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United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Perry Nuclear Power Plant
Docket No. 50-440
License Amendment Request: Improved Licensing and
Design Basis For Isolation of the Feedwater Penetrations

Ladies and Gentlemen:

Pursuant to 10 CFR 50.59 and 10 CFR 50.90, Nuclear Regulatory Commission (NRC) review and approval is requested on a license amendment related to hydrostatic (water) testing of containment isolation valves in the Feedwater System lines. This Technical Specification change stipulates that water leakage from the Feedwater motor-operated containment isolation valves will be added into the Primary Coolant Sources Outside of Containment Program (Technical Specification 5.5.2), and therefore the Feedwater check valves do not need to be included in the hydrostatic test program addressed by Surveillance Requirement 3.6.1.3.11. The proposed testing change is based on design and licensing basis changes being implemented to improve functioning of the Feedwater Leakage Control System.

The desire is to add dual power supplies to the motor-operated containment isolation valve and redirect the feedwater leakage control system to this valve. This improves the reliability of the isolation capability of the penetration, and improves the time required to install the water seal. The proposed Updated Safety Analysis Report (USAR) pages summarizing the improved design and licensing basis are provided for NRC review under the provisions of 10 CFR 50.59, based on initial assessments that have been performed during the design change development process.

NRC approval of this license amendment package is needed to allow installation of the Feedwater penetration improvements during the seventh refueling outage (RFO7). The outage is currently scheduled to begin on April 10, 1999. Therefore, a meeting with the NRC staff is being scheduled for September 10, 1998, to initiate discussions on the attached license amendment request.

Attachment 1 provides a summary, a description of the proposed Technical Specification (TS) and USAR changes, a safety analysis, and an environmental consideration. Attachment 2 provides the significant hazards consideration. Attachment 3 provides the annotated TS page. Attachment 4 provides annotated USAR pages. Attachment 5 provides the annotated Bases page (for the NRC staffs information, since the Bases are revised by PNPP site procedures).

A001 1/1

If you have questions or require additional information, please contact Mr. Henry L. Hegrat, Manager - Regulatory Affairs, at (440) 280-5606.

Very truly yours,

Lew W Myers

Attachments

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III
State of Ohio

I, Lew W. Myers, being duly sworn state that (1) I am Vice President - Nuclear, of the Centerior Service Company, (2) I am duly authorized to execute and file this certification on behalf of The Cleveland Electric Illuminating Company and Toledo Edison Company, and as the duly authorized agent for Duquesne Light Company, Ohio Edison Company, and Pennsylvania Power Company, and (3) the statements set forth herein are true and correct to the best of my knowledge, information and belief.

Lew W. Myers

Lew W. Myers

Sworn to and subscribed before me, the 9th day of September, 1998

Jane E Mott

JANE E. MOTT
Notary Public, State of Ohio
My Commission Expires Feb. 20, 2000
(Recorded in Lake County)

SUMMARY

Pursuant to 10 CFR 50.59 and 10 CFR 50.90, Nuclear Regulatory Commission (NRC) review and approval is requested on a license amendment related to hydrostatic (water) testing of containment isolation valves in the Feedwater System lines. A Technical Specification change will clarify that water leakage from the Feedwater motor-operated containment isolation valves will be added into the Primary Coolant Sources Outside of Containment Program (Technical Specification 5.5.2), and therefore the Feedwater lines do not also need to be included in the hydrostatic test program addressed by Surveillance Requirement 3.6.1.3.11. The proposed testing change is based on design/licensing basis changes being implemented to improve functioning of the Feedwater Leakage Control System. The proposed Updated Safety Analysis Report (USAR) pages summarizing the improved design and licensing basis are provided for NRC review under the provisions of 10 CFR 50.59, based on initial assessments that have been performed during the design change development process.

The Feedwater Leakage Control System (FWLCS) became a significant issue late in initial plant licensing (it was resolved in late 1985), due to NRC reopening of a previously (January 1983) approved penetration configuration/test technique. This led to a negotiated agreement on the licensing basis for the as-built configuration. This licensing basis is described in detail in Section V of the Safety Analysis, below.

Post-accident dose calculation assumptions continue to be met by the excellent as-found leak test results achieved by the motor-operated gate valves installed in the Feedwater penetration for the purpose of providing long-term, high integrity leakage protection. The challenge experienced at the Perry Nuclear Power Plant (PNPP) has been maintaining low enough leak rates on the twin check valves in each feedwater line to ensure that the lines would be filled with FWLCS seal water as quickly as was discussed with the NRC during the licensing process.

The following discussions provide a summary of the issue, followed by more detailed discussions. Specifically, the following information is provided under the heading of SAFETY ANALYSIS:

I. Brief Summary Of The Current Configuration
II. Description Of Why The Feedwater Penetration Isolation Methods Are Being Improved
III. Brief Summary of Proposed Improved Feedwater Penetration Configuration
IV. Summary Of Existing Licensing Basis Versus Proposed Licensing Basis
V. Details of Existing Licensing Basis/References
VI. Details of The Design Change

NRC approval of this license amendment is necessary before the Feedwater penetration improvements can be implemented during the seventh refueling outage (RFO7). The outage is currently scheduled to begin on April 10, 1999. NRC approval on this proposed amendment is requested prior to January 29, 1999, to ensure implementation during RFO7. Otherwise, the feedwater check valves may need to be reworked during the outage, in preparation for the next cycle, until final NRC approval of this license amendment can be completed. This would delay implementation of improvements to the Feedwater penetration isolation method for up to two years.

SUMMARY DESCRIPTION OF THE PROPOSED TECHNICAL SPECIFICATION AND UPDATED SAFETY ANALYSIS REPORT (USAR) CHANGES

A note is being added to the Technical Specification Surveillance Requirement for hydrostatic (water) testing of lines (SR 3.6.1.3.11). The new note states that the Feedwater lines are excluded from this particular hydrostatic testing program (the Bases explain this is because stem, bonnet and seat water leakage from the third, high integrity valve in the Feedwater lines (the gate valves) is controlled by the Primary Coolant Sources Outside Containment Program (TS 5.5.2)). The annotated Technical Specification page is included in Attachment 3.

[Note to reviewers: The proposed Bases changes are included in Attachment 5 for information only, since Bases are not a formal part of the Technical Specifications (Bases changes are processed per the Technical Specification Bases Control Program, Specification 5.5.11).]

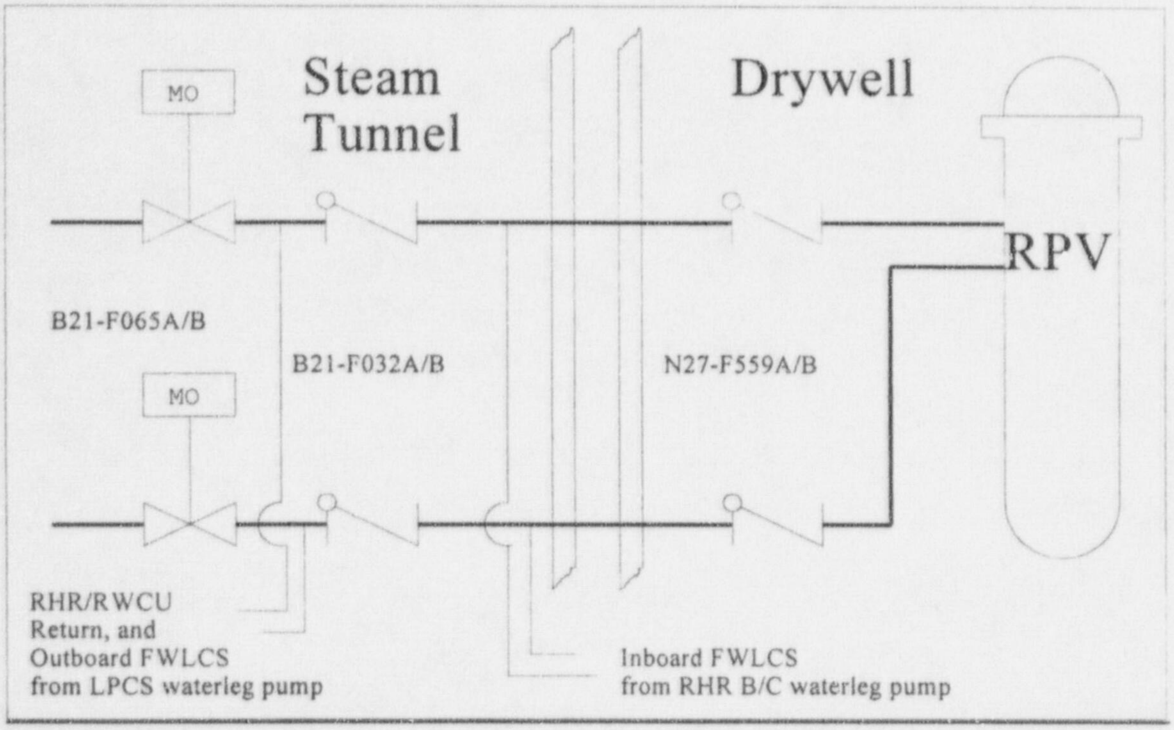
The proposed testing change described above is based on design and licensing changes for the Feedwater penetrations. USAR pages are included in Attachment 4 which describe the improved licensing/design basis for the isolation provisions on the Feedwater System lines, to reflect changes from the licensing/design basis that is currently described in licensing correspondence and the USAR.

