

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of
 CONNECTICUT YANKEE ATOMIC
 POWER COMPANY
 (Haddam Neck Plant)

Docket No. 50-213

EXEMPTION

I.

The Connecticut Yankee Atomic Power Company (CYAPCO or the licensee) is the holder of Operating License No. DPR-61 which authorizes operation of the Haddam Neck Plant (the facility) at steady state reactor core power levels not in excess of 1825 megawatts thermal. The license provides, among other things, that the facility is subject to all rules, regulations, and Orders of the Nuclear Regulatory Commission (the Commission) now or hereafter in effect.

The plant is a single-unit pressurized water reactor located at the licensee's site in Middlesex County, Connecticut.

II.

One of the conditions of all operating licenses for water-cooled power reactors, as specified in 10 CFR 50.54(o), is that primary reactor containments shall meet the containment leakage test requirements set forth in 10 CFR Part 50, Appendix J. By letter dated July 31, 1985, the staff concluded that it was acceptable to defer implementation of specific Appendix J modifications until an integrated assessment, i.e., Integrated Safety Assessment Program (ISAP), could be performed.

In a July 31, 1985 letter, the NRC staff formally established the scope of the Haddam Neck Plant ISAP and designated the Appendix J issues as ISAP Topic 1.03, "Containment Penetration Evaluations." In that letter, the staff recognized that some issues would require exemptions to defer action until such time as the Haddam Neck Plant ISAP could be completed.

Accordingly, by letters dated March 12, and July 15, 1986, the licensee requested exemptions from Sections II.H, III.A and III.C of Appendix J.

III.

By letters dated March 12 and July 15, 1986, the licensee requested three permanent exemptions from requirements of 10 CFR 50 Appendix J. These included a request to perform integrated containment leak rate testing at values less than $\frac{1}{2}$ Pa. By letter dated June 10, 1987, the licensee withdrew the test exemption request and committed to perform a full pressure test for the 1987 outage. The staff has described the acceptability of each of the remaining two permanent exemption requests below. In the March 12 and July 15, 1986 letters, the licensee also submitted a large number of exemption requests for temporary relief from additional Appendix J requirements. The staff resolution of these requests has been described collectively; however, each request for temporary relief has been evaluated individually in the Safety Evaluation dated September 29, 1987.

A. Permanent Exemptions

1. Type C Testing for Steam Generator Blowdown and Auxiliary Feedwater Penetrations

By letter dated March 12, 1986, CYAPCO requested a permanent exemption from Section II.H.4 of Appendix J for Type C testing of the containment isolation valves in the steam generator blowdown (P-15, 16, 17 and 18) and the auxiliary feedwater (P-81) penetrations.

Historically, the implementation of Section II.H.4 of Appendix J does not require that the main steam and feedwater systems in PWRs be Type C tested, by virtue of the definition of containment isolation valves in that section for which Type C testing is required. Similar to the steam and feedwater systems, the steam generator blowdown (P-15, 16, 17 and 18) and auxiliary feedwater (P-81) penetrations are not connected to the reactor coolant system and are not relied upon to prevent the escape of containment air following a postulated LOCA.

By letter dated May 7, 1982, the NRC concluded that Appendix J, Section II.H, does not require these valves in systems identified above to be leak-tested and, therefore, no exemption is necessary. The staff's original conclusion was based on the fact that this is a seismically-designed closed system, such that these penetrations would not be potential containment leakage paths. Additionally, CYAPCO has agreed to procedurally maintain steam generator water above the tube bundle and pressurize the secondary side above Pa as soon as possible following the onset of a postulated LOCA.

Inasmuch as the basis for the original conclusion is unchanged, the NRC concludes that the requests for exemption for penetrations P-15, 16, 17, 18 and 81 are unnecessary and Type C testing of the isolation valves in these lines is not required.

