

LILCO QUALITY ASSURANCE SUMMARY REMARKS -  
PRESENTED BY W. J. MUSELER BEFORE THE SHOREHAM COMMISSION MEETING

This Commission has been barraged with rhetoric and unsubstantiated accusations regarding the quality of the design and construction of the Shoreham plant. Because of this, it may seem too difficult for the Commission to make a determination as to the adequacy of the plant and its design. However, if one examines the hard evidence which is available, you will come to the unmistakable conclusion that the plant has been designed and constructed properly, and that there have been numerous and diverse independent verifications of that adequacy.

I. 100% Reinspection

With respect to the adequacy of the plant's construction, a number of key points should be made:

1. LILCO QA Program

The LILCO and S&W Quality Assurance Programs employed at Shoreham are multi-layered and diverse in order to provide total coverage and redundant quality checks covering the entire plant construction process from the procurement of materials and equipment through the construction and installation phases and including

the extensive Startup Testing Program. To name the major (though not all) Quality organizations involved: LILCO Field Quality Assurance, LILCO OQA, S&W Field Quality Control, S&W Quality Assurance, S&W Engineering Assurance, Contractor Quality Assurance, and Independent Inspection Agencies (for example, The Hartford Steam Boiler Company). As the ASLB noted in its decision:

LILCO developed a QA program for Shoreham prior to the formal NRC requirements for such and prior to construction at the site . . . . Since that time the QA program has been updated and subject to continuing Staff review . . . . LILCO's QA program addresses all aspects of the design, construction and testing of Shoreham, including design control, procurement and construction control, according to each of the 18 criteria of Appendix B . . . .

2. ASLB Proceedings and Decision

The Atomic Safety and Licensing Board examined the Quality Assurance issue on Shoreham for over six (6) months with extensive intervener cross-examination and Board questioning of a QA panel composed of LILCO, S&W, and G.E. expert witnesses. Literally thousands of documents were examined in detail and every aspect of the plant's construction (procurement, construction, inspection, and testing) were covered. As the Licensing Board noted, it

provided ample opportunity to the County to present its evidence of failures on the part of LILCO and the Staff to comply with the Commission's requirements.

The ASLB partial initial decision, which covers all aspects of Quality Assurance, was extremely favorable and demonstrated that Quality Assurance as applied to Shoreham has been comprehensive and effective. The Board, after a searching review of the massive QA record, concluded that:

Design, construction and installation at Shoreham has been affected by the long period of construction and the changing requirements of the AEC and NRC during this period. Stepping back from the details of errors made, we have focused on the overall performance of LILCO and the Staff at Shoreham. Our perception is that neither has been perfect, nor could it have been with realistic use of resources. Nor is perfect performance expected by the Commission. We do conclude, however, that both LILCO and the Staff have had effective programs for identifying and correcting deficiencies. We also conclude that LILCO's and the Staff's programs for operation of Shoreham meet the Commission's requirements and will provide adequate protection of the health and safety of the public. We have found LILCO's and the Staff's testimony credible and persuasive. The County's testimony and cross-examination have not controverted our conclusions and opinion.

As a result of its review of QA and other issues, the Board recommended that Shoreham should be given a low power license once the diesel generator issue is resolved.

### 3. Allegations

Allegations of faulty workmanship or equipment have been leveled against Shoreham a number of times during

its construction. The vast majority of these allegations are vague and general in nature, with very few having any specifics. Nevertheless, each and every allegation has been thoroughly investigated by LILCO and by the NRC. The investigations have extended beyond the allegations made into areas only remotely related to the original charges. None of the allegations made against Shoreham has ever been substantiated. The reason that not one of these allegations has ever been substantiated despite intensive investigations by NRC technical and investigative personnel is very simple. Shoreham has been built properly and its Quality Assurance Programs have been effective.

4. Independent Inspections of Shoreham

In addition to LILCO, S&W, and NRC inspections of Shoreham, a number of third party inspections have been conducted. Torrey Pines Technology conducted a six (6) month onsite inspection program physically reinspecting selected areas covering every discipline (Mechanical, Structural, Electrical) on the site. You have already heard about the Torrey Pines study in detail at another Commission session. Since that time the ASLB reached its conclusions about the TPT effort after more than two weeks of hearings on

the work. The Board recognized TPT's substantial qualifications for the task and their independence and noted that:

The County's consultant, Mr. Hubbard, was quoted as saying that the scope of the program as reflected by viewgraphs he had seen (at the time of initial planning for the study) "was the most comprehensive program he had ever seen developed for construction verification" . . . .

In its opinion, the Board adopted a number of Torrey Pines' conclusions:

"The small number of discrepancies identified, the very small number of potential safety concerns identified, the lack of trends in the discrepancies or safety-related concerns, and the availability of QA documentation on the construction activity from the beginning of the project demonstrat[e] that the QA program has been effectively applied over the duration of the project and that the resultant safety-related plant hardware meets construction requirements of the design documents.

. . . .

"Based on the data reviewed during this independent construction verification effort, the QA program for construction of safety-related equipment at the Shoreham Nuclear Power Station is judged satisfactory."

And further:

- "(1) LILCO and SWEC each have, and have had, construction control procedures in place during the construction activity. The procedures were reviewed in detail and were judged adequate to provide a reasonable and required QA program for the construction. It is concluded that the procedures in effect

for the entire life of the construction activity are adequate and can be reasonably expected to produce adequate nuclear safety-related systems and hardware.

- "(2) The review of implementation of the construction control system indicated that the system was effectively implemented over the duration of the construction activity.
- "(3) Results of the extensive inspections performed on actual plant hardware as well as review of large-bore ASME Code piping material certifications and available preoperational test results on plant systems indicate that the implementation of the construction control program has resulted in adequate construction of nuclear safety systems and components in the Shoreham plant.

