NRC PDR

JUL 30 1979

MEMORANDUM FOR: Stephen Eilperin, Office of General Counsel

FROM: John T. Collins, Deputy Director, TMI-2 Support

SUBJECT: INTERROGATORIES IN THE MATTER OF THE SUSQUEHANNA VALLEY ALLIANCE VERSUS THE NRC

In response to your request, I have enclosed four copies of NRC staff responses to the interrogatories submitted by the Susquehanna Valley Alliance. In addition, I have also included four sets of the reference documents noted in these interrogatories with the exception of the reference drawing. We hope to have the drawings to you in the next day or two.

Our comments on the various affidavits will be forwarded to you by Wednesday, August 1, 1979.

Should you have any questions on any of this material, feel free to contact Richard Bangart of my staff (492-7633) or myself.

ORIGINAL SIGNED BY
JOHN T. COLLINS

John T. Collins, Deputy Director
Three Mile Island Unit 2 Support

Enclosures:
As Stated Above

cc: R. Vollmer
L. Chandler
R. Bangart (w/o encl)
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DEFENDANT NRC'S ANSWERS TO

PLAINTIFFS' INTERROGATORIES SET #1

1. INTERROGATORY: Please state the amount of curies released in 1978 from Three Mile Island Reactors One and Two. Please list separately for each unit.

1. RESPONSE: The information requested can be found in the following two semi-annual effluent release reports which the licensee is required to submit to the NRC pursuant to 10 CFR Part 50.36a(2)(1). These reports contain complete data on the amount of activity, in curies, released in 1978 from Three Mile Island, Units 1 and 2. References which transmitted these reports follow:

GQL 1463, August 30, 1978, J. G. Herbein (Met Ed) to B. H. Grier (USNRC), Radioactive Effluent Release Reports for TMI-1 and TMI-2 (January 1, 1978 to June 30, 1978); and

GQL 0269, March 2, 1979, J. G. Herbein to B. H. Grier, Radioactive Effluent Release Reports for TMI-1 and TMI-2 (July 1, 1978 to December 31, 1978).

These reports are provided as Attachments 1 and 2.

2. INTERROGATORY: Please state the percentages of those releases as between air and water emissions.

2. RESPONSE: The reports listed in the response to #1 provide detail on how much of the release is in air emissions and how much is in water emissions.

3. INTERROGATORY: Please state the quality of the air and waste effluents in 1978, broken down by the type of isotopes released.

3. RESPONSE: The reports listed in the response to #1 provide detail on the specific type of isotopes released.

4. INTERROGATORY: Please state the total amount of tritium released in liquid effluents in 1978.

4. RESPONSE: The reports listed in the response to #1 list the total amount of tritium released in liquid effluents in 1978.

5. INTERROGATORY: Please state the total amount of noble gases dissolved in liquid effluents in 1978.

5. RESPONSE: The reports listed in the response to #1 list the total amount of noble gases dissolved in liquid effluents in 1978.

6. INTERROGATORY: Please state the concentration of each isotope measured in the effluent in air and water from TMI One and Two in 1978. Please state separately for each unit.

6. RESPONSE: The reports listed in the response to #1 provide information concerning the total release and the average release rate of air effluents from TMI Units 1 and 2. This is the form that NRC Regulatory Guide 1.21[(2)] requires this information and it is the form that is most useful in estimating offsite exposures. The reports listed in the response to #1 list the total release and the average diluted concentrations in water effluents from TMI Units 1 and 2 as required by NRC Regulatory Guide 1.21.

7. INTERROGATORY: Please state the answers to Questions One through Six above for 1979, by month.

7. RESPONSE: The data requested for questions one (1) through six (6) were compiled in accordance with Regulatory Guide 1.21 on a quarterly basis. Since the March 28, 1979 accident, these data have been compiled on a more frequent basis. Table 1 provides the data for the period March 28, 1979 to March 31, 1979, and Table 2 provides these data for the months of April and May. For the period January 1, 1979 through March 31, 1979, these data were compiled on a quarterly basis and are provided in Table 3. Tables 4 and 5 provide an isotopic summary of liquid releases.

Following the March 28, 1979 accident, both airborne and liquid releases were reported to the NRC as mixed releases from Units 1 and 2.

In accordance with Section 50.36a of 10 CFR Part 50, the licensee is required to report these data to the Commission. Therefore, for the period January through June 1979 these data should be available approximately September 1, 1979.

8. INTERROGATORY: Please state the total number of curies, to date, excluding tritium and dissolved gases, released into the Susquehanna River as a result of the accident at Three Mile Island on March 28, 1979.

8. RESPONSE: A cumulative total of 0.42 Ci (as of May 31, 1979) of radioactive material, excluding tritium and dissolved gases, has been released to the Susquehanna River since the March 28, 1979 accident.

9. INTERROGATORY: Please state what you consider to be the absolute limits in terms of total number of curies that can be emitted from Three Mile Island Reactors One and Two in the ambient air.

9. RESPONSE: The limitation on releases to ambient air from Three Mile Island Units 1 and 2 are given in Section 2.1 of the TMI-2 environmental technical specifications (Appendix B)[3]. Limitations for gaseous effluents are based on the release rate from the plant and are excerpted from the technical specifications in Attachment 3. The release rate limitation for each specific radionuclide is dependent upon the maximum permissible concentration (MPC) for each radionuclide.

10. INTERROGATORY: Please state what you believe to be the absoute number of curies, excluding tritium and dissolved gases, that can be discharged into the Susquehanna River and the source on which you rely for this response.

10. RESPONSE: The TMI-2 environmental technical specifications (Appendix B) limit radioactivity released in liquid effluents to less than 10 curies per reactor per calendar quarter for all radionuclides excluding tritium and dissolved gases.

11. INTERROGATORY: Please state the answer to the last question in terms of a total monthly quantity, total quarterly quantity, and total annual quantity.

