

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

DOCKETED
USNRC

Before the Atomic Safety and Licensing Board ^{83 DEC 30 P4:27}

In the matter of)
METROPOLITAN EDISON COMPANY, ET AL.)
(Three Mile Island Nuclear)
Station, Unit 1))

OFFICE OF SECRETARY
DOCKETING & SERVICE
Docket Branch. 50-289-OLA
ASLBP 83-491-o4-OLA
(Steam Generator Repair)

TMIA'S FIRST SET OF INTERROGATORIES AND REQUEST
FOR PRODUCTION OF DOCUMENTS TO LICENSEE

Pursuant to 10 C.F.R. §2.740b, TMIA requests that Licensee answer separately and fully in writing, and under oath or affirmation, each of the following interrogatories. Answers must be signed by the person making them and must be served within fourteen days of the interrogatories service. These interrogatories are intended to be continuing in nature and the answers should be supplemented or amended as appropriate, pursuant to 10 CFR §2.740(e), should the Licensee or any individual acting on his behalf obtain any new or differing information responsive to these interrogatories.

Definitions and Instructions

The following definitions are applicable to each interrogatory and are incorporated by reference in each interrogatory. The interrogatories must be read in the light of these definitions and your answers must be responsive to the interrogatories as so defined.

1. "Document": The term "document" means any written, recorded, printed, typed or other graphic matter of any kind or nature, however produced or reproduced, whether sent or received or neither, including drafts or copies bearing meaning,

notations or marks not found on or in the original, and includes but is not limited to:

- (a) all letters or other forms of correspondence or communication, including envelopes, notes, telegrams, cables, telex messages, messages (including reports, notes, notations and memoranda of or relating to telephone conversations or conferences.)
- (b) all memoranda, reports, test results, notes, transcripts, tabulations, studies, lists, comparisons, charts, graphs, summaries, extracts, statistical records, compilations
- (c) all desk calendars, appointment books, diaries
- (d) all books, articles, booklets, bulletins, notices, instructions, manuals
- (e) all photographs, microfilms, tapes or other records, punch cards, magnetic tapes, discs, data cells, print-outs and other data compilations from which information can be obtained.

2. "Communication": The term "communication" means not only oral communications but also any "documents" (as such term is defined in paragraph 1. above), whether or not such document or the information contained therein was transmitted by its to any other person.

3. "Identify", "Identity", or "Identification":

(A) When used in reference to a natural person, the terms "identify", "identity", or "identification" seek the following information:

- (i) full name;
- (ii) present or last known business address;
- (iii) present or last known business affiliation;
and
- (iv) present or last known business position
(including job title and a description of
job functions, duties and responsibilities).

(B) When used with reference to any entity other than a natural person, the terms "identity", "identify", or "identification" require that Licensee state:

- (i) its full name;
- (ii) the address of its principle place of business;
- (iii) the jurisdiction under the laws of which it has been organised or incorporated and the date of such organisation or incorporation, if known;
- (iv) the identity of all individuals who acted or who authorised another to act on its behalf in connection with the matters referred to;
- (v) in the case of a corporation, the names of its directors and principle officers; and
- (vi) in the case of an entity other than a corporation, the identities of its partners or principles or all individuals who act on its behalf in connection with matters referred to.

(C) When used in reference to a document, the terms "identify", "identity", or "identification" mean to provide the following information:

- (i) the nature of the document (e.g., letter, contract, memorandum) and any other information (i.e., its title, index or file number) which would facilitate in the identification thereof;
- (ii) its date of preparation;
- (iii) its present location and identity (as defined in paragraph 3(A) hereof) of its present custodian or, if its present location and custodian are not known, a description of its last known disposition;
- (iv) its subject matter and substance or, in lieu thereof, annex a legible copy of the document to the answers of those interrogatories;

- (v) the identity (as defined in paragraph 3(A) hereof) of each person who performed any significant function or had any role in connection therewith (i.e., author, contributor of information, recipient, etc.) or who has any knowledge; and
- (vi) if the document has been destroyed or is otherwise no longer in existence or cannot be found, the reason, if known, why such document no longer exists, the identity (as defined in paragraph 3(A) hereof) of the person responsible for the document no longer being in existence and of its last known custodian.

(D) When used in connection with an oral communication, the terms "identify", "identity", or "identification" mean to provide the following information:

- (i) its general nature (i.e., conference, telephonic communication, etc.);
- (ii) the time and place of its occurrence;
- (iii) its subject matter and substance;
- (iv) the identity (as defined in paragraph 3(A) hereof) of each person who performed any function or had any role in connection therewith or who had any knowledge thereof; and
- (v) the identity (as defined in paragraph 3(B) hereof) of each document which refers thereto or which was used, referred to or prepared in the course or as a result thereof.

(E) When used in connection with a statute, regulation, or any other legal requirement, the terms "identify", "identity", or "identification" mean to provide the complete legal citation, by section and subsection, or where no such citation exists, any information necessary to facilitate its location.

