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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

DOCKETED
USNRC

'84 NOV -8 P3:11

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

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

Docket No. 50-322-OL-3
(Emergency Planning)

NRC STAFF'S PROPOSED FINDINGS OF FACT AND
CONCLUSIONS OF LAW IN THE FORM OF A SUPPLEMENTAL
PARTIAL INITIAL DECISION ON EMERGENCY PLANNING

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APPENDIX

[As directed by the Licensing Board in an Order dated July 27, 1984, the parties have conferred and agreed upon 1) a "List of Witnesses", 2) "List of Exhibits" and 3) "Sequence of Testimony." These lists are attached as Exhibits to "LILCO's Proposed Findings of Fact and Conclusions of Law on Offsite Emergency Planning" (Findings) dated October 5, 1984 and are not repeated here. The Staff, of course, has no objection to the Board's adoption of the three lists in question. In addition, Applicant has set forth as an additional Exhibit to its Findings a "List of Contentions". The Staff has also not repeated that listing in these Staff findings and has no objection to the Board adopting the "List of Contentions" as an appendix to any Board decision which may be issued in this proceeding.]

Transcript Corrections

The NRC Staff does not have any proposed transcript corrections. Additionally, the Staff does not object to the transcript corrections proposed by Applicant on October 12, 1984. Staff's current understanding is that Intervenors will file an addendum to Applicant's proposed transcript corrections on approximately November 2, 1984. The Staff will promptly advise the Board as to whether the Staff has any objection to Intervenors' addendum.

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INTRODUCTION^{1/}

1. Procedural History

1. "This [Supplemental] Partial Initial Decision [PID] addresses the question whether [, as to matters placed in controversy by Intervenor] the offsite emergency plan for the Shoreham Nuclear Power

[1/ Since the Staff had no substantial disagreement with much of the "Introduction" portion of Applicant's Findings, that section, except as noted below, has been taken essentially verbatim from Applicant's findings. Quotation marks set off these paragraphs. Additions or other changes by the Staff of the paragraphs in question have been set off by brackets. Footnotes have been renumbered to conform to the sequence of the Staff's proposed findings. Subsections IIE, "Participation of the State and Local Governments"; IIF, "Standards That Apply When State and Local Governments Refuse to Participate"; and Section III, "The Governmental Intervenor's Strategy in This Case", of the Applicant's "Introduction" have been deleted. The Staff believes the topics discussed in the deleted subsections are not appropriate to an introductory section in that they relate more to the Applicant's theory of this proceeding as opposed to a procedural or background discussion. Additionally, many of the points raised in these subsections are addressed by the Staff within the context of the proposed findings below. The same is true of Applicant's paragraph 8 which has been deleted by Staff in its entirety.]

Station satisfies NRC regulations, namely 10 C.F.R. § 50.47 and 10 C.F.R. Part 50 Appendix E. In deciding that question we give considerable weight to the FEMA-NRC guidelines in NUREG-0654, FEMA-REP-1."^{2/}

2. - "This [proceeding] represents the first time that an NRC applicant has had to take the entire responsibility for offsite planning. LILCO has done this by preparing an offsite emergency response plan, known as the "LILCO Transition Plan," and by setting up an emergency plan implementing organization known as "LERIO" (Local Emergency Response Implementing Organization). The organization that would implement the plan in an emergency is known as "LERO" (Local Emergency Response Organization). LERO is composed primarily of LILCO employees and contractors, working with [outside] support organizations such as the American Red Cross, the U.S. Coast Guard, the U.S. Department of Energy, and local bus, ambulance, and aircraft companies. See LILCO Transition Plan, LILCO Ex. 80, Chap. 2."

3. "Onsite preparedness was addressed in "Phase I" of this proceeding, when intervenors Suffolk County, the Shoreham Opponents Coalition, the North Shore Coalition, and the Town of Southampton raised issues about LILCO's onsite emergency plan, as well as those elements of offsite preparedness for which LILCO had responsibility and which could be litigated at that time, before the preparation of an offsite plan. In November 1982 the Intervenor refused to go forward with the litigation

^{2/} See Consolidated Edison Co. (Indian Point, Unit No. 2), LBP-83-68, 18 NRC 811, 944 n.71 (1983).

of those issues and were held in default. Long Island Lighting Co. (Shoreham Nuclear Power Station, Unit 1), LBP-82-115, 16 NRC 1923 (1982), [aff'd ALAB-788, 20 NRC ____ (October 31, 1984, slip op. at 137-143).] [This supplemental-PID] covers "Phase II" of the proceeding."

4. "On February 17, 1983, the government of Suffolk County decided not to participate in offsite emergency planning for Shoreham. Thereupon Suffolk County made a formal motion to terminate this proceeding, arguing that without its participation LILCO could not meet NRC planning regulations. This claim was rejected [by the Commission]. Long Island Lighting Co. (Shoreham Nuclear Power Station, Unit 1), LBP-83-22, 17 NRC 608, aff'd, CLI-83-13, 17 NRC 741 (1983). LILCO then prepared its own offsite emergency plan, which it submitted to the NRC on May 26, 1983[^{3/}] Upon the submission of this plan, the County asked the Board to reject it without further proceedings. The Board denied the request. Memorandum and Order Denying "Motion for Rejection of LILCO Transition Plan and for Certification to the Commission," Long Island Lighting Co. (Shoreham Nuclear Power Station, Unit 1), (August 30, 1983) (unpublished)."

5. "The litigation of the "Phase II" issues proceeded. The Intervenors^{4/} submitted 97 contentions, with numerous subparts, dated

[3/ The Transition Plan is an "interim compensating action" under 10 C.F.R. § 50.47(c). Thus, the Board in addressing the contentions may take into account any deficiencies in the plan caused by the non-participation of the State or local government. See Consolidated Edison Co. (Indian Point), CLI-83-11, 17 NRC 731, 733 (1983); CLI-82-38, 16 NRC 1698, 1703 (1982).]

4/ The original 97 contentions were cosponsored by Suffolk County, the Shoreham Opponents Coalition, the North Shore Coalition, and the Town of Southampton. The last three of these parties, however, took no part in the hearings.

July 26, 1983.^{5/} LILCO revised its emergency plan on July 28, 1983 (Revision 1), on November 7, 1983 (Revision 2), and on December 21, 1983 (Revision 3),^{6/} and the Intervenor revised the contentions as of January 12, 1984. Additional contentions were later admitted on the LILCO training program, Order Ruling on Suffolk County Motion for Leave to File New Contentions Concerning the LILCO Offsite Emergency Preparedness Training Program (Mar. 19, 1984) (unpublished), and modified [contentions were admitted] on the public education brochure, Order Reconsidering Memorandum and Order Ruling on Suffolk County's Motion for Leave to File Modified Contentions 16 and 18 Concerning the LILCO Public Education Brochure (Apr. 10, 1984) (unpublished). Finally, the Board raised sua sponte the issue of the effect on emergency preparedness of a strike by LILCO union employees. Memorandum and Order Determining that a Serious Safety Matter Exists (July 24, 1984). Some parts of the contentions were ruled inadmissible by the Board.^{7/} The Intervenor

^{5/} Suffolk County also attempted to raised new issues about onsite emergency preparedness, but these contentions were not admitted. Memorandum and Order Denying Suffolk County Motion for Leave to File Contentions Regarding Onsite Emergency Planning (Aug. 5, 1983) (unpublished).

^{6/} Revision 2 is LILCO Exhibit 1; Revision 3 is LILCO Exhibit 80. Revision 4, issued June 29, 1984, was not entered into the record, except for selected portions that LILCO included as attachments to written testimony. [That revision is currently under review by FEMA.]

^{7/} Special Prehearing Conference Order (Aug. 19, 1983) (unpublished); Order Ruling on Objections to Special Prehearing Conference Order (Sept. 30, 1983) (unpublished); Memorandum and Order Ruling on Intervenor's Proposed Emergency Planning Contentions Modified to Reflect Revision 3 of the LILCO Plan (Feb. 3, 1984) (unpublished); Order Ruling on Suffolk County Objections to Memorandum and Order Ruling on Intervenor's Proposed Modified Emergency Planning Contentions (February 28, 1984) unpublished.

withdrew one contention (51). A few others were resolved by summary disposition.^{8/} The first ten contentions, which allege that LILCO's Plan is illegal under various state and local laws, are addressed separately in our decision on LILCO's Motion for Summary Disposition of those issues. The remaining contentions are addressed in this decision."

6. "On January 17, 1984 the State of New York made an appearance ~~by counsel~~ at the hearings and announced its full support of Suffolk County's position. Tr. 2239. Since that time New York has participated in the hearings and has [essentially] supported the County in every respect."

7. "The hearings began December 6, 1983 and continued over nine months, until August 29, 1984, when the record was closed. Eighty-six witnesses testified, many of them on multiple issues; the transcript numbered 15,714 pages, not counting exhibits and prefiled written testimony, which add over 7000 more."

[8.] "[Pursuant to Board Order, all parties were directed to file proposed findings of fact. Applicant, the State of New York, Suffolk County and the Staff filed such findings.] All of the proposed findings of fact and conclusions of law submitted by the parties have been considered. Those not incorporated directly or inferentially in this decision are rejected as unsupported in fact or law or as unnecessary to the rendering of this decision."

^{8/} Order Ruling on LILCO's Motions for Summary Disposition of Contentions 24.B, 33, 45, 46 and 49 (Apr. 20, 1984) (unpublished); Memorandum and Order Ruling on LILCO's Motion for Summary Disposition of Contentions 16.E, J, K, L and M (Public Information Brochure) (June 28, 1984) (unpublished).

II. BASIC PRINCIPLES OF EMERGENCY PLANNING

[9.] "At the outset it will be helpful to state certain principles of emergency planning that arise out of the NRC regulations and case law."

[A.] NRC Regulations^[9/]

[10. The NRC's emergency planning regulations require that a range of protective actions be developed for the public in areas surrounding a

[9/] [The Board is also constrained to respond to certain comments regarding FEMA and the NRC Staff which were made by the County and State in the Introduction portion of their proposed findings at page 11.

While the Intervenor correctly acknowledge that FEMA and the Staff "...generally support the adequacy of the [Transition] Plan" and that the Board should "... give due weight to the testimony of the FEMA and NRC Staff experts who reviewed the Plan", Intervenor proceed in a footnote to misinterpret 1) a Licensing Board decision in Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit 1), LBP-81-59, 14 NRC 1211, 1462-66 (1981) and 2) Staff testimony at Tr. 15,155-56 (Schwartz). A reading of the TMI Partial Initial Decision relied on by Intervenor shows that the Licensing Board there did not say, contrary to Intervenor's assertion, that "there is no presumptive effect to be accorded to the FEMA testimony". The TMI Licensing Board recognized that 10 C.F.R. § 50.47(a)(2) provides that "a FEMA finding will constitute a rebuttable presumption on questions of adequacy and implementation capability" of an off-site emergency plan, but denied the section was applicable to the TMI restart proceeding before it. However, the Board went on to discuss the weight to be given to a FEMA finding had the regulation been applicable to the proceeding before that Board. Further, a review of the transcript reference relied on by the Intervenor does not show a statement by Staff witness Schwartz to the effect that Staff witness Sears "does not have expertise in offsite emergency planning". All the transcript in question shows is that, over a relevancy objection by Staff Counsel, Mr. Schwartz testified that FEMA in its overall responsibilities for offsite emergency preparedness, not only for nuclear power plants but in its overall dealing with State and local governments on other disasters and other hazards, has a greater degree of expertise in offsite radiological emergency

(FOOTNOTE CONTINUED ON NEXT PAGE)

nuclear power plant. See 10 C.F.R. § 50.47(b)(1-16). Generally, the Commission bases its decision regarding the adequacy of emergency plans on a review of findings and determinations made by the Federal Emergency Management Agency (FEMA), which is responsible for reviewing offsite emergency plans. See 10 C.F.R. § 50.47(a)(2).^{10/} Guidance and criteria for the development of radiological emergency plans is principally found in NUREG-0654, which contains the criteria against which FEMA determines the adequacy of offsite emergency plans.]

[9/] (FOOTNOTE CONTINUED FROM PREVIOUS PAGE)

response planning and preparedness than does the NRC. This is self-evident. In any event, the weight we have given to the testimony of any given witness is discussed in detail below. With respect to Mr. Sears, as we note infra, we specifically find that he has a great deal of expertise in radiological emergency planning. This is in sharp contrast to the lack of such expertise on the part of Intervenor's witnesses.

Finally, the Intervenor's note "that both FEMA and the Staff have basically performed only a 'paper review' of the Plan, which was not particularly helpful to the Board." We do not agree. We note simply that the NRC Staff and FEMA, and particularly FEMA, never represented that their review was more than a determination of whether the Transition Plan complies with the requirements of NUREG-0654. As we more fully discuss below, FEMA testimony consistently noted that, in many respects, a final judgment as to whether the Transition Plan could be implemented would have to await a FEMA graded exercise.]

[10/ Union Electric Co. (Callaway Plant, Unit 1), ALAB-754, 18 NRC 1333, 1335 (1983); Maine Yankee Atomic Power Co. (Maine Yankee Atomic Power Station), DD-83-15, 18 NRC 738, 741-42 (1983); Consolidated Edison Company of New York (Indian Point, Unit No. 2), Power Authority of the State of New York (Indian Point, Unit No. 3), CLI-83-16, 17 NRC 1006, 1014 (1983).]

[B.] Level of Detail

11. "The role of atomic safety and licensing boards, as the Appeal Board made clear in the Waterford case,^{11/} is not to become enmeshed in trivial detail.^{12/} During the course of this Shoreham proceeding this Board often heard evidence in more detail than is required by NRC regulations, and some of the Intervenor's contentions have raised subjects that are not listed in the 16 standards for offsite emergency response plans in 10 C.F.R. § 50.47(b) (1984). See, e.g., Memorandum and Order Denying LILCO's Motion to File Surrebuttal Testimony on Phase II Emergency Planning Contention 67 at 4-5 (July 9, 1984). Therefore, the fact that evidence is in the record does not necessarily mean it is material to the issues this Board must decide."

C. Predictive Nature
of Emergency Planning Findings

12. "Emergency planning findings are different from other safety findings that licensing boards must make in that they are predictive."^{13/} The applicant is not required to prove, and the Board is not required to find, that the present state of emergency planning is

^{11/} Louisiana Power & Light Co. (Waterford Steam Elec. Station, Unit 3), ALAB-732, 17 NRC 1076, 1107 (1983).

^{12/} Emergency plans are to be kept "as concise as possible." NUREG-0654 at 29; Cincinnati Gas & Elec. Co. (Wm. H. Zimmer Nuclear Power Station, Unit 1), LBP-82-48, 15 NRC 1549, 1575 (1982), aff'd with modifications, ALAB-727, 17 NRC 760 (1983).

^{13/} Louisiana Power & Light Co. (Waterford Steam Elec. Station, Unit 3), ALAB-732, 17 NRC 1076, 1103 (1983).

fully adequate.^{14/} Rather, the Board is required only to find that there are no "insurmountable difficulties" to the successful completion of planning, no "barriers . . . that cannot feasibly be removed."^{15/} [This discussion is not directed to Contentions 1-10, the so-called "legal authority" contentions.]

[D.] No Absolute Assurance

13. "Throughout this proceeding various Intervenor witnesses have suggested that their standard for the adequacy of an emergency plan is that it provide a "guarantee" of safety. See, e.g., Tr. 3171, 11,085 (Petrilak); Jeffers and Rossi (Direct Testimony), ff. Tr. 3087, Att. 1, at 3, ¶ 3. No such standard is found in NRC regulations or guidelines. Indeed, an underlying assumption of the emergency planning regulations is that in a serious accident people might receive harmful doses of radiation. Southern California Edison Co. (San Onofre Nuclear Generating Station, Units 2 & 3), CLI-83-10, 17 NRC 528 (1983). The objective of emergency planning is maximum dose "savings."^{16/} And [in dicta,] one licensing board has observed that under worst-case fast-moving accidents no emergency plan can be expected to work very well."^{17/}

^{14/} Id.

^{15/} Pacific Gas & Elec. Co. (Diablo Canyon Nuclear Power Plant, Units 1 & 2), LBP-82-70, 15 NRC 756, 764 (1982), aff'd 20 NRC ____ (1984); Louisiana Power & Light Co. (Waterford Steam Elec. Station, Unit 3), ALAB-732, 17 NRC 1076, 1104 (1983).

^{16/} Cincinnati Gas & Elec. Co. (Wm H. Zimmer Nuclear Power Station, Unit No. 1), ALAB-727, 17 NRC 760, 770 (1983).

^{17/} Consumers Power Co. (Big Rock Point Plant), LBP-83-44, 18 NRC 201, 207 (1983).

14. "Reasonable assurance,"^{18/} as required by NRC regulations, does not mean perfect assurance or zero risk. Thus, the Board does not have to find that all individuals are covered by the plans under all circumstances. - Duke Power Co. (Catawba Nuclear Station, Units 1 & 2), LEP-84-37, 20 NRC ____, slip op. at 7 (Sept. 18, 1984)^{19/} There is no requirement that extraordinary measures, such as building shelters or stockpiling blankets, be undertaken. San Onofre, supra, 17 NRC at 533; NUREG-0396 at 14-15."^{20/}

15. "Nevertheless, the Intervenors have frequently proceeded as though LILCO must provide perfect assurance of safety. For example, there was a great deal of contention about the speed of evacuation, both of the public and of special groups, and yet it is clear that NRC regulations impose no maximum evacuation time."^{21/} What is required is that

^{18/} As a general matter, "the courts have long accepted the Commission's definition of its statutory mandate. . . as requiring not a risk-free environment, but a 'reasonable assurance . . . that the reactor could be safely operated at the proposed location.'" Carstens v. NRC, No. 83-1879, slip op. at 22 (D.C. Cir., Sept. 7, 1984).

^{19/} See also Union Elec. Co. (Calloway Plant, Unit 1), LBP-83-71, 18 NRC 1105, 1112 (1983) (it is not a governmental requirement that emergency response plans formulate protective actions for every conceivable development during a radiological release).

^{20/} Cf. Consolidated Edison Co. (Indian Point, Unit No. 2), LBP-83-68, 18 NRC 811, 996 (1983) (government cannot bear total burden of protecting the mobility-impaired; family and friends do have a responsibility).

^{21/} Cincinnati Gas & Elec. Co. (Wm. H. Zimmer Nuclear Power Station, Unit No. 1), ALAB-727, 17 NRC 760, 770 (1983); see also Consolidated Edison Co. (Indian Point, Unit No. 2), LBP-83-68, 16 NRC 811, 970 (1983) (range of uncertainty is "considerable"). Likewise, there is no required minimum evacuation route capacity. Louisiana Power & Light Co. (Waterford Steam Elec. Station, Unit 3), ALAB-732, 17 NRC 1076, 1109 (1983).

the evacuation time estimates be reliable^{22/} and that attention be paid to the efficiency of evacuation.^{23/} [To the Board's knowledge,] there has never been a case where an emergency plan was rejected because the evacuation times were too high, and there are power plants that have evacuation times comparable to or larger than those for Shoreham.

Cordaro et al., ff. Tr. 2333, at 47. Likewise, there is no requirement that evacuation be possible under all circumstances. Southern California Edison Co. (San Onofre Nuclear Generating Station, Units 2 & 3), LBP-82-39, 15 NRC 1163, 1184 (1982)."

16. "Thus, the NRC does not require a perfect emergency plan, or perfect assurance, and many of the shortcomings Suffolk County and New York sought to develop on the record are immaterial. Indeed, much of the County's case consisted of demonstrating that many problems may arise during large-scale evacuations, a point that may well be conceded without shedding any light on whether NRC regulations are met. The regulations contemplate a plan by which trained personnel, exercising their considered judgment under whatever circumstances may be presented, use the personnel and resources at their disposal to deal with whatever contingencies may arise. See Tr. 17727 (McIntire). In short, the watchword for an emergency plan is flexibility, not rigidity. Tr. 12,738-39 (McIntire), 9275 (Weismantle). And the adequacy of a plan is not determined by the number

^{22/} Louisiana Power & Light Co. (Waterford Steam Elec. Station, Unit 3), LBP-82-100, 16 NRC 1550, 1561 (1982), aff'd with modification, ALAB-732, 17 NRC 1076 (1983).

^{23/} Cincinnati Gas & Elec. Co. (Wm. H. Zimmer Nuclear Power Station, Unit No. 1), ALAB-727, 17 NRC 760, 770 (1983).

and variety of hearing room hypotheticals that intervenors can pose. Near the end of the hearing one NRC Staff witness, who has had a great deal of experience with emergency planning, testified as follows:

- It is a fact that my colleague in Region I, who is a member of the RAC committee and reviewed the LERO plan for RAC, stated that this was the best offsite plan he had ever seen, and this is also my judgment. I have reviewed the offsite plans of all the plants that I am responsible for and this is the best and more [sic in transcript] comprehensive plan I have ever seen.

Tr. 15,226 (Sears). In light of such testimony, and the principles outlined above, it should not prove surprising that in this decision the Board spends little time on many issues that the Intervenor chose to raise, such as, for example, the design of the postcard used to identify disabled people; those sorts of details we leave to the planners themselves."

[E.] Human Behavior

[17]. "Much of Suffolk County's case [, as further discussed infra,] was founded on the vagaries of human behavior. For example, role conflict, shadow phenomenon, credibility, conflict of interest, training, and many other issues were founded on the bedrock assumption that people's behavior -- anxiety, disobedience, even panic -- may confound an emergency plan. [The Staff would delete the following sentence: "Arguably these sorts of contentions ought not to be heard at all;"] NUREG-0654 takes into account human behavior, and following its guidelines

minimizes the possibility of, for example, panic.^{24/} Moreover, the issues are generic ones.^{25/} Nevertheless, we have listened to the intervenors' human behavior evidence in great detail, as have some other licensing boards who have been asked to decide similar issues. The Board finds [as detailed] below, however, that the vagaries of human behavior and the possibility of such things as panic, disobedience, and confusion do not [in and of themselves] make the LILCO Plan inadequate."

I. HUMAN BEHAVIOR

A. Shadow Phenomenon (Contentions 23.A, B and C)

18. Contention 23 asserts that a large number of people would evacuate voluntarily upon learning of an accident at the Shoreham plant. This is the "evacuation shadow phenomenon" which will directly impact any protective action recommendations, because people will evacuate instead of obeying a

^{24/} Louisiana Power & Light Co. (Waterford Steam Electric Station, Unit 3), ALAB-732, 17 NRC 1076, 1102 n.43 (1983). See also Pacific Gas & Elec. Co. (Diablo Canyon Nuclear Power Plant, Units 1 & 2), LBP-82-70, 16 NRC 756, 768 (1982) (the board assumed that responsible citizens would act intelligently on instructions given to general workers who would have some emergency duties); Public Service Co. of New Hampshire (Seabrook Station, Units 1 & 2), LBP-83-32A, 17 NRC 1170, 1177 (1983) ("shadow phenomenon" contention summarily disposed of); Pacific Gas & Elec. Co. (Diablo Canyon Nuclear Power Plant, Units 1 & 2), LBP-82-70, 16 NRC 756, 779 (1982), aff'd 20 NRC ____ (1984), (assuming "overreaction" by the public is likely, we have no remedy beyond that which is already planned, which is to broadcast accurate, consistent information).

^{25/} See Tr. 2169 (McIntire) (his testimony not specific to the LILCO Plan). Cf. Duke Power Co. (Catawba Nuclear Station, Units 1 & 2), ASLBP No. 81-463-01 OL, slip op. at 6 (Sept. 29, 1983) (board could learn nothing new by exploring generic issues of radioprotective drugs in the Catawba setting); Philadelphia Elec. Co. (Limerick Generating Station, Units 1 & 2), LBP-84-18, 19 NRC 1020, 1033 (1984).

sheltering recommendation (23.A); people will evacuate if told no protective actions are necessary (23.B); and people will evacuate if they see their neighbors evacuating in a bordering zone, rather than wait for instructions for their own zone. The intervenor provided two bases for this contention: (1) the shadow phenomenon identified in the TMI evacuation, and (2) a poll of Long Island residents reporting their intended reactions to an accident at Shoreham.

19. "Evacuation Shadow Phenomenon" is a term coined by intervenor's witnesses Donald Zeigler and James H. Johnson, Jr. in their monograph Final Report On A Social Survey of Three Mile Island Residents, published in September 1979 and excerpted as "Evacuation From a Nuclear Technological Disaster" in Geographical Review, vol. 71, No. 1 January 1981. Zeigler, et al., ff. Tr. 2789 at 7, 8. The concept is not new however, and LILCO's witnesses pointed out this is but one extreme end of a distribution of responses to emergencies ranging from underresponse (refusal to leave an unsafe place when advised to do so) to overresponse (leaving a safe area when not advised to do so). Cordaro, et al., ff. Tr. 1470 at 8. "Overresponse" or "overreaction" are used to describe conduct which goes beyond that recommended by emergency officials and are used interchangeably with shadow phenomenon by all parties. See Ziegler, et al., ff. Tr. 2789 at 7, n.2; Cordaro, et al., ff. Tr. 1470 at 8-10. Prior to TMI, however, this was not considered a problem in the social science of disaster research since such behavior typically means people who are already safe are seeking safety. Cordaro, et al., ff. Tr. 1470 at 19. Dynes, Tr. 1516. The intervenors maintain, however, that the experience (of overresponse) of TMI demonstrates that planners must

anticipate dealing with more people than otherwise might be expected. Ziegler, et al., ff. Tr. 2789 at 10. LILCO, on the other hand, maintains that public education beforehand, and emergency information at the time of an accident will mitigate overresponse. Cordaro, et al., ff. Tr. 1470 at 114.

20. This only has relevance if this overreaction would so interfere with the planned evacuation as to substantially disrupt it and render evacuation plans unworkable. We deal with the possible effects of overresponse in our findings on evacuation time estimates and conclude that even substantial overresponse would not render evacuation of the 10 mile Shoreham EPZ ineffective. See Findings 516-519.

21. The way people behave in an emergency, including overresponse and underresponse, is based on their perception of risk at the time of the emergency -- put another way, their situational perception of risk. Cordaro, et al., ff. Tr. 1470 at 17-18. This principle of behavior has been researched in a variety of emergency situations -- natural and man-made. Id. at 18-19. According to LILCO's witness, Dr. Mileti, a sociologist who has studied behavior at various emergencies, the primary influence on this situational perception of risk is emergency information given at the time of the event. Sorenson and Mileti, ff. Tr. 3940 at 4; Mileti, Tr. 1836. While the intervenors agree that response is determined by perceived risk at the time of an accident, they maintain the primary influence on this situational risk perception is pre-accident fear of radiation. Cole, Tr. 3915. This constitutes the major disagreement among the parties.

22. The intervenors argue that a radiological emergency would likely produce a greater overresponse than other types of disasters because it is imperceptible to the human senses and fear of radiation is enhanced by the uncertainty of the consequences of exposure. Ziegler, et al., ff. Tr. 2789 at 23-24. For this proposition, they rely on essentially two pieces of research: the survey conducted in the aftermath of TMI reported in the monograph, supra, and a poll of Long Island residents. Both of these research studies indicate that large numbers of people will disregard official recommendations and evacuate. Id. at 3.

23. We shall first look at the experience during emergencies surrounding other nuclear power plants.

TMI and Ginna

24. Witnesses for both Suffolk County and LILCO are intimately familiar with the research data from TMI. Dr. Ziegler and Johnson produced a survey (referenced above in Finding 19) both of whom were County witnesses. LILCO presented Dr. Sorenson who authored a study entitled "Evacuation Behavior at TMI: Review and Reexamination" SC Ex. 3, and Dr. Dynes who was a member of the President's Commission on Three Mile Island, and formerly was Co-Director of the Disaster Research Center at Ohio State University. The research studies show that within a four day period March 28-March 31 (Wednesday to Saturday) 144,000 people within a 15 mile radius of the plant evacuated as a response to the reactor accident on March 28. SC Ex. 3; Ziegler, et al., ff. Tr. 2789 at 8. This occurred without a general evacuation order, rather, there was an advisory issued by the Governor that pregnant women and preschool children within 5 miles of the plant should evacuate. The Governor also closed all schools in the area on Friday at noon, and on Sunday extended

the school closing through Monday. Cordaro, et al., ff. Tr. 1470, Attachment 10 at 4, 7. The total number of the affected population, however, (pregnant women and pre-school children) was only about 2500 people. Ziegler, et al., ff. Tr. 2789 at 19.

25. LILCO experts testified that the response of the people at TMI was predictable and reasonable given the state of public information during the accident. LILCO's experts state that from the public's point of view, the emergency information at TMI was (1) grossly inconsistent, leading people not to trust information sources and to conclude that the risk was not really known -- that anything could happen, including an explosion; (2) inaccurate, because it kept changing so rapidly, giving people the impression that information was being withheld; (3) not certain, again because people in authority seemed not to know what was going on; (4) of insufficient detail to help people understand exactly what was going on; (5) giving incomplete guidance -- telling pregnant women and small children to leave a neighborhood, but not explaining the risk, if any, to other adults and children; and (6) riddled with rumors that were not laid to rest. Cordaro, et al., ff. Tr. 1470 at 53-54. This constituted an "information disaster," resulting in perception of risk among member of the public that were largely inconsistent with the objective risks that actually existed. Id. at 54-59; see McIntire, ff. Tr. 2086, at 3, Ziegler and Johnson, ff. Tr. 2789, at 37-38.

26. In addition we note that the advisories during the TMI accident went out for varying areas from the plant, covering from 5 to 20 miles. Cordaro, et al., ff. Tr. 1470, Attachment 10. Further, the conflicting information about a hydrogen bubble, the severity of the accident, and

the appropriate response to it, was not the sort of information that would create accurate risk perceptions and therefore minimize overreaction. Cordaro, et al., ff. Tr. 1470, at 52-59; Mileti, Tr. 3977-78.

27. The Ziegler and Johnson study of TMI confirms that of the total evacuees, at least 70% of them evacuated due to conflicting information, and 91% also evacuated because of safety concerns. Tr. 2888 (Ziegler). A telephone survey study by Cynthia Flynn conducted for the NRC in the aftermath of TMI similarly found that 91% of the people who evacuated gave as their reason the fact that the situation seemed dangerous, and that 83% also gave confusing information as their reason for leaving. Cordaro, et al., ff. Tr. 1470 at 57. The parties agree that pre-emergency fear (including for example, fear of radiation) helps shape how people use information and perceive the threat of an accident. Tr. 2051-52 (Sorenson); Tr. 3915-16 (Cole). The County would have us find, therefore, that it was fear of radiation alone which led to the large "overresponse" at TMI. This we decline to do. There is little dispute that TMI does, indeed, represent an information disaster. The County testimony even quotes from the President's Commission report in this regard. Ziegler, et al., ff. Tr. 2789 at 37-38. This is precisely the reason that the guidance criteria provided in NUREG-0654 was developed -- to address the problem found at TMI. Weismantle, Tr. 2000-02; Sorenson, Tr. 2027.

28. Another nuclear accident occurred at the Ginna nuclear power plant 18 miles outside Rochester, New York in January 1982, wherein radiation was released and emergency information was communicated to the public. No mass evacuation occurred and there was factual and timely information

provided to the public. Cordaro, et al., ff. Tr. 1470 at 62-63, Attachment 11. We also note that in its decision approving the revised emergency plan for TMI, the Board concluded ". . . we have no evidence from which we could conclude that public overreaction and refusal to follow protective action instructions will occur to any substantial degree where clear instructions and directions on protective actions are provided." Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 1), LBP-81-58, 14 NRC 1211, 1568 (1981).

29. The County filed rebuttal testimony concerning one discrete area of the LILCO testimony. LILCO relied, in part, on an analysis of TMI evacuation behavior done by Dr. Sorenson to substantiate its contention that while pre-accident fear of radiation does play a role in processing information, it is situational factors present at the time of an emergency that are more significant in showing how people respond. Sorenson, Tr. 2051-52. Drs. Cole and Tyree analyze this study by Dr. Sorenson and conclude that while pre-accident fear of radiation is not a direct cause of evacuation response, it is an indirect cause. Cole and Tyree, ff. Tr. 3907 at 9-12. LILCO filed surrebuttal testimony by Drs. Sorenson and Mileti concluding that Drs. Cole and Tyree misinterpreted Sorenson's Analysis by defining both pre-accident fear of radiation and situational risk perceptions as measures of the same variable -- fear of radiation. Sorenson and Mileti, ff. Tr. 3940 at 9-10. The LILCO testimony also points out that the Sorenson study, standing alone, is limited in quality and must be viewed in light of generic knowledge and validated theory in the field of sociological research. (Id. at 28). We agree. Consequently, we place little weight on the County testimony because it

does not consider other studies of evacuation behavior to provide a context for the analysis (Tyree, Tr. 3910) and Dr. Tyree testified that about 69% of the variation in evacuation behavior was not explained by the variables in the model. Tr. 3913. This we find, is further support for the conclusion that a single study standing alone does not shed much light on human response to emergencies.

30. What emerges from the studies on TMI introduced into this record is that clearly there was both a concern for safety (situational perception of risk influence by fear of radiation) and confusing, inconsistent, inaccurate and misleading information present at the time of that accident. It is also evident that the evacuation at TMI was a response to these factors. We cannot, however, leap to the conclusion that these conditions will occur in any other radiological accident. Guidance has been established in NUREG-0654 to address this problem and a public education information program following this guidance has, indeed, served to mitigate such response at Ginna, noted above. Thus, we do not find that the experience at TMI is a showing that the public will overrespond in the event of a radiological accident at Shoreham.

Opinion Polls

31. The County did not rely on the evidence from TMI alone. The County introduced various analyses of three polls taken in Suffolk County by Social Data Analysts, one taken on behalf of the County in May of 1982 and two subsequent polls taken for Newsday in February and September of 1983. Cole, ff. Tr. 2791 at 4, 15, 17. The results of these polls indicate that as much as 50% of the population of Long Island would attempt

to evacuate during an emergency at Shoreham, under circumstances in which an evacuation of the entire EPZ is advised. Id. at 14.

32. In contrast, LILCO introduced two polls, one by Bill Johnson and one by Yankelovitch, Skelly & White (YSW), to illustrate that different polls will produce different responses, depending on the wording of the question and the amount of information given the respondent. Cordaro, et al., ff. Tr. 1470 at 99, 103, 106-111.

33. The essential problem with all these polls, however, is that "there are frequently discrepancies between what opinion surveys show and the final outcome" of the action predicted. Cole, Tr. 2789. As Mr. Richardson of Yankelovitch, Shelly & White put it, "We have never disagreed with the behavioral scientists, however, that a survey such as the one we performed for LILCO cannot accurately predict what people will do in an emergency." Cordaro, et al., ff. Tr. 1470 at 107.

34. Even if we were to ignore these disclaimers and accept the proposition that polls could be used to predict response, the vagaries of using such polls is amply illustrated by the criticisms levelled at all the polls introduced in the record by the polling experts of both Suffolk County and LILCO. These criticisms encompassed such things as methodology; that the questions in the various polls are biased toward one answer or another, depending upon who was the proponent of the poll, see, e.g., Tr. 1874 (Johnson); 1928-29 (Mileti), 1933-35 (Richardson), 2052-58 (Cordaro), 2059-61 (Mileti), 2832-36 (Cole); that the pre-testing of the surveys was questionable, see, e.g., Tr. 1926 (W. Johnson), 2817 (Cole); that the questions were unclear and open to varying interpretations by respondents, see, e.g., Tr. 1931 (W. Johnson), 2808-14 (Cole); that

analyses of date were not rigorously completed, see, e.g., Tr. 1947-49 (Richardson); that completion rates for the polls were low, casting doubt on the validity of the results, see, e.g., Tr. 1912-17 (Richardson); that sampling procedures violated random selection principles, see, e.g., Cordaro, et al., ff. Tr. 1470 at 97-98; Tr. 2838-39 (Cole); that bias was created by the tones of the persons administering the questions by telephone, see, e.g., Tr. 2801 (Cole); that publicity at the time the poll was taken influenced responses, see Tr. 2818 (Cole); and so forth.

35. Given the difficulties in placing much reliance on polls noted above, and the fact that polls did yield quite different results depending on the question and the amount of information given respondents,^{26/} we cannot place great weight on them. As discussed above, there is sufficient evidence in the record for us to conclude that, in fact, polls are not demonstrably useful in predicting accurately whether overresponse will occur in the event of an accident at the Shoreham nuclear power plant, or to what extent such overresponse might take place.

^{26/} For example, for a scenario advising all persons in the 10 mile EPZ to evacuate, the County survey conducted by Dr. Cole found that under these conditions, 78% of those living within 5 miles (7800 families), 78% of those living within 6-10 miles (16,000 families), 46% of those living in Eastern Suffolk County (27,000 families), 63% of those living in Western Suffolk (205,000 families), and 39% of the people living in Nassau County (175,000 families) said that they would evacuate. Cole, ff. Tr. 2792, at 14 and Att. 2, at 6. However, the survey done by Mr. Johnson for LILCO showed 38% from eastern Suffolk, 54% from western Suffolk and 32% from Nassau initially said they would evacuate, but when given additional information these figures dropped to 19%, 5% and 19% respectively. Tr. 1896 (Johnson). The survey done by YSW for LILCO showed that under this same scenario, 43% of the population initially said they would evacuate, but when given further information in a "follow-up" question, the number dropped to 29%. Cordaro, et al., ff. Tr. 1470, Attach. 13 at 31.

Human Behavior In Emergencies

36. There are many studies across a variety of types of emergency to provide scholars and planners with sound knowledge about how and why the public responds in emergencies. Cordaro, et al., ff. Tr. 1470 at 20. Dr. Dennis Mileti, a sociologist who has studied behavior at various emergencies, presented a detailed analysis describing the factors that go into the decision-making process for response to emergencies containing six steps, each of which can be affected by ten "sender factors" (characteristics of the information disseminated) and six "receiver factors" (characteristics of the person hearing the information). See Cordaro, et al., ff. Tr. 1470, at 21-26, 26-35, 36-41. His conclusion from this analysis that the source, consistency, accuracy, clarity, certainty, frequency, and specificity of emergency information given at the time of the emergency, rather than pre-emergency fears, will result in people responding to official information instead of rumors and prior perceptions, and therefore will reduce overresponse in an emergency, including a nuclear power plant emergency. Cordaro, et al., ff. Tr. 1470, at 45; see also Tr. 1574-76, 1590-91, 1596-1600 (Mileti). Dr. Mileti also testified that the first thing people do in emergencies is seek further information. Tr. 1644, 1760-61 (Mileti).

37. LILCO has developed EBS messages which take the factors identified by Dr. Mileti into account. Cordaro, et al., ff. Tr. 1470 at 49-52. In addition to the EBS messages, the Transition Plan also includes an Emergency News Center to serve as a focal point for all information disseminated to the public during an emergency; a public information brochure detailing what people should do in an emergency, and annual briefings for

the news media to ensure they are acquainted with the emergency plans and know who to contact for release of public information in a survey. Id. at 51-52.

38. -As we noted elsewhere, see Findings 19, 21, 22, supra, the County witnesses allege that radiological disasters are unique. Ziegler, et al., ff. Tr. 2789 at 23-24. However, Dr. Mileti testified that all hazards have similarities and dissimilarities with others, hence each hazard is unique. Cordaro, et al., ff. Tr. 1470 at 113. He goes on to point out that the factors that determine human behavior in emergencies are known, and those are transferable across emergency types. Id. at 114. The key to minimizing overresponse is a good public information system. Id. at 115.

Conclusion

39. We do not find the public will overrespond in the event of a radiological emergency at Shoreham. However, based on all the evidence in this record, we agree that a public education and information system is essential to emergency planning. We find the LILCO Transition Plan contains adequate provisions to address the criteria set forth in NUREG-0654 in this regard. Further, we cannot ignore one salient point: the public education and information program addresses the population within the 10 mile EPZ. Therefore, while we can agree that the Transition Plan does take into account the "shadow phenomenon" from the standpoint of residents within the 10 mile EPZ, we cannot overlook the possibility that some shadow phenomenon may occur in the periphery beyond the 10 mile EPZ. Hence, we consider below what impact, if any, this may have on the evacuation of the 10 mile EPZ in our findings on evacuation time estimates.

B. Role Conflict (Contention 25)

40. The concept of "role conflict" was raised in Contention 25. This phrase refers to the thesis advanced by the Intervenor that emergency workers and others relied on in the LILCO Transition Plan will return to their families rather than perform their assigned emergency duties. The contention addresses six discrete groups of people: (1) LILCO employees in LERO (Contention 25.A); (2) members of the DOE Radiological Assessment Plan (RAP) Team (Contention 25.B); (3) school bus drivers (Contention 25.C); (4) teachers, other school employees, and crossing guards (Contention 25.D); (5) ambulance drivers and medical personnel (Contention 25.E); and (6) American Red Cross volunteers (Contention 25.F).

1. Historical Perspectives

41. Witnesses for LILCO testified that there is a large body of empirical research, particularly a study done at the Ohio State University Disaster Research Center (DRC), which shows that the actual behavior of people who have definite organizational responsibilities in emergencies and who have a clear idea of their emergency roles do their emergency jobs. Dynes, *id.* Tr. 831 at 16-17, Tr. 857, 1012-53 (Dynes). Over the years, the DRC has conducted interviews with personnel in emergency organizations affected by a variety of emergency situations. Id. While many of these interviews have concentrated on officials in top or key positions in the emergency social system, a considerable number have also been conducted with middle- and lower-level employees. Id. The interviews included not just police chiefs but sergeants and patrolmen; not just physicians, but nurses and attendants; not just heads

of public works departments, but supervisors and crew members. Id. The testimony shows that the number of such interviews conducted by the DRC is over 6,000. Id. In all these interviews the DRC was unable to find even one example of emergency role abandonment. Id. Nor did it find any instance where the functioning of an emergency organization was undercut by personnel not reporting to duty. Id. Indeed, the DRC research shows what often occurs is that there is an oversupply of personnel, which in turn requires effective procedures to assure the efficient use of available personnel. Dynes, ff. Tr. 831, at 16-17, 69-71; Tr. 857, 1012-53 (Dynes). This research, which is summarized above, also accords with the over 15 years' experience of the FEMA witness. McIntire, ff. Tr. 2086, at 3; Tr. 2101 (McIntire). FEMA is the federal agency responsible for coordination of emergency response.

42. The term role "abandonment" was mentioned frequently by the witnesses who testified concerning this contention. This term is used in the context of one's neglecting of one's emergency job in favor of seeing to one's family. Not one witness who appeared in this proceeding had ever seen it happen. Tr. 914 (Mileti); Tr. 918-20 (Dynes); Tr. 1135 (Sorensen). Nor had any witness heard of it happening. Id. Neither County witnesses nor LILCO witnesses had ever seen "role conflict" make an emergency response ineffective. Id.; Tr. 3114 (Muto); Tr. 3094 (Petrilak); Tr. 3128, 3133 (Rossi); Tr. 1237, 1239, 1243, 1268 (Dilworth). No County witness knew of any case where it had. Tr. 1399-1400 (Erikson); Tr. 3147, 3186 (Jeffers). Nor was any County witness able to say he or

she had ever abandoned his or her duties in an emergency, Tr. 1249 (Dilworth); Tr. 3111 (Smith); Tr. 3136 (Rossi); Tr. 3147, 3187 (Jeffers), or thought he or she would in the future, Tr. 3113 (Muto); Tr. 3147 (Jeffers); Doremus, ff. Tr. 9491, at 9.

43. Common sense dictates, and there is no dispute in the record, that emergency workers may experience anxiety while they are separated from their families. For example, they may engage in on-the-job phone checking to see that their families are safe, Tr. 1035 (Dynes); they may leave the job temporarily at a time when they are not essential to the group effort, Tr. 1034 (Dynes); or they may make arrangements regarding their families prior to reporting for work, see Tr. 1048 (Dynes). Emergency workers with assigned emergency roles will not abandon their positions or not report to work. See Findings 41-42, 44. To the contrary, the evidence shows that emergency workers both check on their families and do their jobs. Tr. 1119 (Mileti). This scenario of emergency response worker behavior is consistent with the experiences recounted by the County's own witnesses.^{27/} Tr. 3111 (Smith); Tr. 3185-86 (Jeffers).

44. LILCO's witnesses testified that they had reviewed the literature on role conflict. Dynes, et al., ff. Tr. 831, at 51-71; Tr. 1134 (Sorensen). Their testimony shows that some early writers, and even some uninformed writers presently, have concluded that people in emergencies abandon their emergency roles. However, we conclude that what these

^{27/} The State of New York did not present any witnesses on this issue a fact that may be attributable to the commencement of hearings on this contention prior to the State's active participation in this hearing.

writers have actually witnessed is people without clear emergency roles going home to their families. See Tr. 922-24 (Mileti). More recent scholarly work has revealed that a clear definition of one's role in an emergency-keeps one from abandoning that role when the emergency occurs. Tr. 1146 (Mileti). This role definition can be obtained by various means, principally through training. Tr. 1146 (Mileti), Tr. 2155 (McIntire) (training goes a long way toward avoiding role conflict problems and reduces role conflict substantially). In addition, organization is very important. Tr. 2155, 2157-58, 2159 (McIntire). The essential point developed in the record, and which we find, is that phenomena such as role conflict are reasons why emergency planning is done in the first place. Role conflict is not a factor that makes emergency planning unworkable. See Dynes, Mileti, ff. Tr. 831, at 62-63.

45. The County in an attempt to establish its thesis presented Dr. Kai Erikson as a witness. Ff. Tr. 1455. Dr. Erikson testified that role conflict could be a problem. We note that Dr. Erikson is an eminent sociologist and has been found "credible" by another NRC Licensing Board.^{28/} However, his views have been consistently rejected by Commission licensing boards. Cf. Consolidated Edison Co. of New York (Indian Point), LBP-83-68, 18 NRC 811, 958 (1983) (Theory advocated by Dr. Erikson "is

^{28/} Consolidated Edison Co., of New York (Indian Point), LBP-83-68, 18 NRC 811, 958 (1983); see also Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 1), LBP-81-59, 14 NRC 1211, 1564 (1981). If credible means eminent, intelligent, articulate, and sincere, the finding is well founded. But at the same time, as further discussed infra, we find that Dr. Erikson's theory is contradicted by the overwhelming weight of the evidence in this proceeding.

unorthodox, lacks empirical support, and is contradicted by the equally credible opinion of Licensees' witnesses"); Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 1), LBP-81-59, 14 NRC 1211, 1489 (1981) (despite Dr. Erikson's testimony, the TMI board found "no evidence which contravenes the finding that there is reasonable assurance that . . . an adequate number of emergency workers who will stay and perform their jobs."); Pacific Gas & Elec. Co. (Diablo Canyon Nuclear Power Plant, Units 1 & 2, LBP-82-70, 16 NRC 756, 768 (1982) ("most responsible workers would resolve their conflicts . . . by seeing to their families' safety and then reporting for duty"). Cross-examination of Dr. Erikson by LILCO developed the fact that he has never studied a community-wide disaster at the approximate time of its occurrence, Tr. 1326, 1341 (Erikson), and the disaster with which he is most familiar, the Buffalo Creek flood in West Virginia, does not, in our view, provide support for the "role conflict" hypothesis advanced by the County. Mileti, ff. Tr. 831, at 45-46. Dr. Erikson has encountered only three radiological emergency plans, all of which he judged inadequate because of "role conflict," though, in response to questioning by LILCO, he could not articulate the standards for determining when a plan is adequate. Tr. 1344, 1346, 1350 (Erikson).

46. In addition, the record shows that the County witnesses relied on outdated literature in reaching their conclusions and did not cite in their testimony any of the papers thought significant by LILCO witnesses. The record also shows that they were unaware of the important DRC study until shortly before the hearing. Tr. 1394 (J. Johnson), 1395 (Erikson), Tr. 1398. The Board finds this curious since the DRC study is widely

available and has been presented at meetings. Tr. 1162 (Dynes). On the other hand, the record shows that the LILCO witnesses were familiar with, and able to distinguish and discuss the sources cited by County witnesses.

47. The record also shows that the County witnesses' citations to the scientific literature were out of context and could be misleading in many respects. Tr. 1327-28, 1332-33, 1338-39 (Erikson). For example, Dr. Erikson did not know whether some of the authors he relied on in preparing his testimony had experience with actual disasters. Tr. 1337-1339 (Erikson). The articles he apparently relied on did not appear to take into account more recent work, Tr. 1335-36 (Erikson), and did not indicate whether they dealt with trained emergency workers or simply with members of the general public. Tr. 1336 (Erikson).^{29/} In other cases Dr. Erikson could not recall the qualifications of the authors or the context of the portions of articles he cited. Tr. 1337, 1339, 1340 (Erikson). One of the articles relied on by Dr. Erikson was termed "speculative" by the author. Tr. 1335 (Erikson). This lack of support for Dr. Erikson's position can be summed up by looking at Tr. 1399-1400, where, in responding to a question from the Board, he stated that he knew of no study that addressed itself to the central thesis of Contention 25. Tr. 1399-1400 (Erikson); see also Tr. 1359-60 (Erikson).

^{29/} In one instance Applicant's witness, Dr. Mileti, phoned the author of a paper cited by Dr. Erikson and learned that there had been only three emergency workers and that they had all done their jobs. Tr. 993 (Mileti).

48. The FEMA witness, who was present at Buffalo Creek after the disaster, Tr. 2164, 2165, 2176 (McIntire), testified that he did not see any evidence that emergency workers at Buffalo Creek couldn't function because of role conflict. Tr. 2176 (McIntire). In contrast to Shoreham, there were no local emergency response organizations at Buffalo Creek. Id. This testimony is consistent with Dr. Mileti's testimony. Mileti, ff. Tr. 831, at 45-46. The Board finds, in summary, that Dr. Erikson's thesis of role conflict is an unsupported hypothesis, which makes some intuitive sense but which is refuted by the vast body of current credible scientific evidence.

49. The County also relied heavily on opinion surveys, particularly a survey of school bus drivers performed for it in September 1982. Cole, ff. Tr. 1216, at 2-12. As the Board has found in its findings on "shadow phenomenon," supra at Findings 31-35, opinion surveys are not a reliable indicator of what people's actual behavior will be in an emergency. Dyres et al., ff. Tr. 831, at 85-88; Tr. 1085-86 (Mileti).

50. Also appearing as a witness on role conflict for the County was Dr. James Johnson, ff. Tr. 831. In part Dr. Johnson relied on his mail survey of attitudes of people around Three Mile Island. (Some of the 150 respondents to that survey were health care professionals.) However, Dr. Johnson could not remember how many medical personnel near TMI indicated concern for personal and family health as their primary reason for evacuating. Tr. 1383-84 (J. Johnson). Dr. Johnson also relied on a study by Slovic et al. showing that people fear radiation. However, this study was not generally applicable to the public at large, Tr. 1387, 1382 (J. Johnson), and the notion that radiation is "unique" for emergency

planning purposes is not well founded. Dynes et al., ff. Tr. 831, at 93-98. In addition, Dr. Johnson did not have any experience with emergencies in contrast to LILCO's witnesses, Drs. Dynes, Mileti, and Sorensen, who related extensive experience with emergencies. Qualifications of Drs. Dynes, Mileti, Sorensen, ff. Tr. 4968; Tr. 850, 875-76, 907 (Dynes). So did the FEMA witness. Tr. 2164-65 (McIntire). Thus, Dr. Johnson's testimony, as Dr. Cole's, cannot be given much weight.

51. The County essentially discounted the value of experience from nonradiological disasters and concentrated solely on Three Mile Island. However, we find that the TMI experience does not support the County's theory of role conflict. The evidence shows that there were some reports that hospital personnel did not show up for work during the course of the TMI accident. Tr. 1056-57 (Dynes). However, Dr. Mileti investigated these reports and found that the personnel in question did not, as contrasted with LERO, have clearly defined emergency roles relating to the TMI incident. Dynes, Mileti, ff. Tr. 831, at 72-78, 80-85. Applicant's witness, Dr. Dynes, head of the Task Force on Emergency Response and Preparedness for the President's Commission on the Accident at Three Mile Island, also testified that role conflict was not a "major variable" in what happened at TMI and that it was a "meaningless concept" as far as the President's Commission was concerned. Tr. 1162-63 (Dynes). More importantly, a more recent radiological emergency at the Ginna facility in New York State did not reveal instances of role abandonment by emergency workers. Cordaro, Weismantle, ff. Tr. 831, at 93 and Attachment 8; Tr. 1166 (Weismantle); Tr. 1166-67 (Cordaro); see Tr. 2170-71 (McIntire).

2. LILCO Employees (Contention 25.A)

52. No intervenor adduced evidence that LILCO employees in LERO, as compared to other emergency workers, would abandon their roles. The LERO personnel are all volunteers. Weismantle, ff. Tr. 831, at 26; Tr. 911 (Cordaro). Many are also volunteer firemen. Tr. 1125 (Weismantle). In addition, we note that as a general proposition, public utility employees have an emergency function to perform, i.e., restoration of services, in many adverse situations. Tr. 1051 (Dynes).

53. The record, as more fully discussed in the portion of these findings related to the training contentions, establishes that the LILCO employees are being well trained. This training, plus detailed procedures and a family brochure, serve to clearly define their roles. Cordaro, Weismantle, ff. Tr. 831, at 18, 32-33. The LERO workers appear to be highly motivated.^{30/} Cordaro, Weismantle, ff. Tr. 831, at 26-27, and reliable, Cordaro, Weismantle, ff. Tr. 831, at 106. As noted above, they are familiar with the demands of emergency restoration of electric power. Cordaro, Weismantle, ff. Tr. 831, at 17-18, 105, Tr. 864, 865, 866 (Cordaro). Additionally, they have the benefit of the Family Tracking System, a formalized means for LERO workers to contact their families. Cordaro, Weismantle, ff. Tr. 831, at 22-24; Tr. 894-96, 904 (Weismantle). So far as any of the LILCO or FEMA witnesses knew, no other plan has such a feature. Tr. 900 (Weismantle); Tr. 2155 (McIntire). They will also

^{30/} For example, LERO averaged over 95 percent attendance at drills at the EOC. Tr. 1179 (Weismantle).

have access to information about the emergency. LILCO Ex. 3, ff. Tr. 1329. Cordaro and Weismantle, ff. Tr. 831, at 22; Tr. 892-94 (Weismantle, Cordaro).

54. The record further shows that LERO employees are advised to make family plans for emergencies and their families are provided a special brochure which also advises such a plan. Cordaro, Weismantle, ff. Tr. 831, at 20-21; Tr. 885 (Weismantle); see also Tr. 886-87 (Dynes), 887-88 (Mileti). In this regard, the FEMA witness also testified that role conflict for LILCO employees should not be a serious problem because they would tend to make advance preparations for their families. Tr. 2145 (McIntire). Dr. Erikson also emphasized the importance of family "contingency plans," although he apparently felt, without supporting basis, that only policemen and other "professionals" have them and that they are developed only over a long period of time. Tr. 1375 (Erikson). We find no basis in the record for such a broad conclusion. Rather, the record is clear that families generally expect their members who are emergency workers to fulfill their emergency responsibilities. Tr. 873-75 (Dynes).

55. Moreover, the LERO workers' families have a special relocation center. Cordaro, Weismantle, ff. Tr. 831, at 21; Tr. 902-03, 904 (Weismantle). Moreover, only 73 of 1585 LERO workers live within the EPZ. Cordaro, Weismantle, ff. Tr. 831, at 15; Tr. 861 (Weismantle). Even if some of the LERO workers did not show up for work, there is a surplus of workers that LERO could draw on for support. Cordaro, Weismantle, ff. Tr. 831, at 28; Tr. 927-28, 934 (Weismantle).

56. Former Police Commissioner Dilworth's testimony for the County on role conflict was based solely on his experience with police officers. Tr. 1262-63 (Dilworth). He attempted to apply this experience to LILCO employees, Tr. 1242 (Dilworth), with whom he had little or no experience. Tr. 1245-46 (Dilworth). Significantly, his experience with the police department was that the police had never failed to respond because of role conflict. Tr. 1237, 1239, 1268, 1283 (Dilworth). Commissioner Dilworth could not give an example of any emergency organization that was hampered in an emergency because of role conflict. Tr. 1243 (Dilworth). In light of this evidence, his unsupported opinion that LERC workers would not report in an emergency because of role conflict is discounted by this Board.

3. U.S. Department of Energy (Contention 25.B)

57. There is no evidence in the record of this proceeding that DOE RAP Team members, any more than other emergency workers, would abandon their jobs. In fact, the record shows they are well trained and experienced radiological emergency workers. Tr. 956-57 (Cordaro, Weismantle). They are familiar with radiation and the related hazards. Their role is well defined under a federal program and is set forth in detail in the LILCO Plan. Cordaro, Weismantle, ff. Tr. 831, at 34. The FEMA witness testified that role conflict vis a vis Brookhaven National Lab personnel is expected to be "almost nonexistent." McIntire, ff. Tr. 2086, at 5; see also Tr. 2138-40 (McIntire). We also note in this regard that the County's witness, Commissioner Dilworth, had no experience with DOE personnel and, thus, simply did not know what their function would be. Tr. 1242 (Dilworth). Suffolk County's proposed finding 128 recognized that these emergency workers, "... if in fact called upon to participate

with LILCO, probably will resolve role conflict in favor of performing their emergency roles."

4. School Bus Drivers (Contention 25.C)

58. The evidence adduced by the County on the role conflict of school bus drivers consisted of a survey commissioned by the County in which 3% of the school bus drivers queried responded that they would immediately leave the evacuation zone, 24% said they would first report to work, 69% said they would first make sure that their families were safely out of the evacuation zone, and 4% said that they would first check on their families and then report to work. Cole, ff. Tr. 1216, at 2-12; Cordaro, Weismantle, ff. Tr. 831, at 34-35. As the Board has found above, opinion surveys are not a reliable way of predicting what people will or won't do in a real emergency. (See Findings 31-35). Moreover, "making sure that one's family is safely out of the evacuation zone" may be accomplished by, for example, a phone call in some instances. Even accepting the results of the County's poll at face value, the record simply does not support a conclusion of a massive defection of school bus drivers. Cordaro, Weismantle, ff. Tr. 831, at 35. Also, we note that the County's schools witnesses had never personally experienced role abandonment. Tr. 3167 (Smith); Tr. 3168 (Rossi). Their testimony was that the closest they had come to this type of situation was having drivers call in sick when the weather was bad, or having to replace drivers when a problem came up at the drivers' home. Id.

59. The FEMA witnesses testified that training concerning radiation, together with being equipped with personal dosimetry equipment, helped bus drivers relied on in the Indian Point plan mitigate their fears that

they would be contaminated. Tr. 2142-43 (McIntire). Extra compensation also helped. Tr. 2143-44 (McIntire). The record here shows that LILCO will offer basic radiological training to school bus drivers and reimburse them for the time spent in such training. Cordaro, Weismantle, ff. Tr. 831, at 35; Tr. 960-6i (Weismantle). In this regard, training has been found important for bus drivers at Indian Point. Tr. 2157-58 (McIntire). It is also important as regards Shoreham.