11. RESPONSE: The response to Interrogatory 10 gives the limitations on the release of liquid effluents, excluding tritium and dissolved noble gases, on a quarterly basis as provided in the TMI-2 environmental technical specifications (Appendix B). The TMI-2 environmental technical specifications do not provide limitations on monthly or annual quantities.

12. INTERROGATORY: Please state, if any, limits that you consider to be applicable to the TMI Reactors One and Two for tritium and dissolved gaseous being discharged into the Susquehanna or into the ambient air and the source on which you rely.

12. RESPONSE: As discussed in the TMI-2 environmental technical specifications (Appendix B), tritium releases are limited in 10 CFR 20(4), Appendix B, Table 2, to 3×10^{-3} uCi/cc in liquids and 2×10^{-7} uCi/cc in gases. Gaseous releases of xenons are also limited by the same regulation to 3×10^{-7} uCi/cc for Xe-133 and 1×10^{-7} uCi/cc for Xe-135. Liquid xenon releases are limited, as established in the TMI-2 environmental technical specifications (Appendix B), to 5×10^{-3} uCi/cc for Xe-133 and 1×10^{-3} uCi/cc for Xe-135.

13. INTERROGATORY: Please state the total liquid storage capacity for radioactive water currently available on the Three Mile Island Reactor site. Include capacity currently in use, by amount and location, and similarly for capacity still available for storag

13. RESPONSE: Based on data reported by the licensee on daily tank levels, the following table summarizes the total liquid storage capacity for radioactive water currently available at TMI Units 1 and 2 as of July 20, 1979.

TANK LOCATION	TOTAL CAPACITY (gallons)	TOTAL CAPACITY USED (gallons)	TOTAL REMAINING CAPACITY (gallons)
Unit 1 Aux. Bldg.	334,700	77,585	257,115
Unit 2 Aux. Bldg.	317,191	292,055	25,136
Unit 2 Fuel Handling Bldg. Storage Tanks	110,000	0	110,000
Chemical Cleaning Bldg. tank (EPICOR-II)	229,000	0	229,000

13. RESPONSE: (continued)

It should be noted that not all of the remaining capacity listed in the table above is available for providing additional capacity for the water currently stored in the Unit 2 auxiliary building. First of all, it is not desirable to use the remaining capacity in the Unit 1 auxiliary building tanks for the storage of Unit 2 water since it is advantagecus to keep the contaminated water from Unit 2 separate from Unit 1. Surge capacity in Unit 1 will only be used to handle Unit 2 wastes in emergency situations.

In addition, it is not desirable to use the remaining capacity in the Unit 2 fuel handling building (FHB) storage tanks for the storage of the water in the Unit 2 auxiliary building. These tanks were constructed in the Unit 2 FHB after the accident for the purpose of providing additional storage capability for the high level radioactive waste water currently in the Unit 2 reactor building. Any other use of the tanks in the Unit 2 FHB would compromise their original purpose. However, due to the current stable water levels in the reactor building sump, surge capacity in the FHB tanks can be used to handle water in the Unit 2 auxiliary building tanks in emergency situations.

Also the tanks in the chemical cleaning building (CCB) are currently part of the EPICOR-II system which was designed by the licensee to treat the water in the Unit 2 auxiliary building. Any use of the tanks in the CCB to store radioactive water would compromise its intended purposes as part of EPICOR-II. Therefore, these tanks would preferably only be used to store waste in an emergency situation.

13. RESPONSE: (continued)

Thus, at the present time, there is only the surge capacity listed in the Unit 2 auxiliary building (25,136 gallons) which is available to hold the water in the Unit 2 auxiliary building.

14. INTERROGATORY: Please state whether it is your opinion that water containing high-level radioactive waste is currently stored on the Three Mile Island Reactor site.

14. RESPONSE: Current federal regulations do not define high-level radioactive waste in the sense used in this interrogatory. However, water contained in the reactor building basement and the reactor coolant system is considered to be highly radioactive when compared to levels of radioactivity normally encountered (i.e., greater than 100 uCi/ml) in operating PWRs. Water in the reactor coolant bleed tanks is considered to contain intermediate levels of radioactivity (i.e., between 1 and 100 uCi/ml) when compared to operating PWRs.

15. INTERROGATORY: Please describe where that water is being stored and how it is being monitored.

15. RESPONSE: Water in the reactor coolant system (RCS) and the reactor coolant bleed tanks is being monitored by periodic sample collection and analysis. Radioactivity in the reactor building sump is being monitored by analytical methods which consider water balance and analyses of radioactive material in the RCS. Although procedures are being developed, there is no method for directly sampling water in the reactor building sump at this time.

16. INTERROGATORY: What structures or portions of structures have been built or begun on the site of the Three Mile Island Reactor since March 28, 1979?

16. RESPONSE: The following structures have been built or begun since March 28, 1979:

(1) Long-Term Solid Waste Staging Facility (Concrete Structure)

(2) Short-Term Solid Waste Staging Facility

(3) EPICOR-II Control Building

(4) Ventilation system Building for EPICOR-II

(5) Balance-of-Plant Electric Diesel Generator Building

17. INTERROGATORY: For all structures or portions of structures mentioned in response to the previsous question above, provide the following: (a) state the type, purpose, and size of the structure; (b) state the date construction began, including the date the excavation for foundations, etc., commenced; (c) state the date construction ended or is planned to end; (d) state the date on which application for a permit to construct such structures was filed by Metropolitan Edison or GPU, and the date on which approval was given by NRC; (e) if no permit application was deemed necessary, provide a copy of any prior permit or portion of permit NRC, GPU, or Met Ed relied on in determining that such a structure could be built without additional permit(s).

17. RESPONSE:

(1) Long-Term Solid Waste Staging Facility (Concrete Structure)

(a) Purpose: To store prefilter media and ion exchange resin from the operation of EPICOR-I and -II.