4. "Describe" or "Description":

(A) When used with respect to any act, action, accounting, activity, audit, practice, process, occurrence, occasion, course of conduct, happening, negotiation, relationship, scheme, communication, conference, discussion, development, service, transaction, instance,

incident, or event, the terms "describe" or "description" mean to provide the following information:

- (i) its general nature;
- (ii) the time and place thereof;
- (iii) a chronological account setting forth each element thereof, what such element consisted of and what transpired as part thereof;
- (iv) the identity (as defined in paragraph 3(A) hereof) of each person who performed any function or had any role in connection therewith (i.e., speaker, participant, contributor of information, witness, etc.) or who has any knowledge thereof;
- (v) the identity (as defined in paragraph 3(B) hereof) of each document which refers thereto or which was used, referred to or prepared in the course or as a result thereof; and
- (vi) the identity (as defined in paragraph 3(C) hereof) of each oral communication which was a part thereof or referred thereto.

(B) When used in connection with any test data the terms "describe" or "description" mean to provide the following information:

- (i) all calculations, computer printouts and any other documentation used to obtain stated test results, including sequence of testing;
- (ii) an explanation of its meaning (including the nature, source and meaning of each component part thereof);
- (iii) an explanation of the manner in which it was derived;
- (iv) the identity (as defined in paragraph 3(A) hereof) of each person who performed any function with respect thereto;
- (v) the identity of each document (as defined in paragraph 3(B) hereof) which refers thereto or which was used, referred to or prepared in the course or as a result thereof; and
- (vi) the identity (as defined in paragraph 3(C) hereof) of each oral communication which occurred in the course of the preparation thereof or which referred thereto.

5. "Factual Basis": The term "factual basis" means;
(A) set forth each item of information upon which the allegation, contention, claim or assertion to which it pertains is based, and (B) with respect to each such item of information identify each person having knowledge thereof and identify and describe (as defined in paragraphs 3 and 4 hereof) each source thereof, including but not limited to each document oral communication, act, action, activity, accounting, negotiation, practice, process, occurrence, occasion, course of conduct, happening, relationship, scheme, conference, discussion, development, service, instance, incident, event, calculation and computation upon which you rely with respect thereto.

6. "Relates to": The term "relates to" or "relating to" when used in connection with any act, action, activity, accounting, practice, process, occurrence, occasion, course of conduct, contractual provision or document, happening, relationship, scheme, conference, discussion, development, service, instance, incident, event, etc., means used or occurring or referred to in the preparation thereof, or in the course thereof, or as a consequence thereof, or referring thereto.

7. "Person": The term "person" means all natural persons, corporations, partnerships or other business associations, public authorities, municipal corporations, state governments, local governments, all governmental bodies, and any other legal entities..

8. Answer by reference to Documents: Identify each and every document which you claim supports each fact set forth in your answers to the Interrogatories. With respect to each answer, identify (as defined in paragraph 3(C) hereof) the specific document, documents, or portions thereof identified by page and paragraph number within the page, containing the requested information, or attach a copy to the answer hereto.

9. For each interrogatory answer, identify each person who participated in the preparation of the answer, and who provided information to you upon which you relied in preparing ^{your} answer, and precisely what information was provided by each such person.

10. "Licensee": "Licensee" includes Metropolitan Edison Company and GPU Nuclear Corporation, and all present and former officers, employees, agents, and all other persons, engineering or consulting firms or companies acting or purporting to act on behalf of Met Ed, GPU Nuclear, and/or any kind and all parent and predecessor entities.

11. Answers to interrogatories which address the reports of "GPU's Third Party Review Group" should express only the views and opinions of Licensee's Third Party Group members. Within that grouping of interrogatories, "you" or "your(s)" means the Third Party Review Group, its members or any person authorized to act on its behalf.

12. For answers to interrogatories addressed to the Third Party Review Group which ask for a procedural description, describe any votes taken by the group, or other method explaining how the group reached any consensus, and identify how minority views were taken into account.

13. "State the basis" includes the factual, legal and other bases for the relevant assertion, and includes the terms "factual basis," "identify," and "describe" as defined herein.

14. These interrogatories shall be deemed to be continuing so as to require supplemental answers if Licensee obtains additional information after service of the initial answers. Such additional answers shall be served from time to time, but no later than fourteen(14) days after such additional information is received by Licensee.

Interrogatories for Licensee

1. Describe all tests (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee, including a description of the loading conditions and an explanation as to how the tests took into account the load time history effects on the tubes, to determine the fatigue life of TMI-1 steam generator tubes:

- (a) before kinetic expansion repairs were performed; and
- (b) after kinetic expansion repairs were performed.

2. Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee, including a description of the loading conditions and an explanation as to how the tests took into account the load time history effects on the tubes, to determine the stress levels on the TMI-1 steam generator tubes:

- (a) before kinetic expansion repairs were performed, and
- (b) after kinetic expansion repairs were performed.

3. Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee, including a description of the loading conditions and an explanation as to how the tests took into account the load time history effects of the tubes, to determine the effects of the corrosive contaminant on:

(a) stress levels on the TMI-1 steam generator tubes, and

(b) the the fatigue life of TMI-1 steam generator tubes.

4. Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee, including a description of the loading conditions and an explanation as to how the tests took into account the load time history effects of the tubes, to determine the effects of the changed strength and dimensions of tubes which have been kinetically expanded, on:

(a) stress levels on the TMI-1 steam generator tubes, and

(b) the the fatigue life of the TMI-1 steam generator.

5. Describe how the tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee described in Interrogatories 1 through 4 took account of crack size in determining:

(a) stress levels on the TMI-1 steam generator tubes, in particular, the effects of thermal stress, and

(b) the the fatigue life of TMI-1 steam generator tubes.

6. Describe how the tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee described in Interrogatories 1 through 4 took account of crack location in determining:

(a) stress levels on the TMI-1 steam generator tubes, and

(b) the the fatigue life of TMI-1 steam generator tubes.

6. Describe and state the basis for determining the failure mode of:

(a) the kinetically expanded tubes; and

(b) the TMI-1 archival tubes.

7. State the basis for using an axial load of 1110 lb./100°F during the corrosion test referred to in TDR-008.

8. Has Licensee determined or quantified the specific load transfer for testing purposes? If the answer is "yes", describe and state the basis for determining the load transfer under:

(a) ideal conditions; and

(b) service conditions.

9. Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee, to test plasticity failures, including a description of which tubes have been tested for plasticity failures, and a description of the plasticity failure analysis for all sections of the tubes. If only certain tubes were tested, state the basis for selecting the tubes which were tested, and for failing to select others.

10. Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee, to determine the effects of a a simltaneous rupture in both steam generators,

including a simultaneous rupture in both steam generators occurring in conjunction with a LOCA.

11. Do you claim that in the course of corrosion, some tubes failed earlier than others? State the basis for your answer.

12. If your answer to the above interrogatory is "yes":

(a) Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee to determine why some tubes failed earlier than others.

(b) Describe precisely how pre and post-repair testing and analyses of the TMI-1 steam generator took account of the fact that certain tubes had failed earlier than others.

13. Do you claim that the repaired tubes have been returned to the original design basis?

(a) If the answer is "no", state the basis for determining this, and explain precisely why this is or is not safety significant.

(b) If the answer is "yes," state the basis for this determination.

14. Did Licensee perform the "Rockwell hardness test" on any corroded tubes before the expansion repair?

(a) If the answer is "no", state the basis for determining not to perform the "Rockwell hardness test" on corroded tubes before the expansion repair.

(b) If the answer is "yes," describe the test performed, which tubes were tested, and test data (as defined in ¶4B, supra), and analyses developed, including a description of the loading conditions for the test.

15. Did Licensee perform the "Rockwell hardness test" on corroded tubes after the expansion repair?

(a) If the answer is "no", state the basis for determining not to perform the "Rockwell hardness test" on corroded tubes after the expansion repair.

(b) If the answer is "yes," describe the test performed, which tubes were tested, and test data (as defined in ¶4B, supra), and analyses developed, including a description of the loading conditions for the test.

16. Did Licensee perform tests to evaluate the "toughness" of corroded tubes before the expansion repair?

(a) If the answer is "no", state the basis for determining not to perform tests to evaluate the "toughness" of corroded tubes before the expansion repair?

(b) If the answer is "yes," describe the test performed, which tubes were tested, and test data (as defined in ¶4B, supra), and analyses developed, including a description of the loading conditions for the test.

17. Did Licensee perform the tests to evaluate the "toughness" of corroded tubes after the expansion repair?

(a) If the answer is "no", state the basis for determining not to perform tests to evaluate the "toughness" of corroded tubes after the expansion repair.

(b) If the answer is "yes," describe the test performed, which tubes were tested, and test data (as defined in ¶4B, supra), and analyses developed, including a description of the loading conditions for the test.

18. Describe the relationship between the pre-repair "Rockwell hardness test" and tests to evaluate "toughness."

19. Describe the relationship between the post-repair "Rockwell hardness test" and tests to evaluate "toughness."

20. Describe the "lead test" program, including an explanation as to whether the tube samples being used for the lead test program have been expanded prior to the testing sequence.

21. State the basis for determining that the "lead test" program will detect tube degradation.

22. Describe the smallest crack opening displacement detectable by your methods.

23. Describe and state the basis for deciding not to use non-linear fracture mechanics theory and analysis for testing and analyzing the residual tube properties in the TMI-1 steam generators, including the properties of those tubes which were circumferentially cracked?

24. If you claim that non-linear fracture mechanics analysis is inappropriate for testing and analyzing the residual tube properties in the TMI-1 steam generators, including the properties of circumferentially cracked tubes, describe and state the basis for this determination.

25. Describe the empirical data which exists to support the fracture mechanics calculations used by Licensee to test the residual tube properties in the TMI-1 steam generators, including the properties of circumferentially cracked tubes.