2. Reverse Direction Type C Testing With Water of Auxiliary Containment Spray Penetration (P-80)

The auxiliary containment spray penetration (P-80) is isolated by motor-operated valve RH-MOV-31, which is currently Type C tested in the reverse direction with water. During the ILRT, the system outside containment is pressurized by the fire water system at a minimum of 80 psig assuring that there will be no leakage out of containment through this penetration. The licensee has argued that since the fire water system is maintained at least at 80 psig by an electric driven pump with a diesel driven backup, their current testing meets the underlying purpose of the rule. The NRC staff concluded that the above leak testing for this penetration would be in compliance with Appendix J if CYAPCO could demonstrate an effective 30 day water seal at a pressure of at least 1.1 Pa, in accordance with Sections III.C.2(b) and III.C.3(b) of Appendix J. This would require that the fire system satisfy the requirements for a safety grade system (i.e., a code class system, seismically qualified, with emergency power and capable of functioning with a limiting active single failure). However, this system does not meet several of these requirements; therefore, an exemption is required.

During normal operation, the water pressure outside the containment is maintained at 80 psig. Any significant leakage through this valve into containment would be detected as it would lead to the spray down of containment. In a sense, this valve is under continuous test (maintenance of the fire water system pressure boundary). The staff has concluded that this system configuration with the reverse direction Type C test with water provides adequate assurance that this valve is leak tight. Additionally, the licensee has proposed to flange the fire water system outside of containment to allow venting of this line during the ILRT. This will provide further assurance that this valve is leak tight. While the ILRT is not an individual test, it assures that the total leakage through containment is below 0.75 La. Therefore, the ILRT does provide reasonable assurance that the leakage through any one penetration is limited to at most 0.75 La. Therefore, the staff concludes that a permanent exemption for penetration P-80 to perform reverse direction testing with water satisfies the underlying purpose of the rule as the proposed testing and the system configuration provides adequate assurance that this penetration is leak tight. The staff concludes that the permanent exemption should be granted.

B. Exemptions for Temporary Relief

By letters dated March 12, and July 15, 1986, CYAPCO requested exemptions from 10 CFR Part 50, Appendix J, for 29 separate penetrations. The 29 requests can be categorized into four groups as described below. These categories include valves that require (1) Type C testing, (2) Type C testing in the reverse direction, (3) Type C testing with water, and (4) Type C testing at pressures greater than Pa.

1. Exemption for Modifications of Valves Requiring Type C Testing

By letters dated March 12, and July 15, 1986, CYAPCO identified three containment penetrations for which exemptions for temporary relief from the Type C testing requirements, of Section III.C of Appendix J were requested. These penetrations include the reactor coolant charging system penetration (P-8), the containment sump to RHR suction line penetration (P-73) and the cavity fill line penetration from the high pressure safety injection system (P-3). Upon review of the CYAPCO request, the staff determined that a 30 day water seal would exist in the containment sump and, therefore, a Type C water test of P-73 is not required. A discussion of penetrations P-8 and P-3 follows.

Penetration P-8

CYAPCO had previously requested an exemption from the Type C testing requirements for the reactor coolant charging (P-8) penetration. This previous request was based on the seismic design of system piping inside containment and the proposed seismic qualification (upgrading) of system piping from the isolation valves of penetration P-8 to its water source. Subsequent evaluations by the licensee determined such qualification to be a more lengthy and costly effort than is justified for this circumstance alone. Consequently, the licensee requested an exemption for temporary relief so that alternative corrective actions could be evaluated in relation to other issues concerning the charging system.

As stated earlier, the staff has concluded that the ILRT (Type A test) provides reasonable assurance that leakage through any penetration is limited. Additionally, the operation and physical configuration of the

charging system provides a natural deterrent to containment leakage through this system. Based on the foregoing discussion, the NRC concludes that an exemption is technically justified for the period of two refueling outages given the compensatory measures provided by the ILRT and system configuration. This time period would provide a reasonable time to implement necessary modifications to this system to achieve compliance with Appendix J.

