November 12, 1982

Docket No. 50-219
LS05-82-11-041

Mr. P. B. Fiedler
Vice President and Director
Oyster Creek Nuclear Generating Station
Post Office Box 388
Forked River, New Jersey 08731

Dear Mr. Fiedler:

SUBJECT: SEP TOPIC XV-16, FAILURE OF SMALL LINES CARRYING PRIMARY COOLANT OUTSIDE CONTAINMENT - OYSTER CREEK

Enclosed is a copy of a revised safety evaluation report of Topic XV-16 for Oyster Creek. This evaluation has been revised from the previous safety evaluation report dated June 29, 1982, to provide analysis to support the Integrated Assessment and to resolve differences noted between the analysis of your facility and two other similar plants.

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 assessment may be revised in the future if your facility design is changed or if NRC criteria relating to this subject is modified before the integrated assessment is completed.

Sincerely,

Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
Division of Licensing

Enclosure:
As stated

cc w/enclosure:
See next page

SEO4
DSU USE EX(51)
Add: R. Fell

8211180309 821112
PDR ADOCK 05000219
P PDR

OFFICE	SEPB:DL	SEPB:DL	SEPB:DL	SEPB:DL	ORB#5:PM	ORB#5:BC	
SURNAME	TMichaels:dk	RFell	CGrimes	WRussell	JLombardo	DCrutchfield	
DATE	11/4/82	11/5/82	11/8/82	11/9/82	11/9/82	11/12/82	

NRC FORM 318 (10-80) NRCM 0240 OFFICIAL RECORD COPY USGPO: 1981—335-960

Mr. P. B. Fiedler

cc

G. F. Trowbridge, Esquire
Shaw, Pittman, Potts and Trowbridge
1800 M Street, N. W.
Washington, D. C. 20036

J. B. Lieberman, Esquire
Berlack, Israels & Lieberman
26 Broadway
New York, New York 10004

Ronald C. Haynes, Regional Administrator
Nuclear Regulatory Commission, Region I
631 Park Avenue
King of Prussia, Pennsylvania 19406

J. Knubel
BWR Licensing Manager
GPU Nuclear
100 Interplace Parkway
Parsippany, New Jersey 07054

Deputy Attorney General
State of New Jersey
Department of Law and Public Safety
36 West State Street - CN 112
Trenton, New Jersey 08625

Mayor
Lacey Township
818 Lacey Road
Forked River, New Jersey 08731

U. S. Environmental Protection
Agency
Region II Office
ATTN: Regional Radiation Representative
26 Federal Plaza
New York, New York 10007

Licensing Supervisor
Oyster Creek Nuclear Generating Station
Post Office Box 388
Forked River, New Jersey 08731

Resident Inspector
c/o U. S. NRC
Post Office Box 445
Forked River, New Jersey 08731

Commissioner
New Jersey Department of Energy
101 Commerce Street
Newark, New Jersey 07102

OYSTER CREEK
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, (e.g., the main steam and feedwater lines of BWR). The consequences from failures in these lines are considered in SEP Topic XV-18, "Radiological Consequences of Main Steam Line Failure Outside Containment".

IV. REVIEW GUIDELINES

The review was conducted in accordance with SRP 15.6.2 and Regulatory Guide 1.11. 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 staff received the licensee's submittal for this SEP topic on November 10, 1981.

V. EVALUATION

In the submittal, the licensee indicated that a double-ended break of a one-inch instrument line, upstream of the outboard isolation valve, would be the most severe case of the small line rupture outside containment. Altogether, there are 59 such lines at Oyster Creek which extend from the reactor vessel through the primary containment to instruments and gauges in the reactor building. Because of a lack of inboard isolation valves, the discharge from the break would continue until the reactor vessel is depressurized and action can be taken to plug the leak. The staff estimates that 201,00C pounds of primary coolant will be released outside the primary containment during the course of this accident.

The staff's review of the submittal indicates that Oyster Creek's primary coolant technical specification limit for iodine activity consists of a single shutdown value of 8 μCi/gm of gross iodine activity. This limit conflicts with the two-tier (equilibrium and spike) dose equivalent (D.E.) I-131 limits found in the BWR standard technical specifications (STS) and also with the Standard Review Plan (SRP) 15.6.2. In order to evaluate Oyster Creek in accordance with SRP 15.6.2, the staff has assumed the shutdown limit of 8 μCi/gm gross activity as D.E. I-131 activity.

