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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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USNRC

ATOMIC SAFETY AND LICENSING APPEAL BOARD

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Administrative Judges:

Alan S. Rosenthal, Chairman
Gary J. Edles
Howard A. Wilber

OFFICE OF SECRETARY
NUCLEAR REGULATORY COMMISSION
October 31, 1984
(ALAB-788)

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In the Matter of)
)
LONG ISLAND LIGHTING COMPANY)
)
(Shoreham Nuclear Power Station,)
Unit 1))
_____)

Docket No. 50-322 OL

DECISION

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TABLE OF CONTENTS

I.	"Important to Safety"	7
	A. Licensing Board Resolution	11
	B. Commission Guidance	12
	C. Analysis	13
	1. Adequacy of Quality Assurance	14
	(a) Requirements	16
	(b) LILCO's Quality Assurance Program	20
	(i) Turbine Bypass System	20
	(ii) Reactor Core Isolation Cooling System	23
	(iii) Standby Liquid Control System	25
	(iv) High Water Level (Level 8) Trip of Main Turbine and Feedwater Pumps	27
	(v) Rod Block Monitor	29
	(vi) Reactor Water Cleanup System	30
	2. License Condition	32
II.	Systems Interaction	36
	A. Regulatory Requirements and Systems Interaction Studies	39
	B. Alleged Failure to Identify a Serious Systems Interaction Problem	49
	C. Unresolved Safety Issue A-17	52
	D. Unresolved Safety Issue A-47	55
III.	Quality Assurance	59
	A. Background	59
	B. Technical Issues	61
	1. Compliance of the QA Program with 10 CFR Part 50, Appendix B	61

2.	Implementation of LILCO's QA Program	66
	(a) Classifying a QA Deficiency	66
	(b) Defining a QA Violation	69
	(c) Specific Areas of QA Program Implementation	71
	(i) Housekeeping	71
	(ii) Control of Calculations	76
	(iii) Electrical Separation	80
3.	Quality Assurance Organization	83
C.	Procedural Issues	86
IV.	Miscellaneous Technical Issues	96
A.	Water Hammer	96
B.	Environmental Qualification and Post-Accident Monitoring	98
	1. Section 50.49(b)(2) Compliance	99
	2. Section 50.49(b)(3) Compliance	105
C.	Passive Mechanical Valve Failure	108
D.	Anticipated Transient Without Scram	114
E.	Seismic Design	123
F.	Mark II Containment	126
G.	Safety Relief Valve Tests and Challenges	134
H.	Emergency Planning Issues	137
V.	New York State's Appeal	143

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Lawrence Coe Lanpher, Washington, D.C. (with whom Herbert H. Brown and Karla J. Letsche, Washington, D.C., were on the brief), for Suffolk County, New York.

Ben Wiles, Albany, New York (with whom Gerald C. Crotty and Jonathan Feinberg, Albany, New York, were on the brief), for the State of New York.

T.S. Ellis, III, W. Taylor Reveley, III, James N. Christman and Anthony F. Earley, Jr., Richmond, Virginia, for the Long Island Lighting Company.

Bernard M. Bordenick and Edwin J. Reis (with whom David A. Repka, Richard J. Rawson and Robert G. Perlis were on the brief) for the Nuclear Regulatory Commission staff.

Scott E. Slaughter and Peter S. Everett, Washington, D.C., and Anthony F. Earley, Jr., Richmond, Virginia, filed a brief for the Utility Safety Classification Group as amicus curiae.

DECISION

Before us are appeals from a partial initial decision rendered by the Licensing Board designated to preside over all matters in this operating license proceeding other than

offsite emergency planning and low power operation. LBP-83-57, 18 NRC 445 (1983).¹ In a comprehensive decision, the Board resolved all issues in favor of the applicant, Long Island Lighting Company (LILCO), with three exceptions. First, the record was reopened to admit portions of a new contention proposed by intervenor Suffolk County relating to excessive vibration and cylinder head cracking in the diesel generators that provide onsite emergency power.² Second, LILCO was required to supplement the record with regard to the testing of check valve internal parts.³ Third, the

¹ The Licensing Board's decision consists of two principal portions, a narrative opinion that appears in volume 18 of the NRC issuances, and a separate set of findings of fact. (We shall refer to these findings as FF, with a parallel reference to the page number of the Board's unpublished slip opinion.) In another proceeding we criticized this bifurcation because it is repetitious and has a potential for creating internal inconsistencies. Pacific Gas and Electric Co. (Diablo Canyon Nuclear Power Plant, Units 1 and 2), ALAB-781, 20 NRC , n.2 (Sept. 6, 1984) (slip opinion at 3 n.2); ALAB-776, 19 NRC 1373, 1375 n.4 (1984). Moreover, the format made it somewhat difficult for us at times to tie the Board's reasoning to its evidentiary findings. Additionally, the Board's separate findings, which contain some material not included in its opinion, are not published in the NRC issuances. Although the findings are part of the Board's decision and are available for consideration on review, and in the public document room, they will not be conveniently available to the general public. We deem this highly undesirable.

² LBP-83-57, supra, 18 NRC at 464 n.8.

³ Id. at 466-67, 636-37.

record was held open with regard to one aspect of the operation of the residual heat removal system. The Board found that the information in the record on this issue was insufficient to determine whether a design modification would be necessary or whether this issue would be resolved on a generic or a Shoreham-specific basis.⁴

In the Board's view, however, only the diesel generator issue was serious enough to preclude the issuance of a license for operation of Shoreham at low power (i.e. at levels up to five percent of rated power).⁵ On March 24, 1984, LILCO filed a "Supplemental Motion for Low Power Operating License" seeking an exemption under 10 CFR § 50.57(c) to allow operation at low power pending resolution of the questions pertaining to the failure of the diesel generators during operational testing. A separate board was established to resolve the issues raised by the motion.⁶

LILCO, the State of New York, Suffolk County, New York, and the Shoreham Opponents Coalition appealed from the

⁴ Id. at 517-18.

⁵ Id. at 467, 637.

⁶ In a decision issued on October 29, 1984, that Board authorized the Director of Nuclear Reactor Regulation after making the findings required by 10 CFR 50.57(a) to issue to LILCO a low-power testing license.

Board's decision.⁷ As discussed below, LILCO's appeal is limited to a single issue, i.e., the Board's imposition of an operating license condition based upon its acceptance of the NRC staff's definition of the regulatory term "important to safety." With our permission, the Utility Safety Classification Group, an organization consisting of thirty-nine electric utility companies who own over half of the operating or planned commercial reactors in the country, filed a brief as amicus curiae urging reversal of the Licensing Board's decision with respect to this definition. New York's appeal is likewise limited to a single issue, i.e., authorization of low power operation in the absence of assurance that an adequate level of offsite emergency preparedness will be developed at Shoreham. Suffolk County's appeal is directed to the Board's disposition of a wide range of issues.⁸

Last April, following appellate briefing and oral argument, we certified to the Commission three questions.⁹

⁷ The Shoreham Opponents Coalition did not file its own exceptions or brief. Rather, it joined in the exceptions and brief filed by Suffolk County. See letters of James B. Dougherty, Shoreham Opponents Coalition, to the Appeal Board (Oct. 17, 1983 and Dec. 23, 1983).

⁸ The NRC staff and, except as noted above, LILCO support the Board's result.

⁹ ALAB-769, 19 NRC 995 (1984).

First, we asked whether the terms "important to safety" and "safety-related" should be deemed synonymous for the purpose of establishing an acceptable quality assurance program in accordance with General Design Criterion (GDC) 1 of Appendix A and Appendix B to 10 CFR Part 50. Second, we sought Commission guidance as to how the resolution of that question should be applied in this proceeding. Finally, we asked whether some form of environmental evaluation under the National Environmental Policy Act (NEPA) is a precondition to issuance of a license for low power operation in this proceeding. We indicated that we would await the Commission's disposition of these matters before addressing the other issues now pending on appeal.¹⁰

The Commission responded to the certified questions in an opinion issued on June 5.¹¹ The Commission concluded, first, that the question of the definition of "important to safety" required further consideration; accordingly, it set in motion procedures looking toward resolution of the question through the notice and comment process. Second, it instructed us to proceed in the interim "on a case-by-case basis in accordance with current precedent. Cf. Metropolitan Edison Company (Three Mile Island Nuclear

¹⁰ Id. at 1007 n.34.

¹¹ CLI-84-9, 19 NRC 1323 (1984).

Station, Unit 1); ALAB-729, 17 NRC 814 (1983)."¹² Lastly, it determined that NEPA does not require preparation of an environmental impact statement or any other form of environmental evaluation on the proposal to issue a low power license for the Shoreham facility.¹³ We invited the parties to comment on the Commission's opinion insofar as it offered guidance which we must apply in arriving at our decision. Comments were received on July 6.

We now turn to a resolution of the issues on appeal. Like the Licensing Board, we decide those issues essentially in the applicant's favor. We do, however, remand three relatively minor matters to the Board: (1) the question whether the plant may be operated pending resolution of Unresolved Safety Issue A-47, as discussed in Section II(D); (2) resolution of certain issues associated with housekeeping, as discussed in Section III, and (3) the issue of the environmental qualification of electrical equipment, as discussed in Section IV(B).

We first examine LILCO's appeal and the application of the Commission's guidance concerning the definition of "important to safety" to the pending proceeding. In Sections II and III we deal with Suffolk County's arguments

¹² Id. at 1325.

¹³ Id. at 1326.

regarding systems interaction and quality assurance. In Section IV we dispose of the County's remaining challenges to the Licensing Board's decision.¹⁴ Finally, we consider New York's appeal in Section V.

I. "Important to Safety"

All nuclear power plants classify structures, systems or components according to their safety significance. At Shoreham, certain structures, systems and components are identified as "safety-related."¹⁵ That term is derived from Appendix B to 10 CFR Part 50 and Appendix A to 10 CFR Part 100.

Appendix B establishes quality assurance requirements for the design, construction and operation of those structures, systems and components "that prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public."¹⁶ The Appendix B requirements apply to "all activities affecting

¹⁴ The Commission's June 6 opinion is wholly dispositive of Suffolk County's argument regarding the need for a further environmental evaluation.

¹⁵ The term "safety-grade" is frequently used interchangeably with "safety-related." See Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 1), ALAB-729, 17 NRC 814, 874 n.280 (1983), aff'd in principal part, CLI-84-11, 20 NRC ___ (July 26, 1984).

¹⁶ 10 CFR Part 50, Appendix B, Introduction.

the safety-related functions"¹⁷ of such structures, systems and components. These safety functions are more specifically set forth in Appendix A to 10 CFR Part 100. According to Appendix A, "safety-related" structures, systems and components are those that must remain functional in the event of a Safe Shutdown Earthquake¹⁸ to assure:

- (1) [t]he integrity of the reactor coolant pressure boundary,
- (2) [t]he capability to shut down the reactor and to maintain it in a safe shutdown condition, or
- (3) the capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to the guideline exposures of . . . [Part 100].¹⁹

In order to comply with what it perceived to be the Commission's requirements, LILCO classified all Shoreham structures, systems and components as either

¹⁷ Ibid. (emphasis added).

¹⁸ The Safe Shutdown Earthquake for a particular site is that earthquake "which produces the maximum vibratory ground motion for which certain structures, systems, and components [must be] designed to remain functional," based upon a consideration of "the maximum earthquake potential." 10 CFR Part 100, Appendix A, § III(c).

¹⁹ 10 CFR Part 100, Appendix A, § III(c). See id. at §§ VI(a)(1), VI(b)(3). The Commission recently repeated, in effect, this definition of safety-related structures, systems and components as part of its new rule on environmental qualification of electrical equipment. See 10 CFR § 50.49(b)(1).

"safety-related" or "nonsafety-related." Only the former are subject to a quality assurance program designed to satisfy all Appendix B requirements.

Appendix A to 10 CFR Part 50, which sets forth the general design criteria for nuclear power plants, contains yet another term: "important to safety." According to the introduction to that Appendix, structures, systems and components "important to safety" are those "that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public."²⁰ In LILCO's view, there are no "important to safety" structures, systems and components that do not fall within the classification "safety-related." Moreover, LILCO does not interpret General Design Criterion (GDC) 1, which provides that "[a] quality assurance program shall be established and implemented" for structures, systems and components that are important to safety, as imposing any requirements in addition to those contained in Appendix B. Rather, LILCO believes that GDC 1 is satisfied by the Appendix B quality assurance program that it applies to all safety-related items.

In its Contention 7B, Suffolk County, joined by the State of New York and the Shoreham Opponents Coalition,

²⁰ 10 CFR Part 50, Appendix A, Introduction.

challenged LILCO's classification scheme.²¹ Those intervenors asserted, and continue to claim on appeal, that the "important to safety" category includes structures, systems and components contained in, but is broader in scope than, the "safety-related" category. Without specifically identifying those structures, systems and components deemed to be "important to safety" albeit not "safety-related", the intervenors maintain that they too had to be covered by a quality assurance program essentially equivalent to that required by Appendix B.²²

The NRC staff agrees that an "important to safety" class exists and it includes items that are not "safety-related."²³ Unlike the intervenors, however, the staff believes that LILCO has fulfilled all requirements

²¹ Contention 7B concerns the classification scheme used for the quality assurance program and the assessment of potential interactions among plant systems. Systems interaction is discussed in Section II, infra.

²² See Suffolk County Brief in Support of Appeal of Licensing Board Partial Initial Decision (Dec. 23, 1983) (hereafter Suffolk Brief) at 3-11; Suffolk County Response to Appeal Board Order of June 7, 1984 (July 6, 1984) (hereafter Suffolk Reply Brief) at 3-4.

²³ NRC Staff's Brief in Opposition to "Suffolk County Brief in Support of Appeal of Licensing Board Partial Initial Decision" and "LILCO's Brief on Appeal" (March 9, 1984) (hereafter Staff Brief) at 12-38.

applicable to "important to safety" structures, systems and components.²⁴

A. Licensing Board Resolution

The Licensing Board agreed with the intervenors and staff that, as applied to the classification of structures, systems, and components, the term "important to safety" is broader than "safety-related."²⁵ But the Board parted company with the intervenors at that point. It found that, notwithstanding utilization of a two-tier classification scheme ("safety-related" and "nonsafety-related"), LILCO had complied with the Commission's quality assurance requirements because it provided the structures, systems and components in the Shoreham design with quality assurance "commensurate with the items' importance to safety."²⁶ The Board nonetheless imposed a license condition requiring that LILCO "adopt and implement" the definition of important to safety as determined by the Board.²⁷

²⁴ Id. at 39-42.

²⁵ LBP-83-57, supra, 18 NRC at 546. See Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 1) ALAB-729, 17 NRC 814, 876 (1983) ("nothing in the regulations supports [the] assertion that the term 'important to safety' must be read as equivalent to 'safety[related]'").

²⁶ LBP-83-57, supra, 18 NRC at 546.

²⁷ Id. at 546, 635.

B. Commission Guidance

Both LILCO and Suffolk County challenged the Licensing Board's disposition of this issue. Our review of the matter led us to find that "the existing regulations [were] too varied and the historic industry and agency practice too diverse simply to set forth what we perceive to be the proper interpretation of the regulations."²⁸ Accordingly, on April 23, 1984 we certified the following questions to the Commission:

1. Are the terms "important to safety" and "safety-related" to be deemed synonymous for the purpose of establishing an acceptable quality assurance program in accordance with GDC 1 of Appendix A and Appendix B to 10 CFR Part 50?
2. How should the outcome of Question 1 be applied to ~~the~~²⁹ operating license proceeding before us?

As earlier noted, the Commission responded by taking steps toward institution of rulemaking on this issue.³⁰ Pending the outcome of the rulemaking, we are to apply "current precedent." In this regard, the Commission confirmed the Licensing Board's determination that, under current precedent, "'important to safety' applies to a

²⁸ ALAB-769, supra, 19 NRC at 1000.

²⁹ Id. at 1010.

³⁰ See p. 5, supra.

larger class of equipment than the term 'safety-related.'"³¹
But "this does not mean," the Commission stated, "that there is a pre-defined class of [important to safety] equipment Rather, whether any piece of equipment has a function 'important to safety' is to be determined on the basis of a particularized showing of clearly identified safety concerns for the specific equipment. . . ."³²

C. Analysis

In view of the foregoing, what remains for our consideration is whether the Licensing Board correctly determined the quality assurance requirements for "important to safety" systems, structures and components and LILCO's compliance with those requirements. Additionally, we must determine the appropriateness of the Board's license condition that requires LILCO to adopt the proper definition of "important to safety." For the reasons discussed below, we affirm the Licensing Board's finding that LILCO has complied with the Commission's regulations with respect to its treatment of "important to safety" equipment. We additionally conclude that the license condition imposed by the Board is no longer necessary in light of the

³¹ CLI-84-9, supra, 19 NRC at 1325.

³² Ibid.

Commission's guidance. Therefore, that condition is vacated.

1. Adequacy of Quality Assurance

The principal system components for the Shoreham nuclear plant and the quality assurance classification of each are listed in Table 3.2.1-1 of LILCO's Final Safety Analysis Report (FSAR), which contains design criteria and quality standards for the plant.³³ In addition to identifying those structures, systems and components that LILCO considers to be subject to the quality assurance requirements of Appendix B (i.e., that come within the applicant's "safety-related" category), the table identifies various industry codes and other requirements that LILCO applies to both its safety-related and nonsafety-related components.³⁴ Beyond the requirements identified in the FSAR, standards for nonsafety-related equipment are

³³ Tr. fol. 4346 at 170 (Burns, et al.). See also Tr. fol. 1114, Exh. 2, for revisions to this FSAR table.

The FSAR is reviewed by the staff against specific criteria provided by the Standard Review Plan (SRP) (NUREG-0800). While the primary focus of the SRP is safety-related items, other items that the staff believes must meet certain criteria are also addressed. Staff Brief at 30-31.

³⁴ FSAR Table 3.2.1-1. See also Tr. fol. 4346 at 41 (Burns, et al.).

contained in technical specifications approved by the NRC.³⁵ Finally, under Commission regulations and staff guidance, LILCO, like all other utility permittees and licensees, has been required to apply "upgraded"³⁶ quality assurance to certain items -- for example, fire protection systems that, although not performing a safety-related function, are worthy of special treatment.³⁷

In addition, the reactor vendor and principal architect/engineer for Shoreham, General Electric and Stone and Webster Engineering Corporation (Stone and Webster), respectively, apply their own quality assurance treatment to all items produced for Shoreham. General Electric requires

³⁵ Technical specifications include surveillance requirements and conditions that limit operation of the plant where certain specified systems become unavailable. See, e.g., Tr. fol. 4346, LILCO Attachment 8.

³⁶ Upgraded quality assurance refers to a range of requirements that are imposed depending upon the particular structure, system or component involved and the degree of its importance. See Board Notification 84-011 (Jan. 18, 1984) for a generic letter sent by the staff to all licensees and applicants that indicates that the staff intends to continue, as in the past, the practice of imposing additional quality assurance requirements on important to safety items, commensurate with their safety importance. See, e.g., 49 Fed. Reg. 26,036, 26,041 (1984) where the staff has been directed to provide guidance on the application of selected sections of Appendix B to nonsafety-related equipment utilized during the response to an anticipated transient without scram (ATWS) event.

³⁷ See 10 CFR Part 50, Appendix R for fire protection requirements.

an essentially identical degree of engineering quality assurance for all structures, systems and components, independent of safety classification.³⁸ Insofar as their procurement or manufacture is concerned, nonsafety-related items are otherwise afforded quality assurance treatment in varying degrees, based upon an evaluation of their importance.³⁹ Even for such structures, systems and components, however, most of the 10 CFR Part 50, Appendix B criteria are addressed.⁴⁰ Similarly, while not applying Appendix B to items which it deems to be nonsafety-related, Stone and Webster does have some quality assurance procedures for such items.⁴¹ For example, all nonsafety-related systems, structures and components are designed, procured, constructed and tested in accordance with applicable industry codes and standards.⁴²

(a) Requirements

Suffolk County's dissatisfaction with LILCO's quality assurance classification scheme is two-fold. The County agrees with the Licensing Board that LILCO must

³⁸ Tr. fol. 4346 at 42 (Burns, et al.).

³⁹ Ibid.

⁴⁰ Id. at 43.

⁴¹ Id. at 44.

⁴² Id. at 47

recognize and apply quality assurance to an "important to safety" category that is distinct from the safety-related class.⁴³ According to the County, besides failing to identify separately and specifically "important to safety" equipment,⁴⁴ LILCO does not have an appropriate quality assurance program under GDC 1 for any items that would fall into this category.⁴⁵ The County, therefore, urges us to overturn the Licensing Board's finding that adequate quality assurance was applied notwithstanding the definitional error by LILCO.⁴⁶

More particularly, the County argues that GDC 1⁴⁷ requires, for "important to safety" items, a quality assurance program containing planned and systematic actions composed of written policies, procedures and instructions,

⁴³ Suffolk Brief at 3; LBP-83-57, supra, 18 NRC at 546. See also CLI-84-9, supra, 19 NRC at 1325.

⁴⁴ Suffolk Brief at 10-11.

⁴⁵ Id. at 4-11.

⁴⁶ Id. at 4-5.

