UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

4/12/82

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
LONG ISLAND LIGHTING COMPANY	)	Docket Number 50-322
	)	
(Shoreham Nuclear Power Station, Unit 1)	)	

NRC STAFF TESTIMONY OF YI-HSIUNG HSII REGARDING LOOSE PARTS MONITORING

(SUFFOLK COUNTY CONTENTION 5)

OUTLINE OF TESTIMONY

This testimony addresses Suffolk County (SC) Contention 5 regarding the Shoreham loose part monitoring system (LPMS). SC Contends that Shoreham's LPMS could produce a large number of spurious alarms which, if not readily identified or explained, could diminish operator performance and overall plant safety.

The Staff response is that operators actions important to plant safety are never taken based on information obtained from the LPMS alone. Therefore, should a spurious alarm occur, operator performance and overall plant safety will not be impaired.

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NRC STAFF TESTIMONY OF YI-HSIUNG HSII ON
SUFFOLK COUNTY CONTENTION 5-LOOSE PARTS MONITORING

Q. State your name and position with the NRC.

A. My name is Yi-hsiung Hsii. I am a Senior Nuclear Engineer assigned to the Thermal Hydraulics Section of the Core Performance Branch, Division of Systems Integration, Office of Nuclear Reactor Regulation of the U.S. Nuclear Regulatory Commission.

Q. Have you prepared a statement of professional qualifications?

A. Yes. A copy of my professional qualifications is attached to my written testimony.

Q. What is the purpose of this testimony?

A. The purpose is to address Suffolk County Contention 5, which alleges:

> "Suffolk County contends that Shoreham's Loose Parts Monitoring System could produce a large number of spurious (unwanted) alarms which, if not readily identified or explained, could diminish operator performance and overall plant safety. This would violate 10 CFR 50, Appendix A, GDC 1 and 13, as well as 10 CFR 20.1(c), and 10 CFR 50.36 (c) (2), (3) and (5)."

Q. What is the purpose of LPMS?

A. LPMS is an in-service detection system which provides a means for early detection of loose metallic parts in the primary system. Early detection and removal of loose metallic parts can prevent or mitigate mechanical damage to primary system components such as reactor and steam generator internals. It may also prevent malfunction or interference with safety-related moving components such as control rods, valves, pump impellers and other moving parts. By evaluation of the origin of the loose parts, a degraded structure may also be identified for appropriate safety evaluation. In addition, early detection of loose parts causing wear by impact damage is beneficial to maintaining occupational radiation exposure as low as is reasonably achievable by minimizing wear generated crud buildup and by limiting the need for excessive maintenance. Therefore, a LPMS provides diagnostic information to alert the plant operators to abnormal conditions having possible implications on safe operation of the reactor.

Q. What type of LPMS will Shoreham have?

A. The Shoreham LPMS is an acoustic detection, analog processing, and annunciation system providing real time detection of impact noises in the primary coolant system. The system will be operational before power operation and will meet the recommendations of Regulatory Guide 1.133.

Q. What is the scope of Regulatory Guide 1.133 recommendations on LPMS?

A. Regulatory Guide 1.133 states the Regulatory positions regarding LPM system characteristics and programmatic aspects of LPMS. The staff

considers the criteria placed on system sensitivity, data acquisition, and alert level establishment to be particularly important.

Q. How are spurious alarms prevented?

A. Regulatory Guide 1.133 recommends that special provisions be incorporated for minimizing the potential for false alert signals. The alert level will be established to include the effect of background noises. The alert logic will incorporate suitable internal criteria to distinguish the transient signal caused by the impact of a loose part from the signals associated with normal hydraulic, mechanical and electric noises and large amplitude electrical transients. In cases of plant maneuvers, false alert signals will be avoided by automatic procedures that momentarily override the alert alarm. Therefore, if Shoreham's LPMS conforms with the recommendations of Regulatory Guide 1.133, as indicated in the FSAR, spurious alarms from LPMS should be minimized for the Shoreham plant. The NRC routine safety inspection conducted in January 1982 reported that an LPMS automatic inhibit feature for plant maneuvers is not currently utilized by Shoreham. However, a multiple alert counter will be utilized to screen and minimize false alarms.

Q. If a spurious alarm occurs, could it diminish operator performance and overall plant safety?

A. The LPM system includes automatic and manual data acquisition modes. The automatic mode is for continuous, on-line detection of loose parts. When the predesigned alert level is exceeded, the automatic mode is activated automatically. This activation is comprised of an audible or visual alarm to control room operators and simultaneous initiation of

data acquisition recording equipment. For the manual mode, Regulatory Guide 1.133 recommends that at least once per seven days, the operator listen to a portion of the signals from all recommended sensors for the purpose of detecting the presence of loose parts. If signals in this mode indicate the presence or possibility of a loose part, station personnel should actuate the data acquisition system to obtain data for further evaluation to determine whether there is a loose part. For both the automatic and manual modes, no action is required with respect to reactor operation based on information obtained from the LPMS alone. Any longer term action affecting reactor operation will be based on careful evaluation of all pertinent data. Therefore, should a spurious LPMS alarm occur, the operator performance and overall plant safety will not be adversely affected.

