UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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)	)	

SUPPLEMENTAL TESTIMONY OF DONALD O. JOHNSON, DUANE P. JOHNSON AND LEE A. SWANGER ON BEHALF OF LONG ISLAND LIGHTING COMPANY REGARDING AE PISTON SKIRTS AT SHOREHAM

1. Please state your names, employers and business addresses.

A. (Donald Johnson) My name is Donald O. Johnson.

(Duane Johnson) My name is Dr. Duane P. Johnson.

(Lee Swanger) My name is Dr. Lee A. Swanger.

(Donald Johnson, Duane Johnson, Lee Swanger) We are employed by Failure Analysis Associates (FaAA), 2225 East Bayshore Road, Palo Alto, California 94303.

2. Have you previously testified in this proceeding?

A. (Duane Johnson, Lee Swanger) Yes, as members of the LILCO panel on the AE piston skirts. See Attachments 2 and 6, respectively, of the AE piston testimony for our professional qualifications.

(Donald Johnson) I have not testified previously in

this proceeding, but am the author of the memoranda dated February 17, 1984 and February 3, 1984 in Exhibit P-29.

3. Mr. Johnson, describe your responsibilities relevant to the AE pistons.

A. (Donald Johnson) I am an FaAA nondestructive testing technician and a certified Level II Testing Technician in eddy current, liquid dye penetrant, magnetic particle, radiographic and ultrasonic testing. In November 1983, I witnessed the pre-service finishing and inspection at Transamerica Delaval, Inc. (TDI) of the AE piston skirts for the Shoreham Nuclear Power Station. I also performed eddy current examination on some of these skirts after their 100 hour test run. In addition, as a part of the TDI Owners Group program, I performed or witnessed the liquid dye penetrant and eddy current inspections on two AE pistons from the Kodiak engine and the two AE pistons from the R-5 engine.

4. What have you been asked to address in this testimony?

A. (Donald Johnson, Duane Johnson, Lee Swanger) Based on our inspections, we have been asked to clarify the fact that the stud boss regions, particularly the highly stressed area, in the R-5 and Shoreham AE piston skirts are essentially identical and that the highly stressed areas are not polished. I (Donald Johnson) also address the meaning of the following description from my February 3, 1984 memorandum.

During the inspection I observed that there was a layer of plating on the inside of the skirt and that the casting was very smooth, different from general production runs of cast material. The inside of the skirt was cleaned, and all the flash was removed. The boss area was very smooth, as if polished by cratex, and all the ground areas were very carefully polished, with smooth radius into boss.

5. Dr. Johnson and Dr. Swanger, have you inspected the two R-5 AE piston skirts referenced in Donald Johnson's February 3, 1984 memorandum and, if so, what did you observe?

A. (Duane Johnson, Lee Swanger) Yes. Recently, for the first time, we inspected the two R-5 AE piston skirts at TDI. We also recently inspected one of those skirts at FaAA in Palo Alto. The surface conditions we observed in the two R-5 AE piston skirts are essentially the same as the AE piston skirts in the Shoreham emergency diesel generators that we have inspected. The highly stressed areas of the stud boss region in both the Shoreham and R-5 piston skirts are as-cast surfaces that show no evidence of any grinding or polishing. The washer landing areas of all AE piston skirts, including the Shoreham, R-5 piston and Kodiak AE piston skirts, are machined surfaces and, therefore, appear smoother in contrast to the as-cast surfaces. These areas on the AE piston skirts are machined as a part of the manufacturing process to form a flat, circular area for seating of the Bellville washers. On both the R-5 and Shoreham pistons, some of the lip areas formed by the machining had also been ground.

7. Did you see any evidence to suggest that the fatigue resistance in the stud boss region of the R-5 AE piston skirts would be any different from the fatigue resistance of the stud boss region in the Shoreham AE piston skirts?

A. (Lee Swanger) No. I would agree with the testimony given by Dr. Harris on Monday, October 1, 1984 (Tr. at 23784), that there is no evidence of any difference in the fatigue resistance in these areas. Under any given, imposed state of stress, the local stresses would be essentially identical.

8. Mr. Johnson, are the observations of Dr. Johnson and Dr. Swanger consistent with your observations of the R-5 AE piston skirts and the Shoreham piston skirts?

A. (Donald Johnson) Yes. The surface conditions, particularly in the highly stressed areas in the R-5 and Shoreham AE piston skirts, are substantially the same. The highly stressed areas in both are as-cast surfaces that have not been polished. The only as-cast surface in the stud boss region in both the Shoreham and R-5 piston skirts that had been ground or smoothed was the machined washer landing and lip areas. In November 1983, I witnessed the grinding of the lip and the smoothing of the lip and radius area with cratex on the Shoreham AE piston skirts. As a former machinist, I describe the smoothing by cratex as polishing, but it does not produce the same highly polished surface that is normally associated

with metallurgical polishing. Cratex is used to level off the surface created by machining.

9. Mr. Johnson, have you had an opportunity to inspect the AE piston skirts from the R-5 engines since your inspections in January 1984?

