



CONNECTICUT YANKEE ATOMIC POWER COMPANY

BERLIN, CONNECTICUT

P. O. BOX 270 HARTFORD, CONNECTICUT 06101

TELEPHONE
203-666-6911

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Docket No. 50-213
B10556

Mr. Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

- References
- (1) D. G. Eisenhut letter to All Licensees of Operating Plants Applicants for Operating Licenses and Holders of Construction Permits, dated October 31, 1981; forwarding NUREG-0737.
 - (2) W. G. Council letter to D. G. Eisenhut, dated April 13, 1982.
 - (3) W. G. Council letter to D. G. Eisenhut, dated July 9, 1982.

Gentlemen:

Haddam Neck Plant
NUREG-0737 Item II.D.1; Performance Testing of PWR
Relief and Safety Valves

Item II.D.1 of Reference (1) requires licensees of pressurized water reactors to submit plant-specific reports on the qualification of reactor coolant system relief and safety valves. In Reference (2), Connecticut Yankee Atomic Power Company (CYAPCO) docketed the test reports which had been submitted by Mr. D. Hoffman of Consumers Power Company on behalf of the participating PWR Utilities. In Reference (3), CYAPCO informed the Staff that the plant-specific report for Haddam Neck was being prepared and would be the subject of future correspondence. The purpose of this submittal is to provide the plant-specific evaluation required by NUREG-0737 Item II.D.1.

1.0 DESCRIPTION OF SAFETY AND RELIEF VALVE INSTALLATION

- 1.1 PORV's - The two PORV's at Haddam Neck are air-operated Copes-Vulcan relief valves with no loop seal.
- 1.2 Code Safety Valves - Haddam Neck has three Crosby 3K26 safety valves mounted directly on the pressurizer with no loop seal.

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- 1.3 Overpressure Protection System (OPS) Relief Valves - Haddam Neck uses two Crosby 3L4 spring loaded relief valves for low temperature over-pressure protection. These valves are blocked out of service during normal operation.

2.0 TEST VALVE SELECTION JUSTIFICATION

NUREG 0737 Item II.D.1 requires justification that the valves tested by EPRI represent the valves installed at the Haddam Neck Plant.

- 2.1 PORV's - The applicable PORV tested by EPRI is identical to the PORVs at Haddam Neck. For details regarding this test valve selection refer to Appendix B2 of the EPRI Valve Selection/Justification Report.
- 2.2 Code Safety Valves - The applicable safety valve tested by EPRI is the same in nominal size and materials, however, the test valve had a slightly smaller orifice than the safety valves at Haddam Neck (1.531 inch as opposed to 1.800 inch). This difference is justified in Appendix A1 of the EPRI Valve Selection/Justification Report.
- 2.3 OPS Safety Valves - The CYAPCO/Wyle tests were conducted using the Haddam Neck OPS relief valves.

NOTE: Because the Haddam Neck Overpressure Protection System is unique, these valves were not covered by the EPRI testing. CYAPCO performed full flow testing on these valves at Wyle Labs in February, 1979. CYAPCO intends to use the test data from those tests to fulfill the NUREG 0737 testing requirement for the OPS relief valves.

For more details of the valve installation, refer to Table (1) and the attached drawing (NUSCO Drawing No. 16103-29143).

As stated in Reference (3), discharge piping will be discussed in a separate submittal on or about November 1, 1982.

3.0 TEST CONDITIONS JUSTIFICATION

NUREG 0737 Item II.D.1 requires evidence that the fluid conditions under which the valves were tested are equivalent to those expected at the Haddam Neck Plant.

The position taken by the PWR utilities, is that those "expected" fluid conditions will be determined based on an assessment of conditions resulting from the following:

1. Transients and accidents evaluated in each plant's FSAR (or FDSA).
2. The extended operation of the High Pressure Safety Injection System.
3. Cold Overpressurization Events.

In an effort to assist the PWR Utilities with meeting this requirement, EPRI contracted with each of the NSSS vendors to provide a generic report of valve inlet fluid conditions for plants of their design.