⁴⁷ 10 CFR Part 50, Appendix A, GDC 1 states in relevant part (emphasis added):

A quality assurance program shall be established and implemented in order to provide adequate assurance that [important to safety] structures, systems, and components will satisfactorily perform their safety function.

and specifying the organizations involved.⁴⁸ As the County sees it, the FSAR, technical specifications, and supplier quality assurance programs described above do not so qualify but, rather, amount to "an ad hoc endeavor"⁴⁹ in violation of the implicit requirements of GDC 1.

In support of its argument, the County points to the requirements contained in 10 CFR Part 50, Appendix B.⁵⁰ The introduction to that appendix states that the term "quality assurance" used "in this appendix . . . comprises all those planned and systematic actions necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service."⁵¹ Further, Criterion II of the appendix specifies that a quality assurance program under that appendix "shall be documented by written policies, procedures, or instructions . . . [applied to] identif[ied] . . . structures, systems, and components . . . [and carried out by identified] organizations"

We find the County's reasoning to be without merit. By their literal terms, the provisions of Appendix B relied on by the County only apply to quality assurance programs for

⁴⁸ Suffolk Brief at 7-10.

⁴⁹ Id. at 8.

⁵⁰ Id. at 7-8.

⁵¹ 10 CFR Part 50, Appendix B, Introduction.

the safety-related items covered by Appendix B. There are no similar requirements contained in Appendix A to Part 50 pertaining to "important to safety" equipment. Further, the County points to no other authority, and we are aware of none, that would require that degree of formality for the "important to safety" quality assurance program.

Additional support for not extending the Appendix B requirements to the quality assurance program required by GDC 1 for "important to safety" equipment is contained in the Commission's June 6, 1984 response to our certified questions. There, the Commission stated that there is not "a pre-defined class of equipment at every plant whose functions have been determined by rule to be 'important to safety' Rather, whether any piece of equipment has a function important to safety is to be determined on the basis of a particularized showing of clearly identified safety concerns . . . , and the requirements of . . . GDC 1 must be tailored to the identified safety concerns."⁵² The Commission's guidance indicates the regulations are to be flexibly applied, with variation depending on specific safety concerns. For these reasons, we agree with the Licensing Board that a separate quality assurance program akin to an Appendix B program, including written procedures

⁵² CLI-84-9, supra, 19 NRC at 1325.

and identification of all "important to safety items", is not required.⁵³

(b) LILCO's Quality Assurance Program

According to the County, LILCO's quality assurance treatment of nonsafety-related items was deficient in that LILCO misclassified a number of systems in FSAR Table 3.2.1-1. We consider each of these systems in turn.

(i) Turbine Bypass System

The turbine bypass system is used to pass partial steam flow to the condenser during normal startup and shutdown and following a turbine trip or load rejection.⁵⁴ The turbine bypass valves are designed to open automatically in the event of a turbine trip or load rejection in order to reduce the pressurization rate of the reactor.⁵⁵ At the hearing below, the County pointed to this system as an example of a system that, because relied upon in whole or in part to mitigate accidents or transients,

⁵³ See LBP-83-57, supra, 18 NRC at 558-59 (adopting conclusion of Three Mile Island, ALAB-729, supra, that GDC 1 contemplates gradations of quality requirements); id. at 560, 561 (no requirement for a list of "important to safety" systems exists). See also App. Tr. 39-40, where counsel for the County acknowledged the difficulty with creating a generic list of all "important to safety" items for all plants.

⁵⁴ Tr. fol. 4346 at 146 (Burns, et al.).

⁵⁵ Ibid.

should be classified as "safety-related."⁵⁶ On appeal, the County modified its position to assert that the turbine bypass system need not be treated as "safety-related" but, rather, exemplifies the need for a separate "important to safety" category.⁵⁷

The short answer is that the County's current concern has been satisfied. Under the Commission's recent guidance, an "important to safety" class that is broader than the safety-related category must be recognized by LILCO. Nonetheless, not every structure, system or component need be upgraded to safety-related status. In this connection, we have undertaken a review on our own initiative of the adequacy of the classification and quality assurance applied to this system.

We agree with LILCO and the staff that the turbine bypass system need not be treated as safety-related.⁵⁸ Accident analyses indicate that failure of the system in the event of generator load rejection or turbine trip would not result in fuel damage.⁵⁹ The main turbine bypass valves,

⁵⁶ Tr. fol. 1114 at 39-40 (Goldsmith, et al.).

⁵⁷ Suffolk Brief at 14.

⁵⁸ Tr. fol. 4346 at 147-48 (Burns, et al.); Tr. fol. 6357 at 27 (Speis, et al.).

⁵⁹ FSAR at 15A-11 (§ 15A.1.1.5), 15A-16 (§ 15A.1.2.5).
(Footnote Continued)

however, play a role, along with other valves, in relieving the pressure in the event of a feedwater control failure.⁶⁰ Therefore, some importance must be attributed to this system. Even so, should there be a simultaneous failure of the turbine bypass system, the Level 8 trip (see pp. 27-29, infra) and the feedwater controller, only a minor amount of damage to a few fuel rods might occur.⁶¹ This would not pose an undue risk to public health and safety. Thus, the system need not meet the more stringent requirements for safety-related items.

Although the entire turbine bypass system is not considered to be "safety-related," the steam lines leading to the turbine bypass valves meet Appendix B quality assurance requirements.⁶² Further, turbine bypass valves and the turbine generator electrohydraulic control system are subject to the quality assurance program of the

(Footnote Continued)

LILCO witness Edward T. Burns also indicated that any effect of a failure of the turbine bypass valves to open in the event of a generator load rejection or turbine trip would be minor. Tr. fol. 4346 at 146-47 (Burns, et al.).

⁶⁰ FSAR Table 15A.1.7-1.

⁶¹ Tr. fol. 6357 at 24 (Speis, et al.).

⁶² Tr. fol. 1114, Exhibit 2 (FSAR Table 3.2.1-1) at 13; Tr. fol. 4346 at 147 (Burns, et al.).

supplier, General Electric.⁶³ Additionally, LILCO has proposed a technical specification requiring periodic surveillance to confirm operability of the system.⁶⁴ In these circumstances, we believe the system is subject to quality assurance requirements commensurate with its intended function.

(ii) Reactor Core Isolation Cooling System

The reactor core isolation cooling (RCIC) system can provide core cooling water during reactor shutdown in the event of a failure of the main feedwater system.⁶⁵ The RCIC system may also be used to supplement the high pressure coolant injection (HPCI) system.⁶⁶ The County asserted before the Licensing Board that the RCIC system should have been treated as a safety-related system.⁶⁷

⁶³ Tr. fol. 4346 at 148 (Burns, et al.). See pp. 15-16, supra, for a description of General Electric's quality assurance program.

⁶⁴ Tr. fol. 4346, Attachment 8, at 3/4 3-102 to 3-103 and 3/4 7-36. See also NUREG-0420, Safety Evaluation Report (April 1981) (hereafter Staff Ex. 2A) at 7-18 to 7-19. To the extent we rely upon the proposed technical specifications, they must be finally adopted by LILCO prior to the issuance of a full-power license.

⁶⁵ Tr. fol. 4346 at 143 (Burns, et al.).

⁶⁶ Ibid.

⁶⁷ Tr. fol. 1114 at 39-40 (Goldsmith, et al.). Cf.,
(Footnote Continued)

The RCIC system is not directly relied upon in the accident analyses presented in the FSAR.⁶⁸ It is, however, considered a backup for the HPCI system in the event of a control rod drop accident.⁶⁹ Additional backup utilizing safety-related equipment is provided by the combination of the automatic depressurization system (ADS) and low pressure coolant injection (LPCI) or core spray systems.⁷⁰ It is questionable whether the RCIC system is an essential backup given the availability of these other systems. Nonetheless, as shown in Table 3.2.1-1 of the FSAR, the principal components of the RCIC system are subject to the quality assurance requirements of Appendix B.⁷¹ Moreover, the technical specifications proposed for the facility require that the RCIC system undergo periodic surveillance to ensure

(Footnote Continued)

Tr. fol. 6357 at 25 (Speis, et al.) (notwithstanding the staff witnesses' statement that the RCIC system is safety-related, they explain that only that portion of the system necessary to perform a safety function should be treated as safety-related); see also Tr. 7485-86 (Hodges).

⁶⁸ Tr. 4813 (Robare); FSAR, Chapter 15.

⁶⁹ Tr. 4813 (Robare); FSAR Appendix 7A at 7A-34, 7A-35.

We note that those portions of the RCIC system used to mitigate the effects of a control rod drop accident meet most of the safety-related design requirements. Tr. 4814 (Robare).

⁷⁰ Staff Exh. 2A at 6-41 to 6-42; 7-10 to 7-11.

⁷¹ Tr. fol. 1114, Exhibit 2, at 7; Tr. fol. 4346 at 144 (Burns, et al.).

its operability.⁷² For these reasons, we believe that the RCIC system has been designed, constructed and will be operated under quality standards commensurate with its function.

(iii) Standby Liquid Control System

The Standby Liquid Control (SLC) system is a diverse, backup reactivity control system, capable of shutting the reactor down from rated power to cold conditions in the event that an insufficient number of control rods are inserted.⁷³ The FSAR states:

The standby liquid control system is a special safety system and is maintained in a standby status whenever the reactor is critical and at all times when it is possible to make the reactor critical.⁷⁴

The County claimed⁷⁵ below that the FSAR and the Safety Evaluation Report (SER) do not demonstrate that the SLC system is properly designed, classified, and qualified.

⁷² Tr. fol. 4346, Attachment 8, at 3/4 7-10 to 7-11, 3/4 3-42 to 3-46. See also note 64, supra.

⁷³ Tr. fol. 4346 at 159 (Burns, et al.).

⁷⁴ FSAR (Rev. 5, March 1977) at 4.2-84.

⁷⁵ Tr. fol. 1114 at 48, 51.

Further, the County asserts that the system should be classified as safety-related.⁷⁶

Inasmuch as this system does not perform a safety-related function described in Appendix A to Part 100, it is not required to meet all of the qualification requirements for such systems.⁷⁷ LILCO does regard the SLC system as a backup that could be considered to have some safety significance.⁷⁸ Consequently, all of the equipment essential for injecting boron solution into the reactor is built to safety-related standards, including Appendix B quality assurance requirements.⁷⁹ Non-essential equipment, including the tank heater system, is designed to lesser

⁷⁶ The SER for Shoreham lists the SLC system as a "[s]ystem[] required for safe shutdown." Staff Exh. 2A at 7-9 to 7-10. It is clear, however, from the FSAR and testimony of LILCO and staff witnesses that the system is only used as a backup for a type of event that is not considered a design basis accident. See Tr. 4881-82 (Robare, Dawes); Tr. fol. 6357 at 24-25 (Speis, et al.); FSAR at 4.2-84. Further, only a portion of the system would be called upon to perform in such circumstances and that portion is covered by safety-related requirements. Tr. 7485 (Kirkwood); Tr. fol. 6357 at 24 (Speis, et al.). See also note 79 and accompanying text, infra.

⁷⁷ See Tr. fol. 6357 at 24-25 (Speis, et al.) (notwithstanding its general statement that the SLC system is safety-related, the staff explains that its views apply only to portions of the system).

⁷⁸ Tr. 4880, 4901 (Robare).

⁷⁹ Tr. fol. 4346 at 160 (Burns, et al.); Tr. 4888 (Robare); Tr. fol. 6357 at 24 (Speis, et al.); Tr. fol. 1114, Exh. 2 (Table 3.2.1-1), at 3-4.

standards.⁸⁰ Further, the proposed technical specifications for the facility require the system to undergo periodic surveillance to ensure its operability.⁸¹ We conclude, therefore, that the SLC system has been accorded quality assurance treatment commensurate with its intended function.⁸²

(iv) High Water Level (Level 8) Trip of Main Turbine and Feedwater Pumps

The feedwater control system employs a reactor vessel high water level trip ("Level 8 trip") that terminates feedwater flow and trips the turbine in the event

⁸⁰ Tr. fol. 4346 at 160 (Burns, et al.). The County was concerned about the maintenance of the liquid temperature to ensure that the boron remains in solution. See Tr. 1680-81 (Goldsmith). The heaters for this purpose are not primarily relied upon, but are used only when the ambient temperature of the reactor building is too low. Tr. fol. 4346 at 160 (Burns, et al.). Further, the solution temperature is monitored so that an alarm will sound if the temperature falls below a pre-set value. Ibid. Finally, the proposed technical specifications for Shoreham require the solution temperature to be checked every 24 hours. Id., Attachment 8, at 3/4 1-19. These provisions are adequate to ensure that the temperature of the boron solution is maintained despite lower standards applied to the heater system.

⁸¹ Tr. fol. 4346, Attachment 8, at 3/4 1-19 to 1-20. See note 64, supra.

⁸² The SLC system is covered by recently promulgated regulations aimed at reducing the risk from anticipated transients without scram (ATWS) events. 49 Fed. Reg. 26,038 (1984). See section IV(D), infra. As a result, the system may have to meet additional requirements not as yet developed by the staff. See 49 Fed. Reg. at 26,040-41.

of a feedwater controller failure.⁸³ Were the Level 8 trip to fail, the water level would increase until either (1) manual operator action was taken, or (2) wet steam began to enter the turbine, causing vibrations that, in turn, would bring about a trip.⁸⁴ The County points to the Level 8 trip as another example of a system that should be classified as safety-related.⁸⁵

Analyses show that a Level 8 trip failure would not have a significant impact on the transient severity.⁸⁶ Thus, the trip does not perform a safety function⁸⁷ and need not be considered safety-related.

Nevertheless, the Level 8 trip is assumed by the FSAR Chapter 15 transient analysis to operate in the event of failure of the feedwater controller.⁸⁸ LILCO, therefore, has taken steps to assure the reliability of the system.

⁸³ Tr. fol. 4346 at 145 (Burns, et al.); Staff Exh. 2A at 7-19.

⁸⁴ Tr. fol. 4346 at 145 (Burns, et al.).

⁸⁵ Tr. fol. 1114 at 40 (Goldsmith, et al.).

⁸⁶ Tr. fol. 4346 at 145 (Burns, et al.). As noted earlier, even if a feedwater controller failure occurred together with a failure of the Level 8 trip and turbine bypass system, at most the result would be only a small degree of fuel rod damage, insufficient to cause undue risk to the public health and safety. See p. 22, supra.

⁸⁷ Tr. 4820 (Robare).

⁸⁸ Tr. fol. 4346 at 145 (Burns, et al.).

For example, the quality assurance applied to the Level 8 trip instrumentation is equal or very close to that prescribed by Appendix B.⁸⁹ Additionally, a technical specification that requires periodic surveillance to assure operability of the trip has been proposed.⁹⁰ In light of its limited effects in the event of failure, we believe that the Level 8 trip has received appropriate attention.

(v) Rod Block Monitor

Together with the local power range monitor (LPRM) and the reactor manual control (RMC) systems, the rod block monitor (RBM) is designed to prohibit the erroneous withdrawal of a control rod and thus to prevent local fuel damage.⁹¹ The RBM will initiate a rod block signal to the RMC system to stop drive motion during the worst single rod withdrawal error.⁹² Before the Licensing Board, the County

⁸⁹ Tr. 4821 (Robare).

⁹⁰ Staff Exh. 2A at 7-19. See note 64, supra.

⁹¹ Tr. fol. 4346 at 141 (Burns, et al.).

⁹² Ibid.

cited the RBM as another example of a system which should have been, but was not, classified as safety-related.⁹³ On appeal, the County no longer contends that the RBM need be treated as safety-related, but argues that it demonstrates the need for an "important to safety" classification that is broader in scope than the safety-related category.⁹⁴ As we have seen, the Commission has adopted that position. Because the County does not identify any quality assurance deficiencies with regard to this system, its concern must be deemed satisfied.⁹⁵

(vi) Reactor Water Cleanup System

The Reactor Water Cleanup (RWCU) system continuously removes a small amount of water from the reactor coolant system for purification and then returns the

⁹³ Tr. fol. 1114 at 40 (Goldsmith, et al.).

⁹⁴ Suffolk Brief at 14.

⁹⁵ The RBM is subject to the quality assurance requirements of Appendix B. See FSAR at 7.6-62, § 7.6.2.5.5. In addition, LILCO indicated that "full safety system criteria" are applied to the signal sent by the LPRM to the RBM. Tr. fol. 4346 at 142 (Burns, et al.); see also Tr. 4796-98 (Robare). The RMC system, however, is not designed to full safety system standards even though LILCO does believe it to be of high quality. Tr. fol. 4346 at 143 (Burns, et al.). Regardless, these systems do not have to be safety-related because failure of the rod block function would result in only minor (if any) damage to a few fuel rods with no significant threat of radioactive release. Id. at 141; Tr. 4787-88, 4797 (Robare).

water via a feedwater system injection line.⁹⁶ The County cites portions of the RWCU system listed in Table 3.2.1-1 of the FSAR as examples of improper classification by LILCO.⁹⁷

The RWCU system serves no safety function.⁹⁸ But a portion of that system, up to and including the outermost containment isolation valve in the suction lines, is part of the reactor coolant pressure boundary.⁹⁹ Under the traditional criteria used to determine safety-related items, only this portion of the system need be, and is, classified by LILCO as safety-related.¹⁰⁰ The remainder of the system can be isolated from the reactor by motor-operated valves and check valves¹⁰¹ and, thus, need not be considered

⁹⁶ Tr. fol. 4346 at 164 (Burns, et al.).

⁹⁷ Tr. fol. 1114 at 24-25 (Goldsmith, et al.).

⁹⁸ Tr. fol. 4346 at 165 (Burns, et al.).

⁹⁹ Id. at 164.

¹⁰⁰ Ibid. See p. 8, supra.

¹⁰¹ Tr. fol. 4346 at 164 (Burns, et al.).

safety-related.¹⁰² We agree with LILCO that the RWCU system has been properly classified for its intended function.¹⁰³

2. License Condition

After concluding that there is a distinction between the terms "safety-related" and "important to safety," the Licensing Board imposed a condition upon the Shoreham operating license. Insofar as the classification and qualification of structures, systems and components is concerned, the condition obligates LILCO to "acknowledge[] and adopt" the Board's definition of the term "important to safety."¹⁰⁴ The Board concluded, however, that despite its

¹⁰² It is true, as the County notes that additional components of the RWCU system are classified as Quality Group C, "safety-related" under Regulatory Guide 1.26, in a separate classification scheme designed to satisfy that regulatory guide. See Tr. fol. 1114 at 25. Nonetheless, we agree with the staff that these components need not be subject to the Appendix B QA program. Tr. fol. 6357 at 13-14 (Speis, et al.). In this instance, the regulatory guide does not provide an accurate measure of the necessary QA treatment. Moreover, as we discuss infra, regulatory guides are not binding standards.

¹⁰³ The classification of other systems (e.g., the water level indication system) challenged by the County at the hearing either was not pursued on appeal or is questioned for purposes other than quality assurance treatment, such as system interaction analysis, which is discussed infra at Section II. Nevertheless, we have reviewed the record concerning these systems and conclude that they have been subject to quality assurance requirements commensurate with their intended functions.

¹⁰⁴ LBP-83-57, supra, 18 NRC at 563. See also id. at 635.

incorrect usage of the terms, LILCO has met all Commission requirements and modifications would not be likely to result from the condition.¹⁰⁵ Although it thought changes were unlikely, the Licensing Board perceived two reasons for the condition:

- (1) [to] confirm the Commission's regulatory authority over [structures, systems and components] and related activities beyond those which are safety-related, and
- (2) to assure, as a regulatory requirement, the continuation by LILCO of the application of quality assurance [to] important to safety [structures, systems and components] and related activities, commensurate with their safety function.¹⁰⁶

The staff originally was satisfied that the Licensing Board's condition requiring adoption of an "important to safety" classification was appropriate.¹⁰⁷ We have since been advised by the staff that it believes that the Commission's recent recognition of this separate quality assurance class in CLI-84-9¹⁰⁸ obviates the need for the license condition.¹⁰⁹ Similarly, LILCO is of the view that,

¹⁰⁵ Id. at 563.

¹⁰⁶ Id. at 563-64.

¹⁰⁷ Staff Brief at 60-71.

¹⁰⁸ Supra, 19 NRC at 1323.

¹⁰⁹ NRC Staff Response to Order of June 7, 1983 Allowing Comments on the Application of CLI-84-9 (July 6, 1984) (hereafter Staff Response) at 5-7.

given CLI-84-9, no license condition is necessary either to confirm NRC regulatory authority or ensure LILCO's compliance.¹¹⁰

For its part, Suffolk County did not present to us its views on the effect that CLI-84-9 might have on the need for the license condition. We assume, therefore, that the County stands by its original appellate position that the license condition is not only necessary but does not go far enough in requiring LILCO to apply the definitional distinction between "important to safety" and "safety-related".¹¹¹ Presumably, the County would have us impose additional requirements upon LILCO. In particular, it seeks to have LILCO identify all "important to safety" structures, systems and components, and then modify all plant documents to reflect this change. It then wants LILCO to produce evidence of a quality assurance program for all items in the "important to safety" category.¹¹²

In light of the Commission's guidance, we agree with the staff and LILCO that the license condition imposed by the Board is no longer necessary. By its decision in CLI-84-9, the Commission clearly exercised its authority to

¹¹⁰ LILCO's Views on CLI-84-9 (July 6, 1984) at 5-6.

¹¹¹ Suffolk Brief at 11-17.

