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Daniel R. Muller, Assistant Director for Environmental Projects, L

RESPONSE TO AGENCY COMMENTS REGARDING THREE MILE ISLAND DRAFT ENVIRONMENTAL STATEMENT AND CHANGES TO DES FOR INCLUSION IN FES

Plant name - Three Mile Island

Licensing stage - OL

Docket number - 50-289 & 50-320

Responsible branch - Environmental Projects Branch #3

Project leader - W. E. Regan

Date request received by RA-L - August 24, 1972

Requested completion date - September 11, 1972

Description of response - Agency comments regarding Three Mile Island DES have been addressed. Minor changes for FES are indicated.

Radiological Assessment Branch review status - Complete

F. Congel, RA-L, has prepared the enclosed response to the one agency comment directed at the Radiological Impact section of the Three Mile Island Draft Environmental Statement.

This section of the DES was written by the Radiological Assessment Branch in May, 1972 with minor assistance from Argonne National Laboratory. Also enclosed are four pages of text which have been slightly revised.

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

Enclosure:
As stated

cc: w/o encl.
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DATE ▶		9/15/72	9/ /72	9/ /72		

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conditions. The quantity of radioactivity that is released to the environment will be a small fraction of the limits set forth in 10 CFR Part 20 of the Commission's Regulations, and the amounts will be kept as low as practicable in accordance with 10 CFR Part 50.36a. These regulations apply to the combined releases from all systems connected with both Units 1 and 2. The Staff has made calculations of the radiation dose using the estimated release rates of radionuclides listed in Tables 4, 5 and 6 using stated assumptions relative to dilution, biological concentration in food chains, and use factors by people.

2. Radioactive Materials Released to the Atmosphere

The most significant radiation dose to the public will result from the radionuclides in the gaseous effluents from the plant. The radioactive materials released to the atmosphere are principally the fission-product noble gases, krypton and xenon. Nearly all of the dose received by persons living, working or using recreational facilities in the vicinity of the plant will result from radioactive krypton and xenon in the air surrounding the individual. The postulated gaseous effluents from the plant are listed in Tables 4 and 5. We have calculated the potential annual doses using averages for meteorological conditions and assuming releases of the listed isotopes at a constant rate.

During normal operation of the plant at full power, the maximum dose rate due to cloud immersion at the plant's exclusion boundary on the river bank (2100 ft. ESE) where the $X/Q = 9.1 \times 10^{-6} \text{ sec/m}^3$, is calculated to be about 0.55 mrem/yr while the dose at the nearest community (Goldsboro, 1-1/2 miles W) is less than 0.08 mrem/yr. The annual dose (outside) at the nearest home (2340 ft. E, $X/Q = 4.8 \times 10^{-6} \text{ sec/m}^3$) is estimated to be 0.29 mrem/yr. However, a higher dose of 0.45 mrem/yr will be received at another home located 2460 ft. ESE, where a higher X/Q of $7.4 \times 10^{-6} \text{ sec/m}^3$ is calculated. Assuming an occupancy of 3 months annually, the total body dose to campers at Beach Island (2080 ft. SW) and Shelly's Island (2000 ft. W), both normally uninhabited, would be about 0.4 mrem/yr and 0.11 mrem/yr, respectively. The dose also based upon three months per year occupancy; at the proposed recreational area at the southern end of Three Mile Island will range from about 0.08 mrem/yr at a point near York Haven Dam (3500 ft. S) to about 0.04 mrem/yr at the southern tip of the Island (8500 ft. S). A fisherman, pleasure boater or sunbather who spends 500 hours per year just outside the exclusion line at the nearest point on Shelly's Island would receive less than 0.03 mrem/yr due to gaseous effluents. Higher doses, of course, would be received by a fisherman, swimmer, or boater who inadvertently violated the plant exclusion circle. For example, at a shore on Three Mile Island nearest the plant (inside the exclusion circle 830 ft. SW, where the X/Q is as high as $1.4 \times 10^{-4} \text{ sec/m}^3$), a fisherman or boater spending 500 hours per year would receive about 0.5 mrem/yr from gaseous effluents.

Based on an annual release rate of 0.11 Ci/yr of iodine-131, the thyroid dose due to inhalation would be less than 0.5 mrem/yr at the exclusion line (2200 ft. ESE), less than 0.4 mrem/yr at the nearest home, 0.07 mrem/yr at the nearest town (Goldsboro) and 0.3 mrem/yr at the proposed recreation area (3500 ft. S).

