PSNH PUBLIC SERVICE
Company of New Hampshire

SEABROOK STATION
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August 21, 1984

SBN- 705
T.F. B7.1.2

United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing

References:
(a) Construction Permits CPPR-135 and CPPR-136, Docket Nos. 50-443 and 50-444
(b) NUREG-0896, "Safety Evaluation Report Related to the Operation of Seabrook Station Units 1 and 2", dated March 10, 1983
(c) PSNH Letter, dated August 9, 1984, "Alternate Pipe Break Design Criteria", J. DeVincentis to G. W. Knighton

Subject: Safety Evaluation Report (SER) Outstanding Issue No. 5, "Loading Combinations, Design Transients, and Stress Limits"

Dear Sir:

In response to Safety Evaluation Report Outstanding Issue No. 5, which is delineated in Section 3.9.3.1, Reference (b), the Public Service Company of New Hampshire (PSNH) will summarize herein the methodology employed to ensure functional capability of essential ASME Class 1 piping at Seabrook Station. This summary is derived from an evaluation performed for PSNH by the Westinghouse Electric Corporation. This evaluation was based on the assumption that NRC approval has been granted for postulated Reactor Coolant Loop (RCL) pipe rupture elimination through the application of mechanistic fracture mechanics techniques. In Reference (c), PSNH requested that the Staff grant partial exemption from 10CFR50 Appendix A, General Design Criteria 4 (GDC-4) requirements for postulating breaks in RCL piping. Therefore, the validity of this report is contingent on your approval of this exemption request. Similar GDCR-4 exemption requests have already been approved for other utilities.

The analysis contained in the W report was performed for essential Class 1 piping systems for which functional capability must be demonstrated. These piping systems were evaluated to the following three stress criteria:

1. The ASME Boiler and Pressure Vessel Code, Section III, 1971 Edition, up to and including Winter 1972 Addenda. Subsection NB and Appendix F. This is the code of record as indicated the Seabrook FSAR.

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2. The ASME Boiler and Pressure Vessel Code, Section III, 1980 Edition, up to and including Winter 1981 Addenda, Subsection NB, Level C primary stress limits.

3. Westinghouse recommended Criterion for functional capability of Class 1 piping. This criterion is included as Attachment A.

Having evaluated the results of the W report, PSNH has concluded that functional capability of essential Class 1 Piping Systems has been sufficiently demonstrated. Justification for this conclusion is based on:

1. The ASME Code evaluations were performed for approximately 4300 analysis points and of these only six analysis points exceeded the criteria allowables. The number of piping components (six) that exceeded criteria allowables were very few relative to the total number analyzed.

2. For the six points that exceed criteria allowables:

   a. The maximum margin above Criterion 2 allowables was less than 9%.
   b. The maximum margin above Criterion 3 allowables was less than 3%.

3. The resultant deformation of the piping components at these points would be minimal.

4. Flow area for thick-walled piping components, in this case all being concentric reducers, not elbows, is not significantly reduced even for large displacements.

Consequently, PSNH feels that the functional capability of essential Class 1 Piping Systems has been sufficiently demonstrated. Your prompt review of this letter is requested.

Very truly yours,

YANKEE ATOMIC ELECTRIC COMPANY

John DeVincentis

John DeVincentis, Director
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Attachment
cc: Atomic Safety and Licensing Board Service List

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ATTACHMENT A

Westinghouse Criteria for Demonstrating Functional Capability of Class 1 Piping Systems

Included herein are proposed Westinghouse criteria for demonstrating the functional capability of Class 1 piping. These criteria apply to piping systems with $P/t \leq 16$.

A. For elbows and bends, functional capability may be considered assured when the following requirement is met:

$$2B_1 \frac{PD_i^2}{D_o^2 - D_i^2} + B_2 \frac{Mi}{Z} \leq 1.8 \ S_y$$

where $B_1 = (-0.1 + 0.4h)$ and $0 \leq B_1 \leq 0.5$

and $B_1 = 0.5$ for $B_2 = 1.0$

$$B_2 = \begin{cases} 1.3/h^{2/3} & \text{for } \alpha_o > 90° \\ 0.895\ h^{0.912} > & \text{for } \alpha_o = 90° \\ 1.0 & \text{for } \alpha_o = 0° \end{cases}$$

but not less than 1.0, linear interpolation may be used for $0 < \alpha_o < 90°$

$h = \frac{tR}{r_m^2}$, where

- D_o = outside diameter of pipe, in.
- D_i = inside diameter of pipe, in.
- t = nominal pipe wall thickness, in.
- R = bend radius of curved pipe or elbow, in.
- r_m = mean pipe radius = $(D_o - t)/2$, in.
- α_o = bend angle, deg.

Other terms defined in NB-3652, $Z = \frac{2I}{D_o}$, in.^{3}.

B. For straight pipes, girth butt weld, girth fillet weld, girth socket weld connections, tapered transitions and longitudinal butt welds, functional capability may be considered assured when the following requirement is met:

$$2B_1 \frac{PD_i^2}{D_o^2 - D_i^2} + B_2 \frac{Mi}{Z} \leq 1.8\ S_y$$

$$B_1 = 0.5,\ B_2 = 1.0$$

where $Z = \pi r_m^2 t$, r_m is pipe mean radius and t is the thickness of the pipe.

C. For branches and tees, functional capability can be considered assured if the following condition is met:

$$2B_1 \frac{PD_i^2}{D_o^2 - D_i^2} + B_{2b} \frac{M_b}{Z_b} + \frac{M_r}{Z_r} \leq 1.8\ S_y$$

where B_1, B_{2b}, B_{2r}, Z_b and Z_r are defined in NB-3650 of the ASME Section III Code of the 1983 Edition.

D. For reducers, functional capability can be considered assured when the following requirement is met:

$$2B_1 \frac{PD_i^2}{D_o^2 - D_i^2} + B_2 \frac{M_i}{Z} \leq 1.8\ S_y$$

where $B_1 = 0.5$ for $\alpha \leq 30°$ and

$B_1 = 1.0$ for $\alpha > 30°$

$B_2 = 1.0$

and $Z = \pi r_m^2 t$

where α = cone angle of reducer, deg.

E. For bolting of flanged joints, functional capability can be considered assured when the Level D requirements of ASME SEction III Code 1983 Edition (NB-3658) are met.