

LILCO, AUGUST 29, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

DOCKETED
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84 AGO 30 P12:31
Before the Atomic Safety and Licensing Board

In the Matter of)
LONG ISLAND LIGHTING COMPANY) Docket No. 50-322-OL
(Shoreham Nuclear Power Station,)
Unit 1))

LILCO'S SUPPLEMENTAL MOTION TO STRIKE PORTIONS OF THE
JOINT DIRECT TESTIMONY OF DR. ROBERT N. ANDERSON,
PROFESSOR STANLEY G. CHRISTENSEN, G. DENNIS ELEY,
ANEESH BAKSHI, DALE G. BRIDENBAUGH AND RICHARD B. HUBBARD

On August 7, 1984, the Long Island Lighting Company (LILCO) filed its Motion To Strike Portions Of The Joint Direct Testimony Of Dr. Robert N. Anderson, Professor Stanley G. Christensen, G. Dennis Eley, Aneesh Bakshi, Dale G. Bridenbaugh and Richard B. Hubbard (Motion To Strike). In its Motion To Strike, LILCO, inter alia, challenged the qualifications of Suffolk County's experts to testify as to matters figuring prominently in their testimony. At the time of LILCO's August 7 filing, however, Suffolk County had not specified the sponsor of each element of testimony. Pursuant to the Board's Order, Suffolk County filed on August 17, 1984 its Identification Of Witnesses Offering Specific Elements Of Testimony Regarding The County's Emergency Diesel Generator Contentions (Identification Of Witnesses).

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Based on the County's Identification Of Witnesses, LILCO respectfully supplements its August 7, 1984 Motion To Strike with a specific showing that Suffolk County's witnesses are not "qualified by knowledge, skill, experience, training or education" to express expert opinions on certain matters. See Fed. R. Evid. 702. Because Suffolk County has, for the most part, sought to support its Contentions based on attacks on LILCO's analysis, rather than the County's own independent analysis, the credentials of its witnesses should receive particular scrutiny. Without such close examination, it is all too easy for Suffolk County to clothe unsupported and unreliable inferences in eloquent garb, escaping the requirement that this proceeding be based on truth and not rhetoric. The complexity of the matters before the Board renders meaningless opinion testimony by witnesses that have failed to demonstrate their expertise. Their testimony should not be allowed.

In support of this Supplemental Motion, LILCO states:

A. AE PISTON SKIRTS

(1) Page 28, first question and answer, sponsored by all witnesses - This question asks the witnesses to opine as to whether the difference in the experimental and finite element results is "quite good." In order to provide an answer that is meaningful, the witnesses must possess a knowledge of the intricacies of finite element modeling. In order to offer the

Board an evaluation of the finite element versus experimental results, the witnesses should be required to demonstrate a working knowledge of the complexities of modeling a structure and the factors inherent in choosing boundary conditions, elements and nodes. A witness with merely a lay or rudimentary knowledge of the finite element method and no experience interpreting and using the results of the finite element results should not be allowed to offer "expert" testimony in this proceeding.

Finite element analysis is widely used by trained experts to determine the structural integrity of a wide range of structures, but it is not subject to any meaningful scrutiny by a witness who lacks experience in the area. None of the witnesses testifying on behalf of Suffolk County have demonstrated an expertise in finite element analysis. Therefore, this answer should be stricken.

In fact, four of the witnesses have specifically denied any experience in this area. The other two have indicated no experience in their credentials or their deposition.

For instance, Anderson responded to a question regarding the finite element method as follows:

Q. Do you consider yourself an expert or qualified in the mechanics of finite dynamics?

A. Finite dynamics. No, I seldom work in that area.

Anderson Deposition (May 16, 1984) at 91. (Attachment 1).

On May 3, 1984, Eley described his understanding of the finite element method as follows:

Q. Do you understand the finite element analysis?

A. I would not have the capability of completing a finite element analysis myself.

Eley Deposition (May 3, 1984) at 166. (Attachment 2).

Likewise, Hubbard testified that he does not know how to do a finite element analysis. Hubbard Deposition (May 15, 1983) at 63. (Attachment 3).