5. Teachers, Other School Employees, and Crossing Guards
(Contention 25.D)

60. Apparently as a result of the State and County refusal to participate in emergency planning at Shoreham, several school districts in Suffolk County have passed resolutions stating that they do not think the LILCO Transition Plan is adequate and that they oppose the operation of Shoreham. See, e.g., SC Ex. 47. These resolutions assert that "role conflict" would be a problem without stating a basis for this conclusion. Id. On the other hand, representatives of teachers in the Shoreham-Wading River district, the district closest to the plant and within the EPZ, have stated that it is not true that they would abandon the students. Doremus, ff. Tr. 9491, Attachment 4. It appears to the Board that the school boards which have taken adverse positions on emergency planning at Shoreham did so after limited inquiry and without hearing from LILCO and that these decisions were made without knowledge of NRC regulations regarding emergency planning. Tr. 3133 (Rossi); Tr. 3137 (Jeffers).

61. The only empirical evidence that the County school officials relied on in regard to "role conflict" is certain polls. The testimony shows that the County's schools witnesses based their opinions on

polls^{31/} plus the opinions of the staff and superintendent of schools delivered orally during board meetings. Tr. 3090-91, 3097 (Petrilak); Tr. 3104-05 (Smith). The question asked in the poll was how long teachers would stay to implement an early dismissal and whether teachers would be able to supervise children travelling to relocation centers and at relocation centers if there were a quickly developing radiological emergency. Tr. 3092-93 (Petrilak). The poll did not ask those who answered that they would not stay or supervise the reasons why they would not do so. Tr. 3093-94 (Petrilak).

62. No County school witness knew how many of their staffs had families. Tr. 3097 (Petrilak). Nor could they estimate with any confidence how many teachers or other school personnel would abandon school-children. If some teachers were not available, for whatever reason, it appears the problem could be solved by having remaining teachers supervise larger numbers of students. Tr. 3100 (Petrilak); Tr. 3119 (Muto); Tr. 3158-59 (Jeffers); Tr. 966, 1137-38 (Weismantle). We see no reason why the problem of role conflict by teachers cannot be solved by simply planning in advance. This is precisely what Shoreham-Wading River school district is doing. Doremus, ff. Tr. 9491, at 9. School districts have already in some cases polled their bus drivers and teachers. The schools, as required by New York State law, already have early dismissal plans in place. Cordaro et al., Tr. 5/30/84, Vol. 2, at 28. With relatively little effort the Board believes they can plan to avoid problems of "role conflict" in the event that Shoreham operates.

^{31/} The Mt. Sinai School District had taken a poll of teachers. Tr. 3091 (Petrilak). The Middle Island School District had not polled teachers or administrators. Tr. 3112 (Muto).

63. The FEMA witness testified that "[t]he history of disaster response has consistently shown that non-emergency workers, and particularly teachers, also more than meet responsibilities when faced with emergency situations." McIntire, ff. Tr. 2086, at 5; Tr. 2136-37 (McIntire). This testimony is consistent with evidence presented by Dr. Mileti on behalf of LILCO. Mileti, ff. Tr. 831, at 36. The FEMA witness further testified that continued improvement in training and public education would provide a higher competence level to nonemergency workers regarding the safety of their families. Tr. 2137-38 (McIntire). LILCO will offer training and information to teachers. At TMI, the record shows that teachers generally stayed at their posts during the early stages of the accident, although Dr. Erikson said that this was before the issuance of any advisory, Tr. 1347-49 (Erikson).

6. Ambulance Drivers and Medical Personnel (Contention 25.E)

64. Ambulance drivers will be provided in the event of an emergency situation at Shoreham under letters of agreement with the ambulance companies. Cordaro, Weismantle, ff. Tr. 831, at 37. Under the LILCO emergency plan, the drivers will be doing the same sort of thing they ordinarily do in their every day jobs. They will be offered basic radiation training, reimbursed for their time spent in training sessions, and will be provided with dosimeters in an emergency. Cordaro, Weismantle, ff. Tr. 831, at 37.

65. If some of the ambulance drivers did not show up for duty, for whatever reason, it would simply mean that it would take longer to evacuate the special groups involved, not that the emergency response effort would fail. Cordaro, Weismantle, ff. Tr. 831, at 37.

66. Dr. Mileti's informal investigations suggested that role abandonment in this context was not a major problem at TMI. Mileti, ff. Tr. 831, at 73-76. Dr. Erikson had testified in another proceeding that health care professionals would be less likely than other emergency workers to abandon their roles because of role conflict. Id. at 84. He had changed his mind by the time of the Shoreham proceeding because of "new information," presumably two papers from Three Mile Island. Id. at 84. The two papers, not prepared by trained sociologists, reported that some health care professionals had failed to report for work during TMI. But Dr. Mileti asked his research assistant to call the authors, and he found that the people who had left did so because they had no emergency role. Id. Even at Hiroshima and Nagasaki the evidence is that the health care professionals who were not incapacitated there assembled to do their jobs. Mileti, ff. Tr. 831, at 49-50. We are of the view that health care professionals would perform in the event of an emergency at Shoreham.

7. The American Red Cross (Contention 25.F)

67. There is no evidence in the record before us that the American Red Cross personnel would fail to perform their roles in the event of a radiological emergency at Shoreham. Red Cross personnel are dedicated, Tr. 909 (Weismantle), well-trained, Tr. 2159 (McIntire), Tr. 976 (Weismantle), and well organized, Tr. 2160 (McIntire). There is no question that they have a clear definition of their roles. Cordaro, Weismantle, ff. Tr. 831, at 38; Tr. 2160 (McIntire). As more fully

discussed in our findings below related to relocation centers, LILCO relies chiefly on the Nassau County Red Cross chapter and all relocation centers will be at least 20 miles from the Shoreham plant. Former Commissioner Dilworth testified that he had not been thinking about the Red Cross when he wrote his testimony, Tr. 1241 (Dilworth), and no other County witness addressed the Red Cross specifically. The record shows that the Red Cross mans relocation centers largely from among the evacuees themselves. Cordaro, Weismantle, ff. Tr. 831, at 38; Tr. 971-72 (Weismantle); see also Tr. 1390 (J. Johnson). None of the Suffolk County witnesses testified that Red Cross personnel would abandon their roles. The record also shows that the Red Cross set up two relocation centers during Three Mile Island. Cordaro, Weismantle, ff. Tr. 831, at 38. The FEMA witness testified that in their opinion workers from agencies such as the Red Cross would see to the safety of their families before they reported for their emergency roles. Tr. 2148 (McIntire). Thus, past experience related on the record, leads us to the conclusion that "role conflict" will not be a significant problem vis a vis the Red Cross. As Suffolk County has conceded there is no persuasive evidence that the Red Cross would not respond or that the performance of Red Cross workers would be impacted by role conflict. Suffolk County proposed finding 149.

Conclusion

68. In view of the weight of the evidence, summarized above, the Board finds that there is reasonable assurance that trained emergency workers at Shoreham, who have been assigned well defined roles, will

not abandon those roles in time of emergency. Accordingly, we find Contention 25 to be without merit.

II. Credibility and Conflict of Interest

Credibility (Contention 15)

69. Intervenor's Contention 15 alleges that LILCO is not considered by the public or certain support organizations to be a credible source of information and, because of that perception, protective action and other recommendations disseminated by LILCO in an emergency will not be followed by the public.

70. Contention 15 is broken down into seven subparts, 15A through 15G. The various subparts of the contention allege certain people and organizations in particular who would not believe LILCO: (A) People in support organizations such as the Red Cross, DOE, ambulance, fire, rescue organizations, local law enforcement agencies, and the U.S. Coast Guard; (B) Members of the public advised to shelter; (C) School authorities; (D) Motorists directed by traffic guides or security personnel; (E) Members of the public listening to ERS messages; (F) People contacting the rumor control point; and (G) People reading the emergency planning brochure and other public education materials in advance of an emergency. These subparts are not separately admitted, but are treated as reasons in support of the main contention.

71. Applicant presented the direct testimony of seven witnesses on the issue of credibility. These witnesses were: Matthew C. Cordaro, a LILCO vice-president; Carol A. Clawson, Associate Director of Public

Affairs for LILCO; Elaine D. Robinson, Manager, LERO's External Organizations Division; Dennis E. Mileti, Associate Professor of Sociology and Director of Hazards Assessment Laboratory at Colorado State University; John A. Weismantle, Manager of LILCO's Local Emergency Response Implementing Organizations (LERIO); John H. Sorenson, Research Staff Scientist, Resources Analysis Group, Energy Division, Oak Ridge National Laboratory; and Steve Barnett, V. President, Cultural Analysis Group, Planmetrics, Inc. Cordaro et al., ff. Tr. 10396.

72. Suffolk County presented the same five witnesses that appeared for it on Contention No. 11 (see Finding No. 110, infra) as well as Dr. Stephen Cole, Professor of Sociology, SUNY at Stony Brook. Cole et al., ff. Tr. 10727.

73. In addressing Contention 15 the utility and the county each proffered its own public opinion survey on the general subject of the credibility of various entities and the amount of trust persons place in those entities. Cordaro and Weismantle, ff. Tr. 10396, at 10-12; Cole, ff. Tr. 10,727, at 5, 8-12. Most of the "different" results outlined in these two surveys come from sampling error or bias in the questions propounded rather than a difference in the beliefs of the sampled universe. Sorenson, ff. Tr. 10396, at 12-14. What is significant about these polls is not that each reports different "numbers," but that the same conclusion can be reached from both. That is, no one person or organization will be trusted by everyone. Mileti, ff. Tr. 10396, at 15. Government officials as well as utilities, may have low credibility at any particular time. Tr. 2152 (McIntire); Cole, ff. Tr. 10727, at 14.

Consequently, emergency planning must design an emergency public information system that would elicit belief in the emergency information disseminated, regardless of prior "trust" by the public in different groups, people or organizations. Id.

74. The credibility of a source of emergency warnings will affect the public's response to such messages. Notification and instruction will work best if derived from "credible" sources. Mileti, ff. Tr. 10396, at 41; Cordaro et al., ff. Tr. 1470, at 27. As county witnesses conceded, however, credibility is only one of many factors that affect public reaction to emergency information and evacuation decisionmaking. Tr. 10,779, 10,003, 10,805-806, 10,809 (Saegert); see also Cordaro, et al., ff. Tr. 1470, at 26-36.

75. A detailed investigation of the role credibility plays in warning response was conducted on earthquake predictions in a study report by Mileti, Hudson and Sorenson entitled, "Earthquake Predictions Response and Options for Public Policy," University of Colorado, Boulder, 1981. Mileti and Sorenson, ff. Tr. 10396, at 33. Three factors emerged as important in making a prediction credible. Id. The most significant determinant of credibility was the scientific reputation of the person or organization making the prediction. The second most important factor was confirmation of the prediction by other knowledgeable parties. The third factor was the conveyed certainty of the threat. Id. This helps to confirm that for warnings with a technical component, scientific recognition and verification are important determinants of credibility. Id.

76. The public's perception of the "credibility" of a nuclear utility is closely tied to the public's overall attitude toward nuclear energy. Barnett, ff. Tr. 10396, at 20-21. As concerns about radiation and waste increase, the opinions on nuclear energy go from favorable to unfavorable, and perceptions of honesty in communications regarding nuclear development decline. Id.; Cole, ff. Tr. 10727, at 7-13. The public's perception of LILCO's credibility, when compared to other utilities, seems representative of national public attitudes, which are generally suspicious of communications concerning nuclear power from utilities. Barnett, ff. Tr. 10396, at 20; Cole, ff. Tr. 10727, at 7-13.

77. Dr. Barnett testified that large segments of the general public do not trust statements about nuclear power -- no matter what the information source -- based on interviews he conducted with anthropologically based groups. Barnett, ff. Tr. 9689, at 21-22. The County's own witness found that, "there is virtually no one whom a significant majority of residents trust to tell the truth about the Shoreham plant." Tr. 10818-19 (Cole); LILCO Ex. 65, at 11. Dr. Cole also testified that many people would not believe EBS messages even if the county were participating in the emergency response. Tr. 10865 (Cole); see also Tr. 10876-77 (Saegert); Tr. 10811 (Olson). Surveys after the TMI accident and in the Indian Point area indicate that the public would also distrust public officials. Sorenson, ff. Tr. 10396, at 35; Tr. 10845-46 (Saegert).

78. The credibility of particular private and public institutions can vary from very high to very low over time. Mileti, ff. Tr. 10396, at 17, 30; Tr. 2152 (McIntire). Indeed, the credibility of even the most authoritative or highest ranking public official, such as the President,

will vary. Tr. 10739 (Lipsky); Tr. 10802-803 (Lipsky and Saegert); see Tr. 2152 (McIntire); Mileti and Sorenson, ff. Tr. 10,396, at 30.

79. Individuals within an organization are viewed by the public as more credible than the organization itself. Sorenson, ff. Tr. 10396, at 16; Tr. 10448, 10460 (Sorenson). Specific individuals within any organization are viewed as having different degrees of credibility, even as differences in credibility exists between different organizations. Id., at 16, 31, 32. To increase the credibility of a warning, the message should convey to the public that the information is being scrutinized and validated by different sources and originates from emergency planning and other experts. Id., at 17; Mileti and Sorenson, ff. Tr. 10396, at 31.

80. The applicant's witnesses take the position that although low credibility can be overcome by careful design of the emergency information system, low credibility should be assumed for purposes of effective emergency planning. Mileti, ff. Tr. 10396, at 41; see Tr. 10812-13 (Saegert). Dr. Saegert also did not feel the LERO plans would be viewed as credible by the public because she felt that the public will rely on its own impression that Long Island's geography makes evacuation impossible. Tr. 10,870-71, 10,876-77, 10,937 (Saegert).

81. Since no person or organization has complete credibility with everyone at all times, it is prudent to associate as many sources as possible with the emergency messages. Mileti and Sorenson, ff. Tr. 10396, at 33. The LILCO messages do this. Id.

82. To the extent any institutions presently have credibility in nuclear matters, the evidence suggests that these are the NRC and DOE. Cordaro et al., ff. Tr. 10396, at 38; Tr. 9709, 9763 (Barnett); 10,189

(Cole); 11,071 (Muto). Both of these institutions, as well as FEMA, would be part of an emergency response at Shoreham and, consequently, would lend additional credibility to emergency warnings to the public. Id., at 38-39; Tr. 10,469 (Cordaro); Tr. 10,470-71 (Robinson).

83. The County's witnesses had not investigated disaster behavior, they instead relied upon the public opinion surveys performed for the County and a reading of theoretical literature on behavior. Tr. 10,854, 10,882 (Lipsky); Tr. 10,838, 10,881-82 (Olson); Tr. 10,847-50, 10,854-55, 10,857, 10,859, 10,861, 10,864 (Saegert). They discounted or ignored the bulk of empirical research on behavior in disasters. Tr. 10790-92 (Olson); see id. Dr. Saegert believed most of the empirical research to be deficient. She believed the psychological literature should be given more attention, Tr. 10,790 (Saegert), although she admitted that most of the work on which it is based is methodologically flawed. Tr. 10,810-11 (Saegert).

84. The County witnesses also relied heavily on their understanding of the experience at TMI. Tr. 10,794 (Cole). Information from two surveys at TMI was presented by LILCO's witnesses. This information showed that it is possible for one to have low credibility at one time and yet be seen as a useful source of information at another time. Cordaro et al., ff. Tr. 10,396, at 28-29; Tr. 10,443, 10,446-47 (Sorensen).

85. The County witnesses did not address the radiological accident at the Ginna plant, where credibility did not seem to be a problem. Cordaro et al., ff. Tr. 10,396, at 37. A possible explanation for the lack of a credibility problem at Ginna is that the utility used two independent experts to verify or refute utility information it supplied

to the media. Id., Tr. 10,697-98 (Clawson). LILCO has also arranged to have two independent experts from Brookhaven National Laboratory at its Emergency News Center. Tr. 10,446-69 (Robinson, Cordaro).

86. -The Board finds the weight of the evidence with the LILCO witnesses on this contention because of their specific involvement in disaster research and the evacuation plan itself. Tr. 10,403-407 (Sorenson); Tr. 10,407, 10,413-15, 10,418 (Mileti); Tr. 10,410 (Clawson); Tr. 10,410 (Robinson); Tr. 10,408-409 (Sorenson, Mileti); Tr. 10,416-17 (Cordaro, Weismantle); Sorensen, ff. Tr. 10,396, at 37.

Support Organizations (Contention 15A)

87. Subpart A of this contention (not separately admitted) maintains that certain organizations will not credit emergency information from LILCO and, therefore, these organizations will be ineffective in an actual radiological emergency. These organizations include the Red Cross, the DOE RAP Team, the U.S. Coast Guard, ambulance companies, fire and rescue organizations and local law enforcement agencies. The LILCO plan does not rely on the fire and rescue organizations or the local law enforcement agencies. With respect to the other support organizations concerned, however, LILCO has secured written agreements as to their participation. Cordaro et al., ff. Tr. 10,396 at 70. Numerous meetings have taken place between LILCO and the Red Cross, DOE, the Coast Guard, and ambulance companies. Id.; LILCO Ex. 1, Appendix B of Plan. These organizations have already received or will receive training with LILCO or from LILCO personnel. Cordaro et al., ff. Tr. 10,396 at 70. The intervenor's contention under this subpart that these organizations will find LILCO incredible in announcing emergency plans -- or directions, if

any -- is implausible given their participation with the utility thus far.

Sheltering (Contention 15B)

88. Intervenor maintains that members of the public advised to shelter will not do so as a result of LILCO's lack of credibility. For the reasons stated above, the Board finds the arguments in regard to sheltering no more compelling than the preceding arguments on credibility. Consequently, the steps anticipated by the utility to make emergency recommendations as credible as possible -- including providing numerous sources of information and advance public education -- give reasonable assurance that sheltering recommendations will be followed by the public.

School Authorities (Contention 15C)

89. This subpart of the contention says that due to LILCO's low credibility, school officials may not believe information or follow recommendations provided by LERO and as a result fail to take appropriate protective actions in an emergency.

90. Under the LILCO plan, at the time of an emergency each school district would receive EBS notification over one or more of the tone alert radios supplied to them by the utility. Cordaro et al., ff. Tr. 10,396, at 92-93. The message will provide specific guidance for schools. Id. In addition, the LERO School Coordinator will contact the schools to verify their reception of the EBS message and to serve as an individual contact for the school district administrators. Id. at 93.

91. The school administrators that testified on behalf of the County stated that they would seek confirmation of LILCO recommendations from

local or New York State officials. Tr. 11,012, 11,063 (Jeffers); 11,003-04, 11,007, 11,009 (Muto); 11,107 (Muto, Smith); Tr. 11,021-22 (Petrilak); Tr. 11,059-62 (Petrilak, Jeffers). This is necessitated, in the witnesses' view, by concerns for whether they would be authorized to take particular actions rather than by LILCO's credibility in advising them to do so. Id.

92. The utility proposes to solve this problem by informing the schools in advance which government officials the schools should contact in the event of an emergency. Those officials will have been notified by LILCO of the EBS notification irrespective of their participation in the plan. Cordaro and Weismantle, ff. Tr. 10,396, at 97.

93. Further, since school officials will have individual contact with LERO coordinators, who are informed of the plan and the recommended responses for the schools in question, it is not likely that school officials will find state and local officials who had not participated in the planning more "credible" sources of information. Cordaro et al., ff, Tr. 10,396, at 96-98. In the absence of other reliable information, school officials will be inclined to follow EBS advice. Id.

94. LILCO's alleged lack of credibility does not prevent reasonable assurance that its recommendations to school officials in a radiological emergency will be obeyed.

Traffic Guides (Contention 15D)

95. This subpart alleges that because of LILCO's purported lack of credibility, motorists will not follow the directions of the LERO traffic guides. The likely public response to these traffic guides is more fully

expressed in addressing Contention No. 65, infra (see "IX. Evacuation, A. Time Estimates," infra).

96. Traffic guides will be trying to convey to the public the fastest and safest route out of the EPZ. Cordaro and Weismantle, ff. Tr. 10396, at 100. The public will know that this is the purpose of the guides from the public information brochure. Id. Routes out of the EPZ will be identified for the public each year in brochures and glove box stickers and sent to them. Id. This advance knowledge by the public creates increased credibility of traffic guides while performing their assignment.

97. In addition, it is alleged in this subpart that LILCO personnel assigned to perform security functions under the transition plan (i.e., performing security functions at the EOC, relocation centers, and at the EPZ boundary) are unlikely to be trusted or obeyed by the public as a result of LILCO's alleged lack of credibility. These functions are described in OPIP 4.1.3, which is to be added to the Plan in Revision 4. Cordaro and Weismantle, ff. Tr. 10,396, at 102.

98. LILCO's alleged lack of credibility would not affect these security functions. Cordaro and Weismantle, ff. Tr. 10,396, at 102. The purpose of the security functions described in the Plan and Procedures is to provide the means for establishing the identity of whoever leaves or enters a LERO facility, so that if non-LERO people attempt to enter a secure facility, the Security Coordinator will be informed and can track their movements or assign a guard to accompany them. Id.

99. In the case of LERO personnel positioned at the EPZ perimeter, their function is simply to deter entry into the EPZ. Id. They do this

by explaining the emergency situation to those attempting to enter the EPZ. Id. Since these persons who opt to enter the EPZ will be traveling in an opposite direction of those evacuating, they should not impede the evacuation. Id. at 103.

EBS Messages (Contention 15E)

100. This subpart dealing with whether the public will believe EBS messages is not different from the main contention. The findings made previously with regard to the main contention address the allegations of this subpart. See Findings Nos. 73-86, supra.

Rumor Control (Contention 15F)

101. Subpart F of Contention 15 deals with LILCO's proposed rumor control system. LILCO plans that the LILCO district office callboards and customer service centers will receive updated news releases and will be trained to refer rumors and questions that they cannot handle to rumor control, as they would in a storm emergency. Rumor control at the Emergency News Center will be responsible for distribution of information through the LILCO callboards. Cordaro, et al., ff. Tr. 10,396, at 107.

102. All LILCO phone books will have instructions to refer calls to the Customer Service numbers. Moreover, the Company has a local communications network, used during storm restoration, by which the latest accurate information is relayed to the County Center and town halls. The onsite plan provides for liaison with local governments to supply accurate and consistent information about an emergency. Id. at 108. According to LILCO, rumor control is commonly staffed by utility personnel using the utility's offices under other radiological emergency plans in this country. Robinson, ff. Tr. 10,396, at 109.

103. The County's chief concern seems to be that the process of checking and approving information for public release will cause delay and contribute to a public perception that the utility is covering up the truth. Id. at 112. It is true that the public information staff is to ensure that press releases are approved by the LERO Director and reviewed by government and utility coordinators of public information before media dissemination; however, this seems no more than is necessary to ensure consistency and accuracy of information. Id. Moreover, press conferences will be conducted periodically in the ENC and a panel will be available to provide up-to-date information on the status of the emergency. Id.

Public Education (Contention 15G)

104. Dr. Saegert believed the public education brochure and other educational materials prepared by LILCO would not be believed. Studies she cited showed that people could not remember receiving brochures. Tr. 10,871-72 (Saegert). The regulatory requirement, however, is that educational materials be "made available." 10 CFR § 50.47(b)(7); Consolidated Edison Co. (Indian Point, Unit No. 2), LBP-83-68, 18 NRC 811, 943 (1983).

Conclusion

105. The credibility of LILCO with the general public and the specific entities cited in this contention is as good as that of any other institution that would be in a position of making protective action recommendations. To the extent credibility is deficient in an absolute sense, it can be anticipated and provided for in emergency planning. Thus, Contention 15 is without merit.

Conflict of Interest (Contention 11)

106. Contention 11 alleges that LERO command and control personnel might not give an appropriate protective action recommendation promptly in a radiological emergency because these employees may experience a conflict of interest between LILCO's financial and institutional interest and the public interest because of LERO personnel's economic dependence on LILCO. Further, the contention alleges that appropriate measures to ensure the independence of LERO have not been instituted.

107. In the context of responding to a community emergency, "command and control" refers to authoritative direction of activities designed to mitigate that emergency. It includes: (1) the existence of decision-makers who can and will make authoritative decisions; (2) a group or groups that have been assigned the duty of implementing the decisions; and (3) an authoritarian relationship such that the decisions will be accepted as binding by those who are expected to carry out or obey the directions. Purcell et al., ff. Tr. 10727, at 6-7.

108. The command and control functions under the LILCO Plan are to be exercised by LILCO employees or, in the case of the Radiation Health Coordinator, a LILCO contractor. Id. The LILCO employees designated to fill command and control positions in LERO have management positions in the LILCO corporate hierarchy. Id.

109. In response to Contention No. 11, the utility presented four witnesses. These witnesses were: Matthew C. Cordaro, Vice President, Engineering, LILCO; Dennis S. Miletic, Associate Professor of Sociology and Director of the Hazards Assessment Laboratory at Colorado State University; John A. Weismantle, Manager of LILCO's Local Emergency

Response Implementing Organization; and Jay R. Kessler, Vice President, Gas Operations, for LILCO and Director of LILCO's Local Response Organization. Cordaro, et al., ff. Tr. 10,196. The written direct testimony of another LILCO witness on this contention, Mr. Andrew W. Wofford, was stricken from the record. Id.

110. In support of its allegations on Contention No. 11, intervenor presented the testimony of Arthur H. Purcell, Director of Resource Policy Institute, Washington, D.C.; David J. Olson, Professor, Political Science Department, University of Washington, Seattle, Washington; Michael Lipsky, Professor of Political Science, Massachusetts Institute of Technology, Cambridge, Massachusetts; and Susan C. Saegert, Associate Professor of Psychology and Environmental Psychology, City University of New York, New York. Olson et al., ff. Tr. 10,727.

111. The NRC Staff presented two witnesses to address the allegations of alleged conflict of interest of LERO personnel. These witnesses were John R. Sears, Reactor Safety Engineer, Emergency Preparedness Branch, Division of Emergency Preparedness and Engineering Response, Office of Inspection and Enforcement (Tr. 15,139) and Sheldon A. Schwartz, Deputy Director, Division of Emergency Preparedness and Engineering Response, Office of Inspection and Enforcement (Id.).

112. The County's Contention and witnesses take the position that stock ownership in, or long employment with, LILCO by LERO personnel will result in a conflict of interest because these economic interests could result in subtle biases or mindsets reducing objectivity in an emergency. Purcell et al., ff. Tr. 10,727, at 8-9, 12; Tr. 10,920-21 (Saegert, Cole), Tr. 10,929 (Saegert); Tr. 10,962-63 (Lipsky; 10,753 (Lipsky,

Purcell). These witnesses also testified that everyone, public officials as well as utility employees, have subtle mindsets that might influence behavior in certain circumstances. Tr. 10,933 (Saegert); Tr. 10,960 (Olson); 10,961 (Lipsky); see also Tr. 15,216 (Schwartz).

113. The fact that LERO command and control functions would be carried out by LILCO employees, does not give reason to conclude that this would adversely influence these employee's performance of required tasks in the case of a radiological emergency. Although the loss of public confidence in LILCO resulting from ordering an emergency response might translate into eventual detrimental pecuniary effects on the utility (Purcell et al., ff. Tr. 10,727, at 18-20), a failure to order such a response in circumstances justifying one would lead to as great or greater loss of confidence. Tr. 10361-62 (Weismantle); Tr. 10962-64 (Lipsky). Thus, the conflict of interest consideration cuts both ways and there is no reason to presume that appropriate actions would not be taken by LERO command and control personnel. See id. Tr. 15,211-12 (Sears)

114. There are historical examples where those with an interest in covering up an emergency situation frankly informed the public and other instances where they were not completely open. Mileti, ff. Tr. 10,196, at 8-10. Private companies and public officials have been involved in both types of cases. Id.; Tr. 15,213, 15,220 (Sears); Tr. 10,728-33 (Saegert, Lipsky, Olson); Tr. 10,226-27, 10,257-58, 10-369-10,370 (Mileti); see also Tr. 10,225-29 (Mileti).

115. It is important for public safety that one be aware that the downplaying of risk by the private companies or officials can occur. Mileti, ff. Tr. 10,196, at 10. This knowledge enables emergency plans

to address the phenomenon and minimize the chance that such downplaying of the risk will occur in an emergency. Tr. 15,224, 15,254-55 (Schwartz); Tr. 10,271 (Mileti); Cordaro et al., ff. Tr. 10,196, at 10-11. An emergency plan that minimizes this problem will provide for the removal of the effects of the individuals' personalities, fears, biases, beliefs and other influencing factors from both the decisions and the process that links discovery of the threat with the communications of that threat to the public. Id. at 11.

116. "Conflict of interest" hindering an emergency response can be minimized if key decisions and transmittal instructions are formalized in advance (e.g., given event A occurring, read message B to person C and to the public every D minutes) and that a post-event review group exists to hold the individual participants in the system accountable for not following formalized directions. Id., at 11-12; Tr. 10,273-76 (Mileti).

117. The County relies on certain statements made by Metropolitan Edison employees in the wake of the Three Mile Island (TMI) accident as being probative of what would occur in the possible eventuality of an offsite emergency at Shoreham. Purcell and Saegert, ff. Tr. 10,727, at 10-11. At TMI the utility was slow to confirm pessimistic reports about the accident. Tr. 15,168-69 (Schwartz). The current NRC regulations and guidelines were promulgated, in part, to minimize individual biases and avoid the situation that arose at TMI. (Tr. 15,218 (Sears); Tr. 15,218 (Sears); 15,169-70 (Schwartz); Tr. 10,328 (Mileti); 10,841-42 (Purcell)).

118. The LILCO plan follows the NRC regulations and guidelines, and formalizes the decisions and transmittal instructions in the prescribed manner. Cordaro and Weismantle, ff. Tr. 10,196, at 13-20. Plant-specific

emergency action levels (EAL's) have been developed. Id. These EAL's detail actual gauge and meter readings which, if exceeded, mandate the declaration of the emergency at a particular level. Id. The possibility of an ambiguous situation arising has been greatly reduced by the existence of EAL's. Tr. 15,223 (Sears); Tr. 15,224, 15,252-55 (Schwartz), Tr. 15,228 (Sears). As NRC Staff witness Sears testified in questioning by this Board, there is nothing ambiguous about the amount of radiation in the containment which is the final indicator that the core is in very serious trouble. A given amount of radiation in the containment is the trigger for a recommendation to evacuate people in the first two miles from the plant. Tr. 15,209, 15,228 (Sears). No opportunity for "conflict of interest" arises because these criteria are set without discretion. Id. The procedure for making protective action recommendations is clearly defined and mitigates the influence of any conflict. Cordaro et al., ff. Tr. 10,196, at Attachment 1.

119. The process of informing the public has been formalized in four implementing procedures in the LILCO Transition Plan in accordance with Dr. Mileti's research and recommendations as to how to negate the individuals' ability to downplay or ignore the emergency risk. Id. at 16, Attachments 4, 5 and 6. These procedures cover: (1) key decision and transmittal instructions in reference to threat information are formalized; (2) the substance, process and spacing of public information; (3) assurance that participants in the system know that they are expected to carry out tasks in a specific manner; and (4) provision of knowledge to participants that there will be a post-event audit by a review group that will hold the participants accountable if proper procedures are not

followed. Mileti, ff. Tr. 10,196, at 11-12. For example, the activation of the Emergency Broadcast System (EBS) and transmittal of emergency messages is directly determined by the emergency classification and the protective actions recommendation. Id. at 17-18. The substance of the emergency broadcast messages is predetermined by the wording of the sample messages in OPIP 3.8.2 Id. at 18, Attachment 6. The frequency of the messages is also explicitly provided for. Id. at 19.

120. All personnel associated with the development, review and transmission of the EBS messages have been trained and have participated in drills and exercises. Id. These persons are also aware that post-event audit of their actions will occur and they will be held accountable for any failure to follow the procedures. Id. at 19-20; Kessler, ff. Tr. 10,196, at 2; Tr. 15,214-15 (Sears).

121. Drills and exercises provide a test of whether emergency personnel would take the appropriate action in an actual accident. Tr. 15,213, 15,228-29 (Sears). The training of LERO personnel stresses the protection and safety of the public and, thus, helps prevent possible "conflict of interest." Cordaro and Weismantle, ff. Tr. 10,196, at 29, Attachment 8, 9; Tr. 10,271 (Mileti).

122. A plan must also allow judgment to be made in times of emergency (thus making the plan flexible), yet, still provide clear guidance to decisionmakers. Cordaro et al. ff. Tr. 10196, at 13. Staff witness Sears testified that there would be little credibility problem between onsite and offsite organizations (Tr. 15,170). Thus, a situation similar

to the one that developed at TMI -- where the governor checked with his staff to verify the credibility of an NRC official -- would be avoided. Tr. 15,220-21 (Sears); Tr. 10,929-30 (Purcell).

123. The Radiation Health Coordinator (RHC) is responsible for advising on the protective action determination based on recommendations provided by the onsite staff at Shoreham. Cordaro and Weismantle, ff., Tr. 10,196, at 14. The RHC is not a LILCO employee, but a consultant. Id. Besides getting information from the onsite staff, the RHC takes dose projections from survey teams, the responsibility for which rests with the DOE Rap Team Captain. Id., at 15. The Director of Local Response could not disregard the recommendations of the RHC without such action being known, since all information and recommendations going to the Director will be recorded. Id. at 16.

124. The Department of Energy RAP team participates in the making of protective action recommendations. Its close proximity to the plant ensures its involvement in the event of an emergency response. Cordaro and Weismantle, ff. Tr. 10,196 at 15.

125. The LERO structure helps ensure independence of command-and-control personnel from LILCO as an institution by the following means: LERO personnel in the EOC are of equal or superior rank in their regular jobs at LILCO to the site response personnel at EOC; no LERO personnel are associated with the Shoreham plant in their regular jobs; DOE personnel who are knowledgeable about radiation are an integral part of LERO and will be represented at the EOC; and all procedures and protective actions are prepared in advance to the extent possible. Cordaro and Weismantle, ff. Tr. 10,196, at 28-29. In addition, apart from Suffolk County and New

York State officials and personnel, the NRC would be reviewing information directly from the Control Room by means of a dedicated phone. Id. at 30-31.

126.- The cost to LILCO, in its own opinion, of evacuating people from the environs of Shoreham, is relatively minor when compared to the tremendous cost of recovering the plant in the aftermath of an accident. Sears, ff. Tr. 15,139, at 7; Cordaro et al., ff. Tr. 10,196, at 27-28; Tr. 15,201-15,210 (Sears).

127. As the Staff testified, in making decisions about what actions should be taken to address a safety concern, a nuclear power plant owner is frequently faced with decisions that potentially affect both safety and financial interests. Schwartz, ff. Tr. 15,139, at 2. Sometimes these interests are in conflict, such as when a safety interest would require a power reduction or plant shutdown. Sometimes they are in agreement, such as when a concern about the safety of a particular situation results in changes which improve the reliability of the power plant. Id. What matters is that the overriding emphasis is placed on safety interests in situations potentially affecting public health and safety without regard to cost. This emphasis is monitored by the NRC under its statutes and regulations. As an independent organization, the NRC assures that public health and safety interests are the primary consideration. Id. There is no difference in kind between a decision or action a utility may be called upon to take in the regular operation of a plant or in regard to onsite or offsite emergency response. Schwartz, ff. Tr. 15,139, at 2.

128. The NRC ensures that safety interests are given proper consideration by the licensee over financial interests during plant operations. Id. at 3. The primary mechanism by which the NRC accomplishes this end is its inspection and enforcement program. The program protects public health and safety by ensuring that licensees comply with regulatory requirements. The NRC maintains a vigorous inspection program including onsite resident inspectors to monitor a licensee's activities on a daily basis. Id. Because of the communication links and new requirements which have been established since the TMI accident, NRC Headquarters and Regional offices would be informed of an emergency situation and, if necessary, would quickly dispatch response teams to the plant site to monitor the performance of the utility to assure that appropriate actions are taken to mitigate the consequences of the event. Id. The NRC Headquarters operations center and Regional response center would also be staffed to support the response effort. Id.

129. At the time that an emergency originates, the NRC's Office of Inspection and Enforcement plays an active role that provides independence from "conflict of interest" potential in the response. Tr. 15,230. (Schwartz). Upon finding itself in an emergency situation, the utility would immediately call the NRC Operations Center directly from the control room. Id. This call places an Emergency Officer in continual contact with the situation at the plant. Tr. 15,230-31 (Schwartz). This Emergency Officer could take enforcement action to cause the licensee to take other action. Id., at 15,231. These procedures are described NUREG 0728 and 0845. Id., at 15,232. The NRC itself could cause the sirens to be sounded or issue an order to scram the reactor. Id. at 15,233-36.

130. Unlike the NRC's lack of authority over state or local government, the agency has the authority to order a licensee directly to take action. Tr. 15,231-36, 15,248, 15,257-58 (Schwartz); Tr. 15,242-43, 15,257 (Sears). The NRC thus has more control over offsite responses in the LILCO situation than it does in any other. Tr. 15,242-44 (Sears); Tr. 15,248 (Schwartz).

131. The Board does not subscribe to County witness Dr. Olson's belief that NRC regulation is only effective when applied to "routine and repetitive" activities. See Tr. 10,949-51 (Olson); see also Tr. 14,252-54, 14,266-67 (McIntire).

Conclusion

132. Based upon the evidence adduced on this contention, the Board finds reasonable assurance that adequate protective measures will be taken in a radiological emergency at Shoreham and this reasonable assurance is not affected by the fact that command and control responsibilities necessary to effect appropriate protective actions are performed by LILCO employees. The regulations do not require, and indeed could not reasonably contemplate, that command and control personnel be totally free from any and all subtle biases and mindsets (see Tr. 10,732-33 (Saegert)), irrespective of who constituted that group of decisionmakers.

III. EPZ Boundary (Contention 22.D)

133. Contention No. 22D alleges that LILCO's EPZ fails to meet the criteria of 10 CFR 50.47(c)(2) and NUREG 0654, Sections I.D.a., because the proposed EPZ runs through and divides the villages of Port Jefferson

and Terryville and the town of Riverhead. The County contends that the EPZ should include all of both villages and the additional portions of Riverhead.

134.. EPZs are defined as the areas for which planning is needed to assure that prompt and effective actions can be taken to protect the public in the event of an accident. NUREG 0654, Section I.D.2. Under the rules of the NRC, plume exposure EPZs are generally a 10-mile radius from the plant. This is not an absolute, however. As the regulations state, the exact size and configuration of the EPZs surrounding a particular nuclear power reactor shall be determined in relation to local emergency response needs and capabilities as they are affected by such conditions as demography, topography, land characteristics, access routes, and jurisdictional boundaries. 10 CFR 50.47(c)(2); NUREG-0654, Section I.D.2; see also Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit 1), LBP-81-59, 14 NRC 1211 (1981).

135. The utility presented the direct testimony of four witnesses on this contention. These witnesses were: Matthew C. Cordaro, LILCO Vice-President; Charles A. Daverio, Asst. Manager of LERIO for LILCO; Edward B. Lieberman, V. Pres. of KLD Associates, Inc.; and John A. Weismantle, Manager of LERIO. Tr. 8534-8536 et seq.

136. Philip B. Herr, Associate Professor, Department of Urban Studies and Planning, Massachusetts Institute of Technology, testified on behalf of the county in support of its contention. Herr, ff. Tr. 8666.

137. FEMA offered the testimony of Thomas E. Baldwin, Environmental Systems Engineer, Argonne National Laboratory, Joseph H. Keller, Idaho National Engineering Laboratory, Roger B. Kowieski, Chairman, Regional

Assistance Committee, Region II, FEMA, and Phillip H. McIntire, Chief, Natural and Technological Hazards Division, FEMA. Baldwin, et al., ff. Tr. 12174.

138. The NRC Staff and New York State did not offer direct testimony.

139. Effective emergency planning attempts to avoid dividing coherent populations falling within the ten mile radius from the plant or creating a boundary with elongated appendages. Cordaro et al., ff. Tr. 8536 at 7; Tr. 8543, 8549 (Daverio); Herr, ff. Tr. 8666, at 5. During an emergency, confusion in the public might result if, for example, protective actions were recommended for areas more distant from the plant while those closer were not affected by protective action recommendations. Cordaro, et al., Id.

140. As the LILCO witnesses testified, the multiplicity of political subdivisions and jurisdictional boundaries in Suffolk County precludes the effective use of those boundaries in defining the EPZ. Cordaro et al., ff. Tr. 8356, at 11; Tr. 8656-57 (Cordaro). Both LILCO and FEMA witnesses testified that adopting recognized roadways is better for emergency planning than following political or jurisdictional boundaries and that the Shoreham EPZ comports with the relevant regulations and guidelines. Tr. 12943, 12948-49 (Kowieski, McIntire); Cordaro et al., ff. Tr. 8356 at 10; Tr. 8572 (Daverio); Baldwin et al., ff. Tr. 12174, at 11.

141. There are other nuclear power plants where municipal boundaries are crossed by the EPZ boundary. Cordaro, et al., ff. Tr. 8536, at 7. For example, the Browns Ferry EPZ passes through boundaries of Decatur and Athens. Id., Attachments 1-3.

142. The county's sole witness on this contention testified that LILCO has ignored certain principles that have evolved in identifying boundaries for zoning districts, environmental impact statements and EPZs. Herr, ff. Tr. 8666, at 5. These principles are: use wide separators, avoid use of narrow streets, avoid dividing functional systems, locate the boundary in a low-density area, set easy boundary recognition for the public, and minimize unwarranted entry into the area. Id., at 5-12.

143. Professor Herr conceded that the use of wide separators was not possible in all cases and that the western boundary of the village of Port Jefferson might indeed qualify, in his own view, as such. Tr. 8674-75. He was unable to define clearly his own conception of what would or would not constitute "narrow" streets in the area of Shoreham. Tr. 8675-81. He stated that emergency planners do use roads and highways as boundaries. Tr. 8682 (Herr). He also testified that they had not "made the kind of really thorough, definitive analysis which I think one ought to make in order to design an EPZ boundary." Tr. 8741. In short, he had neither a specific alternative proposal nor had he attempted the "interactive" process he felt was necessary to design EPZ boundaries. Tr. 8747-48 (Herr).

144. The FEMA witnesses testified that an EPZ need not incorporate whole population centers rather than divide those centers. Baldwin et al., ff. Tr. 12174, at 11. The critical thing for emergency planning is that the population recognize that they are within the zone or outside of the zone. Id.; Tr. 12952-53 (Keller). A reasonably well traveled public

road would constitute a recognizable boundary that was adequate for the definition of an EPZ. Tr. 12,945 (Keller); Tr. 12943 (Kowieski).

145. The first EPZ boundary was originally established by the Suffolk County Department of Transportation. Cordaro et al., ff. Tr. 8536, at 9. It was similar to the present boundary but it excluded present zones, Q, R, and S. Id., at Attachment 4. Zone Q contains the eastern portion of the incorporated village of Port Jefferson and Zone S contains the southwestern edge of the Riverhead postal zone. Id. In a letter to New York State (Id. at Attachment 5), Richard Strong, Deputy Commissioner of Suffolk County's Department of Transportation, commented on the then EPZ (which did not include the two zones described above that are now in the present EPZ) that it "reflected sound reasoning and a determination based on planning principles and site specific characteristics." Id. at 9-10.

146. Terryville is an unincorporated area on the western edge of the EPZ. It has no political organization or readily ascertainable boundaries. The present EPZ boundary in the area of Terryville follows Jayne Boulevard, a prominent north-south thoroughfare that closely follows the 10-mile radius. Cordaro et al., ff. Tr. 8536; at 13-15; Tr. 8657-58 (Lieberman). Jayne Boulevard would be easily recognized by persons who reside in the area of Terryville. Tr. 8698 (Herr).

147. Riverhead is an unincorporated area on the eastern edge of the EPZ which has no boundaries set by law. It is an area which is both populated and rural in parts. Cordaro et al., ff. Tr. 8536, at 19-20. If the EPZ boundary were extended in the Riverhead area to the point suggested by the contention, an elongated appendage would be created

that might cause confusion among residents of Riverhead and neighboring areas. Cordaro et al., ff. Tr. 8536, at 21, Tr. 8563-64 (Daverio).

148. Osborne Avenue forms part of the EPZ boundary in the Riverhead area. Tr. 8626-27 (Daverio); Tr. 8683-85 (Herr). Residents would not be confused by emergency action recommendations that affected areas only up through the western side of that street.

149. Port Jefferson is an incorporated village. The current western boundary of the EPZ begins at the mouth of the harbor and follows Main Street south through the commercial center of Port Jefferson. Cordaro et al., ff. Tr. 8536, at 22-23; Tr. 8632-34 (Daverio). Main Street in Port Jefferson is a suitable choice for an EPZ boundary for two reasons. First, the public will recognize and remember Main Street in Port Jefferson, as it is also Route 25A, which is one of the major roadways in the EPZ. In contrast, the use of the Port Jefferson's village boundaries as an EPZ boundary would be confusing to the public because it follows narrow streets and frequently cuts across streets and through backyards. Cordaro et al., ff. Tr. 8536, at 22-23; Tr. 8634 (Daverio); see also Tr. 8688-99 (Herr). Second, the village's most recognizable feature is the harbor which forms a natural half-mile wide easily recognizable boundary for the EPZ. Cordaro et al., ff. Tr. 8536, at 23; Herr, ff. Tr. 8666, at 6; Tr. 8575-76 (Herr). Suffolk County's witness agreed that the municipal boundary of Port Jefferson would not be a good EPZ boundary. Tr. 8740-41 (Herr).

Conclusion

150. The Board finds that the Shoreham EPZ boundary, which is approximately 10 miles in radius and follows well-known roads and highways, comports with the principles outlined in the regulations and guidelines. The Board finds no basis for requiring that all of Port Jefferson, Terryville, and additional portions to the east of Riverhead be included within the plume EPZ for Shoreham, nor does the Board find any basis for redefining the Shoreham EPZ. Thus, Contention 22.D is without merit.

IV. LERO Workers

A. Notification of Emergency Response Personnel (Contention No. 26)

151. An offsite emergency plan must include procedures for notification of state and local response organizations and of emergency personnel. 10 C.F.R. § 50.47(b)(5); see also 10 C.F.R. Part 50, App. E, § IV.C.; NUREG-0654, §§ II.E.1., II.E.2. A primary and secondary means of communications must be established to ensure that there will be 24-hour per day notification and activation of the local emergency response network. NUREG 0654, § II.F.1.

152. Contention 26 alleges that the LILCO communications system and procedures for notification to emergency response personnel fail to assure that there will be proper notification to such personnel as required by the regulations and NUREG 0654.

153. The alleged specific deficiencies in the LILCO notification system to LERO emergency personnel are contained in four subparts, A and C

through E, of Contention 26. (Subpart B was not admitted by the Licensing Board).

154. Testimony on the Contention and its subparts was presented by LILCO, the County, the NRC Staff and FEMA. Only the County's witnesses, a panel of three County police officers, stated that the plan was deficient. See Regensburg, et al., ff. Tr. 4442. The other parties' witnesses all testified that the Plan provisions in question did meet the applicable regulatory standards. Cordaro et al., ff. Tr. 4014; Sears, ff. Tr. 4709, at 3-8; Tr. 4724-26 (Sears); Baldwin et al., ff. Tr. 12174, at 23-28; Tr. 12,457-58 (McIntire).

155. The LILCO witness panel consisted of Matthew C. Cordaro, Charles A. Daverio, Norman A. Hobbs, Jr., William F. Renz, and William G. Schiffmacher. John R. Sears from the NRC Staff gave the Staff position on Contention 26. Thomas E. Baldwin, Joseph H. Keller, Rogert B. Kowieski and Philip H. McIntire testified for FEMA. Deputy Inspector Kenneth J. Regensburg, Deputy Inspector Robert A. Snow, and Police Officer Vincent R. Stile were the members of the witness panel proffered by Suffolk County. Id.

156. Subpart A of Contention 26 states that the designated primary notification point for LERO at the Hicksville LILCO Customer Service Office is not capable of performing that function since: (1) there is no assurance of adequate staffing; and (2) that the Plan does not indicate that there will be adequate equipment available to permit notification to emergency personnel within fifteen minutes after an emergency is declared.

157. The Shoreham Local Offsite Radiological Emergency Response Plan, at Figure 3.3.2 through Figure 3.3.4, lists the persons, groups and organizations that are to be notified for standby or mobilization for the 4 levels of emergency. LILCO Ex. 80. Figure 3.3.5 is a schematic layout of the LERO Initial Notification Scheme and Figure 3.3.6 lists LERO personnel who are equipped with pagers. Id. Section 3.3 of the Plan describes the Notification and Mobilization Procedure. Id.

158. Principal LERO personnel will be notified early in an accident by the LILCO Customer Service Office in Hicksville, and when the Local EOC is activated, further notification will be made from the Local EOC Communications Center. Sears, ff. Tr. 4709, at 4-5. OPIP 3.3.2 is a comprehensive procedure that details the complete process from notification by Shoreham to the LERO Customer Service Office, to activation of the pagers by that office, and to subsequent phone calls by personnel who have been paged to the rest of responding LERO workers. Id.; LILCO Ex. 80.

159. The Radiological Emergency Communications System (RECS) is the primary notification system to be used by LILCO in notifying LERO should an emergency occur at Shoreham. Baldwin, et al., ff. Tr. 12,174, at 24. If notification were received via the RECS line, no verification call-back would be needed. Commercial telephone is identified as the backup notification system to RECS. Id. If notification were received in this manner, call back verification would be required. These procedures are detailed in Procedure OPIP 3.3.1, and are considered adequate by FEMA to ensure that LERO will be able to receive and verify notification in the

event of an emergency. Id. A County witness conceded that the initial notifications could be reasonably assumed to be made within 15 minutes. Tr. 4665 (Snow).

160.- The Board finds that the initial notification from the plant to the offsite local emergency response organization required by 10 CFR Part 50, App. E. IV D.3, is complete upon notification to Hicksville, and there is reasonable assurance that this notification will take place within the required fifteen minute period. It is the NRC Staff position that after prompt notification (within 30 minutes of an event), full deployment notification of offsite officials beyond those who are continuously available may take about an hour. LILCO Ex. 25.

161. LILCO has been testing this procedure and making modifications to ensure that the total LERO organization can be notified promptly. Sears, ff. Tr. 4709, at 5.

162. After LERO is notified that an emergency of some classification has been declared, it may become necessary to notify the public. 10 CFR Part 50, Appendix E, Section IV.D.3 requires that the plan demonstrate the capability to make the decision with respect to public notification "promptly on being informed ... of an emergency condition." Once the decision is made to notify the public, the Plan should have as its "design objective" the capability essentially to complete the initial notification of the public within about 15 minutes. The LILCO Transition Plan demonstrates the capability to make a prompt decision on public information and to implement that decision within about 15 minutes. The public notification is effected through a system of 89 outdoor sirens and tone alert radios. If necessary, both of these may be activated by the

LERO worker at Hicksville within 15 minutes after receipt of notification of an emergency. LILCO Ex. 80, OPIP 3.3.2 at 8; Cordaro, et al., ff. Tr. 4014, at 31-32.

163.- The Plan provides that at all times there will be at least two trained LERO workers on duty at the Customer Service Office at Hicksville, Cordaro, et al., ff. Tr. 4014, at 10; Tr. 4097, 4101 (Renz).

164. The Plan's procedures describe in detail the administrative and physical means by which these workers will perform all necessary tasks, including the following: (i) receive and verify the initial communication from the plant that an emergency has been declared (Cordaro et al., ff. Tr. 4014, at 11); (ii) notify by pager one or more groups of additional emergency workers (OPIP 3.3.2; Cordaro et al., ff. Tr. 4014 at 12); (iii) verify that the notice has been sent (OPIP 3.3.2; Cordaro et al., ff. Tr. 4014 at 13); (iv) and, if necessary, activate the Prompt Notification System (OPIP 3.3.4; Cordaro et al., ff. Tr. 4014 at 31). The tasks to be performed at each level of emergency classification were described in the LILCO direct testimony. Cordaro, et al., ff. Tr. 4014, Attachment 1.

165. LERO personnel at Hicksville, even when only two persons are immediately available, are adequate to begin the notification process. Cordaro, et al., ff. Tr. 4014, at 24; Tr. 12,442-445 (Keller). Adequate backup personnel are also in place at the two other locations. Cordaro, et al., ff. Tr. 4014, at 24-28.

166. With regard to the question about equipment in the second section of Subpart 26A of Contention 26, this is more appropriately

addressed in the findings on Subpart 26C which specifically deals with equipment.

167. Subpart 26C of Contention 26 alleges that there is no assurance that "key" emergency response personnel can be contacted reliably through the LILCO paging system, and that even assuming notification, the method by which LILCO's automatic verification system (AVS) will operate is not adequately described in the Plan. The Board finds that this allegation is without merit and that both the pagers and the AVS in issue are reliable and meet applicable requirements.

168. The paging system relied on by LILCO is an existing commercial system operated by Radiofone Corporation. Cordaro et al., ff. Tr. 4014, at Attachment 5. The geographic area covered by the system includes all of Long Island, Manhattan, and the greater metropolitan area of New York City. Id. The individual pagers used are NEC data pagers of a type used at other reactors around the country. Tr. 4720 (Sears). Approximately 142 LERC workers will have pagers at any one time. Tr. 4150 (Renz), 4414 (Daverio). In the event maximum mobilization is required, 87 of the paged personnel will, in turn, effect a manual call-out of 823 additional workers. Tr. 4150-52. (Daverio, Renz), 4414-15 (Daverio).

169. The Suffolk County witnesses that challenged the reliability of the commercial paging system (Regensburg et al., ff. Tr. 4442, at 1f 40-47) had previously stated that a similar paging system would be adequate for notifying emergency workers. Tr. 4589-94 (Regensburg, et al.). In addition, in a letter dated January 15, 1982 from Inspector Regensburg to the Suffolk County Emergency Planning Group, the Inspector states

in regard to the communications portion of the [then Suffolk County] Radiological Emergency Response Plan that "My staff and I have reviewed the revised draft and believe that it will adequately cover communications needs in the event of a radiological incident. No further changes are recommended." LILCO Ex. 13; Tr. 4672-78 (Regensburg).

170. After considering the coverage of the paging system (Cordaro et al., ff. Tr. 4014, at 34), the priority access to the system given to LILCO and other nuclear plant operators (Tr. 4117-21 (Cordaro, et al.)), and the reliability of system components (Sears, ff. Tr. 4709, at 6-7; Tr. Tr. 4720 (Sears); Tr. 4408-10 (Hobbs)), the Board finds reasonable assurance that the commercial paging system will function adequately for notifying LERO personnel.

171. In the event of pager system failure, all emergency personnel will be notified through a cascading phone system. Cordaro, et al., ff. Tr. 4014 at 25-29. This backup notification system is the primary notification system under many RERPs. Tr. 4722 (Sears). The backup cascading phone system used by LERO is also used by the Suffolk County Police Department as its means for calling out emergency workers. Tr. 4576 (Regensburg); Tr. 4658 (Snow).

172. This cascading notification scheme provides reasonable assurance that an adequate number of emergency personnel will be promptly notified and mobilized. The Plan is adequate in satisfying the requirements of NUREG 0654 planning element F.1.e. Baldwin et al., ff. Tr. 12,174, at 25.

173. With regard to the second aspect of the County's Contention 26C on the automated verification system (AVS), the Board finds it will perform

adequately. After the emergency workers receive the message on the pager, they will call the AVS telephone number shown on the pager and the AVS will answer with the standard greeting such as, "You have reached the LERO Verification System. Please enter your emergency worker identification number." Cordaro, et al., ff. Tr. 4014, at 19. The emergency worker will then enter his number, which the AVS will verify. ~~Id.~~ at 19-20.

174. The system will have the capability of handling twelve calls simultaneously. In the event there are more calls than can be handled at one time, the system has the capability to put on hold multiple additional calls. Id. at 20.

175. While contention 26C questions the adequacy of the Plan's descriptions of the AVS, NUREG 0654 II.E.1, at 43, provides that, "[t]he specific details of verification need not be included in the plan." The testimony demonstrates that the LILCO plan utilizes a system that is more than adequate to meet the requirements of the guideline and regulations.

176. A cascading telephone system discussed with regard to Contention 26C (see Findings Nos. 172-174, supra) is also the substance of subpart 26D as well. After 142 emergency workers have been notified by pagers, 87 of these will call out an additional 823 persons by commercial telephone. Cordaro et al., ff. Tr. 4014, at 37-38.

177. With respect to this notification, the provisions for alerting and activating emergency response personnel in each response organization, as described in Section 3.3, pages 3.3-1.4; Figures 3.3.2, 3.3.3, and 3.3.4; and OPIP 3.3.2, are found to be adequate. Baldwin, et al., ff. Tr. 12714, at 25; see LILCO Ex. 80.

178. Contention 26E alleges that the LILCO Transition Plan does not provide for timely notification of non-LILCO emergency support organizations and personnel, that there is no provision for verification of that organizations' receipt of such notification, and, further that, with the exception of certain agencies, the Plan contemplates notification of non-LILCO organizations only if a Site Area or General Emergency has been declared.

179. The LILCO Plan contemplates the involvement of several non-LILCO emergency support organizations and agencies such as Brookhaven National Laboratory, the American Red Cross, the United States Coast Guard and various bus companies, ambulance companies and other supporting organizations. See LILCO Ex. 1; LILCO Ex. 80; Cordaro et al., ff. 4014, at 41-43. The primary means for notifying these organizations is commercial telephone. Cordaro et al., id., at 41. Radio communications will be possible between the EOC and ambulance companies. Id.

180. Provision for the timely notification of non-LILCO emergency support organizations and personnel representing other organizations including hospitals, relocation centers, bus companies, and ambulance companies are adequate as described in Section 3.3, pages 3.3-1-4; Figures 3.3.2, 3.3.3 and 3.3.4; and Procedure OPIP 3.3.32 of the LILCO Transition Plan. Baldwin et al., ff. Tr. 12,714, at 26; LILCO Ex. 80.

181. There is no need for separate verification of notification to these organizations, since direct contact will be made by the telephone and will take place simultaneously with the initial notification. Cordaro, et al., ff. Tr. 4014, at 40-43.

182. The back-up means of notifying certain of these organizations is as follows (see Figure 3.4.1, LILCO Ex. 80): Brookhaven National Laboratory (i.e., Brookhaven Area Office) by dedicated telephone line from the LERO Emergency Operations Center in Brentwood, New York; U.S. Coast Guard by Federal Telephone System from the LILCO Control Room at plant; and Federal Aviation Administration by Federal Telephone System from the LILCO Control Room. Baldwin et al., ff. Tr. 12174, at 27. These back-up means for notifying the above Federal agencies are considered adequate. Id.

