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In the Matter of Consolidated Edison Company of New York, Inc.
Indian Point Unit No. 3
Docket No. 50-286

Gentlemen:

By letter dated May 27, 1969, the board in this proceeding requested the staff for information concerning dose reduction factors and limits on radiation exposures from the proposed operation of Indian Point Unit No. 3. In particular, the board asked that the results obtained by the applicant in response to board's questions as set forth in Applicant's Exhibit 6 be compared with calculated values based upon the staff's assumptions.

The response to the board's questions prepared by the Division of Reactor Licensing is attached. The essential differences between the models used by the staff and applicant are described in items 3 and 4.

As noted in the attachment, we wish to emphasize the analysis applies to hypothetical conditions. Operation of the facility would not be permitted under such conditions.

The board's letter also inquired whether, in our opinion, oral argument would be helpful. We believe that the positions of the staff and applicant as to the adequacy of the engineered safety features of the facility has been fully explained on the record and that further exposition would

not be helpful. If however, the board has uncertainties with respect to this matter after reviewing the record, and wishes oral argument, we will, of course, comply.

Sincerely,

Troy B. Conner, Jr.

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Trial Counsel

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INDIAN POINT UNIT NO. 3

RESPONSE TO ASLB QUESTIONS IN LETTER DATED MAY 27, 1969

1. Case P of Applicant's Exhibit 6 refers to doses obtained with no operative engineered safety features. The doses calculated by the staff for this case were:

Thyroid Doses

Time	Distance	Dose	
2 hours	350 m	1287 r	inorganic
		143 r	organic
		1430 r	Total
30 days	1100 m	3010 r	inorganic
		335 r	organic
		3345 r	Total

The detailed assumptions used by the staff were as follows:

a. A plateout factor of 2 was used for inorganic iodides, in accordance with TID 14844.

b. No plateout was assumed for organic iodides.

c. In accordance with TID 14844, the following release fractions were used:

100% noble gases
50% halogens (50% plateout)

d. Of the iodine available for release from the containment (25%) 10% of the quantity was assumed to be in the organic form.

e. The isotopic composition of iodine released to the containment, in accordance with TID 14844, was taken as:

Isotope	Curies
I-131	2.0×10^7
I-132	3.8×10^7
I-133	4.5×10^7
I-134	5.3×10^7
I-135	4.1×10^7

f. The atmospheric dilution factors used were:

Time	Distance (Meters)	Dilution Factor (sec/m^3)
0-2 hrs.	350	1×10^{-4}
0-8 hrs.	1100	4×10^{-4}
8-24 hrs.	1100	1.2×10^{-4}
1-4 days	1100	4.4×10^{-5}
4-30 days	1100	1×10^{-5}

2. For the above case (no operative engineered safety features), the dose contributions due to inorganic and organic iodides would be:

2 hour dose	inorganic	1287
	organic	143
Total calculated dose		1430
30 day dose	inorganic	3013
	organic	335
Total calculated dose		3345

3. Based solely on applicant's Case P and the staff's standard model:

The applicant and staff do -ot differ in the assumptions for

a. fraction of core inventory of fission product release

b. fraction of organic iodide release

c. isotopic composition of iodine released to the containment

d. organic iodide plateout.

e. inorganic iodide plateout (see answer to Question 4)

The applicant and staff differ in the assumptions for

a. Atmospheric dilution factors, which were discussed in great detail during the course of the public hearing. (See particularly, testimony of I. Spickler and Halitsky, Tr. 654, 662, 670-71, 1054-57, 1820; Jt. Ex. A, 5th Supplement, Part 8; S. Ex. 1, Questions 1 and 2).

4. In determining the dose reduction factors necessary for the proposed Indian Point Unit No. 3 the staff evaluated the radiological consequences from the LOCA, defined as the Design Basis Accident. Employing the standard staff assumptions as documented in answer number one to Board's question number one, the staff calculated the gross thyroid dose without use of filters or chemical spray removal of iodine. Using this value the staff determined the minimum dose reduction factor required to just meet the guidelines of 10 CFR 100 by dividing the calculated gross dose by 300 rem (the Part 100 guideline dose).

The dose reduction factors thus obtained for the Indian Point 3 containment sprays and charcoal absorbers as stated in Staff Exhibit 1 were approximately 4.7 and 11.2 for the two hour and thirty day thyroid doses, respectively.