Westinghouse (contracted by EPRI) developed a generic report, "Valve Inlet Fluid Conditions for Pressurizer Safety and Relief Valves in Westinghouse designed Plants," March 1982, which defines the range of fluid conditions expected in most of their plants. However, Haddam Neck was not specifically addressed in this report because Haddam Neck does not use Westinghouse fuel. In order to fulfill the test condition justification requirement of NUREG 0737 Item II.D.1, CYAPCO performed a plant-specific evaluation of expected fluid conditions. This evaluation concluded the fluid conditions tested by EPRI and CYAPCO (OPS RV's) indeed envelop those expected at Haddam Neck. The basis for this conclusion is as follows:

3.1 FSAR Events

- 3.1.1 The predicted maximum pressurizer pressure is less than the tested value of 2750 psia.
- 3.1.2 The predicted pressurizer pressure ramp rate is bounded by the tested range of 2-300 psi/sec.

3.2 Extended High Pressure Liquid Injection

Consistent with the utilities' position submitted to the NRC in July, 1980, this test condition event is only applicable to those plants where the safety injection system is capable of injection at valve set pressures (2400 to 2500 psia). Since the shutoff head of the HPSI pumps at Haddam Neck is approximately 1200 psia, this test condition event is not applicable and, therefore, does not require justification.

3.3 Cold Overpressure Event

- 3.3.1 The comparison of predicted fluid conditions to the conditions tested by CYAPCO/Wyle for CY's OPS RV's is as follows:

	Predicted	Tested
-Discharge Fluid	Liquid Only	Liquid
-Min. Liquid Temp.	100°F*	200°F
-Max. Liquid Temp.	390°F	400°F
-Liquid Pressure	360-390 psig	332-438 psig

*Note: In this case, the predicted fluid condition was not duplicated by the tests. However, water flow models indicate there will be little difference in valve duty between 345°F and 245°F subcooling (100°F at 380 psig and 200°F at 380 psig, respectively). Therefore, CYAPCO concludes the CYAPCO/Wyle test conditions are equivalent to the OPS event conditions predicted for the Haddam Neck Plant.

4.0 TEST RESULTS

- 4.1 PORV's - Refer to Page 4-61 of the EPRI PWR SV/RV Test Program, and Relief Valve Test Report.
- 4.2 Code Safety Valves - Refer to Page 3-35 of the EPRI PWR SV/RV Test Program, Safety and Relief Valve Test Report. Since the code safety valves are mounted directly to the pressurizer, the short inlet pipe configuration tests are applicable (Test Report Section 3.3.2.a).
- 4.3 OPS Relief Valves - Refer to the attached Wyle Certification Test Report. A chronological summary of this testing follows.

Friday, February 16, 1979:

Valve #2 underwent hot water tests. With water at 400°F, the valve was popped and found to be out of specification. The set pressure nut and blowdown ring were adjusted until specified values were met. Three additional, satisfactory pops were obtained at 400°F, then three at 200°F.

The final leak check (using water) indicated that the valve had developed substantial leakage as a result of the many opening cycles done during the test. It was concluded that the valve should be relapped.

Saturday, February 17, 1979:

Both valves were disassembled and decontaminated in preparation for reworking the following day.

Sunday, February 18, 1979:

Both valves were lapped and reassembled by Crosby. Set pressure adjusting nut and blowdown ring on both were set to factory specifications.

Monday, February 19, 1979:

Both valves were leak tested using N₂ to verify that they had been properly lapped. Both were leak free.

Tuesday, February 20, 1979:

Valve #2 was hot water tested. To minimize the danger of developing new leaks during testing, it was decided to decrease the number of cycles as follows: Two good pops at 400°F (after setting valve to within specification), then one pop at 300°F, then one at 200°F. Here, a very high set pressure was experienced which repeated itself in two successive attempts. A slower pressure ramp was tried, but this caused some chattering of the valve. On the advice of the Crosby representative, the valve was disassembled, examined, and relapped.

Wednesday, February 21, 1979:

Valve #2 was tested according to the abbreviated test schedule described above. It remained within specifications throughout the temperature range. There was an acceptable amount of leakage (one drop every two seconds), noted during the final leak test.

Valve #1 was then tested in the same manner, and remained within specifications. The leak test indicated no leakage.

5.0 PLANT SPECIFIC EVALUATION OF TEST RESULTS

5.1 PORV's

For all twenty applicable tests the PORV fully opened and fully closed on demand. Following test completion, the valve was disassembled and inspected by the Copes-Vulcan representative. No damage was observed that would effect future valve performance.

Based on this favorable performance, CYAPCO has determined that the PORV's at the Haddam Neck Plant will operate in an acceptable manner.