183. The LILCO Transition Plan does limit the notification of certain non-LILCO emergency support organizations to the declaration of a site area or general emergency. Id. at 28. Some non-LILCO emergency workers are notified only at the Site Area or General Emergency classification level. Id., Tr. 12,515-16 (Kowieski).

184. The decision was made not to notify these other support organizations in the Unusual Event or Alert classifications because no functional purpose would be served by notification at those levels. Cordaro et al., ff. Tr. 4014, at 43; Tr. 12,518-19 (Keller). Such limits on notification do not preclude reasonable assurance that these organizations will be notified when, and if, needed. Tr. 12,518-19 (Keller); Baldwin et al., ff. Tr. 12,174, at 28.

Conclusion

185. In sum, Contention 26 and all of its admitted subparts A, C, D, and E are without merit in light of the evidence and for the reasons set out above.

B. Mobilization (Contention 27)

186. "Mobilization" is defined as the activities that take place between the determination that particular offsite emergency response personnel should be notified and the reporting of such personnel, with necessary equipment, to the locations where emergency functions will be performed. Preamble to Contention 27.

187. Contention 27 alleges that LERO mobilization will take at least several hours after notification and, in some cases, even longer because workers will have to travel substantial distances in congested traffic and will have to obtain equipment before they report to their assigned posts. As a result, Intervenor's contend that the LILCO Plan cannot be implemented in a timely manner necessary to provide adequate protection to the public.

188. LILCO presented the testimony of Matthew C. Cordaro, John A. Weismartle, Edward B. Lieberman, and Ronald A. Varley on Contention 27. Cordaro et al., ff. Tr. 7043; see ff. Tr. 4068.

189. Suffolk County's witnesses on this contention were: Joseph L. Monteith, Richard C. Roberts, Philip McGuire, Michael J. Turano, Edwin J. Michel (all Suffolk County police officials), and Philip B. Herr (Associated Professor of City Planning, Massachusetts Institute of Technology). Monteith et al., ff. Tr. 7381.

190. The four FEMA witnesses also presented testimony on this contention. Baldwin et al., ff. Tr. 12,174, at 29-30, Tr. 12,758-81 (Baldwin et al.). The NRC staff and New York State offered no direct testimony on this contention.

191. The County's testimony (and presumably the focus of its Contention 27) expressly addressed only mobilization of LILCO personnel. Monteith, et al., ff. Tr. 7381. The County pointed out that the alleged delays also would be experienced by non-LILCO entities. Id.

192. Mobilization of LERO personnel is keyed to the declaration of and classification of an emergency at Shoreham. Cordaro et al., ff. Tr. 7043, at 9. At the lowest classification (Unusual Event), seven members of LERO are placed on standby; the remainder of LERO is unaffected. Id. At an Alert, 212 members of LERO report to their pre-assigned duty stations or staging areas. Id. at 9-10. In general, these LERO workers include all personnel assigned to the EOC in Brentwood and key personnel needed to activate each staging area. Id. at 10-11. At a Site Area or General Emergency, LERO is fully mobilized. Id. at 10.

193. LERO personnel will report to their assigned facilities. Id. at 11. Bus drivers, traffic guides, route spotters and road crew personnel will be processed at staging areas as they arrive. Id. They will receive dosimetry meters. Id. If the situation does not require these individuals to be dispatched, they will be held on standby at the staging area. Id. at 11-12. Should the situation indicate the immediate need for implementing field activities or for the procurement of emergency vehicles, the arriving personnel will be briefed, given their appropriate equipment and dispatched from the staging area in a continuing process until all necessary field positions have been staffed. Id. at 12.

194. Certain activities such as driving bus routes and guiding traffic are evacuation-specific. That is, these activities would only be required if the emergency were of such a magnitude as to require a classification of General Emergency where evacuation was the recommended protective action. Id. Positioning these individuals at emergency facilities at an Alert classification would be inappropriate. Id. The advance preparations that occur at an Alert stage (see Id. at 10-11) act to accelerate the processing and dispatching of those LERO workers who report at a Site Area Emergency level. This minimizes the effect of the latter mobilization. Id. at 12.

195. NUREG-0654 provides that "[e]ach organization shall provide for timely activation and staffing of the facilities and centers described in the plan." NUREG-0654 H.4. With the exception of radiological field monitoring teams (NUREG-9654 I.8), NUREG-0654 does not require mobilization times to be included in emergency plans. Baldwin, et al., ff. Tr. 12,174, at 29; Tr. 12,785 (Keller); see Tr. 7175-81 (Weismantle).

196. Subpart A of Contention 27 alleges that LERO personnel live or work substantial distances from their reporting locations. See S.C. Ex. 28. Consequently, these workers will need to travel varying and substantial distances to reach their initial reporting locations. See S.C. Ex. 23. LILCO has attempted to minimize initial reporting distances and consequent travel times in two ways. Cordaro et al., ff. Tr. 7043, at 14. First, staging area assignments have been premised on the proximity of LERO workers' homes. Id. Those personnel to the east of Shoreham have been assigned to the Riverhead staging area, those to the west to the Port Jefferson staging area, and those to the south to the Patchogue

staging area. Id. Second, call out lists have been ordered to permit those workers living closest to a staging area to be called first. Id. at 14-14, see S. C. Ex. 28.

197. County witnesses suggested that another call out list, ordered by work locations, also be given to each caller to reduce further mobilization times. Tr. 7462 (Michel). As LILCO witness Lieberman explained, however, travel distances and travel times for LERO workers vary. Tr. 7085 (Lieberman). To judge the merit of Suffolk County's recommendation, one must therefore compare the distributions of home-to-staging area and work-to-staging area travel times, rather than the corresponding travel times for any individual workers. See Tr. 7085 (Lieberman). Mr. Lieberman performed such a comparison for bus drivers -- the largest group of workers to report to staging areas -- and concluded that the difference in distributions of arrival times was, at most, 10 minutes. Id. The Board finds that there is only an insignificant benefit to such a list and, thus, its inclusion in the Plan should not be required.

198. Contention 27.B asserts that LERO personnel will encounter congested roadways on reporting to their initial reporting locations. LILCO maintains that any congestion effect would be inconsequential. Cordaro et al., ff. Tr. 7043, at 15. In most cases LERO workers will be paged or called at emergency classification levels below General Emergency, and thus before an evacuation. Id. In addition, LILCO witnesses noted that LERO workers would initially report to one of three staging areas or the EOC - all of which are located outside the EPZ - further minimizing the potential for concurrent traffic flow and hence congestion at that early stage of an emergency. Id.

199. Contention 27.C asserts that staging area activities will further delay mobilization. Staging area activities of LERO workers include obtaining dosimetry equipment, being briefed on their field assignments, and procuring any equipment needed to perform their assignments. Tr. 7133-42 (Varley, Weismantle); Cordaro et al., ff. Tr. 7043, at 11. The dispute on Contention 27.C focused on the time needed to complete these activities. Monteith et al., ff. Tr. 7381, at 19-24.

200. As the FEMA witness testified, the LILCO Transition plan does not specify estimated deployment times required for field workers to arrive at their field assignments after they have arrived at their staging areas or dispatch locations. The inclusion of these deployment times is not specifically required by NUREG-0654. The effective response of emergency workers to field assignments is evaluated during an exercise. Baldwin et al., ff. Tr. 12,174, at 30.

201. LILCO witnesses contend that the time required to complete these activities has been minimized as a result of a variety of time-saving measures learned from drills and exercises. Cordaro et al., ff. Tr. 7043, at 16. These measures include having key staff area personnel report to staging areas at an Alert stage to ready the facilities should the emergency escalate; speeding dosimetry equipment distribution by simplifying record forms, adding more dosimetry record keepers, and modifying facility layouts; prepackaging information packets for each job function; positioning equipment trailers to permit rapid distribution of field equipment; practicing the installation and use of radios; and providing a system which allows one group of LERO workers, e.g., traffic

guides, to receive their dosimetry equipment while another group is being briefed on their jobs and vice versa. Id. at 16-17; Tr. 7296 (Varley).

202. The Board finds that LILCO has acted to reduce mobilization times related to staging area activities and is attempting to ensure that these will occur as timely as it is within LILCO's power to complete.

203. Contention 27.D alleges that mobilization times of some LERO workers will be extended further because these workers will need to locate buses, fuel trucks, and tow trucks; travel varying distances to obtain them; and finally, prepare them for use. There was little dispute about the time needed to complete this mobilization step. Both LILCO and Suffolk County measured the time and distance needed to travel between staging areas and bus companies. See S.C. Ex. 30; Monteith et al., ff. Tr. 7381, Attachment 6. A comparison of these data shows that the parties are in agreement on these times and distances. These travel times vary from 3 minutes to approximately 1 hour 15 minutes. Id.

204. Contention 27.E deals with congested traffic. Those findings made with regard to Contention 27.B apply to the traffic congestion questions of Contention 27.E also. For the reasons and findings reached with regard to Contention 27.B, Contention 27.E is also without merit.

205. In Contention 27.F, Suffolk County questions whether all LERO workers should be mobilized at an Alert stage. Monteith et al., ff. Tr. 7381, at 23-24. LILCO witnesses explained that the reason all LERO workers are not mobilized at an Alert stage is because some activities like driving bus routes and guiding traffic will be conducted only if an

evacuation is ordered. Cordaro et al. (Contention 27), ff. Tr. 7043, at 12. Accordingly, mobilizing these workers at a lower emergency classification level makes little practical sense. Id. In addition, it is unlikely that mobilizing all LERO workers at an Alert stage would substantially reduce net mobilization times in an extremely fast-breaking event, since preparatory steps like setting up a staging area would still have to be completed before workers could be briefed and dispatched. See Tr. 7175-82 (Weismantle); Cordaro et al. (Contention 27), ff. Tr. 7043, at 26.

Conclusion

206. While emergency workers may encounter delays as a result of the factors cited in the contention, there is little support for the proposition that any alternative organization mobilization would be effected more quickly.

C. Communications (Contentions 24.L, 28-34)

207. Contention 24.L, and 28 through 34 deal with the Transition Plan's emergency communications system.

Dispatch Locations (Contention 24.L)

208. Contention 24.L alleges that LILCO has no agreements with "dispatch locations" to relay communications between LERO personnel in the EOC and emergency response personnel expected to drive ambulances and ambulettes during an emergency. These "dispatch locations" are those at each of the ambulance companies contracted with by LILCO. Cordaro et al., Tr. of 4/6/84, Vol. II, at 20-21. A dispatcher employed by each ambulance

company is available 24-hours a day, as provided for in the contracts. Id. at Attachment 13, at 6-7; Tr. 6429, 6534-35 (Robinson).

209. Should the ambulance company not have the communications equipment to accommodate LILCO during an emergency, the contracts between LILCO and ambulance companies provide that "the contractor [the ambulance companies] shall allow the company [LILCO] to install at the company's expense, communications equipment at the contractor's designed facility. Said equipment will be utilized by the company's emergency operations center [EOC] to coordinate the dispatch of the contractor's vehicle pursuant to this contract." Id.

210. We find that the contracts with ambulance companies adequately provide for dispatch locations and dispatchers so that transportation for special facilities can be mobilized during an emergency.

Communications Links to Federal Agencies (Contention 28)

211. Contention 28 asserts that the Plan fails to provide adequate and reliable means of communications with the federal emergency response organization relied upon in the Plan.

212. The LILCO Transition Plan provides for communication with the relevant federal response organizations by means of commercial telephone, the Federal Telecommunications System, dedicated telephone lines, and/or radio. Commercial telephone serves as a direct means of communication to each of these federal response organizations. Cordaro et al., ff. Tr. 5823, at 7-8; LILCO Ex. 80, at 3.4-4, Fig. 3.4.1. An alternate means of communication with any of these federal response organizations, and others, is provided by the Federal Telecommunications System (FTS). Cordaro et al., ff. Tr. 5823, at 7-8; Baldwin et al., ff. Tr. 12, 174,

at 31; LILCO Ex. 80, at Fig. 3.4.1; OPIP 3.3.2 at 40,42; Tr. 6179-80 (Hobbs), 12,534-36 (Kowieski). Additional communication paths are provided for principal federal response organizations; a dedicated telephone line supports communications between the EOC and the DOE/RAP Team at the Brookhaven Area Office, and marine band radio links the EOC and the U.S. Coast Guard. Cordaro et al., ff. Tr. 5823, at 7-8; Plan at 3.4.-3 to 3.4-4, Fig. 3.4.1; Tr. 5855-58 (Renz); S. C. Ex. 16.

213. The County asserts that LERO personnel at the EOC will not have direct access to the FTS line as a backup means of communication since it is located in the Shoreham Control Room. Regensburg et al., ff. Tr. 6184, at 5. There are, however, four communications paths between the EOC and the Shoreham Control Room: Centrex, commercial telephone, the Radiological Emergency Communications System (RECS), and the ESO radio frequency. Cordaro et al., ff. Tr. 5823, at 8; Plan at 3.4-1 to 3.4-7, Fig. 3.4.1. This arrangement provides at least two methods of communication as set out in NUREG-0654. See Cordaro et al., ff. Tr. 5823, at 8; Baldwin et al., ff. Tr. 12,174, at 31; Tr. 12,534-36 (Kowieski).

Communication Personnel and Repair Technicians (Contention 29)

214. Contention 29 alleges that the LILCO Transition Plan does not identify the number of emergency response personnel who will be manning communications equipment at the various emergency response facilities and that there is no assurance that emergency communications can or will be operated during a radiological emergency.

215. Neither the regulations nor guidelines require such an enumeration. In listing the normal job titles of those individuals designated

to fill communicator roles, the Plan does provide an indication of the number of personnel expected to operate communications equipment. LILCO's testimony also identified the number of personnel expected to fill communicator roles. Cordaro et al., ff. Tr. 5823, at 9-11, Attachment 3; Regensburg et al., ff. Tr. 6184, at 5-6.

216. Contention 29 further alleges that trained repair technicians are not provided in the LILCO Transition Plan. The applicable standards require simply that adequate communications equipment be provided and maintained. The Plan provides for the periodic testing of communications equipment, identifies a sufficient number of communicators, and provides that the Lead Communicator will be responsible for maintaining the operational status of communications equipment. Plan at Figure 4.1.2(2 of 2); OPIP 2.1.1 at 65; OPIP 3.4.1. NUREG-0654 does not require a specification of equipment repair capabilities. Cordaro et al., ff. Tr. 5823, at 11-12; Tr. 12,539-40 (Keller), 12,541 (Kowieski).

217. A representative of the New York Telephone Company will be located at the EOC during an emergency response. Cordaro, et al., ff. Tr. 5823, at 12; Plan at App-B-28; Tr. 5909 (Renz). In addition, communications technicians holding appropriate FCC licenses will be called out by procedure to report to the EOC during an emergency response to perform any necessary repairs to radio equipment. Cordaro et al., ff. Tr. 5823, at 12; Tr. 5899-5908 (Renz).

218. With respect to emergency response facilities other than the EOC, the LILCO Transition Plan contemplates that repairs to communications equipment will be coordinated from the EOC, or replacement equipment will

be on hand at the facility in question. Cordaro et al., ff. Tr. 5823, at 13; Tr. 5912-13 (Renz).

219. We find that adequate provisions exist for communications personnel replacement or repair of communications equipment should the need arise during a radiological response. This provides reasonable assurance that communications equipment will be operable in an emergency and Contention 29 is without merit.

Field Communications and Equipment (Contention 30)

220. Contention 30 alleges that there are inherent operational problems with the mobile radios provided emergency workers, persons other than emergency response personnel will have access to radio frequencies used by LERC, and that field emergency personnel will be unable to communicate with co-workers in the field.

221. FEMA's review of the plan did not identify operating time, range, or recharge requirements for the radios. Baldwin et al., ff. Tr. 12,174, at 33-34. These factors would be evaluated during a FEMA exercise. Id. at 34.

222. While field personnel must be in their vehicle to transmit a message, they need only be within several feet of the vehicle in order to hear a message. Cordaro et al., ff. Tr. 5823, at 16. The only category of field personnel that are likely to be away from a vehicle while performing emergency response functions are traffic guides. Id. Because the traffic guides are to implement a preplanned response, however, communications with them may be reasonably limited to their communicating the following: arrival at their post, problems they observe at their posts,

and their leaving a post. Id., Tr. 6166 (Hobbs); see Tr. 2344 (Lieberman); 5961-62 (Cordaro); 5967-71 (Renz and Daverio).

223. Police, taxi companies, ambulance companies, utilities, and various other organizations rely upon mobile radios to provide effective communications every day. Hobbs and Renz, ff. Tr. 5823, at 16-17. The drain on a battery is much less to receive a message than to transmit one. Id. The mobile radios used by LILCO require 12 volts and could remain in a receive mode for 10-16 hours on the power available from an average car battery without the motor running. Furthermore, there is no reason to believe that field emergency vehicles cannot be restarted to recharge or maintain batteries during transmission of messages. Id. at 17.

224. Although it is conceivable that members of the general public, with the appropriate equipment, could monitor the radio frequencies discussed herein, it is doubtful that such a practice would impair LERO's response. Id. at 17. The LERO frequencies are not published for public use. Baldwin, et al., ff. Tr. 12,174, at 34.

225. The County questioned whether range limitations on simplex radio frequencies, particularly the Riverhead staging area frequency, might prevent communications in some areas. LILCO's witnesses testified that LILCO uses simplex frequencies successfully in LILCO's normal operations, Cordaro et al., ff. Tr. 5823, at 18-19; Tr. 5993-94 (Renz), and that range limitations have not been a significant problem in the more recent training drills, since the original design of the system was reorganized, Tr. 11,768-71, 12,059-60 (Renz); see Babb et al., ff. Tr. 11,140, at 65.

226. The County also asserted that a phenomenon called "heterodyning", when two or more radio users attempt to transmit simultaneously, would inhibit or prevent communications, particularly among traffic guides. Tr. 6185-90 (Snow; Stipulation by Counsel). This appears to be a problem common to virtually all means of radio communication. LILCO demonstrated that this should not be a significant problem, because of the limited nature of traffic guide communications and the ability of the staging area to control communications on the channel and correct any problem. Tr. 6166-67 (Hobbs).

227. LILCO maintains that there is no regulatory requirement or functional necessity that field emergency workers be able to communicate "laterally" with other personnel in the field during an emergency. Cordaro et al., ff. Tr. 5283, at 19-20. The County contends, as did their witnesses, that such communications are always needed for effective traffic control. Regensburg et al., ff. Tr. 6184, at 31; Tr. 6211-13, 6243-50 (Snow).

228. The LILCO communications system is organized as a hierarchy. Communications proceed from a command and control center, such as a staging area or the EOC, to the field. An administrative system is composed primarily of "up and down" communications rather than lateral communications among field personnel. Tr. 5927-30 (Renz, Cordaro). LILCO indicates, and the County agrees, that LILCO's system is administrative in nature. Tr. 5970 (Renz), 6211-13, (Snow). LILCO argues that this system is better adapted to implement a preset evacuation plan. Cordaro et al., ff. Tr. 5823, at 15; Tr. 5929-30 (Cordaro), 5934-35, 5940-41 (Hobbs), 6211-13, 6216 (Snow).

229. In LILCO's view, all or virtually all decisions with respect to traffic flow will be made by LILCO planners before any evacuation takes place and traffic guides will implement that preset plan; this should require no extensive communications between traffic guides. See, e.g., Tr. 6166 (Hobbs).

230. While lateral communication capability could have marginal benefit in an emergency, the Board finds that because the organization of the response is planned in detail by traffic professionals in advance, rather than devised on the spot by field personnel, the LILCO Plan does not depend upon extensive communications among field personnel. See Cordaro et al., ff. Tr. 5823, at 15; Tr. 5930 (Cordaro), 5934-37, 5939-41, 6166 (Hobbs), 6167-68 (Daverio), 6211-13, 6216 (Snow). The LILCO pre-planned response precludes any strategic decision-making process at the field level. Cordaro et al., ff. Tr. 5823, at 15; Tr. 5961-62 (Cordaro), 5970 (Renz).

Backup System for Radio Communications (Contention 31)

231. Contention 31 asserts that the Plan has no provision for any backup radio frequencies to those which comprise the Emergency Radio System, providing communications between command and control personnel at the EOC and field emergency response workers, in alleged violation of 10 CFR Part 50, App. E, § IV.E.9 and NUREG-0654, II.F.1.

232. There are no specific NUREG-0654 requirements for backup communications capabilities between emergency coordinators at the EOC and field emergency workers. Baldwin et al., ff. Tr. 12,174, at 35.

233. The NRC regulations, 10 CFR Part 50, App. E, § IV.E.9, require the offsite communication system to have a backup "power source", which

is not in issue here, and that "All communication plans will have arrangements for emergencies, including titles and alternates at both ends of the communication links and the primary and backup means of communications."

234. In the event of a radio system failure, commercial telephone lines (and dedicated telephone lines between staging area coordinators and the EOC coordinators) are available and will serve as the backup means of communication. Cordaro et al., ff. Tr. 5823, at 24-25.

Field Personnel Communications (Contention 32)

235. Contention 32 alleges that since field personnel will receive their direction from one of the three LILCO staging areas -- who in turn receive direction from the EOC -- the resulting lack of direct communications between field personnel and the EOC will delay implementation of emergency response.

236. The LILCO Transition Plan chain of command is structured with the EOC dictating command and control directives. The three staging areas serve as satellite field control points for communicating information to the EOC from the field and for implementing decisions made at the EOC. Cordaro et al., ff. Tr. 5823, at 28-29. Such a system permits command and control personnel at the EOC to have a complete and integrated picture of what is occurring in the field, rather than receiving numerous fragments of information directly from field workers. Id.

237. Communications between field personnel and their coordinators will be tested in emergency planning drills and/or exercises. Baldwin et al., ff. Tr. 12174, at 36. Any problems in the relay of messages or with the lack of direct communication that could delay significantly the

implementation of emergency actions would be made apparent for correction at that time.

DOE RAP Teams (Contention 33)

238. Contention 33 was rewritten by the Board after other issues raised by the Contention, as filed, were resolved by summary disposition. It states that the LILCO Transition Plan fails to demonstrate that there are any direct communications between the DOE RAP monitoring teams and the EOC.

239. There are direct multi-channel radio communication links between the DOE RAP teams who collect field survey data and the DOE Brookhaven Area Office where dose assessment functions, based on field survey data, are carried out. Cordaro et al., ff. Tr. 13,948, at 5. Similarly, there are direct communications between the Brookhaven Area Office and the EOC by means of a dedicated phone line, commercial telephone, and the Federal Telecommunications System line connected to the Shoreham control room. Id.

240. The FEMA witnesses testified that they preferred the use of radio, and in fact they knew of no plan that considered anything but radio as a means of communication between monitoring teams taking measurements in the field and the dose assessment staff performing the interpretation of those measurements. Tr. 14,315-18 (Keller). The LILCO Transition Plan does provide such direct radio communication between the field monitoring teams and the dose assessment function performed at the Brookhaven Area Office. Tr. 13,959 (Renz). FEMA further testified, based on its observations in drills on at least four separate occasions,

that there have not been any major problems associated with the implementation of a similar system in the state of New Jersey. Tr. 14,319 (Kowieski).

241. LILCO's plan for direct communication between the field monitoring teams and the dose assessment function ensures accurate transmission of the data.

Existing Radio Locations (Contention 34)

242. It is alleged in Contention 34 that the LILCO Transition Plan fails to insure adequate communication among response personnel because it relies upon existing communication links in hospitals, private ambulance companies, and vehicles. See NUREG-0654, II.F.2. We agree with FEMA and LILCO that the LILCO Transition Plan complies with that element of NUREG-0654 because the Plan provides "coordinated communication links" by combining telephone and/or radio links between the EOC and the "fixed and mobile medical support facilities." Cordaro et al., ff. Tr. 5823, at 34-37. Baldwin et al., ff. Tr. 12,174, at 37-38.

243. Contention 34 further alleges that communications between command and control personnel in the EOC and the various medical support vehicles and facilities cannot be effected in a timely manner. LILCO testified that since the support organizations and personnel will use communications equipment used routinely on a daily basis, communications will be effected in a timely manner. Cordaro et al., ff. Tr. 5823, at 37.

244. We find that the Plan meets the planning standard of NUREG-0654, § II.F.2 and that it is accepted practice to configure a coordinated communications link in this manner. Baldwin et al., ff. Tr. 12,174, at 39-40.

Conclusion

245. The Board finds that the offsite communications network comports with the regulations and guidelines and there is reasonable assurance that it will function effectively in a radiological emergency.

V. Training (Contentions 24.S, 39-41, 44, and 98-100)

246. Contentions 24.S, 39-41, 44 and 98-100 raise a group of issues dealing with the adequacy of LILCO's emergency planning training program. In sum, the contentions challenge LILCO's ability to ensure that it has a fully trained and staffed offsite emergency response organization. There are two underlying questions regarding the training testimony heard by the Board. How will the public behave in a radiological emergency, and what training or experience do LERO workers need to deal with this public response? We find as detailed below that the approaches taken in the pre-filed written testimony responding to these questions and the answers provided during cross examination of LILCO and Suffolk County witnesses accounts for the sharp differences among the parties in their opinions about the LERO training program.^{32/}

^{32/} Suffolk County filed testimony (Cosgrove, Falker and Lipsky, ff. Tr. 13,078) and conducted cross-examination of LILCO witnesses Babb, Berger, Cordaro, Daverio, Mileti, Renz and Varley, ff. Tr. 11,136 and Lichtenfels, ff. Tr. 13,463 and FEMA witnesses Baldwin, Keller, Kowieski and McIntire, ff. Tr. 14,142. New York State did not file testimony as regards the training testimony but did conduct cross-examination.

The Theory of the Intervenors

247. The County's witnesses stated the view that LERO workers must be trained to deal with anxious evacuees and crisis conditions. See, e.g., Cosgrove (Training), ff. Tr. 13,083, at 17-18, 22, 30-32, 42, 64, 70, 72-73, 76-77. We disagree. Cross-examination by LILCO developed that no Suffolk County witnesses on training had ever studied the behavior of the public in an emergency. Tr. 13,145-46, 13,150 (Fakler), 13,104, 13,147 (Lipsky), 13,149-50 (Cosgrove). In contrast, witnesses for LILCO and for FEMA testified on the basis of actual studies that the public although anxious will not exhibit aberrant behavior in a radiological emergency so as to require special training of emergency workers, but will behave in a civil manner as people generally behave in other emergencies. Cordaro et al., ff. Tr. 1470, at 11-16; McIntire, ff. Tr. 2086, at 7; Tr. 11,480-82, 11,489, 12,069 (Mileti): see also Tr. 10,764, 10,766-67, 10,771-73, 10,780 (Saegert). Further, the County in its proposed Findings seems to now agree that Suffolk County residents will behave in a radiological emergency as people do in other emergencies, that is in a civil manner. See Suffolk County Proposed Findings 339 & 344.

248. We find that LILCO's and FEMA's position is amply supported by the persuasive testimony given by Dr. Mileti. Dr. Mileti has extensively studied the public's response to emergencies. Moreover, his position has been upheld by other atomic safety and licensing boards. See Consolidated Edison Co. (Indian Point, Unit No. 2), LBP-83-68, 18 NRC 811, 955-60 (1983); and Pacific Gas & Elec. Co. (Diablo Canyon Nuclear Power Plant, Units 1 and 2), LBP-82-70, 16 NRC 756, 825 (1982). The Board generally agrees with LILCO's view of the public's anticipated civil behavior in a

radiological emergency and with the resultant effect on the LERO training program. We find, in short, that it is not necessary and probably would be inappropriate for LILCO to instruct LERO workers in crowd control and other crisis intervention principles when it is unlikely that the public will exhibit the aberrant behavior requiring such control. See Tr. 12,069 (Mileti).

Training of Non-LILCO Personnel (Contentions 24.S, 39.B, and 98)

249. The record shows that in the event of an emergency at Shoreham LILCO will rely on certain non-LILCO organizations to provide services in support of the LILCO/LERO effort. These support organizations include ambulance companies, the United States Coast Guard, DOE, Impell, Island Helicopter, and the American Red Cross. All these support organizations will receive training. Organizations such as schools, hospitals, nursing homes, and other special facilities, which like the general public may be called upon to take action during an incident at Shoreham, are not support organizations but will be offered training and information sessions annually. Cosgrove (Training), ff. Tr. 13,083, at 3; Cordaro et al., ff. Tr. 6457, at 33-36; Babb et al., ff. Tr. 11,140, at 4-5, 78-82; Tr. 6558, 6563-64 (Robinson); Plan, at 5.1-6.

250. 10 C.F.R. § 50.47(b)(15) requires that "radiological emergency response training is provided to those who may be called upon to assist in an emergency," and NUREG-0654 II.0 requires that "each organization shall establish a training program for instructing and qualifying personnel who will implement radiological emergency response plans." The Board finds that, under the regulations and guidelines, training need only be provided to organizations providing essential support services. See Pacific Gas &

Elec. Co. (Diablo Canyon Nuclear Power Plant, Units 1 and 2), LBP-82-70, 16 NRC 756, 791-92, 846 (1982); see Babb et al., ff. Tr. 11,140, at 78; Tr. 14,523-24 (Keller).

251. Support services provided by organizations under the LILCO Plan can be divided into two groups. The first group includes the U.S. Coast Guard, ambulance personnel, helicopter personnel, and Impell personnel. This group will be provided with LERO classroom training and will participate in the exercise program because they are called upon to support LERO for situations that, while similar to their normal activities, are in many respects unique to their LERO response actions. The second group includes the American Red Cross and DOE RAP. This group is called on to support LERO in activities that these organizations conduct as part of their normal response actions. They will also participate in the exercise program. Babb et al., ff. Tr. 11,140, at 26, 84-86; Cordaro et al., ff. Tr. 14,707, Att. 1; Tr. 11,413-16 (Daverio), 6575-77 (Weismantle), 6578-80 (Robinson); see also Tr. 8414-15, 13,109-11 (Cosgrove).

252. The County in its testimony on Contentions 24.S and 98 asserted that LILCO has no agreements with schools, hospitals, nursing homes, other special facilities, the American Red Cross, or the Department of Energy to attend training and periodic retraining. Without agreements, Intervenors assert that there can be no assurance that personnel at these organizations will understand that they have been assigned emergency response functions by LILCO; will understand what the performance of those functions during a radiological emergency entails; will understand how they are to perform those functions under the LILCO Plan; and would be either capable or willing to perform the functions. Cosgrove et al., ff. Tr. 8405, at 5-6; Cosgrove (Training), ff. Tr. 13,083, at 11-12.

253. We find that LILCO is not required by the regulations or guidelines to provide training to schools and other special facilities. Accordingly, LILCO need not have agreements with those entities to provide training. In addition, the evidence shows that it is not necessary to train people to do what they already know how to do. For example, school officials do not require special training to supervise children in implementing protective actions because their normal duties include supervision and protection of the school children in their care. Babb et al., ff. Tr. 11,140, at 78-79; Tr. 1157-58, 1175 (Weismantle), 11,846-52 (Daverio, Cordaro, Mileti), 12,192-95 (Kowieski, McIntire), 14,523-24 (Keller). The Board finds unpersuasive the County's attempts to portray the role of school personnel during a radiological emergency as unique. See Tr. 13,383-85 (Fakler), but see Tr. 13,122-23 (Cosgrove); see also Kansas Gas & Elec. Co. (Wolf Creek Generating Station, Unit No. 1), LBP-81-453-03 OL, 20 NRC ____, slip op. at 22-24, 70-71 (July 2, 1984).

254. The record further shows that LILCO will offer training and retraining annually to organizations such as schools and special facilities that are required to take actions similar to those of the general public in an emergency. Transition Plan, at 5.1-6; Tr. 1172 (Weismantle), 13,223 (Lipsky). There is no basis in the record to believe that such organizations would not accept training without letters of agreement. Tr. 11,864-66 (Daverio, Cordaro).

255. The American Red Cross under the LILCO plan provides the essential service of operating relocation centers. The Red Cross in letters of agreement between it and LILCO has demonstrated its awareness

of this response role and its willingness and capability to perform that role. Cordaro et al., 4/6/84 Vol. II, at 34-36, Att. 25, 27; Cordaro et al., ff. Tr. 14,707, Att. 1. Red Cross personnel do not require training to perform their role under the LILCO Plan because they will perform their normal response function of setting up a relocation center. Moreover, Red Cross personnel will participate in LERO drills and exercises. Cordaro et al., ff. Tr. 14,707, Att. 1; Babb et al., ff. Tr. 11,140, at 26, 85-86; Cordaro et al., 4/6/84 Vol. II, at 35, Att. 25, 27; Tr. 1173 (Weismantle), 2159 (McIntire), 6569, 6572-73 (Robinson), 11,416 (Daverio). We give no weight to the County witnesses' attempt to discredit the letters and the Red Cross's experience by saying that the Red Cross has not run relocation centers in an actual radiological emergency. Equally unpersuasive is the County testimony that a letter of agreement for training is needed. That testimony was based on a County perceived need for training Red Cross personnel to interface with LERO personnel at the decontamination and monitoring facilities, Tr. 8424-26, 13,379-82 (Cosgrove). This averment is mooted by LILCO's proposal to provide monitoring and decontamination at a central location. See Tr. 14,801-02 (Rasbury).

256. The DOE letter of agreement with LILCO recognizes that DOE RAP's role in response to an incident at Shoreham will be to perform its normal radiological assessment function. DOE RAP personnel receive training through DOE. Cordaro et al., 4/6/84 Vol. II, at 35-36, Att. 33; Babb et al., ff. Tr. 11,140, at 85-86; Tr. 6573 (Robinson); see also Tr. 8414-15, 13,109-11 (Cosgrove), 1172, 1174 (Weismantle). While DOE RAP personnel will not receive LERO classroom training, the record

reflects that DOE has orally agreed to participate in the exercise program. Babb et al., ff. Tr. 11,140, at 26; Tr. 6573-74 (Robinson), 11,416 (Daverio). FEMA recommended that the Transition Plan be clarified to reflect the actual participation of DOE RAP personnel in radiological monitoring exercises. Baldwin et al., ff. Tr. 12,174, at 22. We agree with FEMA's recommendation and direct that the Staff monitor that such a clarification is in fact made to the Transition Plan.

257. This Board rejects the argument that the Red Cross and DOE are not aware of their roles under the Transition Plan or how to perform those roles. We find, based on the record cited above, that each of those organizations will perform response roles for which they have substantial experience, and each has a letter with LILCO indicating its willingness to perform that role. In addition, this Board finds no reason to require LILCO to exceed the regulations and to obtain letters of agreement with schools and other special facilities. These organizations simply do not provide essential support services and do not require special training to perform their emergency response roles. LILCO will offer training and information sessions to assist those organizations in understanding their role in an emergency.

258. Contention 39.B addresses the issue of how LILCO will ensure that non-LILCO support organizations maintain a full complement of trained staff to respond to an incident at Shoreham. The Board's findings on analogous issues presented in Contentions 24.S and 98 are equally applicable here with respect to the issues of training for schools, special facilities, DOE, and Red Cross. The remaining issues raised by this contention are that agreements with ambulance companies do not

mention retraining, that the letter of agreement with the Coast Guard mentions only retraining in personal safety and dosimetry, and that, even if LILCO is notified, LILCO's system will not provide attrition-related staff training until after the attrition has resulted in inadequate staffing. Cosgrove (Training), ff. Tr. 13,883, at 87-89.

259. The letter of agreement between the U.S. Coast Guard and LILCO provides that the Coast Guard will notify persons in Long Island Sound waters by marine band radio and direct contact with vessels and that they will provide vessels for radiation monitoring. Transition Plan, at APP-B-8; Tr. 6582-83 (Cordaro). The record shows that LILCO provides training on radiological monitoring and personnel dosimetry to the Coast Guard. There is no LERO training on Marine traffic control or operation of the marine band radio, as those are skills the Coast Guard performs as part of its routine daily duties. Babb et al., ff. Tr. 11,140, Att. 7; Tr. 12,044-45 (Varley). LILCO witnesses testified without contradiction that the Coast Guard has already completed initial training and that the Coast Guard's own contingency plan includes a provision that the Coast Guard notify LILCO if supplemental retraining is required. Tr. 11,471-74 (Daverio), 13,217 (Fakler); Babb et al., ff. Tr. 11,140, Att. 10.

260. In a similar vein, the County did not contradict LILCO's testimony that ambulance companies are required to provide trained personnel under their contracts. Tr. 6567 (Robinson); Cordaro et al., 4/6/84 Vol. II, Att. 13-21C. In FEMA's opinion, and we agree, non-LILCO organizations that have indicated their willingness to provide specific response by signing letters of agreement accept the responsibility to inform LILCO of their training needs. Baldwin et al., ff. Tr. 14,151, at 103.

261. The Board finds that LILCO's letters of agreement and the provision in the ambulance company contracts to provide trained personnel constitute continuing obligations that encompass retraining. Likewise, the Board finds that the provision in the Coast Guard's plan that the Coast Guard will notify LILCO of understaffing provides adequate assurance of such notification. Finally, the Board finds that annually scheduled retraining and LILCO's system of receiving notification of training needs from non-LILCO organizations provide reasonable assurance that non-LILCO organizations will have an adequate number of trained personnel.

Attrition With Respect to LILCO Personnel (Contention 39.A)

262. The Board notes at the outset that every organization experiences problems related to attrition. The County witnesses testified that the LILCO Plan does not compensate effectively for attrition. In their opinion, general quarterly training, semi-annual job-specific training, and annual drills and exercises as provided for by LILCO are too infrequent and do not assure that trained LILCO employees will be available to fill positions in LERO. Cosgrove (Training), ff. Tr. 13,083, at 83-85. Contention 39.A also asserts that LILCO should make satisfactory completion of its emergency response training program a prerequisite to the hiring of personnel who will be assigned response duties. The County did not, however, contradict LILCO's testimony that such a prerequisite would be inappropriate since not all LILCO employees are members of LERO. Babb et al., ff. Tr. 11,140, at 27. The record shows that LILCO will ensure that an adequate number of trained personnel are available to respond to

an emergency by providing annual retraining for previously trained personnel, by training new personnel for the LERO organization to fill those positions affected by attrition, and by overstaffing. Babb et al., ff. Tr. 11,140, at 27; Baldwin et al., ff. Tr. 14,151, at 102; Tr. 14,408-11 (Keller, McIntire).

263. The record also shows that LILCO overstaffs its LERO positions at 150% for jobs that involve the one-time evacuation of the EPZ; (this represents staffing for one shift plus reserve personnel). For those LERO jobs that must be staffed throughout the duration of an emergency, LERO is overstaffed to support a 24-hour-a-day, two-shift operation with enough reserve personnel to staff a complete third shift. Babb et al., ff. Tr. 11,140, at 28-29; Tr. 11,421, 11,446 (Daverio); Baldwin et al., ff. Tr. 14,151, at 102; Tr. 14,408-09 (Keller). The record further shows LILCO is committed to maintaining staffing at 150%. Babb et al., ff. Tr. 11,140, at 29-30; Tr. 11,449 (Daverio). LILCO and FEMA witnesses agreed that overstaffing ensures that adequate response personnel will be available. Cordaro et al., ff. Tr. 11,140, at 28; Tr. 14,408-15 (Keller, McIntire, Kowieski). This testimony was not contradicted.

264. As outlined in the Transition Plan, classroom training will be scheduled quarterly, and each LERO worker will be expected to complete an entire review program annually. New LERO workers will be scheduled to attend quarterly classroom training sessions at which they will view the LERO training videotapes and complete the associated workbook sections. All LERO workers will be required to participate in the drill and exercise program, where they will have an opportunity to practice their LERO job skills. The "quarters" concept spreads the material over the course

of a year to afford flexible scheduling and to involve LERO workers in LILCO activities throughout the year. The structure of the training program also enables a new LERO worker to complete his initial classroom training in six months. Babb et al., ff. Tr. 11,140, at 31-33; Tr. 14,408 (Keller), Cosgrove (Training), ff. Tr. 13,083, at 83-84. If the need arises, LILCO can also provide special accelerated training courses to maintain staffing. Plan, at 5.1-8; Babb et al., ff. Tr. 11,140, at 30; Baldwin et al., ff. Tr. 14,151, at 102; Tr. 11,450-52 (Daverio), 11,452-53 (Varley).

265. The record further shows that the rate of attrition at LILCO historically is low. For both 1982 and 1983, the annual attrition rate for LILCO as a whole was less than 5% (including retirement). Babb et al., ff. Tr. 11,140, at 27. During March 1984 LILCO instituted an austerity program, which included laying off a number of LILCO workers who were members of the LERO organization. Training to qualify new employees as LERO members began soon after the layoffs. Replacements had been trained for 124 of the 166 persons who left LERO, either because of the LILCO austerity program or for other reasons, between March 6 and May 30. Babb et al., ff. Tr. 11,140, at 28; Tr. 11,435-37 (Daverio).

266. The Board finds that LILCO's commitment to overstaffing, its proposal to accelerate training for key individuals, and its schedule for providing quarterly training combine to provide an adequate means for dealing with attrition. The Board further finds that Intervenors' contention that LILCO should make satisfactory completion of its emergency response training program a prerequisite to hiring LILCO personnel is not

supported by the evidence. LERO is a volunteer organization, and membership is not required of all LILCO employees.

Job-Related Experience and Stress (Contention 40)

267. Contention 40 asserts that LILCO personnel will be unable to perform their LERO jobs because their normal daily jobs are unrelated to their LERO jobs and, as a result, they will not have sufficient experience to perform their LERO responsibilities in the event of an emergency. The County further asserts that training cannot compensate for this lack of job-related experience, especially when one considers that the tasks may be accompanied by high levels of stress and fatigue, and that actual real life experience, therefore, is essential. The County also asserts that LERO workers will not retain what they learned in the LERO training program because LERO workers lack incentive and the skills will be infrequently practiced. Cosgrove (Training), ff. Tr. 13,083, at 17-26, 28-34, 46-55.

268. County witnesses considered the selection of candidates an essential element of a training program. In their view, LILCO's reliance on volunteers to perform emergency duties results in persons with little no prior experience filling emergency jobs, no pre-screening of persons who may be unable to learn to perform their emergency jobs, and no prior assessment of whether a particular trainee is potentially ill-suited for emergency work. Cosgrove (Training), ff. Tr. 13,083, at 28-34.

269. The County's further view is that an emergency worker has the experience necessary to perform his job only if as a condition precedent he comes to the job with experience or if he receives post-training experience. Cosgrove (Training), ff. Tr. 13,083, at 26. The County's

witnesses also testified that the only way to learn to perform an emergency response job is through "working at comparable jobs under emergency conditions on a regular basis" and that LERO job skills "can only be learned effectively if, in addition to training, there are regular real life opportunities to actually use those skills." The thesis advanced by the County's witnesses was that "no drill program can fully compensate for the lack of experience that exists among the LILCO personnel." Cosgrove (Training), ff. Tr. 13,083, at 21, 23, 55; see also Tr. 13,141 (Fakler). In cross-examination, however, the County witnesses conceded that a drill and exercise program could substitute for experience, but still maintained that the LILCO training program was insufficient to accomplish that purpose. Cosgrove (Training), ff. Tr. 13,083, at 55; Tr. 13,144 (Fakler), 13,140 (Cosgrove). The magnitude and type of drill program that the County witnesses felt would be appropriate for training LERO personnel would require that the tasks be performed under all possible conditions and was exemplified by the FBI's anti-terrorist training, which is a continuous one-and-a-half-year program. Tr. 13,140-44 (Cosgrove, Fakler, Lipsky).

270. Witnesses for LILCO testified that LERO workers' lack of job-related experience does not preclude assurance of an adequate emergency response. However, the LILCO witnesses conceded that it does require that training provide emergency workers with the information and opportunity to know their emergency jobs and how to do them. Babb et al., ff. Tr. 11,140, at 38-40; Tr. 11,478-79, 11,485-86 (Mileti). FEMA agreed with LILCO that training can prepare a person to fill emergency response roles successfully and that job-related experience is not a prerequisite or regulatory requirement. Tr. 14,458 (Keller).

271. We find that there are a number of reasons why LILCO employees will be able to adequately perform their assigned emergency functions and duties in the absence of prior specific experience. The drills and exercises provided for under the Transition Plan give LILCO personnel the opportunity to practice their LERO job under simulated emergency conditions. Most of the tasks assigned to LILCO employees are not complex or difficult and do not require daily practice to ensure proficiency. In certain instances, the LERO organization has made use of job-related skills of LILCO employees when assigning them to LERO jobs. Babb et al., ff. Tr. 11,140, at 39-45; Tr. 11,486-88, 11,490-94 (Daverio), 11,499, 11,572, 11,228, 11,242-43 (Varley).

272. It is this Board's finding that prior "real life" experience is not inherently necessary for adequate performance of an emergency job and that lack of experience can be compensated for by a good training program. The LERO training program, which the record shows consists of elaborate videotapes and workbooks for classroom use, drills, and exercises is a complete, well-designed program that will provide its participants with an understanding of the tasks necessary to carry out an emergency response for an accident at Shoreham. See Babb et al., ff. Tr. 11,140, at 23-24; Tr. 14,851 (McIntire).

273. The County witnesses claim that the stress of an emergency situation will adversely affect the performance of LERO workers. In their judgment, the first time a LILCO emergency worker is called upon to perform in an actual emergency situation his performance will suffer, and he may either not be able to perform at an acceptable level or flee from his assigned position. Cosgrove (Training), ff. Tr. 13,083, at 20. We

find that these witnesses have not studied the actual behavior of emergency workers in emergency situations. Rather they based their testimony solely on their experience with the Suffolk County Police Department. Tr. 13,145-46, 13,150 (Fakler), 13,104, 13,147 (Lipsky), 13,149-50 (Cosgrove).

274. In contrast, LILCO's witness Dr. Mileti pointed out that in ~~no~~ instance has an emergency response organization been unable to do its job because its workers were incapacitated by stress. Babb et al., ff. Tr. 11,104, at 47-53; Tr. 11,634-35, 11,663-65 (Mileti), 13,146 (Fakler). Stress, for example, did not incapacitate emergency workers at TMI. Id. Dr. Mileti stated, and we agree, that stress would almost certainly exist in LERO emergency workers at Shoreham in an emergency, but that it would not incapacitate those emergency workers when their services were needed. Id. In fact, the record shows that if stress did have an affect on LERO workers, it would probably enhance their ability to meet the demands of the situation. Id. Dr. Mileti's opinions, which we adopt, were based upon his extensive study of the literature on emergencies and his own observations of emergency workers. Babb et al., ff. Tr. 11,140, at 49-52; Tr. 11,604-11, 11,613-22, 11,630-34, 11,640-49, 11,663-65, 12,066-68, 12,074-76 (Mileti).

275. Concerning the issue of fatigue, the record shows that studies of emergency workers have found that fatigue does not interfere with people performing emergency work and that they typically work for long hours and step aside only when replaced by other emergency workers. Tr. 11,600-01 (Mileti). Dr. Babb's own experience with the Suffolk County Police Department confirms this finding. Tr. 11,649-50 (Babb). The FEMA witness

also agreed that nonprofessional emergency workers are not rendered ineffective due to stress or fatigue and that realistic drills can prepare an individual to fulfill an emergency response role. Tr. 14,470-74 (McIntire).

276. Contrary to the County's assertion that LERO personnel will attend LERO training only on an annual basis and that, as a result, the training will be ineffective and forgotten, the record shows that LILCO has intentionally structured its training program in calendar quarters so that an individual is involved in LERO activities throughout the course of a year. Babb et al., ff. Tr. 11,140, at 32-34; Tr. 11,458-63 (Varley).

277. The Board concludes, based on the testimony of Dr. Mileti and the FEMA witness, that emergency workers, including LERO workers, would not be incapacitated by stress and fatigue. Although, as we have noted, stress and fatigue during an actual emergency might indeed be experienced, such stress or fatigue or a lack of day-to-day related emergency experience will not, in our opinion, significantly reduce the performance level of LERO workers. The Board also believes that LILCO's training and retraining program is adequate to ensure that LERO personnel are in a state of readiness throughout the course of a year.

Communications Training (Contentions 44.D and 41)

278. Contention 44.D asserts that the LILCO Transition Plan does not provide for testing whether the content of messages is understood by emergency response personnel. The record shows that FEMA and LILCO testified that the LILCO Plan adequately provides for quarterly testing of communications with federal agencies and states in the ingestion pathway. Babb et al., ff. Tr. 11,140, at 67-68; Baldwin et al., ff. Tr. 14,151,

at 105; Baldwin et al., ff. Tr. 12,174, Att. 1, at 52. A LILCO witness testified that, as part of communication verification drills, communicators will transmit a precompleted message form, and the message received will be checked against the original. Babb et al., ff. Tr. 11,136, at 67-68. FEMA's opinion is, and we agree, that LILCO's use of the Radiological Emergency Data Form, which is the standard New York State form that has been used successfully at other reactor sites, indicates that the federal agencies and New York State will understand the content of the message. Baldwin et al., ff. Tr. 14,151, at 106; Tr. 14,488-90 (Keller, Baldwin). The County offered no evidence to contradict the testimony of FEMA and LILCO that LILCO's provisions for testing of the content of messages are adequate. Accordingly, the Board finds that the provisions of the LILCO Transition Plan for quarterly testing of communications with federal agencies and states within the ingestion pathway are adequate.

279. Contention 41 argues that there is no assurance LERO workers will be adequately trained in the use of communications equipment so as to be able to use it effectively in an emergency. The County alleges specifically, but largely without support in the record, that communications training must include instruction in the proper use of radio frequencies, the range of coverage available for each frequency, and proper radio discipline. The County also argues that the LILCO Plan gives no indication of the scope or content of the communications drills or exercises.

280. The County's witnesses believe that the inexperience of LERO workers in using communications equipment during an emergency will prevent them from operating the equipment effectively under the stress of emergency

conditions. Further, the County's witnesses stated that any radio experience LERO workers might have in non-emergency situations is irrelevant and that the LILCO training program, which the County alleges is primarily-classroom training with almost no "hands-on" experience, does not overcome the lack of experience in operating communications equipment in an emergency. Further, the County's witnesses believe that communications training should prepare LERO workers for high levels of anxiety, including heavy radio traffic and overlapping transmissions. Cosgrove (Training), ff. Tr. 10,083, at 72-73, 77-78; Tr. 13,407 (Cosgrove).

281. We find that the County's testimony is based on the erroneous assumption that communications traffic during an emergency at Shoreham will be heavy and comparable to the radio traffic apparently experienced by County Police emergencies. LERO communications during an emergency would be administrative rather than operational and, as a result, the number of radio transmissions would be limited. Compare Tr. 11,727-29 (Renz) with Tr. 13,216-17, 13,407 (Fakler); see Findings 203-06. Another reason LERO personnel will, in our opinion, be able to use the communications equipment effectively is that the equipment, which consists of radios and telephones, is simple to use. Babb et al., ff. Tr. 11,136, at 58-60. Witnesses for LILCO testified that LERO workers practice using the equipment during drills and exercises. Tr. 11,729-31, 11,741-42 (Renz); Babb et al., ff. Tr. 14,140, at 61, 64-65. These witnesses also had observed that during drills LERO personnel and equipment had fulfilled the intended objectives of the communications link exercised. Babb et al., ff. Tr. 11,136, at 65; Tr. 11,763-66 (Renz, Varley). Despite isolated problems during the drills and exercises, the record does not disclose

that LILCO employees have had a problem learning how to use the mobile radios. Tr. 11,575-78 (Varley).

282. As noted above, FEMA and LILCO witnesses both testified that stress does not incapacitate emergency workers and, therefore, that stress would not impair the use of communications equipment. Moreover, the County witnesses themselves conceded that stress produced by an emergency situation, and problems with operating communications equipment that might result from that stress, probably would occur with any group. Tr. 13,215, 13,406 (Cosgrove).

283. FEMA and LILCO both further testified that adequate training in the use of communications equipment is provided by LILCO. They disagreed with the statement in the contention, which was not supported by County testimony, that training on the range of coverage for each frequency is necessary. Baldwin et al., ff. Tr. 14,151, at 105; Tr. 14,477-78, 14,484 (Keller); Babb et al., ff. Tr. 11,140, at 64-65; Tr. 11,768-72 (Renz). FEMA believed that training in radio discipline would be desirable, Tr. 14,487 (Keller). However, the record shows that LERO workers are taught radio discipline in training Module 8A, Babb et al., ff. Tr. 11,140, Att. 16; Tr. 11,749-54 (Varley, Renz).

284. The Board finds that stress will not impair the ability of LERO workers in an emergency. Indeed, there is evidence that stress may enhance performance. See Tr. 11,634-35, 11,663-65 (Mileti). Consequently, the Board finds that the stress of an emergency will not hamper the ability of LERO workers to use the communications equipment and in any event agrees with FEMA and LILCO that LILCO's program provides adequate training in the use of the equipment. The County's assertion that

training must include instruction in the use of radio frequencies and the range of coverage is not supported by the record. We also note that the ability of LERO workers to actually use the communications equipment will be tested under simulated emergency conditions during a FEMA exercise.

Free Play for Decisionmaking (Contention 44.E)

285. Contention 44.E states that "the [transition] plan fails to describe how exercises and drills are to be carried out to allow free play for decisionmaking." See Contention 44.E. The term "free play for decisionmaking" describes the instructional method used in an exercise whereby the participants collect, analyze, and diagnose accident symptoms and develop response action decisions. Babb et al., ff. Tr. 11,140, at 69. Free play for decisionmaking in drills and exercises is a requirement of NUREG-0654. Babb et al., ff. Tr. 11,140, at 69; Tr. 14,496 (Keller).

286. The LILCO Transition Plan provides for free play for decisionmaking when it states that drill and exercise scenarios will include "scenario initiating events which allow for participant discretion and decisionmaking." Transition Plan at 5.2.2; Tr. 14,500 (Keller). A more detailed description of how free play for decisionmaking is to be carried out in drills and exercises need not be included. Tr. 14,493-94, 14,500 (Keller). Exactly how free play will be carried out depends upon the objectives of each drill or exercise. Baldwin et al., ff. Tr. 14,151, at 106-07; Tr. 14,500-01 (Keller). FEMA and LILCO witnesses both agreed that free play for decisionmaking is adequately addressed in the Transition Plan and procedures. Tr. 14,493-95, 14,500-01 (Keller); Babb et al., ff. Tr. 11,140, at 69-70.

287. The Board finds that both LERO drills and exercises are structured so as to simulate actual emergencies, and free play for decisionmaking is inherent in the manner in which they are conducted. We are satisfied that drill participants do not know the time frames or accident scenario prior to the drill. Babb et al., ff. Tr. 11,140, at 71-72; Tr. 11,807 (Daverio). We also note that LERO workers receive information in much the same manner as the information would be available to them in an actual emergency via the various emergency communications circuits, must make decisions based on that information, and carry out the course of action that they have developed using the procedures and equipment that they would use in an emergency. Babb et al., ff. 11,140, at 40-42, 71; Tr. 14,500 (Keller). "Sub-situations" present participants with additional problems or distractions of the type that might occur in a real emergency, and they must develop on-the-spot responses. Babb et al., ff. Tr. 11,140, at 42. We further note that FEMA believes that such realism in the drill and exercise program provides for the free play aspect of decisionmaking. Tr. 14,491-92 (Kowieski). We agree.

288. The County's contention that free play is lacking in the LERO drills is apparently based on its assumption that free play in decision making must be experienced by field workers such as traffic guides who might experience unscheduled occurrences. The County witnesses testified that free play for decisionmaking was absent from LILCO's drills because the subsituations used to simulate emergency conditions are not equivalent, in their view, to real-life situations. Tr. 13,306-07 (Lipsky).

289. We note that it is important for free play for decisionmaking to occur within LERO and to have other LERO members respond as a result of that decisionmaking process. Tr. 11,800-01 (Daverio). Free play for decisionmaking, where possible, is desirable for all levels of personnel; however, we find that at lower levels in the LERO organizational structure many of the functions are covered by set procedures and there is less room for decisionmaking to occur. Tr. 14,507-08 (McIntire, Keller); 11,798-800 (Daverio). The record reflects that managerial levels of LERO, as well as positions in the field such as transfer point coordinators and route alert drivers, do engage in free play for decisionmaking in drills. Tr. 11,795-802 (Daverio). The Transition Plan also makes provisions for FEMA and the NRC to review the objectives and the scenario for the FEMA graded exercise. See Plan, at 5.2.2; Tr. 14,501 (Baldwin). FEMA reviews the scenario and specifically ensures that free play is included. Tr. 14,496-97 (Kowieski).

290. In conclusion the Board finds that the Transition Plan adequately addresses the NUREG-0654 requirement of allowing for freeplay for decisionmaking in drills and exercises. The Board also finds that allowing for participant discretion and decisionmaking in LILCO's exercise and drill scenarios will allow free play for decisionmaking to be carried out.

Official Observers and Critiques (Contention 44.F)

291. This contention asserts that even though the LILCO Plan provides that the federal, state, and local governments will be invited to evaluate and critique annual exercises, such governments have not agreed to send official observers to LILCO's annual exercise, and, therefore, there is no assurance that observers will be provided.

292. This contention also alleges that LILCO lacks expertise and objectivity, and therefore that LILCO will not be able to critique adequately its own drills and exercises or to take the necessary actions to correct deficiencies in the plan and procedures. We note at the outset that the County's position is contradicted by its own supplemental testimony, which quotes passages from completed critique forms. The LILCO critiques effectively negate any notion that LILCO cannot objectively critique its own drills. See Cosgrove (Supplemental), ff. Tr. 13,083. Moreover, a LILCO witness testified that LILCO has established a control system to ensure that critical comments are considered and resolved. Tr. 5686 (Weismantle). In fact, the LILCO witnesses testified that many deficiencies discovered in early drills have already been corrected. Tr. 5687-90, 5701, 5710-12 (Weismantle), 5871-72 (Renz), 5880-82 (Renz, Daverio), 5966-67 (Daverio), 7073-75 (Varley).

293. We note that it is common practice for utilities and offsite organizations to observe and critique their own exercises using their own and supplemental personnel. See Babb et al., ff. Tr. 11,140, at 75; Tr. 14,514 (Keller). The FEMA witness stated that FEMA looks at a utility's internal drill program as preparation for the federally evaluated exercise. See Tr. 6072, 14,515 (Keller). The Board concludes that

LILCO, like other utilities, is equipped to objectively critique its own drills and exercises and that the Transition Plan adequately provides for evaluation and critiques of LILCO drills and exercises as well as an annual exercise. See Tr. 14,514 (Keller); Baldwin et al., ff. Tr. 14,151, at 107.

LILCO's Classroom Training Program (Contention 99)

294. Contention 99 alleges that the LILCO instructors in the classroom phase of the training program are not experts in the subjects covered or trained and not experienced in teaching methods. Also, the County asserts that the classroom materials provide insufficient information on how each LERO member is to perform the specific duties assigned to him, but concentrate instead on descriptions of the duties and chains of command. Discussed below are the subsections of Contention 99 which were admitted for litigation.

