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Perry Nuclear Power Plant
Docket No. 50-440
Response To Request For Additional Information (RAI) On The License Amendment Request For A Performance-Based Drywell Bypass Leakage Test Program

Ladies and Gentlemen:

By letter dated October 16, 1996, the Nuclear Regulatory Commission (NRC) staff requested a response to several questions on the License Amendment Request for a performance-based Drywell Leakage Test Program. The License Amendment Request was dated January 16, 1996 (PY-CEI/NRR-2007L). Answers to the questions are provided in the attachment to this letter.

If you have questions or require additional information, please contact Mr. James D. Kloosterman, Manager - Regulatory Affairs, at (216) 280-5833.

Very truly yours,

Lew W Myers

Lew W. Myers
Vice President - Nuclear

BSF:sc

cc: NRC Project Manager
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Response to Request for Additional Information (RAI) on the License Amendment Request for a Performance-based Drywell Bypass Leakage Test Program

1. Page 7 of Attachment 1 to the January 16, 1996, submittal states that leakage was identified past 'boot seals' that are installed in the annular space between the safety relief valve discharge lines and the drywell wall. The submittal states that short-term action was to replace the leaking seals. The submittal also stated that longer term actions were being considered. Please discuss the status of this issue. Have the leaking seals been replaced? What longer term actions have been taken or are planned?

   Response: As noted on page 7 of Attachment 1 to the January 16, 1996, submittal, during the fourth refueling outage (RFO4), some leakage was identified past the seals between the safety relief valve (SRV) discharge lines and the drywell wall, and a decision was made to replace the seals. That replacement occurred during RFO4 (see response to item 2 below). The January 16, 1996, submittal also noted that longer term actions are being handled in accordance with the Perry Nuclear Power Plant (PNPP) Corrective Action Program. An Engineering Project has been approved to determine the proper method of resolving this issue. The options under consideration are:

   1) Evaluate the use of the existing seal material and configuration and develop a performance-based seal replacement program,
   2) Obtain a new seal material for the existing configuration which would be better suited to the design and environmental conditions which are present inside the Drywell during plant operating and accident scenarios,
   3) Change the seal configuration to a metal bellows design,
   4) Design a penetration sleeve extension so that the penetration opening will not become uncovered during the periods in a Loss of Coolant Accident (LOCA) when Suppression Pool level is lower than normal levels, and
   5) Investigate the feasibility of eliminating the seals in their entirety by reanalysis of the small, intermediate and large break LOCAs to determine the length of time the penetrations are uncovered (if at all) for each scenario, and the impact of bypass steam, if any. Determine appropriate Drywell Leak Rate Test requirements if the permanently installed seals are eliminated.

   The Engineering Department has determined that the current seals will not require replacement until the seventh refuel outage (RFO7). That outage is currently scheduled for the spring of 1999.

2. Table 2 shows that two tests were performed in 1994 with leakage rates of more than an order of magnitude difference. Discuss why two tests were run one month apart and the reasons for the difference between the leakage rate test results.

Response: As noted above, during RFO4, some leakage was identified past the SRV boot seals. Even though this leakage did not exceed the test acceptance criteria of 10% of the design allowable, a decision was made to replace the seals during the outage. Also, following performance of the initial RFO4 test, it was noted that the flow orifice used during the test had been installed in the reverse direction, opposite to the flow direction markings on the orifice. The retest was performed to resolve issues associated with the orifice and the installation of the new boot seals.

Further investigations have shown that the orifice was a square-edged orifice rather than a chamfered orifice, and that the reversal of the orifice did not invalidate the initial test results. The replacement of the boot seals was the primary difference in the drywell boundary between the two tests, and the order of magnitude reduction in leak rate (from 2,450 scfm to 111 scfm) is attributed to this seal replacement.

3. Provide a list of all drywell isolation valves. (i) Provide diameters of the valves; (ii) Indicate which valves close automatically on indication of a LOCA and which valves are locked closed when drywell integrity is required; (iii) Indicate which valves have position indications in the control room; (iv) For those valves which have neither automatic isolation or are not locked closed, what assurance is there that the valves will be shut if a LOCA occurs? (v) Can it be demonstrated that all valves below a certain diameter can be open during a LOCA without exceeding the design basis $A/\sqrt{K}$? If relevant material is in the UFSAR, a reference is sufficient.

Response: A list of the drywell isolation valves is provided in a table below. The source of the valve numbers is Technical Specification Bases Table B 3.6.5.3-1 "Drywell Isolation Valves", with the addition of the Drywell Vacuum Relief System (M16) valves that are addressed by Technical Specification 3.6.5.6. The valves are grouped by penetration.

(i) The Table provides the diameters of the valves.