(Attachment 1 continued on page 3)

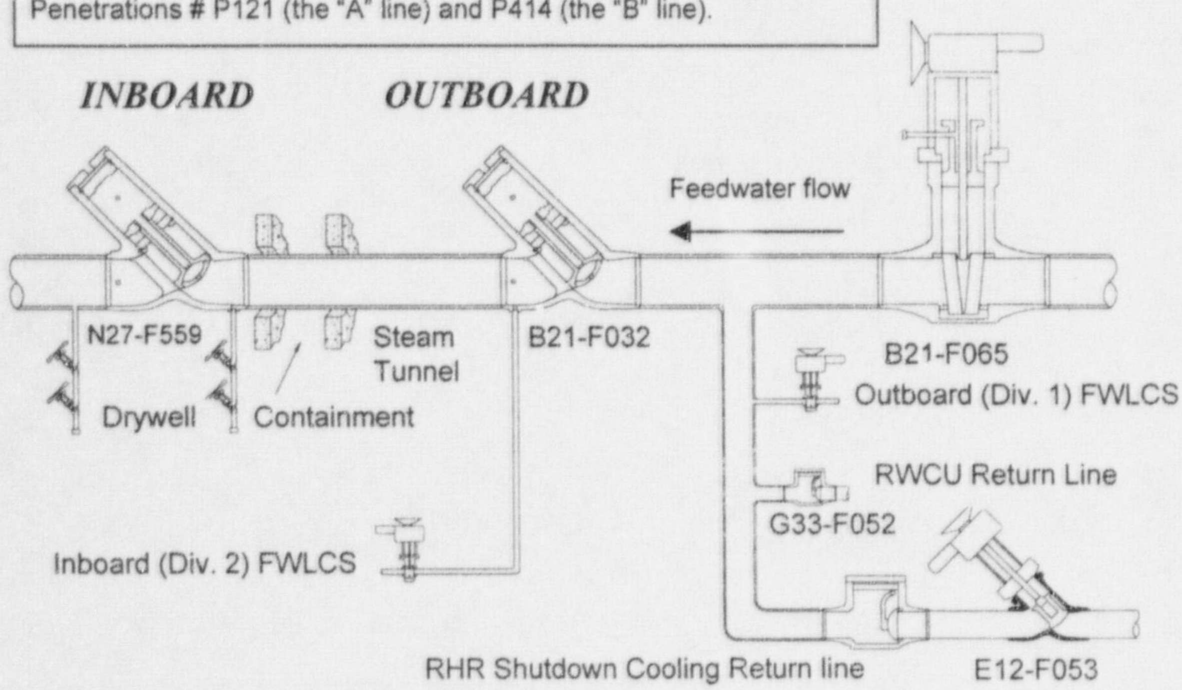
SAFETY ANALYSIS

PART I. Brief Summary of The Current Configuration

Drawings of the current configuration are provided in the following Figures.



Attention:
The following figure is a mirror image of the one above, i.e., the Reactor Pressure Vessel (RPV) is on the left versus the right. Also, it is "typical" of one of the two Feedwater penetrations; Penetrations # P121 (the "A" line) and P414 (the "B" line).



PART I. Brief Summary of Current Configuration (continued)

- There are no automatic isolations of Feedwater lines on accident signals, so that Feedwater can maintain flow to the reactor vessel. As noted in ANSI/ANS-56.2, greater plant safety is assured by maintaining a feedwater supply to the reactor (this makes the Feedwater penetrations a unique case, since remote-manual actions are acceptable for isolation despite the non-safety classification of the system).
- Two piston lift style check valves are in each Feedwater line for isolation of significant flow from a Feedwater line break outside containment. These anti-waterhammer valves are not designed for air tests.
- A third valve (Motor-operated valve (MOV), gate valve) is provided for long-term, high integrity leakage protection when, in the judgment of the operator, continued makeup from Feedwater is unnecessary or is not available. This valve provides a tight water seal against postulated radioactive leakage. As part of the licensing basis discussions, the NRC agreed that the non-safety, non-seismic Feedwater piping outboard of the MOV would remain intact at least until this gate valve can be remote-manually isolated by plant operators.
- FWLCS provides a manually initiated seal water system. The seal water system permits water versus air testing of the valves in the penetration (air tests were only required for the MOV stems and bonnets).
- FWLCS consists of two redundant seal water sources which inject into the Feedwater lines between the valves. The line between the valves is currently assumed to fill with water and pressurize within ≈ 1 hour, based on a 20-minute control room operator manual action.
- The check valves are seat leak tested with water (hydrostatic test) to meet Technical Specification surveillance requirements (19 gallons per minute (gpm) total, distributed amongst the 19 water tested penetrations). Per 10 CFR 50 Appendix J, due to the existence of the water seal system, the leakage past the check valves is not added into the leakage that is included in the licensing basis radiological dose consequence analysis.
- The seats of the third valves (the MOVs) are tested with water; results are added into the Technical Specification 5.5.2 "Primary Coolant Sources Outside Containment" Program (5 gallons per hour (gph) total field limit for the systems outside containment that could contain radioactive fluids after an accident. The licensing basis radiological consequence analysis for the design basis loss-of-coolant accident includes the dose contribution from this liquid leakage.
- As noted in the above bullets and explained in greater detail in the remainder of this attachment, the current licensing basis dose analysis places reliance on closure of the third (motor-operated gate) valves. These are the valves that provide the high integrity containment isolation for the Feedwater lines.

PART II. Description Of Why The Feedwater Penetration Isolation Methods Are Being Improved

- Improve the closure provisions for the third (gate) valves. [As noted above, the existing licensing basis places reliance on closure of the third (gate) valves. It is desired to improve the closure capability of these valves.]
- Improve the reliability of the water seal provisions on the Feedwater line. [The current FWLCS is a manually initiated system, which uses the weight of the inboard and/or the outboard piston lift check valve discs to allow water level (and pressure) to build up in the Feedwater line to a level that would cover the seat/preclude containment air leakage. The difficulty experienced over the past several outages has been with the as-found leakage test results for the check valves. Most notably, this has been with the non-Technical Specification required leakage limit imposed by the PNPP USAR. This USAR limit is imposed to ensure the lines would be able to be filled with water within approximately one hour. A change to the USAR, made **after** NRC approval of the initial licensing basis, documents this more restrictive limit (more restrictive than the 19 gpm Technical

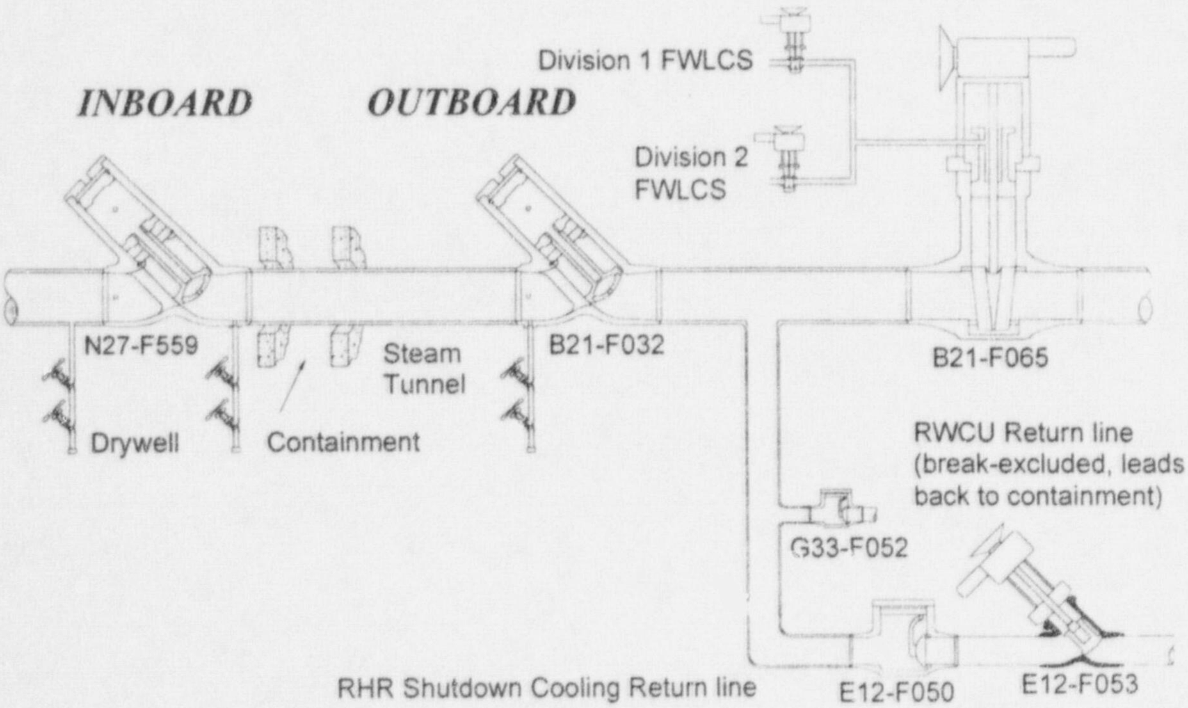
Specification hydrostatic test total). The USAR requires each feedwater valve to leak less than 1 gpm. This was determined appropriate to ensure the line fill-time calculation assumptions would be met. It is desired to implement changes to improve the method used to obtain the water seal on the Feedwater line.]

- Reduce the costs and radiological dose incurred in maintaining the water seal method for the Feedwater lines. [Dismantling of the check valves and polishing of the seats to meet the USAR "fill-time" leak requirement of 1 gpm resulted in over 5 Rem of dose to plant workers during the sixth refueling outage, and cost approximately $880,000 to complete.]

The proposed Feedwater Penetration configuration described in Parts III, IV and VI below will ensure that the FWLCS would be active and providing a water seal on the penetration within the ≈1 hour time frame originally discussed with the NRC.

PART III. Brief Summary of Proposed Improved Feedwater Penetration Configuration

- The FWLCS would remain a manually initiated system, but rather than attempting to fill the large piping volumes between the valves, the two redundant FWLCS lines would be routed to the bonnet of the existing third motor operated gate valve in each Feedwater line. These valves are already assumed to be successfully closed by the operator after the start of the event. Once the FWLCS is lined up, one of the redundant pumps would be aligned to the valves to provide the water seal to the penetration much faster than using the former technique of filling the entire line. The gate valve bonnet and seat areas would begin to fill and pressurize when the seal water reaches the valve, and the seal would be established within several minutes.