5.2 Code Safety Valves

CYAPCO's evaluation of the EPRI test results indicate the safety valves at the Haddam Neck Plant are adequate to perform their intended safety function. However, several safety valve performance concerns were uncovered during the EPRI testing. To assist in addressing these concerns, CYAPCO participated in a Westinghouse Owners Group effort devoted to evaluating pressurizer safety valve performance as observed in the EPRI RV/SV Test Program. The results of the owner's group efforts are reported in WCAP-10105, Review of Pressurizer Safety Valve Performance as observed in the EPRI Safety and Relief Valve Test Program.

In parallel with the Westinghouse Owner's Group efforts, CYAPCO performed an independent review of the EPRI tests. CYAPCO efforts identified a performance concern not specifically covered by the Westinghouse report; this concern is described and assessed below.

Long Safety Valve Blowdown

During steam testing of the Crosby 3K6 safety valve (applicable to Haddam Neck) out of specification ring adjustments were required to reduce valve blowdown. Blowdown is defined as the percent below the valve set point pressure at which the valve reseats. ASME Code criteria is 5% blowdown. With the Crosby recommended ring settings, the valve consistently had blowdowns between 10% and 11% (equivalent to reseat pressures of 2250 and 2225 psia, respectively).

Assessment

The excessive blowdown raises the concern that the safety valve may reseal below pressurizer or RCS saturation pressure. However, CY normal operating pressure is 2000 psig, providing 15-20° subcooling in the pressurizer with 10% blowdown. Therefore, it is concluded that SV blowdown of 10-11% is not a safety concern.

5.3 OPS Relief Valves

For all four tests reported in the attached Wyle test report the valves opened and closed in a stable manner with acceptable blowdowns (percent below set pressure at which valve reseats). Therefore, since the valve performance was consistent with safety analysis assumptions, CYAPCO concludes that the CYAPCO/Wyle tests demonstrate that the OPS Relief Valves will operate in an acceptable manner.

6.0 CONCLUSIONS

CYAPCO concludes that the EPRI testing and the CYAPCO/Wyle testing provide sufficient evidence that the safety and relief valves at the Haddam Neck Plant will operate in an acceptable manner and modifications to the valve/inlet piping system are not required. This conclusion is based on the following:

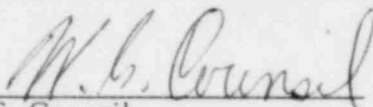
- 6.1 The applicable valves which EPRI tested are equivalent to the valves at the Haddam Neck Plant.
- 6.2 The fluid conditions tested by EPRI and CYAPCO/Wyle are equivalent to the expected operating and accident conditions for Haddam Neck.
- 6.3 CYAPCO's plant specific evaluation concluded that although several valves performance concerns were identified during the EPRI testing, the PORV's, safety valves and OPS relief valves at Haddam Neck will operate in an acceptable manner.

The effect of the discharge piping on valve operability is presently being evaluated. The results of this evaluation will be reported to NRC by November 1, 1982, as committed to in Reference (3).

CYAPCO concludes that this submittal fulfills the plant-specific requirements of NUREG 0737, Item II.D.1, (excluding the discharge piping evaluations) for the Haddam Neck Plant. We trust the Staff will find this information sufficient to resolve any concerns related to the relief and safety valves in use at the Haddam Neck Plant.

Very truly yours,

CONNECTICUT YANKEE ATOMIC POWER COMPANY

A handwritten signature in cursive script, appearing to read "W. G. Council", written over a horizontal line.

W. G. Council
Senior Vice President

TABLE ONE

RCS SAFETY AND RELIEF VALVES

	QTY	SIZE	MANUFACTURER MODEL	RATED CAPACITY	INLET PIPE		BACK PRESSURE RANGE	BLOWDOWN
					DIAMETER	TYPE		
SAFETY VALVES	3	3K ₂ 6	Crosby HB-86BP 1.800" Orifice (1.531" tested)	293,000 lb/hr (212,182 lb/hr tested)	3" Sch. 160 (3" Sch. 160 tested)	Non-Loop Seal, Short (15") (21" tested)	227-541 psia expected (230-842 psia tested)	5% Expected (3.6-11% tested)
PORV'S	2	3"	Copes-Vulcan D-100-160 Air Operated W/Stellite Plug (Same as tested)	210,000 lb/hr @ 2485 psig	3" Sch. 160	Non-Loop Seal	331-472 psia expected (215-635 psia tested)	N/A
OPS RELIEF VALVES	2	3L4	Crosby JB-35-TD-WR 2.853" Orifice (actual installed valves tested)	1512 gpm	3" Sch. 160	Non-Loop Seal	224-504 psia expected (tested values not available)	5% (5.2-10.2% tested)