(ii) The Table indicates which valves receive automatic isolation signals on indication of a LOCA, and which valves are check valves which will close when drywell pressure exceeds the pressure in the associated system outboard of the valves. Although none of these valves are "locked closed", the footnotes to the table provide information on the status of several of the valves when Drywell Integrity is required in Modes 1, 2, and 3, most notably the sealed closed 24 inch and 36 inch Drywell Purge (M14) penetrations.

(iii) The Table notes whether Control Room position indication exists for the valves.

(iv) Since each of the valves listed below will close when needed as a result of its design (either a valve that receives an isolation signal and has motive force for closure, or is a check valve), there is assurance that the valves will be shut when needed if a LOCA occurs.

(v) Since the typical arrangement for the drywell penetrations provides for a dual isolation valve concept (exceptions are discussed below), design basis assumptions for single active failure result in closure of the drywell penetrations by at least one valve. Therefore, there is no need to demonstrate that all valves below a certain diameter can be open during a LOCA without exceeding the design basis $A/\sqrt{K}$. However, three of the penetrations take credit for only one valve each. Two of these penetrations are associated with the safety-related Combustible Gas Control system (M51), which is designed to operate following a LOCA to pump air from the containment into the drywell. The valves receive an isolation signal when the associated M51 compressor is not operating, and are therefore normally closed during plant operation. The opening and closing of these valves upon compressor start and stop is verified quarterly in accordance with the plant instructions which implement Technical Specification Surveillance Requirement 3.6.3.3.1. Since the valves are closed during normal operation, and only stroke open when the M51 compressor is operating during the quarterly testing or during post-LOCA operation, there is not a concern for these valves being an "open drywell bypass leakage path". The third "single-valve" penetration (which serves a fire protection (P54) function) is not a concern since the piping between the drywell and the steel containment shell is safety-related and is not postulated to break following a LOCA. Therefore, it does not constitute a drywell bypass leakage path into the containment following a LOCA.

The above discussion shows that there is no need to demonstrate that all valves below a certain diameter can be open during a LOCA without exceeding the design basis $A/\sqrt{K}$ value. Due to the beyond-design-basis aspects of assuming multiple penetrations are full open, a resistance coefficient (the K in the $A/\sqrt{K}$ formula) was not calculated for each of the individual penetrations.

Drywell Isolation Valves

Valve Number	Valve Diameter	Inboard/ Outboard	Auto Close† or Check Valve?	Position Indication?
1B33-F013A	0.75"	Inboard	Check	NA
1B33-F017A	0.75"	Outboard	Check	NA
1B33-F013B	0.75"	Inboard	Check	NA
1B33-F017B	0.75"	Outboard	Check	NA
1B33-F019	0.75"	Inboard	Auto Close	Yes
1B33-F020	0.75"	Outboard	Auto Close	Yes

1C41-F007	1.5"	Inboard	Check	NA
1C41-F006	1.5"	Outboard	Check	NA
1G61-F030	2.5"	Inboard	Auto Close	Yes
1G61-F035	2.5"	Outboard	Auto Close	Yes
1G61-F150	2.5"	Inboard	Auto Close	Yes
1G61-F155	2.5"	Outboard	Auto Close	Yes
1M14-F055A	24"	Inboard	Auto Close*	Yes
1M14-F055B	24"	Outboard	Auto Close*	Yes
1M14-F060A	24"	Inboard	Auto Close*	Yes
1M14-F060B	24"	Outboard	Auto Close*	Yes
1M14-F065	36"	Inboard	Auto Close*	Yes
1M14-F070	36"	Outboard	Auto Close*	Yes
1M16-F010A	10"	Inboard	Auto Close**	Yes
1M16-F020A	10"	Outboard	Check**	Yes
1M16-F010B	10"	Inboard	Auto Close**	Yes
1M16-F020B	10"	Outboard	Check**	Yes
1M51-F010A	4"	***	Auto Close#	Yes
1M51-F010B	4"	***	Auto Close#	Yes
1P22-F593	1.25"	Inboard	Check	NA
1P22-F015	1.25"	Outboard	Auto Close##	Yes
1P43-F722	10"	Inboard	Check	NA
1P43-F355	10"	Outboard	Auto Close	Yes
1P43-F400	10"	Inboard	Auto Close	Yes
1P43-F410	10"	Outboard	Auto Close	Yes
1P51-F653	1.25"	Inboard	Check	NA
1P51-F652	1.25"	Outboard	Auto Close##	Yes
1P52-F639	2"	Inboard	Check	NA
1P52-F646	2"	Outboard	Auto Close	Yes

1P54-F395	4"	###	Auto Close	Yes

<u>Drywell Isolation Valve Table Notes:</u>

B33 = Reactor Recirculation
C41 = Standby Liquid Control
G61 = Liquid Radwaste Sumps
M14= Containment/Drywell Purge
M16= Drywell Vacuum Relief
M51= Combustible Gas Control
P22 = Mixed-Bed Demineralizer
P43 = Nuclear Closed Cooling
P51 = Service Air
P52 = Instrument Air
P54 = Fire Protection

† Valves identified as "Auto Close" receive an isolation signal post-LOCA, regardless of their normal position during plant operation.