26. Describe and state the factual basis for determining which type of plug has been used in the various locations of the TMI-1 steam generators.

27. Describe and state the factual basis for determining the effect which the plugging of 1,500 tubes would or will have on load distribution.

28. Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee to determine the effects ^{which} plugging 1,500 tubes will have on load distribution.

29. Describe and state the factual basis for determining the revised load for an individual tube after it has been plugged.

30. Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee to determine the revised load for an individual tube after it has been plugged.

31. Describe and state the factual basis for determining how the new load distribution referred to in the preceeding interrogatory affects the fatigue life of an individual tube.

32. Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee to determine how this new load distribution referred to in the preceeding interrogatory affects the fatigue life of an individual tube.

33. Describe precisely how pre-and post-repair testing and analyses of the TMI-1 steam generator took account of the new load distribution identified in the preceeding interrogatory.

34. Describe in precise detail the history of plug retention at TMI-1. Include the complete failure analysis history.

35. Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee to determine the plug retention capability of tubes which suffered corrosion damage and had been expanded before plugging.

36. Describe and state the basis for determining acceptable leakage for plugged tubes.

37. Describe the number and location of plugged tubes which were identified as leaking unacceptably, requiring further repairs, during post-repair testing.

38. Describe and state the factual basis for determining which tubes had unacceptable leakage identified during post-repair testing.

39. Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the

tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee to determine the cause of the lack of integrity of these leaking plugs.

40. Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee to determine whether plugged tubes which have undergone the kinetic expansion repair process will interfere with the plant's ability to respond to transients and accidents?

41. Describe mechanistically your definitions of safety and safety significant as they relates to steam tube repairs and failures.

42. Do you claim that "a turbine trip a maximum power" could result in stresses sufficient to cause a rupture of the repaired portion of a steam generator tube? Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee to determine this.

(a) If the answer is "yes", describe the significance of these stresses, state the basis for your determination, and explain precisely why this is or is not safety significant.

(b) If the answer is "no," state the basis for this determination.

43. Do you allege that "thermal shock from an inadvertent actuation of emergency feedwater at high power" could result in stresses sufficient to cause a rupture of the repaired portion of a steam generator tube? Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee to determine this.

(a) If the answer is "yes", describe the significance of these stresses, state the basis for your determination, and explain precisely why this is or is not safety significant.

(b) If the answer is "no," state the basis for this determination.

44. Do you allege that "rapid cooldown" following a LOCA could result in stresses sufficient to cause a rupture of the repaired portion of a steam generator tube? Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee to determine this.

(a) If the answer is "yes", describe the significance of these stresses, state the basis for your determination, and explain precisely why this is or is not safety significant.

(b) If the answer is "no," state the basis for this determination.

45. Do you allege that "rapid cooldown" following a LOCA could result in stresses sufficient to cause a rupture of the repaired portion of a steam generator tube? Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee to determine this.

(a) If the answer is "yes", describe the significance of these stresses, state the basis for your determination, and explain precisely why this is or is not safety significant.

(b) If the answer is "no," state the basis for this determination.

46. Do you claim that "restart" could result in stresses sufficient to cause a rupture of the repaired portion of a steam generator tube? Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee to determine this.

(a) If the answer is "yes", describe the significance of these stresses, state the basis for your determination, and explain precisely why this is or is not safety significant.

(b) If the answer is "no," state the basis for this determination.

47. Describe and state the basis for determining that the corrosive environment has been eliminated.

48. Do you claim that the concerns raised by Mr. Dillon with respect to fears that the clean up process may cause the corrosion which damaged the steam generators to reinitiate, have any continuing relevancy now that the clean up has been completed?

(a) If the answer is "yes", describe the relevancy, state the basis for your determination, and explain precisely why this is or is not safety significant.

(b) If the answer is "no," state the basis for this determination.

49. Do you claim that the sulfur contamination remaining after the cleaning process poses no risk of reinitiation of IGSCC?

(a) If the answer is "yes", describe the effect, state the basis for your determination, and explain precisely why this is or is not safety significant.

(b) If the answer is "no," state the basis for this determination.

50. Do you claim that an inventory of 0.1 ppm sulfate in solution would have no corrosive effect on the steam generator tubes or the RCS?

(a) If the answer is "yes", describe the effect, state the basis for your determination, and explain precisely why this is or is not safety significant.

(b) If the answer is "no," state the basis for this determination.

51. Do you claim that the release of the 20-50% of the sulfur remaining in the oxide corrosion film will have any corrosive effect on the steam generator tubes or the RCS?

(a) If the answer is "yes", describe the effect, state the basis for your determination, and explain precisely why this is or is not safety significant.

(b) If the answer is "no," state the basis for this determination.

52. State the basis for determining that the chemical composition of contaminants which remains in the steam generators after cleaning is acceptable.

53. State the basis for determining that the explosive residue remaining in the steam generators after cleaning is acceptable.