¹¹² Id. at 12-13.

regulate other than safety-related items. Further, the Commission's authority to regulate all items contained in a nuclear power plant in order to protect the public health and safety is made clear by the Atomic Energy Act of 1954, as amended.¹¹³ The license condition, therefore, adds nothing to the authority of the Commission to regulate in this area.

As to the second purpose ascribed to the condition -- to assure continued application of quality assurance to "important to safety" items -- other means of enforcement exist. LILCO's commitment to continue to apply certain quality assurance measures to "important to safety" equipment appears in its FSAR.¹¹⁴ The FSAR constitutes part of a license application upon which a license approval is based. As stated in 10 CFR Part 2, Appendix C, § IV.E, the "NRC expects licensees to adhere to any obligations and commitments . . . and will not hesitate to issue appropriate orders to make sure that such commitments are met." No further assurance is required.¹¹⁵

¹¹³ See Section 161(i), 42 U.S.C. 2201(i).

¹¹⁴ Tr. fol. 20,654, LILCO Exh. 70, at Insert "A"; Tr. 21,071; Tr. 21,119. See also LILCO's Reply Brief (March 2, 1984) at 12 n.10.

¹¹⁵ In fact, the license condition has the potential for causing difficulty. First, a potential conflict could
(Footnote Continued)

For these reasons, the license condition imposed by the Licensing Board is no longer warranted and, accordingly, is vacated.

II. Systems Interaction

The subject of systems interaction was introduced into this case as part of a broad contention (7B) that was crafted by the Licensing Board from related contentions proffered by the intervenors.¹¹⁶ The contention read as follows:

LILCO and the [s]taff have not applied an adequate methodology to Shoreham to analyze the reliability of systems, taking into account systems interactions and the classification and qualification of systems important to safety, to determine which sequences of accidents should be considered within the design basis of the plant and if so, whether the design basis of the plant in fact adequately protects against every such sequence. In particular, proper systematic methodology such as the fault-tree and event-tree logic approach of the IREP program or a systematic failure modes and effect analysis has not been applied to Shoreham. Absent such a methodological approach to defining the importance to safety of each piece of equipment, it is not possible to identify the items to which General Design Criteria 1, 2, 3, 4, 10, 13, 21, 22, 23, 24, 29, 35, 37 apply, and thus it is not possible to demonstrate compliance with these criteria.¹¹⁷

(Footnote Continued)

arise between the condition and the Commission's ultimate resolution of the matter in its rulemaking. Second, it might convey the impression that, absent such a condition, the Commission would lack regulatory authority over other than safety-related items at a particular facility.

¹¹⁶ LBP-82-19, 15 NRC 601, 604 (1982).

¹¹⁷ Id. at 611.

The Licensing Board found, as a threshold matter, that there is no direct, explicit NRC regulatory requirement for LILCO to perform a single, comprehensive systems interaction analysis for Shoreham.¹¹⁸ Based on the numerous and diverse studies bearing on systems interaction actually performed by LILCO,¹¹⁹ the Board concluded:

We are persuaded that despite the County's position to the contrary, LILCO has far exceeded any regulatory requirements for systems interaction analysis and that the totality of these analyses, although not performed as a dedicated, single exercise, nevertheless represents the equivalent of such an exercise, performed in a thoroughly professional manner. The County has failed to identify any systems interaction that has not been considered and has failed to identify any structure, system, or component that is improperly classified.¹²⁰

The Board recognized that systems interaction is listed as one of the "Top 20" so-called Unresolved Safety Issues (known as USI A-17) and that progress toward resolution of A-17 had been delayed.¹²¹ The Board nevertheless agreed with the staff that there is no undue risk to the public associated with operation of Shoreham pending resolution of

¹¹⁸ LBP-83-57, supra, 18 NRC at 549.

¹¹⁹ These analyses are listed by the Board at 18 NRC 551-53.

¹²⁰ Id. at 553.

¹²¹ FF J-143 (slip opinion at 511).

the item.¹²² Further, the Board found that "the [s]taff position on USI A-47 [a specific systems interaction, discussed at pp. 55-59], is acceptable, i.e. the [s]taff will review the analyses to be supplied by LILCO . . . to assure that they do not represent an undue risk to the public health and safety."¹²³ As a result, the Board concluded that this part of the contention must fail.¹²⁴

The County objects to the Licensing Board's conclusions regarding the applicant's search for adverse systems interactions at Shoreham.¹²⁵ In particular, according to the County, the Board erred in concluding that (1) there is no direct explicit regulatory requirement for LILCO to conduct a systematic systems interaction analysis for Shoreham, and (2) the County failed to identify any systems interaction that had not been considered.¹²⁶ The County also objects to the Licensing Board's treatment of Unresolved Safety Issues A-17 and A-47.¹²⁷ We address these arguments below.

¹²² LBP-83-57, supra, 18 NRC at 554.

¹²³ Id. at 555.

¹²⁴ Ibid.

¹²⁵ Suffolk Brief at 18.

¹²⁶ Ibid.

¹²⁷ Id. at 28-43.

A. Regulatory Requirements and Systems Interaction Studies

The County argues that there is a requirement under Commission regulations that applicants systematically assess their reactor designs for potentially adverse systems interactions.¹²⁸ "Such an assessment," the County maintains, "while perhaps not a single study, must be sufficiently comprehensive to provide confidence that all serious potential interactions have in fact been identified."¹²⁹ The County points to Appendix A to 10 CFR Part 50 and one of our North Anna decisions¹³⁰ as support for its position.

The County acknowledges that there is no express regulatory premise for requiring a single study directed exclusively to systems interactions at nuclear power plants.¹³¹ As the Licensing Board noted, there is also no uniformly recognized definition of "systems interaction" or any generally accepted methodology for conducting studies of

¹²⁸ Id. at 22-25.

¹²⁹ Id. at 25.

¹³⁰ Virginia Electric and Power Co. (North Anna Nuclear Power Station, Units 1 and 2), ALAB-491, 8 NRC 245 (1978).

¹³¹ Suffolk Brief at 22-25. See generally Pacific Gas and Electric Co. (Diablo Canyon Nuclear Power Plant, Units 1 and 2), ALAB-728, 17 NRC 777, 810-11 (1983).

systems interaction.¹³² This is not to say, of course, that potential systems interaction problems may be left unaddressed. There is general agreement that an applicant must "provide assurance that the independent functioning of safety systems is not jeopardized by preconditions in the plant design (particularly dependencies hidden in supporting and interfacing systems) that cause faults to be dependent."¹³³ In other words, an applicant must demonstrate that safety systems are not compromised because of their interrelationship with nonsafety or other safety systems.

As the Licensing Board additionally observed, there are various techniques for evaluating systems interactions, each with its own strengths and weaknesses, and the most effective way to identify potential systems interaction problems is through a combination of various techniques.¹³⁴ At issue is the thoroughness and efficacy of the numerous

¹³² LBP-83-57, supra, 18 NRC at 548.

¹³³ Ibid. See Tr. fol. 6357 at 34-35 (Speis, et al.). Systems interaction is defined by LILCO as a subset of dependent failures whereby one system or component interacts with a second system or component in such a way that it may affect the function of the second system or component. Tr. 5018-19 (Kascsak). We consider the above definition of systems interaction sufficient for our use in this decision.

¹³⁴ FF J-39 (slip opinion at 476).

studies related to systems interaction performed by LILCO and others that were discussed at the hearing.¹³⁵

The County condemns the studies because they "do not constitute systematic analyses performed for the purpose of identifying potential adverse systems interactions and incorporating those data into LILCO's classification scheme."¹³⁶ The Licensing Board was satisfied, however, that systems interaction problems were adequately analyzed to assure that the Shoreham design protects the public from credible accidents despite the lack of a single comprehensive analysis.¹³⁷ So are we.

As noted earlier, the Board reviewed a wide variety of evaluations pertaining to systems interaction. The County insists that we should question the value of two studies because they failed to identify the potential interaction (known in this proceeding as the "Michelson concern") resulting from a reactor vessel water level sensing line break.¹³⁸ These two studies are the water level measurement error analysis performed by General Electric in 1981 (GE

¹³⁵ See FF J-51 to J-141 (slip opinion at 480-510).

¹³⁶ Suffolk Brief at 25-26 (emphasis in original).

¹³⁷ LBP-83-57, supra, 18 NRC at 576.

¹³⁸ Suffolk Brief at 26. See our discussion of this potential interaction (the Michelson concern), infra.

Study)¹³⁹ and the Shoreham probabilistic risk assessment (PRA) performed by Science Applications Incorporated. The County focuses particularly on the PRA. In its view, the PRA's methodology was deficient and, additionally, its results were not analyzed to identify or assess potential adverse interactions.¹⁴⁰ Specifically, the County argues, first, that the PRA failed to detect a sensing line break. Moreover, it submits that the PRA was not a systems interaction analysis because it was not undertaken for that purpose and did not consider several external initiating events and their potential impact on interactions.¹⁴¹ Finally, it asserts that there is no persuasive evidence that potential adverse systems interactions that may have been identified in the Shoreham PRA have been addressed in any systematic way by LILCO.¹⁴²

We do not consider these studies or LILCO's overall systems interaction review fatally flawed. The Shoreham PRA was designed to identify systematically postulated accident sequences and the failures which can cause them.¹⁴³

¹³⁹ Tr. 5329 (Robare).

¹⁴⁰ Suffolk Brief at 26.

¹⁴¹ Id. at 27.

¹⁴² Id. at 28.

¹⁴³ Tr. fol. 4346 at 87 (Burns, et al.).

Although we believe the PRA should have detected the sensing line break, we are satisfied that this failure does not undermine the entire study. The sensing line break problem was omitted from the PRA because its frequency of occurrence was underestimated by the analysts performing the study.¹⁴⁴ This would not automatically affect other aspects of the study. Perhaps more importantly, a basic purpose of employing a battery of analyses is to ensure that genuine problems will be uncovered despite a failure in an individual analysis. The sensing line break problem was separately analyzed by LILCO and General Electric and found not to be significant.¹⁴⁵

We agree with the County that a PRA is not equivalent to a systems interaction study. Nevertheless, a PRA will identify systems interactions if it employs the event

¹⁴⁴ Tr. 6171 (Burns). See also, Tr. fol. 4346 at 120-21 (Burns, et al.).

¹⁴⁵ Tr. 6176-77 (Burns, Kascsak). As earlier noted, the County also criticizes the GE water level measurement error analysis for its failure to detect a sensing line break. Tr. fol. 4346 at 64 (Burns, et al.). That study was not intended to analyze such a break.

tree/fault tree methodology.¹⁴⁶ This methodology was used at Shoreham.¹⁴⁷

Plant walkdowns were used both to develop the event tree/fault tree models¹⁴⁸ and to identify potential independent multiple system failures (i.e., systems interactions).¹⁴⁹ The County argues generally that the walkdowns were limited and not performed in a manner designed to search comprehensively for potential interactions.¹⁵⁰

¹⁴⁶ Tr. fol. 4346 at 71 (Burns, et al.). The plant event trees delineate the accident sequences leading to core damage. The fault trees are used to assess the failure probability for each function or system displayed as a branch point in the event trees. Hence, the event trees should account for intersystem dependencies given a representative spectrum of initiating events while dependencies on common support systems should be accounted for in the fault trees. Id. at 72.

¹⁴⁷ Id. at 87. We note that the disagreement among the parties concerning the definitions of the terms "important to safety" and "safety-related" does not affect the determination of the acceptability of the Shoreham PRA. The PRA methodology disregards labels such as "safety-related" and "nonsafety-related" and evaluates the performance of systems entirely on their engineered or reliability merits. Id. at 73. Consequently, the analysis considers interactions between safety-related systems and between safety-related and nonsafety-related systems. Id. at 100; Tr. 5897 (Kascsak).

¹⁴⁸ Tr. fol. 4346 at 101 (Burns, et al.).

¹⁴⁹ Id. at 102.

¹⁵⁰ Suffolk Brief at 27.

In this connection, the County pointed below to the fact that the walkdowns at Shoreham were on a smaller scale than those performed at the Diablo Canyon and Indian Point plants.¹⁵¹ The evidence indicated, however, that the County's comparison is inappropriate. The purpose of the walkdowns in the Shoreham PRA was to identify system dependencies and interfaces which could disable multiple systems.¹⁵² The systems interaction study at Diablo Canyon had a different purpose. It consisted of an extensive walkdown of plant systems searching for potential failures of non-seismic qualified structures, systems and components that could affect the functioning of safety-related equipment.¹⁵³ Moreover, according to the staff, the Diablo Canyon study had gone beyond the regulatory requirements with respect to the single failure criterion.¹⁵⁴ Similarly,

¹⁵¹ See Suffolk County's Proposed Opinion, Findings of Fact, and Conclusions of Law in the Form of a Partial Initial Decision (Jan. 31, 1983) at 73-74, 248-50.

¹⁵² Tr. fol. 4346 at 102 (Burns, et al.).

¹⁵³ Tr. fol. 6357 at 38 (Speis, et al.). The Diablo Canyon study required 55 staff-years of effort for the development of the methodology and system for documenting and keeping track of interactions identified and analyzed. Tr. 7313 (Conran). LILCO's witnesses characterized the Diablo Canyon study as a "brute force method" and did not believe that the walkdown would identify dynamic or hidden dependencies. Tr. 6117-18 (Joksimovich); Tr. 6151 (Burns).

¹⁵⁴ Tr. 7156, 7524 (Conran).

the Indian Point study was designed to identify and to evaluate seismic-initiated interactions and employed methods and criteria akin to those used at Diablo Canyon.¹⁵⁵ A significant part of the Indian Point walkdown effort involved either the verification or re-creation of system drawings as a result of the age of the plant.¹⁵⁶ In sum, we believe that the Shoreham effort is sufficiently different from the studies conducted at Diablo Canyon and Indian Point to prohibit a direct comparison of the length of the walkdowns at each plant.¹⁵⁷

The County also argues that the Shoreham PRA is deficient because it excluded certain external events such as fire, sabotage, and earthquakes.¹⁵⁸ These exclusions were reasonable. At the time the Shoreham PRA was initiated, published studies had generally concluded that external events were not a dominant contributor to risk.¹⁵⁹

¹⁵⁵ Tr. fol. 6357, Attachment on Indian Point-3 Meeting Summary at 7. See also Tr. 7524 (Conran).

¹⁵⁶ Tr. 7515-18 (Conran).

¹⁵⁷ Although we find nothing in the County's presentation or the record to undermine the adequacy of the Shoreham walkdowns, we note that the PRA is still being reviewed by the staff. See Tr. 6656 (Thadani).

¹⁵⁸ Tr. fol. 4346 at 82 (Burns, et al.).

¹⁵⁹ Tr. 5653-54 (Burns); Tr. fol. 4346 at 82-83 (Burns, et al.).

In addition, the ability to assess seismic and other external effects was a developing technique and had not been demonstrated to be manageable.¹⁶⁰ The exclusion of certain external events from the Shoreham PRA does not render the study deficient. It does mean, however, that this exclusion must be taken into account when determining whether the Shoreham PRA satisfies any requirement that may be forthcoming for a comprehensive systems interaction study.

Finally, the County contends that there is no showing that potential adverse systems interactions that may have been identified in the PRA have been systematically addressed. Specifically, it claims that the LILCO PRA review process "appeared to focus on whether there were any unusual risk outliers, accident sequences, or probabilities identified at Shoreham that were not common to other similar plants."¹⁶¹ We can find no fault with LILCO's review of the PRA.

LILCO witness Robert M. Kascsak explained that the reviewers look at the unacceptable interactions identified by the fault trees and event trees and evaluate how particular sequences contribute to the failure of a system

¹⁶⁰ Tr. 5658 (Burns). See also, Tr. fol. 4346 at 82 (Burns, et al.).

¹⁶¹ Suffolk Brief at 28.

or lead to an unsafe condition.¹⁶² If the trees indicate that the plant will not respond as designed, LILCO investigates in more detail.¹⁶³ While LILCO looked at Shoreham in light of the experience of other plants,¹⁶⁴ we see nothing in the record to suggest that its overall PRA review looked only at those potential problems at Shoreham that were different from those at other plants.

At the time of the hearing, LILCO indicated that the PRA was in draft form and undergoing peer review.¹⁶⁵ Although some interactions that could disable multiple systems had already been identified, these are of such low probability that they do not pose a significant risk to the public.¹⁶⁶ Other potential adverse systems interactions (or other design weaknesses) are being (or will be) addressed by LILCO and the staff. For example, Mr. Kascsak indicated that, as a result of the review process, two design changes

¹⁶² Tr. 5846-48 (Kascsak).

¹⁶³ Tr. 5873 (Kascsak).

¹⁶⁴ Tr. fol. 4346 at 103-04 (Burns, et al.).

¹⁶⁵ Id. at 107.

¹⁶⁶ Id. at 108.

were already planned and two other specific analyses were underway.¹⁶⁷

B. Alleged Failure to Identify a Serious Systems Interaction Problem

The Board found that the County had failed to identify any systems interaction that had not been considered. The County contends that, to the contrary, it did provide a concrete example of a serious adverse interaction between systems to support its claim that the design process and methodology for Shoreham are deficient.¹⁶⁸ In this regard, the County points to the interaction between the reactor protection and feedwater control systems, which is colloquially known in this proceeding as the "Michelson concern."

The facts surrounding the analysis of the Michelson concern are essentially uncontroverted. The reactor protection and feedwater control systems share instrument sensing lines that monitor reactor vessel water level, and both would be affected by a break in a common sensing line. Such a break could result in a false high water level signal -- causing the feedwater control system to reduce feedwater

¹⁶⁷ Tr. 5843-45, 5849-53, 6199-200 (Kascsak). See also Tr. 6191-94 (Burns).

¹⁶⁸ Suffolk Brief at 18.

flow rate and, at the same time, eliminating redundancy in the automatic protection system.¹⁶⁹ General Electric has been aware of the common point between these systems for many years.¹⁷⁰ In January 1982, an NRC staff office released a report that described this potential systems interaction. While not deeming the problem of immediate concern, the staff nonetheless believes that it needs to be addressed.¹⁷¹ LILCO claims that the Shoreham design largely precludes the potential interaction; in any event, it argues, established means are available to accommodate any interaction problem that may occur.¹⁷² Essentially, operator action could mitigate any interaction problem.¹⁷³ The staff has determined that there is adequate time for any necessary operator action and, as a consequence, the plant is safe.¹⁷⁴ The County argues that permitting the

¹⁶⁹ Tr. fol. 5373, SC Exh. 1 at 10.

¹⁷⁰ Tr. 5559-60 (Ianni); Tr. 5585, 5588 (Robare).

¹⁷¹ Tr. fol. 5373, SC Exh. 1 at 10. While this interaction can result in the loss of redundancy in the automatic feature of the protection system, the staff does not suggest that the plant design fails to meet any regulatory requirements. Tr. 6895 (Rossi).

¹⁷² LILCO's Reply Brief at 15-16. See also Tr. fol. 4346 at 157-58 n.39 (Burns, et al.); Tr. 4847-48 (Robare).

¹⁷³ Tr. 5362 (Robare); Tr. fol. 6357 at 31 (Speis, et al.).

¹⁷⁴ Tr. 6893 (Rossi).

interaction to remain without a design solution over the years is unacceptable.¹⁷⁵

The Licensing Board carefully reviewed the Michelson concern and endorsed the staff's judgment that current regulatory requirements and procedures are sufficient to provide reasonable assurance of adequate protection of the public health and safety.¹⁷⁶ We too have reviewed the record and cannot agree with the County that the treatment of the Michelson concern illustrates that a serious interaction problem has been overlooked. The Michelson concern has been known for some time. The five examples of interaction problems associated with that concern noted by the County as evidence of a failure to address the issue were, in fact, listed in the January 1982 staff report¹⁷⁷ and were analyzed for Shoreham.¹⁷⁸ A fully acceptable solution has been devised. We do not agree that the failure to design a 100 percent effective preventive or the need to rely on operating procedures¹⁷⁹ warrants a

¹⁷⁵ Suffolk Brief at 20-22.

¹⁷⁶ FF J-540 to J-606 (slip opinion at 653-84).

¹⁷⁷ See Tr. fol. 5373, SC Exh. 1 at Appendix A.

¹⁷⁸ FF J-597 (slip opinion at 680-82).

¹⁷⁹ Operators at Shoreham are trained to recognize this event and take proper action. Tr. 5375-76 (McGuire).

conclusion that serious systems interactions have gone unaddressed. As a consequence, a review of the Michelson concern does not alter our judgment that systems interactions were adequately considered.

C. Unresolved Safety Issue A-17

As previously noted, there is no explicit NRC requirement for a comprehensive systems interaction analysis of each plant design. Licensing requirements, however, are founded on a defense-in-depth principle and include provisions for design features such as physical separation and independence of redundant safety systems.¹⁸⁰ These design features are supplemented by NRC staff review procedures that assign primary responsibility for review of various technical areas and safety systems to specific groups within the staff. (For example, the acceptability of the facility's containment systems would be addressed by the branch in the Office of Nuclear Reactor Regulation specifically concerned with such systems.) It was this division of responsibility among several staff entities that led the NRC's Advisory Committee on Reactor Safeguards to recommend that the staff give attention to the evaluation of safety systems from a multidisciplinary viewpoint to ensure

¹⁸⁰ Staff Exh. 2A at B-9 and B-10.

the identification of potentially adverse systems interactions.