Contention 99.C

295. Witnesses for the County testified that LILCO personnel will not learn enough in the classroom sessions to enable them to perform their emergency roles because most of LILCO's classroom instructors are not knowledgeable about the material being presented. Cosgrove (Training), ff. Tr. 13,083, at 37-40. However, we note that on cross-examination County witnesses revised their opinion that "it is unlikely that a LILCO instructor who had never performed a particular job . . . could teach someone else how to perform that job" to the more realistic view that it would not be impossible for someone to teach a subject effectively without prior on-the-job experience but that such experience would enhance the instruction. Tr. 13,179-80 (Lipsky).

296. The record developed at the hearing shows that in the LERO classroom sessions, the instructor is present to ensure that the students view the videotape, review the material in the workbook, and work through the self-check exercise contained in the workbook. The instructor is available, throughout the classroom session, to answer questions, and upon the class's completion of the self-check exercise, the instructor conducts a question-by-question review of the material. Babb et al., ff. Tr. 11,140, at 16-17; Tr. 11,222-24, 11,299-306, 11,310 (Varley), 11,263-65 (Berger, Varley); 14,396-97 (Keller). We find that one of the advantages of videotapes is the ability to present the LERO training material without the need for instructors with extensive subject matter expertise or teaching background. Babb et al., ff. Tr. 11,140, at 89-90; Tr. 11,919 (Varley). The record also shows that videotapes and workbooks provide the "expert" presentation of the information, with the instructors providing control and guidance in the classroom setting. Babb et al., ff. Tr. 11,140, at 20, 87-88; Tr. 11,902-03 (Varley).

297. The record further shows that scripts and workbooks were prepared for LILCO by individuals who had expertise in the subject area of the plan and procedures that were to be converted into training materials. Tr. 11,924, 11,929-31 (Varley); Babb et al., ff. Tr. 11,140, at 89-90. They were reviewed by a number of individuals experienced in developing training programs for accuracy and consistency and to determine whether the materials were sufficient to impart the knowledge necessary for each LERO position. Tr. 11,165-66 (Berger, Mileti), 11,929-31 (Varley, Daverio). FEMA's opinion is that the expertise of the instructors in the subject matter or teaching technique is immaterial so

long as the result of the training program is that the emergency worker is trained to carry out his assigned tasks adequately. FEMA also noted that the ability of LERO personnel to perform their LERO job will be evaluated in a FEMA exercise. Baldwin, et al., ff. Tr. 14,151, at 109; Tr. 14,528-29 (Keller).

298. Witnesses for the County also questioned the adequacy of the ~~pre~~-classroom instructor preparation process. Cosgrove (Training), ff. Tr. 13,083, at 38, 40. However, LILCO witnesses testified that all instructors reviewed the videotape, workbook, relevant portions of the plan and procedures, and other material to be presented; were quizzed in a question-and-answer session on their knowledge of the material; and were certified to be qualified to conduct the training sessions to which they were assigned. Babb et al., ff. Tr. 11,140, at 88; Tr. 11,889-92, 11,895-902, 11,920-23 (Varley), 11,886-88 (Daverio). The record is clear that to further ensure that proper information was provided to the students, the instructors were given, and used on a number of occasions, a telephone contact at LERO where they could obtain additional information if a question arose that they could not answer. Tr. 11,358-59, 11,263-66 (Berger, Varley). In addition, classroom sessions were intermittently monitored by LILCO and by Impell (a contractor) training personnel to verify that there was an adequate training process occurring. Tr. 11,204-07 (Varley, Daverio), 11,903-06 (Varley).

299. The Board finds, based on the use of the LERO videotapes and workbooks as the primary instructional tools for the classroom portion of the training program, that there is no need to require LERO instructors

to have extensive subject matter expertise or previous teaching experience beyond the classroom preparation described by the LILCO witnesses in order for those instructors to carry out an effective classroom presentation.

Contention 99.G

300. Witnesses for the County further testified that LILCO's training materials do not contain sufficient information to teach workers how to perform their jobs. This County opinion appears to the Board to be based in part on the misconception that an individual should possess all the skills to perform his LERO responsibilities after attending only the classroom portion of the program. Cosgrove (Training), ff. Tr. 13,083, at 36-37, 39-40. County witnesses also contend that the jobs assigned to LERO workers are complex and difficult. Cosgrove (Training), ff. Tr. 13,083, at 17, 18, 26, 36, and 41; Tr. 13,203-04 (Fakler). We do not agree. As noted by LILCO's witnesses, the LERO training program does provide job-specific training to LERO trainees. The LERO training program is set-out in three steps. First, the classroom sessions where the LERO trainees receive basic information about LERO and about the nature of their jobs. Second the drill program, which provides the trainee with the opportunity to practice his emergency job and gain the necessary skills and experience. Babb et al., ff. Tr. 11,140, at 92-93. The record also shows that trainees gain "hands-on" practical experience in the performance of LERO jobs in the classroom through equipment demonstrations and during in-the-field sessions for traffic guide and bus driver training. Third, during drills and exercises trainees are

required to carry out their LERO jobs in a simulated emergency condition without assistance from exercise controllers. Babb et al., ff. Tr. 11,140, at 13, 21-22.

301. As developed in the record by LILCO's witnesses, the classroom training sessions were designed to give the participants an awareness of the emergency plan, the implementing procedures, and the job responsibilities outlined in the program. The classroom sessions are not the termination point of the training program. In fact, LERO personnel are not expected to perform their jobs until they have completed the classroom sessions identified on Figure 5.1.1 of the Plan and the drills identified on Figure 5.2.1. Babb et al., ff. Tr. 11,140, at 92, 99-100; Tr. 11,227, 11,269 (Varley), 11,229-30, 11,943-44, 12,006-07 (Daverio), 11,298-99 (Berger).

302. The FEMA witness concurred with LILCO that the LILCO Plan and the training program for LERO contain adequate information for personnel to be able to carry out their emergency functions. In addition, of course, FEMA will also evaluate the ability of LERO personnel to perform their job functions at an exercise. Baldwin et al., ff. Tr. 14,142, at 109; Babb et al., ff. Tr. 11,140, at 25.

303. The County's testimony that LERO tasks are complex and difficult appears to be based both on a lack of knowledge of the complexity of the skills that must be learned and a belief that LERO personnel will have to deal with a hysterical public. Tr. 13,119-20, 13,170-78 (Lipsky), 13,325-28 (Lipsky, Cosgrove, Fakler). Indeed, a County witness was unable to describe the "complicated routines" he claimed decontamination workers must learn. Tr. 13,170-76 (Lipsky). Instead, this witness surmized

that any task would become very complicated in a radiological emergency without any knowledge of the components of the task. Tr. 13,177 (Lipsky); see also Tr. 13,325-28 (Lipsky, Cosgrove, Fakler).

304. We find that the testimony of the County witnesses on the behavior of the public in an emergency is not persuasive. See Findings 247-248, supra. Not one of the witnesses was able to state that he had studied the response of the public to a large-scale emergency. Id.

305. Witnesses for both LILCO and FEMA agreed that the emergency response tasks assigned to individual LILCO employees (for example, traffic guidance and monitoring and decontamination) are generally not complex or difficult and do not require daily practice to ensure proficiency. Baldwin et al., ff. Tr. 14,151, at 104; Babb et al., ff. Tr. 11,140, at 39-40; Tr. 11,572 (Varley), 14,457-62 (Baldwin, Keller, McIntire). In the few isolated instances where LERO tasks require a more substantial capability to perform, the record shows that LILCO has taken measures to ensure that the appropriate individuals are obtained to fill those positions, such as the Radiation Health Coordinator position and the command and control positions within LERO. Tr. 11,486-87 (Daverio); see also Tr. 14,593-94 (Keller).

306. Accordingly, the Board finds that the classroom materials provided to the LERO trainees are consistent with the three-part training program and contain enough detail to enable LERO personnel to carry out their assigned responsibilities when the classroom sessions are combined with the drill program. The Board further finds that most LERO jobs are not complex or difficult to carry out and that LILCO has identified and filled those few LERO positions that require persons with additional

knowledge and capabilities with competent and capable individuals. Finally, the Board agrees with FEMA and LILCO that the test of the LERO training program will be the FEMA exercise. Baldwin et al., ff. Tr. 14,151, at 109; Tr. 14,528-29; Babb et al., ff. Tr. 11,140, at 25.

LILCO's Drill and Exercise Program (Contention 100)

307. This contention asserts that LILCO's drill and exercise program is inadequate to prepare LERO personnel for their LERO jobs because not all LERO field personnel are accompanied to their posts by instructors at every drill. The contention further asserts that not every aspect of each LERO job is exercised during each drill and that the drills contain no terminal performance standards to evaluate the performance of individual trainees.

Contention 100.B

308. Witnesses for the County testified that LILCO's drills are of little value because instructors do not accompany each field worker to his post. The County witnesses incorrectly assume that observers are positioned only at the EOC and the staging areas. Cosgrove et al., ff. Tr. 13,083, at 58-59. However, witnesses for LILCO testified that controllers do accompany trainees to field positions, other than the EOC and staging areas during the drills, to observe and provide instruction to the drill participants. Due to the sheer number of people deployed in the field, it is virtually impossible to accompany each person to his

final field destination. Instead, the record reveals that controllers are positioned in key areas to monitor response actions of the field personnel at those locations and to monitor the feedback from drill participants at remote locations. Finally, trainees sent into the field were asked to complete forms detailing their field activities; these provided another means of monitoring field activities. Babb et al., ff. Tr. 11,140, at 103-04; Tr. 11,229 (Varley); 11,233-35, 12,022-25 (Daverio).

309. We find that although traffic guides and bus drivers are not accompanied to their posts at every drill, they do receive supervised "in-the-field" training for aspects of their jobs that could not be exercised during the drills without impacting the public. The record shows that LERO bus drivers participated in a bus driver training and licensing program that provided them with actual "on the road" experience driving buses in the presence of an instructor. Babb et al., ff. Tr. 11,140, at 104; Tr. 11,229-30, 11,272 (Daverio). We find that bus drivers' licensing and relicensing by the New York State Department of Motor Vehicles on a periodic basis gives them the skills and experience necessary to drive a bus. In addition, the record shows that LILCO intends to have the bus drivers drive buses during any FEMA graded exercise which may be scheduled. Tr. 11,229-30, 11,233, 11,931-32, 12,034-35 (Daverio). LERO traffic guides are given 10 hours of training designed to qualify them to direct traffic. They direct actual traffic through intersections in a simulated environment under the supervision of an instructor; emergency conditions, such as the approach of an emergency vehicle, are simulated. Babb et al., ff. Tr. 11,140, at 96-98, 104-05, Att. 22, 23-24; Tr. 11,996-97, 12,001-03 (Babb), 11,229-30 (Varley).

310. The Board agrees with the FEMA and LILCO witnesses that it is not necessary for each individual to be accompanied by a supervisor during all phases of the drill, and that it is adequate for important functional aspects of the response to be evaluated by observers. Tr. 14,541 (Keller), 11,228-29, 11,235 (Varley). The Board also finds that LILCO has developed other methods that are adequate to train and critique LERO field workers.

Contention 100.D

311. This contention and testimony by the County witnesses asserts that it is impossible for LERO trainees to learn their jobs in drill situations because during the drills many trainees do not practice the skills they will have to perform during an emergency. Cosgrove (Training), ff. Tr. 13,083, at 57. The County witnesses take the position that drills must be performed "in a realistic environment under real conditions . . . all conditions." Tr. 13,141 (Fakler). LERO trainees are provided with opportunities to practice their job skills under simulated emergency conditions during drills. Tr. 11,228 (Varley). These opportunities are realistic and are carried out within the realm of what is practical. For example, the record shows that it is not practical for a traffic guide, once he arrives at his assigned intersection in a training exercise under normal, non-emergency conditions, to direct traffic, since it would impact the public. Nor is it practical, both because of cost and the relatively small incremental benefit to be gained, for a bus driver in a training exercise to drive a rented bus, rather than a private vehicle, using the route map that he would use in a real emergency. Tr. 11,242-44 (Varley), 11,362-64 (Daverio, Varley). As noted above, LILCO does provide traffic guides with the opportunity to direct traffic during the elaborate

"in-field" training sessions for traffic guides, and bus drivers with the opportunity to drive buses during a training and licensing program.

312. FEMA took the position at the hearing that LILCO need not have LERO workers perform all aspects of their LERO jobs during drills. However, testimony shows that FEMA will require buses to be driven as part of a FEMA graded exercise. Tr. 14,552-54 (Kowieski), 14,554-55 (McIntire).

313. Accordingly, the Board finds that other than the few instances, such as those mentioned above, where field personnel cannot carry out all their activities, LERO personnel do have the opportunity to carry out their full range of activities while participating in the LERO drills. We also find that the County's position that all LERO participants should be required to exercise all of their responsibilities during a drill is impractical and beyond realistic expectations or requirements for an emergency preparedness training program. See Babb et al., ff.

Tr. 11,140, at 40-42; Tr. 11,228, 11,372-74, 11,242-44, 11,570-71, 11,579-80 (Varley), 11,673-78 (Daverio, Varley), 11,364, 11,766, 11,795, 11,866-70 (Daverio), 12,060-62 (Daverio, Cordaro).

Contention 100.G

314. County witnesses asserted that there are no criteria used in evaluating the performance of individuals during LERO drills. See Cosgrove (Training), ff. Tr. 13,083, at 59. The minimal testimony on the issue submitted by Suffolk County on this issue is not persuasive and does not warrant a finding by us that evaluation of LERO personnel during drills is inadequate.

315. Witnesses for LILCO testified that LERO drills are not the termination of training and, accordingly, they are not the point at which terminal performance behavior should be evaluated. Consequently, the LERO drills do not contain written terminal performance behavior standards for each of the drill participants. Tr. 12,037 (Daverio). However, the record reveals that critiques of the drill participants are an integral part of the LERO drills. Part of the drill scenarios are drill evaluation forms that include objective and observable criteria with which to evaluate the performance of LERO and its trainees. Tr. 12,039 (Daverio), 12,037 (Varley); see Drill Evaluation Sheets, Babb et al., ff. Tr. 11,140, Att. 1, at 7-4 to 7-8; Att. 3, at 15-19; Att. 6 at VII-4 to VII-8. These critiques are aimed at increasing the proficiency with which LERO workers perform their job skills and ultimately to achieve the goals of the terminal performance behavior. Babb et al., ff. Tr. 11,140, at 108; Tr. 11,378-82 (Varley). The terminal performance behavior for LERO and the objective of the LERO training program is to demonstrate the ability of the LERO organization to function as an emergency response organization in the FEMA graded exercise. Babb et al., ff. Tr. 11,140, at 107-08; Tr. 12,037 (Daverio). The record shows that in the FEMA graded exercise, LERO workers will be called upon to perform the job skills they have learned in the training program and to carry out those responsibilities in a simulated emergency environment. LERO will be evaluated by FEMA, the NRC and other impartial federal agencies. Babb et al., ff. Tr. 11,140, at 25.

316. Testimony by the FEMA witnesses was to the effect that the exercise objectives, which are part of any FEMA graded exercise, constitute a standard of performance against which the adequacy of LERO will be assessed. - The FEMA post-exercise assessment will provide an indication of the adequacy of the LERO training program as well as of the ability of the LERO organization to perform its emergency response function. Baldwin et al., ff. Tr. 14,151, at 111; Tr. 14,556-58 (Keller).

317. Thus, the Board will not require LILCO to institute terminal performance standards as part of its drill program. The FEMA evaluated exercise, when scheduled, will provide sufficient determination of the capabilities of LERO to carry out its emergency response role. Moreover, the Board finds that the LILCO drill and exercise program does include provisions for evaluating LILCO trainees against objective, observable criteria.

The County's Supplemental Testimony

318. Based on critique forms supplied to the County by LILCO as a result of Board ordered discovery during the hearings, County Police Officers Cosgrove and Fakler submitted supplemental testimony that purported to be an analysis of the critique forms which had been completed by observers and controllers at LILCO drills. See Cosgrove (Supplemental), ff. Tr. 13,083. The County witnesses stated that the purpose of their analysis was to see whether there were any patterns that were consistent with earlier hypotheses anticipated from the witnesses' review of the training materials. Tr. 13,427-33 (Lipsky), 13,240-41, 13,433-34 (Cosgrove).

319. The forms that were analyzed by the County witnesses contained both numerical ratings and narrative comments; however, the analysis did not consider any of the information contained in the numerical rating portion of the form, Tr. 13,232, 13,234, 13,239-40, 13,245 (Cosgrove), 13,470 (Lichtenfels), nor any of the positive written comments, Tr. 13,244 (Cosgrove). Moreover, we find that there was no attempt by the County witnesses to make any comparison between the positive and negative comments or ratings or to look for any improvements in the frequency of positive ratings. Tr. 13,243-45 (Cosgrove). Despite their limited analysis of the data, the County witnesses sought to draw the broad conclusion that "the LILCO training program has failed to recognize and deal adequately with problems" and that the analysis "indicate[s] significant problems with LILCO's training program." Cosgrove (Supplemental), ff. Tr. 13,083, at 20.

320. Oral rebuttal testimony was presented by LILCO. This rebuttal testimony showed that patterns could not be established by an analysis of the narrative comments alone both because of the small data base and the flawed research design. Tr. 15,514 (Lichtenfels). This rebuttal testimony also showed that the conclusions reached in the supplemental testimony were not supported by the methodology employed in analyzing the data base. Tr. 13,478-79 (Lichtenfels).

321. The Board discounts the County's supplemental testimony. The County witnesses employed a faulty methodology in their review of the training data and consequently did not conduct the kind of careful, systematic review that would produce a reliable, probative analysis. Tr. 13,478-79, 15,514 (Lichtenfels). The rejection by the County

witnesses of available information in the rating portion of the forms, the majority of which apparently provided useful information, renders the conclusions of the analysis questionable. See Tr. 13,501, 13,504-10, 13,495-96, 13,470-72, 13,476-77, 13,526-27 (Lichtenfels). Indeed we find that rejection of a large portion of the data compounds the problems raised by the County's analytical approach of searching only for comments confirmatory of the initial negative hypotheses held by the witnesses. By failing to consider possible contradictory evidence in the ratings or positive written comments, the witnesses did not employ the fundamental research approach of systematic hypothesis testing. Tr. 13,475 (Lichtenfels). Moreover, indications are that the written comments relied on by the County witnesses may have been negatively biased by the (LILCO) request on the critique forms for written justification of low ratings. This further impeaches the reliability of the analysis. See Tr. 13,471-72, 13,512-23 (Lichtenfels). Ultimately, even if the Board had accepted the County's analysis, we could not draw any inferences concerning the LILCO training program as a whole from the analysis. The data base relied on by the County is simply not susceptible of such broad inferences. Tr. 13,476-78 (Lichtenfels), 13,444-45 (Lipsky).

Conclusion

322. Based on the record, which we have extensively discussed above, the Board finds Contentions 24.5, 39-41, 44, and 98-100 are without merit. We further conclude, subject to confirmation by the findings of a FEMA graded exercise, if one is held, that LILCO has an adequate emergency planning training program and that LILCO has shown by a preponderance

of the evidence that it has the ability to ensure that it has a fully trained and staffed emergency response organization.

VI. Notification and Information to Public

A. Notification (Contentions 24.T, 55-59)

323. The central issues in Contentions 55 through 59, and 24.T are whether the LILCO Plan provides for prompt notification to the public and whether the Plan is in accordance with applicable regulations and guidelines.

324. LILCO presented the testimony of Matthew C. Cordaro, Norman A. Hobbs, William F. Renz, William G. Schiffmacher, and John A. Weismantle. Cordaro et al., ff. Tr. 4842. The FEMA Panel of witnesses also addressed these Contentions. Baldwin et al., ff. Tr. 12174, at 46-51, 54-55. Suffolk County's direct testimony was offered by Kenneth J. Regensburg, Robert A. Snow, and Vincent R. Stile. Regensburg et al., ff. Tr. 5416. One of the NRC Staff's witnesses, John R. Sears, while not testifying directly on these Contentions, did testify on Contention 26, which contention is incorporated by reference in Contention 55. Sears, ff. Tr. 4709. The State of New York offered no direct testimony on these issues.

325. Contention 55 specifically alleges that the 89 fixed sirens that would be used to alert the public will not be activated promptly because of the alleged deficiencies cited by intervenors in Contention 26 (see Findings Nos. 156-184, supra), that there is a lack of adequate equipment and qualified personnel to provide prompt notification of LERO emergency workers.

326. For the reasons specified herein previously with regard to Contention 26, see Findings Nos. 151-185, the Board finds that key LERO command and control personnel will be notified promptly and that the sirens will be activated in a timely manner.

327. In a General Emergency (the classification level at which the regulations require that the public notification system be activated) the Customer Service Operator, one of whom is always on duty, will activate the system if the Director of Local Response cannot be reached within ten minutes. Cordaro et al., ff. Tr. 4842, at 8-9; Tr. 12,684-85 (Keller); 12,687 (Kowieski); Tr. 4877-79 (Renz); see Baldwin et al., ff. Tr. 12,174, at 24; see also Findings on "IV. LERO Workers, A. Notification," supra, at Nos. 162-166.

328. The County's witnesses testified that even if command and control personnel receive timely notification, the Director of Local Response will be unable to complete all the steps required for activation of the prompt notification system within 15 minutes. Regensburg et al., ff. Tr. 5416, at 6-8. These witnesses also stated that additional delay in siren activation is likely because the siren system must be activated simultaneously with the broadcast of an EBS message over WALK radio and it is unrealistic to assume that an EBS message can be prepared and transmitted to WALK within 15 minutes. Regensburg et al., ff. Tr. 5416, at 9-12.

329. The FEMA Panel and the LILCO witnesses testified that, while coordinated activation of the siren and the EBS message on WALK radio is a requirement of the LILCO Plan, simultaneous activation is not required. Tr. 12,689 (Keller), 4870-71 (Renz), see Tr. 4859, 4861-67 (Renz).

330. A coordinated activation of the Emergency Broadcast System will not delay the activation of the sirens. In drafting an EBS message the Coordinator of Public Information, or in his absence the Director of Local Response, will make use of one of the sample EBS messages and a combination of information from the Radiological Data Form (used by all offsite authorities in New York State), offsite radiological assessment data, and meteorological conditions. Tr. 4936-40 (Renz, Weismantle). In the case of a General Emergency with protective action recommendations, if the Customer Service Operator must contact WALK, they will use a preplanned message which does not require any supplemental information. Tr. 4933-36 (Renz).

331. Contention 56 alleges that the Plan's provisions for Route Alert Drivers to serve as backup to the siren system are inadequate and that some persons will not hear or understand the broadcast message. The County's witnesses assert this is true because the identification of inoperable sirens, the mobilization of these backup personnel, and the length of time it would take to drive through failed siren areas will not be prompt and, consequently, the public will not be notified within fifteen minutes in violation of the regulations and guidelines. See Regensburg et al., ff. Tr. 5416, at 13, 20-22.

332. There is no requirement that backup power must be available for the sirens. Cordaro et al., ff. Tr. 4842, at 12. LILCO is committed, nevertheless, to restore power to the sirens on a priority basis. Id. LILCO's Systems Operation Department is developing procedures to ensure prompt restoration of power to the siren system following a widespread loss of power generation. Id. As an additional precaution, although not

required, route alert drivers will be used to provide backup notification in areas where it has been determined, by telephone survey and review of electric circuits, that a siren has failed. Cordaro et al., ff. Tr. 4842, at 13; Tr. 4959-61, 4964-65 (Schiffmacher), 4979 (Renz).

333. After the failed sirens have been identified, route alert drivers are dispatched from the staging areas to drive their routes while broadcasting a prerecorded message over a loud speaker system attached to their vehicles. Maps are provided to route alert drivers to assist them in finding and driving their route. Drills have confirmed that the maps are satisfactory. Tr. 5687-90, 5699-703 (Weismantle). More than one route alert driver can be dispatched to cover a route, which is the area covered by one siren. Tr. 5039-40, 5157-59 (Renz, Weismantle). The LILCO Plan also provides that route alert drivers mobilize at the Alert level; this permits prior positioning at the staging areas and ensures a rapid response in the more likely slow-breaking accident. Cordaro et al., ff. Tr. 4842, at 13-14; Tr. 4218 (Cordaro).

334. The regulations and guidelines provide that it is a design objective that the prompt notification system have the capability to complete initial notification of the public within about 15 minutes. NUREG-0654, App. 3, at 3-3; Cordaro et al., ff. Tr. 4842, at 14. However, special arrangements to assure coverage, such as Route Alert Drivers who would provide notification to the public in areas where the sirens have failed, only have to be complete coverage within 45 minutes not 15 minutes. Id.

335. FEMA's witnesses testified that the Plan provisions for route alert drivers as a backup to the siren system are adequate and that the effectiveness of route alerting would be evaluated during an exercise or

a communications drill. Tr. 12689-90 (Kowieski); Baldwin et al., ff. Tr. 12,174, at 47-48.

336. Intervenors also allege that since route alert drivers are to abandon their routes if dosimetry readings exceed specified levels, there is no assurance that the public will be notified. Regensburg et al., ff. Tr. 5416, at 20-21. This ignores provisions in the LILCO Transition Plan for a replacement to be sent to complete the route in question should the original driver's exposure exceed a specified limit. Cordaro et al., ff. Tr. 4842, at 17-18, Tr. 5058-59 (Renz).

337. Contention 57 alleges that the Plan's proposed use of tone alert radios does not provide adequate means for notifying special facilities such as hospitals and schools.

338. The regulations and guidelines do not provide that special facilities be notified before the general public. Baldwin et al., ff. Tr. 12,174, at 50-51; Cordaro et al., ff. Tr. 4842, at 19. The tone alert radios at special facilities are in addition to the required notification to the general public and, therefore, notification to these facilities is adequate.

339. Contention 58 deals specifically with notification to schools. Like other "special facilities" there is no requirement of advance notification. See Finding No. 670. The LILCO Plan as it would be applied specifically to schools is addressed infra at "XII. Schools," see Findings Nos. 661-705.

340. In addition to the sirens and tone-alert radios used to notify special facilities, the LILCO Plan provides that the Public Schools Coordinator, the Private Schools Coordinator, and the Health Facilities

Coordinator will contact these facilities by telephone to verify that they are aware of the need to take protective action and to determine their specific needs for assistance. Cordaro et al., ff. Tr. 5337, at 8; Tr. 5364-65, 5387 (Robinson). The use of commercial telephones for this type of verification complies with the criteria of NUREG-0654. Baldwin et al., ff. Tr. 12,174, at 52.

341. Although the Public Schools Coordinator, the Private School Coordinator, and the Health Facilities Coordinator have the primary responsibility for calling special facilities, as many as fifteen additional personnel could be drawn upon to assist the coordinators. Cordaro et al., ff. Tr. 5337, at 10, Att. 4; Tr. 5388 (Robinson). The Manager of LERO will set priorities and allocate personnel and resources as needed. Cordaro et al., ff. Tr. 7698, at 11; Tr. 5413, 7750, 7753 (Weismantle); OPIP 2.1.1, at 6.

342. The Board concludes that under the LILCO Plan there is reasonable assurance that special facilities will receive timely notification and that LILCO's plan for verification calls provides additional assurance that the health and safety of persons in special facilities will be protected.

343. Contention 59 alleges that the LILCO Transition Plan is inadequate because the Coast Guard will not have the capability of notifying boaters on Long Island Sound within 15 minutes.^{33/}

^{33/} Contention 24.T alleges that LILCO does not have a letter of agreement with the Coast Guard to provide notification to boaters; however, Suffolk County's witnesses conceded that such a letter of agreement does exist. Tr. 5523-25 (Roberts); see LILCO Ex. 80, at App. B.8.

344. The Board finds that Long Island Sound is an "extended water area with transient boats" within the meaning of NUREG-0654, App. 3, at 3-3. Baldwin et al., ff. Tr. 12174, at 55; Tr. 5525-26 (Hoffman). As such an area, it is excepted from the fifteen minute notification regulation of 10 C.F.R. Part 50, App. 3, IV.D.3. See Southern California Edison Co. (San Onofre Nuclear Generating Station, Units 2 & 3), LBP-82-39, -15-NRC 1163, 1268-69 (1982), aff'd, ALAB-717, 17 NRC 346 (1983).

345. By letter of agreement the Coast Guard will provide notification of an emergency with protective action recommendations to boaters on the portions of Long Island Sound within the EPZ. The Coast Guard will broadcast an emergency message over marine band radio and direct Coast Guard boats to make a concerted effort to contact boats within 10 miles of Shoreham. Cordaro et al., Tr. of 4/6/84, Vol. II, at 38-39, Att. 31; Cordaro et al., ff. Tr. 4842, at 21-22; Tr. 5101 (Renz). LILCO sirens are effective to about 2 miles into Long Island Sound to give notice to boaters. LILCO's witnesses testified that smaller boats, which normally would be closer to shore, should be in a position to hear the sirens sound. Boats farther than 2 miles from the shore are likely to have marine band radios. Cordaro et al., ff. Tr. 4842, at 22-23; Tr. 5134-39 (Hobbs, Renz, Cordaro).

346. LILCO also has a letter of agreement with Island Helicopter, Cordaro et al., Tr. of 4/6/84, Vol. II, Att. 35, and can supplement Coast Guard notification with notification by helicopter. Tr. 4857, 5147-48, 5152-53 (Renz, Weismantle).

347. The LILCO Plan provides reasonable assurance that boaters will receive notification to evacuate in the event of a radiological emergency at Shoreham.

Conclusion

348. The LILCO Plan provides for prompt notification to the public by means of sirens, tone alert radios, the U.S. Coast Guard, and other backup systems. Contentions 24.T and 55-59 are without merit.

B. WALK-AM (Contention 20)

349. Contention 20 alleges that because WALK-AM radio does not broadcast at night, persons who have only AM radios will not receive adequate information in the event a radiological emergency at Shoreham occurs at night.

350. The LILCO Transition Plan relies on WALK radio to broadcast EBS messages to the public, and the WALK-FM signal will activate the tone alert radios for notification to schools, hospitals and other special facilities in the 10 mile EPZ. Clawson, et al., ff. Tr. 5254, at 4; Tr. 5267 (Clawson). In addition, the WALK-FM signal will activate equipment at other stations participating in the emergency network, enabling them to simulcast and tape and rebroadcast the EBS messages. Clawson, et al., ff. Tr. 5254, at 4.

351. WALK radio's current license permits AM broadcasts from 6 am to 6 pm, while WALK-FM broadcasts twenty-four hours a day. Clawson et al., ff. Tr. 5254 at 5; Baldwin, et al., ff. Tr. 12,174 at 9. However, the Plan includes a Letter of Agreement which commits WALK radio to broadcast simultaneously, on both its AM and FM frequencies, the EBS messages

twenty-four hours a day. Clawson et al., ff. Tr. 5254 at 7, Attch. 1. If an emergency should occur while WALK-AM is normally off the air (that is, between 6 pm and 6 am), the station operator simply presses a button to activate the AM transmitter and flips a switch to broadcast simultaneously on both AM and FM frequencies. Clawson, et al., ff. Tr. 5254 at 6; Tr. 5288-89 (Clawson).

352. Under Federal Communication Commission regulations, daytime AM stations may use their facilities to broadcast emergency information when necessary to the safety of life and property during nighttime hours when adequate advance warning cannot otherwise be given. 47 CFR 73.1250(f) Clawson, et al., ff. Tr. 5254 at 8.^{34/}

353. WALK-AM has utilized this procedure in the past and pursuant to the authorization cited in 47 CFR 73.1250(f) has broadcast emergency information throughout the night on its AM frequency with regard to snow emergencies. Clawson, et al., ff. Tr. 5254, Attch. 2; Tr. 5294 (Clawson).

354. In addition to the Letter of Agreement with WALK radio, LILCO has also obtained Letters of Agreement with eleven other radio stations on Long Island, including several AM stations, all of which have agreed to utilize the authorization provided under the FCC regulations to broadcast at night in the event an emergency develops during hours the stations are usually not broadcasting. Clawson, et al., ff. Tr. 5254 at 8-9; Tr. 5311 (Clawson).

^{34/} See also generally discussion at Tr. 5309-10 between Judge Shon and Counsel for Suffolk County.

355. WALK radio has a licensed radio station operator on duty twenty-four hours a day. Tr. 5288-89 (Clawson). If the other stations are manned, broadcast of the EBS message will be simultaneous when the WALK-FM signal activates the emergency broadcast equipment at the other stations. If these stations are not manned, the message will be taped automatically and rebroadcast. Tr. 5331-34 (Clawson). The equipment is standard FCC approved emergency broadcast equipment consisting of a McMartin fixed frequency tuner. This equipment is already installed at WALK radio, and the agreements with the other stations call for LILCO to purchase and install this equipment at each station. Tr. 5969 (Clawson). This equipment will be tested weekly as is currently done by all EBS stations. Tr. 5273 (Clawson).

356. WALK radio will be contacted by telephone from the Director of Local Response, or the Public Information Officer, or the Customer Service Supervisor. Tr. 5282-83 (Clawson, Cordaro). If WALK is unable to transmit, the other stations in the network would be notified by direct contact and, as most of the stations are members of the Emergency Broadcast System, they would be able to activate the signal even without WALK-FM. Tr. 5321-22 (Clawson). However, WALK radio has installed a back-up generator of sufficient power for WALK to broadcast to its normal coverage area if a loss of power were to occur. Tr. 5283-85 (Clawson, Cordaro).

Conclusion

357. The Board finds there is reasonable assurance that prompt notification to the populace in the 10 mile EPZ through the EBS network

is available twenty-four hours a day and the standards of 50.47(b)(5) are satisfied.

C. Zones and Routes (Contention 18)

358. Contention 18 alleges that LILCO's public information materials, such as posters, telephone book inserts and the EBS messages, do not tell the reader or listener what zone he is in, nor do they describe the zones in which protective actions are recommended or the prescribed routes to take to evacuate those zones.

359. The LILCO public information materials include the public education brochure, telephone book inserts, refrigerator magnets, automobile glove box stickers, posters, and information packets for commercial establishments consisting of a window display poster, emergency flyers for the public and a sticker indicating EBS stations. Clawson, et al., ff. Tr. 10,035 at 9-11.

360. The public information brochure, to be distributed to residents of the 10 mile EPZ, informs the recipient on the cover what zone he is in. Additionally, the brochure includes maps of both the evacuation route from that zone and the bus route established for that zone. Id., Attach. 1-2.

361. The inserts for the telephone directories will include both a map showing the entire EPZ with each zone designated, and a map of each zone covered by that particular directory. Id., Attach. 3-4. The refrigerator magnets will contain a designation of the zone for the home to which it is distributed, and the EBS stations to tune in for emergency information. Id., Attach. 5.

362. Automobile glove box stickers will identify the zone of the home to which it is distributed and the evacuation routes for that zone. Id., Attch. 6. Finally, packets will be sent to commercial establishments in the EPZ. These packets will contain a window display poster showing the zone and evacuation routes of the zone where the commercial establishment is located; a holder with emergency flyers for the public with zone and evacuation route information; a card to request additional flyers; a sticker containing EBS station information; and an arrow to be placed on the map of the zone on the poster noting the location of the commercial establishment. Id. Attch. 7-10, Tr. 10,163 (Clawson).

363. The EBS messages identify the zones affected by both a letter designation and a boundary description, although they do not give evacuation route descriptions. Clawson, et al., ff. Tr. 10,035, at 14, Attch. 11. However, in addition to the public information materials listed above, the LILCO plan also provides for posters with zone and route information to be posted in public areas, such as beaches, and for "trail blazer" signs marking the evacuation routes to be posted throughout the EPZ. Id. at 12.

364. Thus, contrary to the assertions in the contention raised by Suffolk County, virtually all of the public information materials to be distributed throughout the 10 mile EPZ contain specific identification of zones and evacuation routes from those zones. If people are visiting zones other than the one in which they live, a variety of information is available from sources such as telephone books, commercial display posters and trail blazer signs marking the routes. Suffolk County filed

no testimony on this issue, and nothing in the record before us supports the contention raised by the County.

Conclusion

365. The Board finds that there is reasonable assurance that the public will be able to identify whether they are in a zone where protective actions are recommended, and if so, what evacuation routes are recommended for that zone. The contention is without merit.

D. Hispanics (Contention 21.C)

366. Contention 21.C alleges that since the EBS messages and the public information materials are only written in English, residents of the EPZ who speak only Spanish will not receive adequate information regarding an emergency at Shoreham.

367. FEMA and the NRC have jointly published a Guidance Memorandum No. 20 which states that public information (i.e., brochures and EBS messages), should be translated into a foreign language if the number of the foreign language population of voting age exceeds five percent of the surrounding County's population. The Memorandum notes that such a county is covered under the Voting Rights Act of 1965 (Amended 1975 and 1982) (PL 94-73), and is already under an obligation to provide bilingual ballots and voter services. Clawson, et al., ff. Tr. 5752 at 7-8, Attach 3; Baldwin et al., ff. Tr. 12,174 at 10. Tr. 5772-73 (Clawson, Cordaro). The memorandum further recommends that if minority language individuals in the EPZ do not exceed 5% of the population, other efforts should be taken to inform them, including public meetings, advertisements

in foreign language newspapers, and providing oral assistance to individuals through a buddy system.

368. Data taken from the 1980 census reveals that only 419 residents of the 10-mile EPZ for Shoreham, out of over 100,000 residents, speak only Spanish. This represents significantly less than one percent of the entire EPZ population. Even accepting the figure cited in Contention 21.C of 1,300 residents, the number is still considerably less than two percent. Thus, on the basis of the FEMA guideline, there is no requirement that the public education information and EBS messages be translated and distributed in Spanish. Clawson et al., ff. Tr. 5752 at 6-8. Attch. 1-2.

369. However, LILCO has undertaken efforts to identify this minority population and inform those who only speak Spanish through several means. A letter and reply card has been sent by LILCO to all residents of the EPZ which included a statement in Spanish asking those whose only language was Spanish to identify themselves so a Spanish translation of the letter and card could be sent to them. Id., at 9, Attch. 4-6, Tr. 5783-86 (Clawson, Cordaro). Additionally, LILCO obtained a mailing list from a Spanish language newspaper on Long Island to identify additional Spanish speaking families in the EPZ. Id., Tr. 5767-68 (Clawson).

370. LILCO has also contacted local community leaders, including the head of the Union Hispanica, and the editor and publisher of El Vocero, a Spanish language newspaper based in Hempstead, Long Island. Tr. 5779-80. LILCO also plans to publish an article written in Spanish in the quarterly newsletter, "Keeping Current" which is mailed to all residents of the EPZ and addresses issues concerning Shoreham and emergency planning. Tr. 5756 (Clawson).

Conclusion

371. Hence, the Board finds Contention 21.C. to be without merit. Fewer than one percent of the EPZ population speaks only Spanish, and LILCO is undertaking reasonable efforts to contact and advise these people that information is available to them in their language. The fragment of the population who speaks only Spanish is too small to warrant the time and expense required to translate and distribute all public education materials in two languages as long as reasonable efforts, such as those undertaken by LILCO outlined above, are made to assure that all residents in the EPZ are adequately informed.

E. Brochure (Contention 16.E)

372. Contention 16.E alleges that LILCO's public information brochure is inadequate because the discussion of radiation information is limited to low levels and fails to address the magnitude of radiation doses the public could receive in the event of a severe accident and the health effects from such doses.

373. 10 CFR Part 50, Appendix E, IV.D.2 requires yearly dissemination of basic emergency planning information, including general information as to the nature and effects of radiation, to the public within the 10 mile EPZ.

374. The primary purpose of a public information brochure is to educate the public as to what they should do in an emergency, that is, what protective action options exist, where to turn for emergency information, where to go, the zone in which they are located, and where they may be instructed to go when an evacuation is recommended. Tr. 14,173 (Kowieski).

LILCO's witness, Mr. Watts, further testified that this information should be supplemented with background information on radiation risks and hazards. He pointed out that the key message to be imparted through a brochure is that radiation can be hazardous and situations may develop where protective actions are necessary due to the hazardous nature of radiation and the level being released. Tr. 14,090 (Watts).

375. Suffolk County contends that a person's perception of the risk of exposure will influence his actions during an emergency. Radford and Saegert, ff. Tr. 14,105, at 10. Suffolk further contends that without some basic factual information about radiation doses and their effects, the public will have no basis to make an informed judgment about their response to protective action recommendations. Id., p. 11, Tr. 14,117-18 (Saegert).

376. The LILCO public information brochure contains general information on the nature of radiation on pages 14-16. The brochure also references the fact that radiation or hazardous materials may be released in the air and that protective actions will be recommended based on such releases. Cordaro et. al. ff. Tr. 14,061, at 5, Atch. pp. 2, 3, 4, 5.

377. In addition to the public education brochure, LILCO has distributed a newsletter related to Shoreham and emergency planning entitled "Keeping Current." The spring 1984 issue contained an article on radiation entitled "Radiation -- Where It Comes From - and -- How It Affects Us." Id., at 5-6. This article provided a detailed discussion about the nature of radiation, the acceptable exposure levels, and the effects of radiation from both routine operations and serious accidents at nuclear power plants. Id. Specifically, the article states that

"exposure to very large amounts of radiation over a short period of time (several minutes to several hours) can cause serious injury to cell tissues, and even death." Id., Attch. 2. LILCO will distribute both the brochure and the newsletter annually to all residents in the EPZ. Id., at 6.

378. The discussion in the newsletter sets out both the magnitude of doses and the possible health effects that could result from a severe accident. The brochure states that accidents can occur, and radiation which could be hazardous can be released and that protective actions will be recommended based on such releases. Id., at 7-8; Tr. 14,093 (Clawson).

379. The requirement for yearly dissemination of emergency planning information to the public may be satisfied in several ways, including telephone book inserts, periodic information in utility bills, posters in public areas, and annual distribution of publications. See e.g.: Tr. 14,174-75 (Kowieski, Keller). In fact, FEMA pointed out that their experience has been that other elements of the public information program have proven more effective in providing education information to the public than the brochure. Tr. 14,190 (McIntire). The main concern in providing educational information to the public is that some people do not take warnings seriously. The main points to get across to the public is that high exposure to radiation can be injurious to health and recommendations of protective actions are made to protect the public from exposure which could threaten their health. Tr. 14,187-88 (Keller, McIntire).

380. Suffolk County contends the brochure should specify a range of potential doses and health effects associated with those doses by noting a comparative change in risk of cancer due to exposure. For example, it

should state there is a general 28% chance of developing cancer in the general population as a whole, but exposure to 15 rads of radiation would increase this risk to a 31% chance of contracting cancer, and so on. Tr. I4,116-17 (Radford). We cannot agree. We do not find the level of detail sought by Suffolk County to be necessary to adequately inform the public that radiation can be hazardous to health and protective actions are recommended to protect the public.^{35/} The article in "Keeping Current" certainly makes it clear that there can be health effects from high exposure to radiation.

381. However, since the brochure is a key element in the total public information program, the Board does agree that perhaps more should be said in the brochure to this effect than is currently stated.^{36/} The

^{35/} As the Board noted in Waterford, the purpose of a public information brochure is informational/educational, and rewriting the brochure to secure absolute technical accuracy regarding radiation would render this information incomprehensible to the general public. Louisiana Power & Light Co. (Waterford Steam Electric Station, Unit 3), LBP-83-27, 17 NRC 960, 961 (1983). Additionally, in its decision regarding emergency preparedness for TMI, the Board said "we conclude, however, that the primary purpose of these brochures is not to give a course in radiation biology, but to inform the public what to listen for and what to do in case of an emergency at TMI-1." Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 1), LBP-81-59, 14 NRC 1211, 1525 (1981), aff'd subject to a condition, ALAB-697, 16 NRC 1265 (1982).

^{36/} This is consistent with the Board findings in Waterford, supra, where the Board pointed out the brochure does include a warning that if high levels of radiation are in the air, the public must protect itself from it. Further, we note the Board in Big Rock found the brochure adequate only when the wording was changed to reflect the fact that "... life-threatening doses of radiation might be released...." See Consumers Power Co. (Big Rock Point Plant), LBP-82-60, 16 NRC 540, 545-546 (1982). Finally, in the Catawba proceeding, the Board there said, "The language used should state directly that high levels of radiation are harmful to health and may be life threatening." Duke Power Company (Catawba Nuclear Station, Units 1 & 2), LBP-84-37, 20 NRC ____, slip op. at 19 (September 18, 1984).

brochure need not specify in detail the full range of possible doses and the health effects associated with such doses, but it ought to make clear to the reader that a release of high level of radiation into the air may be harmful to health and that protective actions are recommended to reduce the risk of exposure for the public. We do not think this is overstating the case, but rather agree with FEMA that the public should be sufficiently informed so that warnings are taken seriously and the public is made to understand that protective action recommendations are to protect their health and safety.

Conclusion

382. The Board finds, therefore, that while the current version of the LILCO public information brochure does discuss background information on radiation of an educational nature, this information should be revised to point out that release of high levels of radiation may be harmful to health and protective actions are recommended to reduce the potential risk of exposure for the public. The Staff shall monitor compliance with this directive.

VII. SHELTERING (Contention 61)

383. Contention 61 alleges that sheltering as a protective action recommendation would or could not be implemented. It bases this assertion on averments that: (a) houses in the Shoreham EPZ are largely constructed of wood without basements and hence, a reduction of dosage by 10% afforded by such a structure would not be a viable option; (b) people in automobiles would not reach shelter fast enough and have no protection at all in their

vehicles;^{37/} (d) the transient population on the beaches and in outdoor recreation areas would have no access to shelter; and (e) people on boats would have no access to shelter. Further, the contention alleges that sheltering as a protective action option would not provide significant dose savings and people would still receive health threatening doses because (g)^{38/} homes other than wooden ones only reduce doses by 50%; ~~(h)~~ the average shielding factor in the Shoreham EPZ of 0.7 still means people would receive 70% of the dosage; and (i) this reduction in dosage of 30% would still allow people to receive health threatening doses. Hence, the County alleges whatever the shielding factor, it is insufficient to eliminate health threatening doses.

384. At the outset, we note that the overall objective of emergency response plans is to provide dose savings for a range of accidents that could produce offsite doses in excess of the EPA Protective Action Guides (PAGs).^{39/} The goal is to reduce the health effects of radiation exposure, not to eliminate such effects entirely. Tr. 12,409 (Minor). As the Appeal Board has pointed out, emergency planning must provide for a variety of protective measures, including sheltering and evacuation, the overall objective being the avoidance of as much radiation exposure as possible. Cincinnati Gas & Electric Co. (Wm. H. Zimmer Nuclear Power Station, Unit 1) ALAB-727, 17 NRC 760, 765 (1983). The underlying assumption of the NRC's emergency planning regulations is a recognition that in the event a

^{37/} c) deals with sheltering children at schools and is, therefore, dealt with separately, see Section XII on Schools.

^{38/} Subsection f was not admitted as a contention.

^{39/} NUREG-0654/FEMA-REP-1, Rev. 1, I.D. p. 6.

radiological accident occurs, the public may be exposed to dangerous levels of radiation and planning for emergencies is required as a prudent risk reduction measure. Southern California Edison Co. (San Onofre Nuclear Generating Station, Units 2 & 3), CLI-83-10, 17 NRC 528, 533 (1983).

The decision as to which protective action to take is a complex one based on a number of factors including the nature and duration of the release of radiation (i.e. whether it's short or long term), the possibility of evacuation considering road and weather conditions, and how reliable data is, i.e. whether it is based on monitoring data or general plant conditions, and when the release is projected to occur. Tr. 8887 (Watts), Tr. 8889 (Cordaro).

Contention 61(a)

385. In Contention 61(a) the Intervenors contend that a shielding dose reduction factor of 10% applies to much of the housing in the Shoreham EPZ since this housing is constructed of wood and has no basements.^{40/} This, the Intervenors maintain, is insufficient to render sheltering a viable protective action option. While Suffolk County's witness, Dr. Radford, testified that he was personally not familiar with the housing mix in the Shoreham EPZ, other Suffolk County consultants on the same panel had informed him that housing in Suffolk County is a fairly typical eastern United States mix consisting predominantly of frame houses, mixed with brick and stone, some with and some without basements. Radford, Tr. 12,351. The LILCO Plan assumes an average whole body plume immersion

^{40/} Shielding provided by sheltering in a structure, such as a house, provides protection from immersion in the plume.

shielding factor of 0.7 (or 30%) which is representative of Suffolk County housing. LILCO Testimony on Contentions 60, 61, 63 & 64, ff. Tr. 8760 at 22; Tr. 8870 (Watts). The source for information on this housing in Suffolk County was originally taken from information provided by the Suffolk County Planning Department, and supplemented by a survey done for LILCO by Marketing Evaluations Surveying which confirmed the data.

Tr. 8847 (Daverio). Another witness for the County, testified that the input from the Suffolk County Planning Department indicated typical East Coast housing and this mix of housing is not substantially different from the values shown by LILCO. Tr. 12,411-413 (Finlayson). Hence, we find no disagreement among the parties that the appropriate average shield factor of 0.7 (rather than 0.9 as alleged in Contention 61(a)) should be assumed for the Suffolk County EPZ. As to the question of whether this provides sufficient shelter, again this is based on a number of factors, including not only the shielding afforded by the actual construction materials, but also inhalation dose protection stemming from the rate at which air transfer takes place through the structure (air replacement rate). Tr. 8974 (Watts). The sheltering factors in the LILCO Plan are taken from the 1978 EPA Protective Action Guides (PAGs) which assume a constant air replacement factor of one air change per hour. Tr. 8846 (Watts). The parties generally agreed that the sheltering factors used by LILCO are appropriate. Tr. 12,412-13 (Finlayson). All sheltering provides some benefits, what must be considered is a comparison of doses that might be received under evacuation and under shelter. LILCO Testimony, ff. Tr. 8760 at 21; Tr. 8974-75 (Watts); Tr. 12,333 (Radford). A Suffolk

County witness also testified that sheltering combined with closing off ventilation and ad hoc respiratory measures (such as placing a filter over the nose and mouth) could reduce inhalation doses by 50%.

Tr. 12,387-88 (Finlayson).

Conclusion

386. Intervenors Contention 61(a) that housing in the EPZ would only confer a 10% reduction in whole body external dosage is not supported by the record. The parties agree that an average of 30% whole body external dose reduction for Suffolk County housing is reasonable, and given other factors (such as ventilation rate and ad hoc respiratory measures) the dose reduction for sheltering in the EPZ could be even higher. Hence, the Board finds no merit to Contention 61(a).

Contention 61(b)

387. Contention 61(b) contends that persons in automobiles will not be able to evacuate the EPZ fast enough (assuming two hours of exposure) and vehicles offer no protection at all from radiation exposure.

388. There are three forms of radioactive material that the population may be exposed to in an accident: 1) radioactive noble gases that travel in the plume and cause an external whole body dose (known as cloud shine); 2) radioactive halogen gases which concentrate in the thyroid when inhaled (inhalation dose); and 3) radioactive particulates which are dust-like particles that are deposited on surfaces (ground shine). LILCO Testimony, ff. Tr. 8760 at 18, Tr. 8841-44 (Miele, Watts).

389. The Intervenors's testimony assumed that persons in autos at the time a protective action was announced would, for one reason or another, remain stationary for two hours and thus receive a ground shine and cloud

shine dose. The inhalation dose, however, could be reduced and estimated using the same factors calculated for sheltering in EPZ housing (i.e. utilizing a ventilation-air exchange rate). Tr. 12,377-78 (Finlayson). The LILCO-testimony pointed out that people in cars would hear the sirens and have immediate access to radios. LILCO Testimony, ff. Tr. 8760 at 24. If the driver lives in the EPZ he could return to his home to shelter. If he does not reside in the EPZ, he could seek shelter in a building, or he could drive out of the EPZ altogether. Id. EBS messages in the LILCO Transition Plan advise people who are not at home to seek shelter inside buildings. Baldwin, et al., ff. Tr. 12,174 at 57. A person driving out of the EPZ could do so traveling faster than the average wind speed of 8 to 9 miles an hour experienced near the Shoreham plant. LILCO Testimony, ff. Tr. 8760 at 24; Tr. 8901-3 (Daverio). Thus, within 30 minutes a person could drive from any point inside the 10 mile EPZ to a point outside it if he drove at 20 miles an hour, assuming normal traffic. Id. The Intervenors presented no testimony to support the assumption a person in an automobile would remain in the EPZ for two hours in a stationary position after an EPZ advisory. In the absence of such evidence, we agree that LILCO's assumption is more likely. A driver of an automobile is unlikely to remain motionless upon a sheltering advisory, and whether he drives home, out of the EPZ, or seeks the nearest building in which to shelter, we have reasonable assurance that he would attempt to take one of these options.

Conclusion

390. The Board finds the sheltering recommendation contained in the LILCO Transition Plan for people who are not at home reasonable. We also find Contention 61(b) is without merit.

Contention 61(d)

391. Contention 61(d) contends that the transient population on beaches or in outdoor areas would have no access to shelter in public sheltering areas. The LILCO witnesses testified that most of the transients would be found in the Shoreham beach areas and most of these are town beaches or local resident beaches, hence most of these people are residents of the area. Tr. 8905 (Daverio). Posters at these outdoor areas will advise people to turn on radios, and the EBS messages instruct people not at home to seek shelter inside buildings. LILCO Testimony, ff. Tr. 8760 at 25; FEMA at 57 & 60; Tr. 8905 (Daverio). LILCO has chosen not to specify public shelters because it is unlikely that non-residents could find a particular building, and residents of the EPZ should be encouraged to return home so that a subsequent evacuation would be easier. Id. The LILCO witnesses also pointed out that the transient population on beaches or in parks would most likely be there in warm weather when roads would be passable, allowing for rapid mobilization. Id. at 26. The Intervenors filed no testimony on this aspect of the contention, and FEMA pointed out that there are no specific requirements in NUREG-0654 with regard to sheltering for transients on beaches, in parks, or on boats. FEMA Testimony, ff. Tr. 12,174 at 60.

Conclusion

392. Hence, the Board finds the LILCO Transition Plan does contain provisions for providing instructions regarding sheltering for transients in the EBS draft messages and the requirements of § 50.47(b)(10) are satisfied.

Contention 61(e)

393. Contention 61(e) asserts that people on boats will have no access to shelter. However, testimony filed by LILCO pointed out that the sirens can be heard out to two miles on Long Island Sound and some boaters will, therefore, hear the sirens. Instructions will be broadcast over marine radios and boaters will be advised to evacuate, rather than shelter. LILCO Testimony, ff. Tr. 8760 at 26; Tr. 8906 (Daverio). Further, under an agreement with the Coast Guard at New Haven, Connecticut, the Coast Guard will transmit messages advising boaters to leave the area over the marine band radio, will dispatch boats to notify remaining boaters to evacuate, and will restrict all marine traffic within the 10 mile EPZ. Id. Again the Intervenors filed no testimony regarding this issue and nothing in the record before us contradicts these findings.

Conclusion

394. Although boaters will have no access to shelter as asserted by Contention 61(e), nevertheless the Board finds adequate provisions for this contingency are contained in the Transition Plan. Boaters will be advised to evacuate the area and marine traffic will be restricted by the Coast Guard. Thus we find reasonable assurance adequate protective actions can be implemented for people on boats.

395. Hence the Board finds Contention 61(e) to be without merit.

Contention 61(g)(h)(i)

396. Contention 61(g)(h) and (i) all concern sheltering as a generic protective action. Intervenors contend that sheltering would not provide significant dose savings and that the public would still receive

health-threatening doses even assuming an average shielding factor of 0.7 (See Contention 61(a)).

397. Regarding this issue, FEMA testified that sheltering is one of the possible protective action recommendations that could be made in the event of a radiological emergency. Baldwin, et al., ff. Tr. 12,174 at 57. The Transition Plan provides sheltering factors for various types of structures and procedures whereby the decision-maker compares projected exposures to the EPA PAGs in regard to what protective action recommendation is appropriate. Id.

398. Intervenors agreed that sheltering does provide for a reduction in dose, compared to no sheltering at all, and shielding factors are used to express this reduction. Finlayson et al., ff. Tr. 12,320 at 7; Tr. 12,333 (Radford); Tr. 12,383 (Finlayson). In fact, Intervenors conceded that sheltering can, in many instances, reduce doses to the level where they are not immediately life-threatening. Id. Intervenors' witness also pointed out that whether one chose evacuation or sheltering (or a combination of sheltering with subsequent relocation) the decision may result in injuries and latent effects, and thus the decision is always made on the assumption that it will reduce effects, not eliminate them entirely. Tr. 12,415 (Finlayson).

399. The Intervenors state the thrust of their testimony on this issue is to develop facts to support their interpretation of the consequences (of radiation exposure to the public) attendant to the effectiveness of shielding as a function of accidents which could occur at Shoreham. Tr. 12,414 (Finlayson). In this light it is instructive to note that all

the data on the threshold level of injury from radiation exposure is not yet available. On-going study and research is continually shedding new light in this area, both with respect to greater and lesser radiological consequences. Tr. 12,324-27, 12,336-38, 12,340-44, 12,347-49 (Radford). This generic issue is not for this Board to resolve. What we must look to is whether the guidelines set by FEMA for protective action recommendations are met under the Transition Plan. In this regard, the guideline is in NUREG-0654, II.J.9 which states:

Each State and local organization shall establish a capability for implementing protective measures based upon protective action guides and other criteria. This shall be consistent with recommendations of EPA regarding exposure resulting from passage of radioactive airborne plumes, (EPA-520/1-75-001) and with those of DHEW (DHHS)/DSA regarding radioactive contamination of human food and animal feeds as published in the Federal Register of December 15, 1978 (43 Fed. Reg. 58,790).

400. Under the Transition Plan, the shielding factors utilized by LILCO are taken from EPA-520/1-75-001 in compliance with the guideline. LILCO Testimony, ff. Tr. 8760 at 19; Tr. 8846 (Watts). And, as we noted in our findings under Contention 61(a), the decision as to what the appropriate protective action recommendation would be is complex, and takes into account numerous factors, such as meteorological conditions, evacuation times and routes, projected time and duration of the release, etc., as well as appropriate shielding factors. See Finding 387, supra.

Conclusion

401. The Board finds that the LILCO Transition Plan has established a capability for implementing protective action recommendations, based on the appropriate EPA Protection Action Guides, and follows the guidance

provided in NUREG-0654, II.J.9. All parties are in agreement that sheltering remains a viable option and should not be eliminated from emergency planning. Tr. 12,384 (Finlayson, Minor). Therefore, we find reasonable assurance that sheltering, if implemented under the provisions of the LILCO Transition Plan, would afford protection to the public in the event of a radiological accident at the Shoreham plant.

VIII. Making Protective Action Recommendations

A. Selective Evacuation and Selective Sheltering (60, 63)

402. Contention 60 alleges that the Plan fails to set forth guidelines or indicate the procedure by which selective sheltering would be chosen and recommended as a protective action or what individuals would be subject to such a recommendation. Contention 63 asserts the same problems with regard to the protective action recommendation of selective evacuation.