54. Do you claim that sodium thiosulfate, or other sulfur-bearing species resulting in residual sodium thiosulfate, was introduced into the reactor coolant system in:

(a) July, 1980;

(b) May, 1981;

(c) September 1981;

(d) any other date in TMI-1 history.

55. Describe the precise circumstances of each introduction of sodium thiosulfate, or other sulfur-bearing species resulting in residual sodium thiosulfate, referred to in the preceeding interrogatory, and state the factual basis for determining these circumstances.

56. Describe steps taken by Licensee to determine the extent of damage, and to rid the system of contamination, in response to the instances of introduction of sodium thiosulfate, or other sulfur-bearing species resulting in residual sodium thiosulfate,

referred to in the preceeding interrogatory, including whether Licensee reported such instances to the NRC.

57. Describe any steps taken by Licensee to determine if damage had occurred within the reactor coolant system as a result of introduction of sodium thiosulfate, or other sulfur-bearing species resulting in residual sodium thiosulfate, referred to in the preceeding interrogatory.

58. Has Licensee received NUREG - 0691? If so, describe the precise circumstances as to when this was received, and describe any steps taken to determine if damage had occurred within the reactor coolant system as a result of the findings contained in NUREG - 0691?

59. Describe any thiosulfate residual remaining in the system as a result of any previous introduction of sodium thiosulfate, or other sulfur-bearing species resulting in residual sodium thiosulfate, at the start of September, 1981. State the basis for arriving at this determination.

60. Do you disagree with the NRC Staff finding at page 8 of its Safety Evaluation that "the specific mechanistic steps involved in the sulfur-induced stress corrosion cracking phenomenon have not been clearly established?"

61. Describe, and state the basis for determining:

(a) how cracking occurred at the lower portion of the tubes in the steam generator.

(b) how cracking terminated.

62. Do you disagree with the conclusion of NRC Staff consultant Dr. Digby D. MacDonald that a volatile polysulfur species besides thiosulfate must be present in the RCS?

63. Describe all methods you have used to rid the RCS of the polysulfur species identified by Dr. MacDonald.

64. With respect to contaminants other than sulfur (in its various forms and compounds), describe each contaminant^{within the RCS or steam generators} which could cause or contribute to corrosion.

65. Describe the sealing mechanism which, along with expansion, you claim will "severely reduce the possibility of free circulation of reactor coolant in the upper crevice area which could produce an aggressively corrosive environment." Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee to determine this, including a description of the failure mode.

66. Describe the mechanism which you claim "...limit[s] the possibility of existence of an aggressively corrosive environment due to the presence of small sulfur deposits." Describe all tests, (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by Licensee to determine this, including a description of the failure mode.

67. Do you claim that cracking in the weld area occurred at heat up phase? State the basis for your answer.

68. Do you claim that cracking in the transition zone occurred at heat up phase? State the basis for your answer.

69. Describe and state the basis for determining what precise radiological health and safety consequences, in terms of both radioactive releases into the environment, and exposure to the population, would result from

(a) a single tube rupture; and

(b) a simultaneous rupture in each steam generator.

70. Describe and state the basis for Licensee's response to all findings, comments, and recommendations of "GPU's Third Party Review Group."

71. Define the following: core tubes; peripheral tubes; average tubes.

Interrogatories Addressing GPU's Third Party Review Group Reports

T-1. State the educational and professional qualifications (including a complete list of publications) of each member of Licensee's "Third Party Review Group (TPR)."

T-2. Describe the precise expertise which each member of the TPR has in the area of fracture mechanics.

T-3. Describe the precise expertise which each member of the TPR has in the area of stress analysis of steam generator tubes at nuclear power plants.

T-4. Identify all those who attended or participated in TPR discussions or meetings, and state the educational and professional qualifications (including a complete list of publications) of each such person.

T-5. Identify all those who acted as employees, agents, advisors, or consultants to the TPR, and state the educational and professional

qualifications (including a complete list of publications) of each member of Licensee's "Third Party Review Group (TPR)."

T- 6. Identify all those responsible for or who contributed to defining the purpose, scope, membership, and operation of the TPR.

T- 7. Describe procedurally how all interim and final findings, comments, and recommendations were arrived at by the TPR.

T- 8. State the basis for the TPR's statement in its February 18, 1983 report, "[S]afe operation of the TMI-1 plant after repair of the steam generators will be dependent on ...

(a) [c]ompletion of analyses including ...the contingency of multiple tube rupture.

(b) [t]ranslation of analytical work such as leak before break and multiple tube rupture into useable plant guidance, procedures, and training.

(c) a conservative approach of power escalation after completion of repairs."

T- 9. State the basis for the TPR's recommendation in its February 18, 1983 report, "[A]lthough sufficient operating experience with other once-thru steam generators (OTSGs) would justify allowing the OD indications less than 40 percent through-wall to remain in service, the ID indications are most probably stress corrosion cracks and should be plugged." Describe procedurally how this finding was arrived at.

T-10. Describe GPU's response to the recommendation referred to in the preceeding interrogatory, and identify all those responsible for formulating this response.