In the wake of this recommendation, the staff initiated Task A-17 in 1977.¹⁸¹ While that task is categorized as an "unresolved safety issue," it does not focus upon a particular safety problem (such as the cracking of feedwater nozzles in boiling water reactors (Task A-10)). Rather, it is a generic study to confirm that the current safety criteria and NRC review procedures provide an acceptable level of independence and redundancy for systems required for safety.¹⁸²

While the study has not been completed, there has been no indication to date that current NRC review procedures and safety criteria are inadequate to assure that the effects of potential systems interactions are within the design-basis envelope of the plants.¹⁸³ More specifically, the staff believes that, even though the study is important and should be completed promptly, those procedures and criteria would identify most, if not all, of the safety significant interactions and, thus, provide reasonable assurance that

¹⁸¹ Id. at B-10.

¹⁸² Ibid.; Tr. fol. 20,810 at 5 (Mattson, et al.).

¹⁸³ Tr. fol. 20,810 at 5 (Mattson, et al.).

the facility under scrutiny can be operated without undue risk to the public health and safety.¹⁸⁴

Given the staff's view of the matter, together with the numerous completed systems interaction-related studies having specific application to Shoreham (see p. 37, supra), the Licensing Board concluded that plant operation need not be precluded pending the completion of the staff's A-17 confirmatory study.¹⁸⁵ We agree. True, as the County points out, one staff witness, James H. Conran, supported its claim that there had been insufficient progress made in the A-17 efforts.¹⁸⁶ But, whether or not the staff should have attached a greater priority to the completion of the project, the fact remains that A-17 is not directed to the remedy of a specific determined safety hazard (e.g., feedwater nozzle cracking). Instead, to repeat, its purpose is to confirm the adequacy of existing review procedures and criteria. At this juncture, there is no concrete suggestion of inadequacy; this being so, we see no reason why the mere possibility that the A-17 project might ultimately disclose a weakness in a procedure or criterion should stand in the

¹⁸⁴ Tr. fol. 6357 at 36-37 (Speis, et al.); Tr. fol. 20,810 at 5-6 (Mattson, et al.); Tr. 20,862-63 (Thadani).

¹⁸⁵ LBP-83-57, supra, 18 NRC at 550.

¹⁸⁶ Suffolk Brief at 31 n.15.

way of licensing Shoreham operation now. In this regard, at any particular time the staff presumably has a number of its regulatory directives and processes under re-examination. The pendency of such a re-examination should not preclude the issuance of an operating license in circumstances where reasonable assurance otherwise exists that the facility can be safely operated.¹⁸⁷

D. Unresolved Safety Issue A-47

Another unresolved safety issue concerns the potential for control system failures or malfunctions interfering with the use of safety equipment in the event of an accident or transient.¹⁸⁸ Until recently, systematic evaluations of

¹⁸⁷ Cf. Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 1), CLI-84-11, 20 NRC __, __ (slip opinion at 23-24) (July 26, 1984) (operation of the plant need not be held up pending resolution of the staff's generic systems interaction program). We need add only that the County's cause is not advanced by its reliance upon Virginia Electric and Power Co. (North Anna Nuclear Power Station, Units 1 and 2), ALAB-491, 8 NRC 245, 247-48 (1978) and Gulf States Utilities Co. (River Bend Station, Units 1 and 2), ALAB-444, 6 NRC 760, 775 (1977). Those decisions impose an obligation upon the staff to explain why a generic unresolved safety issue does not stand in the path of construction permit (River Bend) or operating license (North Anna) issuance. Both, however, were written in the context of unresolved safety issues involving discerned safety problems requiring solutions. As noted in the text above, we do not regard A-17 as fitting that description. In any event, as also indicated in the text, we are satisfied with the staff and Licensing Board explanation as to why Shoreham licensing need not await the completion of the A-17 study.

¹⁸⁸ Staff Exh. 2A at B-15.

control system designs had not been performed to determine the effect of control system problems in such circumstances.¹⁸⁹ Therefore, the staff initiated an investigation of such potential interactions, known as USI A-47.¹⁹⁰ Because the effects of control system failures may differ from plant to plant, it is not possible to develop universal solutions to any potential problems.¹⁹¹ Rather, the purpose of USI A-47 is to define generic criteria that will be used for plant-specific studies and to review the adequacy of current control system licensing requirements.¹⁹²

For Shoreham, no specific evaluation of the control system design has been performed.¹⁹³ As we mentioned, systems interactions in general have been studied and to date no undue risk to public health and safety has been discovered (see pp. 37-38, supra). The Licensing Board concluded that the ongoing activities associated with USI A-47 were not an obstacle to its operating license

¹⁸⁹ Tr. fol. 6357 at 43, 44 (Speis, et al.).

¹⁹⁰ Id. at 44; FF J-208 (slip opinion at 538).

¹⁹¹ Staff Exh. 2A at B-15.

¹⁹² Ibid.; FF J-210 (slip opinion at 539).

¹⁹³ Tr. fol. 6357 at 44 (Speis, et al.).

authorization.¹⁹⁴ Rather, as the Board saw it, staff review of the matter outside the adjudicatory arena will be adequate.¹⁹⁵

Contrary to the determination of the Licensing Board, the County asserts that LILCO must complete the studies contemplated by USI A-47 prior to the authorization of a license for Shoreham.¹⁹⁶ In this regard, the County would have LILCO complete two evaluations requested by the staff.¹⁹⁷ Further, the County claims that the results of these studies must be made a part of the adjudicatory record.¹⁹⁸ We agree.

True enough, this issue bears some similarity to USI A-17 (see pp. 52-55, supra). Like USI A-17, there has been no showing of a "discerned safety problem."¹⁹⁹ At the time of the hearing, the staff knew of "no specific control system failures or actions at Shoreham or any other plant

¹⁹⁴ LBP-83-57, supra, 18 NRC at 555.

¹⁹⁵ Ibid.

¹⁹⁶ Suffolk Brief at 41, 43.

¹⁹⁷ Id. at 40-41. The staff has requested that LILCO perform evaluations of (1) the effect of power supply, sensor and sensor impulse line failures on several control systems and (2) the effect of high energy line breaks on control systems. Tr. 7440 (Rossi).

¹⁹⁸ Suffolk Brief at 41, 42.

¹⁹⁹ See note 187, supra, and cases cited.

which would lead to undue risk to the health and safety of the public."²⁰⁰ Further, staff witness C.E. Rossi testified that serious consequences, not included in those already analyzed for the plant, were of "low probability."²⁰¹ Moreover, the staff indicated in its SER that should such control system failures occur, they would not result "in serious events . . . or conditions" beyond the capability of safety systems.²⁰²

There are, however, significant differences between this issue and USI A-17. One notable difference is that in-depth studies have not been performed to verify the staff's expectations in connection with A-47.²⁰³ Importantly, the staff took the position before the Licensing Board that before it could make the reasonable assurance finding necessary for the issuance of a license, it was requiring more information from LILCO.²⁰⁴

We, like the staff, do not have sufficient information to conclude that the ultimate resolution of USI A-47 will have no significance for Shoreham. That may well be the

²⁰⁰ Tr. fol. 6357 at 44 (Speis, et al.).

²⁰¹ Tr. 7456 (Rossi).

²⁰² Staff Exh. 2A at E-15.

²⁰³ Ibid.

²⁰⁴ Tr. fol. 6357 at 45 (Speis, et al.).

case, as some of the staff's testimony indicates. But, without additional analyses, we cannot be sure. Further, the County is entitled to test the basis of any conclusion regarding this matter, in the same manner as any other litigable issue. For these reasons, we remand the questions raised by USI A-47 to the Licensing Board for further consideration in light of any additional information developed by LILCO or the staff.

III. Quality Assurance

A. Background

Four contentions concerning quality assurance (QA) at Shoreham were admitted by the Licensing Board for litigation. Contention SC/SOC 12 charged that LILCO has failed to comply with Appendix B to 10 CFR Part 50 because (1) the QA program for the design and installation of structures, systems, and components for Shoreham was not conducted in a timely manner, and (2) there was a pattern of QA breakdowns at Shoreham. Referring to alleged failures in several areas, Suffolk County argued in Contention SC 13 that the description of the operational quality assurance program for Shoreham does not comply with 10 CFR § 50.34(b)(6)(ii) and Appendix B. Contention SC 14 asserted that the NRC staff's Inspection and Enforcement (I&E) program has not adequately verified that LILCO's QA program has been implemented in accordance with 10 CFR § 50.34(a), paragraph 7, and Appendix B. In Contention SC 15, the

County claimed that the Shoreham QA program involved inadequate review and physical inspection to verify compliance with Appendix B and, as a result, a statistically valid audit of QA documentation of physically inspectable structures and components should be performed.²⁰⁵

The quality assurance portion of the hearing consumed fifty-five days and generated a massive record. The findings of fact of the Licensing Board extended over 500 pages in the slip opinion. The Board reached specific conclusions regarding numerous areas of controversy. It summarized its conclusions as follows:

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 [s]taff 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 [s]taff have had effective programs for identifying and correcting deficiencies. We also conclude that LILCO's and the [s]taff's programs for operation of Shoreham meet the Commission's requirements and will provide adequate protection of the health and safety of the public.²⁰⁶

²⁰⁵ These contentions are stated in their entirety at FF K-1 to K-4 (slip opinion at 847-50).

²⁰⁶ LBP-83-57, supra, 18 NRC at 580-81.

The County objects to a number of the Board's underlying findings. We address these objections below.²⁰⁷

B. Technical Issues

1. Compliance of the QA Program with 10 CFR Part 50, Appendix B

Criterion XVIII of Appendix B to 10 CFR Part 50, dealing with audit requirements, provides, in relevant part, that

[a] comprehensive system of planned and periodic audits shall be carried out to verify compliance with all aspects of the quality assurance program and to determine the effectiveness of the program.

In its brief, the County argues that Criterion XVIII requires the use of a random-sampling statistical methodology in the selection of items to be audited and that such a methodology is feasible.²⁰⁸ Because LILCO does not use such a methodology, the County contends that an audit program has not been established that complies with Criterion XVIII.²⁰⁹

Auditing within LILCO's quality assurance program does not involve a 100 percent review of quality assurance items

²⁰⁷ The County does not categorize its arguments according to individual contentions. We have structured our decision essentially to parallel the County's brief.

²⁰⁸ Suffolk Brief at 43.

²⁰⁹ Id. at 44.

and records.²¹⁰ According to LILCO, the audit process is not a product acceptance activity and, consequently, not every work product was examined.²¹¹ Audits were, instead, "aimed primarily at assessing the process of engineering and the process of building the plant. . . ."²¹² Samples were selected based on the auditor's specific knowledge of the area; the auditor was allowed flexibility in pursuing more important items.²¹³ LILCO did not consider random sampling to be effective.²¹⁴

The County submitted below, and reasserts on appeal, that, for accurate extrapolation of the audit results to those activities not audited, the audit program must employ a statistical methodology in making its sample selection.²¹⁵ The Licensing Board did not explicitly reject that assertion but concluded that audits acceptable for nuclear power plant applications need not provide the type of "mathematical rigor" the County sought.²¹⁶ The Board observed:

²¹⁰ Tr. 12,406 (Eifert).

²¹¹ Ibid.

²¹² Ibid.

²¹³ Tr. 12,420 (Burns); Tr. 12,446-47 (Eifert).

²¹⁴ Tr. 12,413 (Eifert).

²¹⁵ Suffolk Brief at 44.

²¹⁶ LBP-83-57, supra, 18 NRC at 584.

We do need to conclude that the QA program in general meets NRC requirements and, despite whatever lack of mathematical rigor there may be in sampling and overall evaluation, there remains reasonable assurance of no undue risk to the health and safety of the public. This we do, not on the basis of individual noncompliances or lack of rigor, but on the basis of the sum of all factors that contribute to acceptable design, construction and operation. These factors include NRC requirements, professional experience, organization and management, training and procedures and continuing dedication by all concerned.²¹⁷

The County contends that the Board's conclusion is not consistent with the requirements of Criterion XVIII. In its judgment, standing alone LILCO's audits must verify compliance with all aspects of the QA program and determine its effectiveness.²¹⁸ According to the County, the Board's consideration of "all factors" is not acceptable.²¹⁹

Periodic and planned audits must verify all aspects of the quality assurance program. Contrary to the County's view, however, audits conducted in compliance with Criterion XVIII are not intended to verify every QA record or item through extrapolation of the audit results. In conformity with standard industry usage, LILCO employed the term "audit" to mean a "documented activity performed in

²¹⁷ Id. at 584-85.

²¹⁸ Suffolk Brief at 46.

²¹⁹ Ibid.

accordance with written procedures or checklists to verify by examination or evaluation of objective evidence that applicable elements of the quality assurance program have been developed, documented, and effectively implemented in accordance with specified requirements."²²⁰ At Shoreham, auditors primarily review the work process in light of their familiarity with various mechanisms that can cause problems, the disciplines that actually performed the work, and the technical guidance that is available to those disciplines.²²¹

In our opinion, Criterion XVIII requires the performance of audits to ensure that the quality assurance program as a whole has been effectively implemented. Rather than attempting to verify the accuracy of every QA item or record, the audit process determines whether the overall quality assurance program is providing adequate control over activities affecting quality. (This is to be distinguished from quality assurance inspection activities, which are in the nature of product acceptance, as the Licensing Board recognized.)²²² To comply with Criterion XVIII, LILCO must

²²⁰ LILCO Exh. 21, at 23 (Alexander, et al.). See generally, ANSI/ASME NQA-1-1983, "Quality Assurance Program Requirements for Nuclear Facilities," at 5.

²²¹ Tr. 12,428-31 (Eifert).

²²² See FF K-186 to K-189 (slip opinion at 921-23).

identify the activities within the QA program and organize the audit process around these activities.²²³ Furthermore, it must conduct audits of all activities on a regular basis. This, in fact, is what LILCO has done.²²⁴ As a result, we find that it has satisfied Criterion XVIII.

As mentioned previously, the Licensing Board considered other factors (such as "NRC requirements, professional experience, organization and management, training and procedures and continuing dedication by all concerned") in arriving at its ultimate finding of reasonable assurance of adequate safety despite the lack of a statistical sampling audit program. The County complains that such reliance on "other factors" is impermissible because a valid audit must either undertake a 100 percent assessment or develop a methodology from which reliable extrapolations to the entire plant may be made.²²⁵ The County misinterprets the Board's opinion. The Board relied on these "other factors" -- properly, in our view -- in reaching its overall conclusion that safety can be assured. It also found -- specifically -- that the audit program was acceptable even though random

²²³ Tr. 12,410-11 (Eifert).

²²⁴ See, e.g., LILCO Exh. 21 at 25-31, 112-13, 168-69, and 174-75 (Alexander, et al.).

²²⁵ Suffolk Brief at 46.

sampling techniques were not used. In our opinion, the Board reasonably found, in this latter connection, that judgment sampling in the conduct of audits is consistent with the requirements of Criterion XVIII.²²⁶

2. Implementation of LILCO's QA Program

The Licensing Board concluded that LILCO has implemented its QA program in accordance with 10 CFR Part 50 Appendix B and that the program has been effective.²²⁷ The County disagrees.²²⁸ Its position centers on its belief that the Board erred in interpreting the QA regulatory requirements.²²⁹ We find no error in the Board's analysis.

(a) Classifying a QA Deficiency

According to the County, the Licensing Board improperly concluded that, even if proven, deficiencies should not be considered significant unless they can be linked to actual or potential safety defects. As we understand the County's argument, every deficiency, however minor, reflects an

²²⁶ LBP-83-57, supra, 18 NRC at 611. In light of our determination, we need not reach the question whether the Board correctly resolved in LILCO's favor the issue of feasibility of random sampling.

²²⁷ Id. at 580-81.

²²⁸ Suffolk Brief at 48.

²²⁹ Id. at 49.

attitude or lack of discipline that undermines confidence that the QA program has been successful. We have reviewed the Licensing Board's approach and find it fully consistent with Commission regulations and governing precedent.

Quality assurance review involves two separate, yet interrelated, inquiries, i.e., whether deficiencies have been uncovered and corrected, and whether a generic problem exists that could affect the confidence in the safety of the facility. As we observed in our Callaway decision:

It would . . . be totally unreasonable to hinge the grant of an NRC operating license upon a demonstration of error-free construction. Nor is such a result mandated by either the Atomic Energy Act of 1954, as amended, or the Commission's implementing regulations. What they require is simply a finding of reasonable assurance that, as built, the facility can and will be operated without endangering the public health and safety. . . . Thus, in examining claims of quality assurance deficiencies, one must look to the implication of those deficiencies in terms of safe plant operation.

Obviously, this inquiry necessitates careful consideration of whether all ascertained construction errors have been cured. Even if this is established to be the case, however, there may remain a question whether there has been a breakdown in quality assurance procedures of sufficient dimensions to raise legitimate doubt as to the overall integrity of the facility and its safety-related structures and components. A demonstration of a pervasive failure to carry out the quality assurance program might well stand in the way of the requisite safety finding.²³⁰

²³⁰ Union Electric Co. (Callaway Plant, Unit 1), ALAB-740, 18 NRC 343, 346 (1983).

The Licensing Board considered, individually, numerous audit and surveillance findings relative to construction of the Shoreham facility.²³¹ It found the identified deficiencies to be minor, readily correctable, and posing no concern about the adequacy of the Shoreham design, construction or installation.²³² We find no fault with the Board's approach. Contrary to the County's suggestion, all deficiencies need not be treated alike when evaluating the efficacy of a QA program. Obviously, problems genuinely affecting the safety of the plant must be cured before the plant can be permitted to operate. Indeed, Criterion XVI of Appendix B requires specific actions in the event that "significant" deficiencies are identified.²³³ Thus, in determining whether significant defects have been uncovered and corrected the Licensing Board should -- indeed must -- make a judgment respecting the importance of particular defects.

²³¹ See generally LBP-83-57, supra, 18 NRC at 586-601.

²³² See id. at 601.

²³³ Criterion XVI of Appendix B requires, in part:

Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the

(Footnote Continued)

We do not mean to suggest that minor defects may be disregarded. In reviewing quality assurance, after all, a licensing board must be satisfied not only that construction defects have been corrected but that there has been no overall breakdown in quality assurance procedures. In this connection, numerous imperfections, even if minor, may, as the County suggests, be indicative of a more widespread or generic quality assurance problem. That is quite different, however, from the County's position that no QA deficiencies can be considered minor.

(b) Defining a QA Violation

The County argues that the Licensing Board "compounded its error in classifying certain QA/QC deficiencies as 'minor,' etc., by failing to rule correctly regarding what constitutes a QA/QC violation or noncompliance in the first place."²³⁴ The Board determined that not every violation of an internal quality assurance program procedure uncovered by LILCO or Stone and Webster (S&W) auditors represented a violation of Appendix B.²³⁵ In the County's view, any failure to comply with the requirements of a QA manual,

(Footnote Continued)

cause of the condition is determined and corrective action taken to preclude repetition.

²³⁴ Suffolk Brief at 58.

²³⁵ FF K-309 (slip opinion at 978).

operating procedure or other document implementing a portion of the QA program constitutes a violation of Appendix B.²³⁶ We agree with the Board's approach.

Criterion XVI of Appendix B recognizes that deficiencies will occur, and establishes requirements for their identification and correction. Further, Criterion XVIII requires the reaudit of deficient areas. Thus, it is clear that the mere identification by an applicant of a deficiency as part of an audit conducted in accordance with its QA program does not per se constitute a violation of the Commission's regulations. That is not to say that a violation of an applicant's QA manual, operating procedures or other QA document may not, if sufficiently serious, constitute a violation of Appendix B. But, contrary to the County's argument, not every violation of implementing manuals or procedures constitutes an Appendix B violation. Indeed, the Commission's enforcement practice is as follows:

Because the NRC wants to encourage and support licensee initiative for self-identification and correction of problems, NRC will not generally issue a notice of violation for a violation that meets all of the following tests:

- (1) It was identified by the licensee;
- (2) It fits in Severity Level IV or V;
- (3) It was reported, if required;
- (4) It was or will be corrected, including measures to prevent recurrence, within a reasonable time; and

²³⁶ Suffolk Brief at 59-60.

(5) It was not a violation that could reasonably be expected to have been prevented by the licensee's corrective action for a previous violation.²³⁷

The examples set out in the County's brief are consistent with this enforcement practice and the Board's approach.²³⁸

(c) Specific Areas of QA Program Implementation

The County contends that the Licensing Board erred in its consideration of specific deficiencies related to LILCO's QA program.²³⁹ To support its argument, the County discusses three examples which it believes demonstrate the error in the Board's conclusion that LILCO effectively implemented its QA program. We address the County's examples separately.

(i) Housekeeping

During the construction and operation of nuclear power plants, utilities are required by the Commission's

²³⁷ 10 CFR Part 2, Appendix C, § IV.A.

²³⁸ Tr. 16,730 (Higgins). The current staff method for defining violations includes five severity levels with Severity Level I being the most severe and Level V the least severe. Tr. 13,815 (Eifert). These levels are roughly distinguished as follows: Levels I and II - very significant regulatory concern, Level III - significant concern, Level IV - less serious but more than minor concern, and Level V - minor safety significance. Tr. 17,119 (Higgins). See 10 CFR Part 2, Appendix C, § III.