Size: A modular structure with each module consisting of 60 storage cells. Each module to be built on an as-needed basis. Dimension 57 feet wide by 91 feet long by 19 feet high with 3 feet thick base and 4 feet thick walls.

17. RESPONSE: (continued)

(b) July 16, 1979

(c) October 15, 1979

(d) No application for a permit to construct this structure was filed by Met Ed.

(e) The operating license of Three Mile Island Unit 2, provided as Attachment 8 in the response to Interrogatory 25, in referencing Section 50.59 of 10 CFR Part 50(5), was used in determining that this structure could be built without additional permits.

(2) Short-Term Solid Waste Staging Facility

(a) Purpose: To store prefilter media and ion exchange resin from EPICOR-I and -II until the long-term staging area is completed.
Size: Sixteen cells 4.5 feet in diameter by 8 feet high and twelve cells 7 feet in diameter by 8 feet high.

(b) Started Construction: June 1, 1979

(c) Completed Construction: July 20, 1979

(d) See Response provided in (1)(d)

(e) See Response provided in (1)(e)

(3) EPICOR-II Control Building

(a) Purpose/Type: This building is used to provide remote control operation for the EPICOR-II waste treatment system. A wood frame building was constructed.
Size: 24 feet long by 20 feet wide by 15 feet in height.

(b) Started Construction: April 18, 1979

(c) Completed Construction: May 10, 1979

17. RESPONSE: (Continued)

(d) See response provided in (1)(d).

(e) See response provided in (1)(e).

(4) Ventilation System Building for EPICOR-II

(a) Purpose/Type: To maintain a negative pressure in the chemical cleaning building and to filter the exhaust from the chemical cleaning building. The building is a concrete slab and concrete block building approximately 60 feet long by 20.5 feet wide by 15 feet high.

(b) Started Construction: April 13, 1979

(c) Completed Construction: June 8, 1979

(d) See response provided in (1)(d).

(e) See response provided in (1)(e).

(5) Balance-of-Plant Electric Diesel Generator Building

(a) Purpose/Type: Used to provide redundant electric power to non-nuclear safety related equipment.

Size: 68 feet long by 42 feet wide by 11 feet to roof without a stack and 20 feet with a stack.

(b) Started Construction: April 9, 1979

(c) Completed Construction: May 9, 1979

(d) See response provided in (1)(d).

(e) See response provided in (1)(e).

18. INTERROGATORY: What structures, if any, are planned to be built on Three Mile Island that are not specifically approved as part of the existing construction permit or operating license?

18. RESPONSE: See the response to Interrogatory 17. In addition, Metropolitan Edison has proposed to build a waste evaporator building in the area adjacent to the Unit 2 diesel building, which would be used to process the highly contaminated waters in the reactor building sump and the primary system. This building is still in the planning phase and has not been reviewed by NRC.

19. INTERROGATORY: With regard to any structures listed in response to the question above, were any applications for amendments to the operating license or for new construction permits submitted by GPU or Met Ed?

19. RESPONSE: No applications for amendments to the operating license or for new construction permits have been submitted by Met Ed or GPU.

20. INTERROGATORY: In reference to the structures listed in answer to Question 18 above, has or will the NRC require either amendments to the operating license or construction permits be obtained by GPU or Med Ed?

20. RESPONSE: At the present time, Met Ed has not made a formal proposal to build a waste evaporator building. When and if GPU decides to submit a formal proposal to build a building to house a waste evaporator system, the NRC will perform an evaluation to determine the applicability of requiring amendments to Met Ed's operating license or necessity for requiring a new construction permit using similar criteria as was used in the response to Interrogatory 17(1)(e).

21. INTERROGATORY: Please state to the best of your ability where the steam released in the Three Mile Island accident fell.

21. RESPONSE: During and following the March 28 incident, radioactive materials in gaseous effluents were released from the auxiliary and fuel handling building ventilation systems which discharge to the environment through the Unit 2 plant vent. The corresponding dose from these releases to the population in the vicinity of the plant depends in part upon the local meteorological conditions, namely, wind direction, wind speed, and plume dispersion characteristics, which varied during the period of radioactive release. Thus, there is no single location "where the steam released in the TMI accident fell." However, throughout the accident period, the known meteorological conditions indicate that the NNW, ENE, and SSE sectors were the predominant directions from the plant in which radioactive material released from Unit 2 would be expected to be found. NUREG-0558 summarizes radiation measurements made at various times and locations around the Three Mile Island site. The staff made specific periodic estimates of the location and relative concentration of releases throughout the course of the accident. These estimates are referred to, but not specifically presented, in NUREG-0558. NUREG-0558 is provided as Attachment 4 in the response to Interrogatory 23.

22. INTERROGATORY: Please state whether any of this steam feel on the Susquehanna River and whether the addition of radioactivity to the River from this steam has been estimated. If such an estimate has been made, please provide.

22. RESPONSE: Some of the radioactivity released into the atmosphere as a result of the Three Mile Island incident came in contact with the Susquehanna River. Specific estimates were not made to determine the amount. However, total radioactivity in the river water from all sources was monitored by the licensee, personnel from the states of Pennsylvania and Maryland, the Department of Environmental Resources, Environmental Protection Agency, U.S. Geological Survey and U.S. Nuclear Regulatory Commission. NRC measurements indicated no measurable increase in the amount of radioactivity in the river, within the limitations of the instruments, due to the incident.

23. INTERROGATORY: Please list any and all environmental, public health, or other evaluations of the accident at Three Mile Island prepared by NRC or Met Ed and provide Plaintiffs with a copy of such report.

23. RESPONSE: The following is a listing of documents which deal with the environmental and public health evaluation of the accident at Three Mile Island.

