Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

CNL-14-068

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10 CFR 50.90

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Browns Ferry Nuclear Plant, Units, 1, 2, and 3
Renewed Facility Operating License Nos. DPR-33, DPR-52, and DPR-68
NRC Docket Nos. 50-259, 50-260, and 50-296

Subject: **Browns Ferry Nuclear Plant (BFN), Units 1, 2, and 3 - Supplement to Proposed Technical Specification Change to Revise the Leakage Rate Through MSIVs (TS-485)**

References

1. Letter from TVA to NRC, "Browns Ferry Nuclear Plant, Units 1, 2, and 3 - Proposed Technical Specification Change to Revise the Leakage Rate Through MSIVs - TS-485," dated November 22, 2013 [ML14015A403]

2. Letter from TVA to NRC, "Response to NRC Request for Additional Information Regarding Proposed Technical Specification Change to Revise the Leakage Rate Through MSIVs - TS-185 (TAC Nos. MF3124, MF3125, MF3126, MF8124, MF8125, and MF8126)," dated August 15, 2014 [ML14230A827]

3. Letter from TVA to NRC, "Response to NRC Request for Additional Information Regarding Proposed Technical Specification Change to Revise the Leakage Rate Through MSIVs -TS-485 (TAC NOS. MF3124, MF3125, and MF3126)," dated September 30, 2014 [ML14275A247]

In a letter dated November 22, 2013, letter (Reference 1), the Tennessee Valley Authority (TVA) proposed changes to BFN Units 1, 2, and 3, Technical Specification (TS) 3.6.1.3, "Primary Containment Isolation Valves (PCIVs)," to reduce the individual and total leakage rate through the MSIVs.

In an August 15, 2014, response to NRC Request for Additional Information (RAI) SCVB RAI-3 (Reference 2), TVA stated that "The current Acceptance Criteria does not ensure that Technical Specification (TS) Surveillance Requirement (SR) 3.6.1.3.10 verifies the validity of the design basis. Therefore, TVA will supplement the proposed Technical Specification change to revise the leakage rate through the MSIVs..." This letter provides that supplement to the proposed TS change. The proposed supplemental change contained in this letter will require that SR 3.6.1.3.10 verify that the leakage rate through each MSIV is ≤ 60 scfh when tested at ≥ 25 psig and that the combined MSIV leakage rate for all four main steam lines is

≤ 85 scfh when tested at ≥ 25 psig, assuming one MSIV fails to isolate in one line and the other MSIVs isolate in the remaining three main steam lines. When the MSIVs are tested using this SR, the assumptions in the calculation contained in the Reference 1 submittal are confirmed. There are additional minor editorial changes and updated information from the original Enclosure 1 of the Reference 1 submittal.

To ensure that the readability of the original proposed change for MSIV leakage is preserved, Enclosure 1 and Attachments 1, 2, 3, and 4 of the Reference 1 submittal are being replaced in their entirety by the pages in Enclosure 1 and Attachments 1, 2, 3, and 4 of this proposed supplement. Changes to the information in Enclosure 1 are noted by revision bars. Attachments 5 through 11 from Enclosure 1 of the Reference 1 submittal do not change except for the typographical error correction noted below from Attachment 5 and 6.

The November 22, 2013, letter (Reference 1) included two new regulatory commitments. In RAI responses contained in References 2 and 3, the original two Reference 1 commitments were revised and seven commitments were added. The status of the nine commitments are provided in Enclosure 2 of this submittal; this enclosure replaces the list of commitments from the Reference 1 submittal.

One of the commitments corrects a typographical error that was discovered in calculation NDQ099920010019 (Reference 3, Enclosure 1, TVA response to ARCB Branch RAI #5c). The corrected page E-10 is included in Enclosure 3 of this submittal.

The entire proprietary calculation, NDQ099920010019, was originally included as Attachment 5 of the Reference 1 submittal. However, WorleyParsons Polestar, Inc. has determined that the corrected page E-10 contains no information considered to be proprietary in nature. Therefore, the corrected page E-10 from Enclosure 3 of this submittal can replace page E-10 from both Attachments 5 and 6 of the Reference 1 submittal.

The change to the SR and the correction to calculation NDQ099920010019 contained in this letter has no adverse effect on the technical analysis of the Reference 1 submittal and does not change the conclusions of the significant hazards evaluation.

There are no new regulatory commitments associated with this submittal. Please address any questions regarding this request to Edward D. Schrull at (423) 751-3850.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 29th day of January 2015.

Respectfully,

J. W. Shea
Vice President, Nuclear Licensing

Enclosures

cc: See Page 3

Enclosures:

1. TS-485 S1, Alternative Leakage Treatment (ALT) Pathway

   Attachments
   1. Proposed Technical Specification Page Markups
   2. Proposed Technical Specifications Bases Pages Markups (for information only)
   3. Proposed Retyped Technical Specifications Pages
   4. Proposed Retyped Technical Specifications Bases Pages (for information only)

2. List of Regulatory Commitments

3. Corrected Page E-10 for Calculation NDQ099920010019, "Ex-Containment Removal Coefficients for Alternative Source Term Analyses"

cc (Enclosures):

NRC Regional Administrator Region II
NRC Senior Resident Inspector – Browns Ferry Nuclear Plant
State Health Officer, Alabama State Department of Public Health

ENCLOSURE 1

TS-485 Supplement 1

Alternate Leakage Treatment (ALT) Pathway

ENCLOSURE 1
TS-485 Supplement 1

Alternate Leakage Treatment (ALT) Pathway

ATTACHMENTS
[Note: There are no changes to Attachments 5 to 11 except for the typographical error in calculation NDQ099920010019 that is corrected in Enclosure 3 to this submittal. Therefore, Attachments 5 through 11 are not included.]

1. Proposed Technical Specifications Pages Markups
2. Proposed Technical Specifications Bases Pages Markups (for information only)
3. Proposed Retyped Technical Specifications Pages
4. Proposed Retyped Technical Specifications Bases Pages (for information only)
5. NDQ099920010019 *(proprietary)*, "Ex-Containment Removal Coefficients for Alternative Source Term Analyses"
6. NDQ099920010019 *(non-proprietary)*, "Ex-Containment Removal Coefficients for Alternative Source Term Analyses"
7. NDQ0031920075, "Control Room and Offsite Doses Due to a LOCA"
8. NDQ0999980016, "Parameters Used in Dose Analyses"
9. CDN0001990113, "Seismic Evaluation Report"
10. Proposed Updated Final Safety Analysis Report Page Markups
11. Affidavit

1.0 SUMMARY DESCRIPTION

This evaluation supports a request to amend Renewed Facility Operating License Nos. DPR-33, DPR-52, and DPR-68 for Browns Ferry Nuclear Plant (BFN) Units 1, 2, and 3, respectively. The proposed change will make the current passive secondary Alternate Leakage Treatment (ALT) Pathway be the primary pathway and decrease the leakage rates from 100 standard cubic feet per hour (scfh) per valve to 60 scfh for individual Main Steam Isolation Valves (MSIVs) and the combined leakage rates for all four main steam lines from 150 scfh to 85 scfh (References 5 and 6).

2.0 DETAILED DESCRIPTION

2.1 Proposed Changes

Changes to BFN, Units 1, 2, and 3, Technical Specification (TS) 3.6.1.3, "Primary Containment Isolation Valves (PCIVs)" are being proposed to decrease the leakage rate through each MSIV and the combined leakage rate through all four main steam lines.

Surveillance Requirement (SR) 3.6.1.3.10 changes

The current BFN Units 1, 2, and 3, SR 3.6.1.3.10 states:

> Verify leakage rate through each MSIV is ≤ 100 scfh and that the combined leakage rate for all four main steam lines is ≤ 150 scfh when tested at ≥ 25 psig.

The Tennessee Valley Authority (TVA) is proposing to change BFN, Units 1, 2, and 3, SR 3.6.1.3.10 to state:

> Verify MSIV leakage rate as follows:
>
> a. Each MSIV leakage is ≤ 60 scfh when tested at ≥ 25 psig; and
>
> b. The combined MSIV leakage rate for all four main steam lines is ≤ 85 scfh, assuming one MSIV fails to isolate in one line and all MSIV isolate in the other three lines, when tested at ≥ 25 psig.

Mark-ups of the affected TS pages are provided in Attachment 1. Corresponding changes are also proposed for the TS Bases. Mark-ups of the proposed TS Bases changes are provided in Attachment 2 for information only. Corresponding proposed Updated Safety Analysis Report (UFSAR) changes are provided in Attachment 10.

Changes to Credited ALT Pathway

The primary ALT Pathway is proposed to be defined as the passive pathway through the orifice bypass lines around each of the main steam drain lines, through open valve FCV-1-57, through the orifice bypass line around valve FCV-1-58, and finally through a non-orifice bypass line around valve FCV-1-59 to the condenser (Figure 1). The secondary ALT Pathway is proposed to be the pathway through normally open valves FCV-1-168, FCV-1-169, FCV-1-170, and FCV-1-171, and continues through valves FCV-1-57, FCV-1-58, and FCV-1-59 to the main condenser (Figure 2). The use of a

passive pathway as the primary ALT Pathway will result in more than a minimal increase in calculated dose consequences.

2.2 Condition Intended to Resolve

As discussed in a letter to the NRC dated August 30, 2013 (Reference 1), TVA identified that information previously provided to the NRC in certain BFN license amendment requests (LARs) and associated responses to the NRC requests for additional information (RAIs) for the ALT Pathway was incomplete.

To resolve this issue, TVA proposes to take the following actions:

- Change the current ALT primary flow path to become the ALT secondary flow path.
- Change the current ALT secondary flow path to become the ALT primary flow path.
- The maximum leakage from any one MSIV will be decreased from 100 scfh to 60 scfh.
- The total allowable MSIV leakage rate will be decreased from 150 scfh to 85 scfh.
- The dose analysis of record will be revised to include the new ALT primary flow path.

