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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

LICENSEE'S RESPONSE TO PROPOSED CONTENTIONS
OF JOINT PETITIONERS LEE ET AL.

I. INTRODUCTION

On September 21, 1983, Jane Lee, Norman Aamodt and Bruce Molholt ("Joint Petitioners") proposed six numbered contentions in support of their petition to intervene in the above-captioned proceeding. Licensee herein presents its response to those contentions.

The Joint Petitioners are not the only prospective intervenors in this proceeding; Three Mile Island Alert, Inc. ("TMIA") has filed proposed contentions as well. TMIA's contentions are addressed in "Licensee's Response to TMIA

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Supplement to Petition for Leave to Intervene" (hereafter referred to as "Licensee's Response to TMIA"), which is being filed contemporaneously with this document. Several of the issues raised by Joint Petitioners are also raised by TMIA. Where this is the case, Licensee has cross-referenced its Response to TMIA, rather than duplicating that document's detailed discussion here.

II. RESPONSE TO CONTENTIONS

The issue before the Board now is not whether Joint Petitioners are right or wrong about the assertions made in their contentions, but whether or not their contentions meet the NRC's standards for admission into the proceeding as a matter of controversy which then will be decided on the merits by the Board. An analysis of the legal requirements which proposed contentions must meet to warrant adjudication -- including the basic criterion in 10 C.F.R. §2.714(b) that "the bases for each contention [must be] set forth with reasonable specificity" -- is set forth in Licensee's Response to TMIA at 2-8. We rely on that analysis for our response to Joint Petitioners as well. Suffice it to say here that a number of detailed analyses of the steam generator repairs and their impact on operations, together with extensive supporting information, are in the public domain.^{1/} Joint Petitioners' awareness of this material is

^{1/} The most significant examples are the NRC Staff's "TMI-1 Steam Generator Repair Safety Evaluation Report" (NUREG-1019)

(Footnote continued)

apparent from the citations in their proposed contentions. It is encumbent upon a petitioner, especially in circumstances such as these, to honor the requirement to set forth the bases for its contentions with reasonable specificity and with reference to available relevant documentation.

Proposed Contention 1

Joint Petitioners' first proposed contention is that there is no assurance that the "steam generator tube repairs have not contributed to a condition which will cause early failure upon restart." The only bases articulated for this contention are those which are set forth in the section (following Joint Petitioners' second contention) entitled "Discussion 1 & 2". None of the bases there asserted, however, have any applicability to the impact of the repairs on the steam generator tubes. Proposed Contention 1, standing alone, should therefore be rejected for lack of specificity and for lack of basis. In any case, as the analysis below of Proposed Contention 2 will show, Joint Petitioners' discussion section fails to identify any concerns which warrant consideration in this proceeding.

(Continued)

("SER") and its numerous attachments and appendices; Licensee's "Assessment of TMI-1 Plant Safety For Return To Service After Steam Generator Repair," Topical Report 008 (Rev. 3) ("TR-008"); and Licensee's Technical Data Report No. 341, "TMI-1 OTSG Failure Analysis Report" (July, 1982) ("TDR-341").

Proposed Contention 2

Joint Petitioners' second proposed contention is that there is no assurance the steam generator tube repairs "will maintain their integrity under the environmental conditions attendant to operation." Petitioners' discussion section, as best we understand it, sets forth five independent sub-contentions to this general proposed contention:

First, the conditions necessary for initiation of Intergranular Stress Corrosion Cracking (IGSCC) are present in the steam generator system.

Second, there is nothing to suggest the tubes have not suffered significant microstructural, or "morphological" changes apart from the stress cracks.

Third, the effect of dynamic stresses on the repair areas of the tubes was not analyzed.

Fourth, the possible effects of chemical stress cracking agents other than sulfur were not predicted.

Fifth, the past operational history of the steam generator tubes has not been analyzed as a function of expected resistance to IGSCC.

