

July 10, 1981

Docket No. 50-213
LS05-81-07-032



Mr. W. G. Council, Vice President
Nuclear Engineering and Operations
Connecticut Yankee Atomic Power Corp.
Post Office Box 270
Hartford, Connecticut 06101

Dear Mr. Council:

SUBJECT: SEP TOPIC XV-16, RADIOLOGICAL CONSEQUENCES OF FAILURE
OF SMALL LINES CARRYING PRIMARY COOLANT OUTSIDE CONTAIN-
MENT (HADDAM NECK)

Enclosed is our draft evaluation of SEP Topic XV-16 for the Haddam Neck plant. This evaluation compares your facility as described in Docket No. 50-213 with the criteria currently used for licensing new facilities. The evaluation utilizes information contained in your June 20, 1980 submittal. Please respond within 30 days if your as-built facility differs from the licensing basis assumed in our assessment. If no response is received within 30 days we will assume the evaluation is correct.

You will note that the evaluation assumes that the primary coolant activity is limited to a value consistent with the Standard Technical Specification (STS) values. It is our understanding that you intend to implement STS in the future. Since you intend to convert to STS which include provisions for limiting the primary coolant activity, no action is required until the plant integrated safety assessment. If the STS are not implemented by that time, this item will be evaluated during the integrated assessment.

This evaluation will be a basic input to the integrated safety assessment for your facility unless you identify changes needed to reflect the as-built conditions at your facility. This topic assessment may be revised in the future if your facility design is changed or if NRC criteria relating to this topic are modified before the integrated assessment is completed.

Sincerely,

SEDA
5/11

DSU USE EX(02)

Add: Gary - 101
Staley

Dennis M. Cutchfield, Chief
Operating Reactors Branch No. 5
Division of Licensing

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PDR ADOCK 05000213
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Enclosure:

As stated
WRussell
cc w/enclosure
See next page

SEP:DL
GCwalina:dk
7/8/81

SEP:DL
CBerlinger
7/8/81

ORB#5:DL:PM
RCarusso
7/9/81

ORB#5:DL:C
DCrutchfield
7/9/81

AD:SA:DL
GLainas
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OFFICE	As stated	SEP:DL	SEP:DL	ORB#5:DL:PM	ORB#5:DL:C	AD:SA:DL
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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Sincerely,

Walter A. Paulsen

for Dennis M. Crutchfield, Chief
Operating Reactors Branch No. 5
Division of Licensing

Enclosure:
As stated

cc w/enclosure:
See next page

Mr. W. G. Council

cc

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HADDAM NECK PLANT
(CONNECTICUT YANKEE)
SYSTEMATIC EVALUATION PROGRAM

XV-16 RADIOLOGICAL CONSEQUENCES OF FAILURE OF SMALL LINES CARRYING PRIMARY COOLANT OUTSIDE CONTAINMENT

I. INTRODUCTION

Rupture of lines carrying primary coolant outside containment can allow primary coolant and the radioactivity contained therein to escape to the environment. SEP Topic XV-16 is intended to review the radiological consequences of such failures. The review of this topic encompassed those lines which carry primary coolant outside containment during power operation. The scope included those lines that are not normally expected to be open to the primary system but can be opened during power operation (i.e., reactor coolant sample lines, instrument lines, etc.)

II. REVIEW CRITERION

All small lines carrying primary coolant outside containment were reviewed to ensure that any release of radioactivity from their postulated failure was a small fraction of the 10 CFR Part 100 exposure guidelines. Small fraction is defined in the SRP to be no more than 10% of the 10 CFR Part 100 exposure guidelines.

III. RELATED SAFETY TOPICS AND INTERFACES

Lines which were excluded from this review included lines for which failure outside containment is not postulated, or lines for which interlocks prevent opening during power operation (e.g. the PWR residual heat removal lines). The review also did not consider the release of radioisotopes from large pipes carrying primary system fluid prior to automatic isolation of such lines.

IV. REVIEW GUIDELINES

The review was conducted in accordance with SRP 15.6.2. The licensee was requested to provide plant specific information such as the identification of lines covered by this Topic, the size of these lines, break locations and flow, etc. The licensee responded to this request in a letter dated June 20, 1980.