- Although the current licensing basis already assumes that the third valve will be remote-manually closed by the control room operator following a loss-of-coolant-accident (LOCA) to provide the long term, high integrity leakage protection, an even higher confidence level on closure of these valves will be provided by a design change and revisions to plant emergency procedures. The procedures will direct operators to implement an alternate division of electrical power to the gate valves, in the event that the valves normal power supply is lost. An alternate division of power such as this is not a new concept; the operators already receive training on a similar arrangement that is utilized in the PNPP licensing basis for the Station Blackout event. The capability to provide power from Division 3 will be a permanent design modification, but physical and electrical separation between Divisions 1 and 3 will be maintained by employing two features:

1. Normally open, fused disconnect switches at both ends of the circuit, and
2. Fuses normally stored out of the circuit.

- The water seal provided to the disc/seat of the third (gate) valve would provide for a water test on these seats, at $\geq 1.1\ P_a$. One method would be to initiate FWLCS to the bonnet, and measure leakage past the seat by collecting the leakage in the line outboard of the gate valves. Water leakage past the gate valve seats would continue to be added into the Primary Coolant Sources Outside of Containment Program. This Program is in place to protect the assumptions of the radiological dose calculations for PNPP. This is how the water leakage from the Feedwater penetrations is currently addressed in the PNPP dose calculations.
- Due to the injection of the seal water into the stem/bonnet area of the gate valves, the appropriate test for stem/bonnet leakage is to identify any water leakage outside of the piping system, and eliminate it. This test will be performed during the system walkdowns performed per the Technical Specification 5.5.2 Primary Coolant Sources Outside Containment Program, at pressures > 1000 psig. This water test approach for the stem/bonnet will ensure post-accident leakage outside of this Class 2 Feedwater piping is eliminated, and will not adversely affect the PNPP radiological dose calculations.
- The check valves would no longer need to maintain a 1 gpm leakage limit, since the lines would no longer need to be filled with water to make the FWLCS function. It would still be necessary to ensure that the check valves are exercised closed so that significant flow from a Feedwater line break outside of the containment could be prevented. This is the ASME (American Society of Mechanical Engineers) Code Class 1 function of the valves. As noted in Generic Letter (GL) 89-04 Position 3 "Back Flow Testing of Check Valves", many plants were not performing back flow testing of any kind prior to 1989 on check valves that perform a safety function in the closed position to prevent reversed flow. Main Feedwater check valves were listed as an example of such valves. The GL noted that tests on check valves that perform a safety function in the closed position to prevent reversed flow should be performed. "Category C" tests on such "safety function check valves" were described as proving that the disc closes on its seat. An example method discussed for such safety function Category C tests is a visual observation. Upon implementation of this amendment, the PNPP Feedwater check valve closure function will be verified by an inspection of the valve internals at an appropriate frequency as determined by the Inservice Testing Program (ISTP). The design change will incorporate new taps off of the line adjacent to the check valves so that this necessary inspection can be completed (for example, by using boroscopic inspections). The check valves would be removed from the hydrostatic testing program, as such additional testing is not necessary to ensure their closure capabilities to prevent significant flow following a postulated Feedwater line break outside containment. Hydrostatic leak tests of the check valves are also not necessary to address the radiological dose calculations (since the feedwater line high integrity leakage barrier is provided by the gate valves). This is addressed in more detail in Section IV, below.
- Testing of the Reactor Water Cleanup Return line and the RHR Shutdown Cooling Return Line, which both return water to the reactor vessel through the Feedwater process line, is also addressed in detail in Section IV, below.

PART IV. Summary of Existing Licensing Basis versus Proposed Licensing Basis

In summary, the Feedwater lines (and the branch lines that return back into the Feedwater lines) connect back to the Reactor Coolant Pressure Boundary (RCPB), and therefore the applicable General Design Criterion is GDC 55 for the valves in Penetrations P121 and P414. Feedwater penetrations are considered unique, and they comply with GDC 55 using the "other defined basis" words in the GDC ("unless it can be demonstrated that the containment isolation provisions … are acceptable on some other defined basis"). The "degree of conformance" positions which describe the "other defined basis" for PNPP are described below and in the USAR markups in Attachment 4 to this letter.

Additional details and references to docketed letters/the NRC Safety Evaluation Report (SER)/Supplemental SERs (SSERs)/applicable industry guidelines for the following items are provided in Section V below, for reviewers information.

<u>**Summary of Existing Licensing Basis**</u> <u>**(See Section V for details)**</u>	<u>**Summary of Proposed Licensing Basis**</u> <u>**(See USAR markups in Att. 4 for addt'l details**</u>
1. FWLCS is manually initiated.	1. Remains unchanged.
2. FWLCS is effective within approximately one hour after the onset of a LOCA.	2. Remains unchanged.
3. Check Valve design: • Edwards Valve Co. piston lift check valve. • Slow close to prevent waterhammer. • Designed to check reverse flow of water, while not impeding normal flow. • ASME Class 1.	3. Remains unchanged.
4. Check Valve safety-related functions: • Isolation of significant flow from a Feedwater line break outside containment. • Provide barrier to allow FWLCS to fill Feedwater line within approximately one hour after a LOCA.	4. Check Valve safety-related function: • Isolation of significant flow from a Feedwater line break outside containment.
5. Third (gate) Valve design: • Borg Warner Co. Motor-operated gate valve. • Flexible wedge disc design, which has a groove around the circumference of the wedge, between the two seating surfaces. • Limitorque Company Actuator, powered from Division 1 • ASME Class 2	5. Third (gate) Valve design remains unchanged, except: • FWLCS seal water would be injected into the valve bonnet through an existing stem leakoff line to seal the stem, bonnet, and flex-wedge seat with water. The water flows into the groove between the seats and seals the pipe. • Third (gate) Valve actuator could be powered from Division 3 if Division 1 is not available. This is similar to the approach used in the event of a Station Blackout (SBO), where Division 2 is backed up by Division 3 (already proceduralized)). Following this design change, these Feedwater gate valves could also be closed after an SBO, if determined necessary by the operators.

<table>
<tr><th><u>Summary of Existing Licensing Basis</u>
<u>(See Section V for details)</u></th><th><u>Summary of Proposed Licensing Basis</u>
<u>(See USAR markups in Att. 4 for addt'l details</u></th></tr>
<tr><td>6. Third (gate) Valve safety-related functions:
• Long-term low water leakage (high integrity) containment isolation valve, closed to maintain the radiological dose calculation assumptions.
• Provide barrier to allow FWLCS to fill Feedwater lines within approximately one hour after a LOCA.</td><td>6. Third (gate) Valve safety-related functions:
• Long-term low water leakage (high integrity) containment isolation valve, closed to maintain the radiological dose calculation assumptions.
• Provide barrier to allow FWLCS to provide a water seal on the gate valve's flex-wedge seat within approximately one hour after a LOCA.</td></tr>
<tr><td>7. As noted in Supplement 7 to the PNPP Safety Evaluation Report (SSER 7), the Feedwater piping outboard (away from containment) of the third (gate) valve is assumed to remain intact for at least the first hour post-LOCA. The piping is assumed to remain intact for a sufficient length of time for the operator to remotely close the third (gate) valve. The intact Feedwater piping prevents leakage from containment due to
• Operation of Feedwater if it remains available following the event.
• High temperature and pressures in the Feedwater piping, for at least the first hour post-LOCA, if Feedwater is not available following the event. This is supported by RETRAN analysis.
The acknowledgment in the approval of the Feedwater penetration as-built configuration (SSER 7) that the Feedwater piping would remain intact until the third (gate) valve can be successfully closed by the operator is important, since the gate valves are the long-term, high integrity Feedwater line containment isolation valves which are assumed closed in the radiological dose calculations.</td><td>7. Conclusions remain unchanged.</td></tr>
<tr><td>8. The FWLCS consists of two redundant pumps and piping runs, supplying water to seal the Feedwater lines for at least 30 days post-LOCA. Injection is into the Feedwater pipe between the inboard check and the outboard gate valve. The Division 1 system (outboard) injects between the outboard check valve and the Third Valve, and the Division 2 system (inboard) injects between the two check valves. The Residual Heat Removal (RHR) and Low Pressure Core Spray (LPCS) waterleg pumps are used to provide the water for FWLCS.</td><td>8. Remains the same, except that:
• injection for both subsystems is into the bonnets/seats of the existing Third (gate) Valves on both lines. Both FWLCS subsystems would be hard-piped to the gate valve on each line.
• The operator could remote-manually initiate either subsystem to provide the water seal on both gate valves.

[Note: Consideration is being given to a future design change to supply a non-radiologically contaminated water source to</td></tr>
</table>

Summary of Existing Licensing Basis (See Section V for details)	**Summary of Proposed Licensing Basis** (See USAR markups in Att. 4 for addt'l details
	the bonnets of the valves. This would preclude the need to add the leakage past the Third Valves into the "Primary Coolant Sources Outside Containment Program" (further discussion of this test program for the Third (gate) Valves is provided in several items below). Such a future change is anticipated to be able to be implemented under the prc[illegible]ions of 10 CFR 50.59.]
9. Operator action from the Control Room to close the third (gate) valve and initiate FWLCS injection needs to begin within ≈20 minutes, in order to fill the line within "approximately one hour" post-LOCA (since initiation is estimated at approximately the 20 minute point, and fill times were estimated to range from 36 to 44 minutes).	9. Operator actic[illegible] from the Control Room to close the third valve and initiate FWLCS injection is still assumed to begin within ≈20 minutes, but it can be delayed to the ≈ 1 hour point without adverse impact if Division 1 power is available, since the water seal on the gate valve bonnet/seat is obtained within several minutes of initiating the FWLCS. This improves the probability of completion of the action ("operator error" probability is reduced – further information on this is provided in Section VI). If Division 1 power is not available, Division 3 power to the gate valves can be established, which will enable FWLCS to still be established within the "approximately one hour" time frame in the current licensing basis. An evaluation of the operator action per ANSI/ANS 58.8-1984 guidelines is being performed to determine the actual time and dose that would be involved with this action. This will be submitted to the NRC when completed.
10. Third (gate) valve was determined to have potential for stem and bonnet air leakage. A requirement was added into the original Technical Specifications requiring the gate valve stem and bonnet to be Type C pneumatic (air) tested and the results added into secondary containment bypass leakage totals.	10. Due to the injection of the seal water into the bonnet of the valve, air leakage will not be a concern. Stem and bonnet water leakage will be checked and any leakage will be eliminated (this will be controlled by the TS 5.5.2 "Primary Coolant Sources Outside Containment Program" (see further discussion below.)). This leakage elimination will be ensured through system walkdowns per the Program at > 1000 psig, with the gate valves in the closed position.
11. Third (gate) valve through-seat leakage is not considered to be part of the secondary containment bypass leakage, but at PNPP, gate valve through-seat leakage **is** addressed, as part of the NUREG-0737 III.D.1.1 Primary	11. Due to the water seal provided by the high integrity Third Valves, the gate valve seat leakage will continue to be checked by a water test conducted at ≥ 1.1 P_a, and the results will continue to be added into the

