

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

DOCKETED
USNRC

In the Matter of
METROPOLITAN EDISON COMPANY
(Three Mile Island Nuclear
Generating Station, Unit 1)

Docket 50-289 '84 JAN 18 A10:42
(Steam Generator Repair)

OFFICE OF SECRETARY
OF ENERGY

LEE ET AL. RESPONSES TO LICENSEE'S FIRST SET OF INTERROGATORIES

The joint intervenors, Lee et al., provide this single response to Licensee's first set of interrogatories. To answer separately, as requested, would only result in duplication. We affirm that the answers provided herein are, to the best of our current knowledge and understanding accurate and complete.

- 1(2)1 - Sulfates and reduced forms such as thiosulfate.
- 1(2)2 - 1. Sulfur removal is not complete.
2. Sulfur is present in the steel from which the tubes were made.
- 1(2)3 - 1(2)2 - 1 - Self-evident
- 2 - Att. 1, "Historical Review of the Principle Research Concerning the Phenomena of Cracking of Nickel Base Austenitic Alloys", Pg. 1158, Indicated paragraphs.
- 1(2)4 - 1. Sulfides
2. As yet undefined forms which might couple synergistically with other elements or compounds to function as stress cracking agents.
- 1(2)5 - 1. Polysulfides were generated to cause the current problem.
2. Att. 1 - See 1(2)3.
- 1(2)6 -
 - 1. There is still reasonable uncertainty that sulfur remaining in the system will remain inactive, particularly during transients.
 - 2. In the event, particularly, of system oxygenation, spontaneous intergranular degradation could occur spontaneously from the action of sulfur within the alloy matrix.

1(2)7 - 1. Chemical reduction

2. Att. 1 - See 1(2)3.

3. Other mechanisms of which we are unaware by virtue of failure of licensee to look for them.

1(2)8,9 - See 1(2)6.

1(2)10 Yes

1(2)11 Corrosion would likely reinitiate:

1. By the mechanism already evaluated by licensee if active reduced forms of sulfur are generated
2. Spontaneously if tube composition varies excessively
3. By intergranular attack by agents which depend on synergistic response provided by heretofore unevaluated trace contaminants

1(2)12 1(2)11

1. Self-evident

2. Review of attachment (1) "Historical Review of the Principle Research Concerning the Phenomena of Cracking of Nickel Base Austenitic Alloys" - entire.

1(2)13 Self-evident

1(2)14 See 1(2)12

1(2)15 No

1(2)16 -

1(2)17 -

1(2)18 Possibly

1(2)19 1. If a suitable synergist is present, activity can be increased many-fold.

2. If a suitable reducing agent is present, active forms can be generated.

3. If a tube composition is appropriate, effect of active forms of sulfur can be magnified.

1(2)20 1(2)19 -1,2 Self-evident

1(2)19-3 See Att. 1 - Entire paper

1(2)21 Attachment 1 - The paper is short and concise and the desired information is discussed throughout. Paragraph and page references are inappropriate.

1(2)22 In essence, no.. The issue is not "level", but "presence".

1(2)23 We do not allege that administrative controls are inadequate, but that tech specs may be inappropriate.

1(2)24 Not relevant

1(2)25 -

1(2)26, 7,8 Not yet determined

1(3)1 Change in granular or grain - boundary form.

1(3)2 "Islands" of intergranular attack

1(3)3,4,5 a. - As stated in #g Pg. 11 of GPUN Topical Report 008, Rev. 3

- As stated in Third Party Review, 2/18/83, Pg. 8, # b

b. - Because IGSCC was found in areas of most severe IGA.

See SER, ATT 3, Pg. 2, #2. "Severe cracking is usually related to more severe IGA."

1(3)6,7,8 Not yet determined

1(5)1

1 - Active forms of carbon

2 - Unknown agents present in the RCS

3 - Any relatively inactive agent such as low valence sulfur or carbon ions present in otherwise innocuous concentrations acting in concert with a synergist.

1(5)2,3

1 - "Carbonates in the presence of oxidants at high temperature can produce IGA and IGSCC of Inconel 600." SER - Third Party Review 2/18/83 Pg. 9 Recommendation 1 #1.

2 - "Other contaminants (lead, mercury, phosphorus*) can also induce IGSCC", Id.

* One can reasonably assume that this is not a closed set.

3 - We conclude that synergistic effects have not been considered by GPUN or NRC Staff on the basis of available information.

- All oxidation and reduction processes are subject theoretically to the effect of a synergist.

1(5)4,5,6,7 At this point in time, I have no idea except to note that

1. Concentrations of thiosulfate as low as 1 PPM can, under appropriate conditions, cause IGA and IGSCC. -

2. Synergistic effects have not been considered.

1(5)8 Nobody knows

1(5)9-12 Inapplicable

1(5)13 The effect of two (or more) agents acting together is greater than the sum of their individual effects. (You really should know this!)

1(5)14 I don't know, but more important, Licensee and Staff don't either.

The answer lies in reasoned experimentation.

1(5)15,16 Not applicable

1(5)17 - Same as 1(5)14

1(5)18,19 Not applicable

1(5)20 Answer not subject to prediction - must be determined experimentally.

1(5)21,22 Not applicable

1(5)23 Our basis is not documentation but extensive work in the development of synergistic antioxidant systems at Bell Telephone Laboratories.

As a primary corroborative source, we would cite Dr. R. H. Hansen, retired from Bell Labs, Murray Hill, N. J.

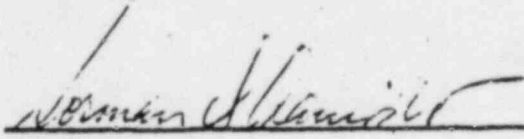
1(5)24,25,26 - Same as 1(5)20

1(5)27 - You must have an error here, meaning 1(5)26 rather than 1(5)25. Nevertheless, there is no answer as in 1(5)20.

1(5)28 - Not applicable

1(5)29,31 Not yet determined

Jane Lee


Norman O. Amott

January 16, 1984