Penetration P-3

The high pressure safety injection (HPSI) system is a seismic, Class 1, safety grade system. The cavity fill line branch is the only branch line of the HPSI system for which the isolation valve is not Type C tested. This system is a closed system outside of containment and water filled to the pumps. The licensee requested an exemption so that alternative modifications could be evaluated in relation to other issues concerning the HPSI system.

As stated earlier, the staff has concluded that the ILRT provides reasonable assurance that leakage through any penetration is limited. Additionally, the operation and physical configuration of the HPSI system provides a natural deterrent to containment leakage past this isolation valve. Based on the foregoing discussion, the NRC concludes that an exemption granting temporary relief for the period of two refueling outages is justified given the compensatory measures provided by the ILRT and system configuration. This time period would provide a reasonable time to implement necessary modifications to this system to achieve compliance with Appendix J.

2. Exemption to Continue Reverse Direction Type C Testing

By letters dated March 12, and July 15, 1986, CYAPCO requested exemptions from Section III.C.1 of 10 CFR Part 50, Appendix J, to continue reverse direction testing of the refueling cavity purification system (P-33), pressurizer relief tank drain (P-78) penetrations, and the reactor coolant pump (RCP) seal water return line (P-7).

The refueling cavity purification penetration (P-33) is isolated by two containment isolation valves; valve PU-V-242A is Type C tested in the direction of accident pressure and valve PU-V-242 is tested in the reverse direction. The pressurizer relief tank drain penetration (P-78) is isolated by valves DT-TV-1844 and DH-TV-554; valve DT-TV-1844 is tested in the direction of accident pressure and valve DH-TV-554 is tested in the reverse direction. In both of the foregoing cases, testing is accomplished by pressurizing between the isolation valves.

The RCP seal water return lines form a common header inside the containment and discharge through penetration P-7, which is isolated by valve CH-RV-332 outside containment. CH-RV-332 is Type C tested in the reverse direction.

As a general guideline, the staff considers reverse testing conservative if the seating force is ten times the calculated peak pressure force. While this ensures that the leak geometry is dominated by the seating force instead of the test direction, there is no rigorous calculation for determining what other seating force may be acceptable. The licensee's reverse direction testing is currently performed with a seating force less than four times the calculated containment peak pressure and therefore do

not satisfy the established criteria for approval of reverse direction testing of valves. However, in the interim, the staff believes that with the current seating forces, the current leak rate tests will provide some indication of the leak tightness of the subject valves. In addition, these valves are exposed to containment atmosphere in the accident direction during the ILRT. As stated earlier, although the ILRT is not performed as frequently as Type C leak-rate tests, the ILRT does provide reasonable assurance that leakage through any penetration is limited. Based on the results of the current reverse direction test in conjunction with the ILRT, the NRC concludes that an exemption is technically justified for the period of two refueling outages. This time period would permit a reasonable time to implement necessary modifications to these valves to achieve compliance with Appendix J.

3. Exemption to Permit Type C Testing Using Water
Instead of Air or Nitrogen

By letter dated March 12, 1986, CYAPCO requested exemptions for 20 penetrations from the air/nitrogen testing requirements of Section III.C.2 of 10 CFR Part 50, Appendix J. The systems affected include the high pressure safety injection system, reactor coolant system, component cooling water system, and the reactor coolant pump seal water system. A complete listing of the affected penetrations is given in Table 1. All of the penetrations identified on Table 1 are currently tested with water during the required Type C tests.

The licensee currently applies a conversion factor to the water leakage rate to obtain an equivalent air leakage rate. The results are then added to the other Type C test results and compared to the acceptance criterion in Section III.C.3. While several empirical and theoretical relationships have been proposed by the industry for converting water leakage rates to equivalent air leakage rates, the NRC has not found such a relationship sufficiently rigorous or conservative to generically justify a revision to Appendix J.