V. EVALUATION

We reviewed Connecticut Yankee's (licensee's) June 20, 1980, submittal received in response to the request for information regarding small lines carrying primary coolant outside the containment. The licensee indicated that the line for the worst-case break (that did not have isolation valves inside and outside containment) of this type was the Loop #1 hot leg sample line, with an ID of 0.245 inch. An independent evaluation of the maximum possible flow from a break in this line, outside containment, but upstream of any valves outside containment, was performed. This flow rate, based on very conservative assumptions, is 100 pounds per minute. (Neither this flow rate or the resulting dose is limiting for this analysis - the letdown line break, described later, is). The duration of the leak is dependent on the time required to manually isolate the instrument lines. The licensee has indicated that this could be accomplished in 30 minutes, based on the following signal indications: area radiation monitors and volume control tank level rate of change indicators. The total amount leaked, therefore, is 3000 pounds.

An iodine spike is assumed to occur at the time of the pipe break, resulting in a gradual increase in coolant iodine concentration. This iodine spike

is modelled by a 500-fold increase in the iodine release rate from the fuel, as specified in SRP 15.6.2. The amount of iodine that could be released to the coolant is unacceptably high, unless the coolant iodine concentration is limited by technical specifications. The plant's current technical specifications do not contain a limit for iodine concentration in the reactor coolant.

Assuming that the Standard Technical Specifications for Westinghouse plants for coolant activity are implemented, the iodine release rate is based on an equilibrium concentration of 1.0 $\mu\text{Ci/g}$ Dose Equivalent I-131. The amount of iodine released to the environment is conservatively assumed to be all that is flashed after release out the break, based on the hot leg temperature. Based on the above assumptions and parameter the 0-2 hour EAB thyroid dose is calculated to be 3.4 rem, and the 0-30 day LPZ dose is about 0.1 rem thyroid. The whole-body EAB and LPZ doses are small fractions of the thyroid doses. These doses are less than 10% of the dose guidelines in 10CFR100, and therefore comply with the SRP 15.6.2 dose criterion.

A review of other lines carrying primary coolant and penetrating the containment was performed to determine the need for any special technical specification limits for the isolation valves in these lines. The letdown line of the Chemical and Volume Control System was identified to be the largest such line. This is a three inch line with inboard and outboard isolation valves, and three pressure reduction orifices (letdown orifices) in parallel upstream of the outboard isolation valve. The containment isolation valves closure signals have been upgraded as a result of TMI Lessons Learned (Diverse Isolation Signals), so that either low pressurizer pressure, low pressurizer level, or high containment pressure signals will cause the valves to close.. Based on these isolation signals, it is assumed that a leak from a ruptured letdown line will be isolated within 30 minutes.

The break is assumed to occur downstream of the outboard isolation valve, and the flow rate is limited by the letdown orifices to about 5% higher than the maximum flow rate during normal operation, which is 170 gpm. Thus, it is predicted that 5400 gallons (31,400 lbs) of coolant will be released before the leak is isolated. An iodine spike is assumed to occur as described above. The flashing fraction is based on the cold leg temperature; no credit is taken for the regenerative heat exchanger.

The calculated 0-2 hour EAB dose resulting from the letdown line break is 29.8 rem thyroid, and the 0-30 day LPZ dose is 0.5 rem thyroid. The whole-body doses are small fractions of the thyroid doses. These doses are also within 10% of the dose guidelines of 10CFR100. They therefore comply with the SRP 15.6.2 dose criterion, provided that Standard Technical Specifications on reactor coolant activity are implemented.

VI. CONCLUSIONS

It is concluded that the radiological consequences of small line failures outside containment are a small fraction of the 10 CFR 100 guidelines, provided that the Standard Technical Specifications for coolant activity are implemented in order to limit reactor water iodine concentrations. Since the licensee is converting to STS which include provisions for limiting the primary coolant activity no action is required until the plant integrated safety assessment. If the STS are not implemented by that time, this item will be evaluated during the integrated assessment.