* These M14 valves are sealed closed per Technical Specification Surveillance Requirement 3.6.5.3.1 prior to entry into Modes 1, 2 or 3, and are verified sealed closed at least once per 31 days thereafter in Modes 1, 2 and 3. This includes removing motive power to the valve operator. The Technical Specifications do not permit opening of these valves even temporarily when the plant is in Modes 1, 2, or 3. Also, for radiation streaming protection, the volume between the 24" Supply valves is filled with water, with a local warning light if the level decreases.

** The M16 automatic isolation valves (1M16-F010A(B)) and the testable check valves (1M16-F020A(B)) are verified closed at least once per seven days per Technical Specification Surveillance Requirement 3.6.5.6.1

***The M51 system has just one valve listed as a drywell isolation valve (although there is a check valve installed outboard of the automatic valve on the M51 penetrations which is not credited as a drywell isolation valve). The M51 piping branches off of the M16 piping outboard of the drywell, and the two systems share a common drywell penetration. See additional discussion regarding the M51 system in the response to question 3.(v) above.

These M51 valves are normally closed during plant operation (when the system compressor is off). See additional discussion regarding these M51 valves in the response to question 3.(v) above.

These P22 and P51 valves are closed as part of the preparations for reactor criticality provided in Integrated Operating Instruction IOI-1 "Cold Startup" since the associated systems are not normally required to be run during Modes 1, 2, and 3.

###The P54 system has just one valve listed as a drywell isolation valve. See additional discussion regarding the P54 piping in the response to question 3.(v) above.

4. Provide a commitment to perform a qualitative assessment at least once per operating cycle and specify the method to be used. The licensee should determine and the commitment should state that the method will provide reasonable assurance of the ability of the drywell to perform its design basis pressure suppression function, that is, that the drywell is operable.

   Response: The commitment to perform a qualitative assessment at least once per operating cycle was provided on page 11 of Attachment 1 of the January 16, 1996 letter. However, the following commitment is provided to supersede the earlier statements:

   > "At least once per operating cycle, a qualitative assessment of drywell bypass leak tightness will be performed, unless the Technical Specification Drywell Bypass Leak Rate Test will be performed in its place. At a minimum, this assessment will be performed during refueling outages, following completion of work on the drywell structure or penetrations. The assessment will involve verifying that a differential pressure can be established between the drywell and the containment. Although the assessment is not as comprehensive as the Technical Specification Drywell Bypass Leak Rate Test, it will provide reasonable assurance of the ability of the drywell to perform its design basis function."

   The current method for performing the assessment involves pressurization of the drywell using air flow from an existing plant system, i.e., the Combustible Gas Control (M51) system compressor(s). During the assessment, systems that are routed into the Drywell may be maintained in their normal operating status, i.e., they are not required to be taken out of service, vented, and drained (this allows them to continue to perform their normal equipment support functions such as seal cooling, air supply, etc.) Therefore, the assessment may not identify drywell bypass leakage that is masked by such plant conditions. However, significant inleakage of air or water into the drywell atmosphere from such systems would be identifiable prior to or following the assessment, and their impact on the results could be evaluated.

   It has been determined that the periodic qualitative assessments will provide reasonable assurance of the ability of the drywell to perform its design function.

5. (a) Describe the procedures that are used to assure that, following a refueling outage or any other outage during which the drywell may be open, that all penetrations are properly isolated, and that no damage has been done, for example, to seals or valves which could cause excessive leakage. (b) Specifically discuss the drywell equipment hatch. What assurance is there, if no drywell bypass leakage rate test is performed, that the drywell equipment hatch is not leaking excessively?

Response: (a) The M14 valves are verified sealed closed prior to entry into Modes 1, 2, or 3 per the plant instruction which implements Technical Specification Surveillance Requirement 3.6.5.3.1. The M16 automatic and testable check valves are verified closed prior to entry into Modes 1, 2, or 3 per the plant instruction which implements Technical Specification Surveillance Requirement 3.6.5.6.1. The M51 automatic isolation valves are normally closed when their compressor is not being run for testing, and the opening and closing of these valves upon compressor start and stop is verified quarterly in accordance with the plant instructions which implement Technical Specification Surveillance Requirement 3.6.3.3.1. The P22 and P51 automatic valves are closed as part of the preparations for reactor criticality provided in IOI-1 "Cold Startup" since the associated systems are not normally required to be run during Modes 1, 2, and 3. Each of the above valves also receives an automatic closure signal upon occurrence of a LOCA. The other valves are either check valves or are normally open automatic valves that receive a LOCA closure signal.

