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SUBJECT: Forwards response to NRC question on TS changes re suppression pool bypass leakage test & drywell-to-suppression chamber vacuum breaker leakage preliminary test strategy.

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JUL 15 1993

Director of Nuclear Reactor Regulation
Attention: Mr. C. L. Miller, Project Director
Project Directorate I-2
Division of Reactor Projects
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

**SUSQUEHANNA STEAM ELECTRIC STATION**
**ADDITIONAL INFORMATION ON PROPOSED**
**AMENDMENTS 160 TO LICENSE NO. NPF-14**
**AND 113 TO LICENSE NO. NPF-22**
**PLA-4001 FILES A17-2/R41-2**

**Docket Nos. 50-387**
**and 50-388**

*Reference: PLA-3968, R.G. Byram to C.L. Miller, "Proposed Amendment 160 to License No. NPF-14 and Proposed Amendment 113 to License No. NPF-22 : Suppression Pool Bypass Leakage Test", dated May 04, 1993.*

Dear Mr. Miller:

Attached please find PP&L responses to information requested by Mr. William Long of the NRC staff. Any questions on this submittal should be directed to Mr. R. Sgarro at (215) 774-7914.

Very truly yours,

R. G. Byram

Attachments

cc: NRC Document Control Desk (original)
NRC Region I
Mr. G. S. Barber, NRC Sr. Resident Inspector - SSES
Mr. R. J. Clark, NRC Sr. Project Manager - Rockville
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# RESPONSE TO NRC QUESTION ON TECHNICAL SPECIFICATION (TS) CHANGE

## SUPPRESSION POOL BYPASS LEAKAGE TEST

There are several potential bypass flow paths between the drywell and suppression chamber air space via cross-connected piping systems external to the containment. However, our evaluation concludes that the potential leakage from these lines has minimal affect on the drywell-to-suppression chamber bypass leakage area and that the proposed TS change and vacuum breaker (VB) leakage test (Ref. PLA-3968) will ensure containment integrity.

The systems with piping external to the containment that are a potential source of drywell-to - suppression chamber bypass leakage are listed below:

1. Containment vent and purge lines (18" and 24" diameter; two flow paths):

2. Drywell and suppression chamber spray lines (12" and 6" diameter; two flow paths)

3. $N_2$ pressurization lines (1" diameter; one flow path)

4. $H_2$ and $O_2$ analyzer lines (1" diameter; four flow paths)

5. Integrated Leak Rate Test (ILRT) data acquisition lines (3/8" diameter; one flow path)

6. Containment instrument gas lines (1" and 3" diameter; one flow path)

The potential bypass leakage through the above flow paths is expected to be minimal compared to the Technical Specification allowable bypass leakage (0.77 $in^2$) based on the following:

1. The cross-connected piping are isolated from the containment by the drywell and suppression chamber containment isolation valves. All flow paths have multiple, in-series containment isolation valves that are designed to meet stringent leakage criteria specified in 10CFR50 Appendix J. In addition, the Technical Specifications require periodic local leak rate testing (LLRT) to ensure that the valves comply with the Appendix J leakage criteria. Therefore, leakage from the drywell-to-suppression chamber airspace can only occur via leakage through multiple containment isolation valves.

2. A bounding analysis has been performed to determine the maximum potential bypass leakage area from the above sources. The leakage area was derived from the TS allowable leakage for the containment isolation valves located in the potential flow paths. The leakage through the containment vent and purge lines was considered separately from the remaining lines, because the vent and purge valves have a separate TS allowable leakage. The evaluation is summarized below:

RESPONSE TO NRC QUESTION ON TECHNICAL SPECIFICATION (TS) CHANGE

SUPPRESSION POOL BYPASS LEAKAGE TEST

a. Vent and Purge Valves

TS 4.6.1.8.2 requires that each 18" and 24" purge supply and exhaust valve be verified to have a leakage rate of less than or equal to 0.05 $L_a$ at least once per 6 months. The maximum leakage for each potential flow path can be conservatively determined by assuming the leakage is equal to the TS limit of 0.05 $L_a$. In reality, the actual leakage would be much less than the TS leakage, since the leakage test is conducted for each individual valve while the actual flow path contains four, in-series containment isolation valves.