403. LILCO presented the direct testimony of five witnesses on these contentions: Matthew C. Cordaro, Charles A. Daverio, Michael L. Miele, Dennis S. Mileti, and Richard J. Watts. Cordaro et al., ff. Tr. 8760; see "Professional Qualifications of LILCO Witnesses," ff. Tr. 4068. David Harris (see Harris, ff. Tr. 1218, at Attachment 1) and Martin Mayer (see Harris and Mayer, ff. Tr. 9574, at 1-2) testified on behalf of the County on Contention 60 and 63. Harris and Mayer, ff. Tr. 9777. The FEMA witnesses offered their findings. Baldwin, et al., ff. Tr. 12174, at 56, 61. New York and the NRC staff presented no witnesses.

404. Selective sheltering and selective evacuation recommendations result in only a portion of a population in a particular area being advised to shelter or evacuate, with the remaining population being advised to take

other actions or to do nothing. Cordaro et al., ff. Tr. 8760, at 9, 30. Under the LILCO Plan, selective sheltering and selective evacuation are protective actions that may be ordered at a projected dose below the Environmental Protection Agency's (EPA) accepted Protective Action Guides (PAGs) to minimize exposure to radiosensitive persons. Id.

405. This protective action strategy has been adopted from the New York State Radiological Emergency Plan. LILCO ex. 80; Baldwin et al., ff. Tr. 12174, at 56; Cordaro et al., ff. Tr. 8760, at 9-10, 34. The New York State Plan provides for selective sheltering at projected doses below the EPA's PAG, particularly for pregnant women and children and for other individuals who could not safely be evacuated. This includes individuals who have been designated medically unable to withstand the physical and/or psychological stress of an evacuation, as well as those individuals who require constant, sophisticated medical attention. Cordaro et al., ff. Tr. 8760, at 10.

406. The LILCO Plan provides that selective sheltering or selective evacuation for the public would not be recommended without consultation with the New York Commissioner of Health. LERO would recommend such actions only if instructed to do so by New York State officials. Cordaro et al., ff. Tr. 8760, at 9-10; Plan at 3.6-6. Absent instructions from the State, if sheltering or evacuation were deemed to be advisable for any portion of the population based upon EPA guidelines, LERO would recommend sheltering or evacuation for the entire population in the affected area. Cordaro et al., ff. Tr. 8760, at 11; Tr. 8778, 8780, 8784, 8822, 8825 (Daverio), 8784 (Miele), 8787, 8805 (Cordaro), 8813 (Watts).

407. LILCO bases this decision upon the advice of behavioral experts, among them Dr. Dennis Mileti, who testified that where a selective sheltering or selective evacuation recommendation is issued to the public, persons other than those advised to take action may do so, Cordaro et al., ff. Tr. 8760, at 12, 32-33, and that a selective evacuation recommendation to the public is likely to be confusing. Tr. 8837, 8839 (Mileti).

408. Selective sheltering would be implemented only at the instruction of the State "for projected doses below the accepted PAGs" (that is, below 1 rem whole body or 5 rem thyroid) and for "pregnant women and children." Cordaro et al., ff. Tr. 8760, at 13, Att. 1. Selective evacuation would be implemented, at the instruction of the State, for "projected dose levels of 1-5 rem whole body or 5-25 rem thyroid," and for "pregnant women and children 12 years and under." Cordaro et al., ff. Tr. 8760, at 30-31. These guidelines were taken directly from EPA's PAGs. Cordaro et al., ff. Tr. 8760, at 31-32. This Board finds that they provide effective guidelines contrary to the assertions of contentions 60 and 63.

409. Suffolk County witnesses Harris and Mayer assert: (1) that no facility-specific plans exist under which special facilities could implement sheltering and (2) that sheltering, as a practical matter, cannot be accomplished in special facilities for a variety of reasons. Harris and Mayer, ff. Tr. 9777, at 12-21.

410. As to the assertion that no facility-specific plans exist for implementing sheltering, LILCO has provided assistance to the facilities regarding sheltering by visiting the facilities, reviewing blueprints,

and discussing sheltering suggestions with the staff. Tr. 9040 (Weismantle). Facility-specific emergency plans and procedures are being developed by LILCO with the staffs of the special facilities. Tr. 10,053 (Miele); see LILCO Ex. 38-47. Every special facility in the EPZ has been visited and toured by LILCO personnel; some meetings have been held following issuance of draft facility-specific plans; oral comments have been taken into account in revisions to the plans; and facility-specific floor plans for some facilities have been developed for sheltering within the facility. Tr. 10,053-55 (Robinson), 10,055 (Miele). The draft plans cover definitions of different classifications of emergencies, communications, organization of facility and staff responsibilities, staffing needs, preparation of residents, sheltering procedures, and evacuation procedures. Tr. 10,055-56 (Robinson).

411. For each facility, sheltering areas were chosen by health physics people from LILCO and its consultants following a tour with the administrator to determine which areas in the facilities would provide the best sheltering factors. Tr. 10,056-57 (Yedvab), 10,055-56 (Miele). The number of people to be sheltered was taken into account. Working with hospital and nursing home administrators, LILCO personnel determined how much space was necessary and where that space should be located based on the amount of shielding afforded by the building structures. Id. Special needs such as food for people and special equipment also were taken into account. Tr. 10,058-59 (Miele). LILCO will continue to provide expert advice and to help these facilities on revisions to these procedures. Tr. 10,060 (Robinson).

412. LILCO has agreed to provide special equipment to some of the facilities. Tr. 10,056, 10,060 (Miele). It has tailored certain implementing procedures to individual facility needs. Id. For example, some of the doorways have been enlarged for ease of access into and out of areas selected for sheltering. Id. Some training has already been provided to the hospitals. Tr. 10,060 (Miele). One nursing home has already conducted drills using the sheltering procedures provided by LILCO. Tr. 10,061 (Robinson).

413. There are sections of the plans which are incomplete, as indicated during cross-examination by New York State. See, e.g., Tr. 10,100-11 (Miele, et al.). The plans will be completed by LILCO and by the facilities as appropriate. Tr. 10,112 (Robinson). LILCO will develop similar plans for the remaining special facilities in the EPZ. Tr. 10,057 (Robinson). The plans for each facility will be updated annually (Tr. 10,061-62 (Robinson)), but these will not be expressly incorporated into the LILCO Plan. Tr. 9042 (Weismantle), 10,062, 10,088 (Robinson).

414. The State (or LERO, if requested by the State) would issue a specific recommendation of selective evacuation, using the procedures outlined in the evacuation section of the State Plan at III-43. Cordaro et al., ff. Tr. 8760, at 35, Attachment 10. The public would be notified of the recommendation to evacuate selected segments of the population by the broadcasting of EBS messages advising the public of the recommended protective action. Id.

415. Selective sheltering and selective evacuation would be suggested only on the recommendation of New York State, and are included in the Plan to provide flexibility to adapt to a State recommendation for selective sheltering or evacuation, should the State choose to respond to

an emergency at Shoreham. Cordaro et al., ff. Tr. 8760, at 9-10. Given this condition in the Plan, the protective action of selective sheltering or selective evacuation will only be taken with the additional assurance of New York State's agreement that it was appropriate.

Conclusion

416. The Board finds that the LILCO Plan adequately describes the guidelines to be used in recommending selective sheltering and selective evacuation, and procedures by which these recommendations would be implemented.

B. Wind Shifts (Contention 64)

417. Contention 64 asserts that, given wind conditions on Long Island, in the event of any evacuation, LILCO must evacuate at least a radius of five to seven miles around the plant, rather than only evacuating the zones within two miles of the plant.

418. LILCO presented the testimony of Messrs. Cordaro, Daverio, Miele, and Watts on Contention 64. Cordaro et al., ff. Tr. 8760, at 35-43; see "Professional Qualifications," ff. Tr. 4008. The FEMA Panel were the only other witnesses offered on this contention. See Baldwin et al., ff. Tr. 12174, at 62.

419. The average wind speed on Long Island -- based on data from Suffolk County Air Force Base taken over 19 years -- is eight miles an hour. Cordaro et al., ff. Tr. 8760, at 42, Att. 18. Average wind speed at the Shoreham meteorological tower is 8-9 miles an hour. Tr. 8903 (Daverio). Shoreham, on the coast, has lower wind variability than an inland or valley location. Tr. 8957 (Cordaro). Even as compared to

other coastal plant sites, such as Turkey Point, Pilgrim and Millstone Point, Shoreham has a lower wind variation. Cordaro et al., ff.

Tr. 8760, at 43, Att. 19, at Table 2.

420. - "Sea breeze" refers to a phenomenon at coastal sites where, as the land warms up relative to the water, the breeze blows in from the water over the land and perhaps upward. Tr. 8959 (Cordaro, Watts). The sea breeze phenomenon could occur on Long Island, both from the Atlantic Ocean and from Long Island Sound. Tr. 8961-62 (Cordaro).

421. This "sea breeze" phenomenon has been studied in detail by both the Brookhaven Laboratory and by LILCO. Tr. 8962 (Cordaro). Effects of sea breeze versus sound breeze can be determined from the meteorological data gathered at the Brookhaven National Laboratory meteorological towers, Tr. 8963-64 (Daverio). The studies show that sea breeze might cause windshifts to occur somewhere five to six miles inland. Tr. 8963 (Daverio). If a sound breeze occurred at the site, it would be noted because it would affect the meteorological tower readings. Tr. 8969 (Daverio). Field survey teams will confirm the direction of the plume so that persons making protective action recommendations will know if there is a windshift for any reason, including a sea breeze. Tr. 8964-65, 8972 (Watts). In making a protective action decision, the measured meteorological data as well as anticipated changes in weather conditions, including any shift, must be considered. Tr. 8975 (Daverio, Miele).

422. Protective action recommendations will apply to persons located in a "keyhole" made up of a 360° area circling the plant plus a downwind wedge of at least 67°, which takes into account possible wind shifts. Cordaro et al., ff. Tr. 8760, at 40; Tr. 8950 (Watts); Baldwin et al.,

ff. Tr. 12174, at 62. Depending upon projected doses, the protective action recommendation will apply to one of the following areas: (1) a two-mile radius from the plant; (2) a two-mile radius plus a five-mile downwind sector; or (3) a five-mile radius plus a 10-mile downwind sector. Plan, OPIP 3,8.2, Att. 5; Cordaro et al., ff. Tr. 8760, at 40. The two- and five-mile radial areas are included to take into account a possible shift in wind. Cordaro et al., ff. Tr. 8760, at 41.

423. Zones affected by a five-mile evacuation actually go out to about seven miles except in Zone J; therefore, in many cases the intervenors' suggestion of evacuation out to seven miles will occur under the LILCO Plan. Cordaro et al., ff. Tr. 8760, at 41.

424. When weather forecast information indicates to the emergency response team that the wind direction will change, the protective action recommendation is recalculated and, if necessary, a new protective action recommendation is issued. Cordaro et al., ff. Tr. 8760, at 41-32; Tr. 8942-43, 8952-53 (Miele); see also Tr. 8920-21, 8945-46 (Watts); 8938-40; 8946 (Daverio).

Conclusion

425. The plan contains adequate provisions for considering wind shifts that might affect the areas to be evacuated. Contention 64 is without merit.

C. Nomogram (Contention 49)

426. Contention 49 alleges that the nomogram which relates iodine to total fission products for the calculation of thyroid dose is "not realistic;" thus, there is no assurance that this procedure will provide

reliable data for use in making protective action decisions. Contention 49 was rewritten by the Licensing Board in its April 20, 1984 order ruling on LILCO's Motion for Summary Disposition of Contentions 24.B, 33, 45, 46, and 49.

427. Only LILCO and FEMA presented the direct testimony of witnesses on this contention. See Cordaro et al., ff. Tr. 13909; Baldwin et al., ff. Tr. 14292.

428. Contention 49 reflects two issues raised in the FEMA RAC review of March 15, 1984, of the LILCO Plan: (1) that the nomogram is not always used to calculate the thyroid dose from radioactivity measured on the particulate filter paper, and (2) that the thyroid dose determination might not be accurate due to filtration, moisture in the containment, and other removal processes. Cordaro et al., ff. Tr. 13909, at 6.

429. The FEMA RAC review found:

(T)he nomogram which relates iodine to total fission products for the calculation of thyroid dose (OPIP 3,5.2., Attachment 11) may not be realistic in this aspect (that "even without core damage, radioiodine may be collected on the particulate filter if the iodine is in elemental form. Therefore, one cannot rule out activity on the particulate filter as not being iodine.) Furthermore, the amount of fission products collected from a core damage accident are (sic) highly dependent on a number of parameters, such as moisture in containment, filtration of release, distance from the site, etc., and are (sic) not easily amenable to the nomogram assumptions. FEMA Review of 29; see Cordaro et al., ff. Tr. 13909, at 7.

430. This Board ruled in its April 20 order that this comment from FEMA "clearly calls into question an important aspect of the entire system, viz, the reliability of the projected dose data available to decision makers when the calculations are being done in the manual backup mode." See Baldwin et al., ff. Tr. 14292.

431. A nomogram is a graphic representation that consists of several lines marked off to scale and arranged in such a way that, using a straight edge to connect known values on two lines, an unknown value can be read at the point of intersection with another line. It is essentially a tool that is of assistance in making a calculation. Cordaro et al., ff. Tr. 13909, at 9; see id., Attachment 1.

432. To calculate doses under the LILCO Plan, personnel go to the field and take measurements as described in OPIP 3.5.1., Section 5.3.7., and in OPIP 3.5.2. See Id. at Attachment 3. These measurements are used in a calculation worksheet that directs the person performing the evaluation to the nomogram. Cordaro et al., id. at 9. The nomogram is used in making a series of calculations resulting in a total thyroid dose for the area in which the air sample was taken. Id.

433. Other factors would be used in conjunction with this method for formulating protective action recommendations, including consideration of plant conditions, the possibility of release, the potential amount of activity for release, and other dose projections performed based on the release rate from the plant, existing meteorological conditions, and field survey measurements. Tr. 13,911A-12 (Watts).

434. With regard to the first FEMA concern, the Board finds that the nomogram does account for particulate iodine collected on the filter paper. A radioactive plume released during an emergency could include radioactive iodine (Cordaro et al., ff. Tr. 13909, at 10) which, when inhaled, would result in a dose to the thyroid. Id. The TCS Air Sampler System used in the LILCO Plan consists of an air pump and a sampler canister which is filled with absorbent material and surrounded by a

particulate filter. Id. The outside filter is a very fine paper which is designed to trap particulate material. Id. This particulate material could consist of radioactive iodine and other non-iodine particulates. Id. at 11:

435. The inner canister of the Air Sampler contains an absorbent material that collects radioactive iodine only in gaseous form. Id. at 11. Thus, when the air sample collection is completed, the amount of radioactive iodine collected in the inner absorbent material and on the outer particulate filter must be determined. This is done in the field by use of a radiation survey instrument, or in the laboratory using radiation analysis equipment. Id. The absorbent material in the inner canister would contain only radioactive iodine. This measurement would require only correction for radioactive decay of the iodine from the time of reactor shutdown to the time of sampling and counting. Id.

436. The outer filter paper, however, may contain both iodine and non-iodine particulate material. Id. The nomogram procedure assumes a certain mixture of iodine and non-iodine particulate material to be present on the filter paper; the radioactivity of this mixture is further assumed to vary as a function of time. Id. Thus, the nomogram allows one to calculate how much of the measured radioactivity on the filter paper is due to particulate iodine at various points in time. Id. By determining the gaseous and particulate components of the thyroid dose separately, and adding these, the nomogram procedure then allows the total thyroid dose from gaseous and particulate iodine to be calculated. Id. at 12.

437. After considering the evidence, we find that the use of the nomogram is a reliable means of making the subject calculations in connection with the other steps which would be taken by LILCO. The determination of the radioiodine fraction of the fission product release is based upon analysis of a range of release scenarios for BWR accidents. As Mr. Keller testified on behalf of FEMA, the procedure uses a most probable iodine/total fission product ratio for the accident scenarios analyzed. Tr. 14,294 (Keller). The ratio used in OPIP 3.5.2 is the same ratio recommended in "Guidance on Offsite Emergency Radiation Measurement Systems," FEMA Rep 2, September 1980, in Appendix B, entitled "An Air Sampling System Developed by Brookhaven National Laboratory for Evaluation of the Thyroid Dose Commitment Due to Fission Products Released from Reactor Containment," Cordaro et al., ff. Tr. 13,909, at 7-8, Att. 2. The method used is also recommended in "Preparedness and Response in Radiation Accidents: U.S. Department of Health and Human Services," FDA 83-8211, Appendix H-4 (August, 1983). Cordaro et al., ff. Tr. 13,909, at 15, Att. 5.

438. When other parameters are considered, such as containment moisture, filtration, and other physical chemistry conditions, these influences would have the effect of suppressing the release of particulate material. Little, if any, iodine or non-iodine particulate material would therefore be likely to be detectable in the field. As a result, the particulate iodine component of any computed down-wind thyroid inhalation dose would be greatly decreased in magnitude. This would also diminish the significance of any uncertainty associated with the mixture of iodine and non-iodine particulates assumed to be present. Cordaro et al., ff. Tr. 13,909, at 13, 14.

Conclusion

439. We find that the method identified in the LILCO Plan for use of the nomogram will provide an accurate and dependable means of determining the thyroid dose to the exposed population during the early stages of an emergency.

IX. Evacuation

A. Evacuation Time Estimates (Contentions 65, 23.C, D, & H)

440. Contentions 65, and 23.C, D, & H raise a number of issues concerning whether LILCO's evacuation time estimates (ETE's) are accurate and reliable or underestimate the actual time required to evacuate the 10 mile EPZ surrounding the Shoreham Nuclear Power Plant. Contentions 23.C, D, & H concern the possible impact of the "shadow evacuation phenomenon" on the ETE's contained in the Transition Plan. Contention 65 addresses specific alleged deficiencies in the assumptions used in the Applicant's ETE's such as time required to mobilize the population, driver compliance with the traffic control scheme, and the effect of accidents and vehicle breakdowns. Extensive direct testimony was filed by all parties. LILCO's prefiled and supplemental testimony on Contention 65 (hereinafter respectively, Cordaro et al. (Contention 65), ff. Tr. 2337 and Cordaro et al. (Contention 65, Supp. 1), ff. Tr. 2337), and on Contentions 23.C, D, and H (hereinafter, Cordaro, et al. (Contention 23.C, D, and H, ff. Tr. 2337) was sponsored by Matthew C. Cordaro, John A. Weismantle, and Edward B. Lieberman; these witnesses testified as a panel. Supplemental testimony in response to New York State testimony on Contention 65 (hereinafter, Cordaro et al. (Con-

tion 65, Supp. II), ff. Tr. 3857) was sponsored and testified to by Dr. Cordaro, Mr. Weismantle, Mr. Lieberman and Dr. Mileti. FEMA's testimony on Contentions 23 and 65 was sponsored and testified to by Philip H. McIntire (hereinafter, McIntire, ff. Tr. 2086). Prefiled testimony on Contentions 65 and 23 on behalf of the NRC staff was sponsored and testified to by Dr. Thomas Urbanik, II (hereinafter, Urbanik, ff. Tr. 3430). Suffolk County's direct testimony on Contentions 65 and 23.H (hereinafter, Roberts et al. (Contentions 65 and 23.H), ff. Tr. 2260) was sponsored by Deputy Chief Inspector Richard C. Roberts, Assistant Chief Inspector Joseph L. Monteith, Deputy Inspector Philip McGuire, Deputy Inspector Michael J. Turano, Jr., and Captain Edwin J. Michel. Additional testimony sponsored and testified to by Philip B. Herr (hereinafter, Herr, ff. Tr. 2909), Bruce William Pigozzi (hereinafter, Pigozzi, ff. Tr. 2909), and Peter A. Polk (hereinafter, Polk, ff. Tr. 2909). Mr. Pigozzi also submitted supplemental testimony on Contention 65 (hereinafter, Pigozzi (Contention 65, Supp.), ff. Tr. 2909). New York State's testimony on Contention 65 (hereinafter, Hartgen et al., ff. Tr. 3695) was sponsored and testified to by Messrs. David T. Hartgen, Richard D. Albertin, Robert G. Knighton, and Foster Beach; these witnesses also testified as a panel. Cross-examination was conducted over the course of nine hearing days.

Evacuation Time Estimates Requirements

441. Evacuation time estimates are required by 10 C.F.R. Part 50, Appendix E.IV and are used for two principal purposes:

1. to provide decision makers during an emergency with knowledge of the length of time required to effect evacuation under various conditions, which allows an informed choice of

protective actions (e.g. between in-place sheltering and evacuation); and

2. to identify those areas or routes in the vicinity of a site where bottlenecks are likely to occur and traffic control would be appropriate. McIntire, ff. Tr. 2086, at 6.

442. The criteria for judging the acceptability of the evacuation time estimates which are required by 10 C.F.R. Part 50, Appendix E.IV is NUREG-0654/FEMA-REP-1, Rev. 1, Appendix 4. NUREG-0654 discusses several elements which the NRC and FEMA believe should be included in evacuation time studies. These elements include: (a) an accounting for permanent, transient, and special facility populations in the plume exposure emergency planning zone (EPZ); (b) an indication of the traffic analysis method and the method of arriving at road capacities; (c) a consideration of a range of evacuation scenarios generally representative of a range of normal through adverse evacuation conditions; (d) a consideration of confirmation of evacuation; (e) an identification of critical links and need for traffic control; and (f) the use of methodology and traffic flow modeling techniques for various time estimates consistent with the guidance of NUREG-0654, Appendix 4. Urbanik, ff. Tr. 3430, at 5-6.

443. Staff witness, Dr. Thomas Urbanik, was a principal author of NUREG/CR-1745 "Analysis of Techniques for Estimating Evacuation Times for Emergency Planning Zones" (November 1980). Urbanik, ff. Tr. 3430 at p. 2. He also provided input to the development of current guidance for evacuation time estimate studies which appear in Appendix 4 to NUREG-0654, Revision 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants" (November 1980) Id. He has reviewed the initial

evacuation time estimate study submittals of approximately 52 operating and near term nuclear facilities for the NRC in light of NUREG-0654, the results of which are published in NUREG/CR-1856 "An Analysis of Evacuation Time Estimates Around 52 Nuclear Power Plant Sites" (May 1981)

Id. As a result we give his testimony substantial weight.

444. The Applicant provided the following evacuation time estimate studies, which were reviewed by Staff witness Dr. Urbanik against the criteria of NUREG-0654, Appendix 4, Rev. 1: "Interim Report, Evacuation of a Single Scenario for the Shoreham Nuclear Power Station," prepared for the Long Island Lighting Company, by KLD Associates, Inc., July 16, 1982; "Shoreham Nuclear Power Station Local Offsite Emergency Response Plan," Rev. 1, July 18, 1983; and "Estimated Evacuation Times for the Entire Population Within the Emergency Planning Zone for the Shoreham Nuclear Power Station, Considering the Effects of Uncontrolled Evacuation, Voluntary Evacuation, Inclement Weather and Accidents," submitted to Long Island Lighting Company by KLD Associates, KLD TM-77, no date. Urbanik, ff. Tr. 3430, at 4.

445. In addition to the Applicant's evacuation time studies, Dr. Urbanik also reviewed evacuation time estimate studies prepared by Suffolk County, including: the preliminary Suffolk County work entitled "Transportation Element for Evacuation in the Vicinity of Shoreham Nuclear Power Station," the County's draft plan entitled "Suffolk County Radiological Emergency Response Plan," September 21, 1982, and a study entitled "Preliminary Evacuation Time Estimates for the Shoreham EPZ," prepared for Suffolk County radiological Emergency Response Plan Steering Committee by PRC Voorhees, November 1982. Id. at 5.

446. Finally, under the Memorandum of Understanding of January 14, 1980 between the NRC and FEMA, FEMA agreed to provide the NRC with an independent assessment of evacuation times around 12 reactor sites which have the highest population density within the 10 mile EPZ or were mutually agreed to by FEMA and NRC. The report, "Dynamic Evacuation Analyses," (TD-13 October, 1981) fulfills this agreement. The report was completed by FEMA's Radiological Emergency Preparedness Division. The FEMA independent assessment of the 12 reactor sites consists of contractor assessments, major conclusions by the contractors, commentary by pertinent State and Local government officials on these assessments and a critique of the contractor's methodologies. In addition, the report was reviewed by the Mitigation and Research Office and the Government Preparedness Office. This report contains the assessment of evacuation times for Shoreham which was conducted by Wilbur Smith and Associates. McIntire, ff. Tr. 2086, at 6.

447. The LILCO study follows the guidance of NUREG-0654. The early work done by Suffolk County Planning Department (SCPD) also followed this guidance, but the recent work done by PRC Voorhees does not utilize the guidance in Appendix 4. There are two major differences in assumptions between the LILCO studies by KLD Associates and the Suffolk County study by PRC. First, the KLD studies are based on a 10 mile EPZ and NUREG-0654, Appendix 4, while the PRC Voorhees study redefines the EPZ to have a 20 mile radius. This is inconsistent with the NUREG-0654 guidance and the requirements in 10 CFR § 50.47(c)(2). The NUREG and the regulations specify having a 10 mile radius, with minor adjustments allowed for political boundaries or physical features (such as roads,

rivers, etc.) which would more easily define the boundaries for the public. Second, the PRC Voorhees study, in contrast to the KLD study, only used a relatively simplistic network of four roadways. This use of a four roadway network was inappropriate for the Shoreham site given the large population and availability of additional routes. Urbanik, ff. Tr. 3430, at 6-7.

448. Facts concerning the configuration of the Shoreham 10 mile EPZ are contained in Appendix A of the Transition Plan and are pertinent here. Half of the 10 mile radius surrounding the plant (the northern half) lies in the open water of Long Island sound. The projected 1985 EPZ winter population is 138,500, and the summer population is 160,000. This population is concentrated primarily to the west and southwest of the plant.

449. Significant portions of the EPZ, particularly to the south and east, consist of park, conservation areas, or large, lightly populated scientific and industrial establishments (Brookhaven National Laboratory and Grumman). Prevailing winds are toward the northern semicircle (i.e., off-shore) over 30% of the time, and toward the lightly populated eastern parts of the EPZ approximately another 35% of the time. The topography of the island is generally flat, with only small hills and bluffs along the northern shore. The highway system contains controlled access highways including the Long Island Expressway (three lanes plus shoulder in each direction) and Sunrise Highway (two lanes plus shoulder in each direction) and several other east-west arterial roads. Cordaro, et al. (Contention 65), ff. Tr. 2337, at 17-18; Tr. 2755-59 (Lieberman).

450. The Applicant's evacuation time estimate studies were made by KLD Associates using the DYNEV traffic simulation model. DYNEV is an adaptation of the TRAFLO Level II simulation model developed by KLD Associates for the U.S. Department of Transportation, Federal Highway Administration. TRAFLO is the result of years of extensive traffic simulation modeling research and is generally accepted. DYNEV makes the appropriate modifications of this model for use in evacuation time estimate studies. KLD Associates is a recognized authority in traffic simulation models. *Urbanik, ff. Tr. 3430, at 7.*

451. DYNEV consists of three major components:

- 1) an equilibrium traffic assignment model
- 2) a capacity model, and
- 3) a traffic simulation model.

The traffic assignment model is designed to identify the best evacuation routes between each pair of origin and destination points (nodes). These best evacuation routes are defined as ones which minimize the travel time from each origin to each associated destination along the network. *Cordaro et al., ff. Tr. 2337 at pp. 21-23.* The capacity model is designed to estimate the permissible service volumes (defined in vehicles per hour) for each traffic movement on each segment of roadway (link). This model reflects a lower service volume due to turning vehicles and the effects on the service volume of any control device that is installed at an intersection. *Id.* The traffic simulation model describes the dynamic process of moving vehicles along each link along the roadway network. Factors considered in this movement include the capacity of each link, density of traffic entering the link and any impedance imposed by a

traffic control device or blockage on a link. Id. Each of these components of the DYNEV system have been validated using rigorous statistical testing methodology. Id. at pp. 31-33.

452.- Input data for DYNEV was obtained from a variety of sources, including the Suffolk County Planning Department, a field survey of the entire EPZ road network, and the queue discharge headway rate of vehicles at major intersections throughout the EPZ. Id. at 33-34. To analyze the Shoreham EPZ, the traffic assignment and traffic simulation models of the DYNEV system were iteratively executed to refine trip assignments (pairs of origin and destination nodes) by identifying bottlenecks and modifying the trip table^{41/} or applying control tactics to reduce their effects within practical limits. See id. at 35-39. This process is suggested as an appropriate analytic technique for estimating evacuation times in NUREG/CR-1745. Id. at 35-36.

453. KLD initially ran its model to produce evacuation time estimates for 21 evacuation scenarios. The first 20 cases examined evacuation times for various portions of the EPZ at distances of 2, 5 and 10 miles from the plant, as well as evacuation for the full EPZ. The results of Cases 1-20 are reported at Appendix A, at V-8. Case 21 assumed a 3-hour trip generation, rather than the 2-hour period assumed in the first 20 cases. Id. at 41-43. In addition to these 21 cases,

^{41/} KLD's trip table was developed by examining a large-scale map and judging which destinations would be suitable for traffic generated at each origin within the EPZ. KLD judged a destination to be suitable if it minimized the distance to be traveled and avoided traveling closer to Shoreham. Cordaro et al. (Contention 65), ff. Tr. 2337, at 36-37.

LILCO also commissioned a series of studies employing alternative assumptions identified by the Intervenors in Contentions 23 and 65, including (1) "shadow" or "voluntary" evacuation from areas outside the EPZ, (2) the impact of accidents during an evacuation, (3) the absence of any traffic control, such as use of traffic guides and route signs, during an evacuation (i.e., an "uncontrolled" evacuation), (4) the deviation of evacuees from their recommended routes (i.e., "noncompliance cases"), and (5) the construction of an additional potential evacuation route on an existing LILCO right-of-way. Cordaro et al., ff. Tr. 2337, at 43-44. The results of these studies were included in Attachment 6 to LILCO's testimony on Contention 65. Cordaro et al. (Contention 65), ff. Tr. 2337, Att. 6.

454. The methodology used by KLD to calculate evacuation time estimates was questioned by both New York State and Suffolk County. New York State witnesses questioned the highway capacity values assigned to the roadway network by KLD. Hartgen et al., ff. Tr. 3695, at 7-11. New York State argued that KLD did not use readily available data to test the accuracy of the assigned capacities. Id. at 5. New York State also contended that the KLD traffic model had not been appropriately calibrated using Shoreham specific data. Id. at 11-15. In addition, Suffolk County contended that use of the equilibrium traffic assignment model was inappropriate since this model assumes "normal" driver behavior and a stable network structure which would not be present in evacuations. Pigozzi, ff. Tr. 2909 at 30-33.

455. With regard to roadway capacity, it was pointed out this data was developed from a detailed survey of the EPZ roadway network and the

measurement of queue discharge headways taken during peak (rush hour) conditions. Cordaro et al., ff. Tr. 2337, at 33-34; see also, Cordaro et al., ff. Tr. 3857, at 6-8. New York State argued that capacities are usually determined using formulas found in the Highway Capacity Manual (Transportation Research Board, 1965). Hartgen et al., ff. Tr. 3695, at 7. However, while this manual was used as a reference in establishing capacities for controlled access freeways (such as the Long Island Expressway) it is not dispositive as to other streets and roadways in the EPZ because the manual assumes typical roadway conditions, and is, in fact, in the process of being updated. Hence, the method employed by KLD (using vehicle discharge headways) is fully in keeping with the procedures set forth in the new Manual (see Transportation Research Circular 212 -- Interim Materials on Highway Capacity, 1980). Cordaro et al., ff. Tr. 3857, at 10-11. LILCO Ex. 11.

456. New York State also contended that the DYNEV model has not been calibrated for evacuation applications. Calibration is the procedure used to confirm the accuracy of a model compared to available data. Hartgen et al., ff. Tr. 3685, at 11. LILCO noted, however, a distinction between the terms "calibration" and "validation". "Calibration" is the process of accumulating all of the inputs to the model, such as specific roadway characteristics and origin/destination pairs, while "validation" is the process by which the accuracy of a model's results is assessed. Cordaro et al., ff. Tr. 3857, at 15-16. For convenience, we shall adopt LILCO's two-part definition to describe this process.

457. New York State pointed out that calibration of transportation planning models is used to predict future transportation patterns based

on historical and current data to identify variables which will affect those patterns and quantify the relationship of those variables. This data is then revised over time to take account of the percentage deviation between the model and observed data. Hartgen et al., ff. Tr. 3695, at 12-13. The DYNEV model, however, assumes that the intrinsic relationship in the three modules of the system (traffic assignment, capacity and traffic simulation) are unlikely to vary over time. Cordaro et al., ff. Tr. 3857, at 17. This is because calibration of the model is based on a driver behavior which has been observed, measured and quantified as empirical inputs to the models by direct field observation. Id. at 18. Validation of the model for evacuation conditions, however, is simply not feasible because no such data base currently exists and use of Shoreham specific data under normal operating conditions would bear little resemblance to the conditions expected for a general evacuation of the Shoreham EPZ. Id. at 19. We note, however, the modules in the DYNEV system have each been validated in contexts other than general evacuations. Cordaro et al., ff. Tr. 2337, at 31-33; see also Tr. 2505-2517, e.g.

458. Suffolk County asserts that use of the traffic equilibrium assignment module is invalid for evacuation applications, since it is based on normal driver behavior. The equilibrium model was chosen because it is responsive to people's desire to minimize evacuation travel time. Cordaro et al., ff. Tr. 2337, at 24. Under normal conditions, motorists will have selected minimum time routes by observation over time in a stable traffic network. Pigozzi, ff. Tr. 2909, at 30-33. Under abnormal conditions, however, motorists will also seek minimum time

routes by relying on external information resources whether this be maps or route signs. Tr. 2438-39, 2479-80 (Lieberman). We agree that the need to move as quickly as possible out of the area of risk (selection of minimum route times) is a more important consideration than moving along the shortest distance route in emergency conditions. See Tr. 2457-60 (Lieberman). Hence, we find that the use of the equilibrium traffic assignment module used by KLD is valid based on the considerations postulated in an emergency scenario.

Mobilization (Contention 65.A)

459. Contention 65.A alleges that LILCO's time estimates inadequately account for the time it will take the public to mobilize for evacuation. We note here a distinction between the County's use of the term "mobilization time" and LILCO's use of this term. According to the County, "mobilization time" is the time that elapses between the first evacuation notice and the time all members of the public have begun to evacuate. Herr, ff. Tr. 2909, at 6. On the other hand, LILCO defines "mobilization time" in two phases, i.e. notification time which is the 20-minute period between the recommendation to evacuate and the time the first evacuee commences an evacuation trip, and following this a 2-hour "trip generation" period which represents the time between the departure of the first automobile and the departure of the last automobile on the evacuation trip. Cordaro et al., ff. Tr. 2337 at 47-49. The issue raised by Contention 65.A is whether the trip generation period (including the 20 minute notification phase) in the Applicant ETE's is appropriate, or whether this time should be substantially increased. Herr, ff. Tr. 2909, at 18; Pigozzi, ff. Tr. 2909, at 10.

460. Mobilization or preparation time is included in evacuation time estimates to account for the fact that after receiving an evacuation notice, persons must prepare to leave. Urbanik, ff. Tr. 3430, at 10. The range-of mobilization time is from 15 minutes in an urban environment to 2 hours in a rural environment. Id. The higher number (2 hours) is necessary at a rural site because evacuation time is dependent on mobilization time for networks without capacity constraints. Id. However, where there are roadway capacity restraints (such as an urban site), evacuation time is not dependent upon the maximum mobilization time. Instead, the evacuation time is dependent upon the mobilization time of those individual's required to fill the roadway to capacity. Id.

461. Suffolk County contends that the trip generation period will be increased by pre-evacuation trips, such as travel from work to home, from home to school, from shopping areas to home, and from home to stores for supplies prior to evacuation. Herr, ff. Tr. 2909, at 8-11; Piggozzi, ff. Tr. 2909 at 10.

462. The source of the data for the trip generation period of 2 hours and 20 minutes used in LILCO's evacuation time estimates was Suffolk County Planning Department's work in 1981 and early 1982. Cordaro et al. (Contention 65), ff. Tr. 2337, at 49. In addition, LILCO commissioned a survey by the National Center for Telephone Research (NCTR) in the fall of 1982 to obtain additional detailed information describing the travel patterns, household structures and vehicle availability of the population residing within the EPZ. Id. at 50-51.

463. The results of the NCTR survey and additional information on daily transportation schedules for school children were used by KLD to

produce a detailed, independent analysis of the time distributions for the pre-evacuation events identified in Figure 4 of Appendix 4 of NUREG-0654 documented in KLD TM-139. Cordaro et al. (Contention 65), ff. Tr. 2337, at 51-52, -Att. 10. These pre-evacuation events include notification, preparation to leave work, travel from work to home, and preparation to leave home. Id. The results of KLD TM-139 were compared to the time distributions in the PRC Voorhees study conducted for Suffolk County, and while there are differences in the time distributions for individual pre-evacuation events, the overall distribution for the public leaving home resulted in virtually identical times. Id. at 52-53.

464. In addition, KLD analyzed scenario 21 using a longer (3 hour) trip generation period and found this had no effect upon the total time required to evacuate the full 10 mile EPZ. This is due to saturated flow conditions, in which roadway capacity, rather than trip generation controls the total evacuation time. Id. at 54-56. In other words, whether people are mobilizing to leave (i.e. engaged in pre-evacuation activities) or are queued up awaiting access to evacuation routes, the time used in the pre-evacuation period is available in a situation where demand exceeds capacity. Only where demand is less than the capacity will "mobilization" time lengthen total evacuation time. Id.

465. The New York State witnesses also criticized the KLD model for failing to consider the effect of a surge of evacuation traffic onto the roadway network early in the evacuation. Hartgen et al., ff. Tr. 3695, at 11. Mr. Hartgen testified that a surge is not an unlikely event since during many times of the day families can be united at home and leave quickly. Tr. 3795 (Hartgen). However, we note such a surge would most

likely cause congestion to build up early in an evacuation, thus contributing to the saturated roadway conditions postulated in Applicant's ETE's. Hence, rather than lengthening the evacuation time estimate, it is conceivable the time could actually be reduced. Cordaro et al., ff. Tr. 3857, at 14-15. Staff witness Urbanik pointed out a larger mobilization time (i.e., greater than 20 minutes) would be inappropriate at Shoreham given that a significant number of people could be ready in the short (approximately 20 minutes) time frame. Even if twenty-five percent of the people would take 3 hours to mobilize at Shoreham, the evacuation time for a 10 mile evacuation of the EPZ would be unaffected and thus the KLD mobilization times are appropriate. Urbanik, ff. Tr. 3430, at 10.

Pre-Evacuation Traffic (Contention 65.B)

466. Contention 65.B asserts that LILCO's time estimates fail to account for congestion caused by the number of pre-evacuation trips people will make before evacuating, thus lengthening evacuation times. These trips include travel from work to home, home to school (and return), shopping areas to home, and home to stores or banks. Pigozzi, ff. Tr. 2909, at 9-11; Tr. 2975-79 (Herr); Cordaro et al., ff. Tr. 2337, at 58-59. Work to home trips would most likely constitute the largest portion of these pre-evacuation trips. Id. This is not likely to affect the evacuation time estimates, however, since as long as the traffic in the nonevacuating direction is controlled so that it does not cross major evacuation traffic in inappropriate ways, then little impact would result on traffic. Urbanik, ff. Tr. 3430, at 11. For example, where two traffic flows merge, it would be undesirable in some cases for nonevacuating

traffic to cross evacuating traffic. This would be the case at those locations in the network that control the evacuation time. Id.

467. According to the studies contained in LILCO's ETE's, congestion begins to occur 40 minutes after the first evacuees leave their homes, and 87% of the work-to-home trips are completed within 40 minutes after the start of an evacuation. Cordaro et al., ff. Tr. 2337, at 58-59. Therefore, interaction between work-to-home and evacuating traffic should be limited in extent since work-to-home travel is nearly complete by the time evacuation travel demand begins to reach roadway capacity. Id. Further, non-evacuating traffic would largely be precluded from turning across heavy flows of evacuating traffic by the presence of evacuating vehicles. If traffic were queued and moving slowly, it would be reasonable and likely that evacuees would allow non-evacuees to turn across their paths. This behavior, which is rational, would not be disruptive to the evacuation. Urbanik, ff. Tr. 3430 at 11.

468. Further, it is unlikely that preparatory trips other than to return from work and to reunite family members will take place in the EPZ after an evacuation is announced. (Cordaro et al. (Contention 65), ff. Tr. 2337, at 59. After the sirens sound most stores and shops will close. Id. The public knows such stores and shops are plentiful in western Suffolk County and Nassau County. Id. The public will seek to avoid delays in evacuation, and radio broadcasts will be urging people to leave the EPZ. Id. Therefore, the Board concludes that there will be few preparatory trips in a general evacuation except to return from work and to reunite family members.

469. This conclusion regarding the general lack of any but the most essential pre-evacuation trips is buttressed by Suffolk County's testimony which asserts that, in haste to evacuate the EPZ, motorists will run out of gas, having failed to make a pre-evacuation trip to the gas station. Polk, ff. Tr. 2909, at 13.

Traffic Control Plan (Contention 65.C)

470. In Contention 65.C, Suffolk County asserts that the traffic control plan presented in Appendix A of the Transition Plan will cause congestion thus increasing evacuation times, for four reasons:

1. LERO traffic guides will screen people moving in directions contrary to prescribed routes;
2. traffic control tactics may cause aggressive behavior;
3. traffic guides may give directions contrary to traffic signals; and
4. people may not perceive the recommended routes as the most expeditious way out of the EPZ.

471. A traffic control plan was included in Appendix A in order to minimize overall evacuation time by use of traffic guides. Traffic guides can be of assistance in expediting traffic flow where their role is perceived to be reasonable for evacuees and they do not employ counterintuitive strategies. Urbanik, ff. Tr. 3430, at 12. For example, traffic guides indicating the use of a shoulder to expedite flow would likely effect a high level of compliance and with a result of improved efficiency. Id.

472. Suffolk County's main concern in this regard is whether such a traffic control plan can, in fact, be implemented. For example, witnesses for the County suggested several reasons why people would

deviate from the routes prescribed in the plan, including the fact that people will have their own perceptions as to which is the "best" route, or that they may wish to travel to a destination that cannot be reached by the prescribed route, and that in an emergency situation people are likely to ignore prescribed routing information due to stress. Pigozzi, ff. Tr. 2909, at 20-22; Herr, ff. Tr. 2909, at 20, 23-24; Saegert, ff. Tr. 2259, at 3, 11; Roberts et al., ff. Tr. 2260, at 30-34.

473. The County also asserted that attempts by LILCO to "discourage" drivers from seeking alternate routes would result in delay. Roberts et al., ff. Tr. 2260, at 46; Herr, ff. Tr. 2909, at 30-31. This would also result in drivers displaying aggressive behavior toward LILCO's traffic guides. Saegert, ff. Tr. 2259, at 13-14; Roberts et al., ff. Tr. 2260, at 49. Lastly, the County asserted that traffic guides may give directions at intersection in conflict with the traffic signals at those intersections (Contention 65.C.3).

474. With regard to deviation from prescribed routes in the Plan, there was general agreement among all parties that the overriding consideration among evacuees would be leaving the EPZ by the most expeditious route. Cordaro et al., ff. Tr. 2337, at 65; Roberts et al., ff. Tr. 2260, at 14; Herr, ff. Tr. 2909, at 20; Pigozzi, ff. Tr. 2909, at 22. LILCO's testimony suggests that this motivation, reinforced by a public information program which specifies the best routes under evacuation conditions and use of traffic guides and signs should result in a high level of compliance. Cordaro et al., ff. Tr. 2337, at 66. The routes chosen to evacuate people west by the shortest path were constrained by two factors: the necessity to disperse traffic to reduce bottlenecks

(and hence, overall evacuation times) and the guidance in NUREG-0654 specifying evacuees should not be advised to take routes which would move them closer to the plant. Id.

475. Notwithstanding this assumption, however, KLD analyzed the effect of non-compliance with recommended routes in a report, KLD TM-140. Cordaro et al., ff. Tr. 2337, Att. 12. In this study, 25% and 50% of the evacuating population were assumed to deviate from their recommended paths during both "controlled" (LERO traffic guides and trailblazer signs in place) and "uncontrolled" (no LERO workers or trailblazer signs; ordinary traffic signals) evacuations. In the case of a "controlled" evacuation, if 25% of the population diverted from their recommended paths, the evacuation time would not be affected. Cordaro et al. (Contention 65), ff. Tr. 2337, at 68-69. If the level of non-compliance increased to 50%, there would be an increase of 35 minutes in the time required to evacuate the entire EPZ. Id. In the case of an uncontrolled evacuation, neither 25% nor 50% non-compliance would have an effect on total evacuation time. Id. The reason for this is that trade-offs would occur among the alternate evacuation routes, since in the area lying west of the plan and north of route 25(a) (the area likely to take the longest time to evacuate) there are relatively few reasonable alternative routes to those depicted in the LILCO traffic control plan. Cordaro et al. (Contention 65), ff. Tr. 2337, at 69-73. Consequently, the effect of non-compliance in this area tends to be limited. Id.

476. Much of Suffolk County's testimony in this regard, is based on other contentions. For example, traffic guides will not have the training and experience necessary to effectively direct traffic (Roberts et al., ff. Tr. 2260, at 35-42), the public information provided by LILCO is not

a credible source for such information (Saegert, ff. Tr. 2259, at 8-9), and signs may be defaced, stolen or destroyed (Roberts et al., ff. Tr. 2260, at 24). However, Suffolk County presented no study analyzing the effect of such concerns (i.e., the lack of the application of a traffic control plan on the evacuation time estimates). We find the speculations contained in this testimony insufficient to invalidate the quantitative analysis presented by LILCO, particularly in view of the studies detailed in the preceding finding.

477. Similarly, Suffolk County's concerns regarding aggressive behavior of drivers toward LILCO traffic guides are based, in part, upon the assumptions that the guides will be perceived as having no authority (Saegert, ff. Tr. 2259, at 14) and their lack of training. Id. at 13-16. LILCO witnesses testified, however, that the notion that people become aggressive in emergencies is unfounded as consensus is created in a community emergency, not conflict. See Tr. 3450-51 (Urbanik); Cordaro et al., ff. Tr. 3857, at 25-27. Motorists will look to LERO workers for help, not to treat them with hostility. Cordaro et al., ff. Tr. 1470, at 129; Cordaro et al., ff. Tr. 3857, at 27; Urbanik, ff. Tr. 3430, at 12; see Urbanik, ff. Tr. 3430, at 11. There is no basis in the record to think that members of the public will perceive the LERO traffic guides as trying to delay their time in the EPZ, rather than directing them to the most expeditious way out of the EPZ. No basis exists for finding that there will be hostility toward these guides. In addition, LERO workers will not force motorists to go in a particular direction. Cordaro et al., ff. Tr. 1470, at 129; McIntire, ff. Tr. 2086, at 3.

478. Even where traffic signals conflict with directions indicated by traffic guides, evacuees can be expected to respond to the traffic

guides when it will aid their evacuation. This conclusion is based on rational behavior which has been observed in many evacuations. Urbanik, ff. Tr. 3430, at 12. Furthermore, compliance with traffic signals is only likely when the traffic signal control is reasonable. Id. Motorists will disobey clearly unreasonable or malfunctioning signals. Id. It is also reasonable to conclude that motorists will respond to traffic guides and move against a red signal when they perceive it to be advantageous. Id.

479. Given that evacuees will react in ways they perceive to be most advantageous to themselves, traffic guide directions in conflict with the signals would not result in confusion or confrontation. Id. In fact, motorists often have occasion to encounter situations where temporary traffic control measures may conflict with existing control measures. Cordaro et al. (Contention 65), ff. Tr. 2337, at 63. Moreover, roadway capacities used by LILCO in its projections were reduced by 15% to account, in part, for any driver uncertainty caused by conflicting signals. Id.; see Tr. 3446 (Urbanik). Thus, it is concluded that the use of the LILCO traffic control plan, including the use of traffic guides, will not cause congestion or increase evacuation time.

Accidents, Disabled Vehicles and Similar Roadway Blockages
(Contention 65.D)

480. Contention 65.D asserts that LILCO's time estimates fail to consider the effects of accidents, breakdowns, vehicles running out of gas, lack of shoulders on some evacuation routes, road construction or repair, and vehicle abandonment.

481. Conflicting testimony was filed by LILCO and Suffolk County on the estimated number of such accidents. Suffolk County relied on two sources: accident statistics for September '82 to September '83 compiled

by the Suffolk County police (Roberts et al., ff. Tr. 2260, at 57-58) and an analysis by PRC Voorhees which based its estimate on the Transportation and Traffic Engineering Handbook, and its underlying report, entitled Solomon, "Accidents on Main Rural Highways Related to Speed, Driver, and Vehicle," July 1964. Polk, ff. Tr. 2909, at 11; LILCO Ex. 9.

482. LILCO relied on two documents describing accidents and breakdowns that occur during an evacuation:

U.S. Environmental Protection Agency Report EPA-520/6-74-002, entitled "Evacuation Risks - An Evaluation" by Joseph Hans, Jr. and Thomas Sell, published in June 1974;

"Hurricane Carla" prepared by M.E. Treadwell and published by the Department of Defense, Office of Civil Defense in 1962.

These reports indicate that accident rates during an evacuation are lower than the national average under normal conditions. Cordaro et al., ff. Tr. 2337, at 79.

483. LILCO witnesses testified that national accident statistics for 1980 indicate that accidents occur at a rate of approximately one per every 77,000 vehicle-miles. Cordaro et al. (Contention 65, ff. Tr. 2337, at 81. Hence, since an evacuation of the entire 10 mile Shoreham EPZ would involve approximately 304,000 vehicle-miles of travel, approximately 4 accidents could be predicted. Id.; see also Urbanik, ff. Tr. 3430, at 13.

484. Given the low speeds associated with an evacuation of the Shoreham EPZ, where capacity restraints on the network would reduce speeds as volume demand increased, the most likely accidents would not involve the total disabling of the vehicle, and the presence of shoulders on most roadways in the network would allow removal of the vehicle so flow could resume on the link. Cordaro et al., ff. Tr. 2337, at 85.

485. On the other hand, Suffolk County witness Polk predicted that 141 accidents would occur during an evacuation of the Shoreham EPZ because he believed accidents are more likely at lower speeds than at higher speeds. Polk, ff. Tr. 2909, at 10-12. In support of this testimony, Mr. Polk cited national accident statistics in the Transportation and Traffic Engineering Handbook, which he claimed showed that accident rates are much higher at low speeds than at higher speeds. Polk, ff. Tr. 2909, at 11-12; Pigozzi, ff. Tr. 2909, at 40-42; Herr, ff. Tr. 2909, at 41-42. However, the figures presented in the Handbook do not display accidents in terms of actual roadway speeds, but in terms of speed deviations from average highway speeds. Cordaro et al. (Contention 65, Supp. 1), ff. Tr. 2337, at 24-27; Tr. 3447-49 (Urbanik). Hence the figures upon which Mr. Polk based his testimony do not show low speeds more dangerous than high speeds, but that a higher frequency of accidents occur to those who travel at speeds far below the speed of the rest of the traffic stream. See Tr. 3448 (Urbanik); Cordaro et al., ff. Tr. 2337, at 25. These same statistics indicate that accident rates are lowest for those vehicles traveling at speeds that approximate the average of the traffic stream. Accordingly, these references do not affect LILCO's prediction of 3 or 4 accidents during an evacuation of the entire Shoreham EPZ where all traffic will be moving at very slow speeds. Id. at 26-27.

486. Normal traffic patterns (i.e., two-way traffic) would mean that wreckers would travel opposite evacuating traffic. Even on a one-way roadway, wreckers could travel the wrong way in the blocked lane to reach

the breakdown. Urbanik, ff. Tr. 3430, at 13. In most breakdowns or accidents, however, a wrecker would not be needed as the vehicle could be pushed out of the way. Id.

487. - The impact of 3 or 4 accidents would be a 5-10 minute increase in evacuation time as set forth in the KLD Associate evacuation time estimate study, KLD TM-77 "Estimated Evacuation Times for the Entire Population within the Emergency Planning Zone for the Shoreham Nuclear Power Station, Considering the Effects of Uncontrolled Evacuation, Voluntary Evacuation, Inclement Weather and Accidents." Cordaro et al., ff. Tr. 2337, Attach. 11, at 26.

488. Finally, we note that KLD conducted two computer runs based on the prediction of four accidents to determine their effect on evacuation times. The four predicted accidents were placed randomly on the evacuation network. It was assumed that one accident created a 30 minute blockage while the others created blockages of 15 minutes each. The KLD runs indicated that traffic blockage lowered the average speed of traffic movement over the network by only 3/10s mph and that the effect on total evacuation was negligible. Cordaro et al. (Contention 65), ff. Tr. 2337, at 84-85, Att. 6, Att. 11, at 24-26.

489. Suffolk County witness Polk also estimated that 277 cars are likely to run out of gas during an evacuation of the 10-mile EPZ. Polk, ff. Tr. 2909, at 12-16. LILCO argued that this estimate was overstated because of outdated fuel consumption data used by Mr. Polk and because of a numerical error contained in Mr. Polk's calculations. Cordaro et al., ff. Tr. 2337, at 29-31. Using Mr. Polk's methodology correcting these

two mistakes, Mr. Lieberman estimated that 96 vehicles would run out of gas using Mr. Polk's methodology. Id. at 31.

490. In addition, the Transition Plan specifies that fuel trucks will be stationed at seven locations within or just outside the EPZ; and that each fuel truck will have a capacity of at least 1250 gallons and will dispense three gallons of fuel to each vehicle seeking fuel. Id. Thus, each fuel truck would be able to service at least 400 cars. Id. Given the length of the average evacuation trip out of the EPZ (on the order of 10 miles), three gallons is a sufficient amount of fuel. Accordingly, this Board finds that whether we accept Mr. Polk's estimate, or Mr. Lieberman's corrections to that estimate, it seriously overstates the number of cars that will run out of fuel during an evacuation. Particularly given the fuel allocation program, we find reasonable assurance that few vehicles should run out of gas during an evacuation.

491. The Staff witness, Dr. Urbanik, testified that the impact of traffic accidents, breakdowns and abandoned vehicles is insignificant, although wreckers should be available in the event that a vehicle cannot otherwise be removed from the road. Urbanik, ff. Tr. 3430, at 13. This is so because the number of accidents and breakdowns are few. Id. Even should accidents or breakdowns occur, in most cases the result would be a change in the place in a road network where the delay occurs, and not a change in total evacuation time. Id. Even under the most unlikely circumstances that an accident or breakdown occurs at the critical point in the network, the time to clear the accident would likely be less than 15 minutes. Id.

492. While road construction and repair occur with some regularity in Suffolk County, the location, effect and frequency of such construction and repair can only be speculative. Tr. 3746-47, 3750 (Beach); Cordaro et al. (Contention 65, Supp. II), ff. Tr. 3857, at 27. As NRC Staff witness Urbanik noted, emergency decision makers should include time dependent factors (such as construction or repair of roadways) into their decisions at the time of an emergency, since they cannot be readily determined earlier. See Urbanik, ff. Tr. 3430, at 14.

493. Examples of the dependent factors include weather conditions and road construction. This is the approach expected in NUREG-0654. Id. It is not possible to evaluate every possible scenario because of the great number of combinations. The evacuation time estimate study serves as a basis from which to make informed decisions based on actual conditions. For example, snow removal is not considered in the Applicant's evacuation time estimate studies. The time estimates assume the roads are passable. Road clearing times would have to be added to the adverse weather estimates. Id.

494. Suffolk County also asserts that LILCO's time estimates also fail to account for the absence of adequate shoulders along many EPZ roads. The Intervenor's assert that shoulders are important as a "safety valve," to store a disabled vehicle, to serve as an alternate travel lane when the normal lane is blocked by a disabled car, construction or other obstruction, and to provide access for emergency vehicles. Herr, ff. Tr. 2909, at 43; Tr. 3029 (Herr). The Transition Plan, however, contemplates that roadway shoulders will serve primarily as storage areas for abandoned or disabled vehicles. See Cordaro et al. (Contention 65), ff. Tr. 2337, at 87;

Tr. 2635 (Lieberman). The testimony of Suffolk County witnesses Roberts et al. assumes that roadway shoulders will be used as evacuation roadways, and hence that the "driveability" of those shoulders is important. See Roberts et al. (Contention 65), ff. Tr. 2260, at 68-69. The Transition Plan does not, however, rely on the availability of those shoulders for evacuation traffic.

495. Suffolk County contends that the validity of KLD's "uncontrolled" evacuation time estimates (KLD TM-77) is questionable because it assumes normal traffic control (signals at intersections) would be operating, and there would not be substantial deviation from prescribed routes. Our findings that motorists would disregard conflicting signals (see Findings 478-479, supra) and our discussion of route compliance (see Findings 474-475, supra), are applicable here and on that basis enable us to find no merit in the arguments raised by Suffolk County in this regard.

496. In sum, it is concluded that LILCO's time estimates adequately account for accidents, breakdowns, vehicles running out of gas and other conditions that could affect normal roadway capacity.

Evacuation of Special Facilities (Contention 65.E)

497. Contention 65.E asserts that the early dismissal of children and the evacuation of special facilities and the handicapped will cause congestion and further lengthen evacuation times.

498. Separate estimates are made for special facilities on a facility by facility basis. The important factors are related to the unique characteristics and requirements of each facility. Preparation of patients and obtaining vehicles are the principal determinates of evacuation time for special facilities. Urbanik, ff. Tr. 3430, at 14.

499. The early dismissal of schools and the evacuation of people in special facilities and the handicapped were considered in the evacuation time estimates contained in the LILCO Transition Plan. The Plan assumes that school children will normally be dismissed and bused home from school at the Alert stage. Cordaro et al. (Contention 65), ff. Tr. 2337, at 88; see also McIntire, ff. Tr. 2086, at Q.23. School-to-home travel time data are incorporated explicitly in the statistical analysis detailed in Attachment 10 to the LILCO testimony. A review of that attachment indicates that the return of school children, even during the period when buses are not readily available at the schools, does not measurably affect trip generation distributions. See Cordaro et al. (Contention 65), ff. Tr. 2337, at 91, Att. 10; Urbanik, ff. Tr. 3430, at 14.

500. Additionally, this analysis shows that the total number of vehicles involved in the evacuation of special facilities and of the handicapped will be less than 1 percent of the total of evacuating vehicles. Accordingly, there is no basis to conclude that any increase in evacuation times will result from their presence. Cordaro et al. (Contention 65), ff. Tr. 2337, at 91; Urbanik, ff. Tr. 3430, at 14.

Poor Driver Behavior (Contention 65.F)

501. In Contention 65.F, Suffolk County asserts that (1) stress and anxiety will diminish driving skills during an emergency, resulting in poor driver behavior that will increase evacuation time estimates and (2) the geography of Long Island "may create a feeling of being 'closed in' which may increase the likelihood of poor driver behavior."