The licensee has proposed to evaluate the water inventories for these penetrations and potential system modifications that would permit testing with air, in order to determine the most effective means to resolve this issue.

In the interim, the staff concludes that the Type C test with water and the use of the CYAPCO water to air conversion will provide reasonable assurance of the leakage integrity of these valves. Additionally, the operation and physical configuration of these systems provides a natural deterrent to containment leakage past the isolation valves following an accident. Based on the above, the NRC concludes that the exemptions granting temporary relief from Appendix J to permit Type C testing with water for these valves is technically justified for the period of two refueling outages. This time will provide adequate opportunity to modify the penetrations as necessary to achieve compliance with Appendix J.

4. Exemption to Permit Type C Testing With a Test Pressure Greater Than Pa.

By letter dated March 12, 1986, CYAPCO requested exemptions from Section III.C.2 of 10 CFR Part 50 Appendix J to permit Type C testing of 3 penetrations at pressures greater than Pa. These penetrations include the reactor coolant sampling system penetrations (P-11), the neutron shield fill line penetration (P-63) and the loop fill line penetration (P-69).

Currently, P-11 and P-69 are tested at normal system pressure, roughly 2000 psig. P-11 is the RCS sampling line and the design of this valve is such that the test pressure of 2000 psig tends to unseat the valve and increase leakage.

The design of the isolation valves in penetration P-63 is such that the test pressure of 70 psig tends to unseat the valve and increase leakage.

Penetration P-69 is a Class 1, seismic line inside of containment and normally isolated from the RCS. The isolation valve in penetration P-69 is a check valve that tends to seat tighter at the test pressure of 2000 psig; however, this line is vented during the ILRT. Penetrations P-63 and P-69 are also addressed in the preceding evaluation for Type C testing with water.

The licensee has requested exemptions from the test pressure requirements of Appendix J for these isolation valves in order to evaluate alternative corrective actions that would either permit testing at Pa or demonstrate conclusively that an exemption is warranted.

Although the current testing is performed at high pressures, the tests provide reasonable assurance of the leakage integrity of the isolation valves. The ILRT confirms these results at lower pressures because the reactor coolant system is vented for those tests. Additionally, the operation of plant systems and the physical configuration of the affected lines are a natural deterrent to containment leakage. Based on the above, the staff has concluded that exemptions granting temporary relief from the test pressure requirements is technically justified for a period of two refueling outages. This time period will provide adequate time to modify the penetrations as necessary to achieve compliance with Appendix J.

C. 10 CFR 50.12 Determinations for Special Circumstances

1. Permanent Exemption

By letter dated March 12, 1986, CYAPCO requested a permanent exemption from 10 CFR Part 50, Appendix J, to permit reverse direction testing of the auxiliary containment spray penetration (P-80). Pursuant to 10 CFR 50.12(a)(2), the Commission will not consider granting an exemption unless special circumstances are present. Item (ii) of the subject regulation includes special circumstances where application of the subject regulation is not necessary to achieve the underlying purpose of the rule.

As discussed previously, the NRC has concluded that given the system configuration, any significant leakage through this valve into containment would be detected because it would lead to a spray down of containment. In a sense this valve is under continuous test (maintenance of the fire water system pressure boundary). The staff has concluded that this system configuration with the reverse direction Type C test with water provides ade-

quate assurance that this valve is leak tight. Additionally, the licensee has proposed to flange the fire water system outside of containment to allow venting of this line during the ILRT. This will provide further assurance that this valve is leak tight. While the ILRT is not an individual test, it does assure that the total leakage through containment is below 0.75 La. Therefore, the ILRT does provide reasonable assurance that the leakage through any one penetration is limited to no greater than 0.75 La. Therefore, the staff concludes that a permanent exemption for penetration P-80 to perform reverse direction testing with water satisfies the underlying purpose of the rule as the proposed testing and the system configuration provides adequate assurance that this penetration is leak tight.