(1) NUREG-0558, "Population Dose and Health Impact of the Accident at Three Mile Island Nuclear Station, Preliminary Estimates for the Period March 28 through April 7, 1979," May 1979, prepared by the Ad Hoc Interagency Dose Assessment Group made up of participants from NRC, EPA and HEW;

(2) GQL 0693, May 15, 1979, J. G. Herbein (Met Ed) to B. H. Grier (USNRC), Interim Report on the Three Mile Island Nuclear Station Unit 2 (TMI-2) Accident;

23. RESPONSE: (continued)

(3) GQL 0780, June 18, 1979, J. G. Herbein to B. H. Grier, Second Interim Report on the Three Mile Island Nuclear Station Unit 2 (TMI-2) Accident (June 15, 1979); and

(4) July 16, 1979, J. G. Herbein to B. H. Grier, Third Interim Report on the Three Mile Island Nuclear Station Unit 2 (TMI-2) Accident.

Copies of the above reports are provided as Attachments 4, 5, 6 and 7, respectively.

24. INTERROGATORY: Please list (or provide page references to) any and all significant adverse environmental or public health impacts discovered in any of the above reports.

24. RESPONSE: Discussions of health and/or environmental impacts can be found in Section IV of the Metropolitan Edison reports and in all sections of NUREG-0558.

25. INTERROGATORY: Please provide the Plaintiffs with copies of the: (1) Facility's Operating License Number DPR-73, plus Attachments One and Two; (2) Report of Advisory Committee on Reactor Safeguards, October 22, 1976; (3) Office of Nuclear Reactor Regulation, Safety Evaluation Report, September 1976, and Supplements One and Two; (4) Final Safety Analysis Report and Amendments thereto; (5) Applicant's Environmental Report, dated February 28, 1975, and Supplements thereto; (6) Draft Environmental Impact Statement, dated June 1972; (7) Final Environmental Statement, dated December 1972; (8) Draft Supplement to Final Environmental Statement, dated July 1976; and (9) Final Supplement to Final Environmental Statement, dated December 1976.

25. RESPONSE: Copies of items 1, 2, 3, 6, 7, 8 and 9 are provided as Attachments 8, 9, 10, 11, 12, 13 and 14, respectively. The 12 volume Final Safety

25. RESPONSE: (continued)

Analysis Report and the 3 volume Environmental Report requested by items 4 and 5 can be obtained from the NRC's public document room located at the following locations:

(1) NRC Headquarters, 1717 H Street, Washington, DC

(2) NRC PDR at the Government Publications Branch, State Library, Department of Education Building, Commonwealth and Walnut Streets, Harrisburg, Pennsylvania.

26. INTERROGATORY: Please state whether Metropolitan Edison Company has provided to NRC any written evaluation of additional construction or operational activities as a result of the accident at Three Mile Island, prior to any approvals obtained from the Director, Office of Nuclear Reactor Regulation.

26. RESPONSE: Yes, the NRC has received the following documents from the Metropolitan Edison Company:

(1) Safety Analysis Report for Transition to Natural Circulation, April 12, 1979;

(2) Revised Safety Analysis Report for Transition to Natural Circulation, May 3, 1979;

(3) PLR-Decay Heat Removal System, May 1, 1979;

(4) The three Interim Reports, dated May 15, June 15 and July 16, 1979, identified in the answer to Interrogatory No. 23.

In addition to these formally submitted documents, there were other written evaluations which the NRC staff has seen in the course of its continued presence at the Three Mile Island site.

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27. INTERROGATORY: Please list all such written evaluations received by NRC since the accident at Three Mile Island.

27. RESPONSE: See response to Interrogatory 26.

28. INTERROGATORY: Were the environmental impacts from the accident at Three Mile Island, the subsequent cleanup, and alternatives to discharge into the Susquehanna evaluated by the Commission and Metropolitan Edison in the final environmental statement? If yes, please provide page references.

28. RESPONSE: The environmental impacts resulting from loss of coolant accidents have been evaluated in the Final Supplement to the Final Environmental Statement related to the operation of Three Mile Island Nuclear station Unit 2, NUREG-0112, dated December 1976. The specific accident which occurred at TMI was not evaluated. However, the environmental impact of a more severe accident, namely the loss of coolant accident resulting from a larger diameter pipe break, was evaluated in Section 7.2 of NUREG-0112. Also, the environmental impact of a similar accident, namely the loss of coolant accident resulting from a small diameter pipe berak, was evaluated in Section 7.2 of NUREG-0112.

The environmental impact of the subsequent cleanup and alternatives to discharge was not evaluated in NUREG-0112. However, as indicated in the May 25 directive from the Commission to the NRC staff, no cleanup or discharge of the water generated as a result of the March 28, 1979 accident may begin until the NRC staff completes certain actions. An environmental assessment of the cleanup of this water and alternatives to discharge into

28. RESPONSE: (continued)

the Susquehanna must be completed and the public must be provided with an opportunity to comment on the assessment. At this time, the NRC staff is in the process of preparing the environmental assessment of the cleanup of the waste water.

29. INTERROGATORY: Please state whether the annual total quantity of radioactive materials in liquid waste for 1979, excluding tritium and dissolved gases, has exceeded five curies for TMI-2.

29. RESPONSE: The total quantity of radioactive material in liquid wastes released from TMI Units 1 and 2 through May 31, 1979 is 0.46 Ci excluding tritium and dissolved gases. Refer to response to Interrogatory 7.

30. INTERROGATORY: Please state whether the annual dose to the whole body or to any organ of an individual as a result of the accident at TMI-2 has exceeded five mrem from the combined releases at TMI Units One and Two.

30. RESPONSE: As indicated in NUREG-0558 provided in the response to Interrogatory 23, the maximum dose to an individual as a result of the accident is less than 100 mrem. This is greater than the 5 mrem discussed in this interrogatory. However, it should be noted that the 5 mrem is a design objective dose for normal plant operation. A discussion of the health impact of the exposure is given in NUREG-0558.