2.3 Explanation of Circumstances

On September 4, 2012, as part of the ongoing extent of condition reviews responding to Notice of Violation EA-11-252 (Reference 10), TVA determined that information previously provided to the NRC in certain BFN LARs and associated responses to the NRC RAIs for the ALT Pathway was incomplete. A 10 CFR 50.9(b) notification was made to the NRC within two working days of discovery.

The ALT Pathway was credited by TVA in NRC submittals to increase MSIV leakage acceptance criteria and to allow use of Alternative Source Term (AST). The submittals containing information that was determined to be incomplete are as follows.

- The MSIV leakage acceptance criteria increase submittals for BFN, Units 2 and 3, dated September 28, 1999 (Reference 2) and February 4, 2000 (Reference 3).
- The MSIV leakage acceptance criteria increase submittal for BFN, Unit 1, dated July 9, 2004 (Reference 4).
- The AST submittal for BFN, Units 1, 2, and 3, dated August 24, 2004 (Reference 5).

The NRC Safety Evaluation Report (SER) for NEDC-31858P, "BWROG Report for Increasing MSIV Leakage Rate Limits and Elimination of Leakage Control Systems" (Reference 6), required the following to be addressed.

> "In parallel to the plant-specific reviews conducted in the past, the staff determined that all licensees referencing the generic report should provide assurance for the reliability of the entire ALT Pathway, including all of its boundary valves. The licensees should also provide assurance that valves required to open the ALT path to the condenser are provided with highly reliable power sources, and that a secondary path to the condenser with orifice flow exists. In addition, valves which are required to open the ALT path to the condenser are to be included in the plant's Inservice Testing (IST) program."

TVA submittals dated September 28, 1999 (Reference 2) and July 9, 2004 (Reference 4) addressed compliance with NEDC-31858P and the associated SER (Reference 6) and stated that valves in each of the four drain lines from the main steam lines (flow control valve Main Steam Line A Drain Isolation Valve (FCV-1-168), Main Steam Line B Drain Isolation Valve (FCV-1-169), Main Steam Line C Drain Isolation Valve (FCV-1-170), and Main Steam Line D Drain Isolation Valve (FCV-1-171)) are normally open motor operated valves (MOVs) that would remain open on loss of offsite power (LOOP). However, these submittals should have also stated that if any MSIV is closed and turbine speed is greater than 1700 revolutions per minute (rpm), these valves would close and would only reopen after turbine speed drops below 1700 rpm.

As a result, TVA submittals failed to address the following:

- Reliability of power sources for these valves. Valves FCV-1-168, FCV-1-169, FCV-1-170, and FCV-1-171 are powered from non-safety related MOV boards that do not have emergency diesel generator (EDG) back-up power supplies.
- Reliability of valve logic to reopen the valves to establish the ALT Pathway.
- The need to include these valves in the IST Program.

TVA submittals dated September 28, 1999 (Reference 2) and July 9, 2004 (Reference 4) stated that two valves in the piping line downstream of the four main steam line drain lines prior to the condenser (Main Steam Drain to Condenser Isolation Valves (FCV-1-58 and FCV-1-59)) are normally closed valves which would require operator action to align the ALT path to the condenser. These TVA submittals also stated that these two valves are powered from essential power buses with EDG back-up and to further ensure valve reliability, these valves would be included in the IST program and periodically stroke tested. One of the valves (FCV-1-59) has a four-inch bypass containing no valves or orifices. Therefore, there is no concern associated with FCV-1-59 with respect to ALT Pathway availability. TVA submittals dated July 9, 2004 (Reference 4) and August 24, 2004 (Reference 5) also stated that valves FCV-1-58 and FCV-1-59 are designed to be available during and after a Loss of Coolant Accident (LOCA) event concurrent with a LOOP. However, the Reactor MOV boards that power FCV-1-58 are not qualified for the post-LOCA environment, e.g., temperature, and the Unit 3 Reactor MOV board is also required to be manually loaded onto the associated EDG. As a result, the previous TVA submittals failed to adequately address the reliability of the power source for FCV-1-58 after a LOCA.

TVA submittals dated September 28, 1999 (Reference 2), February 4, 2000 (Reference 3), July 9, 2004 (Reference 4), and August 24, 2004 (Reference 5), indicate that a secondary orifice contingency path is provided in the unlikely event of a failure of the normally closed valve without the four-inch bypass line (FCV-1-58) in the piping downstream of the four main steam line drain lines prior to the condenser. In these submittals, the secondary ALT Pathway consisted of orifice bypass lines around each of the four drain lines (FCV-1-168, FCV-1-169, FCV-1-170, and FCV-1-171) from the main steam lines through a normally open valve (FCV-1-57), in the piping line downstream of the four main steam line drain lines and then through an orifice bypass line around a normally closed valve (FCV-1-58) and finally through a non-orifice four-inch bypass line around another closed valve (FCV-1-59) to the condenser. These TVA submittals also stated that with the 0.1875 inch orifice path around FCV-1-58, the majority of MSIV leakage would still be directed to the condenser with a smaller remainder through the

closed main steam stop and control valves to the high pressure turbine. However, no TVA calculation was found that supports the statement regarding the 0.1875 inch orifice.

The ALT Pathways have been re-evaluated to resolve these issues and it has been determined that the primary pathway should be through the orifice bypass lines around each of the four drain lines, through valve FCV-1-57 (which will have its power removed), through the orifice bypass line around valve FCV-1-58, and finally through a non-orifice four-inch bypass line around valve FCV-1-59 to the condenser. (This was previously the secondary pathway.) The secondary pathway should be through the four drain line valves (FCV-1-168, FCV-1-169, FCV-1-170, and FCV-1-171), valve FCV-1-57, valve FCV-1-58, and valve FCV-1-59 to the condenser. (This was previously the primary pathway.)

Furthermore, TVA has re-performed the dose analysis to include the new ALT primary flow path that increases the flow bypassing the condenser. The revised dose analysis also assumes decreased individual and total allowable MSIV leakage rates.

3.0 TECHNICAL EVALUATION

3.1 System Description

There are four steam lines installed on each BFN unit and each line is provided with dual quick-closing MSIVs. These valves serve to isolate the reactor coolant system in the event of steam line breaks outside primary containment, a design basis LOCA, or other events requiring containment isolation. For a detailed discussion of the system components and operating characteristics, refer to Section 4.6.3 of the BFN UFSAR.

For a steam line break outside primary containment, the MSIV isolation function prevents damage to the fuel barrier by limiting the loss of reactor coolant. For the LOCA event, the MSIVs limit the release of radioactive materials by closing the primary containment barrier to contain a leak from the nuclear system.

The main steam drain lines are used to preferentially direct MSIV leakage to the main condenser. This drain path takes advantage of the large volume of the steam lines and condenser to provide holdup and plate-out of fission products that may leak through the closed MSIVs. In this approach, the main steam lines, main steam drain piping, and the main condenser are used to mitigate the consequences of an accident. The use of the ALT Pathways to mitigate the consequences of an accident was approved for BFN in License Amendment Nos. 263 (for Unit 2) and 223 (for Unit 3), dated March 14, 2000, and License Amendment No. 261 (for Unit 1), dated September 27, 2006.

3.2 Technical Analysis

TVA proposes to continue to utilize the main steam drain lines to preferentially direct MSIV leakage to the main condenser. However, to resolve issues identified in the 10 CFR 50.9(b) notification associated with the ALT Pathways, the primary ALT Pathway (Figure 1) will be defined as the passive pathway through the orifice bypass lines around each of the main steam drain lines, through open valve FCV-1-57, through the orifice bypass line around valve FCV-1-58, and finally through a non-orifice bypass line around valve FCV-1-59 to the condenser. To support the use of this passive pathway, the dose analysis has been re-performed assuming reduced MSIV leakage rates of 60 scfh

maximum through each MSIV and 85 scfh for the combined leakage rate for all four main steam lines. The secondary ALT Pathway (Figure 2) has now been defined as the pathway through the main steam drain lines and through open valves FCV-1-57, FCV-1-58, and FCV-1-59 to the condenser.

Detailed Description of ALT Pathways to Condenser

The MSIV Seismic Verification Walkdown Boundary (Figure 3) provides a flow diagram schematic that shows the ALT Pathway from the MSIVs to the condenser and the boundary valves associated with the ALT Pathway for BFN, Units 1, 2, and 3. As discussed in NEDC-31858P, "BWROG Report for Increasing MSIV Leakage Rate Limits and Elimination of Leakage Control Systems," the ALT Pathway establishes a seismically rugged route to contain and direct leakage from the MSIVs to the condenser following a design basis LOCA.

The primary ALT Pathway is based on the flow path through the orifice bypass lines around each of the main steam drain lines, through open valve FCV-1-57 (which will have its power removed), through the 0.1875-inch orifice bypass line around valve FCV-1-58 and the four inch bypass line around FCV-1-59 for those events taking credit for the availability of the ALT Pathway to the condenser. The primary flow path from the MSIVs to the condenser continues to be passive, requiring no operator actions or valve positions to change to establish the pathway. This primary flow path consists of the following:

- Four outboard MSIVs through 24-inch lines connecting to two-inch drain lines from each MSIV.
- Four two-inch bypass lines, that contain 0.25-inch orifices (around valves FCV-1-168, FCV-1-169, FCV-1-170 and FCV-1-171), connecting to a three-inch header.
- The three-inch header through normally open, with power removed, valve FCV-1-57 to a three-inch tee.
- The three-inch tee through a one-inch bypass line (around the normally closed valve FCV-1-58) that has a 0.1875-inch orifice and a normally open manual blowdown valve (BOV)-1-525.
- A four-inch bypass line (around normally closed valve FCV-1-59) to the condenser.

In the unlikely event the primary flow path is not available, and consistent with the guidance provided in NEDC-31858P, a secondary flow path is provided (although not with orifice flow). The secondary flow path is through normally open valves FCV-1-168, FCV-1-169, FCV-1-170, and FCV-1-171, and continues through valves FCV-1-57, FCV-1-58, and FCV-1-59 to the main condenser.