A. (Donald Johnson) Yes. On September 29, 1984, I inspected both R-5 piston skirts at TDI. On October 12, 1984, I inspected one of the R-5 skirts at FaAA in Palo Alto. With the exception of the absence of the red dye and developer, the condition of the inside of the skirts was the same as when I inspected them in January 1984. The skirts did not appear to have been run or altered since January 1984.

10. Mr. Johnson, does your testimony today differ from the statements in your February 3, 1984 memorandum?

A. (Donald Johnson) No. The language quoted above in the February 3, 1984 memorandum that I wrote about the R-5 piston skirts was not meant to suggest or imply that the surface condition of the R-5 piston skirts was significantly better than the Shoreham skirts. When I first saw the inside of the R-5 skirt it did appear smooth in comparison to the earlier production AH, AN and AF pistons I had seen. At first glance, the R-5 interior cast surfaces also appeared smooth because of the uniformity in color created by the very thin coat of tin on the inside of the skirt which I had not seen on any other

pistons prior to my inspection of the R-5 skirts in January 1984. The R-5 skirt also appeared generally smoother than the Shoreham pistons as they came directly from the production runs because, at that point, the Shoreham pistons still had some flash on the inside surfaces. Flash is a rough metal edge that is created when the molten cast iron runs into a small imperfection in a core and subsequently solidifies. The Shoreham pistons had flash on the ribs and wrist pin boss areas, but not on the highly stressed boss area. Steps were taken to remove the flash before shipment. And, as I have stated, in the highly stressed areas of the boss, the Shoreham pistons are essentially the same in terms of smoothness as the R-5 pistons.

In my February 3, 1984 memorandum where I indicated that the "boss area was very smooth, as if polished by cratex," I was referring only to the machined surface of the stud boss region which is the washer landing area. In the last sentence from my February 3 memorandum quoted above, I made the observation that the washer landing area and the ground areas in the R-5 skirts were smooth and had been carefully polished. These statements reflect a condition that differs in no way from the overall condition that I observed in the AE skirts that were finally shipped to Shoreham.

11. Mr. Johnson, do you know where the highly stressed area in the stud boss region is?

A. (Donald Johnson) Yes. My choice of words describing the washer landing area in my February 3, 1984 memorandum should have been more specific. I am aware of the difference between the washer landing area and the highly stressed area in the stud boss region. I witnessed or performed eddy current and liquid dye penetrant examinations of the entire stud boss region, including the highly stressed area, in the AE piston skirts from the Shoreham, Kodiak and R-5 engines.

12. Dr. Johnson, please elaborate on your testimony in this proceeding on September 12, 1984 about the comparative smoothness of the surface of the R-5 and Shoreham AE piston skirts.

A. (Duane Johnson) Based on my understanding of the February 3 memorandum and several conversations with Donald Johnson, I commented in my testimony in this proceeding on September 12, 1984 (Tr. at 22312) that the casting surface on the R-5 AE pistons "was smoother than the surfaces which were generally observed on the Shoreham pistons on the inside." I went on to speculate in response to a specific question regarding polishing that the difference in smoothness "could have resulted from polishing" but that "we didn't know that it was the result of polishing." In any event, I did not consider the supposed differences in the surfaces of the R-5 and

Shoreham AE piston skirts to be significant. My recent inspection of the two R-5 AE piston skirts confirms this and furthermore clarifies that the as-cast surface in the highly stressed areas of the R-5 AE skirts have not been polished, and the highly stressed areas in the R-5 and Shoreham AE skirts are essentially the same.

13. Dr. Swanger, please elaborate on the testimony you gave earlier in this proceeding regarding the polishing of the R-5 AE piston skirts in light of your recent personal observations.

A. (Lee Swanger) On September 12 and 13, 1984, I testified regarding the polishing on the R-5 AE piston skirts based on my reading of the February 3, 1984 memorandum written by Donald Johnson. Although my subsequent personal inspection of the R-5 piston skirts has revealed that there is no polishing in the highly stressed area of the stud boss region, my testimony about the practice of polishing an area of interest for a prototype engine is still valid in general, but is not applicable here.

14. Please summarize your conclusions regarding a comparison of the R-5 and Shoreham AE piston skirts.

A. (Donald Johnson, Duane Johnson, Lee Swanger) Based on recent observations and a clarification of the language in the February 3 memorandum, we conclude that the highly stressed

areas in both the R-5 and Shoreham AE piston skirts are very similar as-cast surfaces that have not been polished. I (Lee Swanger) observed nothing that would indicate that the highly stressed areas in the R-5 and Shoreham AE piston skirts differ in their resistance to fatigue cracking.

CERTIFICATE OF SERVICE

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

I hereby certify that copies of LILCO's Motion To Admit Supplemental Testimony Of Donald O. Johnson, Duane P. Johnson And Lee A.Swanger On Behalf Of Long Island Lighting Company Regarding AE Piston Skirts At Shoreham 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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