ENVIRON. FILE (NEPA)

APR 2 1973

50-286

D. Muller, Assistant Director for Environmental Projects, L

INDIAN POINT - 3 REALISTIC ACCIDENT ASSESSMENT

PLANT NAME: Indian Point Unit No. 3
LICENSING STAGE: OL
RESPONSIBLE BRANCH: PWR-1
REQUESTED COMPLETION DATE: March 22, 1973
APPLICANTS RESPONSE DATE NECESSARY FOR
NEXT ACTION PLANNED ON PROJECT: N/A
DESCRIPTION OF RESPONSE: Realistic Accident Assessment
REVIEW STATUS: Complete

Enclosed is the Realistic Accident section for the Indian Point Unit No. 3 Draft Environmental Statement prepared by K. G. Murphy of the Accident Analysis Branch.

Original signed by
H. R. Denton

Harold R. Denton, Assistant Director
for Site Safety
Directorate of Licensing

Enclosure:
Realistic Accident Assessment

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SURNAME ▶	KMURPHY:mj	HSPECTER	BGRIMES	HRDENTON	D. VASSALLO
DATE ▶	3/28/73	3/28/73	3/29/73	3/31/73	3/28/73

Form AEC-318 (Rev. 9-53) AECM 0240 ☆ U. S. GOVERNMENT PRINTING OFFICE: 1972-466-983

Environmental Impact of Postulated Accidents

A high degree of protection against the occurrence of postulated accidents in the Indian Point Unit 3 is provided through correct design, manufacture, and operation, and the quality assurance program used to establish the necessary high integrity of the reactor system, as considered in the Commission's Safety Evaluation dated February 20, 1969. Deviations that may occur are handled by protective systems to place and hold the plant in a safe condition. Notwithstanding this, the conservative postulate is made that serious accidents might occur, even though they may be extremely unlikely; and engineered safety features are installed to mitigate the consequences of these postulated events.

The probability of occurrence of accidents and the spectrum of their consequences to be considered from an environmental effects standpoint have been analyzed using best estimates of probabilities and realistic fission product release and transport assumptions. For site evaluation in the Commission's safety review, extremely conservative assumptions were used for the purpose of comparing calculated doses resulting from a hypothetical release of fission products from the fuel against the 10 CFR Part 100 siting guidelines. The computed doses that would be received by the population and environment from actual accidents would be significantly less than those presented in the Safety Evaluation.

The Commission issued guidance to applicants on September 1, 1971, requiring the consideration of a spectrum of accidents with assumptions as realistic as the state of knowledge permits. The applicant's response was contained in Supplement No. 2 of the Environmental Report submitted by Consolidated Edison dated September 1972.

The applicant's report has been evaluated, using the standard accident assumptions and guidance issued as a proposed amendment to Appendix D of 10 CFR Part 50 by the Commission on December 1, 1971. Nine classes of postulated accidents and occurrences ranging in severity from trivial to very serious were identified by the Commission. In general, accidents in the high potential consequence end of the spectrum have a low occurrence rate and those on the low potential consequence end have a higher occurrence rate. The examples selected by the applicant for these cases are shown in Table I. The examples selected are reasonably homogeneous in terms of probability within each class.

Commission estimates of the dose which might be received by an assumed individual standing at the site boundary in the downwind direction, using the assumptions in the proposed Annex to Appendix D, are presented in Table II. Estimates of the integrated exposure that might be delivered to the population within 50 miles of the site are also presented in Table II. The man-rem estimate was based on the projected population within 50 miles of the site for the year 2010.

To rigorously establish a realistic annual risk, the calculated doses in Table II would have to be multiplied by estimated probabilities. The events in Classes 1 and 2 represent occurrences which are anticipated during plant operations; and their consequences, which are very small, are considered within the framework of routine effluents from the plant. Except for a limited amount of fuel failures and some steam generator leakage, the events in Classes 3 through 5 are not anticipated during plant operation; but events of this type could occur sometime during the 40 year plant lifetime. Accidents in Classes 6 and 7 and small accidents in Class 8 are of similar or lower probability than accidents in Classes 3 through 5 but are still possible. The probability of occurrence of large Class 8 accidents is very small. Therefore, when the consequences indicated in Table II are weighted by probabilities, the environmental risk is very low. The postulated occurrences in Class 9 involve sequences of successive failures more severe than those required to be considered in the design bases of protection systems and engineered safety features. Their consequences could be severe. However, the probability of their occurrence is so small that their environmental risk is extremely low. Defense in depth (multiple physical barriers), quality assurance for design, manufacture and operation, continued surveillance and testing, and conservative design are all applied to provide and maintain the required high degree of assurance that potential accidents in this class are, and will remain, sufficiently small in probability that the environmental risk is extremely low.