With respect to checking for damage to seals or valves which could cause excessive leakage, plant programs require appropriate retests be completed when field work is performed, including corrections for non-conforming conditions identified during performance of work in the field (see also the answer to question 7). If determined necessary, the retests could include leak testing. This concept is consistent with the Bases discussion for Technical Specification Surveillance Requirement (SR) 3.0.1, which notes that upon completion of maintenance, appropriate post maintenance testing is required to declare equipment (in this case the drywell structure) OPERABLE. Also, as noted below in response to question 5(b), the drywell equipment hatch seal receives a leak rate check each time the hatch is bolted back in place. A similar leak rate check is performed on the drywell head seals when the head is reinstalled. The drywell air lock door seals will continue to be required to be leak rate tested within 72 hours of each closure by proposed SR 3.6.5.1.3 (this is currently addressed by SR 3.6.5.2.1).

Also, a visual inspection of the exposed accessible interior and exterior surfaces of the drywell is currently required to be performed at least three times within a ten year inservice testing interval (prior to performance of each Type A test of the Containment), in accordance with Technical Specification Surveillance Requirement 3.6.5.1.2. This periodicity (three times in a 10 year inservice testing interval) will be maintained for the drywell inspections even if the Type A Containment test interval is extended due to adoption of a performance-based 10CFR50 Appendix J Option B program. This periodicity equates to requiring an inspection of the drywell approximately every other refueling outage.

(b) The drywell equipment hatch leakage rate is checked each time the hatch is bolted back in place, in accordance with a post-maintenance periodic test instruction. The expected leak rate is <20 sccm. Test results above this value are subjected to engineering evaluation for determination of corrective actions.

6. Demonstrate, if possible, that one purge valve can be left open without exceeding the containment failure pressure.

   Response: As noted above in the Table, each of the Drywell Purge penetrations has two designated isolation valves. Therefore, one purge valve can be left open without exceeding the containment failure pressure, since the other purge valve in the penetration will provide the drywell isolation function. Also, as noted in the Table, for both the Supply (24") and Exhaust (36") penetrations, the Drywell Purge valves are treated as "sealed closed" valves with Technical Specification controls to ensure they remain closed whenever the plant is in Modes 1, 2, and 3. Also, for radiation protection purposes, the 24" piping between the Drywell Purge Supply isolation valves is kept filled with water to provide shielding, which ensures on an ongoing basis that these valves are closed. For the above reasons, it is not credible to assume significant leakage through these drywell penetrations in Modes 1, 2, and 3.

7. What requirements are there for leakage rate testing of the drywell after modifications to the drywell structure or penetrations?

   Response: Whenever modifications are performed in the plant, in accordance with the non-conforming condition program or the design change process, the field work packages are required to specify necessary retests to ensure associated plant features are operating correctly. If a modification to the drywell structure or penetrations could adversely affect the leakage rate of the drywell, appropriate testing would be designated by the personnel responsible for the work, including necessary leak testing. The qualitative assessment method described above would be available to the personnel as a retest option. Again, this is consistent with the Bases discussion for SR 3.0.1 discussed above in the response to question 5(a).

The following table identifies those actions discussed in this document which are considered to be regulatory commitments. Any other actions discussed in this document represent intended or planned actions, are described for the NRC's information, and are not regulatory commitments. Please notify the Manager - Regulatory Affairs at the Perry Nuclear Power Plant of any questions regarding this document or any associated regulatory commitments.

Commitments
At least once per operating cycle, a qualitative assessment of drywell bypass leak tightness will be performed, unless the Technical Specification Drywell Bypass Leak Rate Test will be performed in its place. At a minimum, this assessment will be performed during refueling outages, following completion of work on the drywell structure or penetrations. The assessment will involve verifying that a differential pressure can be established between the drywell and the containment. Although the assessment is not as comprehensive as the Technical Specification Drywell Bypass Leak Rate Test, it will provide reasonable assurance of the ability of the drywell to perform its design basis function. A visual inspection of the exposed accessible interior and exterior surfaces of the drywell is currently required to be performed at least three times within a ten year inservice testing interval (prior to performance of each Type A test of the Containment), in accordance with Technical Specification Surveillance Requirement 3.6.5.1.2. This periodicity (three times in a 10 year inservice testing interval) will be maintained for the drywell inspections even if the Type A Containment test interval is extended due to adoption of a performance-based 10CFR50 Appendix J Option B program.