The primary ALT Pathway, from the outboard side of the MSIVs through orifice lines to the condenser, does not satisfy the sizing requirements of NEDC-31858P. Paragraph 6.1.1(2) of NEDC-31858P states that the ALT flow path, based on the radiological dose methodology, should be at least one square inch in internal cross sectional area due to the orificed bypass lines. The actual internal cross sectional area of the orificed bypass line around FCV-1-58 is 0.0276 square inches. However, the radiological dose analysis has been performed assuming the orificed pathway and demonstrated acceptable control room dose results and offsite dose results assuming the reduced MSIV leakage rates included in this LAR. The secondary ALT Pathway

satisfies the sizing requirements of NEDC-31858 paragraph 6.1.1(2), but does not include orifices as described in Section 5.3 of the NRC SER for NEDC-31858P (Reference 6).

Reliability of the ALT Primary Pathway and Boundary

To establish the primary ALT Pathway to the condenser, no operator actions are required because this pathway is passive and requires no valve position to be changed to establish the flow path from the MSIVs to the condenser.

The primary ALT Pathway is through this 0.1875-inch orifice with valve FCV-1-58 closed. The radiological dose analysis associated with primary ALT Pathway has been performed assuming the orificed pathway and demonstrated acceptable control room dose results and offsite dose results. To ensure the flow through the 0.1875-inch orifice is not obstructed, periodic radiography inspection of the 0.1875-inch orifice will be performed during refueling outages. In addition, the Main Steam Stop and Control Valves are included in the preventative maintenance program. As such, one Main Steam Stop and one Control Valve is refurbished each outage. These valves are also tested each refueling outage for leak tightness and are highly reliable.

As previously noted, Figure 3 provides a flow diagram that shows the ALT leakage pathway from the MSIVs to the condenser, and the boundary valves. All boundary valves are either closed during normal system operation or fail closed upon loss of power, loss of control air, or hydraulic pressure or close upon line depressurization. All of the boundary valves fall into one of the following categories:

- Manual isolation valves that are normally closed.
- Motor operated valves that are normally closed.
- Air operated valves that are normally open, but fail closed on loss of power, loss of air, or loss of control signal.
- Valves isolated by a spring assisted in-line check valve, that have an opening pressure in excess of the ALT drain path differential pressure once the MSIVs have closed and the line has depressurized.

However, during abnormal operations, some boundary valves would be moved from their normal position and therefore would be verified closed as needed to implement the ALT flow path lineup (e.g., FCV-6-100).

The piping and components within the boundaries of the ALT Pathway are included in the BFN IST and Inservice Inspection (ISI) programs, and, accordingly, will be inspected and tested in accordance with the IST and ISI programs. The IST program will test the power operated valves within the ALT Pathway on a periodic basis. The specific test requirements will be based on the function of the individual valve (e.g., passive versus active). All valves included in the ALT Pathway or boundary are included in the IST or Augmented IST Programs. In addition, the functionality of the ALT path has been made highly reliable through the efforts to ensure the line is seismically rugged as discussed in previous submittals for the ALT Pathways (References 2, 3, and 4). To help ensure valve reliability, boundary valves that may be required to close to establish the ALT Pathway boundary are included in the IST program and are periodically stroke tested.

The ALT Pathway and boundary piping has not been included in the augmented Intergranular Stress Corrosion Cracking weld inspection program because it does not meet the criteria for inclusion. However, this piping is included in the Flow Accelerated Corrosion program that periodically monitors pipe wall thickness degradation.

Reliability of the Secondary ALT Pathway

Valves FCV-1-168, FCV-1-169, FCV-1-170, and FCV-1-171 are normally open MOVs that would remain open in the event of a LOCA concurrent with a loss of off-site power. However, if any MSIV is closed and turbine speed is greater than 1700 rpm, valves FCV-1-168, FCV-1-169, FCV-1-170, and FCV-1-171 close and reopen after turbine speed drops below 1700 rpm, if power is available. These valves are powered from non-safety related MOV boards that do not have EDG back-up power supplies. However, the likelihood of a LOOP occurring prior to the valves reopening is considered small. To ensure valve reliability, valves FCV-1-168, FCV-1-169, FCV-1-170, and FCV-1-171 are included in the IST Program and are periodically stroke tested.

Valve FCV-1-57 is normally open, and will have the power removed, to ensure it remains open. Valves FCV-1-58 and FCV-1-59 are normally closed valves, which would require operator action to align the secondary ALT Pathway to the condenser. These two valves are powered from non essential, Class 1E, Seismic Class 1 Reactor MOV Boards. Units 1 and 2 FCV-1-57 and 58 are not load shed upon LOOP that results in automatic emergency diesel generator back-up availability. Unit 3-FCV-1-57 and 3-FCV-1-58 are also powered from a non essential, 1E, Seismic Class 1 Reactor MOV Board. However, these Unit 3 FCVs are load shed upon LOOP with emergency diesel generator back-up enabled for manual breaker closure after 40 seconds or the breaker would auto close in 11 minutes. To ensure valve reliability, FCV-1-58 and FCV-1-59 are in the IST program and will be periodically stroke tested. However, as stated above, FCV-1-59 has an open full bypass line; therefore, its operation is not essential to align the secondary ALT Pathway based on MSIV leakage of saturated vapor continuing to the condenser through the fully bypassed line.

The Units 1, 2 and 3 Reactor MOV boards and cabling for valves FCV-1-57, FCV-1-58, and FCV-1-59 do not meet EQ requirements.

The most limiting single active failure for the secondary ALT Pathway is the failure of valve FCV-1-58 to open. In this condition, MSIV leakage flow would be diverted through the one-inch orifice bypass line around valve FCV-1-58 and through normally open manual valve BOV-1-525. With the 0.1875-inch orifice in this one-inch line, it is calculated that 48.9% of the MSIV leakage would be directed to the condenser with the remainder through the closed Main Steam Stop and Control Valves to the high pressure turbine and then to the turbine building.

Valves FCV-1-168, FCV-1-169, FCV-1-170, FCV-1-171, FCV-1-57, FCV-1-58, and FCV-1-59 were considered for inclusion in the augmented MOV test programs required by Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," and GL 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Power-Operated Valves." The design basis for establishing the ALT Pathway is a LOCA with assumed major core damage and the MSIVs closed. With the MSIVs closed, the ALT Pathway boundary is physically isolated from the reactor vessel and primary containment except through leakage through the MSIVs. In order to establish

the primary ALT Pathway, no valves are required to change state. In order to establish the secondary ALT Pathway, valves FCV-1-168, FCV-1-169, FCV-1-170, FCV-1-171, FCV-1-58, and FCV-1-59 may change state, but would not have to change state against a large differential pressure because the post-accident conditions would be less severe than the conditions in which these valves are tested during normal power operations. Therefore, FCV-1-168, FCV-1-169, FCV-1-170, FCV-1-171, FCV-1-58, and FCV-1-59 are not included in the GL 89-10/96-05 MOV programs. For valve FCV-1-57, this valve is normally open, and will have the power removed, and therefore it is not included in the GL 89-10/96-05 MOV programs. Following approval of this LAR, the categorization and testing of these valves currently included in the IST Program will be reviewed for applicable changes.

Dose Analysis Summary and Results

The AST dose calculations (Attachments 5, 6, 7, and 8) have been updated to account for a change to the primary alternate leakage path to the condenser. The purpose of this change is to utilize the orificed flow path to the condenser, currently licensed as the secondary alternate leak treatment flow path, as the primary flow path for alternate leak treatment. Using the orificed flow path as the primary flow path provides a passive pathway to the condenser, which, unlike the previous primary pathway, does not require the manipulation of valves to establish a flow path to the main condenser.

Because the new primary ALT Pathway has a smaller cross-sectional flow area than the previous pathway, the fraction of MSIV leakage that bypasses the main condenser increases. The previous flow area percentage of the primary alternate leak pathway to the condenser bypass pathway was 99.5% to 0.5%. The new flow area percentage of the primary alternate leak pathway to the condenser bypass pathway is 48.9% to 51.1%. The 48.9% of the MSIV leakage directed to the condenser is based on a ratio of 0.0288 in^2 (Generic Flow Area to the High Pressure Turbine due to leakage through the Main Steam Stop Valves) and 0.0276 in^2 (0.1875-inch orifice Flow Area of the credited Drainline Pathway). MSIV leakage is being reduced from 150 scfh total and 100 scfh maximum per line to 85 scfh total and 60 scfh maximum per line to partially compensate for this increased main condenser bypass.

Aerosol and elemental iodine removal, due to sedimentation and diffusion respectively, are credited in the main steam lines and in the main condenser. The increased main condenser bypass and reduced MSIV leakage result in changes in aerosol and elemental iodine removal coefficients in the steam lines and main condenser. The methodology used is the same as currently approved by the NRC and is outlined below.

The analysis assumes that three of the four steam lines are isolated and intact up to the turbine stop valves, while in the remaining steam line, the inboard MSIV is assumed to be failed open. For the three steam lines that are isolated and intact, sedimentation occurs in the steam lines from the vessel up to the turbine stop valves. However, only the piping between the inboard MSIV and the point where the drain line taps off to go to the main condenser is credited for removal of activity. This piping is divided into two adjacent volumes: (1) the volume between closed MSIVs, and (2) the volume between the outboard MSIV and the point where the drain lines tap off to go to the condenser. As for the steam line with the failed open MSIV, sedimentation is being credited in one single piping volume, between the outboard MSIV and the point where the drain line taps off as it would be difficult to justify deposition in the section upstream of the outboard

MSIV. A maximum MSIV leakage of 60 scfh in the line with the failed inboard MSIV is assumed. One of the other lines is assumed to leak at 25 scfh, and the other two lines are assumed not to leak. This modeling is conservative as it minimizes deposition credit. The modeling assumes well-mixed control volumes. Only the piping volumes associated with horizontal runs of main steam line piping are included. The amount of fission product aerosol deposition is derived from the methodology in Appendix A to NRC staff report AEB-98-03, "Assessment of the Radiological Consequences for the Perry Pilot Plant Application Using the Revised (NUREG-1465) Source Term" (Reference 7). Particulate deposition in the main condenser is treated using the same approach as that for the steam lines. The deposition of elemental iodine in the MSLs is determined using the NRC staff-accepted RADTRAD model (Reference 7). Because the particulate deposition velocity in the condenser is less than the elemental iodine deposition velocity from NUREG 0800 Section 6.5.2, "Containment Spray As A Fission Product Cleanup System" (Reference 8), TVA used the particulate deposition velocity.