Joint Petitioners, in apparent recognition of their obligation to address relevant documentation in the public domain, reference the NRC Staff's SER in support of their first sub-contention; for the remaining four, they rely on their belief that the SER fails to address the cited factor. In both cases, their reliance is misplaced. Neither the SER, nor the

other safety analyses which have been performed, support their contentions.

By Proposed Contention 2 (First Sub-Contention), Joint Petitioners assert that, when the TMI-1 steam generators recommence operations, the three following conditions which must be present to trigger IGSCC will once again exist: (1) "a highly sensitized metalurgical [sic] state" (i.e., a susceptible alloy microstructure), (2) "dynamic stresses" caused by operation, and (3) the presence of "polysulfites [sic], very labile compounds" in the Reactor Coolant System ("RCS") (i.e., an aggressive environment).

Licensee concedes that Inconel 600, the metal alloy used to form TMI's steam generator tubes, is in "a highly sensitized state" known to be susceptible to IGSCC. (SER Att. 4, at 2.) But as Petitioners are well aware, this was, and still is, true of all Babcock & Wilcox ("B&W") steam generators, since they are all made of the same material and heat-treated in the same manner; neither the occurrence of IGSCC, or the subsequent repair of the tubes, had any affect on the susceptibility of the alloy microstructure. We similarly acknowledge that tensile stresses, including those attendant to operation of TMI's steam generators, enhance initiation of IGSCC. Again, the relevancy of this assertion here is questionable at best, since it is true of all other steam generators as well, and was not a result of the IGSCC or its repair.

Joint Petitioners' assertion that polysulfides are present in the RCS and provide the aggressive environment necessary for IGSCC, is materially different from their first two statements in one crucial respect: it is not even supported by the reference on which they rely. Dr. Digby MacDonald's Technical Evaluation Report (SER Att. 4, at 20-25), cited by Joint Petitioners in support of their assertion, does suggest that hydrogen polysulfides (a volatile polysulfur species that is very labile, that is, readily undergoes rearrangement) most likely acted as the source of sulfur in areas of the RCS, other than the steam generator tubes, which exhibited corrosion.^{2/} But the conclusion Dr. MacDonald draws from this fact is that it is necessary to clean, i.e., desulfurize, the RCS to ensure the existing polysulfides and thiosulfate (from which the polysulfides are formed) are removed or reduced in quantity, or that their corrosive potential is neutralized by oxidation. (SER Att. 4, at 25.)

Licensee has done just that. All tanks, components and piping of the RCS which could have significant sulfur deposits were flushed with an alkaline solution of hydrogen peroxide.

^{2/} Thiosulfate was the likely form of sulfur in the tubes themselves. The other regions of the RCS where corrosion was found (e.g., the Power Operated Relief Valve ("PORV") and a weld in the waste gas system piping) were not exposed to a liquid environment. Consequently, thiosulfate, which can only exist in a dissolved state, could not be the corrosive agent in these areas. (SER Att. 4, at 23.)

And to provide added assurance that the potential for the corrosion had been eliminated, Licensee performed laboratory corrosion tests on representative samples of material in the RCS which had been subjected to a simulated hydrogen peroxide cleaning process. No intergranular attack was observed.

(TR-008 at 27.) The SER concludes that the desulfurization process and the laboratory tests, together with administrative controls designed to prevent further introduction of contaminants, provide reasonable assurance that when operations are restarted, the sulfur concentration will remain below the level required to initiate IGSCC. (SER §§3.5-3.7, at 27-33.)^{3/}

Petitioners totally ignore Licensee's and the NRC Staff's extensive presentation on the impact of the cleaning process on the polysulfides. This wholesale failure to address, or even reference, the detailed documentation available on the issue of whether a chemical environment suitable for IGSCC exists, renders the proposed sub-contention fatally flawed under the Commission's decision in Duke Power Co. (Catawba Nuclear Station, Units 1 and 2), CLI-83-19, ____ N.R.C. ____ (June 30,

^{3/} Included in the information ignored by Joint Petitioners are (a) the fact that the sulfur need not be completely removed to prevent IGSCC, since low levels of reduced sulfur species in solution do not have a significant corrosive effect; indeed there is evidence to suggest the existence of a corrosion threshold in the order of 1.0 ppm (TR-008 at 24; see SER §3.5, at 27); and (b) the fact that after cleaning, the concentration of sulfur compounds in solution of the TMI-1 RCS was less than 0.1 ppm sulfate. (SER §3.6.2, at 30.)

