

YANKEE ATOMIC ELECTRIC COMPANY

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2.C.2.1
FYR 85-98

September 16, 1985

United States Nuclear Regulatory Commission
Washington, DC 20555

Attention: Mr. John A. Zwolinski, Chief
Operating Reactors Branch No. 5
Division of Licensing

References: (a) License No. DPR-3 (Docket No. 50-29)
(b) YAEK Letter to USNRC, dated August 16, 1985
(c) "Mixing of Emergency Core Cooling Water With Steam:
1/14 Scale Testing Phase," EPRI-294-2, Key Phase Report,
January 1975
(d) "Mixing of Emergency Core Cooling Water With Steam:
1/3 Scale Test and Summary," EPRI-294-2, Final Report,
June 1975

Subject: LOCA Injection ΔP Penalty

Dear Sir:

Yankee Atomic Electric Company proposed to replace the currently approved injection ΔP penalty of 0.8 psid during pumped ECCS flow by an injection ΔP penalty of 0.15 psid. The justification for the proposed change was provided in Reference (b). The NRC staff has reviewed Reference (b) and has requested additional information which is provided herein.

The proposed injection ΔP penalty was based on the experimental evidence reported in References (c) and (d). All the data obtained with the pumped ECCS flow conditions were used in arriving at the proposed injection ΔP penalty of 0.15 psid. The relevant reflood phase parameters (core pressure, steam momentum, ECC injection velocity, ECC water temperature) expected for the Yankee plant were compared against the test conditions. All of the above parameters, except the ECC injection flow velocity, are within the range of test conditions. ECC injection velocity was varied between 1 and 16 fps in the test as opposed to 45 fps expected in Yankee. References (c) and (d) were reviewed and it was concluded that a lower injection ΔP penalty should be expected for higher injection velocities bounding the proposed injection ΔP penalty of 0.15 psid.

The NRC staff reviewed our submittal and pointed out that Reference (c) also included tests at injection water velocities of 40 and 70 fps. They requested that these results should also be reviewed.

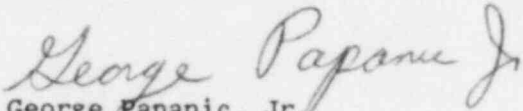
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Table 1 provides the results of our review. An injection water velocity of 45 fps is expected in the Yankee plant. Therefore, only 40 fps injection water velocity data were included in our review. The last column in Table 1, DP10-DP9, represents the cold leg pressure drop. This pressure drop includes the pipe frictional loss which should be appropriately subtracted from (DP10-DP9) to obtain the injection ΔP penalty. Since a higher ΔP penalty yields conservative flooding rates, the pipe frictional loss was conservatively neglected in our calculations and (DP10-DP9) is reported as the injection ΔP penalty.

All data with 40 fps injection velocity is reported in Table 1. Thirteen out of 16 data points showed zero or negative pressure drop for the injection ΔP penalty (DP10-DP9). The remaining three points are bounded by the proposed injection ΔP penalty of +0.15 psid. The use of the proposed ΔP penalty during pumped ECC injection is based on applicable, experimental data and is therefore in compliance with Appendix K requirement I.D.4.

Very truly yours,



George Papanic, Jr.
Senior Project Engineer - Licensing

GP/dps

TABLE 1

Ref/Run #	Pressure PSI	Inj. Water Velocity fps	Steam Mom-Flux PSI	DP10 PSI	DP9 PSI	DP10-DP9* PSI
4/2-15	20.0	39.6	1.078	0.0	0.0	0.0
8/2-19	20.1	40.3	.122	0.0	0.0	0.0
25/2-36	59.8	40.3	1.132	0.0	0.0	0.0
26/2-37	59.7	40.50	.663	0.0	0.0	0.0
27/2-38	59.3	40.50	.136	0.0	0.0	0.0
262/4-55	59.7	40.65	.86	-0.13	0.8	-0.93
263/4-55	60.5	40.76	0.816	-0.12	0.75	-0.87
264/4-55	59.7	40.79	0.854	-0.13	0.78	-0.91
265/4-56	59.2	40.58	0.542	-0.02	0.55	-0.57
266/4-56	60.3	40.38	0.510	0.01	0.45	-0.44
267/4-56	59.0	40.58	0.576	0.0	0.53	-0.53
268/4-57	59.8	40.52	0.335	0.09	0.33	-0.24
269/4-57	59.7	40.50	0.340	0.09	0.34	-0.25
270/4-58	59.7	40.52	0.107	0.18	0.08	+ .10
271/4-58	58.6	40.51	0.143	0.17	0.13	+ .04
272/4-58	59.2	40.49	0.120	0.19	0.10	+ .09

* Injection ΔP Penalty