- T- 11. State the basis for TPR's finding in its May 16, 1983 supplement that Licensee's response is satisfactory, and describe procedurally how this finding was arrived at. Include a precise description of any dissenting views expressed by any members of the TPR, its advisors, or consultants, to this finding.
- T- 12. State the basis for the TPR's recommendation in its February 18, 1983 report, "[t]ubes within three rows of the lane region and in the wedge-shaped region at the periphery which have OD indications at the 15th support plate or above, should be plugged as has been done in other OTSG's." Describe procedurally how this finding was arrived at.
- T- 13. Describe GPU's response to the recommendation referred to in the preceeding interrogatory, and identify all those responsible for formulating this response.
- T- 14. State the basis for TPR's finding in its May 16, 1983 supplement ^{to the finding described in Interrogatory T-12} that Licensee's response is satisfactory, and describe procedurally how this finding was arrived at. Include a precise description of any dissenting views expressed by any members of the TPR, its advisors, or consultants, to this finding.
- T- 15. State the basis for TPR's finding in its May 16, 1983 supplement that Licensee's response to Recommendations A.3 and A.4 is satisfactory, and describe procedurally how this finding was arrived at. Include a precise description of any dissenting views expressed by any members of the TPR, its advisors, or consultants, to this finding.
- T- 16. Describe all tests, test data, (as defined in §4B, infra), and analyses developed and performed by or relied upon by the TPR to determine the failure scenario described in the February 18, 1983

report (Finding B.1). Describe procedurally how this finding was arrived at, and include a precise description of any dissenting views expressed by any members of the TPR, its advisors, or consultants, to this finding.

T-17. State the basis for the TPR's recommendation in its February 18, 1983 report, "[w]e recommend that GPU Nuclear implement corrective measures or verify their existing programs for minimizing ingress of all impurities (not just sulfur) into the reactor coolant system". Describe procedurally how this finding was arrived at.

T-18. Describe GPU's response to the recommendation referred to in the preceding interrogatory, and identify all those responsible for formulating this response.

T-19. State the basis for TPR's finding in its May 16, 1983 supplement, (B. Recommendation 1), that "GPU Nuclear actions are considered adequate for safety." Describe procedurally how this finding was arrived at, including a precise description of any dissenting views expressed by any members of the TPR, its advisors, or consultants, to this finding.

T-20. State the basis for the TPR's decision to recommend additional actions in its May 16, 1983 supplement, (Further comments B.1-6) and describe precisely why these actions are unnecessary to insure safe plant operation. Describe procedurally how these "Further comments" were arrived at.

T-21. Describe all tests, test data, (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by the TPR to determine the future reliability of the materials in the system.

T-22. Describe the "minor differences" in findings between the two "independent metallurgical failure analyses performed", and their ^{describe} resolution, referred to in the February 18, 1983 report (Finding C.1).

T-23. State the basis for the TPR's comment in its February 18, 1983 report, "[cracking in the rest of the reactor coolant system]... tend to be very tight and are indeed very difficult to detect." Describe procedurally how this finding was arrived at.

T-24. State the basis for the TPR's comment in its February 18, 1983 report, "GPU Nuclear should remain alert to the possibility that small cracks may, in fact, be present in susceptible components of the reactor coolant." Describe how the TPR proposes that Licensee "remain alert."

T-25. State the basis for the TPR's comment in its February 18, 1983 report, "[t]he analysis which led to [the conclusion that steam generator tube defects below a certain size range will not propagate due to flow-induced vibrations] depends on a large extrapolations of a limited crack-propagation-rate data base. This makes its hard to substantiate a firm conclusion." Describe procedurally how this finding was arrived at.

T-26. Describe and identify the "large extrapolations" referred to in the preceeding interrogatory.

T-27. State precisely what data was "found to help substantiate GPU's analysis," referred to the the May 16 report.

T-28. Describe and identify the extrapolations which are still necessary, as referred to in the May 16 report.

T-29. Does the TPR claim that on the basis of this new "data" and extrapolations referred to in the proceeding interrogatories, a firm conclusion that steam generator tubing defects below a certain size range will not propagate due to flow-induced vibrations, is still hard to substantiate?

(a) If the answer is "no", state the basis for determining this, particularly in light of the limited data base available for crack propagation rates that has been used in the GPU analysis.

(b) If the answer is "yes," describe the precise safety significance of this finding, and describe GPU's response to this finding.

T-30. State the basis for the TPR's comment in its February 18, 1983 report, "a flow-induced vibration type of loading ... could make a significant non-conservative difference in the results once a crack is initiated." Describe procedurally how this finding was arrived at.

T-31. Do you agree with GPU Nuclear's conclusion that "flow-induced vibrations may not play any role in propagating steam generator cracks? State the basis for your answer.

T-32. State the basis for recommending long-term corrosion tests which include a simulated flow-induced vibrations loading.

T-33. Describe all long-term corrosion tests which include a simulated flow-induced vibrations loading which will be or have been performed by or relied upon by the Licensee.