Summary of Existing Licensing Basis (See Section V for details)	Summary of Proposed Licensing Basis (See USAR markups in Att. 4 for addt'l details
Coolant Leakage Outside Containment Program. This program is currently included in Technical Specifications as TS 5.5.2 " Primary Coolant Sources Outside Containment Program". Based on the requirements of 10 CFR 50 Appendix J, Options A and B, valves such as the check valves and the gate valves, which are currently licensed to be sealed with fluid from a seal system, may be excluded when determining combined leakage rates, i.e., their leakage is not added into the radiological dose calculations. However, since FWLCS uses potentially contaminated suppression pool water, it was considered prudent to address through-seat leakage, at least for the high integrity Third Valves (the gate valves), in the calculations. The gate valves leakage was specifically addressed in several stages during the licensing process. The original commitment in an August 30, 1985 letter was to include seat leakage through the motor operated gate valves into the NUREG-0737 III.D.1.1 Primary Coolant Leakage Outside Containment Program, and ensure it remained less than the water bypass allowable limit (5 gallons per hour (gph) field limit for PNPP). This ensured the water leakage would be limited to within the LOCA radiological calculations. Due solely to an NRC concern on the gate valve stem and bonnet air leakage (see item 10 above), and the inability at that point in time (initial plant licensing) to air test the stem/bonnet separately from the seat, a subsequent letter noted that the gate valves would be tested with air, and the leakage for these gate valves would be included in the secondary containment air bypass totals. This ensured the stem/bonnet air leakage would be limited to within the LOCA radiological calculations. Subsequently, a method was developed for completing the air test on the gate valve stem and bonnet separately from the valve seat, and now, as originally committed, the seats of the gate valves on each line are tested with water and the measured leakage is added into the Primary Coolant Sources Outside Containment	Primary Coolant Sources Outside Containment Program totals (Technical Specification 5.5.2). A ten (10) gallon per hour leakage rate assumption is already included in the current licensing basis LOCA radiological dose calculations for this type of leakage, while the field limit is still set at 5 gph. This doubling (10 gph in the calculations, 5 gph in the field) is consistent with Standard Review Plan guidance (SRP 15.6.5 Appendix B "Radiological Consequences of a Design Basis Loss-of-Coolant Accident: Leakage From Engineered Safety Feature [ESF] Components Outside Containment"). The 5 gph and 10 gph limits are specified in PNPP USAR Section 15.6.5.5.1.2.b "ESF Leakage". [Note: the Revised Accident Source Term radiological calculations submitted to the NRC in support of another pending license amendment request assumed a 15 gallon per hour primary coolant outside containment leakage rate.] Although the Feedwater lines would still be considered to be "hydrostatically tested lines" because water tests are being performed on the Third (gate) valves, the leakage past these containment isolation valves need not be double counted in two separate hydrostatic test programs. Therefore, a Note is being added to the Technical Specification Surveillance Requirement for hydrostatic testing of lines (SR 3.6.1.3.11). The Note explains that the Feedwater lines are excluded from this particular program, and the Bases explain that this is because the gate valve water leakage is controlled by the Primary Coolant Sources Outside Containment Program (TS 5.5.2). Also, as part of the implementation of this amendment, the field limit for leakage will be added into the Bases discussion for the new Note. This is being done to literally comply with Section 6 "General Requirements" of the Nuclear

Summary of Existing Licensing Basis (See Section V for details)	**Summary of Proposed Licensing Basis** (See USAR markups in Att. 4 for addt'l details
Program totals (see Technical Specification 5.5.2).	Energy Institute (NEI) guideline on Appendix J Option B leak rate testing, NEI 94-01 "Industry Guideline For Implementing Performance-Based Option of 10 CFR Part 50, Appendix J".
12. The Inservice Testing Program for valves (Technical Specification 5.5.6) includes stroke time testing of the Third (gate) Valves on a Cold Shutdown frequency to help ensure their reliability.	12. Remains unchanged.
13. The ongoing Motor-Operated Valve (MOV) test program conducted per commitments to Generic Letter 96-05 "Periodic Verification Of Design-Basis Capability Of Safety-Related Power-Operated Valves" includes the Third Valves. It includes checks of dynamic thrust and torque requirements and trending of results to help ensure the reliability of the Third Valves.	13. Remains unchanged.
14. The Check Valve stem is internal to the bonnet, and the bonnet is not considered to be an air leakage pathway and does not require Appendix J Type C testing.	14. Remains unchanged.
15. Testing of the seats of the Check Valves in each of the lines is currently performed by a reverse flow hydrostatic (water) leak rate test. The results of these tests are then added into the Technical Specification hydrostatic leak test total, and compared to an acceptance criteria of 19 gallons per minute (There are more than 19 valves in the program, but the PNPP acceptance criterion is conservatively based on a total equal to "the number of penetration pathways in the program" (multiplied by "1 gpm") rather than multiplying by the number of valves – see Tech Spec SR 3.6.1.3.11.) The reason that the check valves are included in this Technical Specification hydrostatic test program, with its limit of 19 gpm for the valves in the program, is because of Appendix J requirements. Appendix J (and the more recent guidance endorsed by Option B to App. J, i.e., NEI 94-01) requires that valves that are sealed with fluid from a seal system should have "leakage rates that do not exceed those specified in the technical specifications or associated bases". These seal water system leakage rates however, are not required to be	15. Generic Letter (GL) 89-04 Position 3 "Back Flow Testing of Check Valves" noted that tests on check valves that perform a safety function in the closed position to prevent reversed flow should be performed. "Category C" tests on such "safety function check valves" were described as needing to prove that the disc closes on its seat. An example method discussed for such safety function Category C tests is a visual observation. It is proposed that the Feedwater Check Valves be Category C tested for their safety function by performance of a visual inspection of the valve internals at an appropriate frequency as determined by the Inservice Testing Program (ISTP). A tap would be added adjacent to each check valve to permit visual inspections of the valves to verify proper closure. This inspection would constitute the "exercise closed (EC)" test in the ISTP. The "exercise open (EO)" testing would remain the same, i.e., the valves pass proper flow during plant operation.

Summary of Existing Licensing Basis (See Section V for details)	**Summary of Proposed Licensing Basis** (See USAR markups in Att. 4 for addt'l details
added into the containment leakage rate totals which factor into the radiological dose calculations. In addition to the 19 gpm leakage limit discussed above, a more restrictive USAR limit is placed on the leak rate of each check valve in the feedwater line, to support the assumptions of the FWLCS line "fill-time" calculations. This USAR limit is 1 gpm. This limit was added into the USAR after NRC approval of the initial licensing basis. These leakage acceptance criteria are the values that have proven challenging to meet during as-found testing of the check valves over the last several refueling outages.	Hydrostatic leak rate testing would not be required on these check valves since: • The check valves Class 1 function would be verified through the "exercise closed" test method (the internal visual inspection). Hydrostatic leak testing is not considered necessary to ensure the check valves closure capabilities to prevent significant flow following a postulated Feedwater line break outside containment. • The FWLCS function would be provided by closure of the Third Valves and initiation of FWLCS to the gate valve discs within ≈ one hour following a LOCA inside the containment. During the first hour, until the Third Valves are closed, leakage past the Check Valves is assumed not to occur, since the NRC has accepted that the Feedwater piping remains intact until the operator remotely isolates the Third Valve, and that the Feedwater piping would preclude leakage during that period. • The FWLCS function would no longer require the check valves to be leak tight to within 1 gpm, since the Feedwater lines would no longer have to be filled with water, i.e., the rerouting of the FWLCS water to the gate valve bonnets makes the "line fill-time" moot (fill-time was the basis for the 1 gpm limit). • The radiological dose calculations already depend on successful closure of the third (gate) valves to limit releases following a postulated LOCA severe enough to damage fuel. This is specified in the existing licensing basis. The check valves previous "seal water" function will no longer exist. Therefore, the third (gate) valves will continue to be classified as "containment isolation valves", but the check valves will not. For the above reasons, a new Note is added to Technical Specification SR 3.6.1.3.11 to clarify that the hydrostatic test program does not apply to the Feedwater lines.