²³⁹ Suffolk Brief at 61.

regulations to ensure that activities affecting quality are accomplished under controlled conditions such as adequate cleanliness.²⁴⁰ At Shoreham, LILCO has established housekeeping procedures to minimize the accumulation of dirt and debris in all areas of the plant.²⁴¹ To the extent they cover areas involving safety-related equipment, those procedures are part of the implementation of Appendix B requirements.²⁴²

There has been a history of poor implementation of housekeeping procedures at Shoreham. From a staff inspection in 1979 through the Readiness Assessment Team (RAT) inspection in January 1983, continuing inadequacies in housekeeping were identified.²⁴³ These shortcomings persisted despite notices of violation issued by the staff,

²⁴⁰ Criterion II of Appendix B states, in part:

Activities affecting quality shall be accomplished under suitably controlled conditions. Controlled conditions include the use of appropriate equipment; suitable environmental conditions for accomplishing the activity, such as adequate cleanness; and assurance that all prerequisites for the given activity have been satisfied.

²⁴¹ Tr. 11,925 (Kelly, Arrington, Museler).

²⁴² Tr. 11,926 (Museler).

²⁴³ The details of these problems are given at FF K-706 (slip opinion at 1142-43); K-724 (slip opinion at 1149); K-731 (slip opinion 1151-52); K-741 (slip opinion at 1155); K-751 (slip opinion at 1159-60).

commitments for improvement by LILCO, and meetings between the staff and LILCO management. Finally, during the RAT inspection, the staff determined that housekeeping was still not acceptable, and it issued Confirmatory Action Letter (CAL) 83-01 on January 19, 1983.²⁴⁴

In response to that letter, LILCO agreed to undertake a series of actions to resolve the housekeeping problems:

(a) A general clean-up of the major buildings in the plant will be conducted on at least a weekly basis. Additional craft personnel will be assigned full-time to housekeeping duties until [p]lant readiness is acceptable to NRC inspectors. Fifty additional laborers have already been dedicated full-time to this process.

(b) Specific eating areas were established in the [p]lant even within zone 5 areas which normally permit eating and smoking.

(c) Specific verbal instructions have been and will continue to be provided to [p]lant personnel and to all manual construction personnel regarding housekeeping policies.

(d) Inspections have been and will be conducted of all areas by LILCO management personnel and these inspections will be documented.

(e) Field quality assurance will monitor these additional activities as part of their normal surveillance program.

(f) LILCO has initiated weekly Monday morning walking tours of the reactor building, control building, and screenwell with the following personnel generally in attendance:

²⁴⁴ Tr. 20,009 (Greenman); Staff Exh. 12; Confirmatory Action Letters are documents confirming an applicant's agreement to take certain actions to remove significant

(Footnote Continued)

1. Manager of Construction and Engineering;
2. General Superintendent of Construction;
3. Safety Supervisor (head of [p]lant clean-up program);
4. NRC Resident Inspector; and
5. Field Quality Assurance Manager.²⁴⁵

In light of these recent staff and LILCO actions concerning housekeeping, and the staff's assertion that none of the housekeeping issues had safety implications, the Board found that the housekeeping problems had been adequately resolved.²⁴⁶

Before us, the County contends that the repeated housekeeping deficiencies illustrate lack of compliance with Appendix B.²⁴⁷ According to the County, the repetitive nature of the deficiencies demonstrates not only that proper corrective action was not implemented, but also that it is not possible to depend on commitments by LILCO management.²⁴⁸ As a result, the County would have us find that the Board erred in relying upon LILCO's commitments in

(Footnote Continued)

concerns about health and safety, safeguards or the environment. 10 CFR Part 2, Appendix C, § I.E(4).

²⁴⁵ Tr. fol. 19,757 at 21-22 (Museler, et al.). In three weekly tours conducted subsequent to these measures, improvements in housekeeping were noted, although additional efforts were considered necessary. Tr. 20,051-52 (Higgins); Tr. fol. 19,757 at 22 (Museler, et al.).

²⁴⁶ LBP-83-57, supra, 18 NRC at 598-99.

²⁴⁷ Suffolk Brief at 65-66,

²⁴⁸ Ibid.

response to the Confirmatory Action Letter regarding housekeeping.²⁴⁹

We agree with the County that, given LILCO's past lack of diligence in correcting housekeeping deficiencies at Shoreham, the Licensing Board erred in finding the matter had been adequately resolved. It may well turn out that LILCO will totally fulfill the commitments it made in response to the Confirmatory Action Letter. In the circumstances, however, we do not believe that the Board justifiably could terminate its consideration of the housekeeping issue on the strength of an assumption to that effect. Rather, the Board should have kept the issue open to await LILCO's further actions to ensure that housekeeping problems no longer existed. Accordingly, we shall remand this phase of the proceeding to the Licensing Board and require the staff to certify to the Board that LILCO has met its commitments and is maintaining an appropriate level of cleanliness. The Board shall review the staff's

²⁴⁹ Id. at 66. The County also argues that the Confirmatory Action Letter cannot be relied upon because it was not permitted to present evidence on the letter. Id. at 66-67. This argument is actually part of the County's assertion that the Board below erred in prohibiting the County from presenting direct testimony regarding the RAT inspection. We discuss that overall assertion in Section III(C), infra.

certification and determine whether compliance has been achieved.²⁵⁰

(ii) Control of Calculations

A second example of the Licensing Board's error with respect to QA compliance, according to the County, concerns the Board's treatment of calculation deficiencies, particularly related to the "ready traceability" of data.²⁵¹ Ready traceability involves the ability to identify the source of the data, as well as the computer program (if any) employed in performing particular calculations.²⁵² As a result of a review of audits of Stone and Webster's Shoreham engineering project by its Engineering Assurance Division since 1973, twenty-nine deficiencies concerning ready

²⁵⁰ We take into account the staff's assessment that none of the identified housekeeping deficiencies posed a safety problem. Nonetheless, we believe strict compliance with the actions set out in CAL 83-01 is necessary to ensure that deficiencies with safety significance do not arise in the future. In this connection, at oral argument, the County made clear that it did not believe that housekeeping problems justified denial of a license. Rather, it sought only to guarantee that items important to safety have been maintained in a clean condition. App. Tr. 103-07. Although the County was somewhat unsatisfied with the staff's monitoring of cleanliness and sought an audit by some independent, outside auditors approved by the Licensing Board, App. Tr. 104, we are confident that our requirement that the Board approve a staff certification will be sufficient to guarantee that housekeeping receives proper attention from the LILCO management.

²⁵¹ Suffolk Brief at 67.

²⁵² Tr. 13,323-24; 13,332-33 (Eifert).

traceability have been identified in audit observations.²⁵³

The Licensing Board discussed this issue as follows:

S&W [Stone and Webster] asserted that there always was traceability, but that in S&W's own view there was not positive ("ready") traceability of the kind that S&W procedures required. In some instances it took as much as 10 hours to find the input for a given analysis. The observations did not indicate that the input used was incorrect or that the calculation reviewer failed to review the corrections of the input. Nevertheless, S&W, through its audit program, ensured that action was taken to correct the conditions identified by each observation in this category. . . . We conclude that any deficiencies in this area had no adverse impact and have been satisfactorily corrected.²⁵⁴

The County asserts that the Licensing Board failed to "come to grips with" the QA implications of these deficiencies.²⁵⁵ According to the County, these deficiencies "are not simply items of 'minor' concern . . . whose significance/insignificance can be resolved just by determining whether there has been correction or a potential, identifiable safety impact."²⁵⁶ Based on the

²⁵³ LILCO Exh. 24, fol. Tr. 13,320; SC Exh. 51; SC Exh. 53, Tr. fol. 10,726. An "audit observation" is defined in the Stone and Webster Quality Assurance Program Manual as "[a] description of each program deficiency in sufficient detail to assure that corrective action can be effectively carried out by the audited organization." LILCO Ex. 21, Attachment 5 at III-4.

²⁵⁴ LBP-83-57, supra, 18 NRC at 587.

²⁵⁵ Suffolk Brief at 68.

²⁵⁶ Ibid.

repeated failures of Stone and Webster to comply with its procedures for ready traceability, the County maintains that LILCO's QA program was not effective in implementing the requirements of Criterion V of Appendix B or in taking necessary corrective and preventative action.²⁵⁷

In advancing this line of argument, the County acknowledges that the "ready traceability" problems have not caused safety defects.²⁵⁸ It nonetheless would have us find that the existence of these deficiencies reveals some inadequacy in the Shoreham QA effort. This is not necessarily so. Appendix B, after all, does not establish requirements for the maximum amount of time allowed in tracing the data used in design calculations. Criterion XVII, Quality Assurance Records, requires simply that records be "identifiable and retrievable." Stone and Webster personnel were always able to trace the data,

²⁵⁷ Id. at 71. Criterion V, Instructions, Procedures, and Drawings, of Appendix B states:

Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Instructions, procedures, or drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

²⁵⁸ Suffolk Brief at 69.

although in some instances it took as long as ten hours to find the input for a given analysis.²⁵⁹ Thus, there was traceability, but not as prompt as required by Stone and Webster internal procedures.²⁶⁰ We are unprepared to condemn LILCO's QA program as a result of an effort (not completely successful as of the time of the hearing) to establish a strict system for traceability. In our opinion, applicants and licensees should be encouraged to improve on the general requirements of Appendix B. Given the acknowledged lack of any genuine safety shortcoming resulting from the "ready traceability" issue, we find no fault with the QA program in this regard.

Apart from this issue, the County suggests generally that failure to follow rules for the control of calculations can lead to safety concerns.²⁶¹ The County asserts that "there were a number of calculation audit findings, resulting from failure to follow procedural requirements, which clearly had potential to affect safety."²⁶² The

²⁵⁹ Tr. 10,540 (Eifert).

²⁶⁰ Tr. 10,540-41 (Eifert).

²⁶¹ Suffolk Brief at 70.

²⁶² Ibid. As an example, the County refers to a problem with large bore pipe supports that resulted in the reperformance of 1800 design calculations with modifications made to about one percent of those supports. Id. at 70

(Footnote Continued)

Licensing Board specifically reviewed those findings, however, and determined that the deficiencies in this area had been satisfactorily resolved. The Board concluded

that deficiencies identified in this area were minor and were readily corrected without impact on the adequacy of the Shoreham design, construction and installation.²⁶³

We also have reviewed the audit findings and agree with the Board's conclusion. The findings appear to identify deficiencies that one would expect to occur in an engineering project of this magnitude extending over a decade.

(iii) Electrical Separation

In the construction of a nuclear power plant, electrical cables must be separated sufficiently to ensure that a failure in one system does not prevent power from being supplied to a redundant safety system. Maintaining sufficient separation has been an on-going problem at

(Footnote Continued)

n.34. LILCO determined that the primary cause for the need to reperform the calculations was adjustment made to pipe supports during installation. Tr. 10,640-41 (Eifert). Even though some supports were modified following the recalculations, none had lost their entire design safety margin. Tr. 10,641-42 (Museler). While the County did not specify any other audit findings that it believed had the potential to affect safety, LILCO testified that, where necessary, the disclosures contained in the audit findings led to corrective and preventative action. Tr. 13,383-84 (Eifert).

²⁶³ LBP-83-57, supra, 18 NRC at 587-88.

Shoreham.²⁶⁴ The Licensing Board considered this matter and stated:

Noting the lack of current problems in electrical separation and LILCO's several programs in this area, the Board finds LILCO to comply with Commission requirements.²⁶⁵

On appeal, the County argues that the Board failed to respond to the question whether LILCO complied with QA requirements for electrical separation.²⁶⁶ As a result of electrical separation concerns at Shoreham, the County asks us to conclude that LILCO did not implement its QA program in a timely and effective manner.²⁶⁷

Adequate separation of electrical cables is a complex area that has been difficult for all nuclear power plants.²⁶⁸ The staff observed that the Shoreham facility

²⁶⁴ See, e.g., SC Exh. 89B at 4-8; SC Exh. 105, Appendix A; SC Exh. 108, Appendix A; Staff Exh. 8 at 25.

²⁶⁵ LBP-83-57, supra, 18 NRC at 601.

²⁶⁶ Suffolk Brief at 71-72.

²⁶⁷ Id. at 72-75. The County refers to Criterion II of 10 CFR Part 50, Appendix B as a basis for the requirement that the QA program should be implemented in a timely manner. That criterion states, in part:

The applicant shall establish at the earliest practicable time, consistent with the schedule for accomplishing the activities, a quality assurance program which complies with the requirements of this appendix.

²⁶⁸ Tr. 16,969-70 (Gallo); Tr. 17,161 (Narrow).

manifested a "little bit higher . . . level of problem" in this area than the average plant.²⁶⁹ A major reason was the effort by LILCO to implement Regulatory Guide 1.75, which provides guidance for electrical separation.²⁷⁰ According to the staff, applicants implementing this guide during construction (as LILCO has done) would likely have had similar problems.²⁷¹

We believe that the problems regarding electrical separation have been resolved and are not indicative of a breakdown of LILCO's QA program. Over the extended period of plant construction, certain requirements will inevitably change to reflect increased knowledge and experience of designers and regulators. Electrical separation in particular has undergone considerable re-analysis since the early 1970s. LILCO has had a difficult time in this area but appears to have implemented successfully the final separation criteria.²⁷²

In the circumstances, we find that LILCO has complied with Criterion II of 10 CFR Part 50, Appendix B by implementing a QA program with respect to electrical

²⁶⁹ Tr. 16,969-70 (Gallo).

²⁷⁰ Tr. 16,582 (Gallo).

²⁷¹ Ibid.

²⁷² Tr. 16,936-37; 16,970-71 (Higgins).

separation in a timely and effective manner. It might also be noted that LILCO has agreed to perform partial reinspection of electrical cables as part of an agreement between the parties to resolve another contention.²⁷³ The agreement also includes a provision for a 100 percent inspection if a certain number of deficiencies are identified.²⁷⁴

3. Quality Assurance Organization

The LILCO operational quality assurance organization is separated into an onsite Operational Quality Assurance (OQA) Section and an offsite Quality Assurance (QA) Department.²⁷⁵ The onsite OQA Section is headed by the OQA Engineer, who reports to the Plant Manager. The Plant Manager, in turn, reports to the Vice President, Nuclear. The offsite QA Department is headed by the QA Manager, who reports directly to the Vice President, Engineering. The QA Manager has authority to develop and direct the overall QA program for Shoreham but has no functional or administrative authority over the onsite OQA Engineer. One of the functions of the

²⁷³ See Resolution of SC Contention 31/SOC Contention 19(g) - Electrical Separation, Tr. fol. 18,596 at 5.

²⁷⁴ See Amendment to "Resolution of SC Contention 31/SOC Contention 19(g) - Electrical Separation," Tr. fol. 17,818.

²⁷⁵ LILCO Exh. 21, Attachment 4, Sections 1.2.7, 1.2.19 and 1.2.22, and Exhibits (Figures) 1.1 and 1.2.

QA Department, however, is to audit the performance of the OQA Section.²⁷⁶

Criterion I of 10 CFR Part 50, Appendix B requires, generally, that the persons and organizations performing quality assurance functions have sufficient authority and organizational freedom to identify quality problems; initiate, recommend, or provide solutions; and verify implementation of solutions. To that end, those persons and organizations are to report to a management level such that the required authority and organizational freedom are provided. In Contention 13, the County asserted that LILCO's operational quality assurance program did not comply with Criterion I. It argued at the hearing that the operational quality assurance organization did not enjoy sufficient independence.

The Licensing Board rejected the County's argument. In assessing the independence of the operational QA function, the Board considered not merely the organizational structure but all aspects of the operational QA program, including oversight by various groups within LILCO. The Board concluded that LILCO's overall program for operational QA

²⁷⁶ Tr. 12,718; 12,796-97; 14,902 (Muller); Tr. 20,224-25 (Caphton).

provides sufficient organizational freedom and independence from cost and schedule concerns.²⁷⁷

The County continues on appeal to press its argument that the LILCO organizational structure is unacceptable.²⁷⁸ Several considerations, however, convince us that the LILCO operational QA organization has sufficient authority and organizational freedom to satisfy Criterion I of Appendix B. First, the Commission has indicated that there is no need for the rigid separation of quality assurance personnel from individuals having significant responsibility for work performance that is advocated by the County.²⁷⁹ Further, the LILCO organizational structure meets the current staff and industry guidance for providing the necessary freedom and independence for quality assurance personnel.²⁸⁰ Finally, and most significant, while the onsite OQA Engineer

²⁷⁷ LBP-83-57, supra, 18 NRC at 584-85.

²⁷⁸ Suffolk Brief at 82-87.

²⁷⁹ See 40 Fed. Reg. 3210C (1975); 39 Fed. Reg. 13,974 (1974).

²⁸⁰ The NRC Standard Review Plan (NUREG-0800) and Revision 2 of Regulatory Guide 1.33, "Quality Assurance Program Requirements (Operation)," accept the LILCO organizational structure. Tr. 20,220-23 (Gilray); Tr. 14,837-38 (Muller). Revision 2 of Regulatory Guide 1.33 endorses American National Standards Institute Standard N18.7 - 1976, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants," with certain exceptions not relevant here. Tr. 14,837-38 (Muller).

reports to the Plant Manager, the OQA Section is audited by the offsite QA Department. This audit program, along with oversight by other organizational entities within and outside LILCO, provides us with confidence that the LILCO operational quality assurance personnel will have adequate independence from cost and schedule concerns.²⁸¹ Contrary to the County's assertion that outside audits and oversight would only detect influence after the fact, we believe that this continuing surveillance of the OQA Section would provide a substantial incentive for proper action by those quality assurance personnel initially.

C. Procedural Issues

The County asserts that various Board procedural rulings prejudiced its ability to present its case. We have reviewed each of the County's charges. In doing so, we start from the proposition that a mere demonstration that the Board erred is not sufficient to warrant appellate relief.²⁸² "The complaining party must demonstrate actual prejudice -- i.e., that the ruling had a substantial effect

²⁸¹ This independent surveillance of the OQA Section was essential to the staff's acceptance of the LILCO organizational structure. Tr. 20,187-88 (Gilray).

²⁸² Cleveland Electric Illuminating Co. (Perry Nuclear Power Plant, Units 1 and 2), ALAB-443, 6 NRC 741, 756 (1977).

on the outcome of the proceeding."²⁸³ In each instance we seriously doubt that any error was committed. More importantly, we are convinced that the County has totally failed to demonstrate actual prejudice.

1. The County objects generally to the time limits placed on its cross-examination. Despite the limits, the quality assurance portion of the hearing lasted fifty-five days and involved consideration of scores of County exhibits. Even the County's counsel characterized the hearings as "undeniably long . . . undeniably detailed."²⁸⁴ During the hearing, the County was admonished by the Board to pursue its best points first²⁸⁵ and we must assume that the County did so. While the Board clearly did not accord the County an unfettered right to cross-examine, our review of the record reveals no genuine prejudice flowing from the Board's limitations. We note, moreover, that despite the limits, in only two instances did the County make an offer of proof following a curtailment of cross-examination.²⁸⁶

²⁸³ Louisiana Power and Light Co. (Waterford Steam Electric Station, Unit 3), ALAB-732, 17 NRC 1076, 1096 (1983).

²⁸⁴ App. Tr. 113.

²⁸⁵ See, e.g., Tr. 11,319-21 (Judge Brenner).

²⁸⁶ See Suffolk County Offer of Proof (OQA), SC Ex. 79 (Nov. 9, 1982) and Suffolk County Offer of Proof, SC Ex. 78 (Nov. 5, 1982).

In one case, the offer related to issues that were ultimately settled by agreement among the parties.²⁸⁷ In the other case, involving document control and alleged deficiencies concerning the storage of items in the wrong areas, the County does not attempt to explain how its offer of proof relates to the Board's substantive findings on these issues. Thus, we are hard pressed to see how the Board's limitation genuinely affected the County's case.

2. The County complains that the Board impermissibly required it to restructure its cross-examination plan. Following the first day of highly general foundation examination by the County's counsel, which went largely uninterrupted, the Board urged the County to proceed immediately to that portion of its cross-examination plan that involved the actual examples of quality assurance breakdowns and implementation deficiencies. In the Board's view, any additional foundation questioning could be better pursued after the "nitty-gritty" was revealed.²⁸⁸ Although the County did not strenuously object to the Board's

²⁸⁷ See LILCO's Reply Brief at 58. See also Joint Status Report on SC Contention 13(a) (OQA Procedures) (June 20, 1983).

²⁸⁸ See Tr. 10,260-61 (Judge Brenner).

proposal at the time,²⁸⁹ it now asserts that a presiding officer should not be "permitted to interfere" with a party's structure of its cross-examination absent "a clear abuse in the conduct of that examination."²⁹⁰ The County cites no authority for its view, however, and we know of none. On the contrary, the Commission's rules direct the Board to use its powers

to assure that the hearing is focused upon the matters in controversy among the parties and that the hearing process for the resolution of controverted matters is conducted as expeditiously as possible, consistent with the development of an adequate decisional record.²⁹¹

Given that the County's contentions were directed principally to alleged breakdowns in the implementation of the quality assurance program at Shoreham, the Board reasonably required the County to pursue those matters first. The County was not deprived of an opportunity to return to more general matters at a later stage and it has

²⁸⁹ Counsel asked for, and received, a recess in order to prepare for the more detailed examination. See Tr. 10,265: "If you want me to go to the nitty-gritty, to go through these audits and some other things that establish the pattern, which I am willing to do, I'm not prepared to do so immediately. I think I can be prepared to do so tomorrow morning. . . ." See generally, Tr. 10,264-74.