31. INTERROGATORY: Please state whether the effluent from the cooling towers at Three Mile Island has exceeded, excluding tritium and dissolved gases, 2×10^{-8} microcuries per milliliter since January 1, 1979, and state the dates on which such violations occurred.

31. RESPONSE: The concentration level of 2×10^{-8} uCi/ml in the cooling tower effluent is not an instantaneous concentration limit nor is it an instantaneous specification limit. As indicated in the TMI-2 environmental technical specifications, it is a design objective to be met on an annual average basis to ensure that the instantaneous release rate for effluent discharges are within the limits of 10 CFR 20. Release concentrations are provided in Tables 1 through 3 of the response to Interrogatory 7. Based on the data in these tables, the value of 2×10^{-8} was exceeded during the period March 28 to April 30 but as indicated above, this does not represent a technical specification violation. The limits of 10 CFR Part 20 specified in the technical specifications were not exceeded at any time.

32. INTERROGATORY: Please state whether the annual average concentration of tritium and liquid waste prior to dilution in the environment has exceeded 5×10^{-6} microcuries per milliliter at any time during 1979, and state the date on which violations occurred.

32. RESPONSE: The concentration level of 5×10^{-6} in the effluent is not an instantaneous concentration limit nor is it an instantaneous specification limit. As indicated in the TMI-2 environmental technical specifications it is a design objective to be met on an annual average basis to ensure that the instantaneous release rate for effluent discharges are within the limits of 10 CFR 20. Release concentrations are provided in Tables 1 through 3 of

32. RESPONSE: (continued)

the response to Interrogatory 7. Based on the data in these tables, the value of 5×10^{-6} has not been exceeded during 1979. The limits of 10 CFR Part 20 specified in the technical specifications also have not been exceeded at any time.

33. INTERROGATORY: Please state whether the radioactive releases in the effluent from Reactors One and Two have exceeded the values in 10 CFR 20, Appendix "B", for unrestricted areas, at any time during 1979; and state the dates on which such violations occurred.

33. RESPONSE: See Tables 1 through 3 provided in the response to Interrogatory 7 which provides liquid and gaseous releases, January 1, 1979 to May 31, 1979.

1. Liquid Releases The iodine and tritium release concentrations given in I.B and I.C of Tables 1 through 3 are less than the 10 CFR Part 20, Appendix B, concentrations of 3×10^{-7} uCi/ml and 3×10^{-3} uCi/ml respectively. The concentrations given in Part I.A of Tables 1 through 3 are not listed by individual nuclides, however, these concentrations are less than the values in 10 CFR Part 20 for the nuclides most likely to be present in the effluents (e.g., cesiums, cobalts, strontiums, iodines, iron, manganese, zinc, and barium-lanthanum).

2. Gaseous Releases The iodine-131 releases given in II.B of Tables 1 through 3 are within the limits of 10 CFR Part 20. The noble gases appear to have exceeded the limits of 10 CFR Part 20 on a short term basis using the annual average meteorological dispersion factors from the Final Supplement to the Final Environmental Statement, NUREG-0012. 10 CFR Part 20 does, however, permit averaging these releases over a period of one year.

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33. RESPONSE: (continued)

Future calculations based on actual meteorology will be necessary to determine if 10 CFR Part 20 was actually exceeded. The exact dates of the release exceeding 10 CFR Part 20 will be determined when actual meteorological data and better gaseous release data are available.

34. INTERROGATORY: Please state whether in any quarter the total release of radioactivity in liquid effluent from TMI-1 and TMI-2, excluding tritium and noble gases, has exceeded 10 curies per reactor.

34. RESPONSE: No. As indicated in the response to Interrogatory 7, the release in liquid effluents, excluding noble gases and tritium was 0.15 curies for the first quarter and 0.31 curies for the second quarter of 1979, through May 31, 1979.

35. INTERROGATORY: Please state whether the maximum radioactivity contained in any one of the liquid radwaste tanks, excluding tritium and dissolved gases, exceeds 10 curies.

35. RESPONSE: Yes. Radioactivity levels in the Unit 2 liquid radwaste tanks exceed 10 curies, excluding tritium and dissolved, noble gases.

36. INTERROGATORY: Please state where those liquid radwaste tanks are located.

36. RESPONSE: Radwaste tanks referenced in Interrogatory 35 are located in the Unit 2 auxiliary building.

37. INTERROGATORY: Please state whether Xenon-133 has exceeded the maximum permissible concentration (168 hours) of 5×10^{-3} microcuries per milliliter at any time in 1979, and state the dates on which such violations occurred.

37. RESPONSE: No. Discharges of Xe-133 in liquid effluents have not exceeded 5×10^{-3} uCi/ml between January 1 and May 31, 1979.

38. INTERROGATORY: Please state whether the maximum permissible concentration of Xenon-135 (168 hours) has ever exceeded the level of 1×10^{-3} microcuries per milliliter, and state the dates on which such violations occurred.

38. RESPONSE: No. Discharges of Xe-135 in liquid effluents have not exceeded 1×10^{-3} uCi/ml between January 1 and May 31, 1979.

39. INTERROGATORY: Please provide the sources for the responses to Questions 29 through 38.

39. RESPONSE: Sources for answers to Interrogatories 29 through 38 include data obtained from Metropolitan Edison and Babcock and Wilcox. This includes measured station effluent data and tank volume and radioactivity analyses data. It also includes radiological dose data taken from NUREG-0558 provided in response to Interrogatory 23.

40. INTERROGATORY: Please state the basis on which the dilution factor of the Susquehanna River of 250x was developed in the Three Mile Island, Unit Two, Facility Operating License Number DPR-73.