Finally, Christensen testified as follows:

Q. Did you have an occasion, Professor Christensen, to review the FaAA finite element analysis of the replacement crankshafts?

A. I did look at that, yes.

Q. What if anything, sir, did you determine after you looked at that?

A. We will, I will be quite frank. I went back to my textbooks on finite element analysis because it is not an area in which I could consider myself as an expert, not in any way.

* * *

As I mentioned earlier, I am not an expert on finite element analysis, three dimensional finite element analysis, but I think I know enough to be very cautious in its usage.

Christensen Deposition (May 9, 1984) at 289, 291. (Attachment

4). The knowledge that Christensen obtained in order to review the FaAA finite element methodology came primarily from an introduction to finite element analysis contained in a McGraw-Hill mechanical engineers series. As Christensen stated:

[t]he preface of the book, which is the reason that I bought the book, it is not a methodology to be able to carry out a finite element analysis of calculations, it is a book which is more or less telling you the whys and wherefores of it, as the book says in the introduction.

Id. at 292. By his own admission, this does not make Christensen an expert in the finite element method.

(2) Pages 28-29, second question and answer, sponsored by Anderson and sentences on Page 29 by all witnesses - The entire answer details an explanation of the difference between the experimental and finite element results. The answer in its entirety should be stricken. As demonstrated, without a thorough understanding of the process involved in modeling a complex component or experience in interpreting finite element results, Anderson is not qualified to opine as to the percentage accuracy or inaccuracy of the finite element results. Furthermore, Anderson represents a general familiarity with the "usual methodology" of finite element analysis and states that "when properly done, [it] may be an excellent tool for evaluating its structure." (Emphasis added). Without experience with finite

element analysis, there is no basis for the witness opining about the FaAA analysis versus what is typical or proper in the finite element method. The final sentence in the answer concludes that "the greater weight must be given to the results of the finite element analysis - that cracks are predicted to initiate". This conclusion is without foundation because, by their own admissions, the witnesses lack the requisite experience with finite element analysis to offer this opinion.

(3) Pages 31-32, first full question and answer, sponsored by Anderson, Christensen, Eley, Bakshi - The last sentence of the answer, which continues on Page 32, should be stricken because it speculates as to the effect of higher peak firing pressure on the likelihood of AE piston skirt crack initiation predicted in the FaAA Piston Report. The crack initiation predicted by FaAA was predicated on the finite element results. Eley has declared that he knows nothing about finite element analysis, and Anderson and Christensen are not experts in the area. Bakshi's credentials demonstrate no expertise with finite element analysis. None of the witnesses can verify the effect of a higher peak firing pressure because they are not capable of performing a finite element analysis. The witnesses do not have the expertise to offer this testimony. Without a familiarity with and an ability to reiterate the finite element results using a greater peak firing

pressure, there is no basis for the conclusion in the last sentence of the answer continuing from Page 31 to 32.

(4) Page 34, last sentence of the answer carried over from Page 33, sponsored by all witnesses - This testimony should be stricken for the reasons set forth in Paragraph (3), Section A, of this Supplemental Motion.

(5) Page 34-35, first full question and answer, sponsored by Anderson - The answer should be stricken in its entirety. The question talks about assumptions in FaAA's "fracture mechanics analysis." Most of the alleged assumptions discussed by Anderson, however, involve the finite element analyses that predicted the stresses that were ultimately used in the fracture mechanics analysis. The failure of Anderson to recognize this fact merely reinforces the fact that he lacks familiarity and experience with the finite element analysis, as well as with fracture mechanics analysis. By his own admission, Anderson does not have any experience with the finite element method and should not be allowed to offer evidence criticizing the correctness of assumptions used in FaAA's finite element analysis. Anderson has no ability to transform his mere speculation into any meaningful analysis. He also has not demonstrated an expertise in fracture mechanics analysis, a subset of the discipline of mechanical metallurgy. Anderson's principal area of expertise is the "chemical, temperature,

chemical thermodynamics of metals." Anderson Deposition (May 10, 1984) at 58. (Attachment 5).