. . . .

Since an adequate construction system existed, since the system was implemented, and since it will result in satisfactory construction of all nuclear safety-related features inspected when planned actions are completed, the construction of the Shoreham Nuclear Power Station is judged to meet the construction requirements of the design documents obtained from LILCO."

In conclusion the ASLB noted:

that the Torrey Pines study was designed to be a study of the construction control process. It was designed to look at important parts of this process in a logically consistent way, focusing on matters judged to be representative and important for protection of public health and safety. We make no statistical inference from the results of this study. We simply note that nothing resulting from this study detracts from our opinion that LILCO and the Staff have satisfied Commission requirements with respect to Quality Assurance and Quality Control.

With respect to the use of statistics by Torrey Pines, a subject raised at a prior Commission meeting, the Licensing Board concluded

The record establishes that Torrey Pines, both on its own and at the request of LILCO, expressly considered and rejected the applicability of statistical methodology in its independent verification of Shoreham. This decision was based not only on Torrey Pines' experience in its San Onofre and Palo Verde verifications, but also upon Torrey Pines' engineering judgment that for a number of reasons it would have been inappropriate to utilize statistical sampling methodology. As Mr. Johnson testified, GA Technologies, which employs professional statisticians, has evaluated the applicability and cost effectiveness of applying statistical methods to an independent construction verification of a nuclear power plant and has been unable to identify a cost effective way of doing so. The statisticians within GA Technologies whom Mr. Johnson consulted were both familiar with the general field of statistics and were involved in probabilistic risk assessments. There are no accepted methods or accepted ground rules upon which to apply statistical methodology in this context. The difficulties lie in the identification of homogeneous populations, the identification of what will be considered a failure, and the identification of what will be considered acceptable reliability and an acceptable confidence level . . . .

. . . .

The Commission's Quality Assurance Criteria, 10 C.F.R. Part 50, Appendix B, do not require the use of statistical sampling methodology. Moreover, throughout the nuclear power industry, it is not the practice to utilize statistical methodology in quality assurance auditing programs . . . .

LILCO has also had performed an independent inspection of the Reactor Pressure Vessel Ultrasonic Test Program in which the quality of selected welds was verified by reinspection via Contractor employed directly by the NRC.

The foregoing represents a very brief summary of the hard evidence and extensive reviews, inspections, and reinspections which have been applied to the construction of Shoreham. Shoreham's Quality Assurance has been examined under a microscope of far greater magnification than any other plant in the United States and its quality has not been found wanting.

## II. Design Verification

The issue of Design Verification has also been the subject of considerable interest and with that interest, considerable misinformation and rhetoric. The LILCO/S&W design and engineering process includes an extensive Design Verification Program. Calculations require rechecking by different engineers and data verification is documented and checked. In many cases these checks and verifications require a complete review commencing with fundamental engineering principles. Where appropriate, design parameters were verified through extensive laboratory and field testing. The Startup Test Program of the plant incorporates additional design



verifications while the plant is being operated at low, intermediate, and design power levels.

The problems encountered in the industry, notably at Diablo Canyon and at Zimmer, prompted the NRC to suggest that yet another design verification measure be employed to ensure the adequacy of the plant piping systems. LILCO employed Teledyne Engineering Services (TES) to conduct an extensive Design Verification Program, the scope of which was approved by the NRC. In fact, as the Program evolved, Teledyne, LILCO, and S&W decided to expand the scope of the review beyond any which has been done to date in the industry. The Teledyne review ultimately consumed over one (1) year and examined not only the originally specified areas, but also reviewed any potentially generic items. In fact, TES reviewed, in essence, the entire Stress Program in all substantive areas. Checks were made of all pipe supports and all piping in certain categories to ensure conformance to design requirements. As Teledyne stated in its report:

it is apparent that a significant portion of the design at the Shoreham Plant has been subject to review and that the original scope was expanded greatly as a result of the initial review effort.

The Teledyne report, issued in July of this year, contained zero (0) findings. Teledyne concluded that:

In the area of Quality Assurance the TES Reviewers in their summary Trip Report indicate that the LILCO QA Program as applied to construction activity on the LPCS System at Shoreham demonstrates: management awareness and participation, a high level of proficiency and efficiency in the Quality Assurance organization, and exceeds the minimum in application and performance of the Quality Assurance Program requirements.

Based on the results of our Independent Design Review it is TES' opinion that the commitments of the FSAR with respect to Design and Quality Assurance have been complied with by LILCO and SWEC for the Shoreham Nuclear Power Station.

Thus, the problems found at Diablo Canyon, at Zimmer, and at other plants were not found at Shoreham.

Clearly the internal mechanisms for Design Verification at Shoreham have been extensive, and have been demonstrated to be effective.

### III. Summary

Calls for yet another one hundred (100) percent reinspection of Shoreham and yet another "so-called" independent design verification of Shoreham continue to be heard. The proponents of such additional reviews have uniformly failed to point out why the existing Quality Programs in engineering and construction at Shoreham have failed to produce a quality product. They also have not bothered to suggest why the numerous redundant inspections and design verifications of Shoreham which have already been done are inadequate to

provide any added assurance one might desire over and above that provided by the inherent conservatism of the LILCO Quality Programs. I will not suggest why these advocates have not "done their homework," but I will suggest in the strongest terms that the evidence provided by the programs, independent inspections, design verifications which have been done and which are clearly documented for Shoreham provide clear assurance that the quality of construction and design has been more than adequately demonstrated. Shoreham has been designed properly, and it has been constructed as a quality plant.