40. RESPONSE: The dilution factor of 250 for Three Mile Island, Unit Two, was developed to determine expected doses from the finfish consumption pathway

40. RESPONSE: (continued)

for use in the assessments required by 10 CFR Part 50, Appendix I[6]. The specific estimate of 250 was based upon the dilution of plant discharge by the average annual flow rate in the middle channel of the Susquehanna River at the site. The river flow is split at the head of TMI, such that during normal flow conditions approximately 30% of the average annual discharge of 34,000 cubic feet per second (CFS) is diverted to the middle channel on the west side of the island. The average annual discharge of 34,000 cfs was based on records from the U.S. Geological Survey stream gage at Harrisburg, Pennsylvania.

The average annual plant discharge is expected to be 80 cfs. Therefore, the average dilution factor downstream of the discharge was calculated to be 125. It was assumed that an individual fish would be upstream of the discharge point ½ of the time and downstream of the discharge point ½ of the time.

The dilution was, therefore, calculated to be 250 for the region where finfish exist (within a one-quarter mile radius of the discharge point).

41. INTERROGATORY: Please state the number of people living within a five-mile radius of the Three Mile Island plant, a ten-mile radius of the TMI plant, and a fifteen-mile radius of the plant.

41. RESPONSE: The projected 1980 population within a five-mile radius of TMI was estimated in the Final Safety Analysis Report[7] for Unit 2 to be 28,821. Within a ten-mile radius the population for 1980 was projected to

41. RESPONSE: (continued)

be 166,293. A projection for the fifteen-mile radius population was not made. However, the 1980 population projection for a twenty-mile radius was 1,178,584.

42. INTERROGATORY: Please state the exact dimensions of Three Mile Island.

42. RESPONSE: A map of the TMI site is provided as Attachment 15. This map is taken from the Final Safety Analysis Report for TMI, Unit 2, Figure 2.4-1B.

43. INTERROGATORY: Please state whether additional liquid effluents could be stored on the reactor site at Three Mile Island.

43. RESPONSE: The response to Interrogatory 13 lists the current remaining storage capacity available at Three Mile Island, Units 1 and 2. This is the only remaining storage capacity available onsite at this time. As indicated in that response, it is not planned to use the remaining storage capacity in the Unit 1 auxiliary building, the fuel handling building, or the chemical cleaning building to accommodate additional effluents in the Unit 2 auxiliary building. However, this capacity could be utilized in an emergency situation.

44. INTERROGATORY: Please list and produce the test results of any soundings or drillings performed on the TMI Reactor site prior to the construction of facilities after the accident on March 28, 1979.

44. RESPONSE: There was core drilling prior to the construction of both the short-term solid waste staging facility and the long-term solid waste staging facility. The results are attached in a cover letter entitled, "Preliminary Soils Information Solid Waste Staging Facility." (Attachment 16.)

45. INTERROGATORY: Please state the estimated doses from liquid and air radioactive emissions in 1978 and 1979, by month, from Reactors One and Two, to the whole body for the calendar year, for millirems in a seven consecutive-day period and for millirems per hour.

45. RESPONSE: The doses to the maximum individual 0.37 miles WNW of the site from January through December 1978, due to liquid and gaseous effluents from Three Mile Island Units 1 and 2 are:

Unit 1	Iodines & particulates in gases, total body adult	0.86 mrem
	noble gases, total body, adult	1.0 mrem
	liquid, total body, adult	1.8 mrem
Unit 2	Iodines & particulates in gases, total body, adult	0.12 mrem
	noble gases, total body, adult	0.0019 mrem
	liquid, total body, adult	0.035 mrem

Doses at other locations would be lower.

The doses due to radioactive effluents in 1979 are mostly from the March 28, 1979 incident. The best estimate for the maximum exposed individual is less than 100 mrem. Details of this analysis are contained in NUREG-0558, provided as attachment 4.

46. INTERROGATORY: Please list all documents on which you base your calculations of human exposure to radioactivity from the Three Mile Island Nuclear Reactor. Please site specific page references to documents in which mathematical models or calculations relied on are contained.

46. RESPONSE: The following documents were used:

(1) U.S. NRC Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I." (See Attachment 17.) The specific pages are 2 through 7, 12 through 17, 20 through 22, and 24 through 28.

(2) Final Supplement to the Final Environmental Statement related to operation of the Three Mile Island Nuclear Station, Unit 2, NUREG-0112, December 1976, specifically Chapter 5.4.

47. INTERROGATORY: Please list NRC operating procedures, guidelines, internal memoranda, and policies established for the operation of nuclear power plants that exceed permissible concentrations or total quantity of radioactivity within a particular period of time.

47. RESPONSE: The operating conditions imposed on each nuclear power plant by NRC that exceed permissible concentrations or total quantity of radioactivity within a particular period of time, can be found in the technical specifications for each operating facility.

48. INTERROGATORY: Please list all NRC operating procedures, guidance, memoranda, and policies for the preparation of environmental assessment statements, for determining when a negative declaration is issued, and for determining when an environmental impact statement is required.

48. RESPONSE: NRC guidance for the preparation of environmental assessment statements is contained in 10 CFR Part 51[8]. This Part is currently being

48. RESPONSE: (continued)

revised to conform with new CEQ regulations which become effective on 30 July 1979. In addition there is a DOR memorandum No. 5, dated 9 March 1977, which also gives some guidance in this area. (See Attachment 18.)

49. INTERROGATORY: Please state the name and address of the manufacturer of EPICOR-I and EPICOR-II Treatment Systems.

49. RESPONSE: The EPICOR-I and EPICOR-II treatment systems were provided by EPICOR, Inc., 1375 Linden Avenue, Linden, New Jersey.

50. INTERROGATORY: Please list the specifics of the design system of EPICOR-I and EPICOR-II.

50. RESPONSE: See attached EPICOR-I and EPICOR-II System Descriptions (Attachments 19 and 20, respectively).

51. INTERROGATORY: Please list any and all information concerning the manufacture and specifications, manufacture of component parts, prior installations, and produce prior performance data on EPICOR-I and EPICOR-II.