²⁹⁰ Suffolk Brief at 77.

²⁹¹ 10 CFR Part 2, Appendix A, at V.

not shown how the Board's action in any way prejudiced its case.

3. The County complains that the Board's requirement that it "state precisely, in advance, which audit findings it would pursue and, in addition . . . , state exactly what [its] theory was with respect to those audit findings" is a departure from ordinary NRC hearing practice.²⁹² We fail to see that any error was committed or harm done.

Numerous LILCO and Stone and Webster audits were marked for identification as County exhibits during the course of the hearing.²⁹³ Before the hearing began, LILCO and the County agreed to exchange information as to which audits would be used during cross-examination, so that the witnesses could become familiar with them. Apparently as a result of continuing identification by the County of new documents to be used during cross-examination, LILCO asked the Board to direct the County to prepare some statement explaining how each group of audit findings bears on the County's contentions regarding alleged breakdowns in quality

²⁹² Suffolk Brief at 77.

²⁹³ See, for example, SC Exhs. 51 and 56. Each of these exhibits collects thirty or more separate audit reports which, together, comprise hundreds of pages.

assurance.²⁹⁴ The Board did so, and the County complied.²⁹⁵ The County does not indicate that it objected to the Board's ruling or how it has been prejudiced by it. Given the extensive audit findings the County sought to examine by way of cross-examination, we cannot conclude that the Board abused its discretion in requiring the County to explain in some detail which audit findings it would examine, and why.²⁹⁶

4. The County argues that the Board improperly denied it the right to introduce certain audit reports into evidence. In this connection, the County directs our attention to hearing transcript pages 10,286-89 where, it claims, "the Board refused admission of particular audits into evidence" but required, instead, that the County "go through each audit finding which the County believed supported its case."²⁹⁷ Its complaint is without merit.

²⁹⁴ See LILCO's Motion for Further Board Direction on the Conduct of QA Cross-Examination (Oct. 5, 1982) at 15.

²⁹⁵ See Suffolk County Submittal of QA/QC Information (Oct. 11, 1982).

²⁹⁶ Indeed, the County concedes that, given the highly technical nature of the subject matter, "to some extent, it is appropriate that witnesses know the areas of intended cross-examination so that there can be proper preparation." Suffolk Brief at 77 n.40.

²⁹⁷ Id. at 78.

The County, over the applicant's objection, sought to introduce four exhibits which embrace forty-three separate audits, comprising hundreds of pages of exhibit material. It wanted the exhibits introduced into evidence in their entirety in advance of cross-examination. The Board, instead, directed the County to conduct its cross-examination first, and reserved the right to rule on the admissibility of the exhibits following cross-examination. We see nothing wrong in the Board's approach. In our judgment, the Board was under no obligation to allow the introduction of masses of undigested information but was entitled to limit the evidentiary material to those portions of the audit reports that were genuinely the subject of controversy.²⁹⁸

5. The County challenges the Board's decision to limit its presentation concerning the Readiness Assessment Team (RAT) inspection to cross-examination and the filing of proposed findings.²⁹⁹ The Board denied the County's request

²⁹⁸ The County contends that five weeks of cross-examination was insufficient because of the Board's refusal to admit audits that were not specifically addressed. Suffolk Brief at 78. The Licensing Board, however, did allow the County to group audit findings. See, e.g., Tr. 11,360. As a result, we believe the County was provided adequate time to present its best case.

²⁹⁹ See 18 NRC at 11-14. FF K-1041 (slip opinion at 1277).

to present a witness to address the inspection results. The Board explained:

The purpose of the inquiry is limited to finding out what the results of the inspection mean, what the staff found and what LILCO's explanation, if any, is for these matters. We don't need another party coming in and telling us what the facts are. We will get the facts in terms of understanding the County's view of the significance of the items. We have had extensive testimony. We will be able to apply these items to that testimony. And that in fact is the very purpose of having these other examples of applying it to the framework of testimony we have. And the County will be able to cross examine and write findings on it. It is just an area that is highly unlikely that we will make any efficient headway with yet another comment on it. We will have the record from LILCO and the [s]taff.³⁰⁰

The County asserts "that it was gross, reversible error for the Licensing Board to permit testimony by two parties, both of whom had previously stated that the allegations of [its] Contentions 12-15 were not true and then to deny the same right to present testimony by the one party who had sponsored those contentions, namely Suffolk County."³⁰¹

The RAT inspection was a special, unannounced team inspection of the Shoreham plant conducted in January 1983 by members of the NRC's Region I staff. The inspection was performed to determine the status of operational readiness

³⁰⁰ Tr. 19,534-35 (Judge Brenner).

³⁰¹ Suffolk Brief at 80.

of the Shoreham facility.³⁰² The inspection report became available as the extensive quality assurance hearing was drawing to a close. As far as we can tell, the Board's purpose in entertaining testimony regarding the RAT inspection was to determine whether its conclusions called into question the evidence already in the record.³⁰³ This purpose appears to be roughly compatible with the County's objectives.³⁰⁴ Counsel for the County characterized its purpose for presenting a witness as follows:

[I]t would be our intent, if we were permitted to file supplemental testimony, it would be focused. It would be, as it is stated, supplemental testimony. I think it would help at the hearing in terms of keying people into what the County would like to examine into.³⁰⁵

There is always a potential for prejudice when a board opens the door to new evidence but allows only some of the

³⁰² Staff Ex. 13, cover letter.

³⁰³ Tr. 18,816: "[W]e are here to put all of the evidence together and we can put in what . . . [earlier inspections] said along with what we hear from other witnesses, including perhaps the more correct witnesses for the RAT inspection; that is, the staff and maybe LILCO witnesses who are familiar with the details of that inspection." (Judge Brenner).

³⁰⁴ Tr. 18,814: "[I]t seems to us . . . that the inspection report makes some determinations in the very areas that were examined and conclusions drawn upon by Torrey Pines with respect to the QA/QC program, which is what this trial is all about." See generally, Tr. 18,812-20 (Miller).

³⁰⁵ Tr. 19,444-45 (Miller).

parties to enter. In the instant case, however, the County appeared interested in presenting affirmative testimony as a means of outlining its areas of concern, rather than presenting additional factual information. As the Board correctly noted, the results of the RAT inspection and LILCO's response to it were matters uniquely within the knowledge of staff or LILCO witnesses. At oral argument, the County acknowledged that it did not intend to address the facts; it argues, however, that it intended to offer expert opinion on what the facts mean.³⁰⁶ To some degree, such argument could easily be presented in its proposed findings. We cannot ignore, however, that its argument to the Licensing Board suggested only that it wished to outline areas for exploration rather than introduce new, affirmative expert analysis. In such circumstances, the Board quite reasonably concluded that the County's concerns could be amply put forth in its proposed findings. Thus, we see no error in the Board's decision.

Even more important, the County simply alleges an error on the Board's part without demonstrating that the error -- if it was an error -- was genuinely prejudicial. The County acknowledges that it made no offer of proof in connection with any affirmative expert testimony it would have put

³⁰⁶ App. Tr. 113.

forward.³⁰⁷ In the circumstances, any procedural error that may have occurred was plainly harmless.

IV. Miscellaneous Technical Issues

A. Water Hammer

As the Licensing Board explained, "water hammer" is engineering jargon used to describe the pressure changes that result from a sudden change in the velocity of liquid through a pipe.³⁰⁸ As the Board also noted, the term was used expansively in this proceeding to include as well transients involving steam (steam hammer) and two-phase flow (e.g., water entrainment in steam lines).³⁰⁹ No one disputes the need to prevent water hammer, reduce its occurrence, and mitigate its effects. The County acknowledges that LILCO witnesses testified that industry experience with water hammer has been taken into account in the Shoreham design, plant procedures, training, and test programs.³¹⁰ It argues, however, that such consideration is too general so there is no basis to believe that there will be any significant improvement at Shoreham over the

³⁰⁷ App. Tr. 116.

³⁰⁸ FF A-3 (slip opinion at 281).

³⁰⁹ LBP-83-57, supra, 18 NRC at 469.

³¹⁰ See R. Chapman, D. Christensen, R. Dafoe, O. Hanner, M. Wells, "Compilation of Data Concerning Known and Suspected Water Hammer Events in Nuclear Power Plants," NUREG/CR-2059, (May 1982) (hereinafter EG&G Report).

experience depicted in the so-called EG&G Report tabulating industry water hammer experience over a twelve year period.³¹¹ The Licensing Board disagreed.

We have reviewed the Board's decision and the underlying record and can find no support for the County's allegation. Among other things, LILCO's witness testified, without serious challenge, that the events described in the EG&G Report were reviewed, that none of the water hammer types was new, and that Shoreham had been adequately designed to guard against the problem.³¹² Furthermore, a staff witness testified that findings and recommendations dealing with design as developed in the Quadrex Report,³¹³ which evaluated the data in the EG&G Report, were incorporated at Shoreham.³¹⁴ Moreover, the Licensing Board found that water hammer was a condition explicitly considered in developing Shoreham's operating procedures³¹⁵ and means to prevent and mitigate water hammer events are

³¹¹ Suffolk Brief at 99.

³¹² Tr. 2335-A to 2335-E (Fortier, Hodges).

³¹³ R. Uffer, S. Banergee, F. Buckholz, M. Frankel, M. Kasahara, L. Miller, A. Silvester, "Evaluation of Water Hammer Events in Light Water Reactors," NUREG/CR-2781 (July 1982).

³¹⁴ Tr. 2113-14 (Hodges).

³¹⁵ FF A-12 (slip opinion at 284-85).

included in operator training.³¹⁶ In sum, if design information is implemented and procedures are followed, water hammer is not likely to be a problem at Shoreham.

B. Environmental Qualification and Post-Accident Monitoring

10 CFR § 50.49^o requires that certain electrical equipment be environmentally qualified, i.e., it must be able to withstand events such as design basis accidents. As far as pertinent here, LILCO must demonstrate the environmental qualification of (1) all nonsafety-related electrical equipment whose failure under postulated environmental conditions could prevent satisfactory accomplishment of safety functions by safety-related electrical equipment (10 CFR § 50.49(b)(2)), and (2) certain post-accident monitoring equipment (10 CFR § 50.49(b)(3)). Suffolk County raised two interrelated contentions concerning compliance with 10 CFR § 50.49. First, it claimed that LILCO failed to comply with the environmental qualification requirements of 10 CFR § 50.49(b)(2). Second, the County argued that LILCO failed to comply with 10 CFR § 50.49(b)(3) because it did not meet the requirements of Regulatory Guide 1.97 Rev. 2.³¹⁷ We treat these claims

³¹⁶ FF A-14 (slip opinion at 285).

³¹⁷ "Instrumentation for Light-Water Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident" (Dec. 1980).

together. The Licensing Board rejected both. With one minor exception, we affirm.

1. Section 50.49(b)(2) Compliance

Because 10 CFR § 50.49(b)(2) did not become effective until after hearings began on this issue,³¹⁸ the LILCO environmental qualification program does not explicitly identify any nonsafety-related equipment that might interact adversely with safety-related equipment.

The County claims that, as a consequence, LILCO cannot be in compliance with the Commission's regulations. "The logical first step in complying with Section 50.49," the County asserts, "is the preparation of a list of all electrical equipment at Shoreham that is important to safety. Following such preparation, the items can be evaluated to determine if they meet the criteria set forth in Section 50.49, and if they do, they must be included in the Shoreham EQ program."³¹⁹ LILCO argues, to the contrary, that electrical equipment identified by section 50.49(b)(2) is typically either classified as safety-related or otherwise isolated by design so as not to prevent

³¹⁸ See LBP-83-57, supra, 18 NRC at 538.

³¹⁹ Suffolk Brief at 103.

accomplishment of safety functions.³²⁰ The NRC staff agrees.³²¹

The Licensing Board suggested that the staff should articulate criteria that applicants would use when identifying specific nonsafety-related equipment that must be qualified under section 50.49(b)(2).³²² Nevertheless, it agreed with LILCO that the Shoreham design did preclude interactions between safety-related and nonsafety-related equipment.³²³

As noted earlier, section 50.49(b)(2) requires each applicant to establish a program for qualifying such nonsafety-related equipment "whose failure . . . could prevent satisfactory accomplishment of safety functions. . . ." While the preparation of a list of equipment as suggested by the County and recommended by the Board would plainly be one method of complying with the regulation, we agree with the Board's conclusion that LILCO's approach is equally satisfactory. As the Board pointed out, LILCO and staff witnesses testified that, for newer plants such as Shoreham, equipment of the type

³²⁰ LILCO's Reply Brief at 95.

³²¹ Staff Brief at 95.

³²² LBP-83-57, supra, 18 NRC at 539.

³²³ Ibid.

identified by section 50.49(b) (2) is either classified as safety-related or otherwise designed so as not to prevent the accomplishment of necessary safety functions.³²⁴ Thus, there should be no nonsafety-related equipment that could compromise the functioning of safety-related equipment. It follows, therefore, that there would be no equipment to be included in a section 50.49(b) (2) list. Such an approach satisfies the requirements of 10 CFR § 50.49.

The County argues, in addition, that LILCO's design approach, even if conceptually valid, is untested, that the staff has no basis for reviewing it, and that there can thus be no assurance that it will satisfy the requirements of section 50.49. As LILCO points out, however, various analyses were performed to provide assurance that there were no unacceptable interactions between safety-related and nonsafety-related electrical equipment.³²⁵ At the hearing, the County's witness challenged LILCO's assertion by pointing to certain nonsafety-related equipment that he believed should be included in the environmental qualification program because their failure could mislead an

³²⁴ Id. at 538-39; FF I-14, I-15, I-16 (slip opinion at 444-45).

³²⁵ LILCO's Reply Brief at 95 n.87. See also Tr. 19,653-54 (Kascsak).

operator. On cross-examination, however, it was demonstrated that such equipment need not be included because, in each case, there was redundant, series or diverse instrumentation that would prevent misleading information being provided to the operator. We have reviewed the record and agree with the Licensing Board's determination that the LILCO and staff testimony has not been effectively undermined.³²⁶

Although the Board was prepared to resolve the contention regarding nonsafety-related equipment in LILCO's favor, it nonetheless recognized that documentation of the Shoreham environmental qualification program was incomplete in two respects. First, the final scope of the environmental qualification program for nonsafety-related equipment had not yet been determined. Second, the staff had not completed its review of the Shoreham plant.³²⁷ The gist of the County's argument is that completion of such review is a prerequisite to a definitive finding that LILCO has complied with section 50.49 and that only the Board can make such finding.³²⁸

³²⁶ LBP-83-57, supra, 18 NRC at 539; FF I-19, I-20, I-21 (slip opinion at 446-47).

³²⁷ LBP-83-57, supra, 18 NRC at 543.

³²⁸ Suffolk Brief at 104-06.

All parties recognize that certain minor matters may be left to the staff for post-hearing resolution where hearings would not be helpful and the Board can "make the findings requisite to issuance of the license."³²⁹ The disagreement arises as to whether the issues left for post-hearing resolution are of the type that must be reserved for board resolution.³³⁰ Except in one respect, we think the answer is no.

Because the LILCO program could not have explicitly included formal qualification of nonsafety-related equipment at the time it was developed, LILCO was to submit to the staff a list of any equipment which must comply with 10 CFR § 50.49(b)(2). Such list was to include equipment whose failure under postulated accident conditions could mislead the operator and thereby prevent satisfactory accomplishment of certain safety functions.³³¹ But the Licensing Board found, with support in the record, that there would be little or no nonsafety-related equipment at Shoreham that could prevent the satisfactory accomplishment of safety functions by safety-related equipment because all

³²⁹ Consolidated Edison Co. of New York (Indian Point Station, Unit No. 2), CLI-74-23, 7 AEC 947, 951 (1974) (footnote omitted).

³³⁰ Id. at 951-52.

³³¹ LBP-83-57, supra, 18 NRC at 636.

nonsafety-related electrical equipment will be either upgraded to be environmentally qualified or isolated from safety-related equipment.³³² As we read the Board's decision, the staff is being asked simply to confirm that LILCO has either upgraded or properly isolated nonsafety-related equipment so that no nonsafety-related equipment falls within the section 50.49(b)(2) category. In our judgment, such confirmation does not constitute an improper delegation of decisional responsibility over adversary issues from the Board to the staff.

Nonetheless, the Board also observed that there may be "a small number of items which must be included in the qualification program."³³³ If so, LILCO would need to justify interim operation before environmental qualification. In such circumstances, the County would be entitled to address this matter. In a note to the parties served last August, the staff indicated that LILCO had submitted any necessary identification of equipment under

³³² Id. at 538-39, 543-44; FF I-14, I-15, I-16, (slip opinion at 444-45). See also Tr. 19,529 ("It is our belief . . . [that] [t]here would be no equipment in that [10 CFR § 50.49(b)(2)] category for Shoreham.") (LILCO witness Kascsak); Tr. 19,510-11 ("It is a general opinion that the list in item [(b)(2)] should be very small or nonexistent. And that is because of the way Class [1E] equipment is normally defined.") (Staff witness Noonan).

³³³ LBP-83-57, supra, 18 NRC at 544.

section 50.49(b)(2) and that this matter "has been resolved by LILCO to the satisfaction of the NRC staff."³³⁴ It is unclear, however, whether the staff's approval rests on its confirmation that there is no equipment that needs to be qualified or a substantive determination that LILCO has properly justified interim operations. As a consequence, we require the staff to advise the Licensing Board (with copies of its filing served on all parties) whether any equipment falls into the section 50.49(b)(2) category and, if so, the basis for the staff's approval. The Licensing Board shall review the staff's submission and take such further action as it deems necessary.

2. Section 50.49(b)(3) Compliance

Certain post-accident monitoring equipment must be environmentally qualified in accordance with 10 CFR § 50.49(b)(3). Specific guidance concerning the types of variables to be monitored is provided in Regulatory Guide (Reg. Guide) 1.97, Rev. 2, and a schedule for implementing that guide is set out in SECY-82-111,³³⁵ adopted by the

³³⁴ Note to Attached Service List from Bernard M. Bordenick (August 7, 1984), transmitting Memorandum for Edwin Reis, from A. Schwencer, "Shoreham License Conditions" (July 30, 1984) at 2.

³³⁵ "Requirements for Emergency Response Capability" (March 11, 1982).

Commission in 1982.³³⁶ At the hearing, the County contended that LILCO was not in compliance with Reg. Guide 1.97 for two reasons: first, that regulatory guide had not yet been implemented by the staff so there was no staff position on whether LILCO was in compliance; second, four specific variables would not be properly monitored. The Board acknowledged that it had to decide the issues presented by the County in the absence of staff testimony on their technical merits.³³⁷ Nevertheless, it did not see that lack of information as an obstacle to decision. Rather, it reviewed the evidence submitted by LILCO and the County and concluded that the post-accident monitoring equipment would achieve the purposes stated in the regulatory guide for the four variables in question.³³⁸

The County does not seriously challenge the Board's technical resolution of the issue.³³⁹ Rather, it contends that the Board should have found that the issue was not ripe for litigation because the staff had failed to complete its

³³⁶ See FF H-8 (slip opinion at 420).

³³⁷ LBP-83-57, supra, 18 NRC at 533.

³³⁸ Id. at 535.

³³⁹ Suffolk County argues generally that there is insufficient information to permit the conclusion that LILCO will adequately comply. Suffolk Brief at 121. The County fails to support its argument in this respect, however.

work.³⁴⁰ It claims, in this connection, that LILCO's "commitment" to comply with Reg. Guide 1.97 is an insufficient basis for the Board's decision. We uphold the Board's determination.

We do not find the staff's failure to implement Reg. Guide 1.97 or to review Shoreham's post-accident monitoring capability to be an obstacle to the Board's resolution of the issue. To begin with, SECY-82-111 provides that Reg. Guide 1.97 compliance need not be accomplished before fuel loading. Thus, such compliance is not a precondition to issuance of the Board's decision. Moreover, regulatory guides do not set out mandatory regulatory requirements. Methods and solutions different from those set out in the guides can be acceptable if they provide a basis for the findings requisite to the issuance of a license.³⁴¹ In the instant case, based on the evidence in the record, the Licensing Board concluded that LILCO satisfied the purposes stated in the regulatory guide for each of the four items which were the subject of the County's contention.³⁴² The

³⁴⁰ Id. at 120-21.

³⁴¹ Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 1), ALAB-698, 16 NRC 1290, 1299 (1982), reversed in part on other grounds, CLI-83-22, 18 NRC 299 (1983).

³⁴² LBP-83-57, supra, 18 NRC at 535.

Board's substantive conclusion is unchallenged. We have reviewed the record and find no basis for upsetting the Board's decision.

C. Passive Mechanical Valve Failure

Suffolk County is concerned about the possibility that undetected failures will occur in valves used in various Shoreham safety-related systems. On appeal, the County makes three principal points. First, it maintains there should be a comprehensive failure analysis of all safety-related valves. Such analysis is necessary, the County claims, chiefly for two reasons: there have been repeated valve failures and there is no better way to justify requests for deviation from valve testing frequency requirements. Second, it asserts that, absent such analysis, all safety-related valves should have position indicators. Third, it contends that the Board improperly construed the single-failure criterion embodied in the Commission's regulations. We affirm the Board's determination.