(6) Page 36, last sentence and paragraph (1) of the answer carried over from Page 35, sponsored by Anderson - Once again, the answer should be stricken because the witness opines about the assumption in "the mathematics of FaAA's analysis" without the requisite expertise or experience to evaluate the finite element analysis.

(7) Page 39, first full question and answer, sponsored by Anderson - The answer should be stricken in its entirety because the witness opines as to what could have been done in FaAA's analysis. Without the requisite expertise or experience with the finite element method, the witness' answer is nothing more than a lay person's list of wishes that may or may not be related to the validity of the finite element analyses underlying FaAA conclusions. Without the necessary understanding of the finite element method, the witness should not be allowed to offer such testimony under the guise of expertise.

(8) Page 40, first full question and answer, sponsored by Anderson - The first and fifth sentences should be stricken for the reasons set forth in Paragraph (7), Section A, of this Supplemental Motion.

(9) Page 47, first full question and answer, sponsored by all witnesses - This answer offers a general conclusion about the probability of crack initiation and propagation in the Shoreham AE piston skirts. The answer summarizes the criticisms of the FaAA finite element and fracture mechanics analyses. For all the reasons previously set forth, none of the witnesses has the expertise or experience to evaluate and judge the adequacy of the finite element analyses. The answer should be stricken in its entirety.

B. REPLACEMENT CYLINDER HEADS

(1) Page 62, Paragraphs (a), (d) and (f), portions sponsored by Hubbard - The conclusions stated in Paragraphs (a) and (f) necessitate an understanding of fracture mechanics, yet Hubbard has stated that he is not familiar with the principles of fracture mechanics. Hubbard Deposition (May 15, 1984) at 64. (Attachment 3). Hubbard has also stated that, with the exception of metallurgy courses, he has had no background in casting methods. Id. at 25. (Attachment 3). He thus lacks the requisite expertise to formulate an opinion regarding the reproducibility of TDI's casting process, discussed in Paragraph (d).

(2) Page 68, Sentence beginning "Fourth" in answer continuing from Page 67, portions sponsored by Hubbard - The fourth point made in this answer requires familiarity with the

principles of fracture mechanics. Hubbard has stated that he has no such familiarity.

(3) Page 74, answer to final question on Page 73, portions sponsored by Hubbard - Hubbard has no expertise with which to judge FaAA's design analysis, as he lacks expertise in the principles of fracture mechanics.

(4) Page 78, first and second questions and answers, sponsored by Anderson - Answering these questions requires expertise in the area of foundry practices for large steel castings. Anderson has stated that he does not consider himself to be an expert in foundry practices; that he has never been employed by a foundry; that he has done consulting work mainly for foundries that produce small castings; and that although he has been involved in analyzing a number of casting problems, he has never analyzed cylinder heads prior to this case. Anderson Deposition (August 4, 1984) at 15-19. (Attachment 6). As Anderson is the sole sponsor of these questions, these two questions and answers should be stricken.

(5) Page 80, answer to second question, portions sponsored by Anderson, Hubbard - This question also requires the type of expertise in foundry and casting procedures which both Anderson and Hubbard lack.

(6) Pages 82-83, second question and answer, sponsored by Anderson - The answer to this question requires an evaluation of casting improvements made by TDI. Anderson does not have the requisite expertise in foundry practices to evaluate TDI casting changes. Since Anderson is the sole sponsor of this question, it should be stricken along with the answer.

C. CRANKSHAFT SHOTPEENING

(1) Page 133, second question and answer, portions sponsored by Christensen - The answer to this question requires knowledge of stress analysis and fatigue analysis since it attempts to define the most critical area of fatigue initiation in the crankshafts. Additionally, it also relates to metallurgical matters in terms of the effect of shotpeening on the ultimate tensile strength or yield stress of the fillet material of the crankshafts. Nowhere in the qualifications, testimony or deposition transcript of Christensen is there any indication that he is knowledgeable, either as a result of education or training, on stress analysis, fatigue analysis or metallurgical matters. Indeed, a review of Christensen's qualifications and his deposition testimony indicates that most, if not all, of his experience relates to the operating aspects of diesel engines, particularly marine. Thus, Christensen lacks the requisite education or training.