2. Exemptions Granting Temporary Relief

In an April 5, 1984 letter, the NRC staff noted that not all containment penetrations are tested in accordance with Appendix J. The Staff concluded that it was acceptable to defer implementation of specific Appendix J and Appendix A modifications until an integrated assessment, i.e., ISAP, could be performed. The basis for the staff's conclusion was that, although the integrated containment (Type A) leak test is not performed as frequently as local leak rate tests would be, the integrated leak rate test does provide an indication of overall containment leak-tightness, including penetrations.

In a July 31, 1985 letter, the NRC staff formally established the scope of the Haddam Neck Plant ISAP and designated Appendix J issues as ISAP Topic 1.03, "Containment Penetration Evaluations." In this letter, the staff notified CYAPCO that some issues would require exemptions to defer action until such time as the necessary modifications could be completed.

By letters dated March 12, and July 15, 1986, CYAPCO requested 29 exemptions from the requirements of various sections of 10 CFR Part 50, Appendix J. In most all cases, CYAPCO has described plant modifications required to bring the subject penetrations into compliance with the requirements of 10 CFR Part 50, Appendix J. The licensee has requested exemptions for the 29 penetrations until these modifications can be evaluated and ranked using an integrated safety assessment. As part of this effort, CYAPCO will schedule plant modifications based on the safety significance of each item and then incorporate the planned modification schedule into an integrated implementation schedule having defined completion dates. The staff has concluded that the necessary modifications to assure compliance with Appendix J can be completed during the next two refueling outages using the methodology described above.

In an effort to bring the Haddam Neck Plant into compliance with 10 CFR Part 50, Appendix J, CYAPCO has previously made modifications to the Haddam Neck Plant. In the 1983 outage, two penetrations were modified to permit testing as required by Appendix J. During the 1984 outage, penetration 62 was modified to meet Appendix J requirements, and a filtration system was added to the component cooling water (CCW) system in an effort to resolve substantial penetration leakage rates in this system. During the 1986 refueling outage, the capacity of the filtration system was increased. During an unplanned outage in July 1986, CYAPCO performed local leak rate tests on nine penetrations and all penetrations were found to be acceptable.

During the current 1987 outage modifications are being made to penetrations P-7, P-10, P-30, P-38, and P-60, P-23, P-31, P-35, P-36, P-37, P-59 and P-72B. CYAPCO will also install a flushing tee to the crosstie line between the component cooling water system and the service water system to help in removal of any silt that might affect the performance of the CCW valves. The 1987 outage modifications are projected to cost approximately 3.7 million dollars. CYAPCO also has ongoing engineering and procurement activities for future outages in an effort to bring the Haddam Neck Plant into compliance with 10 CFR Part 50, Appendix J.

The staff concludes that with the installed and planned modifications, CYAPCO has taken prudent steps in improving the Haddam Neck Plant containment integrity from both a risk and operating experience perspective. The modifications made during the previous outages demonstrate CYAPCO's good faith efforts in seeking ultimate resolution of Appendix J issues.

Pursuant to 10 CFR 50.12(a)(2)(v), the Commission will not consider granting an exemption unless the licensee has made good faith efforts to comply with the regulation. The NRC concludes that special circumstances, as described in 10 CFR 50.12(a)(2)(v), exist and the exemptions for temporary relief from 10 CFR Part 50, Appendix J, should be granted.

IV

Accordingly, the Commission has determined pursuant to 10 CFR 50.12(a), that (1) these exemptions as described in Section III are authorized by law, will not present an undue risk to the public health and safety, and

are consistent with the common defense and security. Special circumstances are present for the reverse direction testing of penetration P-80 in that application of the regulation in this particular circumstances is not necessary to achieve the underlying purposes of Appendix J to 10 CFR Part 50. Further, special circumstances, as given in Section III.C, are present for exemptions granting temporary relief as described in Section III.B above. In summary CYAPCO has demonstrated a good faith effort to comply with the regulations by modifying existing penetrations over the last four outages in an effort to reduce containment leakage problems and assure compliance with Appendix J. Therefore, the Commission hereby grants the exemption requests identified in Section III above.