Q. Could a spurious LPMS alarm violate 10 CFR 50, Apendix A, GDC 1 and 13?

A. 10 CFR 50, Appendix A, General Design Criteria (GDC) 1, "Quality Standards and Records," states that structures, systems, and components important to safety shall be designed, fabricated, erected and tested to quality standards commensurate with the importance of the safety functions to be performed. GDC 13, "Instrumentation and Control", states that instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated

systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges.

LPMS is designed to provide an in-depth defense to reactor safety by early detection of loose metallic parts in the primary system. Its function is not directly related to system operational variables which have direct implications to reactor safety. Therefore, a spurious LPMS alarm would not violate the aforementioned general design criteria.

Q. Could a spurious LPMS alarm violate 10 CFR 20.1(c)?

A. 10 CFR 20.1(c), Purpose of General Provisions of "Standards for Protection Against Radiation," states that persons engaged in activities under licenses issued by the Nuclear Regulatory Commission make every reasonable effort to maintain radiation exposures, and releases of radioactive materials in effluents to unrestricted area, as low as is reasonably achievable (ALARA).

Radiation release ALARA is achieved through the reactor system design, safety analyses and plant protection systems. LPMS can help maintain ALARA by minimizing wear-generated crud buildup through early detection of loose parts in the primary system. Spurious LPMS alarms would not aggravate the basic plant design and protection system since an LPM alarm alone would only activate the data acquisition system to further check out the possibility of loose parts. Therefore, 10 CFR 20.1(c) would not be violated.

Q. Could a spurious LPMS alarm violate 10 CFR 50.36(c) (2), (3), and (5)?

A. Item c of 10 CFR 50.36, "Technical Specifications", requires that the following items be included in Technical Specifications of a plant:

(2) Limiting conditions for operation, (3) Surveillance requirements, and (5) Administrative control.

Limiting conditions for operation (LCO) are the lowest functional capability or performance levels of equipment required for safety operation of the facility. The Shoreham Technical Specifications require for LCO regarding LPMS that the loose-part detection systems shall be operable. Should a spurious LPMS alarm occur, the data acquisition system is actuated to record the impact noise data. The LPMS still remains operable.

For the LPMS surveillance requirements, the Shoreham Technical Specifications specify the frequencies of performing channel check, channel functional test and channel calibration to demonstrate that each channel of the LPMS is operable. Spurious alarms do not alter those requirements.

As for the administrative control, the Technical Specifications require that with one or more LPMS channels inoperable for more than 30 days, the licensee should prepare and submit a special report to the Commisssion pursuant to Specification 6.9.2 within the next ten days outlining the cause of the malfunction and the plans for restoring the channel(s) to operable status. Spurious alarms do not alter this requirement.

Q. What are your conclusions regarding Suffolk County Contention 5?

A. Spurious LPMS alarms will not cause adverse effect upon operator performance and overall plant safety. Operator actions important to plant safety will not be based on information obtained from the LPMS

alone. These alarms will merely result in immediate actuation of the data acquisition system.

Yi-hsiung Hsii
Core Performance Branch
Division of Systems Integration
U. S. Nuclear Regulatory Commission

PROFESSIONAL QUALIFICATIONS

I am employed as a Senior Nuclear Engineer in the Thermal-Hydraulics Section of the Core Performance Branch of the Division of Systems Integration. In my present work assignment, I have been working as a technical reviewer on safety evaluation reports and reload methodological topical reports in core thermal hydraulic area submitted by applicants and licensees. I also serve as technical monitor and project manager of a few technical assistance programs granted to national laboratories.

I graduated from Taiwan University with a BS in Mechanical Engineering in 1964. After one year of military service in Taiwan, I attended North Carolina State University, where I received Ph.D in Mechanical Engineering in 1972. I am a registered Professional Engineer, Certificate Number 10352, in the state of Virginia.

Prior to joining the NRC staff in January 1981, I was employed by the Babcock and Wilcox Company for a total of eleven years. From January 1967 to August 1968 I was employed as an Engineer in the Thermal Analysis Group. From 1971 to 1981, I was employed as a Senior Engineer and then Principal Engineer in the Technical Staff Section. My work at B&W included PWR core thermal hydraulic design analysis, and development of computer codes in the areas of containment systems, reactor system transients, and fuel pin thermal performance analysis, as well as general-purpose heat transfer codes.