Summary of Existing Licensing Basis (See Section V for details)	**Summary of Proposed Licensing Basis** (See USAR markups in Att. 4 for addt'l details
16. The American Society of Mechanical Engineers (ASME) Code Class 1 boundary extends out to and includes the second (outboard) check valve, consistent with the guidance in Regulatory Guide 1.26 "Quality Group Classifications And Standards For Water-, Steam-, And Radioactive-Waste-Containing Components Of Nuclear Power Plants", including Position C.1.c. This constitutes the Reactor Coolant Pressure Boundary (RCPB) for the Feedwater penetrations. The RCPB is addressed by General Design Criterion (GDC) 14 "Reactor Coolant Pressure Boundary". Since the Feedwater lines at PNPP have the third shutoff valves (the gate valves), the ASME Code Class 2 boundary extends out from the second check valve to and including the third valve in each Feedwater line, as discussed in Position C.1.c of Regulatory Guide 1.26. This constitutes the "Reactor Coolant System boundary (RCS)" for the Feedwater lines, as described in the 10 CFR 50.2 definition of the RCPB. The RCS is addressed by GDC 15 "Reactor Coolant System Design". The Reactor Water Cleanup (RWCU) and RHR branch lines that tie in to the main process pipe (the Feedwater line) are also Code Class 2, as explained in USAR Table 3.2-1 "Equipment Classification" and the associated Note 8 to the table.	16. It is proposed that the Code Class boundaries would remain the same.
17. There is a branch line off of the Feedwater line that taps in between the outboard check valve and the Third Valve (see Figure 1). This line provides the return pathway for RWCU and RHR shutdown cooling water to the reactor vessel. These branch lines currently get sealed due to operation of one of the Feedwater Leakage Control subsystems.	17. Once the FWLCS is rerouted to the stem/bonnets of the third valve rather than into the Feedwater pipe, the branch lines off of the Feedwater line will need a different licensing basis for leakage mitigation. The RHR branch line off of the Feedwater line will be treated as a closed system outside of containment, similar to the lines discussed in Note 4 to USAR Table 6.2-33 and Note 7 to Table 6.2-40. These Notes explain why leakage is not considered to be bypass leakage. A safety-related globe valve (1E12-F053A/B) in this branch line will be treated as a high integrity containment isolation valve, similar to the

Summary of Existing Licensing Basis (See Section V for details)	**Summary of Proposed Licensing Basis** (See USAR markups in Att. 4 for addt'l details
	Feedwater gate valves. The 1E12-F053A/B valves will be added to the containment isolation valve listings. These valves meet the qualifications of a containment isolation valve. An air test will be performed on 1E12-F053A/B, and the air leakage will be added into the Type C totals and limited by 0.60 L_a. Also, the leakage from the F053 valves will be added into the Type A Integrated Leak Rate Test (ILRT), since the Feedwater penetrations will not be drained during the ILRT. Leakage from the systems listed in USAR Notes 4 and 7 as "closed" are controlled by the Primary Coolant Sources Outside of Containment Program, as described in the Notes. Thus, this RHR branch pathway would consist of an air leak rate tested containment isolation valve and a closed system outside of containment. In addition, a high-to-low-pressure interface water test is performed on the E12-F053 globe valve and the check valve inboard of the F053 (E12-F050A/B) (see the Figures) in accordance with ASME Section XI. These valves are tested to water leakage limits of ≤ 5 gpm. Although these valves will continue to receive this high-to-low pressure test, they do not meet the literal definition of Pressure Isolation Valves (PIVs) since they connect to the Reactor Coolant System (GDC 15) versus the Reactor Coolant Pressure Boundary (GDC 14), and therefore they will not be added to the PIV listing currently contained in Operational Requirements Manual (ORM) Attachment 3. A Reactor Water Cleanup (RWCU) branch line also exists. This line returns the filtered RWCU water to the Reactor Vessel via the Feedwater lines. The piping "outboard" of the RWCU branch line check valve (1G33-F052A/B) leads directly back to containment penetration P132, and is ASME Code Class 2, Seismic Category I, protected from pipe whip, missiles and jet forces, and analyzed for "break exclusion". This closed system outside containment

Summary of Existing Licensing Basis (See Section V for details)	Summary of Proposed Licensing Basis (See USAR markups in Att. 4 for addt'l details
	contains only mechanical joints, including the packing on the outboard containment isolation valve (1G33-F039) for Penetration P132. This outboard valve, including the stem and bonnet, is already part of the air leak rate test program. The remainder of the RWCU line between the Feedwater line and Penetration P132 will be added to the Technical Specification 5.5.2 Primary Coolant Sources Outside Containment Program, with a specific leakage acceptance limit of zero (0) leakage when tested at RWCU operating pressures (>1000 psig). This obviates the need to add the RWCU branch line check valves (1G33-F052A/B) into a leak rate testing program, since zero water leakage outside the lines when operating at over 1000 psig ensures that there will be no air leakage from those mechanical joints at P_a (7.8 psig for PNPP). This approach meets Branch Technical Position CSB 6-3 "Determination of Bypass Leakage Paths in Dual Containment Plants", Item B.9. Item B.9 specifies the criteria for when a closed system may be used as a leakage boundary to preclude bypass leakage. This approach is also substantiated by PNPP leak test program results, where joints that showed water leakage at full system operating pressures, did not exhibit measurable air leakage when tested at P_a. The piping of each FWLC subsystem which will connect to the bonnets/seats of the gate valves contains two currently existing isolation valves. These valves receive a high-to-low pressure interface water test since they connect back to the RHR/LPCS waterleg pumps. These tests will continue to be performed. Although these valves will continue to receive this test, they also do not meet the definition of PIVs and will not be added to the list in ORM Attachment 3.
18. Intersystem leakage is acceptably addressed. During normal plant operation, the Feedwater system is operated at pressures higher than	18. Intersystem leakage continues to be acceptably addressed. Normal operation of Feedwater remains

Summary of Existing Licensing Basis (See Section V for details)	**Summary of Proposed Licensing Basis** (See USAR markups in Att. 4 for addt'l details
RPV pressures, so that flow is into the reactor. If Feedwater system flow into the reactor is shut off entirely, the Feedwater check valves serve to prevent significant reverse flow back into the Feedwater piping. When Feedwater flow into the reactor has been stopped, plant procedures/instructions direct that the high integrity third (gate) valves also be closed to provide additional isolation capability.	unchanged. When Feedwater flow into the reactor is shut off, the check valves will continue to perform their safety function. As discussed in Generic Letter 89-04, the periodic ISTP Category C visual inspection of the check valve internals will continue to show that the disc is in the closed position on its seat, in order to perform its safety function to prevent significant reverse flow back into the Feedwater piping. A design basis unisolable LOCA does not exist in such a situation. The other vessel water injection systems will provide sufficient makeup capacity to prevent fuel damage. When Feedwater flow into the reactor has been stopped, plant procedures/instructions will continue to direct that the high integrity third (gate) valves also be closed to provide additional isolation capability.
19. Technical Specification 3.6.1.8 "Feedwater Leakage Control System (FWLCS)" ensures the waterleg pumps operate properly, on a 31 day Frequency.	19. Remains unchanged.

PART V. Details of Existing Licensing Basis / References

The above statements about the existing licensing basis evolved as a result of the "question and response" (Q&R) period of the license application process. Synopses of some of the relevant correspondence, in chronological order, are provided later in this section.

The Feedwater penetrations are unique since the isolation valves are not designed to automatically close even though the Feedwater system is non-safety-related. During a design basis accident, it is desirable to maintain reactor coolant make-up from all potential sources and as such the Feedwater containment isolation valves (the gate valves) do not receive an automatic closure signal. For these valves to close, the operator must first determine that continued make-up from the Feedwater is unnecessary, and then initiate remote manual closure. However, since it is also necessary for the Feedwater penetrations to automatically isolate in response to a Feedwater line break outside of containment, the penetration configuration includes two check valves in series provided to close to prevent significant reverse flow. Industry guidance documents such as ANS 56.2/N271-76, "Containment Isolation Provisions for Fluid Systems" conclude that "greater safety is assured by maintaining a feedwater supply to the reactor" as opposed to automatically isolating the penetration. The most definitive PNPP licensing basis/docketed statements regarding the above position on "greater safety" due to maintaining Feedwater flow to the reactor vessel can be found in letter PY-CEI/NRR-0295L, Subject: "Feedwater Isolation Valve Testing (Question 480.50)," dated

August 30, 1985. That August 30, 1985 letter and Supplement 7 to the NRC Safety Evaluation Report (SSER 7) provide the best descriptions of the overall licensing basis for the Feedwater penetrations, with SSER 7 being the most important. A summary of the correspondence leading up to that letter and the subsequent NRC approval of the as-built Feedwater penetration configuration in SSER 7 is:

- The NRC originally raised generic secondary containment bypass leakage path concerns in several Questions that were later summarized in the PNPP Safety Evaluation Report (SER), dated May 1982, in Section 6.2.1.9 "Secondary Containment" and Section 6.2.3 "Containment Isolation System." The staff felt that the Cleveland Electric Illuminating Company (CEI), the licensee, had not yet provided enough justification for eliminating consideration of leakage from lines that penetrate the primary and secondary containment (which could be considered potential bypass leakage paths). The staff also noted, as provided by General Design Criteria (GDC) 55 and 56, that there are containment penetrations whose isolation provisions do not have to satisfy the explicit requirements of the General Design Criteria, but can be accepted on some other defined basis. At that time the NRC felt that CEI had "not correlated all the design deviations from the explicit requirements of the General Design Criteria to the justifications for such deviations."

- CEI's response to NRC Question 480.45, presented to the NRC via a letter dated April 26, 1982, was that the feedwater penetrations had been excluded as potential bypass leakage paths. CEI stated that the feedwater system has a dedicated leakage control system which pressurizes the Feedwater line between the inboard check valve and outboard gate valve. CEI also stated that the FWLC subsystems meet single failure criteria, are missile protected, Seismic Category 1, Safety Class 2 and have a temperature and pressure rating in excess of that for the Containment.

- CEI's response to NRC Question 480.48, presented to the NRC via a letter dated April 26, 1982, provided additional information regarding CEI's Containment Leakage Testing Program. CEI informed the NRC that:

  "Isolation valves, pressurized by a water seal system, will be Type C tested with water and the leakage excluded in combined leakage rate, consistent with the Type C test acceptance criteria in 10 CFR 50, Appendix J."

  "The feedwater lines are Type C tested with water and the leakage is not included in the 0.60 La. This is consistent with 10 CFR 50, Appendix J acceptance criteria since a dedicated Feedwater Leakage Control system is provided. Refer to response to 480.45 (NOTE 10 to [FSAR] Table 6.2-33) and new FSAR Section 6.9."

- The deviations for the Feedwater Lines were accepted in PNPP Supplemental Safety Evaluation Report (SSER) No. 2, Sections 6.2.1.9 and 6.2.6, dated January 1983. The basis for the acceptance was the letter dated April 26, 1982 (discussed above) which addressed the issue and provided the criteria the applicant used to determine and assess potential bypass leakage paths (note that there is a typographical error in SSER 2 Section 6.2.1.9 where it references an incorrect CEI letter date, this was corrected in SSER 5, App. G). These criteria showed that the penetration lines in question were excluded because they contain physical barriers or design provisions (e.g., the lines contain water seals, they involve closed Category I piping systems, and/or leakage controls are provided in the design) that will effectively eliminate leakage. Where relied on to eliminate leakage, these provisions are designed to (1) meet the single-failure criteria, (2) be missile protected, and (3) have a temperature and pressure rating in excess of that for containment. It was concluded in Section 6.2.1.9 of SSER 2 that the applicant provided sufficient justification to exclude the Feedwater lines as potential bypass leakage paths.