T-34. State the basis for the TPR comment C.4 in the May 16 report, "there is much about reactions between peroxides and system materials

which is not understood, so that (in spite of testing) there remains a risk that the process could be detrimental."

T-35. Does the TPR believe there is any uncertainty as to the residual risks or effects of the clean up process undertaken by Licensee. If the answer is "yes" describe the residual risks or effects which remain, or could remain, and describe their safety significance.

T-36. Does the TPR claim that the stress levels on the TMI-1 steam generator tubes can be higher, or the strength of the tubes lower, than those in a normal OTSG? Describe all tests (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by the TPR to determine this. Include a definition of a "normal OTSG."

(a) If the answer is "no", state the basis for determining this, and explain how this reconciles with finding E.1 in the February 1983 TPR report.

(b) If the answer is "yes," describe the precise safety significance of this finding.

T-37. Does the TPR claim that the integrity of the tubes in the TMI-1 steam generator have been reduced to a degree where restart or the subsequent operation of the plant may be influenced? Describe all tests (including a description of which tubes were tested in the TMI-1 steam generator, and their location within the tube bundle), test data (as defined in ¶4B, supra), and analyses developed and performed by or relied upon by the TPR to determine this.

(a) If the answer is "no", state the basis for determining this, and explain how this reconciles with finding E.1 in the February 1983 TPR report.

(b) If the answer is "yes," describe how the integrity of the tubes in the TMI-1 steam generator have been reduced to influence restart or the subsequent operation of the plant.

T-38. Does the TPR claim that "the cooldowns starting from the one in April 1979," have subjected the tubes to stresses that are higher than the design stresses?

(a) If "no", state the basis for this statement in light of the TPR comment, "from the information received, the levels of these stresses could not be determined with any accuracy."

(b) If "yes", describe these stress levels, and the effects of these stresses on the tubes.

T-39. State the basis for the TPR's comment in its February 18, 1983 report, [t]he explosive expansion of the tubes could affect the stress levels, if the process would change the strength or some dimensions of the tubes."

T-40 Does the TPR claim that the repair process changed ^{the} strength and dimensions of the tubes? If the answer is "yes" describe precisely how the strength and dimensions of the tubes were changed.

T-41 Does the TPR claim that the changed strength and dimensions of the tubes due to the repair process can affect the stress levels in the tubes in the restart and subsequent operation periods?

(a) If "yes", describe these effects, and state the basis for your answer.

(b) If "no", state the basis for this answer.

T-42 Does the TPR conclude that "a corrosive environment, and not abnormal stress levels, must have been responsible for the appearance of the cracks," solely on the basis that significantly higher stress levels than in normal OTSG's were not found?

(a) If the answer is "no", what other basis has the TPR relied upon to reach its conclusion.

(b) If "yes", state the basis for this statement.

T-43 State the basis for the TPR's comment in its February 18, 1983 report, "the tubes probably have some small defects that were not detected by the eddy current tests and were not eliminated by the repair." Describe procedurally how this finding was arrived at.

T-44 State the basis for the TPR's comment in its February 18, 1983 report, "[t]hese defects present the potential for leaving the tubes in a weaker condition than in a normal OTSG."

Describe procedurally how this finding was arrived at.

T-45 Does the TPR claim that the small defects referred to in the two preceding interrogatories could propagate as fatigue cracks if the tubes were subjected to flow induced vibration? State the basis for your answer, and explain how the limited data base available for crack propagation rates that has been used in the GPU analysis affects the conclusion.

T-46 State the basis for the TPR's comment in its February 18, 1983 report, "among the undetected defects there may be some that are large enough to break through to the OD and propagate along the circumference in a stable manner, with the potential of breaking the

tube when the crack becomes unstable." Describe procedurally how this finding was arrived at.

T-47. Does the TPR claim that the tubes referred to in the preceeding interrogatory may break before leak? State the basis for your answer.

T-48. State the basis for determining that relevant stresses in the free span part of the tubes are axisymmetric throughout the wall?

T-49. Does the TPR claim that stresses in the expansion transition zone are axisymmetric? State the basis for your answer.

T-50. Does the TPR claim that in the transition zone the tube could break before it leaks? State the basis for your answer. Describe the precise safety significance of a "controlled leak" which would result, including its consequences regarding radioacitve releases, and its impact on the stresses within the steam generators during normal and accident conditions.

T-51. State the basis for the TPR's comment in its February 18, 1983 report, that there is a "low probability that [a maximum total leak rate of 1 lb/hr.] will obtained in these steam generators." Describe procedurally how this finding was arrived at.

Request for Production of Documents:

1. Provide all test data used to support the conclusion that there is no evidence of cracking in the transition zone.

2. Provide all calculations, computer printouts, and other data produced as a result of "induced strain tests " which were used to determine the effect of kinetic expansion on the overall longitudinal tube strain and as-fabricated preload.