1983). The First Proposed Sub-Contention accordingly must be rejected as lacking in specificity and basis.^{4/}

Proposed Contention 2 (Second Sub-Contention) states that the SER has not shown that the tubes have not suffered significant "morphological" changes other than IGSCC. Licensee does not contest that a microstructural evaluation of the tubing is appropriate. Contrary to Joint Petitioners' suggestion, however, such an analysis was performed here; in fact, a series of metallurgical tests were performed on tubing removed from the TMI-1 steam generators.^{5/} The subsequent evaluation of the data and analysis, demonstrated that the microstructure "is representative of that normally expected for steam generator tubing," and that "no secondary mode of failure [such as low or high cycle fatigue] is associated with the intergranular corrosion." (TR-008 at 1, items b & c; see also id. at 13, item b.) These tests, moreover, were discussed with approval by the NRC Staff's consultants (SER Att. 3 at 2-4; Att. 4 at 2-3.)

^{4/} The TMI Technical Specifications already require that, for purposes of pH control, lithium concentrations in the primary coolant be kept between 0.2 and 2.0 ppm (TR-008 at 31 (Table VI-1).) Licensee's increase in the minimum lithium concentration to 1.0 ppm is simply intended as additional assurance that sulfur-induced IGSCC will not recur. (See TR-008 at 23 (Lithium added because it "could possibly be an inhibitor").)

^{5/} Fourteen tests, including sodium azide spot tests and scanning transmission electron microscopy, were performed. In addition, eddy-current examination was performed on the complete length of the tubes in service. (See TR-008 at 8-9.)

Petitioners do not in any manner attempt to show how Licensee's analysis is inadequate. In fact, they totally ignore that analysis and provide no basis for their bald assertion to the contrary. The Board should therefore reject the proposed sub-contention.

Proposed Contention 2 (Third Sub-Contention) asserts that there is no assurance the steam generator tube repairs will maintain their integrity during operation because the SER does not analyze the effect of "dynamic stress", i.e., stresses attendant to operations,^{6/} on the tubes in the repair area. Licensee again agrees that such an analysis is necessary. For that reason, it instituted a multiphase test and analysis program to demonstrate the repaired tubes' load carrying and leak-tight capabilities when exposed to both "normal" steady state stresses such as tensile loading, and "transient" stresses such as heatup and cooldown thermal loading.^{7/} Licensee also tested

^{6/} Although Joint Petitioners do not define the term "dynamic stress" in this sub-contention, we assume it is intended to have the same meaning here as it was given in the First Sub-Contention, namely, stresses caused by operation.

^{7/} (See SER §3.4.2.a & b, at 18-20; TR-008 at 37-39 (load-carrying and leak-tight capabilities of the repaired joint); see also SER §3.4.2.d at 21; TR-008 at 82-85 (capabilities of the free-span).) The first phase of the test program involved qualification testing to show capability to operate for the first five years. The second phase included extended confirmatory tests to verify that the repaired tubes will maintain their design-life capabilities. (See TR-008 at 35-36.)

and analyzed the capability of the tubes to withstand the maximum loads which would be experienced during an accident -- those attendant to a Main Steam Line Break (MSLB).^{8/} Based upon these tests and the accompanying calculations, Licensee concluded that the repaired tubes will maintain their structural and leak-tight integrity during steady-state operations, transient conditions and design-basis accidents. (TR-008 at 88-89.)^{9/}

The tests performed by Licensee were examined in detail by the NRC Staff. (See §3.4 of the SER.) Based on their review of Licensee's tests, as well as independent tests performed by a Staff consultant, the Staff concurred in each of Licensee's findings.