The revised control room and offsite dose analyses continue to utilize AST and the regulatory guidance of Regulatory Guide 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors" (Reference 9) for BFN Units 1, 2 and 3. The control room and offsite dose results are given in Table 1 while the input parameters are given in Table 2. The computer code RADTRAD was used to calculate the resultant control room and offsite doses. The resulting doses continue to satisfy the radiological dose limits of 10 CFR 50.67 and Regulatory Guide 1.183, which require doses less than five rem TEDE for the Control Room (CR), and 25 rem TEDE for the Exclusion Area Boundary (EAB) and Low Population Zone (LPZ).

Table 1- Control Room and Offsite Dose Results

30-day CR TEDE (rem)	Max-2-hour EAB TEDE (1-3 hr) (rem)	30-day LPZ TEDE (rem)
4.72	5.92	5.4

Table 2 - Input Data

#	Description	Value	
1	Reactor power for core inventory (3952 x 1.02), MWt	4031	
	No 1.02 factor used for drywell natural desposition calculation (conservative)		
2	Number of assemblies in core	764	
3	LOCA Source Term Input	Reg Guide 1.183	
4	Primary Containment Volumes, ft^3		
	Drywell	159,000	
	Supression pool air space	119,400	
	Suppression pool liquid	141,051	
5	Reactor Building Volume, ft^3	1,311,209	
6	Containment leakrate, %/day	2	
	Drywell to Reactor Building, cfm	2.208	
	Torus to Reactor Building, cfm	1.658	
7	Volume at base of stack (50% of free volume), ft^3	34,560	
8	Volumetric Flowrate, Drywell to Main Condenser, cfm	0.363	
9	Volumetric Flowrate, Condenser to Environment, cfm	1.107	
10	Volumetric Flowrate, Drywell to Turbine Building (Condenser Bypass), cfm	0.3788	
11	Combined MSIV Tested Leak Rate, scfh total	85	
12	Per Line MSIV Tested Leak Rate, scfh max per line	60	
13	MSIV Leakage Test Pressure	≥ 25 psig	
14	CREVS filter efficiency	Not Credited	
15	Control room intake flow, cfm	6717	
16	Control room Volume, ft^3	210,000	
17	Hardened wet well vent release (elevated), 8 hours to 30 days, cfh	10	
18	SGTS ground level leakage (base of stack), cfm	20	
19	SGTS Stack Flow, cfm	24750	
20	SGTS HEPA filter efficiency, particulate, %	90	
21	SGTS Charcoal Filter Efficiency, %	Not Credited	
22	ESF Leakage		
	Flow, gpm	20	
	Amount of Iodine that flashes, %	10	
23	Steam Line and Main Condenser Removal Efficiencies	Aerosol Particles	Elemental Iodine
	Steam line	99.97	99.70
	MC bypass	92.90	25.30

Table 2 - Input Data (continued)

#	Description	Value
24	Breathing rate, offsite, m^3/s	
	0-8 hours	3.50E-04
	8-24 hours	1.80E-04
	>24 hours	2.30E-04
25	Breathing rate, control room, m^3/s	3.50E-04
26	Control room occupancy factor	
	0-24 hrs	1
	1-4 days	0.6
	4-30 days	0.4
27	Generic Flow Area to HP Turbine, in^2	0.0288
28	Min Flow Area of Drainline Pathway, in^2	0.0276
29	Reference Atmospheric Pressure, psia	14.4
30	Reference Steam Line Pressure, psia	1050
31	Drywell maximum accident conditions	
	Pressure, psig	48.5
	Temperature, F	295.2
32	Volume of Inboard to Outboard MSIV, ft^3	53.7
33	Volume of Outboard MSIV to Drain Line Tap, ft^3	173.1
34	Main Condenser Volume, ft^3	122,400
35	Main Condenser Sedimentation Height, ft	27.2
36	Drywell Sprays	Not Credited
37	CAD System Release (Activity same as CNMT leakage Case)	
	Flow rate, cfm	139
	CAD operation, days post accident	10, 20, 29
	CAD operation duration, hours	24
38	Drywell Natural Deposition	
	Particulate	Powers 10% Model
	Elemental	Same as Particulate
39	Surface Area for elemental iodine deposition in DW, m^2	3409

Structural Integrity

Portions of the main steam piping and components in the Turbine Building at BFN were not originally designed as Seismic Class I. Therefore, seismic verification walkdowns and evaluations of piping/supports were performed to demonstrate the main steam line piping and components that comprise the ALT path were rugged, and would be able to perform the safety function of MSIV leakage control following a design basis event (DBE).

A review of the earthquake experience data on the performance of nuclear power plants and condensers was conducted. Using the experience-based methodology, supplemented by the walkdowns and evaluations, the components in the ALT leakage path can be relied upon to maintain structural integrity. The seismic evaluation results are summarized in the BFN calculation provided in Attachment 9. This calculation documents outliers that required resolution for BFN Units 1, 2, and 3. All outliers documented in the BFN calculation provided in Attachment 9 have been resolved. These resolutions are documented and verified in References 11, 12, 13, and 14.

In summary, the seismic verification walkdowns and evaluations of piping/supports demonstrated that the main steam line piping and components that comprise the ALT path were rugged, and would be able to perform the safety function of MSIV leakage control following a DBE. Therefore, it has been concluded the components in the ALT leakage path can be relied upon to maintain their structural integrity.

MSIV Leakage Rate Testing

The MSIVs will continue to be leakage rate tested in accordance with the Primary Containment Leakage Rate Testing Program described in TS 5.5.12, except that the acceptance criteria for MSIV leakage will be reduced as reflected in this LAR.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

The NRC's regulatory requirements related to the content of the TSs are contained in 10 CFR 50.36. The TS requirements in 10 CFR 50.36 include the following categories: (1) safety limits, limiting safety systems settings, and control settings; (2) LCO; (3) surveillance requirements; (4) design features; and (5) administrative controls.

As stated in 10 CFR 50.59(c)(1)(i), a licensee is required to submit a license amendment pursuant to 10 CFR 50.90 if a change to the TSs is required. Furthermore, the requirements of 10 CFR 50.59 necessitate that the NRC approve the TS changes before they are implemented. The TVA submittal meets the requirements of 10 CFR 50.59(c)(1)(i) and 10 CFR 50.90.

The main steam lines, steam drain piping, and the main condenser are used to mitigate the consequences of an accident to limit potential exposures below the doses limits prescribed in 10 CFR 50.67(b)(2)(i) for the exclusion area, 10 CFR 50.67(b)(2)(ii) for the low population zone, and in 10 CFR 50.67(b)(2)(iii) for control room personnel.

TVA commits to having administrative controls in place to ensure that the power is removed from valve FCV-1-57 to ensure that it remains in the open position.

4.2 Precedent

There is not a specific precedent for using the proposed primary ALT Pathway. The previously approved secondary ALT Pathway is the same as the proposed primary ALT Pathway. In Reference 6, the NRC issued an SER on NEDC-31858P, "Safety Evaluation Report of GE Topical Report, NEDC-31858P, Revision 2, BWROG Report for Increasing MSIV Leakage Limits and Elimination of Leakage Control Systems," approving NEDC-31858P for use. BFN evaluated the ALT Pathway for the Units 2 and 3 licensing submittal (Reference 2) and the Unit 1 licensing submittal (Reference 4) in accordance with the technical methodology in NEDC-31858P.

4.3 Significant Hazards Consideration

The proposed change decreases the leakage rate through each MSIV and the combined leakage rate through all four main steam. Additionally, the proposed change establishes the primary Alternate Leakage Treatment (ALT) Pathway as a flow path through the orifice bypass lines around each of the main steam drain lines, through open valve FCV-1-57, which will have its power removed, through the 0.1875-inch orifice bypass line around valve FCV-1-58 and the four-inch bypass line around FCV-1-59 for those events taking credit for the availability of the ALT Pathway to the condenser. This results in an increase in the flow that bypasses the condenser. The primary flow path from the MSIVs to the condenser is passive, and requires no operator actions or valve positions to change to establish the pathway. Furthermore, the proposed change establishes the secondary ALT Pathway through normally open valves FCV-1-168, FCV-1-169, FCV-1-170, and FCV-1-171, and continues through valves FCV-1-57, FCV-1-58, and FCV-1-59 to the main condenser.

The Tennessee Valley Authority (TVA) has concluded that the proposed change to the Browns Ferry Nuclear Plant (BFN) Units 1, 2, and 3 does not involve a significant hazards consideration. TVA's conclusion is based on its evaluation in accordance with Title 10 of the Code of Federal Regulations (10 CFR) 50.91(a)(1) of the three standards set forth in 10 CFR 50.92, "Issuance of Amendment," as discussed below:

1. *Does the proposed amendment involve a significant increase in the probability or consequence of an accident previously evaluated?*

    Response: No.

    The proposed change continues to use the main steam drain lines to direct MSIV leakage to the main condenser, although at a lower rate than is currently allowed. Therefore, the ALT Pathway takes advantage of the large volume of the steam lines and condenser to provide holdup and plate-out fission products that may leak through the closed MSIVs. Additionally, the main steam lines, main steam drain piping, and the main condenser continue to be used to mitigate the consequences of an accident to limit potential doses below the limits prescribed in 10 CFR 50.67(b)(2)(i) for the exclusion area, 10 CFR 50.67(b)(2)(ii) for the low population zone, and in 10 CFR 50.67(b)(2)(iii) for control room personnel.

