIV - Residual Heat Removal Gate Valves

The original concern involving pressure isolation revolved about the fact that valves can leak due to a lack of positive closure under all system conditions. Gate valves which are verified closed before operation and which do not change position during power operation have extremely low leakage rates. TVA will verify minimal leakage rates on these valves.

7. PSIV - Residual Heat Removal Hot Leg Check Valves

The RHR pump discharge lines in the hot leg recirculation mode are protected from reactor coolant system pressure by two check valves in series and a relief valve designed to pass the maximum probable leakage past the two check valves back to the reactor sump. Failure of all three of these components is required in order to overpressurize the discharge lines. In reviewing these multiple defenses, TVA feels that damage to the discharge piping is an improbable event. Thus, valves 63-640, -641, -643, and -644 will not be tested for pressure isolation function.

8. PSIV - Upper Head Injection Check Valves

Each valve train from the RCS to the upper head injection accumulator is protected from RCS pressure by two check valves in series. Leakage past these check valves would be indicated by an increase of level in the UHI surge tank. TVA feels that the most reasonable approach to monitoring these valves for leakage is to monitor the surge tank level. Accordingly, check valves 87-558, 87-559, 87-560, and 87-561 will be monitored for pressure isolation, and the leakage past 87-562 and 87-563 will be monitored by verifying UHI surge tank level.

Table Q112.38-2 lists safety valve data which shows conservatism in available relief rates for a 9 gal/min leak.

The valves excluded from measured leak rate testing can be tested for closure by observing their ability to maintain an established differential pressure, by leak test, or by any other equally acceptable alternative.

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Table Q112.38-1

Pressure Isolation Valve Table

| Piping | TVA Valve No. | ASME Section XI Category |
|---|---|---|
| Accumulators | 63-560 | AC |
| | 561 | AC |
| | 562 | AC |
| | 563 | AC |
| RHR | FCV 74-1 | A |
| | 2 | A |
| | 8 | A |
| | 9 | A |
| UHI | 87-558 | AC |
| | 559 | AC |
| | 560 | AC |
| | 561 | AC |

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Table Q112.38-2

Safety Valve Relief Rate Conservatism

| Piping | Safety Valve Setpoint (psig) | Volumetric Relief Capacity (gal/min) | 9 gal/min leak rate as a % of Capacity |
|---|---|---|---|
| RHR Pump Discharge | 600 | 820 | 1.1% |
| SIS Accumulator | 700 | 235 | 3.8% |
| SI Pump Discharge | 1750 | 60 | 15% |
| UHI Accumulator | 1800 | 70 | 13% |

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212.13
(5.2.7)

Question:

The discussion of Intersystem Leakage Detection provides methods of detecting leakage of reactor coolant to secondary systems, but it does not address the potential leakage to ECCS rooms. Describe methods of detecting, monitoring, and alarming leakage into ECCS rooms and the sensitivity of this equipment to meet the requirements in the Technical Specifications.

Response:

Limitations for leakage from the RCS are provided in the Standard Technical Specifications. Provisions for detection of leakage from the ECCS during post-accident operation are described in revised Section 6.3.2.11. These provisions will also apply during all periods of normal operation.

212.18 (5.5.7) Question:

Pressure relief valves in RHR discharge lines are sized to relieve "maximum possible back leakage through valves separating the RHRS from the RCS". What flow rate is considered to be "maximum possible backleakage" and what is its basis? Describe and justify the overpressure protection of the RHR system when it is in operation.

Response:

The pressure relief valves in the discharge lines from the RHRS to the RCS are capable of relieving the maximum possible back-leakage through the check valves separating the RHRS from the RCS. Their capacity is more than adequate, since each is capable of relieving 20 gpm, while the check valves are designed for 0 leakage.

Also refer to Section 5.5.7.3.3 and 5.5.7.3.4.

212.74 (5.2.2) Question:

Check valves in the discharge side of the high head safety injection, low head safety injection, RHR, charging, and boron injection systems perform an isolation function in that they protect low pressure systems from full reactor pressure. The staff will require that these check valves be classified ASME KWV-2000 category AC, with the leak testing for this class of valve being performed to code specifications. Each check valve in the systems identified above must be leak tested; it is not satisfactory to just pull a suction on the outer most check valve. This only verifies that one of the series check valves is seated. The necessary frequency of testing will be that specified in the ASME Code, except in cases where only one or two check valves in series separate high to low pressure systems. In these cases, leak testing will be performed at each refueling after the valves have been exercised.

Identify the ASME IWV-2000 Section II category for each valve referred to in the above discussion. Verify that you will meet the required leak testing schedule, and that you have the necessary test lines to leak test each valve. Provide the leak detection criteria that will be used.

Response:

Refer to the response to Q112.38.