The Board found, with support in the record, that the safety-related valves were constructed to appropriate codes and standards and are highly reliable.³⁴³ The analysis recommended by the County does not represent standard

³⁴³ Id. at 483.

industry practice and is not required by Commission regulations.³⁴⁴ The County concedes as much³⁴⁵ but argues that the experience at other plants justifies the type of comprehensive analysis it seeks. The Board carefully scrutinized the one historical example of supposed unreliability pointed to by the County -- namely, the failure of main steam isolation valves at Brunswick Unit 2. It concluded that the valve failures were caused primarily by plant-specific maintenance problems at the Brunswick plant, and that, in any event, the failures were detectable.³⁴⁶ We agree.

Section 50.55a of 10 CFR requires valve testing to satisfy the requirements of the ASME Boiler and Pressure Vessel Code Section XI. The Code prescribes a three month testing interval for valves.³⁴⁷ Nonetheless, deviations from Code requirements are permitted.³⁴⁸ In our judgment, and contrary to the County's assertion, comprehensive analysis of all valves is not needed to justify departures

³⁴⁴ FF C-19 to C-21 (slip opinion at 312).

³⁴⁵ Suffolk Brief at 107.

³⁴⁶ LBP-83-57, supra, 18 NRC at 484.

³⁴⁷ Tr. 3656 (Fortier).

³⁴⁸ Tr. 3635 (Fortier); Tr. 3929 (Kirkwood). See also, 10 CFR § 50.55a(a)(2).

from valve testing frequencies. Such deviations require technical justification which must be evaluated by the staff. While we are inclined to agree with the County that a comprehensive analysis of the type it seeks could provide some additional information, the County has not demonstrated that the current deviation approval procedure is faulty or unsatisfactory or that a comprehensive analysis would result in a significant improvement over existing practices.

The Board thoroughly evaluated the County's argument about the need for position indicators, and rejected it.³⁴⁹ We can add little to the Board's analysis. The Board noted that many safety-related valves have position indicators, and that the others either cannot accommodate them (but nonetheless have some other mechanism for detecting failure) or are sufficiently reliable not to warrant them.³⁵⁰ The County's witness did not suggest that such indicators were essential, but merely desirable.³⁵¹ We do not believe that the County has undermined the Board's findings regarding the need for position indicators.

³⁴⁹ LBP-83-57, *supra*, 18 NRC at 484-86. FF C-35 to C-40 (slip opinion at 317-19).

³⁵⁰ FF C-35 to C-37 (slip opinion at 317-18).

³⁵¹ See Tr. 3725 ("... I think I would feel better if they all had them.") (Bridenbaugh).

Finally, the County challenges the Board's approval of LILCO's application of the so-called single failure criterion. That criterion provides:

A single failure means an occurrence which results in the loss of capability of a component to perform its intended safety functions. Multiple failures resulting from a single occurrence are considered to be a single failure. Fluid and electric systems are considered to be designed against an assumed single failure if neither (1) a single failure of any active component (assuming passive components function properly) nor (2) a single failure of a passive component (assuming active components function properly), results in a loss of the capability of the system to perform its safety function.²

² Single failures of passive components in electric systems should be assumed in designing against a single failure. The conditions under which a single failure of a passive component in a fluid system should be considered in designing the system against a single failure are under development.³⁵²

Generally speaking, the single failure criterion requires that fluid and electric systems remain functional even if there is a single failure of a component.

LILCO witness Raymond E. Fortier described the application of the single failure criterion for fluid systems at Shoreham as follows:

First, the fluid systems are designed for a single failure of active components. Also, fluid systems are designed for single failure of passive

³⁵² 10 CFR Part 50, Appendix A, Definitions and Explanations.

components such as pump seals,³⁵³ valve stem seals, and measuring devices

LILCO claims that such design satisfies the regulations with respect to the single failure criterion.³⁵⁴ The County contends, however, that the criterion requires that fluid systems remain functional where there is a failure in an active component and it is also assumed that there is a passive failure that cannot be detected via periodic testing or functional observation.³⁵⁵ The Licensing Board rejected this interpretation of the criterion.³⁵⁶ We affirm.

To begin with, the Board's interpretation is consistent with the language of Appendix A, which requires, with one exception, assumption of the failure of a single active component or a single passive component, but not both simultaneously. The County's interpretation would transform the rule essentially into a "double failure" criterion, i.e., the failure of an active component along with the

³⁵³ Tr. 3633.

³⁵⁴ Tr. 3634 (Fortier).

³⁵⁵ Suffolk Brief at 109. An active component is one which requires mechanical movement to perform its safety function. A passive component is not required to have such movement to perform its function. Failure of a valve to open upon receipt of an initiation signal would be an example of an active failure. Leakage from a valve stem would constitute an example of a passive failure. Tr. 3640-41 (Fortier).

³⁵⁶ LBP-83-57, supra, 18 NRC at 482.

assumed failure of a passive component.³⁵⁷ Moreover, as the Licensing Board observed, the County could not point to any study or example supporting its interpretation of the single failure criterion.³⁵⁸ In such circumstances, we have no basis for upsetting the Board's interpretation.

³⁵⁷ See ibid. See also Tr. 3561-62 (Minor).

³⁵⁸ FF C-21 (slip opinion at 312). The County contends that its proposed approach "is a methodology that has been used in electrical system evaluation," citing to testimony at pp. 3562 and 3574 of the transcript. See Suffolk Brief at 109-10. The testimony does not support that assertion. The County's witness conceded that he could point to no specific examples when his interpretation had been employed and was able to suggest only "the likelihood that some plants have considered at least portions of this type of analysis in conducting their PRA analysis. . . , and considering certain failure mechanisms in their safety systems that would probably get into the assumption of certain valve failures." Tr. 3573-75 (Minor). Similarly, the County claims that "even LILCO's witness confirmed that a limited number of passive failures should be assessed along with a single active failure," citing to testimony at p. 3648 of the transcript. Suffolk Brief at 109. We disagree with the County's reading of the testimony. As we construe it, the witness testified that the conditions under which a single failure of a passive component in a fluid system should be considered have not been established. That does not relieve an applicant, however, of the obligation for considering passive failures in the design of a facility. LILCO did so by analyzing the three most likely passive failures, i.e. pump seals, valve stem leakage, and measuring devices. Tr. 3648 (Fortier). We do not understand the witness to suggest that LILCO undertook anything analagous to a "double failure" analysis of the type advocated by the County. See generally Tr. 3634 (Fortier). In any event, neither the County nor its witness has demonstrated that its interpretation has been applied as a regulatory requirement.

D. Anticipated Transient Without Scram

A scram is the shutting down of a nuclear reactor, either automatically or manually by the reactor operator. At times, events will occur that should produce a scram, but do not. An anticipated transient without scram (ATWS) occurs when the reactor trip system -- or scram system -- fails to operate as required and the reactor consequently does not shut down. Some ATWS events obviously have serious safety significance.³⁵⁹

In 1981 the Commission proposed various modifications looking to the prevention or mitigation of ATWS events.³⁶⁰ At the same time, it noted that certain changes -- installation of a recirculation pump trip on boiling water reactors (BWRs) and changes in operating procedures and operator training, for example -- were already underway, and found that there were no substantial safety risks in operating over the next two or four years while additional changes were being implemented.³⁶¹ Recently, the Commission made its ATWS rule final.³⁶² It has required the installation or modification of certain equipment and has

³⁵⁹ See 46 Fed. Reg. 57,521 (1981).

³⁶⁰ Ibid.

³⁶¹ Id. at 57,522.

³⁶² See 49 Fed. Reg. 26,036 (1984).

recommended the establishment of a reliability assurance program to enhance the effectiveness of the reactor trip system.³⁶³

At issue on the appeal is whether LILCO has taken adequate measures to protect the public pending full implementation of the requirements set out in the Commission's final rule. The County claims that the Board erroneously concluded that LILCO has taken such measures. Specifically, the County argues that the Board did not demonstrate why the interim measures are a sufficient substitute for a redundant, automated standby liquid control (SLC) system; that it did not have sufficient evidence to find that the interim measures are satisfactorily implemented; and that it did not adequately explain why it rejected several of the County's concerns.³⁶⁴ We have reviewed the Board's decision and find no fault with its determinations.

The County believes, first and foremost, that General Design Criterion 20 of 10 CFR Part 50, Appendix A has not been met in that no interim measures are sufficient to compensate for the lack of an automatically initiated and totally redundant SLC system that meets the single failure

³⁶³ Id. at 26,038-41.

³⁶⁴ Suffolk Brief at 110.

criterion. The need for such system was considered by the Commission -- and rejected -- during the course of the rulemaking.³⁶⁵ That being so, there is no basis for concluding that such system is needed as an interim measure.

Shoreham interim operating procedures for mitigating the consequences of an ATWS were based on guidance developed by General Electric and reviewed by the NRC staff.³⁶⁶ The Licensing Board found these procedures adequate.³⁶⁷ The County claims that there was insufficient evidence to show that the interim measures are acceptable. Principally, it argues that the staff testimony indicating approval of the interim measures is unreliable because the staff witness did not personally evaluate the Shoreham ATWS procedures.³⁶⁸

³⁶⁵ The final rule requires installation of an automatically initiated SLC system only if the plant were already designed and built to include that feature. There is no requirement for a redundant system for any facility. See 49 Fed. Reg. at 26,042-45.

³⁶⁶ LBP-83-57, supra, 18 NRC at 500.

³⁶⁷ Id. at 503-04.

³⁶⁸ Suffolk Brief at 111. The County also asserts that certain criteria upon which the staff based its review was not part of the record. Ibid. The County fails to explain this assertion. We note that ATWS criteria are contained in Section 15.3 of the SER. See Tr. fol. 9255. Thus, we are unable to conclude that the County's assertion is correct or, if true, is significant.

We reject the County's claims. Although the staff witness was not responsible for the formal staff evaluation of Shoreham's ATWS procedures, he nonetheless reviewed the Shoreham ATWS submittal³⁶⁹ and was familiar with, and approved, the criteria used to evaluate the interim procedures.³⁷⁰ Moreover, it is evident from the decision that the Board itself reviewed the procedures in detail.³⁷¹ In the circumstances, the County has failed to undermine the Board's conclusion that the interim measures are acceptable.

The County also argues that the Board failed to address specific recommendations that the County believes would improve ATWS protection. As we discussed, the Licensing Board specifically found the current procedures to be satisfactory³⁷² and we must therefore assume that it found additional modifications unnecessary. Nevertheless, we have reviewed the County's suggestions and find them unpersuasive.

First, the County contends that the ATWS procedures should be revised to require immediate verification of

³⁶⁹ Tr. 8967, 8983 (Hodges).

³⁷⁰ Tr. 8966 (Hodges).

³⁷¹ LBP-83-57, supra, 18 NRC at 500-02; FF D-6 to D-12 (slip opinion at 339-44).

³⁷² LBP-83-57, supra, 18 NRC at 503-04.

sodium pentaborate injection.³⁷³ Plainly, the prompt injection of sodium pentaborate is important to slow the chain reaction and thus lower the power level in the reactor in the event of an ATWS. But there is no need to single out this item for separate and immediate verification. Verification of all "Immediate Operator Actions" is required in Step 4.1 of the ATWS procedure.³⁷⁴ Moreover, all operators are trained to look for expected results of any action they have just initiated.³⁷⁵

The County urges that the operator be instructed to raise the water level above the top of the active fuel.³⁷⁶ This instruction is already provided in the ATWS procedure as an immediate operator action under certain conditions and as a final plant condition, and the need to keep the fuel covered with water is also listed in the discussion section of the procedure.³⁷⁷

The County contends that the procedures should be modified to require that the SLC system achieve about

³⁷³ Suffolk Brief at 111-12.

³⁷⁴ See Attachment 1 to Tr. fol. 8870 (Calone, et al.).

³⁷⁵ Tr. 9029, 9035 (Calone).

³⁷⁶ Suffolk Brief at 111.

³⁷⁷ See Attachment 1 to Tr. fol. 8870 at 3-5 (Calone, et al.).

eighty-six gallons-per-minute flow.³⁷⁸ This requirement was adopted by the Commission as part of the final rule. The implementation date remains open, however, pending further Commission guidance.³⁷⁹ In light of the other steps to be taken on an interim basis, we see no need to compel adoption of these procedures in advance of any timetable the Commission may establish generally.

The County claims that the current procedures are ambiguous and that the operator should be explicitly directed first to attempt to scram the reactor manually.³⁸⁰ The Licensing Board found no ambiguity in the procedures,³⁸¹ and we agree. As the Board explicitly found, the first three immediate operator actions, as set out in the procedures, are to arm and depress the manual scram pushbutton, place the mode switch in shutdown, and verify that all rods are inserted.³⁸² In short, the operator is instructed first to scram the reactor manually. If the reactor does not scram at that stage, the operator would

³⁷⁸ Suffolk Brief at 111.

³⁷⁹ 49 Fed. Reg. at 26,045.

³⁸⁰ Suffolk Brief at 112.

³⁸¹ See LBP-83-57, supra, 18 NRC at 501; FF D-6 (slip opinion at 339-40).

³⁸² FF D-6 (slip opinion at 340).

need to take certain further steps, described in the procedures as conditional immediate operator actions. It is these actions that the County appears to believe are ambiguous. It argues, in this connection, that LILCO's witness testified that an operator would decide to initiate the SLC system pumps without attempting other means of manually scrambling the reactor.³⁸³ We disagree with the County's reading of the testimony. As we read it, operators would concurrently undertake further efforts to scram the reactor manually while initiating the conditional immediate operator actions, such as starting the SLC system pumps. The Board found, based on the evidence, that the possibility of misleading instructions is eliminated in training and that this arguable ambiguity does not cause problems in practice.³⁸⁴ It suggested -- but did not require -- that this aspect of the procedure nonetheless be clarified by LILCO in consultation with the staff, and we endorse both its suggestion and its refusal to require such clarification as a condition of the license.

Suffolk County believes that the ambiguities and omissions it perceived in the emergency procedures raise broader questions about the adequacy of the operator

³⁸³ Suffolk Brief at 112-13.

³⁸⁴ LBP-83-57, supra, 18 NRC at 501.

training for ATWS events.³⁸⁵ In particular, the County appears concerned that the staff did not specifically review the ATWS training. It is true that the training itself was not reviewed. Rather, the staff will rely on the operator testing to verify that training has been satisfactory.³⁸⁶ Nonetheless, LILCO testified about training procedures and, relying on such testimony, the Board found training adequate to protect the public.³⁸⁷ Nothing in Suffolk County's highly general allegations warrants overturning the Board's determination.

Finally, the County contends that, because there is a ten-minute rule of thumb applied to the design of safety-related systems used to mitigate accidents, LILCO improperly relies on an operator taking action within forty seconds of an ATWS event. The County asserts that LILCO should perform an analysis of the effects of delaying manual initiation of the SLC system for ten minutes after the onset of a severe ATWS event.³⁸⁸

³⁸⁵ Suffolk Brief at 114.

³⁸⁶ Tr. 8968 (Hodges).

³⁸⁷ LBP-83-57, supra, 18 NRC at 503; FF D-13 (slip opinion at 344-45).

³⁸⁸ Suffolk Brief at 113.

We see no need for such analysis. First of all, the ten-minute rule of thumb is not a requirement but is merely an assumption used in analyzing certain transients for design purposes.³⁸⁹ Moreover, the record shows that the procedures are adequate. LILCO's witness testified that there will be several alarms that will alert the operator that a scram is imminent or has occurred.³⁹⁰ The "immediate actions" incorporated in the emergency shutdown procedure call for a manual scram and verification of a rapid neutron flux decrease.³⁹¹ The ATWS is therefore recognizable within seconds of occurrence, and the operator will continue to attempt manual insertion of the control rods until the threshold for SLC system initiation is reached. Such sequence should not require ten minutes for operator action. Nor are there other demands on the operator that would take priority over SLC system initiation.³⁹² As a consequence, we find the current procedures acceptable and see no need to employ a "ten-minute" requirement.

³⁸⁹ See Tr. 9239 (Eckert).

³⁹⁰ Tr. 9065 (Calone).

³⁹¹ Applicant Ex. 6, Tr. fol. 1699.

³⁹² Tr. 9031 (Calone).

E. Seismic Design

The effects of the vibratory ground motion of an earthquake must be considered in the engineering design of a nuclear power plant.³⁹³ Earthquake motion is described in terms of displacement (the distance a point on the ground moves); velocity (the speed at which the point moves); and acceleration (the rate at which that velocity changes). In order to determine the effect of these motions on a nuclear power plant and the adequacy of the structural design, a "response spectrum" is developed. A response spectrum is defined in the regulations as

[A] plot of the maximum responses (acceleration, velocity or displacement) of a family of idealized single-degree-of-freedom damped oscillators against natural frequencies (or period) of the oscillators to a specified vibratory motion input at their supports.³⁹⁴

As we noted in our Diablo Canyon opinion, response spectra tend to have jagged peaks and valleys which are evened out when the spectra are combined for engineering analysis and design purposes. When so "smoothed" they are sometimes called "design response spectra."³⁹⁵

³⁹³ See 10 CFR Part 100, Appendix A, § VI(a)(1).

³⁹⁴ 10 CFR Part 100, Appendix A, § III(1).

³⁹⁵ Pacific Gas and Electric Co. (Diablo Canyon Nuclear Power Plant, Units 1 and 2), ALAB-644, 13 NRC 903, 924 n.40 (1981), review declined, CLI-82-12A, 16 NRC 7 (1982).

Reg. Guide 1.60³⁹⁶ was issued by the staff in 1973 to provide the industry with an acceptable methodology for defining these design response spectra. As we have noted earlier, regulatory guides do not constitute regulatory requirements.³⁹⁷ With regard to design response spectra, in fact, the staff encourages that they be developed on a site-specific basis rather than by application of the spectra reflected in the guide, and may even request site-specific spectra for certain sites.³⁹⁸

Such site-specific spectra were developed for Shoreham (before, it might be noted, Reg. Guide 1.60 was issued).³⁹⁹ They differ in some respects from the spectra that would be obtained from application of Regulatory Guide 1.60. In particular, the Safe Shutdown Earthquake (SSE) design response spectrum at certain frequencies is less conservative than that developed using Regulatory Guide 1.60. Following its review, the Board concluded that the Shoreham SSE design response spectrum was developed in

³⁹⁶ "Design Response Spectra for Seismic Design of Nuclear Power Plant", Reg. Guide 1.60 (Rev.1) (Dec. 1973).

³⁹⁷ See note 341 and accompanying text, supra.

³⁹⁸ Tr. 4184-85 (Rothman).

³⁹⁹ See FF E-21 to E-22 (slip opinion at 353-54).

accordance with the Commission's regulations and is adequately conservative.⁴⁰⁰

The County does not identify deficiencies in the analysis actually employed at Shoreham. Rather, it argues that Part 100, Appendix A of the Commission's regulations requires the SSE spectrum to define the maximum vibratory accelerations predicted for a facility and that, to the extent the site-specific SSE spectrum is less conservative than that set out in Reg. Guide 1.60, LILCO has failed to demonstrate that the site-specific SSE spectrum is sufficiently conservative.⁴⁰¹ The Board found that it was inappropriate to compare the spectra produced by the site-specific methodology and Reg. Guide 1.60.⁴⁰² We agree.

All of the witnesses who testified on the issue explained that there was neither any need for nor any merit in comparing the site specific spectrum with that contained in Reg. Guide 1.60.⁴⁰³ The SSE spectrum derived for Shoreham reflects actual site characteristics. Reg. Guide 1.60 spectra are designed for applicability at essentially

⁴⁰⁰ LBP-83-57, supra, 18 NRC at 506-10.

⁴⁰¹ Suffolk Brief at 115-16.

⁴⁰² LBP-83-57, supra, 18 NRC at 509.

⁴⁰³ See Tr. 4176 (staff witness Rothman); Tr. 4178 (applicant witness Wong); Tr. 4140 (applicant witness Lucks). The County presented no witnesses on this issue.

any location in the country and are unnecessarily conservative for Shoreham.⁴⁰⁴ The County in effect advocates that we require compliance with site-specific criteria or Reg. Guide 1.60, whichever is more conservative. We do not believe that the Commission's regulations contemplate such an approach.

F. Mark II Containment

Contention 21 related to alleged deficiencies in Shoreham's primary containment.⁴⁰⁵ As to one part of the contention -- regarding the operation of the residual heat removal system in the steam condensing mode -- the Board retained jurisdiction to review a staff analysis before making a decision whether to permit Shoreham to operate at power levels in excess of five percent of rated power.⁴⁰⁶ But it was satisfied that it could reach a decision on all other aspects of the contention.

The County challenges this determination in view of the pendency of several additional staff reviews. It asserts that the relevant issue is whether, before completion of

⁴⁰⁴ Id. at 4178, 4184 (Wong, Lucks). This is because the Shoreham site has a deep soil profile. Reg. Guide 1.60 includes data from sites that have rock or shallow soil profiles, which tend to attenuate the effect of earthquakes less than deep soil. Tr. 4179-84 (Lucks); Tr. fol. 3970 at 6 (Wong).

⁴⁰⁵ See LBP-83-57, supra, 18 NRC at 511; Suffolk Brief at 117.
⁴⁰⁶ LBP-83-57, supra, 18 NRC at 520.

these reviews, there is adequate information on which the Board could have based its decision.⁴⁰⁷ In the County's view, "the absence of complete analyses and review of those analyses result in an insufficient basis for a licensing decision."⁴⁰⁸ Although agreeing with the County's statement of the issue, we disagree with its conclusion respecting it. There may be circumstances in which staff analyses must be reviewed by a licensing board before any final decision is reached.⁴⁰⁹ None of the illustrations offered by the County, however, presents such a situation.