The combined effect of both chemical spray and charcoal absorber units, without credit for organic iodine removal, was insufficient to meet the guidelines of 10 CFR 100 for the 30 day dose. The applicant proposed the use of impregnated charcoal units which would remove both elemental and organic iodines. The staff calculated an efficiency for organic iodine removal of only 5% per pass would be needed to reduce the thirty day thyroid dose to within the limits of 10 CFR Part 100. The staff, based on available data, is confident that this efficiency

is well within the capability of the proposed system. On review of the R&D effort currently underway at ORNL the staff anticipates the efficiency value will increase significantly, thus, further reducing the calculated thirty day thyroid dose.

In the staff analysis, a plateout factor of two was assumed for inorganic iodides, zero for organic iodides. The plateout factor was assumed to be independent of the operation of the specified engineered safety features. However, in all but cases A and P, the applicant states that it takes no credit for plateout.

The staff position differs from that of the applicant in including the depletion of iodine by a plateout mechanism in its determination of the amount of iodine available for leakage from the containment building. The principal reason for this difference is that the applicant uses a spray removal constant leading to an iodine half life of such short duration that this removal mechanism would deplete the airborne iodine at a rate comparable with the plateout deposition velocity. The staff analysis assumes a considerably longer removal half life due to the sprays and therefore the plateout mechanism is the dominant one during the initial time period. In effect, as noted previously, the staff analysis considers the iodine reduction as two sequential processes, namely the very rapid initial plateout (including the steam washout effect), followed by the slower iodine removal by the alkaline sprays. It should be noted here that the applicant has also applied such a plateout factor in those cases where no competitive removal mechanism is assumed operative.

5. Thyroid Dose Contributions Due To Organic and Inorganic Iodides for Various Postulated Conditions.

A. Spray and Filter Systems (Applicant's Case M)

Using the staff calculated value of λ = 4.9 hr^{-1} for the spray system removal constant applicable only to the inorganic iodide fraction, and 5% radioactive iodine exchange effectiveness* of the impregnated charcoal filters applicable only to the organic fraction (no credit for removal of inorganic iodides), the dose contributions due to inorganic and organic iodide were derived. This model, using the above conservative assumptions, was used in the staff analysis of calculated doses.

2 hour dose	Inorganic	130 rem
	Organic	136 rem
Total calculated dose	=	266 rem
30 day dose	Inorganic	148 rem
	Organic	152 rem

(Based on minimum organic iodide removal required to effect reduction to 300 rem guideline exposure. A value considerably lower than this dose is expected to be attained).

* The 5% radioactive iodine exchange effectiveness (organic iodide removal efficiency) used is an extremely conservative value and is expected to be significantly increased upon evaluation and acceptance of the results of the R&D program currently in progress at ORNL.

B. Sprays Only Operative - No Filters (Applicant's Case K)

This is a case where only the spray system is assumed to be effective for removal of inorganic iodides, with the removal constant given for case M, and no reduction of organic iodides occurs.

2 hour dose	Inorganic	130 rem
	Organic	142 rem
Total calculated dose		272 rem
30 day dose	Inorganic	148 rem
	Organic	335 rem
Total calculated dose		483 rem

C. Filters Only Operative (Applicant's Case J)

This is a case, where no iodine removal by the spray system is assumed. Two cases will be considered: (1) the impregnated charcoal filters are assumed to have a 5% exchange effectiveness for radioactive iodides (organic iodide reduction) per pass, but no credit for removal of inorganic iodides is included, in accordance with the staff's conservative assumptions for Indian Point 3. (2) the impregnated charcoal filters are assumed to function in a realistic, yet conservative manner. The reduction of airborne inorganic iodides is assumed as 90% per pass, and for organic iodides as the minimum 5% per pass.

Case 1 - Organic Iodide Removal Only - 5%/pass

2 hour dose	Inorganic	1287
	Organic	136
Total calculated dose		1423
30 day dose	Inorganic	3010
	Organic	152
Total calculated dose		3162

Case 2 - Inorganic Iodide Removal - 90%/pass

Organic Iodide Removal - 5%/pass

2 hour dose	Inorganic	838 rem
	Organic	136 rem
Total calculated dose		974 rem
30 day dose	Inorganic	596 rem
	Organic	152 rem
Total calculated dose		748 rem

This analysis has been made at the Board's request to consider hypothetical conditions involving the inoperability of essentialsafety features. The staff wishes to emphasize that operation of the facility would not be permitted unless those components in both the spray and filter systems (as well as all engineered safety features) which would be necessary to assure at least minimum function are operable, even with the assumption of a single component failure.