The plant-specific radiological analysis has been re-evaluated to ensure that the effects of the increase in the condenser bypass flow and proposed decrease in MSIV leakage continues to maintain the acceptance criteria in terms of offsite doses and main control room dose. The analysis results comply with the dose limits prescribed in 10 CFR 50.67(b)(2)(i) for the exclusion area, 10 CFR 50.67(b)(2)(ii) for the low population zone, and in 10 CFR 50.67(b)(2)(iii) for control room personnel.

Therefore, the proposed change does not involve a significant increase in the probability or consequence of an accident previously evaluated.

2. *Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?*

   Response: No.

   The proposed change does not involve any physical changes to plant safety related systems, structures, and components (SSCs) or alter the modes of plant operation in a manner that is outside the bounds of the current alternate leakage treatment pathway. Because the safety and design requirements continue to be met and the integrity of the Reactor Coolant System (RCS) pressure boundary is not challenged, no new credible failure mechanisms, malfunctions, or accident initiators are created, and there will be no effect on the accident mitigating systems in a manner that would significantly degrade the plant's response to an accident.

   Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. *Does the proposed amendment involve a significant reduction in a margin of safety?*

   Response: No.

   The proposed change to Surveillance Requirement 3.6.1.3.10, to decrease the allowable MSIV leakage, and increase the condenser bypass flow due to only crediting the passive ALT Pathway, does not involve a significant reduction in the margin of safety. The allowable leak rate specified for the MSIVs is used to quantify a maximum amount of leakage assumed to bypass containment. The results of the re-analysis supporting these changes were evaluated against the dose limits contained in 10 CFR 50.67(b)(2)(i) for the exclusion area, 10 CFR 50.67(b)(2)(ii) for the low population zone, and 10 CFR 50.67(b)(2)(iii) for control room personnel. Margin relative to the regulatory limits is maintained.

   Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, TVA concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92 (c), and accordingly, a finding of "no significant hazards consideration" is justified.

Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 REFERENCES

1. Letter from TVA to NRC, "Updated Reply to Notice of Violation; EA-11-252; and Follow-up to 10 CFR 50.9, 'Completeness and accuracy of information,' Notification," dated August 30, 2013

2. TVA letter to the NRC, "Browns Ferry Nuclear Plant - Units 2 and 3 - Technical Specification (TS) Change 399 - Increasing Main Steam Isolation Valve (MSIV) Leakage Rate Limits and Exemption from 10 CFR 50, Appendix J," dated September 28, 1999

3. TVA letter to the NRC, "Browns Ferry Nuclear Plant - Units 2 and 3 - Response to Request for Additional Information Regarding Technical Specification (TS) Change 399 -Increased Main Steam Isolation Valve (MSIV) Leakage Rate Limits and Exemption from 10 CFR 50, Appendix J - Revised TS Pages for MSIV Leakage Limits," dated February 4, 2000

4. TVA letter to the NRC, "Browns Ferry Nuclear Plant Unit 1 - Technical Specification (TS) Change 436 - Increased Main Steam Isolation Valve (MSIV) Leakage Rate Limits and Exemption from 10 CFR 50, Appendix J," dated July 9, 2004

5. TVA letter to the NRC, "Browns Ferry Nuclear Plant - Units 1, 2, and 3 - Supplemental Information Associated with Response to Request for Additional Information (RAI) Related to Technical Specification (TS) Change No. TS-405 - Alternative Source Term (AST)," dated August 24, 2004

6. NRC letter to General Electric, "Safety Evaluation Report of GE Topical Report, NEDC-31858P, Revision 2, BWROG Report for Increasing MSIV Leakage Limits and Elimination of Leakage Control Systems," September 1993, dated March 3, 1999

7. AEB-98-03, "Assessment of the Radiological Consequences for the Perry Pilot Plant Application Using the Revised (NUREG-1465) Source Term. Particulate" dated December 9, 1998

8. NUREG-0800, Section 6.5.2, "Containment Spray As A Fission Product Cleanup System," Revision 4, published March, 2007

9. Regulatory Guide (RG) 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," published July, 2000

10. NRC letter to TVA, "Browns Ferry Nuclear Plant - NRC Inspection Procedure 95003 Supplemental Inspection Report 05000259/2011011, 05000260/2011011, AND 05000296/2011011 (PART 1), dated November 17, 2011

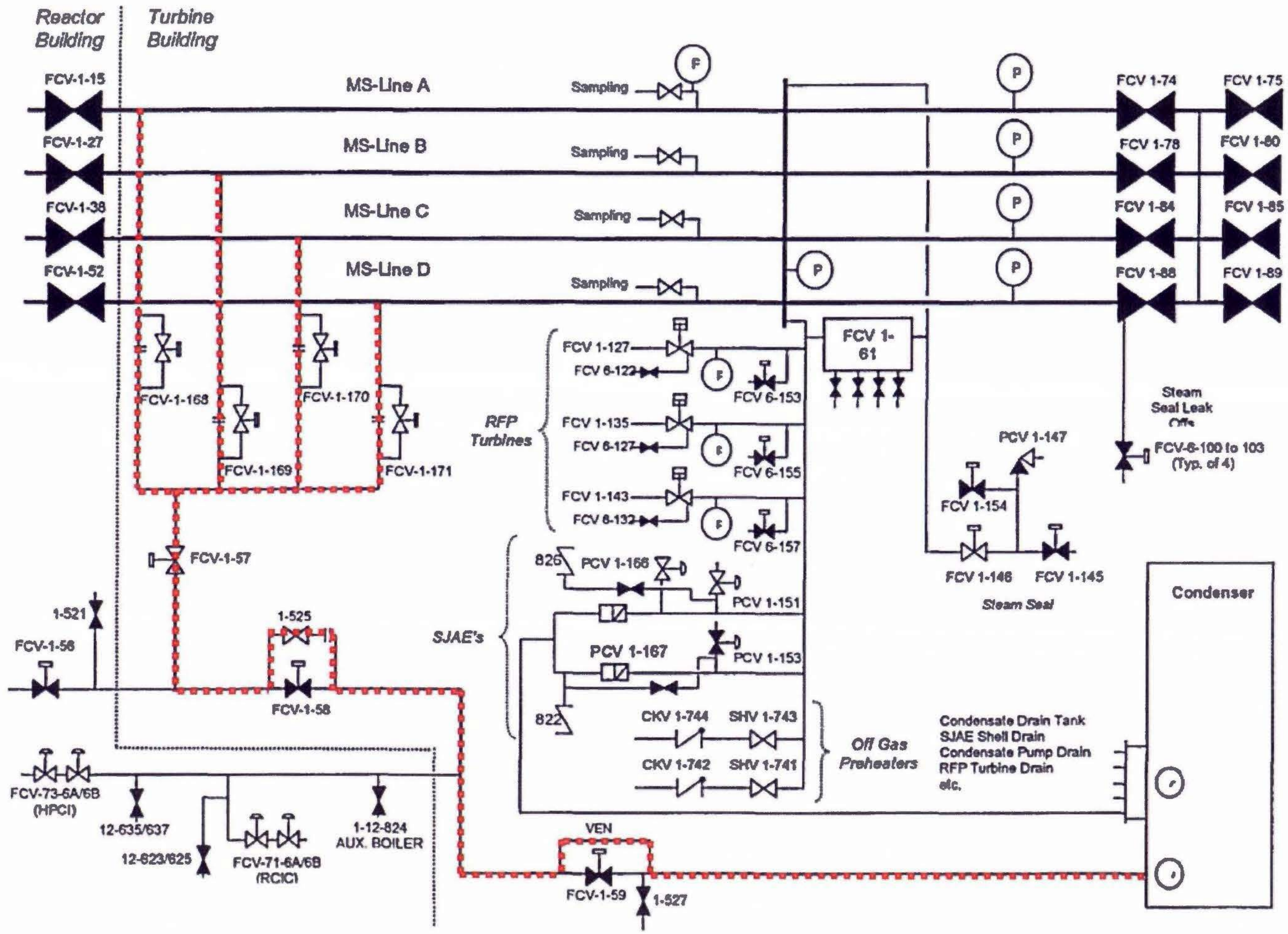
11. TVA Calculation CDQ2001980069, "Main Steam Seismic Ruggedness Verification - Unit 2"