3. Provide all calculations, computer printouts and other data which supports your conclusion that "The repaired tube will sustain the maximum design basis axial load of 3140 lbs., residual stresses will be minimized, tube preload will not change more than \pm lbf., and leakage will be much less than technical specification."

4. Provide all data used in residue test.

5. Provide all data used to determine the effect of the repair method on existing cracks. Include all data used to support your conclusion that there is no ductile tearing of tube material.

6. Provide all test data upon which you based your conclusion that the cracking mechanism due to corrosion has been arrested and is not likely to recur.

7. Provide all test data used to support your conclusion that the 400 hours of chemical cleaning was sufficient to remove existing sulfur.

8. Provide all data used in testing leak and axial load qualifications.

9. Provide all data used in determining measurements of residual stress; include results.

10. Provide all data used to determine that "...the sulfur concentration on the tube I.D. in the area of the kinetic expansion does not change, that it is not driven further into the base metal, and that the expansion does not significantly alter the grain boundary structure in a way that would trap sulfur."

11. Provide all data used in connection with expansion length detection program. Provide in particular but not limited to all data from laboratory expansion which you claim confirms no growth (ductile tearing) and indicates no change in known cracks.

12. Provide data which supports your conclusion that the kinetic expansion process had no adverse effect on the steam generator.

13. Provide all data which you claim proves your assertion that the expansion repair method causes no damage to adjacent plugged tubes.

14. Provide the data which you used as a basis for your conclusion that the relief of preload in some of the tubes will not render them unacceptable for continued use.

15. Provide test data which supports your claim that "Cracks in the roll transition or the area of the seal weld do not exclude the use of Westinghouse rolled plug."

16. Provide all test data which you claim indicates that in tubes with defects between US+4" and US+8" , if "...the existing crack would propagate in the future and sever at US+5",.... the expansion joint below the severance would provide enough engagement to maintain the preload in the tube and carry the loads associated with the most severe transient during normal operation."

17. Provide all documents relied upon by the Third Party Review Group in the production of their reports. Include all communications (as defined in paragraph 2 herein) of the TPR in connection with their independent review.

18. Provide all documents generated by the TPR (as defined in paragraph 1 herein) including minutes and transcriptions of any TPR informal or formal meeting.

19. Provide all written communications and records of all oral communications (as defined in paragraph 1 and 2 herein) with members of the NRC Staff in connection with TMI-1 steam generators failures and repairs, including notes, minutes, and transcripts of meetings.

20. Provide all documents and studies, and the particular parts thereof, relied upon by the Licensee, including all calculations, computer printouts and any other documentation used to obtain stated test results, including sequence of testing, now or in the past, which served as the basis for or contributed to the production of the following documents:

- (a) Topical Report 008, Rev. 3;
- (b) Topical Report 010;
- (c) Topical Report 406;
- (d) Technical Data Report 388, including all graphs contained within;
- (e) Technical Data Report 417;
- (f) Technical Data Report 421;
- (g) BAW-177 "Preliminary Calculations of the Effect of Plugged Steam Generator Tubes on Plant Performance," March, 1982.
- (h) Topical Report 007, Rev. 1

21. Provide all training materials used by Licensee in training operators as to the procedures and guidelines outlined in Topical Report 406.

22. Provide all documents or portions thereof which have been withheld from all parties, or from the intervenors, on the basis of the "proprietary" or "trade or commercial secret" information claimed to have been within the documents. Include all Topical Reports and Technical Data Reports.

Pursuant to 10 CFR §2.741, TMIA hereby requests that Licensee respond in writing to the above request for production of documents (as defined in paragraph 1 hereof) and describe all test data (as defined in paragraph 4(B) herein) relative to the above interrogatories and produce the original or best copy of each requested document at or to: Louise Bradford, 1011 Green St., Harrisburg, PA 17102. Documents shall also mean copies of documents even though the originals are not in the possession, custody, or control of Licensee.

Respectfully submitted,
THREE MILE ISLAND ALERT, INC.

By: Louise Bradford JD

Louise Bradford
Joanne Doroshow

Dated: December 30, 1983

DOCKETED
USNPC

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

'83 DEC 30 P4:27

Before the Atomic Safety and Licensing Board

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

In the Matter of

METROPOLITAN EDISON COMPANY, ET AL.

(Three Mile Island Nuclear
Station, Unit No. 1)

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}
}
} Docket No. 50-289-OLA
ASLBP 83-491-04-OLA
(Steam Generator Repair)

CERTIFICATE OF SERVICE

I hereby certify that copies of "TMIA's First Set of Interrogatories and Request for Production of Documents to Licensee" were served this 30th day of December, 1983, by deposit in the U.S. mail, first class, postage prepaid to those on the attached Service List and hand delivered where possible.


Joanne Doroshow

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of)	
)	
METROPOLITAN EDISON COMPANY, <u>ET AL.</u>)	Docket No. 50-289-OLA
)	ASLBP 83-491-04-OLA
(Three Mile Island Nuclear)	(Steam Generator Repair)
Station, Unit No. 1))	

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