(2) Page 134, first question and answer, second sentence, portions sponsored by Christensen - This answer presupposes metallurgical knowledge about the effect of heat upon shotpeening. Again, nowhere in the qualifications of Christensen, his testimony or deposition is there any indication that he has any education or training in metallurgical matters sufficient to enable him to offer such an opinion.

(3) Page 135, both questions and answers, portions sponsored by Christensen - Again, both of these questions and answers require again, a detailed knowledge of metallurgy and particular knowledge of shotpeening. Christensen has not demonstrated competence in these areas. Thus, Christensen should not be permitted to sponsor this testimony.

(4) Page 138, first question and answer, first sentence, portions sponsored by Christensen, Eley and Bakshi - This question and answer again presupposes a knowledge of stress analysis and fatigue initiation analysis. Neither the testimony, nor the qualifications or depositions of Christensen, Eley or Bakshi indicate any education, training or competence in these areas.

(5) Pages 138-139, second question and answer, beginning of the second sentence, portions sponsored by Christensen and Bakshi - This question and answer also assumes a knowledge of stress analysis, metallurgical matters and

experience in shotpeening. These witnesses do not have this prerequisite knowledge and should not be permitted to testify on those matters.

(6) Page 140, first and second question and answer, portions sponsored by Christensen - Both of these questions and answers relate to the metallurgical properties of the crankshafts and the effect on them of shotpeening correctly, and allegedly incorrectly, performed. Thus, they require a detailed knowledge of metallurgical matters and shotpeening. As demonstrated earlier, Christensen does not possess this knowledge. Thus, Christensen should be precluded.

(7) Page 142, second question and answer, portions sponsored by Christensen - This question and answer also require detailed knowledge of fatigue analysis, stress analysis, metallurgical matters and shotpeening. Christensen does not have the requisite knowledge of these matters.

D. CYLINDER BLOCKS

(1) Page 162, first question and answer, sponsored by Anderson, Christensen; all but last two sentences, Eley, Bakshi - This question asks about the accuracy of FaAA's finite element analysis in showing the effects of stress on the top of the blocks. The witnesses do not possess the working, detailed understanding of finite element analysis necessary to offer an opinion as to the accuracy of FaAA's analysis. None of Suffolk

County's witnesses can reduce the assumed boundary conditions and modeling required in a finite element analysis to mathematical formulas and then run the finite element analysis to determine its accuracy. Without the demonstrated expertise or experience to offer this opinion, the answer should be stricken.

(2) Page 163, first question and answer, sponsored by Anderson, Christensen, Eley, Bakshi - This question requests the witnesses to opine on how FaAA's allegedly incorrect or non-conservative assumptions affected conclusions regarding crack growth predicted by the finite element analysis. Again, these witnesses have no knowledge of how any supposed assumptions were reduced to mathematical formulas, or how these numbers were factored into the finite element analysis, or what effects, if any, such assumptions had on the results.

The County's witnesses cannot say whether FaAA's alleged assumptions had no effect, a 1% effect, or a 10%, 50% or 100% effect on the analysis. Hence, their testimony is couched in language like "cracks might well initiate" and "it is not possible to state by what percentage the FaAA conclusion is in error." The reason for this is simple - these witnesses are not qualified to offer expert opinions on finite element analysis and the answer should be stricken.

E. CONCLUSION

For all of the foregoing the reasons, the noted portions of the Joint Direct Testimony of Dr. Robert N. Anderson, Professor Stanley G. Christensen, G. Dennis Eley, Aneesh Bakshi, Dale G. Bridenbaugh and Richard B. Hubbard should be stricken.

Respectfully submitted,

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CERTIFICATE OF SERVICE

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(Shoreham Nuclear Power Station, Unit 1)
Docket No. 50-322 (OL)

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I hereby certify that copies of LILCO's Supplemental Motion To Strike Portions Of The Joint Direct Testimony Of Dr. Robert N. Anderson, Professor Stanley G. Christensen, G. Dennis Eley, Aneesh Bakshi, Dale G. Bridenbaugh, and Richard B. Hubbard were served this date upon the following by first-class mail, postage prepaid, or by hand as indicated by an asterisk:

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3. Unit Survey