Joint Petitioners do not explain in their Third Sub-Contention what they perceive to be the inadequacies in the evaluations by Licensee and the NRC Staff of tube integrity under stress, or why they otherwise disagree with the conclusions reached in the evaluations. Indeed, Joint Petitioners fail to even reference the relevant sections of the SER and

^{8/} (See SER §3.4.2.a, at 18-19; TR-008 at 39 (the repaired joint); SER §3.4.2.d, at 21-22; TR-008 at 84-85 (the free-span).) A MSLB is the most limiting accident scenario for tube integrity considerations. (See TR-008 at 84.)

^{9/} With respect to the MSLB, the analysis showed that through-wall defects can be detected well below the threshold size that could fail during such an occurrence. (TR-008 at 85-87; SER §3.4.2.d, at 22.)

Topical Report. For these reasons, Joint Petitioners' proposed sub-contention must be rejected on the ground that they failed to supply any bases for their allegation.

Joint Petitioners next assert, in Proposed Contention 2 (Fourth Sub-Contention), that the tubes might not maintain their integrity because the effect of chemical stress cracking agents other than sulfur has not been predicted. The contention is simply unsupported speculation. As we discussed in detail in Licensee's Response to TMIA (at 25-26), Licensee examined the potentially corrosive elements present in the RCS. On the basis of that examination, the safety analyses unanimously concluded that sulfur, in its various forms, was the causative agent of the IGSCC in the TMI-1 steam generators. Petitioners give no indication that they have even read the relevant documents, much less identify any deficiencies in these analyses. Nor do they provide an explanation as to why the effect of other corrosive agents on future operations should be predicted, given the fact that sulfur was the only corrosive agent present in the system in significant quantities. The proposed sub-contention thus lacks any bases, and should be rejected.

Proposed Contention 2 (Fifth Sub-Contention) asserts that the SER does not analyze the past operational history of the steam generator tubes as a function of expected resistance to IGSCC. Joint Petitioners have once more overlooked or ignored

the discussion in the various safety analyses on the issue they raise. Both TDR-341 and TR-008 describe in detail Licensee's review and analysis of the operational history of the TMI-1 steam generators from April, 1978 to November, 1981, which was undertaken in order to determine whether instances of excessive tube stress or chemical contamination could have contributed to the tube failure.^{10/} The evaluation revealed "that the tubes were not subjected to excessive stress." (TR-008 at 7.) On the other hand, Licensee found that there were a handful of instances where chemical contaminants entered the RCS. Licensee concluded that the contamination of the RCS with sodium thiosulfate during several of these instances which was then present during Hot Functional Testing ("HFT"), combined with oxygen introduction and changes in the water level of the RCS following HFT to provide the aggressive environment necessary for IGSCC. (TR-008 at 7-8, 13-15; TDR-341 at I-3.) The NRC Staff concurred in this evaluation of the relationship between the tubes' operational history and the onset of IGSCC. (SER §3.1, at 5-7.)

^{10/} Licensee also analyzed the fabrication history of the steam generator tubes. (See TR-008 at 10, item b; 11, items c & d; 12-13, §D.) The report found that the heat treatment of the tubes following assembly increased their sensitization. As noted supra p. 5, this is true of all B&W steam generators; there is nothing to indicate the fabrication or installation of the TMI-1 tubes was at all extraordinary, much less that the prior heat treatment is tied in any way to the subject matter of this proceeding -- the repair. (TR-008 at 13.)

Joint Petitioners have not identified any inadequacies in the consideration of operational history in the current safety analyses. As a consequence, their Fifth Sub-Contention should be disallowed.

Proposed Contention 3

Joint Petitioners' third proposed contention is that Licensee has provided no assurance that elements or compounds other than sulfur did not significantly contribute to the IGSCC. The reasons why this proposed contention should be rejected are discussed in Licensee's Response to TMIA at 25-26. See also the discussion of their similar assertion in Proposed Contention 2 (Fourth Sub-Contention), p. 11, supra.