12. TVA Calculation CDQ0001980038, "Main Steam Seismic Ruggedness Evaluation"

13. TVA Calculation CDQ0001980039, "Main Steam Seismic Ruggedness Verification - Unit 3"

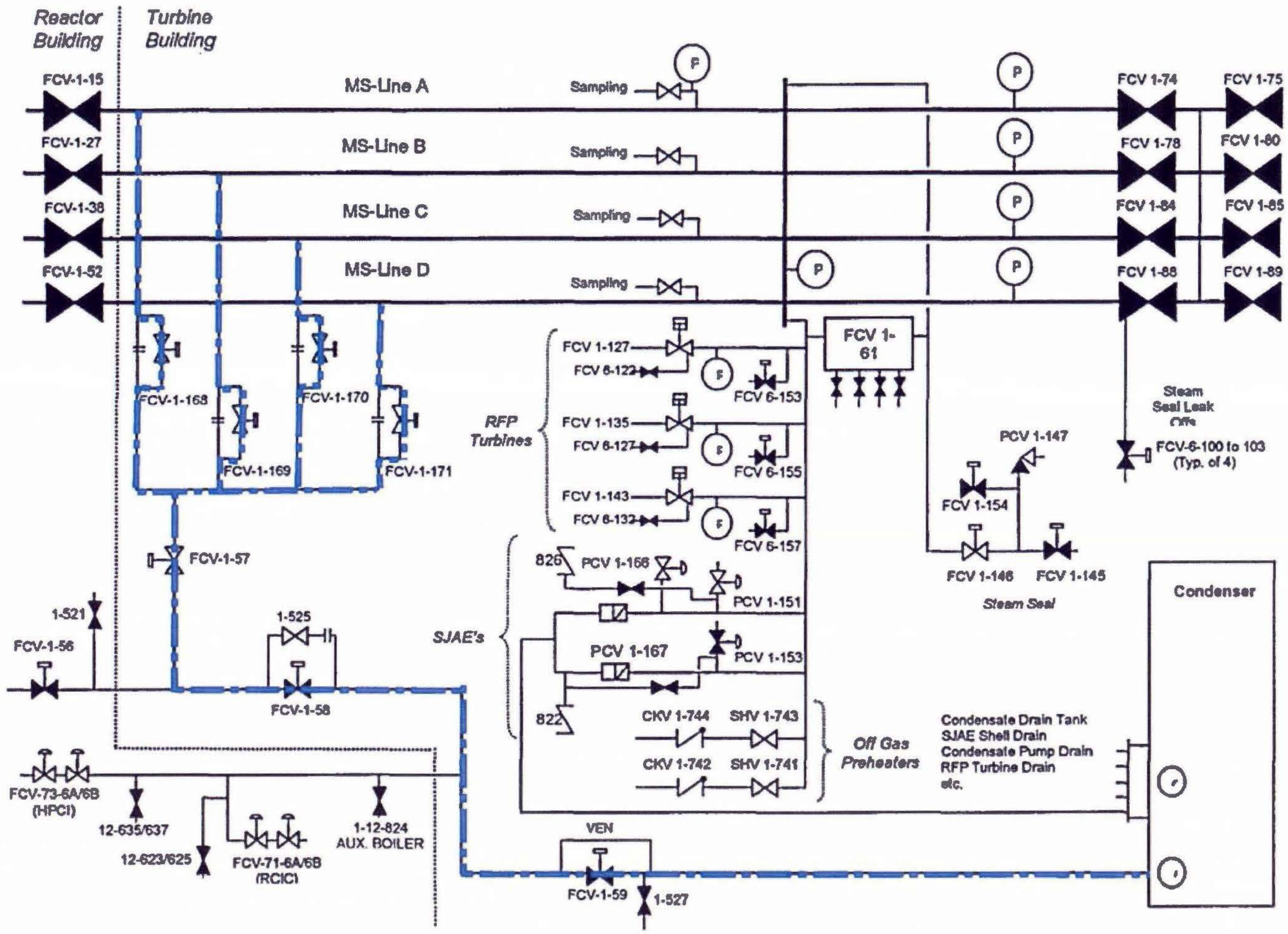
14. Calculation TVA/BFN-01-R-003, "MSIV Seismic Ruggedness Verification at BFN Unit 1", EDMS No. W87 070313 001

Figure 1



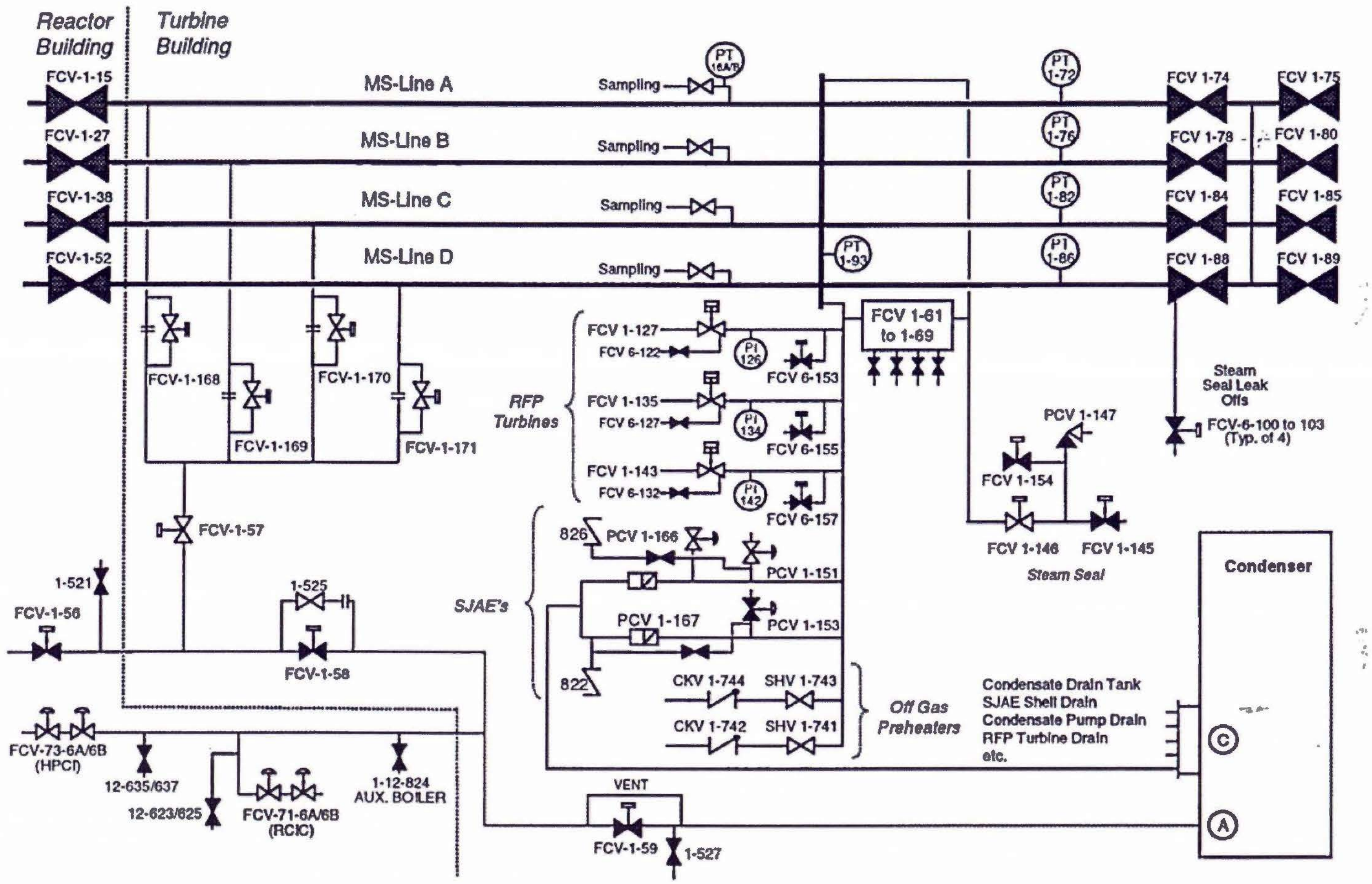
BFN Primary "ALT" Pathway from Main Steam Lines to Condenser

Figure 2



BFN Secondary "ALT" Pathway from Main Steam Lines to Condenser

Figure 3



MSIV Seismic Verification Walkdown Boundary

ATTACHMENT 1

Proposed Technical Specifications Pages Markups

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.6.1.3.5	Verify the isolation time of each power operated, automatic PCIV, except for MSIVs, is within limits.	In accordance with the Inservice Testing Program
SR 3.6.1.3.6	Verify the isolation time of each MSIV is ≥ 3 seconds and ≤ 5 seconds.	In accordance with the Inservice Testing Program
SR 3.6.1.3.7	Verify each automatic PCIV actuates to the isolation position on an actual or simulated isolation signal.	24 months
SR 3.6.1.3.8	Verify a representative sample of reactor instrumentation line EFCVs actuate to the isolation position on a simulated instrument line break signal.	24 months
SR 3.6.1.3.9	Remove and test the explosive squib from each shear isolation valve of the TIP System.	24 months on a STAGGERED TEST BASIS
SR 3.6.1.3.10	Verify MSIV leakage rate as follows: ~~through each MSIV is ≤ 100 scfh and that the combined leakage rate for all four main steam lines is ≤ 150 scfh when tested at ≥ 25 ps~~ig. a. Each MSIV leakage is ≤ 60 scfh when tested at ≥ 25 psig; and b. The combined MSIV leakage rate for all four main steam lines is ≤ 85 scfh, assuming one MSIV fails to isolate in one line and all MSIV isolate in the other three lines, when tested at ≥ 25 psig.	In accordance with the Primary Containment Leakage Rate Testing Program

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.6.1.3.5	Verify the isolation time of each power operated, automatic PCIV, except for MSIVs, is within limits.	In accordance with the Inservice Testing Program
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SR 3.6.1.3.9	Remove and test the explosive squib from each shear isolation valve of the TIP System.	24 months on a STAGGERED TEST BASIS
SR 3.6.1.3.10	Verify MSIV leakage rate as follows: ~~through each MSIV is ≤ 100 scfh and that the combined leakage rate for all four main steam lines is ≤ 150 scfh when tested at ≥ 25 psig.~~ a. Each MSIV leakage is ≤ 60 scfh when tested at ≥ 25 psig; and b. The combined MSIV leakage rate for all four main steam lines is ≤ 85 scfh, assuming one MSIV fails to isolate in one line and all MSIV isolate in the other three lines, when tested at ≥ 25 psig.	In accordance with the Primary Containment Leakage Rate Testing Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
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SR 3.6.1.3.9	Remove and test the explosive squib from each shear isolation valve of the TIP System.	24 months on a STAGGERED TEST BASIS
SR 3.6.1.3.10	Verify MSIV leakage rate as follows: ~~through each MSIV is ≤ 100 scfh and that the combined leakage rate for all four main steam lines is ≤ 150 scfh when tested at ≥ 25 psig.~~ a. Each MSIV leakage is ≤ 60 scfh when tested at ≥ 25 psig; and b. The combined MSIV leakage rate for all four main steam lines is ≤ 85 scfh, assuming one MSIV fails to isolate in one line and all MSIV isolate in the other three lines, when tested at ≥ 25 psig.	In accordance with the Primary Containment Leakage Rate Testing Program

ATTACHMENT 2

Proposed Technical Specifications Bases Pages Markups
(for information only)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.1.3.9

The TIP shear isolation valves are actuated by explosive charges. An in place functional test is not possible with this design. The explosive squib is removed and tested to provide assurance that the valves will actuate when required. The replacement charge for the explosive squib shall be from the same manufactured batch as the one fired or from another batch that has been certified by having one of the batch successfully fired. The Frequency of 24 months on a STAGGERED TEST BASIS is considered adequate given the administrative controls on replacement charges and the frequent checks of circuit continuity (SR 3.6.1.3.4).