- In a letter from the NRC (B. J. Youngblood to M. R. Edelman) dated December 21, 1983, the concern was raised that within the first hour the FWLCS would not yet have established a water seal and that air testing should be performed. This was defined as question 480.50(a). The NRC was basing this question on their review of the Grand Gulf FWLCS design.

- Concerning NUREG-0737 Post-TMI Action Item III.D.1.1 on Primary Coolant Leakage Outside Containment, letter PY-CEI/NRR--0237L, dated May 29, 1985, provided the proposed PNPP "Leakage Surveillance and Preventive Maintenance Program". This Program was in response to License Condition 16. It committed to implementing a program to reduce leakage from systems outside of containment that would or could contain highly radioactive fluids during serious transients or accidents to a level as low as possible. This letter noted that the Feedwater Leakage Control System would be included in the Program.

- In letter PY-CEI/NRR-0259L, Subject: "Containment Bypass Leakage (Questions 480.49 - 480.51, License Condition 16)", dated July 10, 1985, from CEI's Murray R. Edelman to NRC's B. J. Youngblood, CEI provided some additional information in response to testing with air or water. This letter, however, did not attempt to close the air vs. water test issue for the feedwater lines. In a number of places in Attachment 1 to the letter, it was stated that leakage through the Feedwater lines was still under evaluation.

- Letter PY-CEI/NRR-0295L, Subject: "Feedwater Isolation Valve Testing (Question 480.50)", dated August 30, 1985, from CEI's Murray R. Edelman to NRC's B. J. Youngblood, provided the basis for NOT testing the penetration with air. This letter was provided in response to NRC's request to justify leak testing of the feedwater valves with water in lieu of air. At this time, CEI had already installed the FWLCS, and replacement check valves with metal seats, and therefore discussed the possibility of "backfit" in the cover letter, since the NRC had approved water testing (versus air testing) of the penetrations in SSER 2, dated January 1983. CEI also furnished the justification that the design was acceptable as is. This letter, together with the approval of the issue by the NRC in SSER 7, represents the most definitive basis for the Feedwater configuration.

  This letter does include a commitment to add the leakage through the Third valves (the motor operated Feedwater gate valves) into the Primary Coolant Sources Outside Containment leakage reduction program (NUREG-0737, Item III.D.1.1). The commitment on page 2 of the Attachment was as follows:

  > ***"Any leakage through the motor operated gate valve has been accounted for through NUREG 0737 testing and added to the water bypass allowable."***

  Some of the statements relevant to the current license amendment are as follows:

  > *"The attachment to this letter summarizes the redundant and independent means of keeping feedwater piping filled with water post-LOCA, and the results of the requested* [by the NRC staff] *analyses of the system response to a LOCA (RETRAN). ..*

... *"Following a LOCA, the FWLCS is manually initiated from the Control Room. The operator first verifies feedwater unavailability through low feedwater pressure, then closes the outboard motor operated gate valves with the keylock switches, and opens the motor operated FWLCS valves from the Control Room. Sealing water is provided from the suppression pool via the RHR & LPCS Waterleg Pump[s]. Since the source of sealing water is the suppression pool, a 30 day water supply is assured.*

"When the FWLCS is initiated following a LOCA, there should be no demand for keep-fill water in the RHR and LPCS systems since these systems will be operating. Therefore, the Waterleg Pumps should be totally dedicated to provide sealing water to the FWLCS." ...

"In the case of a LOCA where the feedwater lines remain water filled, static head pressure and the feedwater check valve disc weight force the feedwater check valves to close. Initiation of the FWLCS pressurizes the volumes between the inboard and outboard isolation check valves and between the outboard isolation check valve and the motor operated gate valve.

"Since the waterleg pumps operate at a pressure higher than the static head pressure, leakage is into the Reactor Vessel.

"Any leakage through the motor operated gate valve has been accounted for through NUREG 0737 (Closed System Leak Testing) testing and added to the water bypass allowable.

"In the case where the feedwater lines do not remain completely water-filled, the feedwater system can be operated to ensure positive pressurization **up to the gate valve**, *and thus leakage would be into the Reactor Vessel. Then FWLCS will be initiated and begin to fill the volumes between the inboard and outboard isolation check valves and between the outboard isolation check valve and motor operated gate valve. The weight of the check valve discs, and no upstream pressure, will force the check valves to close. When the volumes fill up, the pressure will increase until the weight of the disc is overcome. At this point, the disc will lift and leakage into the vessel will occur. As the pressure is relieved, the disc will re-seat until pressure builds up again and the disc lifts. This process will continue throughout the duration of the LOCA event. ..."*

Following a LOCA event, ***"the feedwater system will not be completely drained since the system will be intact*** *and operating initially post-LOCA.*

"The Perry design includes a backup feedwater flow path through a motor-driven pump. When the turbine-driven feed pumps lose driving steam and trip on vessel level 2 post-LOCA, flow is automatically diverted through the motor-driven pump. The motor-driven feed pump and/or the feedwater booster pumps will continue to pump water into containment post-LOCA."

"The pumps will continue to operate for about 10 minutes before the feedwater booster pumps trip on low water level. During this time, no extraction heating is available and cold water from the condenser hotwell is being pumped into the vessel which cools down the feedwater and the piping. When feedwater flow is finally stopped, feedwater flashing is not expected to occur. Therefore, a

significant voiding of the piping is not expected."...

*... "**the FW-LCS will provide an adequate seal within one hour following a LOCA.** If a loss of off-site power is assumed at this time, the FW-LCS will maintain the volume of water between the inboard isolation check valve and the outboard motor operated gate valve. During this one hour, operation of the feedwater system will maintain a system pressure higher than the containment pressure, thus assuring water leakage into the vessel.*

RETRAN Analysis

"Feedwater system response to a LOCA was analyzed using the RETRAN 02 MOD 3 computer code. These calculations were performed to determine certain response characteristics of the feedwater system and do not represent a realistic basis for design. No substantive conclusions can be drawn concerning the reliability or integrity of the feedwater system. These results only contribute to understanding characteristics of the system which affect post-LOCA leakage.

"The RETRAN analysis modeled the guillotine rupture of a feedwater line inside the drywell concurrent with a Loss of Offsite Power (loss of all feed pumps). The model included piping between the feed pumps and the break. Computer output shows that initial blowdown and boil-off result in depletion of all feedwater liquid in about 3 minutes after the LOCA. After the initial 3 minutes, stored heat in the pipe walls maintains vapor pressure in the piping higher than drywell pressure for 20 minutes (resulting in net flow into the drywell). At 20 minutes post-LOCA, the FWLCS is initiated.

"RETRAN results show that the piping is totally filled with liquid in 44 minutes after FWLCS initiation. The 44 minute time assumes a divisional failure in the FWLCS. During the fill time, almost all flow is either into the drywell or into the volume being cooled by incoming FWLCS water.

"With the exception of a 1 minute period shortly after FWLCS initiation, there is no leakage past the motor operated gate valves (B21-F065A & B) into the non-safety feedwater piping during the time the feedwater lines fill with liquid." ...

*... "**Based on the high integrity of the piping** and the ability to withstand single pump failures, **there is a high degree of assurance that the Condensate and Feedwater systems will be available post-accident.***

"The feedwater system from the reactor vessel through the outboard containment isolation check valve is classified as Safety Class 1, Seismic Category I. ... From the outboard containment isolation check valve to the motor-operated gate valve the system is classified as Safety Class 2, Seismic Category I. ... All other feedwater and condensate lines and pressure retaining parts are designed to ANSI B31.1. All stress levels in the piping are below the ANSI B31.1 allowables.

"Except for flanges at some equipment requiring removal for maintenance, all piping connections are welded. The systems are designed to be leak tight at normal operating pressures. Because operating pressures are much higher than the pressures existing in the piping post-LOCA when the reactor vessel is

depressurized, leakage out of the lines post-LOCA is not expected.

"All feedwater and condensate pumps have backup pumps. The feedwater booster pump backup will automatically start on a trip of another booster pump, ensuring positive pressure is maintained in the feedwater lines.

"The probability of a full circumferential large line break is extremely small. If a pipe failed it would crack or split, just enough to relieve stresses. This less severe failure would not result in a rapid depressurization of the feedwater lines. In such event, the piping would remain filled with water, then once the FWLC was initiated, water would be injected into an already water-filled volume.

"Even if an earthquake occurred concurrent with the LOCA and LOOP, the non-safety piping would most likely maintain its integrity. A recent study of actual piping performance during earthquakes states that "The performance of large and small bore welded steel piping studied in several recent domestic and foreign earthquakes has been excellent. Very few, if any, failures have been reported due to inertial loads. (NUREG-1061 Vol. 2)"

- In letter PY-CEI/NRR-0352 L, Subject: "Feedwater Isolation Valve Testing Question (480.50)", dated September 20, 1985, from CEI's Murray R. Edelman to NRC's B J. Youngblood, CEI stated that based on Letter PY-CEI/NRR-0295 L and discussions that took place between CEI and PNPP personnel on September 17, 1985, that the following resolutions were reached and would be reflected in the next amendment to the FSAR:

  *"The feedwater check valves (N27-F559A & B and B21-F032A & B) will be tested with water and only included in the Technical Specification limits for water leakage since through line leakage is not considered a potential bypass leakage path based on **system design and integrity**."*

  This is consistent with 10 CFR 50 Appendix J (and the more recent guidance endorsed by Option B to App. J, i.e., NEI 94-01) which note that primary containment barriers sealed with fluid from a seal system do not have to be added into the 0.60 L_a leakage test totals. However, to satisfy a Staff concern regarding potential stem and bonnet leakage through the motor operated gate valves, CEI did commit to test the third (gate) valves with air to identify any air leakage from the stems/bonnets, and add any leakage to the 0.0504 L_a Technical Specification bypass leakage totals. Technical Specification changes to reflect these agreements with the Staff were committed to be incorporated prior to issuance of the Final Draft Specifications.

