

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)	)	

TESTIMONY OF ALBERT W. ZEUTHEN  
FOR LONG ISLAND LIGHTING COMPANY  
ON SOC CONTENTION 19(c) -- FERRITE  
CONTENT OF WELDING MATERIALS

PURPOSE

This testimony establishes that LILCO substantively complies with Regulatory Guide 1.31, Revision 3. The testing program at Shoreham, including additional testing not required by the Regulatory Guide, ensures adequate ferrite content in materials.

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1. Q. What is your name and business address?
- A. My name is Albert W. Zeuthen. My business address is Long Island Lighting Company, 175 East Old Country Road, Hicksville, New York, 11801.
2. Q. By whom and in what capacity are you employed?
- A. I am employed by the Long Island Lighting Company. I am Section Head of Materials Engineering.
3. Q. Would you please summarize your professional qualifications?
- A. In my present position, I provide technical support and consultation on materials, welding and corrosion problems at Shoreham. This includes questions involving the applicability of ASME Code and

regulatory guides to Shoreham. My resume appears on pages 8-9.

4. Q. Are you familiar with SOC Contention 19(c)?

A. Yes.

5. Q. What is the concern of the Contention?

A. To assure the adequacy of materials for welding, stainless steel weld metal must contain a certain amount of ferrite. Regulatory Guide 1.31 contains provisions for verifying the amount of ferrite in the materials. SOC Contention 19(c) argues that LILCO does not comply with Revision 3 (the latest revision) of Regulatory Guide 1.31 with regard to "stainless steel weld metal."

6. Q. What provisions do Regulatory Guide 1.31 establish for testing ferrite content of weld metal?

A. Regulatory Guide 1.31, Revision 3 provides for two alternative methods of delta ferrite control depending upon the use of the materials being tested: chemical composition analyses using constitutional diagrams or magnetic measurement. In addition to these two methods, Revision 1, as modified by the Interim Position MTEB 5-1, which Shoreham committed to meet in the FSAR, requires testing of welds, some of which has been done at Shoreham.

7. Q. What are constitutional diagrams?
- A. By evaluating the nickel equivalent and the chromium equivalent in the weld filler material, the amount of ferrite can be determined. Constitutional diagrams show the percentage of ferrite or ferrite number resulting from various mixes of these factors.
8. Q. How have the requirements for ferrite control been applied to Shoreham?
- A. The requirements regarding ferrite content have been incorporated in the purchase specifications for welding materials. Accordingly, the manufacturers have been required to perform the tests and provide the test results. This is in accordance with Regulatory Guide 1.31.
9. Q. What tests have the manufacturers performed?
- A. Manufacturers perform whichever test is appropriate. The ultimate use of the material determines which test is appropriate. As mentioned earlier, there are two tests to determine ferrite content: magnetic measurements using calibrated instruments, or chemical analyses using constitutional diagrams. In either case, ferrite content is based on undiluted weld metal pads.

10. Q. What constitutional diagrams were used to determine ferrite content of Shoreham materials?
- A. There are two diagrams used: the Schaeffler diagram and the Delong diagram.
11. Q. Are both diagrams widely accepted in the industry?
- A. Yes.
12. Q. How do you know that the tests have been performed?
- A. The manufacturers must certify the materials provided. These certifications include the results of the required tests, whether measurement or analysis, and must also certify that the ferrite content of each heat and lot is within the specifications.
13. Q. How are the Shoreham materials controlled to assure proper ferrite content?
- A. The manufacturer's certifications are reviewed for compliance by the quality assurance personnel and welding materials are not released for field usage until approved. Welding materials are then released to each welder. Extensive documentation exists to assure traceability of all materials used.
14. Q. So, in other words, LILCO itself does not perform

the ferrite verifications, but rather relies on the certifications of the manufacturers?

A. Yes, that is correct. Again, this process complies with the Regulatory Guide requirements.

15. Q. SOC contends that Shoreham does not comply with Regulatory Guide 1.31, Revision 3. Does it?

A. All significant requirements of Revision 3 are met. Let me explain. Revision Guide 1.31, Revision 3 was based upon a cooperative study group of the American Society of Mechanical Engineers, the American National Standards Institute and the Nuclear Regulatory Commission which was formed to analyze data to determine how testing of production welds could be reduced without sacrificing ferrite control. They analyzed 1500 welds and determined that ferrite content could be ensured without performing measurements on production welds. Accordingly, the testing requirements for production welds were deleted.

16. Q. In what ways does Shoreham not comply with Revision 3?

A. Revision 3 incorporated new provisions for the preparation of a weld pad that relate to its thickness, and adopted the ferrite numbering system

instead of the percent ferrite system used in the earlier version. In addition Revision 3 requires 6 readings of ferrite instead of 5 readings to be taken from the undiluted weld pads.

17. Q. Would these differences be significant with respect to the Shoreham materials?

A. No. I believe that the difference in weld pads or the additional reading are inconsequential. The change from percent ferrite to ferrite number is a matter more of standardization than substance. In addition, Shoreham has performed additional testing not required by Revision 3 to assure ferrite content.

18. Q. What is that additional testing you refer to?

A. For coated electrodes, ferrite was determined from the chemical analysis of undiluted weld metal and a constitutional diagram. For consumable rings and rods for the gas tungsten arc weld process, ferrite was determined from weld pad measurements.

19. Q. And LILCO essentially complies with Regulatory Guide 1.31, Revision 3?

A. Yes.



20. Q. Would you summarize your conclusions regarding SOC  
Contention 19(c)?

A. Shoreham substantially complies with Revision 3.  
The testing program instituted at Shoreham, including additional testing not required by the  
Regulatory Guide Revision 3, ensures proper ferrite  
control of weld metal.



## PROFESSIONAL QUALIFICATIONS

Albert W. Zeuthen

My name is Albert W. Zeuthen. My business address is Long Island Lighting Company, 175 East Old Country Road, Hicksville, New York, 11801. I joined LILCO in 1975. I am currently Section Head of Materials Engineering. In this position, I provide technical support and consultation on materials, welding, and corrosion problems at the Shoreham Nuclear Power Station, during the design, construction and operation phases. I deal with issues involving the application of various codes and regulatory guides. I am involved with activities concerning failure analysis for Electric Production, Gas Turbine Division, and Overhead Lines. I have represented LILCO at EPRI meetings and at NRC meetings if they concern Shoreham.

Previously, I was a Senior Engineer with Consolidated Edison responsible for metallurgic and welding services for Indian Point Units 1 and 2 and construction of Unit 3. I prepared all welding procedures for Units 1 and 2 as well as procedures for other facilities. I was responsible for welding repairs at Indian Point as well as high pressure turbine casings at East River Waterside and Astoria.

Prior to working with Consolidated Edison I was a Senior Engineer with Mobil Corporation for 20 years and had world-wide experience in the design, construction and repairs of equipment used in refineries. My work at Mobil resulted in granting of two patents.

I am a member of the ASME Boiler and Pressure Vessel Code Committee and serve as Chairman of the Subgroup on Steel Plates and a member of Section II Materials. I am a member of the American Society for Metals and the Metal Science Club of New York.