Table II indicates that the realistically estimated radiological consequences of the postulated accidents would result in exposures of an assumed individual at the site boundary to concentrations of radioactive materials that are comparable to or within the Maximum Permissible Concentrations (MPC) of 10 CFR Part 20. The table also shows the estimated integrated exposure of the population within 50 miles of the plant from each postulated accident. Any of these integrated exposures would be much smaller than that from naturally occurring radioactivity. When considered with the probability of occurrence, the annual potential radiation exposure of the population from all the postulated accidents is an even smaller fraction of the exposure from natural background radiation and, in fact, is well within naturally occurring variations in the natural background. It is concluded from the results of the realistic analysis that the environmental risks due to postulated radiological accidents are exceedingly small, and need not to be considered further.

Table I. Classification of Postulated Accidents and Occurrences

Class	AEC Description	Applicant's Examples
1.	Trivial incidents	Not considered
2.	Small releases outside containment	Evaluated under routine releases
3.	Radioactive waste system failure	Release from gas decay tank or liquid waste hold-up tank
4.	Fission products of primary system (BWR)	Not applicable
5.	Fission products to primary and secondary systems (PWR)	Failed fuel and steam generator tube leak, and steam generator tube rupture
6.	Refueling accident	Fuel bundle drop or heavy object drop onto fuel in core
7.	Spent fuel handling accident	Refueling accident outside containment
8.	Accident initiation events considered in design-basis evaluation in the Safety Analysis Report	Loss of coolant accident, rod ejection or steam line failure outside containment
9.	Hypothetical sequence of failures more severe than Class 8	Not considered

TABLE II
SUMMARY OF RADIOLOGICAL CONSEQUENCES
OF POSTULATED ACCIDENTS[1/]

Class	Event	Estimated Fraction of 10 CFR Part 20 limit at site boundary[2/]	Estimated Dose to Population in 50 mile radius man-rem
1.0	Trivial Incidents	3/	3/
2.0	Small releases outside containment	3/	3/
3.0	Radwaste System failures		
3.1	Equipment leakage or malfunction	0.18	54
3.2	Release of waste gas storage tank contents	0.7	210
3.3	Release of liquid waste storage contents	0.019	5.9
4.0	Fission products to primary system (BWR)	N. A.	N. A.

1/ The doses calculated as consequences of the postulated accidents are based on airborne transport of radioactive materials resulting in both a direct and an inhalation dose. Our evaluation of the accident doses assumes that the applicant's environmental monitoring program and appropriate additional monitoring (which could be initiated subsequent to an incident detected by in-plant monitoring) would detect the presence of radioactivity in the environment in a timely manner such that remedial action could be taken if necessary to limit exposure from other potential pathways to man.

2/ Represents the calculated fraction of a whole body dose of 500 mrem, or the equivalent dose to an organ.

3/ These releases are expected to be a small factor of 10 CFR Part 20 limits for either gaesous or liquid effluents.

TABLE II - Continued

Class	Event	Estimated Fraction of 10 CFR Part 20 limit at site boundary 2/	Estimated Dose to population in 50 mile radius, man-rem
5.0	Fission products to primary and secondary systems (PWR)		
5.1	Fuel cladding defects and steam generator leaks	3/	3/
5.2	Off-design transients that induce fuel failure above those expected and steam generator leak	0.004	1.2
5.3	Steam generator tube rupture	0.23	71
6.0	Refueling accidents		
6.1	Fuel bundle drop	0.036	11
6.2	Heavy object drop onto fuel in core	0.64	200
7.0	Spent fuel handling accident		
7.1	Fuel assembly drop in fuel rack	0.023	7.1
7.2	Heavy object drop onto fuel rack	0.092	28
7.3	Fuel cask drop	N.A.	N.A.
8.0	Accident initiation events considered in design basis evaluation in the SAR		
8.1	Loss-of-Coolant Accidents		
	Small Break	0.37	210
	Large Break	3.2	6,100

TABLE II - Continued

Class	Event	Estimated Fraction of 10 CFR Part 20 limit at site boundary[2/]	Estimated Dose to population in 50 mile radius, man-rem
8.1(a)	Break in instrument line from primary system that penetrates the containment	N. A.	N. A.
8.2(a)	Rod ejection accident (PWR)	0.32	610
8.2(b)	Rod drop accident (BWR)	N. A.	N. A.
8.3(a)	Steamline breaks (PWR's outside containment)		
	Small Break	0.001	0.38
	Large Break	0.002	0.71
8.3(b)	Steamline break (BWR)	N. A.	N. A.