502. While the possibility exists that some motorists would behave badly due to stress and anxiety, based on over thirty years of research, the evidence is that a negligible proportion of persons panic in disaster

situations. McIntire, ff. Tr. 2086 at at p. 7. The research covers a range of situations from massive strategic bombing in Europe to the more recent natural and technological hazards including the Three Mile Island accident and the eruption of Mount St. Helens, and other disasters. Id. Panic occurs only under special circumstances, e.g. when people are faced with a highly visible and immediate threat to survival within an enclosed area and escape routes are closed off. Id. Non-cooperative behavior during evacuation is always isolated. Id.

503. While one could hypothesize that increased stress and anxiety will impair judgment (see Herr, ff. Tr. 2909, at 47-48; Saegert, ff. Tr. 2259, at 17-18), an equally plausible hypothesis is that added stress and anxiety levels increase vigilance and result in better driving skills. Cordaro et al., ff. Tr. 1470, at 130-31; Tr. 2502-03 (Lieberman). For example, while stress levels in the population surrounding TMI increased due to the accident, id., there was no evidence that automobile accidents increased during the evacuation at TMI, despite increased traffic volume on highways. Id. at 131-32.

504. Even assuming that decreased driving skills caused by stress and anxiety would cause traffic accidents during an evacuation of the 10 mile Shoreham EPZ, evacuating traffic will be moving at so slow a rate that accidents would be of a minor nature, Cordaro et al., ff. Tr. 1470, at 135, and therefore would not affect traffic time estimates. It has been noted in many studies of other emergencies that accidents and traffic jams are not problems in vehicular evacuations. Id. at 132; Urbanik ff. Tr. 3430, at 13; Tr. 3450-51 (Urbanik).

Estimates for Special Populations (Contention 65.G)

505. Contention 65.G asserts that the Transition Plan does not contain evacuation time estimates for various special populations which cannot rely on private vehicles.

506. However, the Staff witness, Dr. Urbanik noted that separate estimates have been made for special facilities as required by NUREG-0654. The estimates are based on particular requirements of the various facilities, and are contained in Table XV, Appendix A, Revision 1 of the LILCO Transition Plan. These facilities include homes for handicapped, schools, hospitals, and nursing homes. Urbanik, ff. Tr. 3430, at 15; see Cordaro et al., ff. Tr. 2337, at 93-94.

507. Suffolk County presented no testimony on this contention and there is nothing in the record to contradict a finding that the LILCO Transition Plan does contain estimates for the transit-dependent population in the Shoreham EPZ.

Route Spotters (Contention 65.H)

508. Contention 65.H asserts that the evacuation route spotters designated in the LILCO Transition Plan will be ineffective. The responsibility of the evacuation route spotters involves, "[t]raveling through the areas being evacuated to verify and report on evacuation traffic flow as directed by the Evacuation Route Coordinator." Cordaro et al. (Contention 65), ff. Tr. 2337, at 94. The LILCO Transition Plan states that six route spotters will patrol the important evacuation routes listed in Figure 8.1 of Appendix A.

509. While there is no requirement for route spotters, use of route spotters will aid in the evacuation. Each traffic guide will be able to

report traffic conditions by mobile radios. This information would be useful in changing strategies if necessary. In addition, Revision 2 to the LILCO Transition Plan calls for the use of helicopters, following the recommendations of FEMA. Personnel to man these helicopters are in addition to the assigned route spotters and this aerial surveillance will constitute the primary means of route spotting due to its speed and mobility. Cordaro et al., ff. Tr. 2337, at 95. Hence, we find the Transition Plan provisions for route spotters adequate.

The Evacuation Phenomenon (Contentions 23.C, D, and H)

Contention 23.C

510. Contention 23.C asserts that an area by area evacuation of the EPZ is unrealistic, since people will voluntarily evacuate their zone within the EPZ when they perceive neighbors in bordering zones evacuate. The EPZ consists of 19 separate emergency planning zones. The LILCO Transition Plan contemplates choosing zones for evacuation using a "keyhole" configuration.^{42/} The keyhole size and orientation will be chosen using computer dose projections. Which of the 19 emergency planning zones to be evacuated will then be selected based on the correspondence with the chosen keyhole. If any part of a zone falls within the keyhole configuration, then the entire population within the zone will be ordered to evacuate. Cordaro et al. (Contentions 23.C, D, and H), ff. Tr. 2337, at 9.

^{42/} A keyhole consists of a 360° circle of 2 miles around the facility, plus a downwind sector of 67½° out to 5 miles, or a 360° circle of 5 miles around the plant, plus a downwind sector of 67½° out to 10 miles. See Cordaro et al., ff. Tr. 2337, at 9-10, Attach. 14.

511. The Transition Plan does not contemplate "area-by-area" or "staged" evacuation by EPZ area zones as Contention 23.C suggests. Cordaro et al., ff. Tr. 2337, at 10. However, Staff witness, Dr. Urbanik, notes a staged evacuation using the keyhole configuration would be in keeping with the sector concept contained in NUREG-0654. Urbanik, ff. Tr. 3430, at 9-10. Under the Transition Plan, all zones for which evacuation is recommended will be evacuated simultaneously. For example, if only part of a zone fell within the keyhole, all of that zone will be evacuated. There are, however, potential situations where protective action recommendations may need to be combined to account for wind changes. In such cases, evacuation of the entire 5 or 10 mile EPZ could be recommended. Cordaro et al. (Contentions 23.C, D, and H), ff. Tr. 2337, at 10. Consequently, contrary to the assertions in Contention 23.C, "neighbors" will not sit by while others evacuate. While the keyhole concept does envision evacuation of, for instance, only southern parts of the EPZ, people in the north are not "neighbors" of these zones as the Contention suggests. Consequently, even if people in areas not at risk elect to evacuate at the same time as people in other areas who are at risk evacuate, and a wind shift occurs placing these other areas at risk subsequently, the public already would have evacuated. In view of all the considerations noted above, we find this contention to be without merit.

Evacuation Time Estimates Assuming the Evacuation Shadow Phenomenon
(Contention 23.D)

512. Contention 23.D asserts that voluntary evacuees from outside the EPZ -- the so-called "shadow phenomenon" -- will impede traffic

evacuating the EPZ, thus increasing the evacuation times presented in Appendix A of the LILCO Plan. In response to this concern, KLD performed a series of model runs to examine the impact of a voluntary evacuation from areas outside the EPZ on the ability of traffic originating within the EPZ to leave the 10-mile EPZ. Cordaro et al. (Contentions 23.C, D, and H), ff. Tr. 2337, at 13, Att. 11. The effects of this shadow phenomenon were studied for both a "controlled" and an "uncontrolled" evacuation. Id. Suffolk County also presented analyses designed to study the impact of the shadow phenomenon. Polk, ff. Tr. 2909, at 5, Att. 3.

513. The KLD study considered the shadow phenomenon under five scenarios, all of which assumed an evacuation of the entire 10 mile EPZ. For a controlled evacuation, two runs were made, one assuming 25% and the other 50% voluntary evacuation of a zone between 10 and 20 miles of Shoreham under normal weather conditions. For an uncontrolled evacuation, three runs were made, one assuming 25% and one assuming 50% voluntary evacuations under normal weather conditions, and one assuming 50% voluntary evacuation under adverse (winter) weather conditions. Cordaro et al. (Contentions 23.C, D, and H), ff. Tr. 2337, at 14.

514. For these runs, KLD assumed that voluntary evacuees in areas outside the EPZ would begin their evacuation trips over a period of 4 hours, compared to a trip generation period of 2 hours for people living within the EPZ. Cordaro et al. (Contentions 23.C, D, and H), ff. Tr. 2337, at 16-17. This difference in trip generation period for people outside the EPZ was based on a number of assumptions including (1) longer notification times for areas outside the EPZ because of limited siren

coverage, (2) no special dismissal program for school children in these areas would be in place, and (3) a likely perception by people in these areas that the incentive to evacuate rapidly is not as compelling as in those areas closer to the plant. Id.

515. Suffolk County witnesses Herr and Pigozzi argued that this two-hour difference in trip generation period was unacceptable. See Herr, ff. Tr. 2909, at 53; Pigozzi, ff. Tr. 2909, at 47. Each witness based his conclusion on the instinctive perception that notification time would not be delayed in areas outside the 10-mile EPZ. Id. Given the lower level of urgency likely to be perceived by persons living outside the EPZ, KLD's trip generation assumption appears appropriate.

516. The KLD study shows that for a "controlled" evacuation of the entire 10-mile EPZ and a voluntary evacuation of 25% of the population living from 10 to 20 miles from the plant, the total evacuation time for people within the 10-mile EPZ would lengthen by 20 minutes. For a 50% voluntary evacuation, the time would increase by 1 hour 40 minutes. For an "uncontrolled" evacuation of the entire 10-mile EPZ, 25% and 50% voluntary evacuations of people from the 10 to 20 mile region would increase total evacuation time for people within the EPZ by 30 minutes and 1 hour 5 minutes, respectively. Cordaro et al., ff. Tr. 2337, at 17-18, Att. 15.

517. PRC Voorhees developed estimates for Suffolk County that take the shadow phenomenon into account, using data derived by Professors Zeigler and Johnson and Dr. Cole. The PRC Voorhees analysis, using its EVACPLAN model, concludes that during the summer months, under normal weather conditions and with no breakdowns or other road impediments, evacuation

of the EPZ will take approximately 17 hours. During the rest of the year, evacuation will take approximately 11 hours. These estimates, of course, increase if there is adverse weather. Id., at 5; SC Exs. 6, 7.

518. LILCO presented testimony disputing the estimates presented by PRC Voorhees, claiming several flaws in the study, including: the use of only four unconnected, east-west evacuation routes; the failure to allow flow from one evacuation route to another to utilize the full roadway network; and the use of an analyses based upon a single, presumed assignment of evacuees to evacuation routes. Cordaro et al. (Contention 65, Supp. 1), ff. Tr. 2337, at 11-12. As a result, roadway capacities were, in some case, unrealistically underutilized; routing assignments were arbitrary; and unnecessarily extreme bottlenecks were permitted to occur. Id.

519. The basic differences between the estimates produced by KLD and PRC Voorhees centers on whether it is appropriate to include voluntary traffic travelling from the East End of Long Island on the Sunrise Highway in the traffic estimates. The Sunrise Highway forms part of the Southern boundary of the EPZ and KLD assumes evacuating traffic on this road never enters the EPZ, but is routed around the EPZ. Cordaro et al., ff. Tr. 2337, at 15. On the other hand, PRC Voorhees considered this traffic along with evacuation traffic from the EPZ because it argued that the Sunrise Highway constitutes an access route that should be considered part of the EPZ. Piggozzi, ff. Tr. 2909 at 46; Herr, ff. Tr. 2909 at 53. Considering that virtually all traffic from the East End is outside the 10 mile EPZ and, given the assumption people would not perceive it in

their best interests to move closer to the source of danger, we agree with the assumption in the KLD study that virtually all of this traffic will take evacuation routes outside the EPZ. Hence, we find that evacuation of the 10 mile EPZ is unlikely to be affected by voluntary evacuation traffic travelling on the Sunrise Highway since this traffic borders and does not enter the EPZ.

Access Control to the EPZ (Contention 23.H)

520. Contention 23.H asserts that the LILCO Transition Plan fails to provide adequate control of access at the EPZ perimeter, thus violating the requirements of NUREG-0654, Section II.J.10.j. At the outset, this Board notes that Suffolk County's contention raises concerns about perimeter control during an evacuation of the Shoreham EPZ. This concern is not addressed by NUREG-0654 II.J.10.j, which involves control of access to evacuated areas.

521. The LILCO Transition Plan assigns personnel at all major entrances to the EPZ to guide traffic entering and leaving the EPZ at those locations. Cordaro et al. (Contentions 65), ff. Tr. 2337, at 21. These traffic guides will deploy traffic cones in a manner that will indicate to the public that entry into the EPZ at these points is discouraged, but they will not attempt to screen or deter any vehicles seeking to enter the EPZ, or prohibit their entry in any way. Id. Their primary function will be to facilitate the evacuation of vehicles from inside the EPZ. Id.

522. Suffolk County presented testimony asserting that traffic guides will be unable to inhibit any traffic into the EPZ with any degree of success. Indeed, the SCPD supplied lists of intersections outside, but

near the edge of, the EPZ where traffic guides should be located if entry into the EPZ is to be minimized. Under the Plan, however, many of these locations will not be manned. Roberts et al., ff. Tr. 2260, at 65, 76-78 and Atts. 12, 13; Tr. 3360-65 (Roberts). The SCPD witnesses also testified that the traffic guides will not be able to discourage access to the EPZ because they lack the authority, training and experience to control traffic effectively. Thus, evacuees who affirmatively desire to enter the EPZ disregard whatever instructions the traffic guides give them. Indeed, even trained, experienced police officers would find controlling access into the EPZ to be exceedingly difficult. Roberts et al., ff. Tr. 2260, at 66.

523. While it may be true that access to the EPZ will be totally prohibited by the traffic control plan contained in the Transition Plan, we do not perceive this to be a significant problem during an evacuation. People will be in haste to leave, according to the County witnesses (see Finding 469, supra) and consequently, any persons desiring access to the EPZ during an evacuation would likely disregard any perimeter control, even that of police officers, as pointed out by Suffolk County testimony cited above.

524. Thus, we do not find this a deficiency in the Transition Plan on the basis of the criteria of NUREG-0654 cited by the Intervenors in Contention 23.H.

Conclusion on Shadow Evacuation

525. LILCO has provided evacuation time estimates for 36 separate cases or scenarios including controlled, uncontrolled and "shadow evacuation" cases which is appended hereto as Table 1. Whichever of

these cases will prevail during an emergency, we find the inclusion of all these cases adequate for decision makers to rely on for making protective action recommendations. In this regard, we would note that given that the area surrounding the Shoreham EPZ has substantial development, given the difficulty of controlling access on arterial highways, and given that local officials do not support the 10 mile EPZ concept, the estimates including the evacuation shadow phenomenon may be appropriate for Shoreham. The choice as to what estimates to rely on must be determined depending upon the circumstances prevailing during an emergency.

Conclusion

526. The Board finds the assumptions and methodology in the Applicant's evacuation time estimate studies are consistent with the guidance of NUREG-0654. LILCO has provided reasonable estimates that can be used by emergency planners for making informed decisions. We find that there is reasonable assurance that the estimates indicate the sensitivity of the evacuation times to a number of relevant factors (i.e., population and road conditions) such that decision makers can adjust for actual conditions if an accident were to occur at Shoreham.

B. Road Obstacles and Cars Without Fuel (Contention 66)

527. Contention 66 asserts that the Transition Plan provisions pertaining to removal of roadway obstacles and dispensing of fuel to motorists will not be adequate in a Shoreham emergency. Specifically, the subparts of this Contention concern: the number of tow trucks needed to remove blockages on evacuation routes; whether tow trucks will

be able to remove obstructions expeditiously in light of heavy evacuation traffic; the asserted lack of Plan provisions for evacuation of motorists with disabled cars; the realism of LILCO's assumption that normal snow removal services will be provided during a radiological emergency; and the adequacy of LILCO's fuel distribution system.

528. Testimony on this Contention was filed by LILCO, Suffolk County, New York State and FEMA. LILCO's prefiled testimony on Contention 66 (hereinafter, Cordaro et al. (Contention 66), ff. Tr. 6685) was sponsored by Dr. Matthew C. Cordaro, Mr. John A. Weismantle, and Mr. Edward B. Lieberman; these witnesses testified as a panel. LILCO's testimony on Contention 97 (hereinafter, Cordaro et al. (Contention 97), ff. Tr. 6950) was sponsored and testified to by Dr. Cordaro, Mr. Weismantle, and Mr. Michael L. Miele. FEMA's testimony was sponsored by Mr. Thomas E. Baldwin, Mr. Joseph H. Keller, Mr. Roger B. Kowieski, and Mr. Philip H. McIntire (hereinafter, Baldwin et al., ff. Tr. 12,174); these witnesses testified as a panel. Suffolk County's testimony, which addressed only Contention 66 (hereinafter, Monteith et al. (Contention 66), ff. Tr. 6868), was sponsored by Assistant Chief Inspector Joseph L. Monteith, Deputy Chief Inspector Richard C. Roberts, Deputy Inspector Philip McGuire, Deputy Inspector Michael J. Turano, Jr., and Captain Edwin J. Michel and was testified to by a panel consisting of Messrs. Monteith, McGuire, Turano, and Michel. New York State's testimony, covering Contentions 66.D and 97.B (hereinafter, Gibbons, ff. Tr. 7005), was sponsored and testified to by Mr. Thomas D. Gibbons.

Provisions For Tow Trucks (Contention 66.A)

529. The LILCO Transition Plan specifies that up to twelve road crews will be assigned to remove roadway obstructions during an evacuation. The number of road crews that will actually be assigned will depend on the size of the area to be evacuated. Cordaro et al. (Contention 66), ff. Tr. 6685, at 6. Two major factors were considered in the selection of twelve road crews: (1) the number of obstructions likely to need clearing, and (2) the time needed to clear a given obstruction. Id. at 7.

530. Consistent with its testimony on Contention 65 concerning the number of expected accidents, LILCO estimated that four accidents or breakdowns would occur during an evacuation of the Shoreham 10 mile EPZ. Id. at 7-8. See Findings 483-485, supra. LILCO further testified that not all of these accidents/breakdowns would result in a disabled vehicle and hence the need for road crew response. Cordaro et al. (Contention 66), ff. Tr. 6685, at 7-9. Finally, LILCO testified that rapid response times would be realized because road crews will be assigned to intersections of major east-west and north-south evacuation routes. Id. at 9.

531. FEMA witnesses stated that the provisions in the Plan for removal of disabled vehicles were adequate. Baldwin et al., ff. Tr. 12,174, at 63; Tr. 12,802 (Baldwin). FEMA witnesses explained that their conclusion about the adequacy of the Plan's tow truck provisions was based on the fact that such provisions are in the Plan, and not based on a judgment of whether the particular number or location of tow trucks is adequate. Tr. 12,802-03 (Baldwin). FEMA pointed out that NUREG-0654 does not

provide any no specific guidelines for determining whether a specific number of tow trucks is adequate. Id.; Tr. 12,815 (Kowieski).

532. Suffolk County considers that the number of tow trucks LILCO intends to employ is too few if one considers the land area to be covered and the expected volume of evacuation traffic. According to the County witnesses, the EPZ covers roughly 160 square miles of land, and in an evacuation of the full EPZ, approximately 50,000 vehicles will travel 304,000 vehicle-miles (excluding the effects of the shadow phenomenon). Monteith et al., ff. Tr. 6868, at 7. Relying on their traffic control experience, the SCPD witnesses testified that 12 tow trucks are far too few to cover this area and traffic volume. Tr. 6879-80 (McGuire, Monteith, Michel); 6916-17 (Michel). The SCPD witnesses were unable to identify the precise number of trucks that would be necessary, but did note that for a Shoreham demonstration involving approximately 20,000 people, 8 tow trucks were available. Tr. 6930-34, 6941 (Michel, McGuire, Monteith).

533. The County premised its testimony on this issue on its earlier testimony that 141 accidents would occur in an evacuation. See Findings 485, supra. We previously concluded that the LILCO estimate of the number of accidents is more realistic. Id. Consequently, given our earlier conclusion about the expected number of accidents, we find the provisions in the Transition Plan adequate.

Time Needed To Remove Obstacles (Contention 6C.B)

534. The time necessary to remove an obstruction from a roadway depends both on the proximity of the road crew to the obstruction and the

congestion it will encounter in reaching that obstruction. Cordaro et al. (Contention 66), ff. Tr. 6685, at 10. The LILCO witnesses testified that steps had been taken to minimize each of these factors. Road crews have been located on evacuation routes with the largest traffic flow at spacing intervals of two to four miles. Id.; Tr. 6734-35 (Lieberman). In addition, the crews have been placed mainly south and west of the plant at radial distances of five to ten miles. Cordaro et al. (Contention 66), ff. Tr. 6685, at 10. Thus, the greatest probability is that these road crews will travel in a counter flow direction to evacuating traffic in reaching an obstruction. Tr. 6726 (Lieberman).

535. The SCPD witnesses testified on behalf of Suffolk County that under LILCO's deployment strategy, tow trucks are required to travel on evacuation routes in the same direction as the evacuating traffic and while on evacuation routes, LILCO's trucks will travel only as fast as the evacuating traffic (according to LILCO, at an average of 6.8 mph). Monteith et al., ff. Tr. 6868, at 12. They go on to state even when LILCO's trucks travel against evacuation flow, they could still encounter substantial delays due to pre-evacuation travel. Tr. 6892-93 (Michel).

536. The Board, however, finds first, few accidents or breakdowns requiring towing are expected, supra at Finding 485, second that we have already found pre-evacuation travel unlikely to impact evacuation traffic, supra at Finding 468, and third, given the relatively short distances the road crews would need to travel to reach an accident or breakdown, we have reasonable assurance the response of the road crews

and tow trucks will be expeditious under the circumstances of an evacuation of the 10 mile EPZ.

Evacuation of Persons Whose Cars Become Disabled (Contention 66.C)

537. LILCO testified that the Transition Plan does not explicitly provide for the evacuation of persons whose cars become disabled due to breakdowns or accidents. Cordaro et al. (Contention 66), ff. Tr. 6685, at 11; Tr. 6794 (Weismantle). LILCO also testified, however, that in its view, such express treatment is not required. Rather, the Plan assumes people whose automobiles become disabled will be offered rides by fellow evacuees. Cordaro et al. (Contention 66), ff. Tr. 6685, at 12. Additionally, LILCO testimony pointed out these people could catch a ride on one of the buses transporting people from the EPZ, or could ride with a road crew. Id. at 11.

538. The County's witnesses, however, noted that most evacuating vehicles will be filled with family members and their personal possessions, and that evacuees may thus be unable or unwilling to pick up stranded persons. Monteith et al., ff. Tr. 6868, at 14-15; Tr. 6920-22 (Monteith). The County also testified that relying upon evacuation buses to pick up stranded evacuees is feasible only if they become stranded on a bus route (Tr. 6921 (Monteith)), and evacuation buses generally do not traverse the Long Island Expressway or Sunrise Highway. Tr. 6796-97 (Lieberman).

539. Given all the testimony in this record concerning human response to disasters, see Section I.A.B., infra. we do not find the County's concerns in this regard plausible. We agree with LILCO's assumptions that fellow evacuees will help out their fellow human beings, and given

the few incidents of this type expected, we see no inadequacy in the Transition Plan in this regard.

Snow Removal (Contention 66.D)

540. All parties agreed that LILCO has no agreements with local organizations for snow removal services. Tr. 6801 (Weismantle); Cordaro et al. (Contention 66), ff. Tr. 6685, at 15; Gibbons, ff. Tr. 7005, at 3; Baldwin et al., ff. Tr. 12,174, at 65. However, LILCO's position is that such agreements are not needed, since local governments have a continuing responsibility to perform their normal responsibilities. Cordaro et al. (Contention 66), ff. Tr. 6685, at 13; Tr. 6804 (Weismantle), 6805 (Cordaro). For example, LILCO testified that if an Unusual Event or Alert classification was in effect and there was no immediate hazard to the snow removal crews, it would remain the appropriate government's responsibility to remove the snow. Tr. 6805 (Cordaro); see also Tr. 7012-13, 7036-37 (Gibbons).

541. Further, LILCO testified that even if snow removal crews ceased functioning during an emergency at Shoreham, there would be little effect on the Transition Plan. Cordaro et al., ff. Tr. 6685, at 13. This would be so in the following two all-inclusive scenarios for adverse weather conditions suggested by LILCO which could exist when the siren system was sounded for an emergency and snow removal crews were assumed to abandon their jobs. Id. In the first scenario, if light to moderate snow were falling, an evacuation order would be premised on the adverse winter weather evacuation time estimates contained in the Plan, and further accumulation of snow following the cessation of plowing would not affect the assumptions made in computing those evacuation time

estimates. Id. In the second scenario, if a heavy snowfall or blizzard condition were assumed, then roads (particularly side streets and driveways) would be literally or nearly impassable. As a result, the protective action recommendation would be to shelter. Id. at 14. Continued plowing of major roadways within the EPZ would not change that recommendation. Id.; cf. Tr. 6899 (Turano, Monteith) (impassability of roads along north shore). Further, all parties were in agreement that should an evacuation be ordered, continued plowing would be counter-productive since snow removal equipment was likely to impede, rather than aid, traffic flow. Tr. 6815 (Lieberman), 6898 (Monteith), 7008-09 (Gibbons).

542. The State and County witnesses testified, however, that in their view many of the major Shoreham EPZ evacuation routes are particularly susceptible to snow and ice hazards; a standard police cruiser cannot navigate those roads safely without four-wheel drive. Monteith et al., ff. Tr. 6868, at 16-17; Tr. 6899 (Turano), 6899-6900 (Monteith). They also testified that snowfall need not be unusually heavy to cause traffic on any road in the Shoreham 10 mile EPZ to come to a standstill; a light dusting could be enough to snarl traffic. Tr. 6898, 6900 (Michel, Monteith); Monteith et al., ff. Tr. 6868, at 17. In some cases, they stated even 4 inches of snow could render a road impassable. Tr. 7026 (Gibbons).

543. LILCO advanced several arguments on this point, including the following: snow removal operations can be expected to occur at least up to the point when the sirens sound so that roads will be reasonably clear at the time of an evacuation; additional snow or ice accumulation would

have no effect because the time estimates for adverse winter weather conditions allow for an additional 90 minutes (Tr. 6814, 6819 (Weismantle)); if less than 4 inches of snow were to fall, roadways would still be passable (Tr. 6814-15 (Weismantle)); and if greater snowfalls were to occur, a sheltering recommendation would be issued in "virtually all cases" (Cordaro et al., ff. Tr. 6685, at 13-14; Tr. 6820-22 (Weismantle)) and, the deployment of snow removal equipment during an evacuation would be undesirable because snow plows would impede traffic and, in the absence of drifting, any snowfall, regardless of depth, will reduce highway capacity by no more than 30%. Tr. 6815-17 (Lieberman).

544. Mr. Gibbons of New York State suggested, however, that the State Department of Transportation's quarterly engineering newsletter reports that snow and ice on roads reduces capacity by approximately 50%, provided that the depth is such that the highway still can be traversed. Tr. 7026 (Gibbons).

545. The Staff witness, Dr. Urbanik, testified that road clearing time would have to be added to the adverse weather estimates contained in Applicant's ETE's. Urbanik, ff. Tr. 3430, at 15.

546. Given the record before us, the Board concludes that there are no provisions for snow removal in the Transition Plan, and as a consequence, during or after a snow storm evacuation may not be a feasible alternative for the population in the 10 mile Shoreham EPZ. However, we do not find this renders the Transition Plan inadequate. As we noted in our findings in Section VII, infra., sheltering is a feasible alternative to evacuation in such a situation, consistent with the purposes of emergency planning.

Fuel Disbursement (Contention 66.F)

547. Contention 66.F asserts that LILCO will be unable to provide fuel for evacuees and that its fuel distribution scheme will cause congestion and delays in evacuation.

548. The Transition Plan provides for fuel to be dispensed to vehicles at seven sites within or near the Shoreham 10 mile EPZ. These fuel allocation sites will be located along the major east-west and north-south evacuation routes. Cordaro et al. (Contention 66), ff. Tr. 6685, at 14-15. Located at each site will be a fuel truck having a capacity of at least 1200 gallons or, assuming a limit of three gallons per evacuating vehicle, the ability to service 400 vehicles. Id. at 15.

549. While exact locations (as distinguished from general areas) have not been chosen for these fuel allocation sites, Tr. 6837, 6842-43 (Lieberman), the considerations that LILCO will use in selecting these locations are adequate. These considerations include placing allocation sites in areas adjoining evacuation roadways, providing sufficient space to hold multiple vehicles, and clearly indicating a limit of three gallons per car. Cordaro et al. (Contention 66), ff. Tr. 6685, at 14-16; Tr. 6838 (Lieberman).

550. The Board also notes that FEMA pointed out this provision in the Plan is an "extra". There is no specific requirement for supplying gas along evacuation routes, and the provisions for removing obstacles (using tow trucks) has been found adequate by FEMA. Keller, Tr. 12,817-818. See our Finding 531, supra.

551. Hence the Board finds this provision in the plan adequate.

Conclusion

552. For the reasons discussed above, the Board finds that the contentions involving road obstacles and cars without fuel are without merit and do not render the Transition Plan inadequate.

C. Weather (Contention 97.B)

553. Contention 97.B asserts that if a heavy snowfall and a severe accident at Shoreham occur simultaneously, there is no reasonable assurance that the evacuation procedures in the Plan could be implemented. LILCO's response to Contention 97 is two-fold: heavy snows are rare on Long Island; and, even if roads became impassable due to heavy snow, sheltering, not evacuation, will be the recommended protective action, which can be ordered by the LERO Director from any location even if the EOC cannot be manned. Cordaro et al., ff. Tr. 6950, at 8, 10; Plan, App. C, at II-4; Tr. 6982-91 (Cordaro, Weismantle).

554. Suffolk County attempted through cross-examination of the LILCO witnesses to establish that during a severe storm the EOC may not be activated (hence protective action recommendations could not be made), see Tr. 6982-6991, and that the Director of Local Response would be unable to determine whether the roads in the EPZ are passable. See Tr. 6967-6980.

555. LILCO witnesses, however, responded to these concerns, noting that for a sheltering recommendation, all that is necessary is that a message be broadcast to the public telling them to shelter. Tr. 6982 (Weismantle). Special facilities would be notified by tone alert radios. Tr. 6984 (Weismantle). Functions other than notification to

the public, such as dose assessments, can also be carried on without activation of the EOC as part of the onsite emergency response organization. Tr. 6989 (Weismantle).

556.- Further, information on the passability (or lack thereof) of roads is available to the Director of Local Response from several sources, including weather service information and the EOF and the TSC and the entire on-site organization. Tr. 6970 (Weismantle); Tr. 6979-80 (Cordaro); Tr. 6981-82 (Miele).

Conclusion

557. We find Suffolk County concerns as to whether sheltering could be implemented during severe storm weather unfounded. We find reasonable assurance, given the record before us, that the Transition Plan contains adequate provisions to contend with the conditions which may exist if an accident at the Shoreham plant occurred during severe weather conditions.

D. Buses for the Public (Contentions 67, 24.F.2, and 24.I)

Contention 67

558. Contention 67 raises a number of issues about the bus transportation system provided for in the Transition Plan and the evacuation of EPZ residents who do not have access to automobiles. The issues include the number of potential evacuees who will require bus transportation, the number of buses and bus trips needed to serve this group, the time needed to complete bus routes, and the adequacy of the sheltering provisions at the eleven transfer points. Suffolk County Contentions 24.I and 24.F.2 raise questions about the sufficiency of the letters of agreement LILCO has obtained for use of the designated transfer points and buses.

559. Direct testimony on Contention 67 was filed by LILCO, FEMA, Suffolk County and New York State, and cross-examination on this testimony by the parties covered five hearing days.

560.- Before dealing with the specific subparts of Contention 67, we review briefly the details of the bus transit plan contained in Appendix A to the LILCO Transition Plan. The transit plan is based on the establishment of 11 transfer points, which act as depots. Cordaro et al. (Contention 66), ff. Tr. 7980, at 12. At each transfer point there will be two categories of buses: route buses and transfer buses. Id. Route buses will depart from transfer points, travel along assigned routes picking up passengers, and then return with them to the transfer points. Id. at 12-13. Route buses are scheduled to make one or more runs along their assigned routes, depending on the length of the route, returning each time to the transfer point. Id. at 15. Transfer buses make only one trip, from the transfer point to an assigned relocation center, carrying passengers who have been transferred from route buses. Id. at 13. Upon arrival at the transfer points, route bus passengers will either transfer from the route buses to waiting transfer buses or will remain on route buses -- which will then be, by definition, transfer buses -- and will proceed directly to the assigned relocation center. Id. It is not contemplated that transfer buses will return to the transfer points following their arrival at relocation centers. Id.

Number of Buses Needed (Contention 67.A)

561. Contention 67.A asserts that the 333 buses provided in the LILCO Transition Plan for the evacuation of that portion of the EPZ

population presumed to be without access to automobiles are insufficient to accomplish this purpose, because LILCO has underestimated the transit-dependent population and has assumed too high a bus capacity factor.

562. The Plan assumes that 11,097 persons would need bus transportation during an evacuation. Cordaro et al., ff. Tr. 7980, at 11. While LILCO and the County presented conflicting evidence as to whether the number would be much lower (LILCO suggested 6,500 persons) or much higher (the County suggested between 13,000 and 22,000 persons), Cordaro et al., ff. Tr. 7980, at 7, 11; Tr. 8081-83 (Cordaro, Weismantle); Herr and Michel, ff. Tr. 8150, 9-21; Tr. 8485-04 (Herr). The numbers are estimates since they are based on unquantifiable factors such as predicting how many commuters would return home to unite with their families. See Tr. 8487 (Herr), 8037-41 (Lieberman); Herr and Michel, ff. Tr. 8150, at 16 and Table 6. Given the record before us, we find the number of persons assumed in the plan (11,097) reasonable.

563. LILCO estimated the population of each of the 19 sectors of the EPZ, what percentage of this population would need bus transportation, and assumed that each 40-passenger route bus would carry 30 passengers. Tr. 8076 (Lieberman); Cordaro et al., ff. Tr. 7980, at 14. This assumption represented a 75% load factor, based on an assumed seating capacity of 40 adults. Cordaro et al., ff. Tr. 7980, at 14. LILCO assumed no standees to account for storage of suitcases, bedrolls and other possessions in the aisles (Tr. 6419-20 (Robinson)), and asserted that these assumptions were conservative because in a real emergency, passengers would consist of both adults and children, and luggage could be stored on laps, under seats or in aisles. Tr. 8079-81 (Weismantle,

Lieberman). Based on this load factor, LILCO then calculated that it would need 333 buses to make 474 trips: 236 route buses (for 377 trips), plus 97 transfer buses (one trip each), which corresponds to an average load factor of 75%. Cordaro et al., ff. Tr. 7980, at 15.

564. New York State witnesses testified that the number of buses needed to transport persons from the EPZ was significantly higher than that calculated by LILCO. The State estimate was based on two grounds: first, buses should be limited to a single run, and second, that LILCO should have used a bus carrying capacity of 22.5 passengers rather than the 30 passengers assumed by LILCO. Acquario et al., ff. Tr. 8289, at 7-9. New York State witnesses suggested that limiting route buses to a single run would have two effects: it would improve the flexibility of the transit plan, and would also lower the risk of driver exposure to radiation. Id. at 7-8. LILCO witnesses testified in response to these concerns that the schedules contained in Appendix A are not rigid; buses can make additional runs if people remain on given routes, or that buses can be reassigned to other routes by the transfer point coordinator to meet demand/supply imbalances. See Tr. 8082-84 (Lieberman, Weismantle). Thus, LILCO's transit plan already possesses flexibility. New York State's concern about driver exposure is without basis. All drivers will be given dosimetry equipment which they will be instructed to check regularly and to take appropriate action if necessary. See Tr. 8297 (Albertin, Knighton).

565. The dispute over the carrying capacity of buses centers on LILCO's analyses, which assumed the physical capacity of a bus was 40 adults plus luggage. Cordaro et al. (Contention 66), ff. Tr. 7980, at 8;

Tr. 8079-80 (Lieberman, Weismantle). On the other hand, New York State witnesses testified that the maximum adult capacity should be limited to 30 passengers because of the luggage evacuees will seek to carry. Acquario et al., ff. Tr. 8289, at 8. As noted above, LILCO witnesses testified, however, that luggage can be stored under seats, in the aisle or on people's laps. Tr. 8079-80 (Lieberman, Weismantle). Additionally, bus passengers will be a mixture of adults and children, which makes a nominal capacity of 40 persons based solely on adults conservative, since children can sit on adult laps. Finally, LILCO assumes that during an evacuation a number of bus passengers are likely to be willing to stand. Tr. 12,868 (Keller); see also Cordaro et al. (Contention 66), ff. Tr. 7980, at 14. If this is so, the nominal seating capacity of the buses may understate the actual effective capacity.

566. However, in calculating the number of route buses, LILCO assumed that each bus would carry 30 passengers -- a load factor of 75% based on adults only -- in order to account for uncertainties in the spatial distribution of the EPZ population needing bus service. Cordaro et al. (Contention 66), ff. Tr. 7980, at 14. New York State witnesses also suggested that a 75% load factor is appropriate in calculating the number of route buses. See Acquario et al., ff. Tr. 8289, at 8-9.

567. The Board agrees that a bus capacity figure of 30 passengers per bus is reasonable.

Evacuation Time Estimates - Buses (Contention 67.C)

568. Suffolk County Contention 67.C asserts that bus evacuation times will be far longer than those presented in the Transition Plan.

Specifically, the County argues that LERO will have problems mobilizing buses and bus drivers, the route times will not be met because of heavy congestion, and that the last transfer buses will not be able to clear the EPZ within 15 minutes as stated in the Plan. Herr and Michel, ff. Tr. 8150, at 23-24.

569. With regard to the mobilization of buses and bus drivers, we have already concluded that LERO can be mobilized in a timely manner. See Findings in Section IV.B, supra. On cross-examination Mr. Lieberman testified that LILCO has performed detailed analyses of three extreme accident scenarios to determine how mobilization efforts would impact on the bus schedules contained in Appendix A. Tr. 8133-36 (Lieberman). With the exception of the extreme case of an immediate general emergency with an evacuation of the entire EPZ during a school day, Mr. Lieberman testified that the bus schedules in Appendix A could generally be met and that the last portion of each schedule could be met exactly. See Tr. 8136 (Lieberman).

570. In the extreme case of an immediate general emergency with an evacuation of the entire EPZ during a school day, buses would be delayed in arriving at transfer points; however, the automobile-owning public evacuation would also be delayed because of the time necessary to position traffic guides. Tr. 8116-18 (Weismantle, Lieberman). Accordingly, the uncontrolled evacuation time estimates would be pertinent and protective action recommendations would be made using those estimates. Id.

571. New York State witnesses testified that LILCO's predicted 7 mph speed during pick-up is not realistic because the literature on the average speed of buses performing normal pickup and drop-off functions

relied upon by LILCO (Tr. 8110-11 (Lieberman)), does not realistically reflect the conditions that will be present during an evacuation.

Acquario et al., ff. Tr. 8289, at 10-11. However, buses are not expected to begin to service their routes until 2 hours and 15 minutes after the declaration of an emergency (Plan, App. A, at IV-74b); and the route times which underlie the bus schedule were based on conservative travel speed assumptions or calculated speeds from the DYNEV model, whichever was lower. Cordaro et al. (Contention 66), ff. Tr. 7980, at 18-19; Tr. 8102-06 (Lieberman). The projected speeds during pick-up, thus, appear realistic.

572. We note that Suffolk County concerns regarding this issue were based on projected delays in mobilization of LERO workers and projected traffic congestion not accounted for in LILCO's evacuation time estimates. These issues have already been discussed in our findings, Section IV.B, infra, and consequently, for these reasons also we find LILCO bus evacuation times reasonable.

Transfer Points (Contention 67.D)

573. In Contention 67.D, Suffolk County asserts that transit-dependent individuals will potentially be exposed to health-threatening doses of radiation as a result of the location of the eleven transfer points and the lack of effective sheltering at those facilities. Four of the eleven transfer points are located within the EPZ at distances from 6 1/2 to 7 miles from the Shoreham plant; the remaining seven are located outside the EPZ at distances from 10 to 14 miles. Cordaro et al. (Contention 66), ff. Tr. 7980, at 20.

574. FEMA's witnesses testified that the Plan has no procedures detailing how evacuees at transfer points would be protected. Baldwin et al., ff. Tr. 12,174, at 67. Mr. Baldwin testified that it would be prudent to have transfer points outside the EPZ so evacuees would not be at risk. Tr. 12,885-86 (Baldwin).

575. LILCO asserted there will be no waits at transfer points of more than 10 minutes (Cordaro et al., ff. Tr. 7980, at 21-23), that evacuees will not be exposed to inclement weather because route buses may not discharge passengers unless a transfer bus is waiting (Tr. 8115-16 (Lieberman)), and that persons who evacuate by bus will receive the same radiation dose as persons who evacuate by private automobiles. Tr. 7998-99 (Weismantle).

576. The State and County witnesses stated that the buses will encounter traffic conditions which will render LILCO's dispatching and routing schedules meaningless. Accordingly, all the assumptions upon which its evacuation time estimates are based will be wrong. Herr and Michel, ff. Tr. 8150, at 23-24. In this regard, once again we note that the County has raised evacuation time estimate issues and, given our findings in this and other area (e.g. mobilization, notification of LERO workers), find the provisions in the LILCO plan for buses for the transit-dependent population provides reasonable assurance that appropriate measures are available to protect the public in the event of a radiological emergency at Shoreham.

Letters of Agreement (Contention 24.I)

577. In Contention 24.I, Suffolk County alleges that the LILCO Plan does not include letters of agreement with the owners of designated transfer

points not owned by LILCO, and therefore there is no assurance that LILCO would be permitted to use the areas relied upon in the Plan as transfer points.

578.- Seven of the 11 transfer points are not owned by LILCO. Cordaro et al., Tr. 4/6/84, Vol. II, at 15. However, LILCO has obtained Letters of Agreement with owners of these properties allowing LILCO to use these properties as vehicle staging areas in accordance with the LILCO Transition Plan. Id. at 15-18.

579. These agreements extend through the early part of 1985 and most contain options for renewal at the end of the current term. Id., Attch. 22.A, B, D, F, G and H.

580. We find these Agreements are currently adequate. FEMA, during the course of a graded exercise, will test LILCO's ability to field the necessary resources, such as those outlined in the Letters of Agreement. Baldwin et al., ff. Tr. 12,174 at 12. Additionally, FEMA also testified that, even in the absence of Letters of Agreement with owners of transfer points, the RAC review did not find this an area of concern that would be sufficient to render the Plan inadequate in this regard. Id. at 16.

581. We agree and find Suffolk County's Contention on 24.I without merit.

Letters of Agreement: Buses (Contention 24.F.2)

582. This contention asserts that if an emergency occurred when school was in session, LILCO would not have access to buses to evacuate persons without access to an automobile (including the homebound, nursing

and adult home residents, nursery school students and hospital patients) because LILCO's agreements with school bus companies are subject to the preexisting commitments of those companies to school districts.

583.- Of the 1,236 buses covered by LILCO's agreements, approximately 938 are subject to prior commitments to schools both within and outside the EPZ. Cordaro et al., Tr. 5/20/84 Vol. II, at 57-59; Tr. 9307-08 (Weismantle). Assuming that none of the 938 buses would be available to LILCO, LILCO would have only 298 buses to transport people out of the EPZ. If an emergency occurred when buses were required by schools, the available buses would be required to make multiple runs, which in turn would take much more time. See Tr. 9299-9301 (Weismantle).

584. However, LILCO testified that as school runs were completed, some of the 938 committed buses could become available and LILCO would ask school districts outside the EPZ to release some buses. Cordaro et al., Tr. 5/30/84 Vol. II, at 57-59. There is no reason that this would not be done in an emergency situation.

585. New York State witness, Mr. Failla testified that State records on the number of buses in service indicate that if a radiological accident were to occur during school sessions, the bus companies could in fact provide LILCO with only about 10% of the number of buses contracted for by LILCO. Failla, ff. Tr. 9948, at 2-3. Mr. Failla based this conclusion on a simple matching of the number of buses committed by a given contract with the New York State records of the buses owned by the contracting company. See Tr. 9953-54, 9959-60 (Failla).

586. LILCO witness Robinson testified, however, that this conclusion failed to account for buses owned by subsidiaries, or associated companies, of the contracting company, which LILCO and the contracting company had implicitly included within the contract. Tr. 9988-91, 10,006-07 (Robinson). Had those companies been included, the number of licensed buses would have matched or exceeded those committed under the letters of agreement. See Tr. 9989 (Robinson); Failla, ff. Tr. 9948, at 2. Mr. Failla agreed that buses were commonly owned by a single individual or entity under various corporate names for tax purposes. Tr. 9975-76 (Failla).

587. We find no basis in the record to dispute the contracts which constitute the Letters of Agreement for buses. The contracts specify that each bus company will provide the number of vehicles listed therein. We have no basis in this record to assume that the bus companies will breach the contracts.

588. Hence we find no merit to Contention 24.F.2. We find reasonable assurance that the Letters of Agreement for buses satisfy the criteria set forth in NUREG-0654 and adequate provisions to evacuate the transit dependent population are provided in the Transition Plan.

Conclusion

589. Based on the record discussed above, we find that the Contentions dealing with buses for the public are without merit and that the concerns raised by those Contentions do not render the Transition Plan inadequate.

X. Relocation Centers

A. Public Relocation Centers (Contentions 24.0, 24.P, 74 and 75)

590. Issues concerning public relocation centers for evacuees from an emergency at Shoreham are raised in Contentions 24.0, 24.P, 74, and 75. These issues are (1) whether LILCO has an agreement with the American Red Cross to provide the services relied upon from the Red Cross regarding Shoreham related relocation centers (Contention 24.P); (2) at least one of the centers designated in Revision 3 of the LILCO Plan, Suffolk County Community College, is not available for LILCO's use due to the County's refusal to make it available, and therefore a portion of the anticipated evacuees have no relocation center to go to in the event of an emergency (Contention 24.0); (3) the designated relocation centers are within 20 miles of the Shoreham site, contrary to the guidelines of NUREG-0654 Section II.J.10.h (Contention 74); and (4) the relocation centers cannot accommodate the number of evacuees who may require shelter (Contention 75).

591. LILCO and Suffolk County each prefiled direct written testimony on Contentions 24.0, 74, and 75 on March 2, 1984. This testimony sought to respond to the Contentions as originally admitted. Those contentions were based on previous drafts of the LILCO plan. The plan relied on five relocation centers all of which at that time were in Suffolk County. Three of these shelters were state and county buildings, to be used as reception centers for the public, with the American Red Cross-Suffolk County Chapter providing services at the relocation centers.

592. Prior to commencement of the hearings on the relocation center issues, the American Red Cross informed LILCO that certain relocation centers, which LILCO was relying on in its plan, had to be changed, because New York State and Suffolk County officials refused to make the centers available to the Red Cross for use in emergency planning for Shoreham. Cordaro et al., ff. Tr. 14,707. By agreement of the parties, these issues were removed from the hearing schedule. See Tr. 9573-74. After the parties were unable to agree upon a schedule for filing additional or modified testimony, the Board ordered that LILCO and the County file supplemental testimony. Order of June 8, 1984. LILCO's supplemental testimony was filed on June 15, 1984. This supplemental testimony set out LILCO's changes to the Plan. These changes included reliance upon the BOCES II Occupational Center and a facility at SUNY-Farmingdale as well as St. Joseph's College in Patchogue and Dowling College as primary rather than secondary relocation centers. The County's revised testimony was filed on June 26, 1984. This testimony consisted primarily of two essentially identical letters, one from the district superintendent of BOCES II in Suffolk County and one from the president of SUNY-Farmingdale. These letters disavowed any intention for allowing the facilities in question to be used as relocation centers in offsite emergency planning for Shoreham. See Harris and Mayer, ff. Tr. 14,870, at 2. As a result of this eleventh hour development, LILCO requested and the Board granted permission to withdraw its previously filed testimony on Contentions 24.0, 74 and 75. This withdrawal included the supplemental testimony filed on those issues by LILCO on June 15, 1984. New testimony was subsequently filed which significantly changed LILCO's proposal by moving the entire

proposed relocation center operation to Nassau County. In reaching our conclusion that LILCO's present approach is adequate, we have taken into account the fact that while there are relocation center possibilities in Suffolk County,^{43/} those facilities have effectively been made unavailable to LILCO due to circumstances beyond LILCO's control, i.e., the actions of Suffolk County and the State of New York. The record shows and we find that LILCO continues to rely upon the American Red Cross to provide relocation centers during an emergency at Shoeham. Cordaro et al., ff. Tr. 14,707, at 15. We also find that LILCO intends to designate, in Nassau County, one or two central locations to which all evacuees from the EPZ will be directed. The evidence shows that LILCO will perform monitoring and if necessary decontamination, at the reception center; and that the American Red Cross will then send evacuees needing public shelter from that center to congregate care centers in the Nassau County area, taken from a list of such centers with which the Red Cross has an agreement to provide shelter during any emergency. Id. at 15-16.

593. As discussed, infra, no monitoring or decontamination will be done at the congregate care centers. Those activities will take place at the central reception center only. We also note that the Red Cross has a letter of agreement with LILCO to provide staff, food, beds, medical care, case worker services, personal counseling, shelter and other aid

^{43/} See Cordaro et al., ff. Tr. 14,707 at 15; Tr. 14,790-92 (Robinson), 14,860 (Rasbury). See also Tr. 14,945-47 (Cipriani), 15,024-27 (Hines). Messrs. Cipriani and Hines, the authors of the letters discussed above, were subpoenaed by LILCO.

as necessary. Id. at 17-18, Att. 1. We also note that the American Red Cross will provide a representative at the LERO EOC in addition to setting up its own operation center in Nassau County at the Red Cross building. Id. at 18.

594. The LILCO Transition Plan estimates that about 32,000 people or 20% of the population in the 10-mile EPZ will seek to use the public relocation centers. Id. at 18-20. We find that this number is reasonable. Our finding is based on studies of persons who evacuated from previous disasters, and the Suffolk County planners own conclusion that 20% of those who evacuated would seek to use such centers was a good planning number. Id. at 18-20.

595. The congregate care shelters, which have agreements with the Nassau County American Red Cross and from which the Red Cross will choose shelters at the time of an emergency to direct people to and from the reception center, have a combined capacity of up to 48,000 people in Nassau County alone. Id., Att. 1, at 2. Accordingly, we find that the capacity for the shelters is adequate. As to the issue of location, we find that all of the relocation centers that will be used by the American Red Cross at the time of an emergency, with the exception of the SUNY-Farmingdale facility, are in Nassau County. We also find that all centers are beyond 20 miles from the Shoreham site. Id. at 20-21. We also note that the American Red Cross letter of agreement with LILCO states specifically that any relocation centers designated at the time of an emergency by the Red Cross would be 20 miles or beyond from the Shoreham site. Therefore, we conclude that LILCO has met the provisions of NUREG-0654 Section II.J.10.h regarding relocation centers location. Id. at 21-22.

596. Finally, we find that the allegation that relocation center facilities may not have adequate space, toilet and shower facilities, food, drinking water, sleeping accommodations, and other necessary facilities is without record support. Mr. Frank Rasbury, an American Red Cross representative and Director of the Nassau County Chapter of the American Red Cross, testified that American Red Cross standards had been used in choosing the buildings the Red Cross would rely upon for congregate care centers including a consideration of adequate parking space, food, toilet and showers for people who may be seeking shelter there. Id. at 23. While we cannot find that most of the facilities are perfect regarding all of the items on the Red Cross checklist, many are satisfactory for emergency shelter. The record shows that the Red Cross chooses, from among those available in the community, the buildings which most closely meet the ideal for use during a disaster. Id. at 23-24.

597. Since emergency planning does not require extraordinary measures such as the building of new buildings or the stockpiling of blankets in order for a finding of adequate protection, San Onofre, supra, 17 NRC at 533, and since the American Red Cross standards regarding the choice of shelters have been followed for Shoreham, we find that the facilities are adequate for emergency planning purposes. In this regard, it is significant to note that LILCO relies upon the American Red Cross to operate the shelters and has no intention of doing that work itself.

598. Accordingly, we find as regards Contentions 24.0, 24.P, 74 and 75, that (1) the letter of agreement between LILCO and the American Red Cross is adequate to provide reasonable assurance that the Red Cross will perform the duties relied upon in the LILCO Plan; (2) the location of

relocation centers in Nassau County meets the guidelines of NUREG-0654 as all relocation centers relied upon will be 20 miles or more from the Shoreham site; (3) that the relocation centers to be provided by the American Red Cross have sufficient capacity to house the expected evacuees of the 10-mile EPZ; and that (4) there is reasonable assurance that the facilities relied upon by LILCO for shelters will be suitable for that purpose.^{44/} The LILCO Plan is therefore adequate in its approach to providing relocation centers for emergencies, provided that (1) the plan is revised to reflect the changes noted in the record, and (2) that a reception center is designated in the public information materials and the LILCO Plan so that evacuees will be directed to a particular area.

44/ By letter dated October 30, 1984, Counsel for LILCO advised the Board that LILCO had very recently finalized agreements with the lessee of Nassau Veterans Memorial Coliseum (which is owned by Nassau County) and the American Red Cross for use of the Coliseum as a reception center as previously described in LILCO testimony on relocation centers. As promised during the hearings (Tr. 14,793-97), Counsel for LILCO attached copies of the following letters: (1) a letter dated October 1, 1984 from the Nassau County Executive to the General Manager of the Coliseum, approving the use of the Coliseum as a reception center under the LILCO Plan; (2) a Letter of Agreement between LILCO and the General Manager of the Coliseum, dated September 25, 1984 and approved on October 8, 1984, allowing LILCO and the Red Cross to use the Coliseum as a reception center; and (3) a Letter of Agreement between LILCO and the American Red Cross, dated October 23, 1984 and approved October 24, 1984, providing for coordination between LERO and the Red Cross for those organizations' joint use of the Coliseum as a reception center in response to an emergency at Shoreham. These agreements confirm the implementation of commitments already reflected in the record. [See, e.g., LILCO's Proposed Findings of Fact and Conclusions of Law on Offsite Emergency Planning, ¶¶ 522-532, and the Staff's findings above.] The Board is of the view that it is not necessary to reopen the record in order to receive confirmatory information such as the agreements attached to the letter to us from LILCO's counsel. However, LILCO is directed to include this information in a future revision to the Transition Plan.

The Staff is directed to confirm that LILCO has complied with the above Board directives.

Conclusion

599.- For the reasons noted above, we find that Contentions 24.0, 24.P, 74 and 75 are without merit.

B. Thyroid Contamination Equipment at Relocation Center (Contention 77)

600. Contention 77 asserts that the thyroid monitoring equipment to be used at relocation centers is not sufficiently sensitive to accurately detect 150 cpm in the presence of background readings that are likely to exceed 50 cpm.

601. Pursuant to OPIP 3.9.2 of the LILCO transition plan, LILCO proposes to utilize an Eberline RM-14 survey meter with HP-270 to measure thyroid contamination levels at relocation centers. Cordaro et al., ff. Tr. 13,755, at 5 and Att. 3. LILCO also proposes to use an RM-14 meter with a tungsten shielded HP-210 probe at relocation centers when a more sensitive instrument is appropriate; e.g., at times when elevated background radiation levels are indicated and to monitor childrens' thyroids. Id. at 9-10 and Att. 4; Tr. 13,756-762 (Daverio, Miele). The record shows that the RM-14 meter with tungsten shielded HP-210 probe is between three and four times more sensitive than the RM-14 meter with HP-270 probe and is capable of detecting thyroid contamination in background radiation fields at least four times greater than would be possible with an RM-14 with HP-270 probe. Id. Tr. 13,787-792 (Miele). While the use of the tungsten shielded HP-210 probe is presently not

provided for in OPIP 3.9.2, the record shows a LILCO commitment that it be used at relocation centers and the appropriate implementing procedures will be reflected in future revisions of the LILCO Plan. Cordaro et al., ff. Tr. 13,755, at 9.

602. At the outset we note that the County's apparent presumption that background radiation levels at relocation centers are likely to exceed 50 cpm is presently without a record basis. When the County propounded Contention 77, two of the relocation centers which LILCO at that time was relying on were less than 15 miles from the Shoreham site. See Contention 74. At present, however, all of the relocation centers upon which LILCO will rely are more than 20 miles from the Shoreham site. Cordaro et al., ff. Tr. 14,707, at 20-21 and Att. 1. A FEMA witness testified, without contradiction, that it is unlikely that background radiation levels at relocation centers more than 20 miles from Shoreham would ever exceed 50 cpm. Tr. 14,578 (Keller). In addition, the FEMA witness testified that the concern about potential elevated background radiation levels was apparently raised by the possibility that persons might track contamination into monitoring areas. Tr. 14,279-280 (Keller).

603. Under the LILCO Plan this concern is not valid. There will be separate whole body and thyroid monitoring areas and people will not have their thyroids monitored until after it is determined that they are not contaminated or that, if contaminated, they are decontaminated. Tr. 14,280 (Keller). The LILCO Transition Plan provides that a thyroid scan will be performed only after whole body monitoring has been performed and individuals are "clean." See OPIP 3.9.2, Sections 5.6 and 5.8. At

present the Plan does not expressly state that there are to be separate areas for whole body and thyroid monitoring. However, the record shows that monitoring personnel are trained to set up separate areas for whole body and thyroid monitoring. See Babb et al., ff. Tr. 11,140, at Att. 20, Module No. 10 (Radiological Monitoring and Decontamination), pp. 3, 5-11, 19-20. In addition, radiation monitoring personnel are trained to have persons enter the building through a controlled route, to conduct body monitoring at a station that should be close to the contaminated parking area, if possible, and which will be blocked off from "clean areas" by ropes, doors, chairs, or other barriers. Id. at 5. The record further shows that if a person is contaminated, he or she will be isolated, will be directed to decontamination stations along controlled routes, and will not be allowed to enter any non-contaminated or "clear areas." Id. at 3. If a person is not contaminated, the record shows he or she will be directed to the monitor performing thyroid scans. Id. at 8. Finally, clean people will take a different route from contaminated people. Id. at 3.

604. We find that even if the thyroid monitoring area is in close proximity to the whole body monitoring area, a significant concern is not raised by the County's assertions because radiation monitoring personnel are instructed to "[c]ontact the Decontamination Leader if the average background is greater than 50 cpm; it may be necessary to move the monitoring station to insure that accurate readings can be obtained." Id.

at 6; see Tr. 14,278-279 (Keller).^{45/} The FEMA witness testified that during a FEMA graded exercise, FEMA would simulate a situation where background radiation levels exceeded 50 cpm and would at that time evaluate the response of monitoring personnel. Tr. 14,278-279 (Keller).