51. RESPONSE: Information requested in Interrogatory 51 concerning system design is given in the response to Interrogatory 50.

With regard to system performance data, it should be noted that EPICOR-I and EPICOR-II are systems that use ion exchange to treat the water. The use of ion exchange in the treatment of radioactive waste water is

51. RESPONSE: (continued)

standard practice in nuclear power plants and the principles and performance data upon which they are based are described in NUREG-CR-0143, provided as Attachment 21.

The EPICOR-I system has been used onsite previously at Unit 1 and system decontamination factors were found to be satisfactory.

The EPICOR-II facility is similar to EPICOR-I. The major difference lies in the fact that EPICOR-II is located inside a ventilated and filtered building. It is planned to use it to process liquid wastes that are of a higher activity level than those processed by EPICOR-I.

52. INTERROGATORY: Please state what NRC and Met Ed's projected performance capability of EPICOR-II was on April 15, on May 16, and on May 25, 1979.

52. RESPONSE: The EPICOR-II system was originally designed to process wastes with a cesium-137 and iodine-131 specific activity of no greater than 100 uc/ml. This design objective has not changed.

53. INTERROGATORY: Please state the current characteristics in terms of concentration of various radioactive isotopes in the primary coolant water, in all water held in tanks on the reactor site, in the reactor core and containment building.

53. RESPONSE: Concentrations of important radionuclides for radiological dose considerations at requested locations are presented in Tables 6 and 7.

54. INTERROGATORY: Please state how the various water systems are presently segregated or inter-connected through plumbing mechanisms or leaks.

54. RESPONSE: Information concerning the various waste systems can be obtained from the following drawings:

1. Flow Diagram - Radwaste Disposal Reactor Coolant Liquid, DWG 2027, Rev. 24.
2. Flow Diagram - Radwaste Disposal - Miscellaneous Liquids, DWG 2045, Rev. 19.
3. Flow Diagram - Auxiliary Building Emergency Liquid Cleanup System, DWG M006, Rev. 4.
4. Flow Diagram - Fuel Pool Waste Storage System, DWG M014, Rev. 3.

These drawings are provided as Attachments 22 through 25.

55. INTERROGATORY: Please list the projected treatment efficiency on primary coolant water for all radioactive components of EPICOR-II.

55. RESPONSE: EPICOR-II was not designed to process primary coolant system water.

56. INTERROGATORY: Please list all solid radioactive materials presently on-site, the level of radioactivity, and the disposal techniques anticipated.

56. RESPONSE: The current inventory of solid waste includes approximately 700 drums (55-gallon) of compacted low-level trash, 9 liners (50 cubic feet) of solidified evaporator bottoms, 46 boxes (4 feet by 4 feet by 8 feet) of noncompactible low-level trash, 9 liners (180 cubic feet) of dewatered resin, and 3 liners (180 cubic feet) of dewatered filter medium. All of these

56. RESPONSE: (continued)

containers qualify as Low Specific Activity (10 CFR Part 71.4[9]) material and will be transported to a licensed burial facility for ultimate disposal.

57. INTERROGATORY: Please state whether, to the Defendants' knowledge, there is any method currently known to determine the amount of cell damage caused by radiation as experienced from the Three Mile Island Reactor.

57. RESPONSE: We are not aware of any method to determine the amount of cell damage in humans caused by low doses of radiation (i.e., about 100 mrem). In NUREG-0558 (Attachment 4) the dose to a hypothetical offsite maximum individual was estimated to be less than 100 mrem. Recently Dr. Joseph Gong of the State University of New York at Buffalo presented a talk on the erythroid effects of radiation of rats in the 1 roentgen (R) range (Symposium on Biological Effects, Imaging Techniques and Dosimetry of Ionizing Radiation, Bureau of Radiological Health, June 1979). At this symposium Dr. Gong stated that he has detected an increase in the amount of normoblasts for bled rats at doses as low as 50 mR. To the best of our knowledge, this is the lowest level of exposure at which cell damage has been observed in animals. However, we are not aware of any studies that have shown similar effects in humans at doses of 100 mrem or less.

TABLE 1

	PERIOD 3/28/79 - 3/31/79
I. Summary of Releases (Liquid)	
A. Curies Discharged (excluding tritium & dissolved noble gases)	1.1E-1
Concentration (uCi/cc)	1.32E-7
B. Iodine-131 Released	
Total Curies	1.063E-1
Concentration (uCi/cc)	1.24E-7
C. Tritium Releases	
Total Curies	5.5E-1
Concentration (uCi/cc)	6.61E-7
II. Summary of Releases (Airborne)	
A. Noble Gases	
Total Curies	8.83E+6
Release Rate (Ci/sec)	1.12
B. Iodine Releases	
Total Curies	4.57
Release Rate (uCi/sec)	5.8E-1

TABLE 2

	PERIOD 4/01/79 - 4/30/79	PERIOD 5/01/79 - 5/31/79
I. Summary of Releases (Liquid)		
A. Curies Discharged (excluding tritium & dissolved gases)	2.74E-1	4.0E-2
Concentration (uCi/cc)	4.39E-8	6.21E-9
B. Iodine-131 Released		
Total Curies	1.28E-1	5.1E-3
Concentration (uCi/cc)	2.1E-8	7.8E-10
C. Tritium Releases		
Total Curies	10.12	4.7
Concentration (uCi/cc)	1.62E-6	7.3E-7
II. Summary of Releases (Airborne)		
A. Noble Gases		
Total Curies	1.11E+6	1.4E+3
Release Rate (Ci/sec)	1.41E-1	1.74E-4
B. Iodine Releases		
Total Curies	9.5	7.8E-2
Release Rate (uCi/sec)	1.20	9.9E-3