The assumptions used by the staff are provided in Table 1. The model assumes that 38% of the discharge flashes to steam and is released to the environment without credit for SGTS filtration or plateout in the reactor building. In addition, an iodine spike occurs as a result of the reactor shutdown or depressurization of the primary system. The spike is modelled by increasing the equilibrium iodine release rate from the fuel by a factor of 500. These assumptions are in accordance with the Standard Review Plan.

In the estimation of the amount of primary coolant released, the discharge rate was assumed to decrease during the accident, as action is taken by the control room operator to cool and depressurize the reactor. This deviates from the SRP which states that the flow is estimated "with the reactor coolant fluid enthalpy corresponding to the normal reactor operating conditions." The time dependent, decreasing flow rate is justified because the proper response to this accident would be to shutdown the plant to affect repairs.

Because of the resulting high doses using the current technical specification limit and other design parameters (See Table 2), the staff has also evaluated the case which assumed the adoption of the BWR STS D.E. I-131 primary coolant activity limits of 0.2 μCi/gm (equivalent) and 4 μCi/gm (spike). The implementation of this measure significantly reduces the calculated radiological consequences of this accident.

VI CONCLUSION

The results in Table 2 show that even with the adoption of the BWR STS D.E. I-131 reactor coolant equilibrium activity limit of 0.2 μCi/gm, the EAB and LPZ thyroid doses of 470 rems and 77 rems, respectively, exceed the SRP guideline value of 30 rems. The whole body doses at this reactor coolant concentration are within the SRP guideline values.

Because the calculated thyroid dose is directly proportional to the D.E. I-131 reactor coolant equilibrium activity, the guideline value of 30 rems, thyroid, can be achieved by reducing this activity from 0.2 μCi/gm to 0.013 uCi/gm, D.E. I-131 (i.e., 0.2 μCi/gm x 30 rems/470 rems).

Similarly, using 0.13 μCi/gm, D. E. I-131 equilibrium concentration, would result in a dose corresponding to the 10 CFR Part 100 value of 300 rems.

It should be noted that the evaluation performed by the staff was based on the SRP Section 6.2.3 guidance in Branch Technical Position 6-3 which states that "Whenever the pressure in the secondary containment volume exceeds -0.25 inches w.g. (sic water gage), the leakage prevention function of the secondary containment is assumed to be negated." However, some credit may be justified for the Standby Gas Treatment System (SGTS) in mitigating the radiological consequences of this accident by consideration of 1) the integrity of the secondary containment under the positive pressurization caused by the line break, and 2) the location of the broken line with respect to both potential leakage paths through the boundary of the secondary containment and the intake(s) to the SGTS. Such credit could be pursued through the integrated assessment and has the potential for considerable reduction in the calculated doses. For example, if one-third effectiveness credit is assumed (as proposed but not justified by the licensee), then the potential doses calculated for the STS are less than the guideline value of 10 CFR Part 100.

TABLE 1

Assumptions Used in the Radiological Consequences of Instrument Line Break Outside Containment at Oyster Creek

1.	Mass of reactor coolant in vessel-mixing volume (lbm)	483,000
2.	RWCS cleanup rate (lbm/hr) (gpm)	2.7×10^5 750
3.	Condensate demineralizer cleanup rate (carryover fraction x feedwater flow rate) (lbm/hr)	7.2×10^4
4.	Iodine spiking factor	500
5.	Flash fraction (percent)	38
6.	Duration of accident (hours)	4
7.	X/Q values	
	Ground level values (sec/m^3)	
	0-2 hr, EAB 0-4 hr, LPZ	7.6×10^{-4} 6.5 x 10-5
8.	Reactor coolant concentration (μCi/gm), D.E. I-131	0.2

9. Discharge rate of reactor coolant from break

Time After Break hours	Discharge Rate lbm/hr
0-0.5	96,000
0.5-1.0	87,000
1.0-1.5	69,000
1.5-2.0	53,000
2.0-2.5	37,000
2.5-3.0	25,000
3.0-3.5	14,000
3.5-4.0	8,000

10. No Credit for Standby Gas Treatment System filtration

11. RWCS continues to function during the accident

12. No cleanup from condensate demineralizer following the break

TABLE 2

Radiological Consequences of the Instrument Line Break Outside Containment at Oyster Creek

	Thyroid Dose (Rem)	Whole Body Dose (Rem)
0-2 hour, EAB	470	0.1
0-4 hour, LPZ	77	0.01