SR 3.6.1.3.10

The analyses in References 1 and 5 are based on leakage that is less than the specified leakage rate. Leakage through each MSIV must be ≤ ~~100~~ 60 scfh when tested at ≥ P_t (25 psig). The combined leakage rate for all four main steam lines must be ≤ ~~150~~ 85 scfh when tested at ≥ 25 psig ~~in accordance with the Primary Containment Leakage Rate Testing Program.~~ INSERT 1 ~~If the leakage rate through an individual MSIV exceeds 100 scfh, the leakage rate shall be restored below the alarm limit value as specified in the Containment Leakage Rate Testing Program referenced in TS 5.5.12. This ensures that MSIV leakage is properly accounted for in determining the overall primary containment leakage rate.~~ The Frequency is specified in the Primary Containment Leakage Rate Testing Program.

(continued)

INSERT 1

The dose calculation assumes one MSIV in one steam line fails to isolate. Therefore, in the case of the failed MSIV, the line leakage is assumed to be the leakage from the non-failed MSIV that causes the highest total MSIV leakage. The acceptance criteria for the leakage from each MSIV is ≤ 60 scfh when tested at ≥ 25 psig. In the case of the combined MSIV leakage rate for all four main steam lines, four combinations of MSIV leak rates are calculated. Each combination includes the "Maximum" leak rate for one Main Steam Line (MSL) and the "Minimum" leak rate past both MSIVs for each of the other three MSLs. The highest total value is selected and compared against the acceptance criteria, which is the combined MSIV leakage rate for all four main steam lines of ≤ 85 scfh, assuming one MSIV fails to isolate in one MSL and all MSIVs isolate in the other three lines, when tested at ≥ 25 psig. The "other" three steam lines are assumed to be normally isolated by both MSIVs in the line. In these lines, the MSIV leakage is assumed to be the leakage from either the inboard or the outboard MSIV in each line with the lowest leakage. This method of combination testing verifies that the MSIV leak rates remain within the bounds of the Design Basis Control Room and Offsite Dose Analysis.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.1.3.9

The TIP shear isolation valves are actuated by explosive charges. An in place functional test is not possible with this design. The explosive squib is removed and tested to provide assurance that the valves will actuate when required. The replacement charge for the explosive squib shall be from the same manufactured batch as the one fired or from another batch that has been certified by having one of the batch successfully fired. The Frequency of 24 months on a STAGGERED TEST BASIS is considered adequate given the administrative controls on replacement charges and the frequent checks of circuit continuity (SR 3.6.1.3.4).

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(continued)

INSERT 1

The dose calculation assumes one MSIV in one steam line fails to isolate. Therefore, in the case of the failed MSIV, the line leakage is assumed to be the leakage from the non-failed MSIV that causes the highest total MSIV leakage. The acceptance criteria for the leakage from each MSIV is ≤ 60 scfh when tested at ≥ 25 psig. In the case of the combined MSIV leakage rate for all four main steam lines, four combinations of MSIV leak rates are calculated. Each combination includes the "Maximum" leak rate for one Main Steam Line (MSL) and the "Minimum" leak rate past both MSIVs for each of the other three MSLs. The highest total value is selected and compared against the acceptance criteria, which is the combined MSIV leakage rate for all four main steam lines of ≤ 85 scfh, assuming one MSIV fails to isolate in one MSL and all MSIVs isolate in the other three lines, when tested at ≥ 25 psig. The "other" three steam lines are assumed to be normally isolated by both MSIVs in the line. In these lines, the MSIV leakage is assumed to be the leakage from either the inboard or the outboard MSIV in each line with the lowest leakage. This method of combination testing verifies that the MSIV leak rates remain within the bounds of the Design Basis Control Room and Offsite Dose Analysis.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.1.3.9

The TIP shear isolation valves are actuated by explosive charges. An in place functional test is not possible with this design. The explosive squib is removed and tested to provide assurance that the valves will actuate when required. The replacement charge for the explosive squib shall be from the same manufactured batch as the one fired or from another batch that has been certified by having one of the batch successfully fired. The Frequency of 24 months on a STAGGERED TEST BASIS is considered adequate given the administrative controls on replacement charges and the frequent checks of circuit continuity (SR 3.6.1.3.4).

SR 3.6.1.3.10

The analyses in References 1 and 5 are based on leakage that is less than the specified leakage rate. Leakage through each MSIV must be ≤ ~~100~~ 60 scfh when tested at ≥ P_t (25 psig). The combined leakage rate for all four main steam lines must be ≤ ~~150~~ 85 scfh when tested at ≥ 25 psig ~~in accordance with the Primary Containment Leakage Rate Testing Program.~~ INSERT 1 ~~If the leakage rate through an individual MSIV exceeds 100 scfh, the leakage rate shall be restored below the alarm limit value as specified in the Containment Leakage Rate Testing Program referenced in TS 5.5.12. This ensures that MSIV leakage is properly accounted for in determining the overall primary containment leakage rate.~~ The Frequency is specified in the Primary Containment Leakage Rate Testing Program.

(continued)

INSERT 1

The dose calculation assumes one MSIV in one steam line fails to isolate. Therefore, in the case of the failed MSIV, the line leakage is assumed to be the leakage from the non-failed MSIV that causes the highest total MSIV leakage. The acceptance criteria for the leakage from each MSIV is ≤ 60 scfh when tested at ≥ 25 psig. In the case of the combined MSIV leakage rate for all four main steam lines, four combinations of MSIV leak rates are calculated. Each combination includes the "Maximum" leak rate for one Main Steam Line (MSL) and the "Minimum" leak rate past both MSIVs for each of the other three MSLs. The highest total value is selected and compared against the acceptance criteria, which is the combined MSIV leakage rate for all four main steam lines of ≤ 85 scfh, assuming one MSIV fails to isolate in one MSL and all MSIVs isolate in the other three lines, when tested at ≥ 25 psig. The "other" three steam lines are assumed to be normally isolated by both MSIVs in the line. In these lines, the MSIV leakage is assumed to be the leakage from either the inboard or the outboard MSIV in each line with the lowest leakage. This method of combination testing verifies that the MSIV leak rates remain within the bounds of the Design Basis Control Room and Offsite Dose Analysis.

ATTACHMENT 3

Proposed Retyped Technical Specifications Pages

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.1.3.5	Verify the isolation time of each power operated, automatic PCIV, except for MSIVs, is within limits.	In accordance with the Inservice Testing Program
SR 3.6.1.3.6	Verify the isolation time of each MSIV is ≥ 3 seconds and ≤ 5 seconds.	In accordance with the Inservice Testing Program
SR 3.6.1.3.7	Verify each automatic PCIV actuates to the isolation position on an actual or simulated isolation signal.	24 months
SR 3.6.1.3.8	Verify a representative sample of reactor instrumentation line EFCVs actuate to the isolation position on a simulated instrument line break signal.	24 months
SR 3.6.1.3.9	Remove and test the explosive squib from each shear isolation valve of the TIP System.	24 months on a STAGGERED TEST BASIS
SR 3.6.1.3.10	Verify MSIV leakage rate as follows: a. Each MSIV leakage is ≤ 60 scfh when tested at ≥ 25 psig; and b. The combined MSIV leakage rate for all four main steam lines is ≤ 85 scfh, assuming one MSIV fails to isolate in one line and all MSIV isolate in the other three lines, when tested at ≥ 25 psig.	In accordance with the Primary Containment Leakage Rate Testing Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.1.3.5	Verify the isolation time of each power operated, automatic PCIV, except for MSIVs, is within limits.	In accordance with the Inservice Testing Program
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SR 3.6.1.3.7	Verify each automatic PCIV actuates to the isolation position on an actual or simulated isolation signal.	24 months
SR 3.6.1.3.8	Verify a representative sample of reactor instrumentation line EFCVs actuate to the isolation position on a simulated instrument line break signal.	24 months
SR 3.6.1.3.9	Remove and test the explosive squib from each shear isolation valve of the TIP System.	24 months on a STAGGERED TEST BASIS
SR 3.6.1.3.10	Verify MSIV leakage rate as follows: a. Each MSIV leakage is ≤ 60 scfh when tested at ≥ 25 psig; and b. The combined MSIV leakage rate for all four main steam lines is ≤ 85 scfh, assuming one MSIV fails to isolate in one line and all MSIV isolate in the other three lines, when tested at ≥ 25 psig.	In accordance with the Primary Containment Leakage Rate Testing Program

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.6.1.3.5	Verify the isolation time of each power operated, automatic PCIV, except for MSIVs, is within limits.	In accordance with the Inservice Testing Program
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SR 3.6.1.3.9	Remove and test the explosive squib from each shear isolation valve of the TIP System.	24 months on a STAGGERED TEST BASIS
SR 3.6.1.3.10	Verify MSIV leakage rate as follows: a. Each MSIV leakge is ≤ 60 scfh when tested at ≥ 25 psig; and b. The combined MSIV leakage rate for all four main steam lines is ≤ 85 scfh, assuming one MSIV fails to isolate in one line and all MSIV isolate in the other three lines, when tested at ≥ 25 psig.	In accordance with the Primary Containment Leakage Rate Testing Program

ATTACHMENT 4

Proposed Retyped Technical Specifications Bases Pages
(for information only)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.1.3.9

The TIP shear isolation valves are actuated by explosive charges. An in place functional test is not possible with this design. The explosive squib is removed and tested to provide assurance that the valves will actuate when required. The replacement charge for the explosive squib shall be from the same manufactured batch as the one fired or from another batch that has been certified by having one of the batch successfully fired. The Frequency of 24 months on a STAGGERED TEST BASIS is considered adequate given the administrative controls on replacement charges and the frequent checks of circuit continuity (SR 3.6.1.3.4).