605. The Board further finds that although thyroid contamination monitoring will likely not be conducted in the presence of background radiation levels exceeding 50 cpm, LILCO's procedure for the use of the RM-14 meter with HP-270 probe is presently inadequate in three respects: (1) the present procedure indicates that the background reading should be taken with the shield of the HP-270 probe open when it should be taken with a closed shield, Tr. 13,777-780 (Miele); Tr. 13,794 (Daverio); Tr. 14,287-289 (Keller); (2) the present procedure does not indicate that the meter is to be set for a fast response time, Tr. 13,763-764 (Miele); and (3) the present procedure does not presently include special provisions for monitoring the thyroids of children, Tr. 13,795 (Daverio). Testimony presented by LILCO shows, however, that LILCO has committed to revise OPIP 3.9.2 to indicate that both the back-

^{45/} We note that section 5.3.3 of OPIP 3.9.2 instructs monitoring personnel to "[e]nsure decontamination facility/relief center background radiation levels remain less than 50 cpm. This is especially important where monitoring is performed to maintain RM-14 sensitivity." We note, however, that in LILCO's written testimony it is stated that this provision was included inadvertently and will be removed in future revisions of the Plan. See Cordaro et al., ff. Tr. 13,755 at 9. Since removal of this provision from the Plan is inconsistent with the training of monitoring personnel, and because FEMA believes it would not be prudent to allow background radiation levels to reach much above 50 cpm, Tr. 14,280-281 (Keller), the Board directs that LILCO leave this provision in the Plan. The Staff shall monitor compliance with this directive.

ground radiation and thyroid contamination readings are to be conducted with a closed shield, Tr. 13,794 (Daverio); to indicate that the RM-14 meter is to be set on a fast response time, Tr. 13,795 (Daverio); and to include special provision for monitoring children with an HP-210 probe, id.

606. Accordingly, the Board finds that, with the changes noted above, which we hereby direct, there is reasonable assurance that persons will be adequately monitored for thyroid contamination under the LILCO Plan. Use of the more sensitive tungsten shielded HP-210 probe in conjunction with the HP-270 probe with the RM-14 meter provides additional reasonable assurance that persons with contaminated thyroids will be identified. In this context we note that the County did not elicit any testimony on cross-examination of LILCO or FEMA witnesses to challenge the capacity of the RM-14 meter with a tungsten shielded HP-210 probe to detect thyroid contamination in the presence of background readings exceeding 50 cpm. See Tr. 13,787-792 (Miele).

607. With respect to the County's assertion that the Plan provides that persons are to be sent to a hospital only when thyroid contamination exceeds 150 cpm over background and its concern that monitoring personnel will not be able to detect 150 cpm above background when the meter is set on fast response, the Board finds that these concerns are insufficient to warrant a conclusion that the public health and safety will not be adequately protected. Applicant's witness, Mr. Miele, testified that the thyroid scan at relocation centers is intended to provide more of a qualitative measure of the thyroid contamination level than a quantitative measure. Moreover, the record shows that monitoring

personnel are more concerned, and rightly so, about determining if the dose to the thyroid has been substantial enough to warrant action. Cordaro et al., ff. Tr. 13,755, at 8-9; Tr. 13,772-777 (Miele). Witness Miele also testified that monitoring personnel are being trained to view the 150 cpm threshold as a qualitative rather than a quantitative guideline. Tr. 13,774-776 (Miele).

608. LILCO and FEMA witnesses both testified that there will always be uncertainty, regardless of the contamination level or who does the monitoring, and that monitoring personnel will have to exercise judgment under the then prevailing circumstances. Tr. 13,774-776 (Miele); Tr. 14,274-275 (Keller). Finally, the FEMA witness testified that the Protective Action Guidelines for thyroid exposure for the general population, developed by EPA, range from 5-25 rem, that the 150 cpm threshold contained in the LILCO Plan is well below the 5 rem exposure level at which protective action is recommended, and, thus, that radiation monitoring personnel would have to misread a thyroid contamination reading by more than 600 counts before the public safety were to be endangered. Tr. 14,276-277 (Keller). The FEMA witness, whose testimony was uncontroverted, stated that this would be extremely unlikely. Id. Accordingly, we find that even if it is true that there will be some variance in the reading when the RM-14 meter is set for a fast response, see Tr. 13,768 (Miele), we are of the view, for the reasons noted above, that this variance does not raise a concern sufficient to warrant a conclusion that the public health and safety will not be adequately protected by the proposed LILCO procedures.

Conclusion

609. Based on all the evidence of record, summarized above, we find that Contention 77 is without merit.

XI. The Handicapped, Hospitals, and Nursing Homes

A. Ambulances (Contentions 24.G, 24.K)

610. For Contention 24.G, the Intervenor's assert that LILCO's proposed evacuation of persons in special facilities, hospitals, and the handicapped cannot and will not be implemented because LILCO does not have agreements with ambulance companies to provide sufficient numbers of vehicles. For Contention 24.K, the Intervenor's assert that LILCO's proposed evacuation of special facilities and the handicapped cannot and will not be implemented because LILCO does not have agreements with ambulance companies or individuals to provide medical and paramedical support services in the vehicles to be used for evacuating special facilities and the handicapped.

1. Availability (Contention 24.G)

611. In the event that the entire 10-mile E. were evacuated, approximately 113 ambulance trips and 209 ambulette trips would be necessary to evacuate residents of special facilities (excluding hospitals) and other residents requiring transportation in ambulances orambulettes. Cordaro et al., Tr. 4/6/84 Vol. II, Attachment 23 at IV-75; Tr. 6586-87 (Robinson). LILCO has contracted with eleven ambulance companies to provide 63 ambulances and 130ambulettes, which are vans that have been modified to accommodate people in wheelchairs

and handicapped people. Cordaro et al., Tr. 4/6/84 Vol. II at 8, 9, 11. For the population that these vehicles will be serving, which excludes hospitals, each ambulance and ambulette would have to make on the average of no more than two trips. Id. at 11-12; Tr. 6443 (Weismantle). The estimates of the capacities of ambulettes and ambulances in the Transition Plan are somewhat conservative since an average capacity of 4 persons in wheelchairs was assumed for ambulettes and these vehicles will hold on the average of 7 persons (4 persons in wheelchairs and 3 persons in seats). Cordaro et al., Tr. 4/6/84 Vol. II at 12; Tr. 6421-22, 7784-85 (Robinson). However, we recognize that the numbers represent average capacities and as such the capacity of some ambulettes is less than 4 persons in wheelchairs. Tr. 7784-87 (Robinson); SC Ex. 36. Further, the Transition Plan calls for two persons for each ambulance but some ambulances can handle 3 or 4 persons. Tr. 6422 (Robinson). Moreover, LILCO is recommending that the Suffolk Infirmary (approximately 10 miles from Shoreham) shelter rather than evacuate based in part on the greater health risk which some patients would encounter by being moved. Cordaro et al., Tr. 4/6/84 Vol. II at 12, Tr. 5/10/84 Vol. II at 18. Under the Transition Plan, 65 ambulances and 15 vans are assumed to be required to evacuate the Suffolk Infirmary. Cordaro et al., Tr. 4/6/84 Vol. II, Attachment 23 at IV-175. Accordingly, we find that the number of persons in special facilities needing transportation by ambulance or ambulette may be less than the number of patients planned for in the LILCO Transition Plan.

612. Within the vicinity of the Shoreham plant there are three hospitals which are located more than 9 miles from the plant. Cordaro

et al., Tr. 4/6/84 Vol. II at 12. Two of these hospitals are located just within the EPZ boundary and one is located just beyond the EPZ boundary. Id. In the event of an evacuation of the entire 10 mile EPZ, the LILCO-Transition Plan does not call for an evacuation of these three hospitals using the vehicles LILCO has contracted for while the nursing home and home bound population are being evacuated. Cordaro et al., Tr. 4/6/84 Vol. II at 12-13; Tr. 6480-81 (Cordaro). This strategy is being employed since LILCO is recommending that these hospitals shelter their patients because of (1) the distance of the hospitals from the Shoreham plant, (2) the sheltering benefits offered by the hospital buildings, and (3) the health risk in moving hospital patients. Id. However, should it become necessary to evacuate the hospitals, the patients would be transported using the vehicles LILCO has contracted for, after the homebound and nursing and adult home population have been evacuated. Cordaro et al., Tr. 4/6/84 Vol. II at 13; Tr. 6480-82 (Cordaro). FEMA determined the use of these resources on an as-available basis is adequate since the evacuation of these hospitals is planned as a secondary protective action recommendation. Baldwin et al., ff. Tr. 12,174 at 78.

613. With respect to LILCO's contracts with ambulance companies for the provision of 63 ambulances and 130 ambulettes, a concern was raised about the availability of these vehicles due to the contractual terms under which the vehicles are to be provided. Tr. 6431-40. LILCO's contracts with ambulance companies provide, in relevant part, the following:

For an actual radiological emergency, the Contractor will assign for immediate use of those vehicles which are not at the time engaged in responding to a public or individual emergency. Vehicles so engaged and therefore not immediately available for the Company's requisition shall complete the work associated with said response and upon completion, shall contact the Contractor's dispatcher for immediate instructions and shall therefore be promptly assigned for the Company's use under this contract.

Cordaro et al., Tr. 4/6/84 Vol. II, Attachments 13-21.c at 7, 8. This provision by its own terms obligates the ambulance companies to make ambulances and ambulettes immediately available for a radiological emergency at Shoreham except where a vehicle is engaged in responding to a public or individual emergency. Id.; Tr. 6431-34 (Robinson). Vehicles engaged in a response to a public or individual emergency become immediately available for a radiological emergency at Shoreham upon completion of their response to the public or individual emergency. Id. Most of the ambulance companies under contract to LILCO are used generally for prearranged transportation and not for emergencies (life-threatening situations). Tr. 6431-32, 6440 (Robinson). The response to life-threatening situations generally are handled by community and fire district ambulances. Cordaro et al., Tr. 4/6/84 Vol. II at 11; Tr. 6431-32, 6439-40 (Robinson). LILCO contracts with the ambulance companies provide that these vehicles will be made available for response during a radiological emergency at Shoreham on a priority basis. Tr. 6431-37 (Robinson). In addition, many towns and town volunteer fire districts within twenty miles of Shoreham have community ambulances. Cordaro et al., Tr. 4/6/84 Vol. II at 13, Attachment 22. There are a total of 61 community ambulances which may be available for

use in an emergency. Id. Although LILCO is not intending to rely on these ambulances, we do not believe it is unreasonable to expect that at least some of those services would respond. Id. Thus we find that prior commitments by the ambulance companies will not significantly affect, if at all, the availability of ambulances and ambulettes for LILCO's response during a radiological emergency at Shoreham.^{46/}

614. Based on a consideration of the whole record, we find that LILCO's contracts with ambulance companies will provide sufficient numbers of vehicles to evacuate special facilities, hospitals and the handicapped.

2. Staffing of Vehicles (Contention 24.K)

615. LILCO has entered into contracts with ambulance companies that provide for appropriate personnel to staff ambulances and ambulettes in the event of a radiological emergency at Shoreham. Cordaro et al., Tr. 4/6/84 Vol. II at 18, Attachments 13-21.C; Tr. 6517-23 (Robinson). These contracts clearly provide that ambulances and ambulettes supplied will be manned by drivers and medical technicians as appropriate. Cordaro et al., Tr. 4/6/84 Vol. II, Attachments 13-21.C at 1-2; Tr. 6533-34 (Robinson). Further, the contracts state that the drivers "shall be duly licensed and shall have received emergency preparedness

^{46/} We note that Intervenor's concern about Section 3010 of the New York Public Health Law is not well founded (Intervenor's Findings at 438) since that provision does not by its terms prohibit an ambulance service from operating outside its "usual territory" for the sole purpose of assisting during a radiological emergency. See N.Y. Public Health Law § 3010 (McKinney 1984).

training prior to vehicle operation." Cordaro et al., Tr. 4/6/84 Vol. II, Attachments 13-21.C at 2.

616. The County's witnesses testified that despite the contracts between LILCO and the ambulance companies, there is no assurance that vehicles actually would be staffed by sufficient qualified personnel. Harris and Mayer, ff. Tr. 9574, at 9-10. Moreover, they point out that the LILCO Transition Plan makes no provision for skilled health professionals to accompany patients on buses. Id. at 10.

617. We note that there is no requirement in either the Commission's emergency planning regulations or implementing guidance that agreements with individuals who are to man these vehicles is required or necessary in order for us to make a reasonable assurance finding. See 10 CFR § 50.47; Appendix E to 10 CFR Part 50; NUREG-0654, FEMA-REP-1, Rev. 1 (1980). Intervenors have provided no evidence to suggest that these ambulance companies will not abide by their contractual obligations to provide drivers and medical technicians where appropriate. With respect to the concern for provision of medical personnel on buses, LILCO has identified the number of non-ambulatory patients in special facilities and who are handicapped and -- as we found earlier -- is providing a sufficient number of ambulances and ambulettes for that segment of the population. See Cordaro et al., Tr. 4/6/84 Vol. II, Attachment 23. Thus we do not believe that the absence of provisions for skilled health professions to accompany patients on buses is a matter of such significance that it renders the planning in this area inadequate. Consequently, we find that there is reasonable assurance (1) that LILCO's proposed evacuation of the special facilities

and the handicapped can and will be implemented, and (2) that the personnel relied upon in LILCO's Transition Plan for evacuation of the special facilities and handicapped will be provided under the provisions of the contracts between LILCO and the ambulance companies.

B. Hospitals, Nursing Homes (Contentions 24.J, 24.N, 72)

1. Agreements With Special Facilities (Contention 24.J)

618. Contention 24.J alleges that the LILCO Transition Plan's proposed evacuation of the special facilities in the EPZ cannot and will not be implemented because the Plan does not include agreements with these special facilities it relies upon to perform several functions necessary to a successful evacuation of such facilities. These include such facilities as hospitals and nursing homes.

619. NUREG-0654, Section II.A.3 requires, in relevant part, that each plan include written agreements referring to the concept of operations developed between Federal, State and local agencies and other support organizations having an emergency response role within the Emergency Planning Zones. NUREG-0654, FEMA-RFP-1, Rev. 1 (1980) at 32; Baldwin et al., ff. Tr. 12,174 at 12. LILCO takes the position that the "support organizations" referenced in NUREG-0654, Section II.A.3 are those upon which the utility relies to provide a service for the off-site plan. They do not include either those organizations to which the utility or other offsite organizations would provide assistance or where the support organization would only be caring for their own charges. Tr. 9031 (Robinson). Consequently, LILCO concedes that it does not have letters of agreement with the special facilities referenced in Conten-

tion 24.J and that such agreements are not necessary since such facilities are not "support organizations" within the meaning of NUREG-0654, Section II.A.3. Tr. 9030-31 (Robinson); Cordaro et al., Tr. 5/10/84 Vol. II at 7-8. FEMA, which is the federal agency charged with the responsibility of reviewing and making findings on offsite emergency response plans, takes the position that letters of agreement are required from support organizations assigned (emphasis supplied) emergency response roles. Baldwin et al., ff. Tr. 12,174 at 12. Moreover, FEMA presented uncontradicted testimony that the special facilities referenced in Contention 24.J, except for Central Suffolk Hospital, are not identified in LILCO's Transition Plan as support organizations having an emergency response role within the EPZ. Id. at 17. It is FEMA's view, therefore, that letters of agreement from any of these facilities which do not have identified emergency response roles are not necessary. Id. Consequently, we find that the record shows that agreements with the special facilities referenced in Contention 24.J, such as hospitals and nursing homes, are not generally required by NUREG-0654, Section II.A.3. However, we find the LILCO Transition Plan deficient to the extent that a letter of agreement between LILCO and Central Suffolk Hospital could not be found by FEMA. Id.

620. Although the LILCO Transition Plan does not contain any facility-specific plans or procedures for sheltering or evacuating patients, the record shows that these facilities have been involved in planning for a radiological emergency at Shoreham. Tr. 9042 (Weismantle); Tr. 9039 (Miele); Cordaro et al., Tr. 5/10/84 Vol. II at 8, 9; See Plan, App. A, at II-28, 29, IV-166 to 168, IV-172 to 176. Each of the facilities referenced in Contention 24.J has been visited by LILCO and supplied

tone alert radios that automatically activate and transmit the EBS message being broadcast over the air, except for one nursery school which was offered but refused to accept the radio. These EBS messages will contain recommended protective actions to be taken. Cordaro et al., Tr. 5/10/84 Vol. II at 8; Plan, App. A at IV-166. During a radiological emergency at Shoreham, the Health Facilities Coordinator would contact each special facility involved to (1) verify that the EBS message has been received, (2) identify their transportation requirements, and (3) if necessary, provide advice on how best to effectuate sheltering plans that are being developed with them. Plan, App. A at IV-166; Tr. 9039 (Miele); Tr. 9040 (Weismantle). Further, LILCO has obtained sufficient equipment and personnel to transport hospital patients, residents of handicapped facilities, adult homes and nursery homes, and nursery school children should it become necessary to evacuate these persons during a radiological emergency at Shoreham. Cordaro et al., Tr. 5/10/84 Vol. II at 8-9; Tr. 9038 (Robinson); Tr. 9043-44 (Weismantle). In the event the hospitals involved require evacuation, the LILCO Transition Plan calls for LERO to evacuate patients using an ad hoc expansion of transportation resources that are committed to other aspects of evacuation with priority given to relocation of radiosensitive patients (maternity, newborns, pediatrics). Plan, App. A at II-28.^{47/} After its review of the LILCO

^{47/} Intervenors' cite the TMI case, Metropolitan Edison Co., LBP-81-59, 14 NRC at 1639-41, for the proposition that this ad hoc expansion of transportation resources would be inadequate. Intervenor's Findings at 443. However, we find that case inapposite to the matter here since in TMI the Board was faced with the lack of generalized plans for each school district in the county where the school children constituted a sizable segment of the population. See 14 NRC 1640-41.

Transition Plan, FEMA determined that LILCO's decision to make in-place sheltering the primary protective action recommendation for hospitals was adequate because these hospitals are near the EPZ boundary. Baldwin et al., ff. Tr. 12,174 at 78. In addition, LILCO is working with the facilities developing each facility's plans for an effective response during an emergency, including in many instances facility-specific plans and procedures for sheltering and evacuation. Cordaro et al., Tr. 5/10/84 Vol. II at 8. Training will be offered to the employees of each facility. Id. Furthermore, while not specifically directed at evacuations caused by radiological emergencies, the New York State Department of Health requires that all of the special facilities to plan for disasters including the conduct of evacuation drills for their patients or charges. Tr. 9035 (Glaser). These facilities do have plans for evacuation. Id.

621. Suffolk County's witnesses expressed "grave doubt" that the special facilities in question could be expected to comply with protective action recommendations if there were no agreements between LILCO and those special facilities. Tr. 9892 (Harris/Mayer). However, we do not share such doubt since we find that the record shows that sufficient emergency planning has taken place and will take place with these special facilities so that they can be expected to carry out an evacuation of their charges in the event of a radiological emergency at Shoreham without having agreements with LILCO. Nonetheless, we strongly urge LILCO to continue its efforts with the special facilities to develop facility-specific plans and procedures for sheltering and evacuation. Finally, LILCO should include in its Transition Plan a letter of agree-

ment with Central Suffolk Hospital since it has been identified as a support organization in order to remedy the deficiency we have found. FEMA should report to the NRC staff as soon as there is evidence of such an agreement.

2. Evacuation Time Estimates for Special Facilities (Contention 72.A)

622. Contention 72.A provides that the LILCO Transition Plan's proposed evacuation of special facilities, assuming vehicles were available and mobilized, will be too lengthy to provide adequate protection against health threatening doses of radiation. The Intervenor's claim the proposed evacuation will be too lengthy because (1) large numbers of trips are necessary to transport persons to relocation centers, (2) vehicles will encounter traffic congestion from evacuating traffic, and (3) time will be necessary to load and unload passengers from ambulances.

623. LILCO has calculated detailed evacuation time estimates for each of the special facilities in the EPZ, except for the residents of the Suffolk County Infirmity. Cordaro et al., ff. Tr. 9101 at 5-6, 10, Attachment 2. These estimates were calculated by adding the time required to complete the following series of separate steps: (1) the time at which evacuation vehicles arrived at staging areas; (2) the time needed to travel from the staging area to the special facility; (2) the time needed to load passengers at the facility; (4) the time needed to reach the EPZ boundary; and, (5) for multiple runs cases, the time to travel to and from reception centers. Id. at 6-7. Although his testimony concerned evacuation time estimates for the general population, the NRC Staff's expert witness who reviewed LILCO's evacuation time estimates, Dr. Urbanik, noted that LILCO's estimates provided separate estimates

for special facilities as required by NUREG-0654. Urbanik, ff. Tr. 3430 at 15. The loading time assumed by LILCO in calculating the estimate was based on a discussion with an ambulance company which has responsibility for evacuating the special facilities in the event that were necessary. Tr. 9104, 9123-24 (Lieberman). The time assumed for unloading patients was the same as that assumed for loading them. Cordaro et al., ff. Tr. 9101 at 9; Tr. 9130 (Lieberman). There would be approximately one hour available for preparing patients in wheelchairs before the arrival of vehicles to evacuate them. Tr. 9127 (Lieberman). For patients who could not be transported other than by ambulances, there would be approximately 2 hours available to prepare the patients to be transported in the event evacuation were necessary. Tr. 9127 (Lieberman). LILCO's evacuation time estimates for vehicles evacuating special facilities assumed a speed that specifically accounts for congested traffic conditions. Cordaro et al., ff. Tr. 9101 at 8; Tr. 9128 (Lieberman). With respect to the number of trips necessary to transport persons to relocation centers, the only special facility assumed in LILCO's estimates to be served by a second wave of ambulances is the Suffolk County Infirmary. Tr. 9119, 9128 (Lieberman). LILCO's estimates assume that there will be nine vehicles available in time to make a second trip to evacuate the Suffolk County Infirmary and the Woodhaven Nursing Home since those vehicles would be ready for a second trip before some vehicles were available for their initial trip. Tr. 9128-29 (Lieberman). This assumption is reasonable. Since there are so few multiple trips that will have to be made to evacuate the special facilities, we do not find that the further identification of relocation centers for special facilities

presents a significant concern as argued by the Intervenors (Intervenors' Findings at 445).

624. The times required to complete the steps used in LILCO's evacuation time estimates for special facilities were calculated using conservative assumptions for such factors as mobilization times, travel speed, and passenger loading rates. Cordaro et al., ff. Tr. 9101 at 7-9, LILCO's evacuation time estimates disclosed that, with the exception of the Suffolk County Infirmity, special facilities could be evacuated before the last member of the automobile-owning public leaves the EPZ. Id. at 10. For the Suffolk County Infirmity, we agree with LILCO that it would be more advisable for that facility to shelter rather than evacuate its residents because (1) its located near the EPZ boundary, (2) its masonry construction provides a high level of radiation shielding, and (3) a number of its patients would be exposed to trauma if they were moved. Id. With respect to the exclusion of the three hospitals located at the boundary of the EPZ, we believe it was reasonable to exclude them from the evacuation time estimates for special facilities for the reasons we set out in addressing Contention 72.E. Accordingly, we conclude that LILCO's evacuation time estimates are reasonable and account for the three concerns raised by Intervenors in Contention 72.A. Cordaro et al.

3. Relocation Centers for Special Facilities (Contentions 24.N, 72.C)

625. Contention 24.N alleges that evacuation cannot and will not be implemented because relocation centers for school children, patients in hospitals, handicapped individuals and residents of special facilities have not been identified, and no letters of agreement have been obtained

from facilities relied upon as relocation facilities for special facilities.^{48/} Contention 72.C alleges that the LILCO Transition Plan fails to identify reception centers for persons evacuated from hospitals, nursing homes or other special health care facilities other than the United Cerebral Palsy of Greater Suffolk, Inc.

626. With regard to letters of agreement with reception centers generally, LILCO will identify in the Transition Plan the reception centers for special facilities, but it does not intend to enter into letters of agreement with these facilities. Rather, LILCO contemplates that under the Transition Plan each of the special facilities will make arrangements directly with reception centers, with LILCO assisting those facilities to locate reception centers. Cordaro et al., Tr. 5/10/84 Vol. II at 11; Tr. 9087 (Robinson); Tr. 9088-89 (Yedvab). LILCO is working closely with special facilities to assist them in finding reception centers. Tr. 9087 (Robinson).

627. For the identification of reception centers for hospital patients, LILCO has contacted hospitals outside the EPZ to determine whether they would accept patients from the three hospitals if necessary. Cordaro et al., Tr. 5/10/84 Vol. II at 15. Although the hospitals outside the EPZ have indicated a willingness to accept as many patients as possible during an emergency, they cannot commit to a number in advance because of the daily flux in hospital patient populations in

^{48/} That part of Contention 24.N concerning reception centers for school children is addressed in Section XII under Contention 71.

terms of the number and the kind of care required. Id. As a consequence, LILCO will include in the Transition Plan a list of hospitals that could serve as reception centers and that will be contacted during an emergency, instead of a list of specific reception hospitals paired with hospitals in the EPZ. Id. at 16. We note that hospital patients can be prepared to begin evacuating prior to a final determination being made by the receiving hospital. Tr. 9065-66 (Yedvab). Moreover, past disaster experience indicates that hospitals do everything in their power to respond to patient and community needs during emergencies. Cordaro et al., Tr. 5/10/84 Vol. II at 15-17. In addition, the LILCO Transition Plan has procedures for finding reception hospitals for patients at the time of an emergency, including the use of lists of hospitals in the Long Island area and their telephone numbers. The LILCO staff is assigned the task of calling those hospitals. Cordaro et al., Tr. 5/10/84 Vol. II at 16.

628. For nursing and adult homes, the LILCO Transition Plan contemplates that all nursing and adult homes within the EPZ would be advised to evacuate should the general public in the same zones be advised to evacuate, except for the Suffolk County Infirmary. Since the Suffolk County Infirmary is a County facility, it has not been willing to work with LILCO to discuss protective actions for its residents even though LILCO has attempted to work with this facility. Cordaro et al., Tr. 5/10/84 Vol II at 18. Attachments 3-7. Cordaro et al., Tr. 5/10/84 Vol. II at 17. Currently, the LILCO Transition Plan indicates that reception centers for these facilities are "to be identified". Id. at

629. Mr. Glaser, an advisor to LILCO, has met with the majority of nursing homes within the EPZ and, except for the Suffolk Infirmary and

one other nursing home, they have cooperated in discussions on planning for an incident at Shoreham. Tr. 9083 (Glaser). They intend to incorporate the work LILCO is doing on emergency preparedness into their facility disaster plans. Id. Further, LILCO has been working with the Nassau/Suffolk Hospital Council, the Suffolk County Health Facilities Associations, hospitals outside the EPZ, and each of the ten nursing and adult homes within the EPZ to assist them in determining appropriate reception centers. Cordaro et al., Tr. 5/10/84 Vol, II at 19. LILCO will revise the LILCO Transition Plan as appropriate to reflect the reception centers that are finally chosen by the adult and nursing homes in the EPZ. Id. at 20. Moreover, all hospitals and nursing homes are required by the New York State Hospital Code to have written emergency and disaster preparedness plans rehearsed and updated at least twice a year, which include the reception and treatment of patients in emergencies or disasters that might occur either within or outside the hospitals. Cordaro et al., Tr. 5/10/84 Vol. II at 16-17; Tr. 9074 (Glaser); Tr. 9088 (Yedvab).

630. Two of the other special health care facilities mentioned in Contention 72.C, have already identified reception centers for their facilities. Cordaro et al., Tr. 5/10/84 Vol.II at 22, Attachment 43; Tr. 9087-88 (Robinson). LILCO is working to obtain reception centers for the remaining facilities, and will revise the LILCO Transition Plan to reflect the relocation centers these facilities chose for their patients. Cordaro et al., Tr. 5/10/84 Vol. II at 22. Attachments 17, 41-42, 44-66.

631. FEMA testified that to the extent that residents of special facilities within the EPZ will be sent to relocation centers different from the general public relocation centers, the LILCO Transition Plan must have a final listing of the relocation centers for special facilities that is supported by letters of agreement. Baldwin et al., ff. Tr. 12, 174 at 19; Tr. 12,266-67 (Kowieski). According to FEMA a failure of the Transition Plan to identify such relocation centers for special facilities would be a deficiency. Tr. 12,266-67 (Kowieski). The County's witnesses agreed. Harris and Mayer, ff. Tr. 9777 at 7. Accordingly, we find that the record shows that it is necessary for the LILCO Transition Plan to identify those reception centers that are to be relied on by special facilities within the EPZ, and that supporting agreements are necessary for those reception centers except for the three hospitals which will be advised to shelter in the vast majority of cases. (See findings at Section XI.B.(5). Contention 72.E). However, those agreements do not necessarily have to be between LILCO and those reception centers.

4. Determination of Evacuation For Hospitals (Contention 72.D)

632. Contention 72.D asserts that the LILCO Plan fails to specify adequately or accurately the circumstances that would necessitate an evacuation of the hospitals in the EPZ, and does not include adequate procedures for those making protective action recommendations to determine whether evacuation is needed. Consequently, it is alleged the LILCO Plan fails to comply with NUREG-0654 Section II.J.10.m and 10 CFR Section 50.47(b)(10).

633. EPA's Manual of Protective Action Guides and Protective Actions for Nuclear Incidents recognizes the need in some circumstances to apply different criteria for special groups, including bedridden and critically ill patients. Cordaro et al., Tr. 5/10/84 Vol. II at 24-25, Attachment 68. Thus LERO has decided to recommend that the three hospitals on or near the EPZ boundary shelter, instead of evacuate, patients unless circumstances during a radiological emergency show that evacuation would be prudent. Tr. 8778, 8780 (Daverio). LILCO has engaged in extensive and detailed planning with the three hospitals on the implementation of protective actions during a radiological emergency at Shoreham. See Cordaro et al., Tr. 5/10/84 Vol. II at 26, Attachments 69-98.

634. Section 5.3.2 of procedure OPIP 3.6.1 in LILCO's Transition Plan specifically discusses the method for calculating the dose for the hospital population. Cordaro et al., Tr. 5/10/84 Vol. II at 24, Attachment 67. Using the OPIP 3.6.1 procedure, LERO calculates the sheltered dose for hospitals and nursing homes based on the whole body and thyroid dose reduction factors set forth in OPIP 3.6.1. Tr. 8871 (Watts). The sheltered dose for a hospital and the evacuation dose for the zone where the hospital is located can be compared. Tr. 8873 (Miele). Using the dosimetry equipment installed at the hospitals, one can determine the actual dose to persons in hospitals.

635. The LILCO Transition Plan provides that after the dose is calculated, LERO personnel will discuss the recommendations with hospital administrators so appropriate protective action can be determined. Cordaro et al., Tr. 5/10/84 Vol. II at 24-25, Attachment 67; Tr. 8878 (Cordaro). Such factors as release duration and probable time of

evacuation would be discussed at that time. Tr. 8876 (Watts). This discussion could result in considering evacuation of radiosensitive hospital patients at doses below the EPA PAG levels. Tr. 8884 (Watts).

636. Accordingly, we find that the contention is without merit since the record shows that LILCO's Transition Plan adequately describes the circumstances under which hospitals might be evacuated and the procedures by which persons would determine the protective action recommendation of evacuation.

5. Ad Hoc Evacuation of Hospitals (Contention 72.E)

637. Contention 72.E asserts that there is no assurance that adequate protective measures could or would be taken for hospital patients since the LILCO Transition Plan provides for "ad hoc" expansion of transportation resources to evacuate the three hospitals in the EPZ which does not meet the planning requirements of 10 CFR § 50.47 (a)(1) and (b)(10) and NUREG-0654 II.J. 10.d.

638. In the vast majority of cases the three hospitals in the EPZ will be advised to shelter. Cordaro et al., ff. Tr. 9101, at 11. This is based on their distance from the plant, the high shielding factors these facilities provide, and the risks of evacuating their patients. Plan Appx A at IV-172. In the event evacuation is recommended for these hospitals, the transportation requirements of these hospitals would need to be determined at the time of the emergency because the patient's characteristics change on a frequent basis. Cordaro et al., ff. Tr. 9101 at 11. As we found earlier in Section XI.B, there are adequate transportation resources being made available to these hospitals in the event evacuation is needed. Because in the case of the Shoreham EPZ each of

the three hospitals is located at the boundary of the EPZ, which is approximately 10 miles from the Shoreham plant, FEMA has determined that the decision of making in-place sheltering the primary protective action recommendation for hospitals is adequate. Baldwin et al., ff. Tr. 12,174 at 78. Moreover, FEMA found the use of transportation resources on an available basis to evacuate these hospitals adequate since the evacuation of hospitals is planned as a secondary protective action recommendation. Id.

639. Consequently, we find the record shows that this contention is without merit and that LILCO has identified adequate transportation resources for evacuating hospitals thus complying with 10 CFR § 50.47 and NUREG-0654.

C. Registration of Handicapped (Contention 73.A)

640. The State and County contended in Contention 73.A and at the hearing that LILCO's plan for identifying handicapped persons needing assistance from LERO in the event of a radiological emergency at Shoreham is inadequate because: (1) LILCO relies on mailback registration cards to identify these persons; (2) a mailback survey is inherently inadequate, see Harris and Mayer, ff. Tr. 9574, at 16-17, Tr. 7904 (Albertin), 9615-18 (Harris, Mayer), 9641-42 (Saegert); (3) the postcard and all instruments used by LILCO to identify handicapped persons are poorly designed, see Tr. 7904-07 (Albertin, Knighton), 9611-12, 9657-63 (Saegert); (4) handicapped persons cannot respond properly to the registration card because they have not been adequately informed what they will need to do in the

event of an emergency, see Acquaria et al., ff. Tr. 7854, at 8; Saegert, ff. Tr. 9574, at 4; (5) handicapped persons will not respond to the post-card because there is some perceived stigma attached to being identified as a handicapped person, see Saegert, ff. Tr. 9574, at 3-5; and (6) LILCO's other means of identifying handicapped persons are not workable, see Tr. 7918-20 (Acquario, Aibertin, Knighton), 9615-16 (Mayer).

641. The standard against which we must measure LILCO's procedures for registering handicapped persons within the Shoreham EPZ is NUREG-0654, II.J.10.d. This publication provides that "plans to implement protective measures for the plume exposure pathway shall include . . . means for protecting those persons whose mobility may be impaired due to such factors as institutional or other confinement." While there is no specific regulatory requirement for preregistering handicapped persons, licensing boards have held that reasonable efforts to identify them should be made. See, e.g., Consolidated Edison Co. (Indian Point, Unit No. 2), LBP-83-68, 18 NRC 811, 1016 (1983).

642. The record discloses that OPIP 3.6.5 of the Transition Plan does provide for a working list of noninstitutionalized handicapped persons who need special evacuation assistance from LERO. Testimony shows that the LILCO program for identifying these persons includes: (1) a letter asking persons with special needs, or knowing persons with special needs, to return an enclosed postpaid registration card, (2) a similar request in LILCO's Public Information Brochure, (3) an article in the LILCO newsletter, "Keeping Current," which is sent out via a general mailing that provides an address where handicapped persons can write for assistance, and (4) an address in the County and community telephone direc-

tories where those with special needs can write for assistance. See Clawson et al., ff. Tr. 7526, at 5-8, Att. 1-2, 5-6. A LILCO witness testified that both a "Keeping Current" article and the brochure with a postpaid registration card will be distributed at least annually. Id. at 7, 12-13. In addition, LILCO stated that it is checking a list of customers who have special priority for electric service restoration on the assumption that these customers may have one or more family members dependent on an electro-mechanical life support system, id. at 9. LILCO testimony also showed that LILCO has obtained a list of hearing-impaired persons who own TTY's from the Service Bureau for the Deaf, Tr. 7603, 7663 (Robinson). Additionally, LILCO has contacted both the County Handicapped Services and Office of the Aging, Tr. 7660-61 (Robinson), and plans to contact additional organizations associated with the handicapped in order to reach handicapped persons. Id.

643. Based on the record, the Board finds that LILCO is in fact making reasonable efforts to identify handicapped persons who may need assistance from LERO during a Shoreham emergency. This finding is further supported by testimony from the FEMA witnesses that the guidelines, cited above, require only that some methodology be developed to identify handicapped persons and their special needs, that mailback registration cards are commonly used at other nuclear sites, that the applicant's only duty is to see that the cards are sent out and that any responses are not disregarded, that FEMA knows of no requirement that a mailback survey be supplemented, and that LILCO's plan to identify handicapped persons through a mailback survey is adequate. Baldwin et al., ff. Tr. 12,174, at 79; Tr. 12,933-34, 12,936-37 (Keller, Kowieski).

644. The Board further finds that the potential operation of the Shoreham plant has been well publicized on Long Island, residents of the EPZ have had and will have a reasonable opportunity to avail themselves of the assistance LILCO has offered, and, contrary to State and County assertions, there is no basis for us to find that such persons will not take advantage of the assistance being offered to them. Tr. 12933-34 (Keller); Clawson et al., ff. Tr. 7526, at 9-12.

645. Regarding the concern that handicapped persons will not respond properly to the survey because they do not understand what an evacuation entails, the Board agrees with testimony from LILCO witnesses that people essentially have a general understanding of what is involved in an evacuation and that the Public Information Brochure will adequately supplement that understanding. See Tr. 7662-58 (Clawson, Cordaro).

646. While we were justified in examining the claim that the registration materials at issue are poorly drafted, particularly since LILCO's witness conceded that the wording on the postcard could be improved, Tr. 10,130-31 (Mileti), we cannot conclude that LILCO is not making reasonable efforts to identify handicapped persons. We have no doubt that such written materials always could be improved. However, it seems unlikely to us that reasonable persons, with the requisite expertise, could ever agree on the exact wording. For example, a State witness testified that LILCO should simply ask persons "what special need do you have," Tr. 7916 (Albertin), whereas a County witness testified that the use of general terms such as "special needs" are unclear to people. Tr. 9611 (Saegert).

647. Additionally, LILCO's efforts to identify handicapped persons by additional means, including the article in "Keeping Current," appeals to friends, family, and neighbors of handicapped persons to assist LILCO in locating these people. Tr. 7633 (Clawson). Additionally, LILCO's contact with organizations for the handicapped provide further assurance that such persons will be identified. Id. As an added precautionary measure, the record shows that there will be a designated telephone number which can be dialed during an emergency if a handicapped person has not pre-registered but needs assistance from LERO at the time of an emergency.

648. Witnesses for the State cited 1980 census statistics regarding the numbers of handicapped and hearing-impaired persons in the EPZ to support their contention that LILCO has identified only a fraction of these people. Tr. 7856, 7863 (Acquario, Knighton). We have assigned little weight to these statistics. This is because we find the census definition of handicapped to be very broad, see Tr. 7876-77 (Knighton), and that such a definition is likely to include persons who really are not handicapped for emergency planning purposes. Moreover, the record discloses that LILCO is not trying to identify all handicapped persons in the EPZ but only those who require assistance from LERO in an emergency. Tr. 7548-52 (Robinson). As a FEMA witness stated, it is FEMA's judgment that most handicapped people either live with someone or have already made special arrangements for all types of unique situations including emergencies. Tr. 12,934 (McIntire).

Conclusion

649. The Board finds, provided past efforts to identify handicapped persons within the EPZ continue, that LILCO is making reasonable efforts

to identify and protect "those persons whose mobility may be impaired [during an emergency] due to such factors as institutional or other confinement."

D. Notification and Evacuation of Handicapped People at Home
(Contentions 58, 73.B)

650. Suffolk County and New York State assert in Contentions 58, 73.B.1 and B.3 that the LILCO Transition Plan is inadequate because: (1) the only provision for notifying non-deaf handicapped persons at home of a pending evacuation is by means of a telephone call from the Home Coordinator; (2) many handicapped persons cannot communicate by phone; and (3) there is no indication in the Plan that a sufficient number of people will be available to make the calls. Harris and Mayer, ff. Tr. 9574, at 14, 18-19.

651. LILCO provided the testimony of Matthew C. Cordaro, Edward B. Lieberman, Elaine D. Robinson, and John A. Weismantle on Contention 73.B. Cordaro et al., ff. Tr. 7698. New York State provided testimony by William J. Acquario, Richard D. Albertin, and Robert G. Knighton appears ff. Tr. 7854. The FEMA Panel also testified on this issue, Baldwin et al., ff. Tr. 12,174, at 79-81; as did Suffolk County's witnesses, Harris, Mayer, and Saegert, ff. Tr. 9574.

652. The presumption in Contentions 58, 73.B.1, and 73.B.3 that the only means of notifying non-hearing impaired handicapped persons at home of a pending evacuation is by means of a telephone call is false. Handicapped persons at home, except the hearing impaired, will be notified of a pending evacuation by sirens and EBS messages along with the rest of

the population in the EPZ. Cordaro et al., ff. Tr. 7698, at 8. There is no regulatory requirement for separate notification of handicapped persons with full hearing at home.

653. In addition to siren and EBS notification, Section 5.1.2 of OPIP 3.6.5 of the Plan provides that LERO will call handicapped persons to confirm that a vehicle is being dispatched to evacuate them. Cordaro et al., ff. Tr. 7698, at 8-12, Att. 2.

654. The number of handicapped persons to be called will depend on the number of handicapped persons identified through LILCO's preregistration program and the percentage of the EPZ being evacuated in the emergency. Cordaro et al., ff. Tr. 7698 at 9-10; Tr. 7738-41 (Robinson).

655. The Home Coordinator has primary responsibility for calling these people but may draw on communicators and administrative personnel for assistance. Cordaro et al., ff. Tr. 7698, at 9-10. There are fifteen administrative support personnel, a number of communicators, and other personnel whose responsibilities would not begin until a later stage of the emergency who could assist in making the telephone calls. Id. at 11-12; Tr. 7752-53 (Weismantle).

656. The County maintains that there is no assurance that these people would be available to call handicapped persons and that the telephone calls, therefore, will take too long to permit timely evacuation. Harris and Mayer, ff. Tr. 9574, at 18-19. It also maintains that LILCO's Plan to call handicapped persons is inadequate because they may not be near the telephone or may be unable to communicate by telephone. Id.

657. The phone call merely provides advance notice that a vehicle has been dispatched to assist them in evacuating. Cordaro et al., ff.

Tr. 7698, at 11-12; Tr. 7720 (Weismantle). Evacuation vehicles are dispatched automatically to the residences of handicapped persons whether or not they are reached by telephone. Id. Consequently, if a handicapped person is not reached by phone beforehand, they will still be evacuated.

658. Suffolk County Contention 73.8.4 asserts that the evacuation of the handicapped at home will take "far too long" and therefore expose these people to health-threatening doses of radiation. LILCO witnesses presented evacuation time estimates for this group based on the type of vehicle -- ambulance, ambulette, or bus -- that would transport these people from the EPZ. Cordaro et al., ff. Tr. 7698, at 16-17. These evacuation time estimates are the summation of the times required to complete four discrete steps: (1) the time at which equipment becomes available at the staging area to transport the handicapped from the EPZ; (2) the time needed to travel from the staging area to the location of the first stop; (3) the time needed to make all stops; and (4) the time need to travel from the locations of the last stop to the EPZ boundary. Id. at 14. In estimating the time to complete each step, LILCO employed conservative assumptions. Id. at 14-16; Tr. 7775-76, 7779, 7782, 7792 (Lieberman).

659. The evacuation times for the handicapped at home are not significantly different from those for the general population. Cordaro et al., ff. Tr. 7698, at 17; Tr. 7767-68 (Lieberman, Weismantle). Since protective action recommendations are designed to provide dose minimization and are keyed to the time needed to evacuate the automobile-owning public, it follows that the handicapped at home would not be exposed to

health-threatening doses of radiation as suggested in Contention 73.B.4. Cordaro et al., ff. Tr. 7698, at 17; Tr. 7838 (Weismantle).

Conclusion

660. The Board finds that the LILCO Plan provides reasonable assurance that non-deaf handicapped persons at home will be notified in a timely fashion, and that LILCO's special alerting provisions provide additional assurance that the health and safety of these persons will be protected.

XII. Schools (Contentions 24.E, 24.F, 24.M, 61.C, 68, 69-71)

661. In general, Suffolk County Contentions 24.E, 24.F, 24.M, 61.C, 68, 69-71 deal with the alleged inadequate protection for school children under the LILCO Transition Plan.

662. LILCO offered six witnesses on these contentions. These were: Matthew C. Cordaro, Edward D. Lieberman, Elaine D. Robinson, Michael L. Miele, John A. Weismantle, and Richard R. Doremus. Cordaro et al., Tr. of 5/30/84, Vol. II; Doremus, ff. Tr. 9490. New York presented Charles V. Failla on its behalf with regard to Contention 24.F.2. Failla, ff. Tr. 9947. The FEMA Panel offered their findings. Baldwin et al., ff. Tr. 12174. Suffolk County's witnesses on these contentions were George J. Jeffers and Antony R. Rossi. Jeffers, ff. Tr. 11,001.

663. Seventeen school districts are covered by LILCO's Plan. Eleven districts have schools in the EPZ; six districts have no schools in the EPZ, but have pupils who live in the EPZ. In addition, there are two parochial schools inside the EPZ, three parochial schools outside the EPZ that have students who live in the EPZ, and thirteen nursery schools

covered by the Plan. Cordaro et al., ff. Tr. 9154, at 12; LILCO Ex. 80, at App. A, II-10 and Fig. 4.

664. Under the Plan, individual schools and school districts are relied upon for implementation of early dismissals, for sheltering in schools, for evacuation/relocation of school children, and for retaining of school children in schools beyond the school day. See LILCO Ex. 80, Appendix A, at II-19, 11-20. The particular protective actions recommended depend upon the Emergency Action Level involved, whether schools are in session, and whether the school is located in the EPZ. Id.

665. The LILCO Plan's provisions for schools originated with a draft prepared by the Suffolk County Planning Department. Cordaro, et al., Tr. of 5/30/85, Vol. II, at 16-17. In 1980, planners from the County Planning Department held discussions with school officials from the school district in the EPZ. Id.; see id., Attachment 11. The portions of the draft County plan dealing with protective actions for schools were incorporated into the original version of the LILCO Transition Plan. Cordaro et al., id., at 18. The utility has since made certain changes, including the addition of the two protective action options of sheltering and evacuation. Id. at 18-19.

666. The specific Contentions are addressed seriatim .

667. Contention 24.E asserts that LILCO has no agreements with the schools that the schools will implement protective measures and no agreements with nursery schools or parents to permit LILCO employees to drive buses to evacuate the children.

668. Most of the school districts within or near the EPZ have refused to participate in emergency planning with LILCO. Cordaro et al., ff.

Tr. 9154, at 29-30. Officials of the Sinai, MICSD and MCCSD districts testified that their districts have no intent of reaching any agreements with LILCO. Patrilak, ff. Tr. 11,001, at 2-3; Tr. 11,002-03 (Muto); Jeffers and Rossi, ff. Tr. 11,001, at 3.

669. LILCO has obtained copies of early dismissal plans for ten of the seventeen school districts with schools or students in the 10-mile EPZ. -Cordaro, et al., Tr. of 5/30/84, Vol. II, at 12, 39. It has met with the school districts to discuss the updating of individual district plans. Id. These plans provide the means for the schools to implement whatever protective actions might be required in the event of an emergency at Shoreham.

670. No letters of agreement with schools have been secured by LILCO. Baldwin et al., ff. Tr. 12,174 at 13; Tr. 9170 (Weismantle). NUREG-0654, II.A.3. requires agreements with "support organizations." However, as testified to by FEMA, neither schools nor nursery schools are "support organizaions", and no agreements are required with them or or the parents of children at those schools. Tr. 12,214 (McIntire); Tr. 12,433 (Keller); see also Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit 1), LBP-81-59, 14 NRC 1211, at 1639 (1981).

671. Contention 24.F asserts that there will not be enough available buses to evacuate people without transportation of their own, including homebound people, people in special facilities, and children in schools and nursery schools because: (1) LILCO has no agreements under which such buses will be available; (2) most buses are under contract to school districts or others; (3) most buses would be required by schools; (4) many

buses have capacities less than 40 passengers; and (5) LILCO does not itself own enough buses.

672. LILCO has 1236 buses under contract with 12 bus companies. Cordaro, et al., Tr. 5/30/84, Vol. II, at 57; Cordaro et al., ff. Tr. 6457, at 6-7, Att. 1-12. See Findings 582-586, supra. The bus companies have not contracted their entire fleets. Tr. 9311 (Weismantle). About 938 of these are subject to prior commitments to schools, fewer than half of which are in the EPZ. Cordaro, et al., Tr. 5/30/84, Vol. II, at 58; Tr. 9307 (Weismantle). Assuming an evacuation of the entire ten-mile EPZ during school hours and the buses which have been committed to schools remain unavailable in an emergency, there remain 298 buses available almost immediately to transport people out of the EPZ. Cordaro et al., Tr. 5/30/84, Vol. II, at 58; Tr. 9308 (Weismantle).

673. On this basis, the Board finds that this is an adequate number of buses to provide reasonable assurance that the people described in Contention 24.F will be evacuated in a timely manner. See Findings 558-588, supra.

674. LILCO relies on the fact that school districts in New York must by law, and do in fact, have early dismissal plans that require the availability of buses and drivers. Under the contracts between Middle Island School District and the bus companies, for example, the bus companies are obligated to come at the District's call to pick up children early. Tr. 3115 (Muto). The companies have always met this obligation in Superintendent Muto's experience. Tr. 3116 (Muto).

675. The RAC has recommended that the Plan should specify the number of licensed drivers that have been trained to respond to a radiological emergency at Shoreham. Baldwin et al., ff. Tr. 12,174, at 18. LILCO has

offered to provide training and dosimeters to the drivers. Cordaro, et al., Tr. of 5/30/84, Vol. II, at 60.

676. The Board finds reasonable assurance that there will be an adequate number of buses and drivers in the event of a radiological emergency.

677. In Contention 61.C.1., the protective action option of sheltering pupils in the schools is challenged. The contention asserts that: (1) the schools have done no preplanning; (2) some schools have no basements or other suitable areas for sheltering and there is no information in the Plan about sheltering capacities or shielding factors, in violation of NUREG-0654, II.J.10.m; and (3) the Plan states that LILCO will not change an early dismissal recommendation even if a sheltering or evacuation recommendation is made for the general public.

678. Contrary to the contention, preplanning has been done. Tr. 9241 (Weismantle). LILCO has prepared a set of generic sheltering guidelines, submitted these to the schools, and offered to have a health physicist survey each school in the EPZ and make recommendations as to the best places for sheltering. Tr. 9220-23, 9436 (Miele). A number of these surveys have already been done. Id. See also Cordaro et al., Tr. of 5/30/84 Vol. II, at 29, 50, 78.

679. Some of the school's existing early dismissal plans (a requirement of New York State law) expressly provide for sheltering. See Cordaro et al., Tr. of 5/30/84, Vol. II at 77-99.

680. The LILCO Transition Plan does not specify sheltering capacities or shielding capabilities for school buildings. Baldwin et al., ff. Tr. 12,174 at 59; Tr. 9279 (Weismantle). Such information is not required

in emergency plans. Id.; Tr. 9219 (Weismantle). For most schools, however, the sheltering factor is as great as or better than the typical home, where presumably the students would be sheltered if they were not at school when a sheltering recommendation was given. Tr. 9276, 9281, 9306, 9438 (Miele).

681. In many cases, schools will provide shielding factors much better than 0.6 since institutional buildings normally have a shielding factor of 0.2. There are schools, however, which have shielding factors of less than 0.6. The Plan does not list which schools within the EPZ meet a 0.6 shielding factor or which have basements. Tr. 9281-83, 9275-77 (Miele, Weismantle); Tr. 9305-06 (Miele); Tr. 9278-79 (Weismantle).

682. The allegation that LILCO would not change a prior recommendation to schools for early dismissal is based on a mistake in the Plan, which LILCO states will be corrected. Tr. 9273-74 (Weismantle). As a consequence, Contention 68 is without basis.

683. The admitted portions of Contention 69 allege that the early dismissal option for schools is not workable because the individual early dismissal plans are not included in the Transition Plan (69.B), early dismissal takes too long to implement (69.C) especially with the accompanying problems of congested roads and working parents not at home (69.D), and the plan does not deal with a change or protective action to sheltering or evacuation after early dismissal has begun (69.E).

684. There is no requirement that emergency plans for each school or school district be included in the LILCO emergency plan. See Finding 670, supra. Appendix A of the LILCO Transition Plan provides for early dismissal of schools. All schools in the EPZ have early dismissal

plans, which they use for emergencies such as heavy snowstorms. Tr. 9258 (Weismantle, Robinson); Tr. 12,740-41 (Keller, McIntire). The LILCO Plan relies on the efficient operation of those plans. Baldwin, et al., ff. Tr. 12,174, at 68. This arrangement is adequate for providing reasonable assurance that the school children's health and safety will not be endangered. Baldwin et al., ff. Tr. 12,174, at 68-70. Contention 69.B, therefore, is without merit.

685. Contention 69.C alleges that early dismissal will take a long time. It alleges that the early dismissal process takes a long time ordinarily, and that in a radiological emergency congested road conditions and role conflict experienced by bus drivers and other personnel in authority will make the problem worse. The contention alleges that "large numbers" of schoolchildren will have to walk home, distances up to two or three miles, which will take a long time. The contention alleges that children going home in an early dismissal would encounter early evacuation and mobilization traffic.

686. The County's witnesses based their opinions on the timeliness of early dismissal principally on experience with snow emergencies (Tr. 11,094-95 (Rossi)), on their speculation about what would happen in a radiological emergency (Tr. 11,108 (Rossi)), and on numerous practical problems they can foresee (Tr. 11,096-98 (Rossi)). They, nevertheless, testified that the early dismissal plans are the quickest way to get the children home. Tr. 3113-14 (Muto); Tr. 3107 (Smith); Tr. 3161 (Jeffers). The County's evidence emphasized that there are many practical problems with any unscheduled dismissal. See Tr. 11,027 (Smith), 11,028

(Muto). However, the NRC regulations do not require that all problems be eliminated, but only that there be an adequate plan for dealing with them.

687. Contention 69.C states that "large numbers of children" will have to walk home, at distances of up to two to three miles. While there is little evidence of record as to the specific numbers and distances involved, LILCO notes that New York State regulations allow elementary students to walk two miles and secondary students to walk three miles. Most districts, however, will bus elementary school students who live more than one-half mile away, intermediate level students who live more than one mile away, and high school students who live over one-and-a-half miles away. Cordaro, et al., Tr. of 5/30/84, Vol. II, at 40-41.

688. The LILCO Plan is not unreasonable or unworkable on its face for anticipating that school children will go home in the normal mode as they do every day. On the assumption that buses are provided for those students who are normally bussed to and from school, there is reasonable assurance that all students will reach their homes in a timely manner. There are no specific NUREG-0654 guidelines for returning children home in the event that an early dismissal of schools is initiated. Baldwin, et al., ff. Tr. 12,174, at 70.

689. With regard to traffic congestion because of early evacuation or mobilization traffic, the likelihood is slight because the tone-alerts will give schools immediate notice of an evacuation. Cordaro, et al., Tr. of 5/30/84, Vol. II at 41.

690. Contention 69.D addresses the issue of children whose parents are away from home during the day, raising the potential problem that they might have to return to an empty house in the event of an early

dismissal. Some schools' early dismissal plans make specific provision for this possibility by requiring parents to fill out an early school closing questionnaire indicating a responsible adult neighbor who has agreed to take charge of the child in the event of a parent's absence from home. Id. at 44; Tr. 9270 (Weismantle), 3144-45 (Jeffers). This problem exists in any early dismissal, including those for snow emergencies. Tr. 3115 (Muto). Care for such children is not specifically required by NUREG-0654. Baldwin et al., ff. Tr. 12,174, at 71.

691. Contention 69.E deals with the problems of an escalating emergency, causing a change in the protective action recommendation during the course of an early dismissal. The contention first repeats the allegation of Contention 61 that LILCO does not plan to inform the schools of subsequent sheltering or evacuation protective action recommendations. As already noted, this is a mistake in the LILCO Plan that will be corrected. See Finding No. 682, supra.

692. The contention goes on to say that schoolchildren may be stranded in the schools or on the way home (walking or on buses), without available shelter, means of evacuation, or other protection; thus, they may be exposed to the radioactive plume as it passes. See Jeffers and Rossi, ff. Tr. 11,000, at 11-12. The students still at school, however, could shelter there if that were the protective action recommendation. Cordaro, et al., Tr. 5/30/84, Vol. II, at 45. If students were on the

way home when it was announced that sheltering or evacuation was recommended, they would continue home and take protective actions with their families. Id.; see Tr. 12,737 (Baldwin). In effect, they would be treated like other members of the public. Tr. 9448 (Miele).

693. Contention 70 addresses the plan to evacuate children directly from the schools to reception centers when evacuation is recommended for the general public. The contention alleges that relocation centers are not identified, that the LILCO Plan does not provide details of the safe reuniting of children and their families, and that school officials have not conducted "preplanning" for a Shoreham emergency.

694. There is no NRC requirement that all schools in the EPZ be able to evacuate their students directly to relocation centers. An earlier draft plan prepared by Suffolk County planners provided only for early dismissal for most schools not for their transportation to reception center. Cordaro, et al., Tr. of 5/30/84, Vol. 11, at 17-18.

695. There is no NUREG-0654 guideline providing for the designation of special reception centers for schoolchildren. Tr. 12,750 (Kowieski). LILCO has committed itself to find reception centers for each school in the EPZ, to advise the schools of the choice, and to make available maps showing the recommended best bus route between each school and its designation reception center. Cordaro, et al., Tr. of 5/30/84, Vol. 11, at 53-54; Tr. 9286-88 (Weismantle).

696. It is not necessary that the Plan contain detailed procedures for the "safe reuniting" of families with their children at the school reception centers. There is no such guideline in NUREG-0654. Tr. 12,751

(Kowieski). It is sufficient that LILCO will identify reception centers and notify parents of their location.

697. As to schools not preplanning for evacuation, it is true that some schools are not participating. One reason appears to be limited resources and a reluctance to use those available in planning for a plant that in the school officials' view may never operate. Tr. 9239-40 (Weismantle), 9498, 9528-29 (Doremus), 9214-16 (Cordaro). To address this problem LILCO has offered its own resources to help the schools plan. Cordaro, et al., ff. Tr. 9367, at 26.

698. Contention 71 alleges that evacuation of nursery school children and other schoolchildren would not work for a variety of reasons involving availability of buses and bus drivers, supervision of the children, mobilization and evacuation traffic, and the need for multiple bus runs.

699. Contention 71 (71.A.1) first alleges that the school buses needed for evacuation would be in the custody of the normal school bus drivers or would be located substantial distances away. Most buses are garaged at the bus companies' yards when not in use. Tr. 6605-06 (Robinson). The regular school buses relied on for snow emergencies would be relied on here. Cordaro, et al., Tr. of 5/30/84, Vol. II, at 61-62. The schools have worked out means for notifying their bus drivers during the day in the event of snow emergencies and that could be done here. Id. at 54.

700. The contention next alleges (71.A.2) that the LILCO Plan has no provision for supervising children at schools, on buses, or at relocation centers. For early dismissal in a snow emergency, supervision on the bus is ordinarily provided only by the drivers. Such supervision will be

sufficient in the event of a radiological emergency as well. Teachers or other supervisory personnel are not expected to accompany the children. Tr. 3114 (Muto).

701. - Contentions 71.B.1. and B.2. allege that an evacuation would take too long because the evacuating buses would encounter traffic congestion and a substantial number of multiple bus runs, as well as staggered dismissal times, would be required. LILCO witnesses admitted that during an accident that developed rapidly into a General Emergency in which evacuation has been recommended, school bus transportation would probably be affected by the evacuation traffic. Cordaro et al., Tr. of 5/30/84, Vol. 11, at 63.