For Susquehanna, $L_a$ is equal to 317,907 sccm[1] and 0.05 $L_a$ is 15,895 sccm. For two flow paths (purge and vent lines), the total allowable TS leakage is 31,790 sccm. The TS leakage test is conducted at a differential pressure of 45 psi and the equivalent leakage area $(A/(k)^{1/2})$ is calculated to be 0.00105 $in^2$ or **0.136% of the TS allowable** bypass leakage area of 0.77 $in^2$.

b. Remaining Flow Paths

The containment isolation valves for the remaining flow paths do not have individual leakage criteria. These valves are included with the remaining containment isolation valves and penetrations listed in TS Table 3.6.3-1 that must have a combined leakage rate of less than or equal to 0.6 $L_a$ (TS 3.6.1.2.b). A conservative estimate of the potential leakage can be determined by assuming that the total TS allowable LLRT leakage of 0.6 $L_a$ (190,744.2 sccm) is bypassed to the suppression chamber airspace. The 0.6 $L_a$ is a bounding leakage rate, since it includes the valves with potential for bypass leakage and all other valves and penetrations subject to LLRT per TS 3.6.1.2.b. The equivalent leakage area $(A/(k)^{1/2})$ for 190,744.2 sccm at a differential pressure of 45 psi is 0.00629 $in^2$ or **0.817% of the TS allowable** bypass leakage area of 0.77 $in^2$.

3. Leak rate testing is controlled by PP&L Procedure NDAP-QA-0412 "Leakage Rate Test Programs". This procedure requires that LLRT Program Goals be set-up to define the target as-found LLRT leakage rate for each isolation valve. The target as-found leakage rates are based on the prior leakage history for each valve, coupled with a LLRT program philosophy that emphasizes the need to maintain the LLRT leakage as low as practical. As-found leakages that exceed the target values require an evaluation and leakage reducing

[1] Standard Cubic Centimeter Per Minute (SCCM)

activities consistent with NDAP-QA-0412. The target values are defined at leakage rates significantly lower than the TS allowable LLRT rates. This ensures that the actual as-found leakage will be significantly lower than the TS limit (see Item 4 below).

4. An estimate of the potential leakage area can be determined from the total measured LLRT data for prior outages. The measured LLRT data is a conservative estimate of the potential bypass leakage, since it includes the valves listed above plus all other valves and penetrations that fall into the less than or equal to 0.6 $L_a$ criteria. The average total LLRT leakage rate for the previous nine outages at Susquehanna is 50,111 sccm. The equivalent leakage area $(A/(k)^{1/2})$ is 0.00165 $in^2$ or 0.215% of the TS allowable bypass leakage area of 0.77 $in^2$.

The above evaluation determines a conservative estimate of the potential bypass leakage via the external drywell and suppression chamber cross-connected piping. A bounding evaluation based on the maximum TS LLRT leakage rate (.6 $L_a$) indicates that the potential leakage area is less than 1% of the TS allowable bypass leakage area of 0.77 $in^2$. A more realistic evaluation based on actual LLRT data indicates that the potential leakage is an order of magnitude less than the bounding approach. The LLRT program required by the Technical Specifications and 10CFR50 Appendix J ensure that the potential leakage will remain a small fraction of the drywell-to-suppression chamber allowable leakage.

The proposed TS limit for the VB leakage test is 30% of the total allowable bypass leakage area. This provides a 70% margin to accommodate the expected non-VB leak paths described above and in PLA-3968. Therefore, the proposed TS change to reduce the test frequency of the drywell-to-suppression chamber bypass tests will not have an adverse impact on containment integrity.

# DRYWELL-TO-SUPPRESSION CHAMBER VACUUM BREAKER LEAKAGE PRELIMINARY TEST STRATEGY

The preliminary leakage testing strategy associated with the technical specification change for drywell-to-suppression chamber vacuum breaker leakage is as follows and is shown on the attached sketch:

- The plant will be in condition 4 or 5.

- Maintenance and any other surveillance testing will have been completed prior to testing a set of vacuum breakers.

- The drywell side of the downcomer will be blanked off with either a gasketed test plate or an inflatable plug. The test plate is permanent plant equipment and is contained within the the jet deflector ring.

- Vacuum breakers will be closed by normal means; all half couplings will be plugged except the test connection.

- A leak rate monitor (LRM) will be attached to a threaded half coupling on the inboard vacuum breaker. This will permit pressurizing the test volume via the half coupling to 4.3 psig (+0.7, -0.0).

- After the volume has stabilized the makeup flow (leakage) into the test volume will be read directly from the LRM.

- If the measured leakage exceeds the capability of the LRM, additional LRMs will be hooked up in parallel and the total leakage will be the sum of all the LRM readings.

- The leak rate will be compared to the technical specification acceptance criteria.

# SUPPRESSION CHAMBER VACUUM BREAKERS

Typical Test Sketch using Flowrate Makeup Method