SR 3.6.1.3.10

The analyses in References 1 and 5 are based on leakage that is less than the specified leakage rate. Leakage through each MSIV must be ≤ 60 scfh when tested at ≥ P_t (25 psig). The combined leakage rate for all four main steam lines must be ≤ 85 scfh when tested at ≥ 25 psig. The dose calculation assumes one MSIV in one steam line fails to isolate. Therefore, in the case of the failed MSIV, the line leakage is assumed to be from the non-failed MSIV that causes the highest total MSIV leakage. The acceptance criteria for the leakage from each MSIV is ≤ 60 scfh when tested at ≥ 25 psig. In the case of the combined MSIV leakage rate for all four main steam lines, four combinations of MSIV leak rates are calculated. Each combination includes the "Maximum" leak rate for one Main Steam Line (MSL) and the "Minimum" leak rate past both MISVs for each of the other three MSLs. The highest total value is selected and compared against the acceptance criteria, which is the combined MSIV leakage rate for all four main steam lines of ≤ 85 scfh, assuming one MSIV fails to isolate in one MSL and all MSIVs isolate in the other three lines, when tested at ≥ 25 psig. The "other" three steam lines are assumed to be

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.1.3.10 (continued)

normally isolated by both MSIVs in the line. In these lines, the MSIV leakage is assumed to be the leakage from either the inboard or the outboard MSIV in each line with the lowest leakage. This method of combination testing verifies that the MSIV leak rates remain within the bounds of the Design Basis Control Room and Offsite Dose Analysis. The Frequency is specified in the Primary Containment Leakage Rate Testing Program.

REFERENCES

1. FSAR, Section 14.6.
2. BFN Technical Instruction (TI), 0-TI-360.
3. 10 CFR 50, Appendix J, Option B.
4. FSAR, Section 5.2.
5. FSAR, Section 14.6.5.
6. NRC No. 93-102, "Final Policy Statement on Technical Specification Improvements," July 23, 1993.
7. FSAR Table 5.2-2.
8. General Electric NEDO-32977-A (Boiling Water Reactor Owners Group Topical Report, B21-00658-01), "Excess Flow Check Valve Testing Relaxation", dated June 2000.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.1.3.9

The TIP shear isolation valves are actuated by explosive charges. An in place functional test is not possible with this design. The explosive squib is removed and tested to provide assurance that the valves will actuate when required. The replacement charge for the explosive squib shall be from the same manufactured batch as the one fired or from another batch that has been certified by having one of the batch successfully fired. The Frequency of 24 months on a STAGGERED TEST BASIS is considered adequate given the administrative controls on replacement charges and the frequent checks of circuit continuity (SR 3.6.1.3.4).

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(continued)

BASES

SURVEILLANCE REQUIREMENTS

<u>SR 3.6.1.3.10</u> (continued)

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8. General Electric NEDO-32977-A (Boiling Water Reactor Owners Group Topical Report, B21-00658-01), “Excess Flow Check Valve Testing Relaxation”, dated June 2000.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.1.3.9

The TIP shear isolation valves are actuated by explosive charges. An in place functional test is not possible with this design. The explosive squib is removed and tested to provide assurance that the valves will actuate when required. The replacement charge for the explosive squib shall be from the same manufactured batch as the one fired or from another batch that has been certified by having one of the batch successfully fired. The Frequency of 24 months on a STAGGERED TEST BASIS is considered adequate given the administrative controls on replacement charges and the frequent checks of circuit continuity (SR 3.6.1.3.4).

SR 3.6.1.3.10

The analyses in References 1 and 5 are based on leakage that is less than the specified leakage rate. Leakage through each MSIV must be ≤ 60 scfh when tested at ≥ P_t (25 psig). The combined leakage rate for all four main steam lines must be ≤ 85 scfh when tested at ≥ 25 psig. The dose calculation assumes one MSIV in one steam line fails to isolate. Therefore, in the case of the failed MSIV, the line leakage is assumed to be from the non-failed MSIV that causes the highest total MSIV leakage. The acceptance criteria for the leakage from each MSIV is ≤ 60 scfh when tested at ≥ 25 psig. In the case of the combined MSIV leakage rate for all four main steam lines, four combinations of MSIV leak rates are calculated. Each combination includes the "Maximum" leak rate for one Main Steam Line (MSL) and the "Minimum" leak rate past both MISVs for each of the other three MSLs. The highest total value is selected and compared against the acceptance criteria, which is the combined MSIV leakage rate for all four main steam lines of ≤ 85 scfh, assuming one MSIV fails to isolate in one MSL and all MSIVs isolate in the other three lines, when tested at ≥ 25 psig. The "other" three steam lines are assumed to be

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BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.1.3.10 (continued)

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6. NRC No. 93-102, "Final Policy Statement on Technical Specification Improvements," July 23, 1993.
7. FSAR Table 5.2-2.
8. General Electric NEDO-32977-A (Boiling Water Reactor Owners Group Topical Report, B21-00658-01), "Excess Flow Check Valve Testing Relaxation", dated June 2000.

ENCLOSURE 2

TS-485 Supplement 1

List of Regulatory Commitments

List of Regulatory Commitments

#	Commitment	Status
1	TVA will verify FCV-1-57 is open and the motive power is removed prior to entry into Mode 3 from Mode 4. Furthermore, TVA will ensure, through administrative means that FCV-1-57 is open and that the motive power is removed when the Unit is in Modes 1, 2, and 3.	To be completed before implementation.
2	To ensure the flow through the 0.1875-inch orifice is not obstructed, radiography inspections of the 0.1875-inch orifice will be performed during each refueling outage. These inspections will first be performed during the spring outage of 2014 for Unit 3, during the fall outage of 2014 for Unit 1, and during the spring outage of 2015 for Unit 2.	Unit 3 inspection was completed during the spring outage of 2014. Unit 1 was completed during the fall outage of 2014. No obstructions were observed.
3	TVA will perform a radiography examination, during each Unit's refueling outage, starting with the Unit 2 outage in the spring of 2015, on the 0.25-inch orifice around valves FCV-1-168, FCV-1-169, FCV-1-170, and FCV-1-171 to ensure that the flow path through these orifices is not plugged.	Radiography inspection will be performed starting with the Unit 2 outage in the spring of 2015 and will be performed for Units 1 and 3 during their next outage.
4	TVA will perform a radiography examination, during each Unit's refueling outage, starting with the Unit 2 outage in the spring of 2015, on the 1 inch globe valve (BOV-1-525) to ensure that it is not plugged.	Radiography inspection will be performed starting with the Unit 2 outage in the spring of 2015 and will be performed for Units 1 and 3 during their next outage.
5	TVA will revise the main steam line radiation alarm response procedures to require valves FCV-1-58 and FCV-1-59 to be opened when a main steam line high radiation alarm is received and the main steam line radiation monitor indicates that main steam radiation is increasing.	To be completed before implementation.
6	TVA will revise procedures to require manually restoring motive power to valves FCV-1-58 and FCV-1-59 on RMOV Board 3C in the event of a loss of offsite power in combination with receipt of a main steam line radiation monitor alarm or a drywell radiation monitor alarm.	To be completed before implementation.
7	TVA will revise procedures to require removing motive power from valves FCV-1-58 and FCV-1-59 once they have been opened in response to receiving a main steam line radiation monitor alarm or a drywell radiation monitor alarm.	To be completed before implementation.
8	TVA will revise the FSAR to add descriptions of the two proposed ALT Pathways.	To be completed before implementation.
9	TVA will correct calculation NDQ099920010019 and include it in a supplement to LAR TS-485.	Complete. The corrected page of the calculation (page E-10) is included in this supplement.

ENCLOSURE 3

Corrected page E-10 for
Calculation NDQ099920010019
"Ex-Containment Removal Coefficients
for Alternative Source Term Analyses"

Of course, only one single value needs to be used, as the steam line leakage is assumed to be mixed in the main condenser and no distinction can be made as to what line each aerosol particle is coming from. Therefore, these two sedimentation velocities are averaged according to what fraction of the particles reaches the condenser through each of the two lines, based on the flow rates out and the removal efficiencies along the steam lines.

The calculation of the average will be as follows:

$$u_{sed,cond} = \frac{Q_A(1-\eta_A)u_{sed,A}+Q_{B2}(1-\eta_{B1})(1-\eta_{B2})u_{sed,B2}}{Q_A(1-\eta_A)+Q_{B2}(1-\eta_{B1})(1-\eta_{B2})} \quad (9)$$

where Q_A and Q_{B2} are the flow rates going out or A and B2, respectively, $u_{sed,A}$ and $u_{sed,B2}$ are the median settling velocities of the aerosol leaking out of the two steam lines, h_A, h_{B1} and h_{B2} are the aerosol removal efficiencies in A, B1 and B2, respectively.

The numerical calculation is performed in the next section.

6.5 Calculation of the Removal Coefficients in the Steam Lines and Main Condenser

Volume A:

Inside Diam:	21.562 in
Length:	68.25 ft
Settling Area:	122.6 ft^2 (DxL)
Volume:	173.1 ft^3 (πxD^2/4xL)

Knowing that u_s= 1.17E-3 m/s = 13.82 ft/hr and that $\lambda_{leak,A}$ =1.06/hr, one obtains:

$\lambda_{sed,A}$ = 9.79/ hr

η_A = 90.2%

Volume B1:

Inside Diam:	23.647 in
Length:	17.6 ft
Settling Area:	34.7 ft^2 (DxL)
Volume:	53.7 ft^3 (πxD^2/4xL)

Knowing that u_s = 1.17E-3 m/s = 13.82 ft/hr and that $\lambda_{leak,B1}$ =0.28/hr, one obtains:

$\lambda_{sed,B1}$ = 8.93/ hr

η_{B1} = 96.9%

Volume B2:

Inside Diam:	21.562 in
Length:	68.25 ft
Settling Area:	122.6 ft^2 (DxL)
Volume:	173.1 ft^3 (πxD^2/4xL)

Knowing that u_s= 2.04E-4 m/s = 2.405 ft/hr and that $\lambda_{leak,B2}$ =0.44/hr, one obtains:

$\lambda_{sed,B2}$ = 1.70/ hr

η_{B2} = 79.4% R005