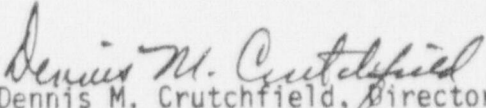
Further, the Commission grants the exemptions from the requirements of 10 CFR Part 50, Appendix J, for all penetrations identified in Table 2 of this exemption package for a period of two refueling outages following the 1987 outage. Within three months after startup from the 1987 outage, CYAPCO will provide a final description of all Appendix J modifications performed during the 1987 outage and a schedule for resolution of all outstanding Appendix J issues.

Pursuant to 10 CFR 51.32, the Commission has determined that the issuance of this exemption will have no significant impact on the environment (51 FR 18521, May 20, 1986 and 51 FR 29527, August 18, 1986).

A copy of the Commission's concurrent Safety Evaluation related to this action is available for public inspection at the Commission's Public Document Room, 1717 H Street, N.W., Washington, D.C. and at the local public document room located at the Russell Library, 123 Broad Street, Middletown, Connecticut 06457.

These Exemptions are effective upon issuance.

FOR THE NUCLEAR REGULATORY COMMISSION


Dennis M. Crutchfield, Director
Division of Reactor Projects - III, IV, V
and Special Projects
Office of Nuclear Reactor Regulation

Dated at Bethesda, Maryland this
29 day of September, 1987.

TABLE 1

Summary List of Exemption Requests for
Penetrations with Type C Water Tests

Penetration Number	System Location
1. P-3	High pressure safety injection
2. P-7	RCP seal water return
3. P-10	RCS letdown
4. P-11	RCS sampling
5. P-24	Safety injection recirculation
6. P-28	CCW to RCP oil coolers
7. P-30	Space heating steam supply
8. P-34	CCW from RCP thermal barrier
9. P-38	CCW to RCP thermal barrier
10. P-60	CCW to neutron shield cooler
11. P-61	CCW from neutron shield cooler
12. P-63	Neutron shield fill
13. P-66	CCW to drain cooler
14. P-67	CCW from drain cooler
15. P-68	Primary water to containment
16. P-69	Loop fill
17. P-74	RCP seal water supply
18. P-75	RCP seal water supply
19. P-76	RCP seal water supply
20. P-77	RCP seal water supply

TABLE 2

Summary of Exemptions for Temporary Relief Granted

Penetration No.	System Location	Exemption Category
P-3	High pressure safety injection	Type C test
P-7	RCP seal water return	Reverse direction test
P-8	Containment Sump to RHR section line	Type C test
P-10	RCS letdown	Water test
P-11	RCS sampling	Water test and overpressure test
P-24	Safety injection recirculation	Water test
P-28	CCW to RCP oil coolers	Water test
P-30	Space heating steam supply	Water test
P-33	Refueling cavity purification system	Reverse direction test
P-34	CCW from RCP thermal barrier	Water test
P-38	CCW to RCP thermal barrier	Water test
P-60	CCW to neutron shield cooler	Water test
P-61	CCW from neutron shield cooler	Water test
P-63	Neutron shield fill	Water test and Overpressure test
P-66	CCW to drain cooler	Water test
P-67	CCW from drain cooler	Water test
P-68	Primary water to containment	Water test
P-69	Loop fill	Water test and Overpressure test
P-74	RCP seal water supply	Water test
P-75	RCP seal water supply	Water test
P-76	RCP seal water supply	Water test
P-77	RCP seal water supply	Water test
P-78	Pressurizer relief tank	Reverse direction test
P-80	Auxiliary containment spray	Type C testing