Radioactive iodine may be ingested by milk cows after deposition in grazing areas. Radiation exposure to the thyroid gland can result from drinking milk from these cows. A liter of milk consumed daily from a cow grazing five months per year at the nearest dairy farm (1-1/2 miles ESE, $X/Q = 1.6 \times 10^{-6} \text{ sec/m}^3$) would result in a dose to an infant's thyroid of about 9 mrem/yr.

3. Radioactive Materials Released to Receiving Water

During normal operation of the plant, the liquid radwaste effluent will be combined with the forced draft cooling tower blowdown before release into the Susquehanna River. Calculation of radiation doses from radionuclides released into the liquid effluent requires estimating the concentrations of these radionuclides at the point of discharge. A nominal flow rate of 36,000 gallons per minute (80 cfs) for the cooling tower blowdown was used to calculate the liquid radwaste dilution in the discharge canal. The river flow ranges from a low of 1,600 cfs to a maximum flood level of 740,000 cfs with an average annual flow of 34,000 cfs. Thus, an additional factor of 100 was conservatively assumed in order to estimate the effluent dilution after mixing with the river water.

The principal pathways leading to exposure doses to man are drinking water from the river, consuming fish and invertebrates caught in the river; and swimming, boating, and picnicking in or on the shore of the river. Bioaccumulation factors used to calculate doses from fish and invertebrate consumption are listed in Table 11. The doses to individuals resulting from the previously mentioned pathways are calculated using the estimated annual nuclide liquid releases given in Table 6 and dilution factors described above. In addition, it was assumed that each person drinks 1,200 cc of water per day, consumes 20 grams of invertebrates per day, swims 100 hours per year, and goes boating and picnicking on the shoreline for 500 hours per year. A delay of twenty-four hours is assumed between release and consumption. No delay factor is considered for recreational use. The results of the individual dose calculations are summarized in Table 12.

4. Radioactive Materials Stored on Site

The dose contribution at and beyond the site boundary due to radioactive storage areas on site is expected to be negligible.

5. Population Doses From All Sources

Values of the cumulative dose to the population from gaseous effluents based on 1970 census figures are listed in Table 13 for various distances from the station. The combined dose to all individuals living within fifty miles of the station (1,868,000) from exposure to radioactive gaseous effluents is estimated to be 9.4 man-rem per year. It was assumed that 10 percent of this total population would be exposed while fishing, boating or picnicking in the immediate vicinity of the plant.

The dose from ingesting fish and invertebrates was estimated by assuming that 10 percent of the total population within a fifty mile radius of the station obtained 25 percent of this intake from the Susquehanna River. Thus, the effective exposed population via this pathway is 47,000. The combined annual population dose via the drinking water, fish, invertebrate, recreation and transportation (of nuclear fuel and solid radioactive waste) pathways is calculated to be 33 man-rem.

The population dose from all of the above pathways is summarized in Table 14

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TABLE 12

ANNUAL DOSES AT EQUILIBRIUM CONDITIONS
TO INDIVIDUALS AT VARIOUS LOCATIONS

LOCATION	PATHWAY	DOSE (MREM/YR)		
		GI TRACT	THYROID	TOTAL BODY
Exclusion Boundary (2170' ESE)	Cloud	--	0.5	0.55
Residence ¹ (2340' E)	Cloud	--	0.3	0.29
Residence ¹ (2460' ESE)	Cloud	--	0.4	0.45
Goldsboro (nearest town 1.5 miles W)	Cloud	--	0.06	0.08
Three Mile Island Recreation Area ² (3500' S)	Cloud	--	0.1	0.08
Shelly's Island (2000' W)	Cloud	--	0.1	0.11
Dairy Farm ³ (1.5 miles E)	Ingestion of milk	--	8.6	--
Susquehanna River	Drinking water	0.009	2.0	0.04
	Fish Consumption	0.06	0.03	0.2
	Invertebrate Consumption	0.02	0.2	0.05
	Swimming	--	--	0.0009
	Picnicking, fishing and boating	--	--	0.003

¹No shielding was assumed.²Dose calculation assumes an occupancy of 3 months per year.³Dose to a child's thyroid based on consuming one liter of milk daily from a cow grazing five months per year at that particular farm.

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Response to EPA Comment

Comment -

Page 5, 2nd paragraph

Response -

The highest calculated value of the atmospheric dispersion value ($X/Q = 1.4 \times 10^{-4}$ sec/m³) which could apply to people using the Susquehanna River occurs on the southwest shore of Three Mile Island. The total body dose would be less than 9 mrem/yr if a person spent all of his time at this location; therefore, there does not seem to be any potential for excessive exposure to persons utilizing this section of the river.

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