We agree with the Licensing Board's conclusion that the mere pendency of confirmatory staff analyses regarding litigated issues does not automatically foreclose board resolution of those issues. As we noted in connection with our discussion of post-accident monitoring in section IV(B), certain matters may be left to the staff for post-hearing resolution where the Board can make the findings requisite to issuance of the license. With this guideline in mind, we now turn to the County's examples.

407 Suffolk Brief at 118.

408 Ibid.

409 See, e.g., Three Mile Island, supra, 17 NRC at 885-88.

1. Vacuum breakers are devices installed between the suppression pool (wetwell) and the upper zone (drywell) of the primary containment. They are designed to equalize pressure between the two areas.⁴¹⁰ Two problems arose in connection with the vacuum breakers, and modifications were made to resolve both. The Board concluded that such modifications were acceptable.⁴¹¹ Nonetheless, LILCO is undertaking additional measures to strengthen further the valve component of the vacuum breakers. Qualification of the redesigned valve has not yet been completed, however, and the County insists that no final determination regarding vacuum breakers can be made until all modifications have been reviewed.

We believe the Board reasonably resolved this matter in LILCO's favor at this stage. The staff reviewed and accepted the modifications and generic qualification testing of the vacuum breakers when the initial changes were made. The staff concluded, and the Board agreed, that the plant could then operate safely. The fact that additional modifications are contemplated does not undermine that conclusion. As staff witness Eltawila observed:

⁴¹⁰ Tr. 9827 (Eltawila).

⁴¹¹ LBP-83-57, *supra*, 18 NRC at 516-17; FF F-31 to F-36 (slip opinion at 373-75).

Let me make it clear right now that if Shoreham decided to go right now without any additional tests, they can go based on our assessment of what we did for Susquehanna. So the additional modification that Shoreham is doing is nice, but it's not necessary at this time The valve was tested with some modification and it performed satisfactorily, so the additional modification that is contemplated right now will improve the valve performance.⁴¹²

2. John Humphrey, a former General Electric employee, raised a number of concerns related to the Mark III containment design. Twenty-two of them are potentially applicable to the Mark II containment used at Shoreham.⁴¹³ The staff made a preliminary assessment of these concerns. It concluded, however, and the Board agreed, that only one of the twenty-two concerns, i.e. operation of the residual heat removal system when in the steam condensing mode, had potential safety significance. As to it, there was insufficient information to analyze the effect of the discharge from the relief line.⁴¹⁴ The Board retained jurisdiction to review that item. In doing so, it accepted the staff's additional conclusion that there would be no erosion in the safety margin that already exists at Shoreham

⁴¹² Tr. 9826-27.

⁴¹³ FF F-37 (slip opinion at 376).

⁴¹⁴ FF F-38 to F-43 (slip opinion at 376-79).

resulting from any of the other "Humphrey concerns."⁴¹⁵ The County does not contradict that conclusion. In these circumstances, we find no merit in the County's argument that the mere pendency of staff reviews prevents resolution of the issue.

3. During the course of its testing program for the Mark III containment, General Electric identified certain loss-of-coolant accident (LOCA) loads that had not been included in the original design review of the Mark II containment.⁴¹⁶ In 1975, the staff required each Mark II owner to reassess its containment design in view of this new information.⁴¹⁷ The amplified response spectra (ARS) that were generated from the reassessment were compared with those developed for the plant's design basis loads.⁴¹⁸ Had the revised spectra fallen completely within the design basis, that would have definitively demonstrated that all structures and components were embraced within the original design.⁴¹⁹ At some frequencies, however, the ARS produced in the confirmatory assessment turned out to be higher than

⁴¹⁵ FF F-38 (slip opinion at 376); Tr. 9856-57 (Fields).

⁴¹⁶ LBP-83-57, supra, 18 NRC at 512.

⁴¹⁷ Id. at 511-12.

⁴¹⁸ FF F-64 (slip opinion at 386).

⁴¹⁹ Tr. 9973 (Malovrh).

the design basis response spectra.⁴²⁰ But it does not automatically follow that the design of the structures, systems and components is inadequate. LILCO's witness testified that such difference was not significant because the newly developed spectra did not result in the loads for which the plant was actually designed being exceeded.⁴²¹ The staff reviewed the reassessment insofar as it concerned the piping systems and supports (and, as far as we can tell from the testimony, has no difficulty with the analyses). It had not yet completed its review of the equipment, however.⁴²²

The Board, without awaiting completion of the staff's review, accepted LILCO's conclusion, upon analysis, that the plant design (including the equipment) could fully accommodate the newly developed spectra.⁴²³ The County does not challenge the substance of that determination. It argues simply that the Board should have awaited completion of the staff's work. The staff is satisfied with the Board's resolution of the issue and tells us that the confirmatory analysis is unlikely to indicate any

420 FF F-65 (slip opinion at 386).

421 See ibid.; Tr. 9973-76 (Malovrh).

422 Tr. 9972-73 (Terao); Tr. 9973-75 (Malovrh).

423 LBP-83-57, supra, 18 NRC at 525-26.

problems.⁴²⁴ Given the uncontroverted evidence in the record offered by LILCO, and the staff's judgment regarding the expected outcome of its review, we believe that the Board's resolution of the issue is reasonable.

4. As part of the confirmatory analysis of the Mark II containment, LILCO selected some thirty piping systems in the plant as a representative sample.⁴²⁵ The Board examined the sample and concluded that there was no evidence to contradict LILCO's testimony that the piping systems it selected are representative.⁴²⁶ Presumably out of an abundance of caution, however, the staff asked LILCO to perform a 100 percent evaluation of all piping systems attached to three locations on the containment wall. The staff testified that it regarded the further analysis as confirmatory because it had not seen any piping system stresses or support loads which exceeded or failed the code allowables.⁴²⁷ The Board found that no additional analysis was necessary, and concluded that LILCO had adequately demonstrated the safety of the piping. In so doing, it

⁴²⁴ Staff Brief at 114. See also, NUREG-0420 (Supp. 3) (SER) (Feb. 1983) at 3-1.

⁴²⁵ FF F-66 (slip opinion at 387).

⁴²⁶ LBP-83-57, supra, 18 NRC at 526.

⁴²⁷ FF F-67 (slip opinion at 387).

rejected the County's suggestion that LILCO perform a 100 percent reanalysis of all piping.⁴²⁸ We believe there is ample evidence in the record to support the Board's conclusion that the piping systems are safe.

5. LILCO is required to perform preoperational and periodic tests to detect leakage paths between the drywell and the wetwell areas of the containment.⁴²⁹ The results are to be measured against acceptance criteria that are considered to be conservative.⁴³⁰ A high pressure test -- intended to simulate the pressures resulting during a large loss of coolant accident -- is performed only once, during the preoperational test period.⁴³¹ The County argues that the drywell seal could deteriorate over time after the preoperational test is conducted and that the only way to verify the adequacy of the seal is to review the predictive validity of the test itself.⁴³² The Board reviewed the staff's justification for the adequacy of the tests, noting that the County had not discussed any alleged

⁴²⁸ LBP-83-57, supra, 18 NRC at 526.

⁴²⁹ FF F-45 to F-49 (slip opinion at 379-81).

⁴³⁰ FF F-47 to F-48 (slip opinion at 380).

⁴³¹ LBP-83-57, supra, 18 NRC at 521.

⁴³² Suffolk Brief at 119.

deficiencies.⁴³³ It resolved the issue in LILCO's favor. We see no basis for overturning that result. In our opinion, the County has not undermined the adequacy of the tests. Moreover, we note that the high pressure test is performed at 35 psig (pounds per square inch gage).⁴³⁴ The seals have an internal volume that is maintained at a pressure of approximately 60 psi.⁴³⁵ In any event, that pressure is monitored during the life of the plant. Thus, any deterioration in the seals would be readily detectable.⁴³⁶

G. Safety Relief Valve Tests and Challenges

Safety relief valves (SRVs) are used in boiling water reactor (BWR) power plants to relieve excess pressure in the reactor vessel by releasing steam from that vessel to the suppression pool.⁴³⁷ In view of concerns that grew out of the accident at Three Mile Island, the staff issued

⁴³³ LBP-83-57, supra, 18 NRC at 522.

⁴³⁴ Tr. 9872 (Metcalf).

⁴³⁵ Tr. 9875 (Metcalf). We note that LILCO witness James E. Metcalf stated that the seals are pressurized to "approximately 60 pounds per square inch" without indicating whether this valve was in terms of gage or absolute pressure. Regardless of the term intended by the witness, however, the difference in the pressure values would not be sufficient to alter our discussion of this matter.

⁴³⁶ Ibid.

⁴³⁷ FF G-3 (slip opinion at 391).

NUREG-0737⁴³⁸ which, among other things, provided guidance for reducing the incidence of stuck open relief valve (SORV) events in all reactors. As the Board recounted, LILCO participated in a BWR Owners Group study that recommended three actions in furtherance of NUREG-0737: use of Target Rock two-stage SRVs, use of an operating procedure providing for manual implementation of low-low set relief, and lowering of the valve reclosure set point.⁴³⁹ The staff reviewed these recommended actions and found them to be sufficient and in compliance with the guidance contained in NUREG-0737. The Board agreed.⁴⁴⁰ We affirm.

NUREG-0737 provides that --

Challenges to the relief valves should be reduced substantially (by an order of magnitude).⁴⁴¹

The use of more reliable two-stage valves instead of three-stage valves is estimated to result in a marked reduction in the number of SORV events.⁴⁴² The County asserts that LILCO may not claim credit for this improvement because the decision to use two-stage valves at Shoreham was

⁴³⁸ "Clarification of TMI Action Plan Requirements" (Nov. 1980).

⁴³⁹ LBP-83-57, supra, 18 NRC at 530.

⁴⁴⁰ Id. at 528-32.

⁴⁴¹ NUREG-0737, II.K.3.16-1.

⁴⁴² LBP-83-57, supra, 18 NRC at 531.

made before NUREG-0737 was issued.⁴⁴³ The Board rejected this argument⁴⁴⁴ and so do we. We agree with the staff that the argument is overly formalistic and ignores the historical context of NUREG-0737.⁴⁴⁵ The three-stage valve was typical of that used at the time NUREG-0737 was issued⁴⁴⁶ and the two-stage valve was thus the type of improvement contemplated by NUREG-0737. To adopt the County's argument would be tantamount to penalizing LILCO for committing to the improvement at an early stage on its own initiative.

The County also contends that the order of magnitude improvement claimed by LILCO results from a combination of reducing valve failures and challenges to the valves while NUREG-0737 requires an order of magnitude improvement resulting solely from a reduction in challenges.⁴⁴⁷ The Board found the County's interpretation too restrictive. Despite the literal wording of NUREG-0737, the Board concluded that improved valve reliability could be

⁴⁴³ Suffolk Brief at 123.

⁴⁴⁴ LBP-83-57, supra, 18 NRC at 531.

⁴⁴⁵ Staff Brief at 122.

⁴⁴⁶ See Tr. 8634-37 (Smith, Hayes).

⁴⁴⁷ Suffolk Brief at 122.

considered in measuring compliance with NUREG-0737.⁴⁴⁸ We find the Board's construction of the requirements of NUREG-0737 to be eminently sensible.

Staff witness Marvin W. Hodges, who is the author of the NUREG-0737 item dealing with relief valves, testified that the reduction of stuck open relief valve events was the intended goal.⁴⁴⁹ Even the County's witness admitted that it would be logical to consider both challenges and failure rates in an effort to reduce the occurrence of SORV events.⁴⁵⁰ We agree with the Board that the purpose of this task item is to reduce valve failures and all modifications to achieve this purpose should be included in determining if the "order of magnitude" reduction of valve failures has been achieved.⁴⁵¹

H. Emergency Planning Issues

LILCO filed its application for an operating license in 1975 but the case languished until LILCO asked the Board

⁴⁴⁸ LBP-83-57, supra, 18 NRC at 531.

⁴⁴⁹ Tr. 8491, 8509-10, 8614-15 (Hodges).

⁴⁵⁰ Tr. 8795-97 (Bridenbaugh).

⁴⁵¹ The County observes that the reduction of SORV events may not be realized in view of the performance of two-stage valves at the Hatch 1 and Browns Ferry 2 plants. See Suffolk Brief at 124 n.60. As the Board noted, however, these incidents related to a problem of a failure of the valve to open rather than close and were thus unrelated to the requirements of NUREG-0737. The Board found, in any event, that the valve opening problem was remediable. See LBP-83-57, supra, 18 NRC at 531-32.

in the fall of 1981 to bring the prehearing process to an end.⁴⁵² Hearings were eventually scheduled for May 1982. As of that date, LILCO had prepared its onsite emergency plan but Suffolk County had decided to abandon its earlier offsite emergency efforts and begin anew. In the interest of expediting the litigation of emergency planning questions, the Licensing Board decided to bifurcate the hearing into two phases: Phase I, dealing with onsite issues, plus those offsite issues that could be litigated in the absence of the County's plan, and Phase II, comprising all remaining offsite issues.⁴⁵³ Following a number of procedural skirmishes, including efforts at redrafting litigable contentions, the Board ruled on the admissibility of onsite emergency planning contentions, accepting some and rejecting others.⁴⁵⁴

At the conclusion of discovery, prefiled testimony was submitted. At that time, however, the Board was still in the midst of hearings dealing with other health or safety issues at Shoreham. As a consequence, the Board proposed

⁴⁵² See Appendix A of the Licensing Board's decision (slip opinion at A-16 to A-17).

⁴⁵³ See generally, Suffolk Brief at 88-89.

⁴⁵⁴ See LBP-82-75, 16 NRC 986 (1982).

that, to expedite consideration of Phase I emergency planning issues, the parties conduct cross-examination, redirect examination, and recross-examination initially by means of public prehearing depositions without the Board present. As the Board observed in a memorandum memorializing the proposal:

The depositions would be conducted as if the parties were examining on the prefiled direct testimony at the evidentiary hearing. The depositions would be filed with the Board, with the portions which each party seeks to move into evidence so noted. The witnesses would thereafter appear at the hearing before the Board to answer any Board questions and respond to questions from the parties. The questions from the parties are expected to be well-focused and primarily follow-up questions to the depositions and any Board questions. However, within reasonably set time limitations, parties may orally highlight salient facts in the depositions by re-asking some of the deposition questions at the hearing.⁴⁵⁵

The County objected to the proposed procedures on the ground that the Board lacked the requisite authority to direct that initial examination of the prefiled testimony be undertaken through public depositions. Following the receipt of written views from all interested parties, including the County, the Board rejected the County's argument.⁴⁵⁶ The Board convened a conference of counsel

⁴⁵⁵ Memorandum Advising SOC [Shoreham Opponents Coalition] and NSC [North Shore Committee] of Board Proposal to Require Depositions and of Opportunity to File Views (Nov. 9, 1982) at 1-2 (unpublished).

⁴⁵⁶ See LBP-82-107, 16 NRC 1667 (1982).

shortly thereafter to clarify and discuss implementation of its ruling. At that time counsel for the County indicated that his client would not participate in the examinations that the Board had ordered. As a result, the Board found the County in default and ordered its Phase I contentions dismissed.⁴⁵⁷

On appeal, the County presents three allegations of error. First, it claims that the Board erred in bifurcating emergency planning issues into two phases.⁴⁵⁸ Second, it asserts that the Board erred in denying admission of certain contentions.⁴⁵⁹ Third, it argues that the Board erred in requiring the use of evidentiary depositions.⁴⁶⁰ In this latter connection, the County contends:

Since the order for evidentiary depositions was illegal, the subsequent default ruling was likewise illegal.⁴⁶¹

We find that the Board's employment of evidentiary depositions was both lawful and reasonable. Thus, in

⁴⁵⁷ LBP-82-115, 16 NRC 1923 (1982).

⁴⁵⁸ Suffolk Brief at 91-94.

⁴⁵⁹ Id. at 94-95.

⁴⁶⁰ Id. at 96-98.

⁴⁶¹ Id. at 97-98. We note in this regard that the County rests its challenge to the default determination on the legality of the Board's procedural ruling; it does not contest the dismissal of its contentions as the appropriate sanction for default.

disagreement with the County, we find the Board's default ruling unassailable.

The County's argument regarding the Board's proposed procedure has a single theme -- i.e., that section 189 of the Atomic Energy Act, 42 USC § 2239, provides parties with an opportunity for a hearing and such hearing must be an oral presentation before a Licensing Board.⁴⁶² The County's brief is wholly bereft of authority to support its position.⁴⁶³ The Board's decision, on the other hand, is thoughtful and well documented.

As the Board notes, section 189 does not in terms specify the nature of the hearings that must be held. But section 181 of that Act, 42 USC § 2231, brings into play the procedural ground rules established by the Administrative Procedure Act (APA), 5 USC § 551 et seq. We may assume, without deciding, that section 189 requires that a proceeding involving an application for a facilities license under 10 CFR Part 50 of the Commission's regulations must be conducted in accordance with the formal hearing requirements

⁴⁶² Id. at 96.

⁴⁶³ The County cites only to 10 CFR § 2.71a (which we assume to be a reference to 10 CFR § 2.718) for the proposition that licensing boards have discretion to control the course of a proceeding.

of the APA.⁴⁶⁴ For, the APA expressly authorizes agencies in licensing cases such as this to adopt procedures for the submission of all or part of the evidence in written form as long as the parties are not prejudiced.⁴⁶⁵ The right to submit rebuttal evidence and conduct cross-examination, moreover, is not unlimited; it is bounded by a need for a full and true disclosure of the facts.⁴⁶⁶

To be sure, the receipt of an initial round of cross-examination or rebuttal in written form is novel in NRC proceedings. However, Suffolk County makes only the most generalized, undocumented claim of prejudice, i.e. that the Board's procedures will necessarily lead to a less than full Board consideration of the facts, including a failure to assess witness credibility. The Board was committed to review the evidentiary depositions carefully and take such procedural steps (including oral cross-examination) as were necessary to ensure full development of the record and a

⁴⁶⁴ See Kerr-McGee Corp. (West Chicago Rare Earths Facility), CLI-82-2, 15 NRC 232, 247-56 (1982), aff'd City of West Chicago v. NRC, 701 F.2d 632 (7th Cir. 1983); Union of Concerned Scientists v. NRC, 735 F.2d 1437, 1444 n.12 (D.C. Cir. 1984).

⁴⁶⁵ 5 USC § 556(d). Hearing boards routinely receive direct testimony in written form.

⁴⁶⁶ Ibid.

fair and thorough resolution of any matters the County wished ultimately to raise. Had the County continued to participate in the matter, it might have been able to show that prejudice had, in fact, resulted, or that additional oral cross-examination before the Board was needed. (The Board, of course, would likewise have been accorded an opportunity to assess the County's concerns in this regard.) The County's decision to withdraw from participation in these matters deprives its argument on appeal of any substance.⁴⁶⁷

V. New York State's Appeal

The State of New York has filed an appeal limited to a single argument, i.e. that the Board should not authorize issuance of a low power license "until a full determination on all relevant offsite emergency planning issues is made."⁴⁶⁸ Earlier in this proceeding, the County filed a motion to terminate the case entirely in light of its

⁴⁶⁷ Given our conclusion that the Licensing Board did not err in holding the County in default on the Phase I issues, we need not reach the County's claims regarding the bifurcation of the proceeding or Board rulings on the admissibility of its Phase I contentions.

⁴⁶⁸ Brief of Mario M. Cuomo, Governor of the State of New York in Support of Suffolk County Exception Nos. XII-1 through XII-6 to the September 21, 1983 Preliminary Initial Decision (Dec. 20, 1983) at 12.

decision not to adopt or implement an offsite emergency plan for Shoreham. The Board denied the motion⁴⁶⁹ but nonetheless asked the Commission to decide whether the uncertainty surrounding offsite emergency planning should affect issuance of a license for low power operation.⁴⁷⁰ The Commission concluded that it should not.⁴⁷¹ We are, of course, bound by the Commission's earlier determination in the absence of any significant changes in circumstances. We have carefully reviewed the State's arguments and its request for relief and find nothing in its presentation that could warrant our departure from the Commission's earlier determination.

For the reasons stated, we affirm the Board's decision in principal part, and remand for further consideration consistent with this opinion those portions dealing with Unresolved Safety Issue A-47, housekeeping, and environmental qualification of electrical equipment. The condition imposed by the Licensing Board requiring LILCO to

⁴⁶⁹ LBP-83-22, 17 NRC 608 (1983).

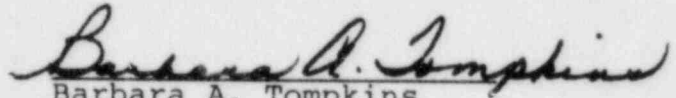
⁴⁷⁰ LBP-83-21, 17 NRC 593 (1983).

⁴⁷¹ CLI-83-17, 17 NRC 1032 (1983).

"acknowledge . . . and adopt" the Board's definition of the term "important to safety" is vacated.⁴⁷²

It is so ORDERED.

FOR THE APPEAL BOARD


Barbara A. Tompkins
Secretary to the
Appeal Board

⁴⁷² Our sua sponte review of the record on those matters considered by the Board in its partial initial decision but not embraced by the appeals reveals no error warranting corrective action.