

December 1, 1982

Docket No. 50-29
LS05-82 -12-002

Mr. James A. Kay
Senior Engineer - Licensing
Yankee Atomic Electric Company
1671 Worcester Road
Framingham, Massachusetts 01701

Dear Mr. Kay:

SUBJECT: YANKEE NUCLEAR POWER STATION - SEP TOPIC XV-16, RADIOLOGICAL
CONSEQUENCES OF FAILURE OF SMALL LINES CARRYING PRIMARY
COOLANT OUTSIDE CONTAINMENT

Enclosed is the staff's revised final evaluation of SEP Topic XV-16 for the Yankee Plant. This evaluation is based on our review of your topic safety assessment report submitted by letter dated February 1, 1982, and additional information submitted on June 15, 1982 and at a November 18, 1982 meeting.

The staff made an independent assessment of this topic, for reasons given in the evaluation, and found that the doses meet the acceptance criteria.

The enclosed safety evaluation will be a basic input to the integrated safety assessment for your facility unless you identify changes needed to reflect the as-built condition of your facility. The 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,

SEOY
DSU USE(11)

ADD:

Ralph Caruso, Project Manager
Operating Reactors Branch #5
Division of Licensing

M. Boyle

Enclosure: As stated

cc w/enclosure: See next page

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| OFFICE | SEP B:DL <i>PM</i> | SEP B:DL <i>MB</i> | SEP B:DL <i>CG</i> | SEP B:DL | ORB#5:PM | ORB#5:BC |
| SURNAME | TMichaels:dk | MBoyle | CGrimes | WRussell | RCaruso | DCrutchfield |
| DATE | 11/24/82 | 11/24/82 | 11/24/82 | 11/24/82 | 12/1/82 | 12/1/82 |

Mr. James A. Kay

cc

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SYSTEMATIC EVALUATION PROGRAM

TOPIC XV-16

YANKEE

TOPIC 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 radioactive material in it to escape to the environment. SEP Topic XV-16 is intended to review the radiological consequences of such failures. The review of this topic included those lines which carry primary coolant outside containment during power operation, including 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 the dose from any release of radioactivity from their postulated failure was a small fraction of 10 CFR Part 100 exposure guidelines. Small fraction is defined in the Standard Review Plan to be no more than 10% of the guideline values.

III. RELATED SAFETY TOPICS AND INTERFACES

Lines which were excluded from the review included lines for which failure outside containment is not postulated, for this review topic, 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, (e.g., the main steam and feedwater lines). The consequences from failure in these lines are considered in SEP Topic XV-18, "Radiological Consequences of Main Steam Line Failure Outside Containment."

Topic II-2.C, "Atmospheric Transport and Diffusion Characteristics for Accident Analysis," provides the meteorological data used for calculating the offsite dose consequences (these data are included in Table 1).

IV. REVIEW GUIDELINES

The review was conducted in accordance with Standard Review Plan (SRP) 15.6.2. The staff requested the licensee to provide an assessment of this topic, including plant-specific information such as the identification of lines covered by this topic, the size of these lines, break locations, flow rates, and means for isolating the leak. The licensee responded to this request in a letter dated February 1, 1982, and supplied additional requested information on June 15, 1982.

V. EVALUATION

The staff reviewed the licensee's submittal and disagreed with some of the assumptions and bases used in their calculation. The licensee did not provide enough detail to permit a step-by-step critique of the licensee calculative method. The staff independently evaluated postulated breaks in two lines to determine the resultant doses.

The first is a postulated break in an instrument line. The largest instrument line has an inner diameter of 0.305 inches, but has two excess flow check valves, one inside and one outside containment. Therefore, this line is adequately protected from the radiological consequences of the postulated small line break and meets current licensing acceptance criteria.

A break in a small line that would result in the largest leak rate of reactor coolant outside containment, but which could be isolated, was also evaluated. This line is the letdown line. The flow out a break in this line is limited by pressure breakdown orifices inside containment. The flow through these orifices following a break is essentially the same as the normal flow, because the differential pressure would change negligibly. The total flow through the two orifices in use is at most 100 gallons per minute; it is normally lower because a vari-orifice is throttled down and/or one of the orifices in parallel is valved out. The operators would be alerted by an alarm in the control room when one or two additional charging pumps start, to maintain pressurizer level. The flow can be stopped by closing the isolation valve. The staff assumed that the identification of the leaking line and the isolation of it would require 30 minutes. During this time, the leak is assumed to continue at 100 gallons per minute. Additional assumptions for this case are presented in Table 1, and the results of the dose calculations are in Table 2.

VI. CONCLUSIONS

Based on the above evaluation, the staff has found that the Yankee Plant meets the current licensing criteria (less than 10% of 10 CFR Part 100 guidelines, i.e., 30 rem thyroid) for the radiological consequences of failures of small lines carrying primary coolant outside containment.

Table 1

Assumptions Used in Offsite Dose Calculations for Small Line Break

| | |
|------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Leak rate (letdown line break) | 100 gpm |
| Duration of leak (letdown line) | 30 minutes |
| Initial coolant iodine activity, iodine-131 equivalent (based on technical specification for equilibrium coolant activity concentration) | 1 microcurie/gram |
| Increase in iodine release rate from core to coolant, over equilibrium release rate at technical specifications iodine activity | Factor of 500 |
| Flashing fraction (fraction of iodine that is airborne) | 0.33 |
| Atmospheric Dispersion Coefficients | |
| 0-2 hour Exclusion Radius | 2.8 E-4* sec/cubic meter |
| 0-8 hour Low Population Zone outer boundary | 2.8 E-5 " |
| 8-24 hour " | 1.9 E-5 " |
| 24-96 hour " | 1.6 E-5 " |
| 4-30 days " | 1.1 E-5 " |

* 2.8 E-4 means 0.00028

Table 2

Calculated Offsite Doses Resulting From Postulated Small Line Break

| <u>Letdown Line Break</u> | Thyroid | Doses, Rems Whole Body |
|---------------------------------------------|---------|---------------------------|
| 0-2 hour Exclusion Area Boundary | 14 | 0.0024 |
| 0-30 day Low Population Zone Outer Boundary | 1.4 | 0.00024 |