Proposed Contention 4

Joint Petitioners assert in Proposed Contention 4 that there is no assurance that beyond-design compressive fatigue or stress did not predispose TMI's steam generators to IGSCC. Petitioners have given no indication, however, why or how compressive stress could possibly have been a factor in the onset of IGSCC. There is simply no reason to believe that it was. To the contrary, by definition, IGSCC requires a tensile stress across grain boundaries to initiate cracking. The consistent circumferential orientation of the cracks, moreover, compels the conclusion that axial tension stress was the cause

of the observed IGSCC (along with the metallurgical and environmental factors). Axial compressive stress could thus not be a factor because, again by definition, such a loading could not apply a tensile stress across circumferentially-oriented grain boundaries. (TDR-341 at II-2, II-3; see SER §3.1, at 4; TR-008 at 10, item d.) Similarly, compressive fatigue was demonstrated not to be a factor here; indeed, examination of the fracture surfaces showed no evidence of any fatigue whatsoever. (TR-008 at 10.)

In light of Petitioners' failure to address -- or even reference -- the above discussions, or to reference contrary authority for this assertion, or even to proffer a credible explanation for their concern that compressive fatigue or stress could potentially predispose the steam generators to IGSCC, the proposed contention should be rejected as lacking specificity and basis.

Proposed Contention 5

Proposed Contention 5 seeks to inject in this proceeding an issue of management competence and integrity having nothing to do with the adequacy of the steam generator repair program; it should be addressed, if at all, to the Atomic Safety and Licensing Board which has been charged, in connection with management issues in the TMI-1 Restart Proceeding, to hold a reopened hearing on the allegations of falsification of leak

rate tests at TMI-2. One of the Joint Petitioners (Norman Aamodt) has in fact been invited by that Licensing Board to propose appropriate sub-issues for consideration in that hearing. (Memorandum and Order, September 14, 1983, Docket No. 50-289 (Restart).) Further, the NRC Staff has already notified the Commission and the affected Boards and parties in the Restart Proceeding that, in connection with the revalidation of its position in the restart hearing on management issues, the Staff has under investigation the matter of pre-accident leak rate testing practices at TMI-1 as well as TMI-2. (BN-83-183, September 2, 1983, and BN-83-183A, September 23, 1983.) The proposed contention should thus be dismissed on the ground that it is beyond the scope of this proceeding.

Proposed Contention 6

Joint Petitioners' Proposed Contention 6 claims there is a lack of assurance that the repaired steam generator tubes will maintain their integrity under transient conditions in that the SER fails to present an "adequate analysis" of tube integrity during transients. The analyses by Licensee and the NRC Staff of tube integrity during transients has been discussed in the context of Petitioner's generic assertion, in their Third Sub-Contention of Proposed Contention 2, that operational stresses have not been adequately assessed. See pp. 9-11, supra. For the reasons set forth therein, Proposed Contention 6 fails to meet the basis-with-requisite-specificity requirement of 10 C.F.R. §2.714(b), and should be rejected.

CONCLUSION

For the foregoing reasons, none of Joint Petitioners' proposed contentions should be admitted for litigation. Joint Petitioners should therefore not be permitted to participate as parties to the instant proceeding. 10 C.F.R. §2.714(b).

Respectfully submitted,

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
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BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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| Station, Unit No. 1) |) |

CERTIFICATE OF SERVICE

I hereby certify that copies of "Licensee's Response to Proposed Contentions of Joint Petitioners Lee et al.," dated October 6, 1983, were served this 6th day of October, 1983, by deposit in the United States mail, first class, postage prepaid, to those persons on the attached service list.

Diane E. Burkley
Diane E. Burkley

October 6, 1983

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)

METROPOLITAN EDISON CO., ET AL)

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

Docket No. 50-289-OLA

ASLBP 83-491-04-OLA

(Steam Generator Repair)

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