- The response to NRC Question 480.48 was subsequently revised and submitted to the NRC under Amendment No. 21, dated September 30, 1985. This provided details on the types of testing that would be performed on the feedwater isolation valves.

  "The inboard and outboard check valves will be tested with water to a pressure not less than 1.10 Pa. The outboard gate valves will be tested with air. Water leakage through the check valves is not included in the 0.60 La Type B and C test totals. Air leakage through the gate valves is included in the bypass leakage test total, even though through-seat leakage is not considered bypass leakage."

  i.e., although check valve leakage does not factor in to the dose calculations, the gate valve stem and bonnet (and seat) air leakage would be factored in to the dose calculations (seat leakage was included simply because it was not considered possible at the time to determine air leakage from the stem and bonnet separately from seat leakage). A corresponding stem/bonnet requirement was put into the Technical Specification Containment Isolation Valve table for valves B21-F065A and B which stated "During Type C testing, valve stem and bonnet are checked for leaks as potential secondary containment bypass leakage paths."

- Portions of the positions discussed above from Letter PY-CEI/NRR-0295L dated August 30, 1985, were approved in Section 6.2.6 of Supplemental Safety Evaluation Report (SSER) No. 7, dated November 1985. Specifically, the NRC agreed that the FWLCS is a manually activated system, effective within approximately 1 hour after the onset of a LOCA, that the Feedwater piping outboard of the third valve would remain intact and a water seal would be maintained in the feedwater piping during the first hour after the LOCA (even if the feedwater system becomes inoperable at the time of the LOCA), and that the water seal would remain until the control room operator remote-manually closes the third (motor operated gate) valve. The pertinent statements from SSER 7 are as follows:

  "As reported in Section 6.2.6 of SSER No. 2, the staff concluded that the applicant's proposed leak testing program meets the requirements of Appendix J to 10 CFR 50 and is acceptable. However, the design details for the feedwater leakage control system (FWLCS) had not been reviewed before the issuance of SSER 2. The applicant stated that the FWLCS would provide post-accident sealing for both feedwater lines thus precluding the need to perform "Type C" leak testing (Appendix J) of the feedwater isolation valves with an air test medium. ***The feedwater isolation valve arrangement consists of an inboard (inside containment) check valve, an outboard (outside containment) check valve which is of the same design as the inboard valve, and an outboard remote manual motor-operated isolation valve. Thus, there are three isolation valves in series for each feedwater line which the applicant has proposed to hydrostatically leak test."***

  "The FWLCS is a manually activated system and is estimated by the applicant to be effective within approximately 1 hour after the onset of a LOCA. By letter dated August 30, 1985 (M. R. Edelman to B. J. Youngblood), the applicant has provided sufficient information to demonstrate a water seal would also be maintained by the feedwater system outside the containment during the initial hour after a LOCA. That is, if the feedwater system becomes inoperable during the rapid vessel depressurization following a LOCA, the water within the feedwater piping will begin to flash into the drywell. It is expected that a water seal would remain for a sufficient length of time following the accident until the operator remotely isolates the motor-operated valve. Thus, a water seal would exist in the piping beyond the motor-operated valve."

  "On the basis of the above, the staff recognizes the existence of a water seal throughout the event to eliminate "valve through leakage." However, leakage can also occur through the valve's stem and packing. To address this concern, the applicant provided a detailed description of the feedwater isolation valves to demonstrate the low probability of leakage occurring in this manner. The staff has reviewed the design of both the feedwater check valve and the motor operated isolation valve. Regarding the check valve, the staff agrees with the

applicant's assertion that the stem leakage is eliminated by a flanged and gasketed bonnet design arrangement. However, for the motor-operated valve, the staff finds that there is a potential for stem leakage. Therefore the staff will require a Type C (Appendix J) pneumatic leakage test to be performed on each feed-water motor-operated valve. The check valves may be hydrostatically tested because stem leakage may be considered incredible. ...... On the basis of conformance with the above, the staff considers this issue resolved.

PART VI. Details of The Design Change

The Feedwater Leakage Control System (FWLCS) currently consists of two independent trains, one Division 2 powered train that furnishes sealing water to an inboard volume and a Division 1 train that furnishes sealing water to an outboard volume. The FWLCS system was designed and installed as a single failure proof, safety-related, seismically qualified system that was designed to withstand the dynamic effects of postulated piping failures in the steam tunnel including protection from internally generated missiles. The FWLCS piping that connects to the inboard and outboard Feedwater volumes is ASME Class 2.

The FWLCS, which is manually initiated, includes interlocks to ensure that the outboard FWLCS is not initiated without the Feedwater MOV being closed thereby preventing the inadvertent discharge of the suppression pool water to the Feedwater piping system. The inboard FWLCS system is not interlocked with the Feedwater MOV.

In the proposed design, both independent trains of the FWLCS will be routed to the bonnet area of the existing Feedwater MOV. To allow the FWLCS to seal the 20" gate valves, FWLCS will be supplied to an existing 1/2" threaded connection in the packing area of the valve bonnet. The original purpose of the 1/2" threaded connection was for a packing leak-off line. A modified lantern ring is already installed which permits flow down along the valve stem and into the valve bonnet area. Once in the bonnet area of the 20" gate valve, FWLCS seal water flows around the wedge-shaped gate into the area between the two hardfaced mainseats in the valve body. Since FWLCS is supplied at higher than accident pressure, any leakage path available past the mainseats in the valve body would be sealed by the FWLCS.

The rerouted FWLCS subsystems will continue to be designed and installed as a single failure proof, safety-related, seismically qualified system and will be designed to withstand the dynamic effects of postulated piping failures in the steam tunnel including protection from internally generated missiles. The FWLCS piping that connects to the bonnet area of the existing MOV will conform to the requirements of ASME Class 2. In the revised configuration both trains of the FWLCS will be interlocked so that the systems can not be operated unless the Feedwater MOVs are closed. The proposed addition of both divisions of FWLCS to the bonnets of both of the gate valves on the Feedwater lines, together with the provisions for providing alternate power from Division 3 over to the gate valves, eliminates the possibility of FWLCS single failure, with the exception of a failure of one of the gate valves to close. As discussed above, the current licensing basis, as reflected in SSER 7, accepted the as-built configuration of the Feedwater lines. It assumes that the third (gate) valves will be successfully closed by the operator. This part of the licensing basis is being retained (the closure of the third (gate) valves. This will allow initiation of one of the FWLC subsystems to the bonnet of the valves, resulting in the desired water seal on the lines.

ENVIRONMENTAL CONSIDERATION

The proposed Technical Specification change request was evaluated against the criteria of 10 CFR 51.22 for environmental considerations. The proposed change does not significantly increase individual or cumulative occupational radiation exposures, does not significantly change the types or significantly increase the amounts of effluents that may be released off-site and, as discussed in Attachment 2, does not involve a significant hazards consideration. Based on the foregoing, it has been concluded that the proposed Technical Specification change meets the criteria given in 10 CFR 51.22(c)(9) for categorical exclusion from the requirement for an Environmental Impact Statement.

COMMITMENTS WITHIN THIS LETTER

The following table identifies those actions considered to be regulatory commitments. Any other actions discussed in this document represent current or planned actions, and are described for the NRC's information. Please notify the Manager - Regulatory Affairs at the Perry Nuclear Power Plant of any questions regarding this document or any associated regulatory commitments.

Commitments
1. Although the current licensing basis already assumes that the third valve will be remote-manually closed by the control room operator following a loss-of-coolant-accident (LOCA) to provide the long term, high integrity leakage protection, an even higher confidence level on closure of these valves will be provided by a design change and revisions to plant emergency procedures. The procedures will direct operators to implement an alternate division of electrical power to the gate valves, in the event that the valves normal power supply is lost. An alternate division of power such as this is not a new concept; the operators already receive training on a similar arrangement that is utilized in the PNPP licensing basis for the Station Blackout event. The capability to provide power from Division 3 will be a permanent design modification, but physical and electrical separation between Divisions 1 and 3 will be maintained by employing two features. Normally open, fused disconnect switches at both ends of the circuit, and Fuses normally stored out of the circuit.
2. If Division 1 power is not available, Division 3 power to the gate valves can be established, which will enable FWLCS to still be established within the "approximately one hour" time frame in the current licensing basis. An evaluation of the operator action per ANSI/ANS 58.8-1984 guidelines is being performed to determine the actual time and dose that would be involved with this action. This will be submitted to the NRC when completed.
3. Due to the injection of the seal water into the bonnet of the valve, air leakage will not be a concern. Stem and bonnet water leakage will be checked and any leakage will be eliminated (this will be controlled by the TS 5.5.2 "Primary Coolant Sources Outside Containment Program". This leakage elimination will be ensured through system walkdowns per the Program at > 1000 psig, with the gate valves in the closed position.
4. Due to the water seal provided by the high integrity Third Valves, the gate valve

Commitments

seat leakage will continue to be checked by a water test conducted at $\geq 1.1\ P_a$, and the results will continue to be added into the Primary Coolant Sources Outside Containment Program totals (Technical Specification 5.5.2).

5. Generic Letter (GL) 89-04 Position 3 "Back Flow Testing of Check Valves" noted that tests on check valves that perform a safety function in the closed position to prevent reversed flow should be performed. "Category C" tests on such "safety function check valves" were described as needing to prove that the disc closes on its seat. An example method discussed for such safety function Category C tests is a visual observation. It is proposed that the Feedwater Check Valves be Category C tested for their safety function by performance of a visual inspection of the valve internals at an appropriate frequency as determined by the Inservice Testing Program (ISTP). A tap would be added adjacent to each check valve to permit visual inspections of the valves to verify proper closure. This inspection would constitute the "exercise closed (EC)" test in the ISTP. The "exercise open (EO)" testing would remain the same, i.e., the valves pass proper flow during plant operation.