TABLE 3

	PERIOD 1/01/79 - 3/31/79
I. Summary of Releases (Liquid)	
A. Curies Discharged (excluding tritium & dissolved noble gases)	1.5E-1
Concentration (uCi/cc)	8.03 E-9
B. Iodine-131 Released	
Total Curies	1.07E-1
Concentration (uCi/cc)	5.7E-9
C. Tritium Released	
Total Curies	26.1
Concentration (uCi/cc)	1.54E-6
II. Summary of Releases (Airborne)	
A. Noble Gases	
Total Curies	8.83E+6
Quarterly Release Rate (Ci/sec)	1.12
B. Iodine-131 Releases	
Total Curies	4.57
Quarterly Release Rate (uCi/sec)	5.8E-1

TABLE 4

SUMMARY OF LIQUID RADIONUCLIDES DISCHARGED BY ISOTOPE
PERIOD 1/1/79 THROUGH 3/27/79

Radionuclide	Activity Ci
H-3	2.54E +1
Cr-51	1.65E -3
Mn-54	3.36E -4
Co-58	2.13E -2
Fe-59	1.33E -4
Co-60	1.19E -3
Zn-65	3.94E -5
Nb-95	1.43E -3
Zr-95	7.71E -5
Zr-97	8.88E -5
Mo-99	8.56E -6
Ru-103	7.37E -5
Ag-110	8.32E -4
Sb-122	5.78E -5
Sb-124	3.77E -5
I-131	2.54E -4
Xe-131m	2.60E -5
I-132	---
I-133	---
Xe-133m	2.60E -5
Xe-133	9.95E -3
Cs-134	3.21E -3
Cs-136	1.22E -5
Cs-137	4.55E -3
Ba-140	2.88E -5
La-140	3.94E -4

TABLE 5

LIQUID RADIONUCLIDE DISCHARGES BY ISOTOPE

Radionuclide	3/28/79-4/30/79 Activity (Ci)	5/1/79-5/31/79 Activity (Ci)
H-3	10.670	4.7
Cr-51	3.5E -4	1.64E -3
Mn-54	4.11E -4	1.57E -4
Co-58	0.022	1.24E -2
Co-60	6.9E -3	1.41E -3
Nb-95	1.82E -4	5.17E -4
Zr-95	4.83E -5	7.22E -5
Ag-110m	1.25E -3	9.37E -4
I-131*	0.235	5.05E -3
Xe-131m	—	7.25E -4
I-132	3.44E -4	—
I-133	1.4E -4	1.43E -5
Xe-133	0.012	7.5E -5
Cs-134	2.11E -3	2.18E -3
Cs-136	2.7E -4	1.3E -3
Cs-137	5.61E -3	4.83E -3
Ba-140	5.99E -4	5.43E -3
La-140	1.29E -3	4.09E -3

*I-131 is the only radionuclide of significance released to the river from Unit 2 accident of 3/28/79. Other radionuclides came primarily from Unit 1.

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TABLE 6

ESTIMATE OF CONCENTRATION OF ACTIVITY IN WASTE LIQUIDS

(As of July 1, 1979)

ACTIVITY (uCi/ml)	REACTOR COOLANT	CONTAINMENT SUMP*
H-3	0.2-0.3	1.0-1.5
Sr-89	305-330	300-400
Sr-90/Y-90	17-19	10-18
I-131	0.5-0.6	0.5-1.5
Cs-134	18-22	30-40
Cs-137/Ba-137m	90-110	200-260
Ba-140/La-140	4-5	0.5-1
Total of Others	0.1-5	0.1-10

*Ranges are estimated (sample has not been obtained for analysis).

TABLE 7

CONCENTRATIONS OF PRINCIPAL NUCLIDES IN TMI UNIT 2
AUXILIARY BUILDING TANKS AS OF
JUNE 15, 1979
(uCi/ml)

	Reactor Coolant Bleed Tank A	Reactor Coolant Bleed Tank B	Reactor Coolant Bleed Tank C
I-131	1.9	2.8	3.0
Cs-134	6.5	7.6	7.7
Cs-136	0.28	0.29	0.28
Cs-137	28	35	35
Ba-140	0.09	0.3	0.29
H-3	0.23	0.27	0.29

	Neutralizer Tank A	Neutralizer Tank B	Miscellaneous Waste Holdup Tank Auxiliary Bldg Sump & Sump Tank; Miscellaneous Sumps	Evaporator Condensate Tanks; Contaminated Drain Tanks
I-131	0.15	0.18	1.0	$< 10^{-1}$
Cs-134	0.56	0.72	2.4	$< 10^{-1}$
Cs-136	0.01	0.02	0.08	$< 10^{-1}$
Cs-137	2.5	3.3	10.1	$< 10^{-1}$
Ba-140	.01	0.03	0.8	$< 10^{-1}$
H-3	NA*	NA*	0.98	NA*

*Not analyzed as yet. H-3 levels are estimated to be less than 0.2 uCi/gm.

REFERENCES

(1) Title 10, CFR Part 50.36a, "Technical Specifications in Effluents from Nuclear Power Reactors."

(2) Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Release of Radioactivity in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," Rev. 1.

(3) NUREG-0432, Three Mile Island Nuclear Station, Unit No. 2, Environmental Technical Specifications (Appendix B), Section 2, "Radioactive Discharges," February 8, 1978.

(4) Title 10, CFR Part 20, "Standards for Protection Against Radiation."

(5) Title 10, CFR Part 50.59, "Changes, Tests and Experiments."

(6) Title 10, CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low As Practicable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents."

(7) Metropolitan Edison Co., Final Safety Analysis Report, Three Mile Island Nuclear Station, Unit No. 2, April 1974.

(8) Title 10, CFR Part 50, "Licensing and Regulatory Policy and Procedures for Environmental Protection."

(9) Title 10, CFR Part 71.4, "Packaging of Radioactive Material for Transport and Transportation of Radioactive Material Under Certain Conditions, Definitions."