6. The RHR branch line off of the Feedwater line will be treated as a closed system outside of containment, similar to the lines discussed in Note 4 to USAR Table 6.2-33 and Note 7 to Table 6.2-40. These Notes explain why leakage is not considered to be bypass leakage. A safety-related globe valve (1E12-F053A/B) in this branch line will be treated as a high integrity containment isolation valve, similar to the Feedwater gate valves. The 1E12-F053A/B valves will be added to the containment isolation valve listings. These valves meet the qualifications of a containment isolation valve. An air test will be performed on 1E12-F053A/B, and the air leakage will be added into the Type C totals and limited by $0.60\ L_a$. Also, the leakage from the F053 valves will be added into the Type A Integrated Leak Rate Test (ILRT), since the Feedwater penetrations will not be drained during the ILRT. Leakage from the systems listed in USAR Notes 4 and 7 as "closed" are controlled by the Primary Coolant Sources Outside of Containment Program, as described in the Notes. Thus, this RHR branch pathway would consist of an air leak rate tested containment isolation valve and a closed system outside of containment. In addition, a high-to-low-pressure interface water test is performed on the E12-F053 globe valve and the check valve inboard of the F053 (E12-F050A/B) (see the Figures) in accordance with ASME Section XI. These valves are tested to water leakage limits of ≤ 5 gpm.

7. The remainder of the RWCU line between the Feedwater line and Penetration P132 will be added to the Technical Specification 5.5.2 Primary Coolant Sources Outside Containment Program, with a specific leakage acceptance limit of zero (0) leakage when tested at RWCU operating pressures (>1000 psig). This obviates the need to add the RWCU branch line check valves (1G33-F052A/B) into a leak rate testing program, since zero water leakage outside the lines when operating at over 1000 psig ensures that there will be no air leakage from those mechanical joints at P_a (7.8 psig for PNPP). This approach meets Branch Technical Position CSB 6-3 "Determination of Bypass Leakage Paths in Dual Containment Plants", Item B.9.

Commitments

8. The piping of each FWLC subsystem which will connect to the bonnets/seats of the gate valves contains two currently existing isolation valves. These valves receive a high-to-low pressure interface water test since they connect back to the RHR/LPCS waterleg pumps. These tests will continue to be performed.

9. When Feedwater flow into the reactor has been stopped, plant procedures/instructions will continue to direct that the high integrity third (gate) valves also be closed to provide additional isolation capability.

10. In the proposed design, both independent trains of the FWLCS will be routed to the bonnet area of the existing Feedwater MOV. To allow the FWLCS to seal the 20" gate valves, FWLCS will be supplied to an existing 1/2" threaded connection in the packing area of the valve bonnet. The rerouted FWLCS subsystems will continue to be designed and installed as a single failure proof, safety-related, seismically qualified system and will be designed to withstand the dynamic effects of postulated piping failures in the steam tunnel including protection from internally generated missiles. The FWLCS piping that connects to the bonnet area of the existing MOV will conform to the requirements of ASME Class 2.

SIGNIFICANT HAZARDS CONSIDERATION

The standards used to arrive at a determination that a request for amendment does not involve a significant hazard are included in Commission regulation 10 CFR 50.92, which states that operation of the facility in accordance with the proposed changes would not:

1) involve a significant increase in the probability or consequences of an accident previously evaluated;
2) create the possibility of a new or different kind of accident from any accident previously evaluated; or
3) involve a significant reduction in a margin of safety.

The proposed amendment has been reviewed with respect to these three factors, and it has been determined that the proposed change does not involve a significant hazard because:

1) This proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated.

It is proposed that water leakage from the Feedwater motor-operated containment isolation valves will be added into the Primary Coolant Sources Outside Containment Program (Technical Specification 5.5.2), and therefore the Feedwater lines do not need to also be included in the hydrostatic test program addressed by Surveillance Requirement 3.6.1.3.11. The proposed testing change is based on design/licensing basis changes being implemented to improve functioning of the Feedwater Leakage Control System. The proposed design change will provide Feedwater Leakage Control System seal water directly to the bonnets and seats of the motor operated gate valves in the Feedwater lines, and allow for power to the valves to be provided from redundant power supplies.

The proposed changes do not increase the probability of occurrence of an accident previously evaluated because the Feedwater Leakage Control System is not an initiator of a previously evaluated accident. The Feedwater Leakage Control System is used to mitigate the consequences of an event that has already been initiated due to some other cause, specifically a design basis Loss of Coolant Accident (LOCA). Therefore, changes to the design and testing on the Feedwater Leakage Control System have no impact on the probability of occurrence of an accident previously evaluated. The Feedwater Leakage Control System is a manually initiated system, and the probability of an inadvertent initiation remains unchanged from that previously reviewed, so the possibility of a loss of feedwater transient is not increased.

The proposed changes do not significantly increase the radiological consequences of an accident previously evaluated, because the Feedwater lines will continue to be isolated following a LOCA either inside or outside of containment. For a line break outside of containment, the check valves will provide the necessary short-term closure function to prevent significant loss of reactor coolant inventory, as currently stated in Updated Safety Analysis Report (USAR) Section 6.2.4.2.2.1.a.1. The third (gate) valves in the Feedwater line will also be available to provide the long-term, high integrity leakage protection. The check valves Code Class 1 closure function will be verified at an appropriate frequency by performance of an exercise closed (EC) test comprised of a visual inspection of the internals of the valves, in accordance with the Inservice Testing Program. The radiological consequences of such a line break outside of containment event are not significant, as there is no postulated fuel damage.

For a line break inside of containment (a design basis LOCA event), the majority of the currently reviewed and accepted licensing basis is being maintained. Design changes are being implemented to improve the functioning of the Feedwater Leakage Control System. The redundant subsystems will be piped to the bonnets of the third, high integrity valves in the Feedwater lines (the gate valves) to provide a more rapid and effective seal on the stem, bonnet and flexible wedge seats. Water leakage from the stem, bonnets and seats of the gate valves will be addressed through controls imposed by Technical Specification 5.5.2, Primary Coolant Sources Outside Containment". The doses from such water leakage are accounted for in the radiological dose calculations. Since the leakage from the Feedwater lines is accounted for by the Primary Coolant Sources Outside Containment Program, there is no need to include the water test results of the Feedwater lines into the Surveillance Requirement 3.6.1.3.11 leak test totals.

The branch lines off of the Feedwater lines will also be addressed either through the Primary Coolant Sources Outside Containment Program (Technical Specification 5.5.2) or through additional Appendix J air leak rate test requirements (Technical Specification Surveillance Requirement 3.6.1.1.1 and Specification 5.5.12 "Primary Containment Leakage Rate Testing Program"). The new test methods for these lines do not impact the existing radiological dose calculations, since the existing leakage limits of the leak rate test programs are not changed by the proposal.

The design changes associated with the Feedwater Leakage Control System will continue to satisfy licensing/design criteria for this piping to an equivalent degree as the current design. The minor exception is where the two Feedwater Leakage Control subsystems tie in to the bonnets of the gate valves, and this constitutes only a separation issue. Since the Feedwater Leakage Control System piping at this juncture is Code Class 2, break excluded, and protected from pipe whips and jet impingements, it is considered to be acceptable.

Addition of the provisions for an alternate power supply to be provided to the gate valves (if necessary following a LOCA event) will improve the probability of closure of these high integrity valves without creating an electrical separation concern. A separation concern will not be created since the supply circuitry from the alternate power source will be a permanent modification, and physical and electrical separation between electrical divisions will be maintained by employing two features:

1. Normally open, fused disconnect switches at both ends of the circuit, and
2. Fuses normally stored out of the circuit.

Based on the discussions above, it is concluded that neither the probability nor the consequences of previously evaluated accidents are significantly increased as a result of the proposed changes to the Technical Specifications and to the licensing and design bases for the Feedwater penetrations.

2) This proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.

The Feedwater Leakage Control System was developed specifically to mitigate the consequences of a design basis LOCA inside the containment. The system itself and the proposed changes do not produce parameters or conditions that could contribute to the initiation of accidents different than those already evaluated in the Updated Safety Analysis Report. The proposed changes are intended to improve the functioning of the Feedwater Leakage Control System should it be called upon following a LOCA. The changes affect mitigation of that previously evaluated event. In other plant conditions, including normal operation, the system is not activated and cannot induce events. Thus, the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3) This proposed amendment does not involve a significant reduction in a margin of safety.

The proposed changes only affect the methods used to ensure Feedwater Leakage Control System performance and reliability, and clarification of the licensing/design basis of the system. The new proposed Note in Surveillance Requirement 3.6.1.3.11 clarifies that the water leakage from the Feedwater lines does not need to be counted in two separate leak test programs. The Primary Coolant Sources Outside Containment Program (Technical Specification 5.5.2) will ensure that leakage from the Feedwater lines is minimized, and accounted for in an appropriate fashion in the radiological dose calculations. Leak rate testing on the branch lines off of the Feedwater lines will also be controlled and limited by existing acceptance criteria for plant programs that protect the assumptions of the radiological dose calculations. Therefore, the margin of safety provided in the PNPP dose calculations will remain unchanged.

The majority of the existing licensing bases, and therefore the margins of safety, are maintained by this proposal. The items that are changed are done so to improve the reliability of the system or for an administrative clarification. The Feedwater Leakage Control System Technical Specification itself (Technical Specification 3.6.1.8) does not need revision. The design changes will maintain the existing licensing/design criteria, with the minor exception of divisional separation at the point that the two divisions have to be piped into the bonnets of the third (gate) valve. Since the piping at this junction point is Code Class 2, break excluded, and protected from pipe whips and jet impingements, it is considered to be acceptable. It will not lead to a significant reduction in a margin of safety. The manually initiated divisional cross-tie will not create an electrical separation concern. The alternate power supply provision will be a permanent modification, and physical and electrical separation between electrical divisions will be maintained.

Based on the above discussions, the proposed license amendment is concluded to not result in a significant reduction in the margin of safety.