702. While delays may occur, the students could be sheltered at the schools while awaiting evacuation. Cordaro et al., Tr. of 5/30/84, Vol. 11, at 63.

703. Mr. Lieberman calculates that about 422 bus trips would be necessary to evacuate public and parochial school students from the entire EPZ. Cordaro et al., Tr. of 5/30/84 Vol. 11, at 55. The school districts own their own buses or have contracts with bus companies to provide them. Tr. 9446 (Weismantle). Approximately 350 school buses plus 35 coaches are available to the 11 districts with schools in the EPZ, with only minimal sharing. Tr. 9458, 9485-86 (Weismantle). This does not include other school districts that have students who live in the EPZ; for example, Middle Country District has about 91 buses available. Tr. 9458 (Weismantle).

704. Either using multiple bus runs or supplying additional buses to the schools from the 1236 contracted to LILCO could be used to evacuate

children. Cordaro et al., Tr. of 5/30/84 Vol. 11, at 57; Tr. 9298-99 (Weismantle). It is also likely that school districts with no schools in the EPZ would release some of their buses to help evacuate schools in the EPZ. Doremus, ff. Tr. 9491, at 26; Tr. 9309-10 (Weismantle). Also, LERO-contracted buses could evacuate the schools and then help evacuate the general public. Tr. 9301-02 (Weismantle); see also Tr. 12,227 (Kowieski).

Conclusion

705. The LILCO Plan provides reasonable assurance that school children will be protected in the event of a radiological emergency.

XIII. Ingestion Pathway

A. 50-mile EPZ (81)

706. Contention 81, in general, alleges that LILCO's Plan does not provide adequate planning and procedures for the 50-mile ingestion pathway EPZ; therefore it does not comply with 10 C.F.R. § 50.47 and NUREG-0654 II.J.11.

707. LILCO and FEMA were the only parties presenting witnesses on this Contention. See Cordaro et al., ff. Tr. 13,563; Baldwin et al., ff. Tr. 12,174.

708. The specific allegations of Contention 81 are set out in subparts 81.A. through 81.F., each is addressed below.

709. Contention 81.A. argues that the Plan does not provide adequate procedures for the disposition of contaminated lactating dairy animals or the treatment of uncontaminated animals should uncontaminated feed be unavailable.

710. Contention 81.B states that while the Plan calls for withholding contaminated milk from the market to allow decay of radionuclides, it does not call for milk disposal or continued withholding after the decay period. In addition, this period is not defined and how the withholding will be achieved is not stated.

711. The Plan includes specific initial procedures to minimize or prevent contamination. If a General Emergency is declared, LERO will immediately contact dairy farmers located within a 10-mile radius of Shoreham. Cordaro et al., ff. Tr. 13,563, at 10. LERO maintains a comprehensive list of the names, addresses and telephone numbers of commercial dairy farmers located on Long Island and in those other counties which lie within the 50-mile Ingestion Pathway. Id. This list is updated on a semiannual basis by the New York Department of Agriculture and Markets. Id. Farmers will be instructed to remove dairy animals from pasture and place them on stored feed until further notice. These immediate precautionary measures reduce the possibility of milk contamination. Cordaro et al., ff. Tr. 13,563, at 11; Tr. 13,568-72 (Daverio, Watts).

712. In the event of any radiological release, LERO will dispatch environmental survey teams to collect samples of milk, fodder, and forage from dairy farms located in the area of potential contamination. Cordaro et al., ff. Tr. 13,563, at 12; Tr. 13,598-601 (Porter, Watts). Laboratory analysis of these samples will be coordinated by personnel implementing the Dose Assessment Function under the supervision of the Radiological Health Coordinator. Id.

713. LERO will compare the laboratory test results for the milk samples with the Protective Action Guides that are set forth in Attachments 1-3 of OPIP 3.6.6. Id. If the projected or measured activity of a particular radionuclide in a sample is found to exceed the applicable preventive response level, LERO will initiate further protective actions. Potentially affected farmers will be instructed to keep all dairy animals indoors and to provide them with uncontaminated food and water, i.e., feed and water from covered sources. Farmers will also be advised to withhold their milk from commerce, store it at reduced temperatures, and take a representative one-gallon sample from each milking. These samples will be picked up by environmental survey teams for laboratory analysis. Cordaro et al., ff. Tr. 13,563, at 12-13, Att. 1; Tr. 13,608-11 (Cordaro, Daverio, Porter, Watts).

714. The concern that "uncontaminated store feed" might not be available is unfounded. The un rebutted testimony of the LILCO witnesses was that stored feed and vitamins account for the substantial, if not predominant, share of the diet of dairy animals in the region. Porter and Watts, ff. Tr. 13,563, at 15. Because of the relatively severe winters in New York State, local dairy farmers typically maintain a substantial supply of stored feed. Id. This climate also necessitates that such feed be kept in a shelter of one form or another. Id.; see Tr. 13,620-22 (Porter and Watts).

715. The Plan contains additional safeguards for preventing public consumption of contaminated milk. OPIP 3.6.6 calls for environmental survey teams to sample milk at processing plants as well as from tank trucks. The processor will be advised to withhold contaminated milk

from commerce to allow for the radioactive decay of a particular radio-nuclide. The processor will also be instructed to store all incoming shipments in separate tanks and to take representative one-gallon samples from each such shipment for monitoring purposes. Cordaro et al., ff. Tr. 13,563, at 13-14, Att. 1; Tr. 13,616-19 (Daverio and Watts); Tr. 13,714 (Cordaro, Porter, Watts).

716. With regard to "disposition" of contaminated animals, there is little need for such a procedure in the Plan. To the extent that dairy animals receive external contamination, such contamination may be removed simply by washing and scrubbing the affected animal. Porter and Watts, ff. Tr. 13,563, at 16. Even assuming that a lactating dairy animal did receive some internal contamination, this would not pose a potential public health problem except insofar as milk is concerned. Id.

717. There is no significant beef production within the 50-mile EPZ. Id. While the evidence showed that at least one farm may slaughter some dairy animals for consumption by residents of County institutions, beef produced by this farm would be monitored for radioactive contamination in the event of a radiological emergency. If any other commercial beef operation were to be identified within the 50-mile zone, it would be an easy matter to expand the scope of the existing procedures to cover it. Id. at 17.

718. LILCO's Plan includes a policy of compensating food-chain establishments for losses sustained by reason of a radiological emergency. Cordaro et al., ff. Tr. 13,563, at 14, 20, 24-25, 31-33, Att. 1. LILCO states it will compensate fully any farmer, processor, vendor, commercial fishery, or other food-chain establishment for food that has been

rendered unsalvageable as a result of the radiological emergency. Id.; Tr. 13,634 (Watts); 13,636 (Cordaro); 13,679-87 (Cordaro, et al.); 13,690-91 (Daverio). This compensation policy extends to the radioactive contamination of food, the spoilage of uncontaminated food withheld from the marketplace, and incidental economic losses. Tr. 13,619 (Cordaro and Daverio). This policy will eliminate any incentive for the farmer or merchant to sell or distribute contaminated food to anyone other than LILCO. Tr. 13,687-88, 13,729 (Cordaro); 14,252, 14,257-58 (Keller, McIntire). In addition, the United States Food and Drug Administration has the authority to condemn contaminated food intended for, or with the potential of travelling in, interstate commerce. Baldwin et al., ff. Tr. 12,173, at 87.

719. The Plan does provide standards for determining what would constitute an adequate "decay period" for short-lived radioisotopes, contrary to the contention. It uses the methodology established by the U.S. Food and Drug Administration for dealing with contaminated food stuffs. Baldwin et al., ff. Tr. 12,174, at 87. The decay period for short-lived radioisotopes is handled by standard methods which involve the half life of the nuclide, the initial contamination level, and the response level for a particular protective action. These guidelines are reflected in Attachments 1 and 2 of OPIP 3.6.6, which set forth preventive and emergency response levels for various radionuclides, and in Attachments 3, 4 and 5 of OPIP 3.6.6, which constitute protective action worksheets for milk, water and other foods, respectively. LILCO Ex. 80; Porter and Watts, ff. Tr. 13,563, at 18. By using these, LERO can determine the appropriate decay period for a particular food sample. Id.

720. Food stuffs contaminated by "long-lived radioisotopes" are dealt with solely by considering the response level for a particular protective action. Baldwin et al., ff. Tr. 12,174, at 87. In the event that a milk or food sample were determined to have an unacceptably high concentration of any of these radioisotopes, LILCO would undertake to purchase the affected food and dispose of it in accordance with Sections 5.4 and 5.5 of OPIP 3.6.6. Cordaro et al., ff. Tr. 13,563, at 19.

721. Contention 81.C. states that the Plan in calling for washing, brushing, or peeling of contaminated fruits and vegetables does not contain procedures for disposing of wash water, how removal of surface contamination by washing would be achieved and what are the criteria for a contaminated operations area and how it is measured; or how many local farm stands can be located and controlled.

722. If the radioactive contamination of locally produced fruits and vegetables exceeds the applicable preventive protective action guide, LILCO's policy will be to buy all such produce from farmers, vendors, and other food-chain establishments. Cordaro et al., ff. Tr. 13,563, at 20-23, Att. 1; Tr. 13,636, 13,639-40, 13,646-47 (Cordaro, Watts). The recommendation to wash, peel or scrub will apply only if the food may be consumed safely by the public; that is, the level of radioactivity is below the applicable preventive protection action guide. Tr. 13,640-43 (Watts).

723. Washing fruits and vegetables to eliminate low levels of radioactive contamination is no different from washing them to remove other toxic residues. Porter and Watts, ff. Tr. 13,563, at 22. In both

cases, the contamination is significantly diluted by the wash water, which is further diluted by sewer water or septic systems. Id. Peelings and other residue would be disposed of as any other garbage would, in a trash receptacle or other container. Id.

724. While LILCO's anticipated procedure of dispatching environmental survey teams to collect representative samples from farmstands in the ingestion pathway and then advising each to withhold their produce does not appear on its face to be reasonably calculated to reach the great majority of farmstands in the area efficiently, EBS bulletins, other public announcements, or telephone contact with many farmstands will inform them of LILCO's buy-back policy. This reasonably assures that contaminated produce will be withdrawn from sale. See Cordaro et al., ff. Tr. 13,563, at 23-25, Att. 1 and 5; Tr. 13,649-52 (Daverio); 14,252, 14,257-59 (Keller, McIntire).

725. Contention 81.D. alleges that the Plan contains no maps showing key land use data, watersheds, water supply intakes and treatment plants and reservoirs; in addition, it is contended that how other water supplies would be made available and how affected wells and reservoirs would be identified and secured is not stated.

726. LERO does maintain maps showing key land use data, dairies, food processors, surface water intakes, reservoirs, treatment plants, and groundwater sources. Cordaro et al., ff. Tr. 13,563, at 25-26. In addition, LERO has a United States Geological Service hydrologic unit map which shows drainage basins within the New York portion of the 50-mile EPZ as well as a comprehensive list of New York streams that drain into river basins in that area.

727. With regard to other water supplies being available, wells provide virtually the only source of drinking water for residents of Nassau and Suffolk Counties. Cordaro et al., ff. Tr. 13,563, at 26. This testimony was uncontested. Because of the natural filtration process that occurs when surface water enters the aquifer, radioactive material is filtered from the water to a large degree and would cause reduced contamination of well water supplies. Id. It is unlikely, therefore, that residents of Nassau and Suffolk Counties (which represents approximately 80% of the New York portion of the 50-mile EPZ) would ever be in need of alternative drinking water supplies. Id.

728. The reservoirs situated on the periphery of the 50-mile EPZ in New York's Putnam and Westchester Counties do provide potable water to residents in that area. Cordaro et al., ff. Tr. 13,563, at 26-27. Assuming that an airborne radiological release contaminated these reservoirs, affected resident would be advised, via EBS bulletin, to drink bottled water, well water, or tap water which had been stored in closed tanks or vessels prior to the advisory, pursuant to Attachments 7 and 8 of OPIP 3.6.6. Id. at 27.

729. LILCO's testimony admits expressly that insofar as Contention 81.D.2 deals with "securing" reservoirs, the Plan does not mention, nor does LILCO intend to establish, such a procedure. Id. at 27, n.1.

730. LERO maintains a comprehensive list of community wells and surface water sources that are situated in the New York segment of the 50-mile EPZ. If a radiological emergency is declared, environmental survey teams will periodically obtain water samples from reservoirs, wells, and other water sources in the area of potential contamination.

If these samples are determined to have an unacceptably high level of radioactive contamination, LERO will contact the affected water supply operators and inform them. In addition, residents of affected water districts will be advised, by EBS bulletin, to limit or cease consumption of tap water until further notice. Cordaro et al., ff. Tr. 13,563, at 26-29; Tr. 13,668-79 (Cordaro, Porter, Watts).

731. Contention 81.E. asserts that the Plan does not state how the public's diet is to be restricted; how condemnation will be conducted and paid for; or how exports of agricultural products and ducks can be controlled.

732. OPIP 3.6.6 includes specific procedures and criteria for developing dietary recommendations. Among the factors to be considered is the relative importance of the particular food item in the average daily diet. Attachment 6 of OPIP 3.6.6 assigns average daily consumption values for specific food groups based on FDA Guidelines. If the measured activity of a radionuclide in a food sample exceeds the emergency response level, LERO will advise the general public, by EBS bulletin, to restrict its diet to foods other than those identified as contaminated. In such circumstances, LERO may also recommend that the public use foods in sealed packages, cartons, or cans, which are protected from radioactive contamination. Cordaro et al., ff. Tr. 13,563, at 30-32, Att. 1; Tr. 14,249 (Keller).

733. In OPIP 3.6.6, Section 5.C, it states that once the decision is made to curtail the consumption of food or water, the Director of Local Response would approve procurement of necessary supplies. Baldwin et al., ff. Tr. 12,174, at 89. The Logistics Support Coordinator will

obtain these supplies through Material Purchasing and the Support Services Coordinator would arrange for local distribution. Id. The plan states on page 1 of Procedure OPIP 3.6.6., that LILCO will compensate for food which is not salvageable. Id.; see Finding No. 718, supra. It does not provide for a "condemnation" process per se. Cordaro et al., ff. Tr. 13,563, at 31.

734. Attachment 11 to OPIP 3.6.6. identifies duck and other poultry farms on Long Island. Cordaro et al., ff. Tr. 13,563, at 32. LERO would use this information to contact suppliers, advise them of the buy-back policy (assuming, of course, that there were some radiological contamination) and thereby prevent the poultry from entering commerce. Id. at 33. In addition, since the normal diet of commercially raised ducks consists almost entirely of stored feed, it is unlikely that such ducks will receive internal contamination as a result of an atmospheric release of radioactive particulates. Id. There is no means by which LILCO could directly prevent or control exports -- except by buying them -- as a matter of law. The offer to purchase, if financially credible to the supplier, will stop the products from going to market.

735. In Contention 81.F. it is alleged that the LILCO Plan does not provide for personnel, facilities, equipment or a communications network to implement the actions described above.

736. With respect to personnel, OPIP 3.6.6., Sec. 2.0 expressly provides that the Director of Local Response has overall responsibility for making protective action decisions concerning the ingestion exposure pathway. Cordaro et al., ff. Tr. 13,563, at 34. The Department of

Energy initially will provide dose assessment and environmental survey personnel from Brookhaven National Laboratory, which is located approximately six miles from Shoreham. DOE will provide additional personnel from remote locations, if necessary, within sufficient time to monitor the ingestion exposure path. Id. at 34-35, Attachment 1; Tr. 13,702-03 (Daverio); Tr. 14,253-54 (Keller and McIntire).

737. By virtue of its membership in the Institute of Nuclear Power Operations, LILCO can draw on the resources of other member utilities in the event of a radiological emergency. Member utilities within a 300-mile radius of Shoreham can furnish approximately 60 two-man radiological survey teams equipped with survey instrumentation and vehicles. These utilities can also provide approximately 25 health physics supervisors to coordinate these teams and roughly 45 health physics/environmental engineers to coordinate sample analysis and interpret environmental data. Member utilities located beyond a 300-mile radius of Shoreham can substantially augment these resources, if necessary, within a 24-hour period. Cordaro et al., ff. Tr. 13,563, at 35-36.

738. To augment the number of field survey teams, the Radiation Health Coordinator can also call upon LILCO personnel assigned to Shoreham's Radiological Environmental Monitoring Program. More than a dozen LILCO/REMP employees are available to supplement or assist survey teams. Id. at 36.

739. The implementation of ingestion pathway protective actions is to be primarily carried out by food chain establishments. Therefore, specific resources for the implementation of the protective actions are not shown in the plan. The procedures to notify these establishments of

what protective actions to take are given in Section 5.4 of Procedure OPIP 3.6.6. Baldwin et al., ff. Tr. 12,174, at 90.

740. The Plan describes in detail the equipment required for monitoring the ingestion pathway. Specifically, Section 5.2.2 of OPIP 3.6.6 delineates various types of equipment and materials that would be necessary for sampling milk, water and foodstuffs. Porter and Watts, ff. Tr. 13,563, at 36-37.

741. The communications network would function as follows: As stated in Section 5.1.3.6 of OPIP 3.6.6, the Director of Local Response would communicate protective action recommendations directly to the New York State Commissioner of Health, as well as to the Chief of the Radiation Control Unit of the Connecticut Department of Environmental Protection. Cordaro et al., ff. Tr. 13,563, at 37. If New York State officials, for whatever reason, failed to assume responsibility for the ingestion exposure pathway, LERO personnel would undertake to implement appropriate protective actions. In this eventuality, Section 5.4 of OPIP 3.6.6 provides that the Radiation Health Coordinator would be responsible for communicating recommended protective measures. Id.

742. The FEMA witnesses testified that the federal government will commit substantial resources to environmental surveillance and monitoring of the ingestion exposure pathway in the event of a major radiological emergency. Tr. 14,252-54, 14,266-67 (Keller, McIntire).

Conclusion

743. The Board finds that LILCO's Plan includes adequate planning and procedures governing the 50-mile ingestion pathway EPZ and thus is in compliance with the applicable NRC regulations and NUREG-0654 II.J.11.

B. Recovery and Reentry (Contentions 85, 88)

Contention 85 - General Plans for Recovery and Reentry

744. Contention 85 and the testimony presented by the County assert that the Transition Plan fails to include a general plan for recovery and reentry and does not set forth procedures for implementing recovery and reentry operations. Minor, ff. Tr. 15,384, at 2-5.

745. The record shows that OPIP 3.10.1 establishes a Recovery Action Committee (Committee). The procedure also delineates its responsibilities. This Committee includes the Manager of Local Response, the Radiation Health Coordinator, and a Nuclear Engineer. The Committee has two functions. The first is to assist the Director of Local Response in making recovery/reentry decisions. The second function is to implement recovery/reentry activities authorized by the Director of Local Response. In addition, representatives of FEMA, DOE, EPA, and state and county governments will be invited to participate in the Committee's deliberations. Cordaro et al. (85), ff. Tr. 15,282, at 7, Att. 1; Tr. 15,292 (Daverio).

746. The record further shows that the Nuclear Engineer will be called upon to determine that the plant is stable. He will, for example, investigate containment isolation, core damage, coolant damage, and other matters relating to plant stability. Tr. 15,291-82, 15,321-28 (Cordaro, Daverio). At the same time, the Radiation Health Coordinator will review data derived from air monitoring, environmental survey sampling, and ingestion pathway sampling. The Radiation Health Coordinator will then compare these data with the dose criteria for reentry, as set forth in

OPIP 3.10.1. Cordaro et al. (85), ff. Tr. 15,282, at 7-9, Att. 1; Tr. 15,301-02 (Daverio), 15,306-08 (Watts).

747. The Manager of Local Response will convene the Committee if the prerequisites set forth in Section 4.0 of OPIP 3.10.1 are satisfied. The Committee will develop specific recommendations regarding environmental decontamination, transportation, traffic control, communications, security and other matters set forth in Section 5.2 of OPIP 3.10.1. The Manager of Local Response will convey these recommendations to the Director of Local Response, who will authorize specific recovery/reentry operations. Cordaro et al. (85), ff. Tr. 15,282, at Att. 1.

748. As provided by OPIP 3.10.1, the Health Services Coordinator is responsible for decontamination activities. Given the wide variety of circumstances that may exist in the course of a radiological accident, it is, of course, not possible for LILCO to include comprehensive decontamination procedures in the Plan. There is, however, a wide variety of publicly available technical literature on the subject of radioactive decontamination options and procedures which LILCO can utilize. Cordaro et al. (85), ff. Tr. 15,282, at Att. 1; Tr. 15,293-95, 15,312-14 (Daverio), 15,298-99, 15,314-15 (Watts).

749. Included in OPIP 3.10.1 is a general procedure governing the disposal of radioactive waste. Solid radioactive wastes, collected from decontamination activities, will be transported to Shoreham pending ultimate disposition. Liquid wastes will be discharged to the sewers only after a determination that the isotopic activity in such waste materials is below an acceptable level. Cordaro et al. (85), ff. Tr. 15,282, at Att. 1; Tr. 15,319-21 (Cordaro, Daverio, Watts).

750. Embodied in OPIP 3.10.2 is a method for calculating total population dose. Under OPIP 3.10.2, hourly zone population estimates are multiplied by the whole body and thyroid doses, yielding an hourly dose for each zone. The sum of these hourly dose values, which represents the total dose for each zone, is then multiplied by the applicable dose reduction factor. The sum of these calculations constitutes the total population dose. Cordaro et al (Supp. 85), ff. Tr. 15,282, at 3-4, Att. 1.

751. We find, in addition, that LERO will confer with federal agencies and, where possible, state and local governments to evaluate available population and dose data prior to calculating total population dose. Sources for periodic population estimates include, among others, Marketing Evaluations survey data; reports from traffic guides, evacuation route spotters, and transfer point coordinators; and estimated evacuation times from Appendix A of the Plan. Cordaro et al. (Supp. 85), ff. Tr. 15,282, at 4, Att. 1; Tr. 15,346-48, 15,351-58 (Daverio, Watts).

752. The Board thus concludes that the LILCO Plan adequately sets forth a general plan for recovery and reentry, including adequate procedures for initiating and implementing a recovery/reentry operation, in compliance with applicable NRC regulations and NUREG-0654 II.M.

Contention 88 - Dose Criteria for Reentry

753. With respect to Contention 88, the Intervenors contend that the Transition Plan fails to state the dose criteria that will provide the basis for a determination that it is safe for the public to reenter previously evacuated areas and that LILCO's method of calculating total

population exposure is not adequate for determining dose rates or a projected dose in an area to be reentered. Minor, ff. Tr. 15,384, at 2, 5-6.

754. The record establishes that the radiological criteria that will serve as a basis for a determination that it is safe for the public to reenter previously evacuated areas are set forth in section 5.3 of OPIP 3.10.1 of the Plan (Revision 4). Section 5.3.2.b provides that an area will be considered contaminated if "evaluation of environmental monitoring results, plant data, and/or laboratory analysis of isotopes shows that direct constant exposure and inhalation of resuspended particulates for one year (allowing for radioactive decay) will result in a dose greater than 500 mR to wholebody or equivalent to any organ." Section 5.3.2.b also provides that the applicable models for calculating dose criteria for reentry are contained in Regulatory Guide 1.109 and WASH 1400 and that the results of this calculation are to be compared with Attachment 1 of OPIP 3.6.6 for ingestion pathway considerations. Cordaro et al., ff. Tr. 15,284, at 6, Att. 2; Tr. 15,29-30, 15,361 (Daverio, Watts).

755. The Board notes that there are presently no NRC regulations or NUREG-0654 or other guidelines that address acceptable offsite radiological levels for reentry. Cordaro et al., ff. Tr. 15,284, at 7. LILCO's radiological criteria for reentry, however, are consistent with 10 C.F.R. § 20.105(a), the acceptable contamination levels for reentry set forth in Part I, Section IV.C of the New York State Radiological Emergency Preparedness Plan and the protective action guidelines for reentry which will be issued by the Environmental Protection Agency. Id.; Tr. 15,363-64, 15,369-79 (Daverio, Watts).

756. Under Section 20.105(a) of 10 C.F.R., the NRC will approve proposed limits on levels of radiation in unrestricted areas if the Applicant demonstrates that the limits are not likely to cause any individual to receive a dose to the whole body exceeding 0.5 rem in any period of one calendar year. Cordaro et al., ff. Tr. 15,284, at 7-8, Att. 3; Tr. 15,369-75 (Watts). Part I, Section IV.C of the New York State Radiological Emergency Preparedness Plan also uses 0.5 rem as the threshold contamination level for reentry. Cordaro et al., ff. Tr. 15,284, at 8, Att. 4; Tr. 15,369-72, 15,375-79 (Daverio, Watts). Additionally we note that LILCO contacted EPA to determine the dose criteria guidelines for reentry that will appear in EPA's draft guidance due out this fall and learned that the guidelines will cover a range from 0.5 rem to 5.0 rem. Tr. 15,367-68, 15,373 (Watts).

757. FEMA and LILCO witnesses both testified that a calculation of total population exposure is not used for initial protective actions but, rather, is useful in assessing the potential long-term consequences of a radiological accident. Tr. 15,341-42 (Watts); 14,338, 14,579 (Keller). The LILCO witnesses testified that calculation of total population dose is a public information tool and a means that may be used in assessing the long-term health consequences, if any, of a radiological release. We find that Intervenors have not established that there is an immediate need to know the total population dose; the dose will be calculated only after due deliberations within LERO and consultation with other offsite agencies. Cordaro et al. (Supp. 85), ff. Tr. 15,284, at 4, Att. 1; Tr. 15,341-42, 15,347-48 (Daverio, Watts). As an illustration of this principle, a LILCO witness testified how total population dose was used

following the accidents at Three Mile Island and Ginna in the manner described above. Tr. 15,341-42 (Watts).

758. The Board finds that the LILCO Plan does include dose criteria for reentry by the public into previously evacuated areas, that the dose criteria satisfy NRC regulations and NUREG-0654 guidelines and that, contrary to the Intervenor's presumption, total population exposure is not used in assessing dose criteria for reentry.

Conclusion

759. Accordingly, for the reasons discussed above, we find that Contention 85 and 88 are without merit.

C. New York State Plan (Contention 92)

760. Four issues regarding a New York State Emergency Plan for Shoreham, or lack thereof, are raised in Contention 92. These issues are (1) whether such a plan exists; (2) whether the Transition Plan can be considered as adequate absent a State Plan; (3) whether the State would respond during an actual emergency; and (4) whether the Transition Plan provides for coordination of LERO and State responses if the State does respond in the event an emergency at Shoreham. Neither New York State or Suffolk County presented testimony or other evidence on this issue.

761. Contention 92 asserts that there is not a site-specific volume for Shoreham in the New York State Plan. LILCO agrees with this assertion. Cordaro and Weismantle, ff. Tr. 13,899, at 4. The record does show, however, that site-specific plans exist for every other nuclear power

plant in New York State. The record also shows that the Transition Plan does not rely upon a response from New York State in an emergency. Id.

762. The "New York State Disaster Preparedness Plan" prepared by the Disaster Preparedness Commission of the State of New York (revised September 1982) describes the responsibilities of the State with regard to a radiological emergency. Id. at 4-5, Att. 10. Under Article II.B of the State Executive Law, the State Disaster Preparedness Commission will "create, following the declaration of the State Disaster Emergency, a temporary organization in the disaster area to provide integration and cooperation of efforts among the various federal, state municipal and private agencies involved." Id. at 5, Att. 10, at A-5. Apparently New York State personnel generally perform four functions in an emergency at a nuclear power plant in the State. These functions are dose projection based upon release data communicated to State officials, ingestion pathway sampling in the 50-mile EPZ, interdiction of contaminated foods, and making protective action recommendations if a state of emergency has been declared. Id. at 6. The Transition Plan relies on LERO for all four of these functions. Id.

763. LILCO's position is that New York State has indicated that the State and County would respond to an emergency at Shoreham. This position is based on the fact that the Governor of New York stated, in a press release dated December 20, 1983, that "of course, if the plant were to be operated and a misadventure were to occur, both the State and County would help to the extent possible; no one suggests otherwise." Id. at 7. In addition, LILCO relies on the fact that the "New York State Disaster Preparedness Plan" prepared by the Disaster Preparedness Commission of

the State of New York (September 1982), Id., Att. 10, states that "it is the policy of the State to take actions to prevent or mitigate the effects of natural or man-made disasters, to be prepared, within its resources, to respond to an emergency or disaster, and to expedite recovery." Id. at 1-3, Att. 10. According to the New York State Plan, services provided to prevent, minimize, and respond in recovery after a disaster "will be coordinated to the maximum extent with comparable activities of local governments, other states, the federal government, and voluntary/private agencies of many types." Id. According to LILCO it appears that nothing in the New York State Plan contradicts the notion that the State and County would participate in an actual emergency at Shoreham, and no testimony to the contrary was presented by New York State or Suffolk County. The County and State position was directly contrary to LILCO's position. See "Opposition of Suffolk County and the State of New York to LILCO's Motion for Summary Disposition of Contentions 1-10" etc., dated September 24, 1984, at pp. 90-94. However, the Board finds that it is not necessary to determine whether the state will or will not respond in the event of an emergency at Shoreham. Any finding by us in this regard would be speculative. All we need find and do find is that the Transition Plan allows for participation of both New York State and County officials during an emergency should State and County officials choose to participate in an emergency response. Id. at 8. Existing communication systems already installed within the State could be used to notify the State of an emergency whether or not the State chooses to respond. Id. at 8, Att. 12. There also presently exists space for use by State officials in the LILCO Emergency Operations Facility, the Emergency Operations Center,

and the Emergency News Center. Id. at 8, Att. 13. The Transition Plan provides that in making any protective action recommendations the Director of Local Response is to take into account advice that may be received from local and State government officials. Id. at 9, Att. 14. Consequently, if New York State officials should decide to participate, their involvement could easily be incorporated into the emergency response. Id. at 9. If they do not respond, the Transition Plan as discussed above provides for LERO to perform the functions that the State performs at other nuclear facilities in New York State.

Conclusion

764. For the reasons discussed above, the absence of a New York State plan for Shoreham, in and of itself, is not considered a deficiency for offsite emergency planning purposes if LILCO has adequate legal authority to implement its Transition Plan.^{49/}

D. Connecticut (Contention 24.R)

765. Contention 24.R alleges that LILCO has no agreement with the State of Connecticut under which the State agrees to implement protective actions for portions of the 50 mile ingestion pathway EPZ that are in Connecticut.

^{49/} Our findings with regard to the absence of a New York Plan for Shoreham should not be read as a ruling on Contentions 1-10, the so-called legal authority contentions. Issues raised in those contentions are addressed by us elsewhere.

766. Direct testimony on this contention was filed by LILCO which included an attachment consisting of a letter dated December 15, 1983 from Frank Mancuso, State Director of the Office of Civil Preparedness in Connecticut to Dr. Don DeVito, New York State Director of the Office of Disaster Preparedness. This letter sets forth the State of Connecticut's willingness to provide support and radiological assistance in that part of the 50 mile ingestion pathway which lies within the State of Connecticut in the event of a radiological emergency at Shoreham. Cordaro, et al. Tr. 4/6/84, Vol. 11, Attach. 28.

767. Subsequently, New York State introduced a letter dated March 30, 1984 to Mr. Mancuso from Dr. David Axelrod, Commissioner of Health and Chairman of the New York State Disaster Preparedness Commission responding to the December 15, 1983 letter. New York Ex. 3, ff. Tr. 6598. This letter disavowed any agreement between New York State and the State of Connecticut to "exchange information in the event of a nuclear accident at Shoreham."

768. A further letter from Mr. Mancuso to Dr. Axelrod, dated April 18, 1984 responding to the March 30, 1984 letter was received in the record as LILCO Ex. 48 at 2, ff. Tr. 9945. This letter clarified the December 15, 1983 letter and stated, while there is no "agreement" between New York State and Connecticut with regard to the Shoreham Nuclear Power Station, nonetheless Connecticut was "meeting the requirements of NUREG-0654/FEMA-Rep-1."

769. One further exchange of correspondence completes this record: LILCO wrote directly to the State of Connecticut on May 22, 1984 asking for confirmation that Connecticut would, in fact, implement the necessary

protective actions for the 50 mile ingestion pathway in Connecticut as set forth in NUREG-0654. Cordaro & Renz, ff. Tr.13,858 at 2-3, Att. 1. The State of Connecticut responded on June 14, 1984, stating in part "This office will react to an accident at Shoreham or any other nearby facility by instituting existing emergency plans and resources to protect the health and Safety of residents of Connecticut. This is true whether we are notified by LILCO or any other competent source such as the Federal Emergency Management Agency." Cordaro & Renz, ff. Tr. 13,858, Att. 2.

770. Thus, we have not one but three letters from the State of Connecticut in the record before us: two written to New York State and one written directly to LILCO. However, all of these letters make very clear that the State of Connecticut will do whatever is necessary to protect the health and safety of its citizens, and we have absolutely no evidence in the record to refute this assertion by the State of Connecticut.^{50/}

Conclusion

771. Therefore, the Board finds uncontroverted evidence that there is, indeed, agreement by the State of Connecticut that it will implement protective actions for the portions of the 50 mile ingestion pathway that are in Connecticut, whatever the source of those recommendations may be.

772. Contention 24.R is without merit.

^{50/} We note no party disputed the authenticity of these letters and the Board has no basis on which to doubt their validity.

XIV. Loss of Offsite Power (93-96)

773. Contentions 93 through 96 deal with the potential loss of offsite power in conjunction with an emergency at Shoreham.

774. Only LILCO and FEMA presented witnesses on these Contentions. See Cordaro et al., ff. Tr. 5575, et seq.; id., ff. Tr. 5717; Baldwin et al., ff. Tr. 12,174.

775. The preamble to these Contentions alleges that the LILCO Plan "must provide an adequate response for even 'the worst possible accident, regardless of its extremely low likelihood.' NUREG-0654, Section I.D., at 7. This includes a loss of offsite power, which would not be unlikely in conjunction with a severe accident at Shoreham." The Board does not accept this premise for these Contentions. First, NUREG-0654 does not require an adequate response for the "worst possible accident" at Shoreham; it simply provides that the worst possible accident is taken into consideration in the planning basis for the provisions of NUREG-0654. Tr. 5581-83 (Weismantle). The language refers to "the worst possible accident" at the plant, not the worst possible conditions that can be imagined to exist offsite, such as a loss of offsite power. Cordaro et al., ff. Tr. 5575, at 4. Second, the assertion that a loss of offsite power would not be unlikely in conjunction with a severe accident at Shoreham is untrue. An accident at Shoreham would be highly unlikely to cause a loss of offsite power because of ample and interconnected generating capacity on the LILCO system and the New York Power Pool. Cordaro et al., ff. Tr. 5575, at 5-6. Shoreham would represent less than twenty percent of total LILCO generating capacity. Id.

LILCO's unrebutted testimony was that the probability of a loss of offsite power "in conjunction with" an accident at Shoreham is extremely unlikely. Id.; see Tr. 5592, 5594-95, 5653-55 (Cordaro).

776.- Contention 93 alleges that the LILCO Plan does not provide backup power to the EOC, staging areas, bus transfer points, receiving hospitals, or relocation centers. There is no regulatory requirement for such backup power. See Cordaro et al., ff. Tr. 5575, at 8. LILCO's testimony, however, demonstrated that all these facilities would function adequately in the event of a loss of offsite power. Id. at 8-11; Tr. 5601-02 (Renz); 5604-07 (Schiffmacher).

777. There is no requirement in NRC regulations or NUREG-0654 for a backup power supply at the EOC. Cordaro et al., ff. Tr. 5575, at 12-13; Baldwin et al., ff. Tr. 12,174, at 95; Tr. 5621-22, 5624-25 (Schiffmacher). In any event, backup power for the EOC is supplied by a 75 kw gas-fired emergency generator. Id. This generator is sufficient to provide power for the functioning of the EOC in the case of an offsite loss of power. See id.

778. The staging areas at Riverhead and Port Jefferson also have backup generators sufficient to support LERO activities. Cordaro et al., ff. Tr. 5575, at 9; Tr. 5609-10 (Schiffmacher). At Patchogue, the radio is backed up by a battery. Cordaro et al., ff. Tr. 5575, at 9; Tr. 5610-11 (Schiffmacher). At all three staging areas, flashlights and car lights will also be available. Cordaro et al., ff. Tr. 5575, at 9; Tr. 5611-13 (Renz).

779. Bus transfer points and relocation centers can function adequately without backup power. Cordaro et al., ff. Tr. 5575, at 9-11; Tr. 5601, 5613-15, 5619-20 (Renz).

780.- Receiving hospitals are likely to have multiple backup power sources. Cordaro et al., ff. Tr. 5575, at 10; Tr. 5617-19 (Renz, Weismantle). There is nothing in the record to the contrary.

781. Contention 94 alleges that there is no backup power supply for the LILCO Customer Service office or the EOC and that in the event that power to these facilities were lost, LILCO would not be able to provide for prompt notification of emergency personnel. As set out in Finding 777, the EOC has a backup power supply. Similarly, the Customer Service Office has a 156 KW emergency diesel generator. Cordaro, et al., ff. Tr. 5575, at 12.

782. Contentions 95.A, 95.D. and 95.E. question LILCO's ability to provide an appropriate alert signal and a follow up instructional message to the general public on the grounds that there is no backup power supply for the sirens, that the tone alert radios do not operate on batteries, and that the Emergency News Center does not have a backup power supply and a backup news facility has not been established.

783. There is no requirement for backup power supplies for any of these items. Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 1), LBP-81-59, 14 NRC 1211, 1542 (1981); Cordaro et al., ff. Tr. 5575, at 14-15, 21, 22; see also Baldwin et al., ff. Tr. 12,174, at 96-97.

784. Based on his experience as a consultant to a number of utilities and states concerning emergency planning and communications, LILCO's witness Hobbs testified that LILCO, like the majority of other utilities,

uses electro-mechanical sirens and that he was not aware of any utility or government responsible for notification of the public in the vicinity of a nuclear power plant that has a direct backup power supply for such a siren system. Cordaro et al., ff. Tr. 5575, at 20. Other emergency plans for nuclear power plants in New York have been accepted and have no independent backup power supplies for electro-mechanical sirens such as those used by LILCO. Cordaro et al., ff. Tr. 5575, at 14-15.

785. A loss of power to the siren system is unlikely because of interconnections and the design of the LILCO grid. Cordaro et al., ff. Tr. 5575, at 15. If power were lost, LILCO has committed to restore power to the sirens on a priority basis by use of black start gas turbines. Id. at 15-16. LILCO has the means to do so. Id. at 16; Tr. 5625-34 (Schiffmacher). In addition, the alerting function performed by the sirens will be backed up by route alert drivers, tone alert radios, and perhaps by helicopter notification through Island Helicopter. Cordaro et al., ff. Tr. 5575, at 17-19, Att. 2; Baldwin et al., ff. Tr. 12,174, at 96; Tr. 5638-40 (Renz); see Findings 326-28. This arrangement complies with applicable requirements. Cordaro et al., ff. Tr. 5575, at 19-20.

786. The tone alert radios are backed up by batteries. Cordaro et al., ff. Tr. 5575, at 21; Tr. 5651 (Renz).

787. A loss of offsite power would not render the EOC inoperable. Cordaro et al., ff. Tr. 5575, at 22. If necessary, the EOC would be relocated to LILCO's Mineola office. Id.; Tr. 5651-52 (Renz).

788. The Board, therefore, finds Contentions 94 and 95 without merit.

789. Contentions 96.A and 96.C allege that the LILCO Transition Plan is inadequate because it does not provide for backup power supplies for

(1) all ambulance and bus companies that might supply emergency vehicles and (2) residential lighting, public streetlights, traffic signals, and service stations in the EPZ.

790. Contention 96.B asserts that evacuation of hospitals, nursing homes, and facilities for the handicapped could not be accomplished were there a loss of offsite power because these facilities do not have a backup power supply.

791. There is no regulatory requirement for backup power supplies to either ambulance or bus companies. Cordaro et al., ff. Tr. 5717, at 6. The available evidence shows that these facilities will not become inoperable if offsite power is lost. All of the ambulance companies upon which LILCO relies continue to operate during power outages. Cordaro et al., ff. Tr. 5717, at 8, Att. 1. Eight of the eleven ambulance companies with which LILCO has contracts have backup power supplies. Id. at Att. 1; Tr. 5720-22 (Robinson), 5735-36 (Cordaro, Robinson). The three ambulance companies that do not have backup power communicate by means of personal pocket pagers and/or two-way radios. Cordaro et al., ff. Tr. 5717, Att. 1; Baldwin et al., ff. Tr. 12,174, at 98; Tr. 5735 (Robinson). Ambulance drivers will be instructed to call their dispatcher if they are not receiving radio communications. Cordaro et al., ff. Tr. 5717, at 9.

792. A loss of offsite power will not affect the availability of buses because a dispatcher remains on duty regardless of a power outage, and bus drivers will not be contacted by electrically operated dispatch radios. All bus drivers are LERO workers and will report to staging

areas to receive their instructions before picking up the buses. Cordaro et al., ff. Tr. 5717, at 9.

793. The Board finds that the lack of provisions in the LILCO Plan for backup power supplies to ambulance and bus companies will not jeopardize the public health and safety.

794. With regard to special facilities (96.B.), LILCO is not required by NRC regulations or NUREG-0654 to provide backup power to special facilities in the community.

795. The three hospitals in the EPZ, and eight of the ten nursing and adult homes in the EPZ, have emergency backup power due to the nature of the care they provide to their residents. Cordaro et al., ff. Tr. of 5/10/84, Vol. II, at 27-28. The two adult homes that do not have emergency backup power have battery packs to provide emergency light by which to move patients out of the building in an evacuation. Id. at 28. Four of the ten nursing and adult homes have elevators that will run on emergency power, and four others have no elevators. Id. at 28-29.

796. For the facilities without backup power, loss of power would not make evacuation impossible because flashlights and other portable lights could be used to provide enough light to evacuate. Cordaro et al., ff. Tr. of 5/10/84, Vol. II, at 29. The ambulances, ambulettes, and buses used to transport residents of these facilities would not be affected. Id. at 28.

797. As was the case with respect to special facilities, there is no regulatory requirement that emergency plans provide backup power for residential lighting, streetlights, service stations, or traffic signals (96.C.). Cordaro et al., ff. Tr. 5717, at 6; Tr. 14,578 (Kowieski,

McIntire). Requiring backup power sources for residential lighting, streetlights, service stations, and traffic signals would constitute a major reworking of the community; such is not contemplated by the regulations or guidelines. Cordaro et al., ff. Tr. 5717, at 6-7; Tr. 5719-23 (Robinson).

798. The loss of residential and street lighting might delay the mobilization of some evacuees. See Tr. 14,300 (McIntire). Cordaro et al., ff. Tr. 5717, at 9-10; Tr. 5737-38 (Robinson). LILCO would rely on people generally having some secondary source of light in their homes, such as flashlights or candles. Id. LILCO sends out a bill enclosure advising people to prepare for storms and power outages by taking such action as acquiring secondary sources of light in their homes. Tr. 5737-38 (Robinson). Motor vehicles can be operated without streetlights. Cordaro et al., ff. Tr. 5717, at 10.

799. FEMA witnesses testified that a loss of power to traffic signals and gas pumps during an evacuation would have significant initial effects. Baldwin et al., ff. Tr. 12,174, at 99; Tr. 14,299-300 (McIntire). If there is significant traffic flow at an intersection along the evacuation routes in the EPZ, it will be manned by traffic guide. Cordaro et al., ff. Tr. 5717, at 11; Tr. 5738-44 (Cordaro, Robinson, Weismantle). Of the 57 intersections on the evacuation routes with traffic signals, 50 of those are traffic guide posts. Tr. 5739-40 (Cordaro, Robinson).

Conclusion

800. The Board finds that the regulations and guidelines do not require that a radiological emergency plan include provisions for backup power for residential lighting, streetlights, service stations, and

traffic signals. There is reasonable assurance that the evacuation would not be sufficiently impaired to jeopardize the public health and safety.

XV. Strike by LILCO Employees

801. On July 24, 1984, we issued a memorandum and order determining that a serious safety matter exists and admitted the following issues sua sponte:

(1) Whether LILCO's ability to implement its offsite emergency preparedness plan would be impaired by a strike involving the majority of its LERO workers;

(2) Whether LILCO should be required to place the reactor in cold shutdown in the event of a strike by LERO workers; and

(3) Whether placing the reactor in cold shutdown during a strike by LERO workers after the reactor has operated at full power, would give "reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency."

(In the Matter of Long Island Lighting Company (Shoreham Nuclear Power Station, Unit 1)), Memorandum And Order Determining That A Serious Safety Matter Exists (July 24, 1984) at 3). We also invited testimony to be presented and scheduled evidentiary hearing on these matters to begin on August 28, 1984. Id. at 4.

802. During the Conference of Counsel that we held on August 8, 1984 in Bethesda, Maryland, the Applicant stipulated that LILCO's ability to implement its offsite emergency preparedness plan would be impaired by a strike involving the majority of its LERO workers and that it could not implement the plan during such a strike. Tr. 13,989, 13,995-96. After discussing and considering LILCO's stipulation and the arguments of the parties concerning the stipulation, we found that LILCO's stipulation

totally resolves issue (1) and leaves no dispute of material fact. Consequently, we ruled that the answer to issue (1) is yes. Tr. 13,997.

803. Evidentiary hearing sessions on the remaining strike issues were conducted from August 28, 1984 through August 29, 1984 in Hauppauge, New York. The Applicant presented the following panel of witnesses: Dr. Matthew C. Cordaro, Vice President, LILCO; Mr. John A. Scalice, Operations Manager, LILCO; Dr. Elias P. Stergakos, Radiation Protection Engineer, LILCO; and Mr. John A. Rigert, Manager, Nuclear Systems Engineering Division, LILCO. Tr. 15,434; Cordaro et al., ff. 831, Attachment 1, at 1; LILCO Ex. 74 at 1; LILCO Ex. 75 at 1; LILCO Ex. 76 at 1). Suffolk County presented Mr. Gregory C. Minor, Vice President, MBH Technical Associates, San Jose, California, as a witness. Tr. 15,598; Finlayson et al., ff. Tr. 12,320, Attachment 2. The NRC staff presented a panel of witnesses composed of Mr. Robert A. Benedict, Senior Management Systems Engineer, Office of Nuclear Reactor Regulation, NRC, Mr. Marvin W. Hodges, Section Leader, Reactor Systems Branch, Office of Nuclear Reactor Regulation, NRC, Mr. Theodore R. Quay, Section Leader, Accident Evaluation Branch, Office of Nuclear Reactor Regulation, NRC, and Mr. John R. Sears, Senior Reactor Safety Engineer, Emergency Preparedness Branch, Office of Inspection and Enforcement, NRC. Tr. 15,651-52, 15,655; NRC Ex. 1; NRC Ex 2; NRC Ex. 3 at 1.

A. Availability of Personnel In the Event of A Strike

804. As we have found, the Shoreham Nuclear Power Station has a Local Emergency Response Organization (LERO) which is composed largely but not entirely of LILCO employees. LILCO Ex. 71 at 1. A substantial portion of LERO members (approximately two-thirds) are LILCO employees

that belong to one or another of two unions. Id. For the foreseeable future, the composition of LERO is expected to resemble its present form. Id. Based on the current composition of LERO it cannot be demonstrated that a strike against LILCO involving all of the LERO union members would not, under any circumstances, impair the functioning of LERO in the event of a radiological emergency requiring offsite response. Id. at 1-2.

805. Strikes of any significance generally do not start without at least several days notice established by either the contract expiration date, the subsequent failure of negotiations, or by reports of unrest among union members. LILCO, Ex. 71 at 2. Also the process by which strikes begin, including membership meetings and votes, provides some time for LILCO management to become aware of any impending strike. Id.

806. A strike by LILCO's unions on July 10, 1984 started after the expiration date of the contract. Id. at 2; Tr. 15,455-456 (Cordaro). Prior to the start of the strike in July 1984, the LILCO union leadership worked with LILCO management to provide ample notice of the actual start of the strike and to assure an orderly transition. LILCO Ex. 71 at 2. The contracts that expired before the strike contained no-strike clauses prohibiting strikes during their term. Id. at 2; Tr. 15,455-456 (Cordaro). Such clauses, or other clauses prohibiting strikes without notice to management are typical of union contracts. Id. LILCO expects to include such clauses in future contracts it negotiates with LILCO's unions. Id.

807. LILCO has conceded that in the event of a serious accident, which is extremely unlikely to occur, LERO's ability to handle the accident would be hampered by a strike because of the unavailability of union people. Tr. 15,440-441 (Cordaro). For that reason, LILCO

expressed a willingness to accept the following condition on an operating license for Shoreham:

PROPOSED LICENSE CONDITION

So long as LILCO shall rely on an offsite emergency response organization consisting entirely or primarily of LILCO employees, then in anticipation of the commencement of a strike by a union representing LILCO employees, LILCO shall bring the Shoreham Nuclear Power Station (SNPS) to cold shutdown condition using normal operating procedures. LILCO shall commence bringing SNPS to cold shutdown condition 24 hours prior to the commencement of such strike, or immediately upon receipt of less than 24 hours' notice of the impending commencement of a strike, with the goal of having the plant in cold shutdown condition by the time the strike commences. LILCO shall maintain SNPS in cold shutdown condition until the end of the strike except that, with the prior approval of the NRC Staff upon review of written application by LILCO, LILCO shall be permitted:

- (1) to take the reactor to a refueling mode to conduct refueling or other operations requiring access to the reactor core if it is shown that such operations cannot result in the occurrence of any events requiring offsite emergency response capability; and
- (2) to conduct such other operations as the Staff shall approve if it is shown that the strike does not, in fact, impair LILCO's ability to implement its offsite emergency preparedness plan.

This condition shall terminate at such time as any or any combination of agencies of the Federal, New York State, or Suffolk County governments shall provide to the NRC written notice of its or their agreement, under terms and conditions approved by FEMA, to assume legal responsibility for effectuation of offsite emergency response for Shoreham Nuclear Power Station.

(LILCO, Ex. 71 at 3-4; Tr. 15,440-441 (Cordaro)).

808. For a BWR reactor in the cold shutdown condition, NUREG-0737 requires that there be a minimum of one licensed senior operator, one

licensed operator and one auxiliary operator. Tr. 15,657-658 (Benedict). Further, Section 13.1.2 of the standard review plan, NUREG-0800, provides that a health physics technician shall be on site whenever there is fuel in the reactor. Tr. 15,657-658 (Benedict). It also requires that a five-man fire brigade be on site. Id. These guidelines will form a part of the technical specifications which will be a part of the Shoreham operating license. Tr. 15,658 (Benedict).

809. There are presently twenty non-union LILCO employees who are licensed Senior Reactor Operators. LILCO Ex. 78 at 1. In addition to the licensed non-union LILCO employees, there are six Shift Technical Advisors and more than 75 non-licensed LILCO management employees that are available to perform necessary plant activities in the event of a strike. LILCO Ex. 78 at 2. In the event LILCO cannot meet the manpower requirements for the various conditions of operation of the plant, the Shoreham technical specifications will require LILCO to bring the plant to a cold shutdown condition within 36 hours. LILCO Ex. 77 at 3/4 0-1; Tr. 15,444-445 (Scalice).

810. The NRC has not developed minimum shift requirements for a BWR plant; however, it has determined that six shifts is sufficient to allow for retraining, vacations, illness and time off. Tr. 15,658-659 (Benedict).

811. Shoreham has specific procedures that detail those operator actions required to bring the plant to cold shutdown. LILCO Ex. 73 at 2-4. The time needed to perform all of the procedures to bring the Shoreham plant to cold shutdown is approximately 12 to 16 hours. Id. at 4; Tr. 15,662 (Hodges); Tr. 15,612-613 (Minor). While not desirable,

power reduction to cold shutdown at the Shoreham can be accomplished in approximately 8 hours in accordance with defined procedures. LILCO Ex. 73 at 3-4; Tr. 15,663 (Hodges).

812. Based on a comparison of the number of licensed operators at the Shoreham to the technical specification requirements for licensed operators, the Applicant has a sufficient number of non-union management level personnel available at the site to bring the plant to a cold shutdown condition using specific plant procedures. Tr. 15,444 (Scalice); LILCO Ex. 73 at 2-5; LILCO Ex. 78 at 2. The number of non-union management personnel is also sufficient to maintain the reactor in cold shutdown, and to bring it to a lower condition of operation such as the refueling mode. LILCO Ex. 73 at 5-6; Tr. 15,444 (Scalice).

813. For most of the accidents that might be faced at the Shoreham plant, a LERO organization consisting of management people could handle on an ad hoc basis most of those incidents. Tr. 15,440 (Cordaro).

814. The NRC's Office of Inspection and Enforcement has provisions for conducting inspection activities in the event of a strike at a operating nuclear power plant. Tr. 15,660 (Sears). At the start of a strike, the NRC's field inspectors are required to observe the transfer of operations responsibility from the persons going on strike to those management personnel who assume responsibility for the reactor control room. Tr. 15,660 (Sears). After the transfer of operating responsibility, the NRC's field inspectors must verify, through direct observation in the control room, that management personnel are operating the plant safely and properly. Tr. 15,660 (Sears). When the strike has ended, the NRC field inspectors must directly observe the transfer of operating

responsibility from those persons operating the plant to the union operators. Tr. 15,660-661 (Sears).

815. Based on the NRC staff's review, it has determined that the twenty non-union licensed senior operators available to LILCO could cover the requirements for maintaining the Shoreham plant in cold shutdown for at least six shifts for the positions of licensed senior operator, licensed operator and auxiliary operator. Tr. 15,657, 15,659 (Benedict).

816. Based on this record, we find that LILCO has sufficient numbers of non-union management employees available to place and maintain the Shoreham plant in a cold shutdown condition after full power operation in the event of a strike by a union representing LILCO employees. Moreover, we find that LILCO has a sufficient number of non-union personnel to bring the Shoreham plant to cold shutdown in less than 16 hours using defined procedures.

B. Potential Accidents During Cold Shutdown

817. In addressing the question of the acceptability of LILCO's proposed license condition to meet the concerns we raised in our July 24, 1984 memorandum and order, an issue was raised about what accidents could occur at cold shutdown.

818. Based on a review of the Shoreham Final Safety Analysis Report (FSAR) Chapter 15 events, including a consideration of whether these events could lead to a degraded core, LILCO's witnesses, Dr. Stergakos and Mr. Rigert, testified that there are no credible events that could lead to a degraded core or result in radiological consequences in excess of EPA's Protective Action Guidelines (PAGs) of 1 rem to the whole body and 5 rem to the thyroid. LILCO Ex. 72 at 2; Tr. 15,447 (Rigert).

819. This conclusion by LILCO's witnesses was based on the facts that in the cold shutdown condition, the reactor is subcritical with all control rods inserted, fully depressurized, the coolant is at a temperature of less than or equal to 200°F, and many of the systems are not in service. LILCO Ex. 72 at 3; Tr. 15,447 (Rigert). Furthermore, the time to mitigate any potential event is greatly increased and the required capacity of any mitigation system is greatly reduced during cold shutdown because of the low decay heat production rate, temperature and pressure. LILCO Ex. 72 at 3; Tr. 15,448 (Rigert).

820. Chapter 15 of the Shoreham FSAR provides the results of analyses for the spectrum of accident and transient events that must be accommodated by the Shoreham plant. LILCO Ex. 72 at 2. It includes most of the transient and accident analyses. Tr. 15,663 (Hodges). Of the 38 accident or transient events addressed in Chapter 15, 22 of the events could not physically occur during cold shutdown. LILCO Ex. 72 at 3; Tr. 15,436-437 (Rigert). However, the fuel handling accident, which is one of these 22 events, could occur during the refueling mode. LILCO Ex. 72 at 3. An additional 13 events could occur, but the offsite radiological consequences would be inconsequential or non-existent. Id. The remaining 3 events are possible at cold shutdown but have offsite radiological consequences below the EPA PAG limits. LILCO Ex. 72 at 3; Tr. 15,436-437 (Rigert). These matters were uncontradicted.

821. With respect to fuel handling accidents, the NRC staff would require an approximately 16 day period to elapse prior to allowing the movement of fuel under strike conditions since this period would lower

any potential doses from a fuel handling accident below PAG limits.

Tr. 15,666-667 (Quay); see LILCO Ex. 72 at 4-5.

822. After reviewing the LILCO analysis regarding Chapter 15 events, the NRC witness, Mr. Hodges, concluded that none of the Chapter 15 events leads to radiological consequences in excess of EPA's PAG of 1 rem to the whole body and 5 rems to the thyroid. Tr. 15,662-663, 15,672 (Hodges). He also testified that most of the Chapter 15 events cannot occur from cold shutdown but all of those events that can occur have consequences that should be negligible or very small. Tr. 15,663-664 (Hodges). Suffolk County's witness, Mr. Minor, did not take issue with the conclusions reached about the likelihood or consequences of the Chapter 15 events. Tr. 15,617-618 (Minor).

823. Suffolk County's witness, Mr. Minor, contended, however, that LILCO's Chapter 15 analysis was too restrictive and thus inadequate because it failed to consider some accident sequences, including degraded core accident sequences. Tr. 15,660-663 (Minor). Mr. Hodges, the NRC staff witness, testified that indeed more severe accidents, which are beyond design basis accidents, are normally the basis for emergency planning and suggested that would be the case for the cold shutdown condition as well. Tr. 15,664 (Hodges). Mr. Hodges explained that even though there are accidents which can occur from cold shutdown that lead to core melt, the likelihood that such accidents would occur is small since multiple failures have to occur and a significant amount of time would be available for corrective action. Tr. 15,665 (Hodges). Mr. Hodges testified that the time to respond to an accident occurring at cold shutdown should be at least an hour and a half as compared to minutes for some

accidents occurring at full power. Tr. 15,664 (Hodges). For the cold shutdown condition, he noted that the number of systems available to provide make-up flow or alternate cooling paths is increased. Tr. 15,665 (Hodges).-

824. With regard to the likelihood of occurrence of these accidents, the available response time and the capacity for mitigation during cold shutdown, the testimony of Mr. Quay, an NRC staff witness, who is the Section Leader in the Accident Evaluation Branch, Division of Systems Integration, was in full agreement with Mr. Hodges. Tr: 15,667-668 (Quay). Moreover, Mr. Quay testified that for containments that are similar to Shoreham and for similar BWRs, the NRC staff has found that the risk dominating events occur during power operation. Tr. 15,667 (Quay). Furthermore, Mr. Minor conceded that to his knowledge there are no probabilistic risk assessment scenarios that originate during the cold shutdown condition after operation at full power that result in substantial offsite doses. Tr. 15,618 (Minor).

825. Accordingly, the Board finds that it is very unlikely that accident sequences involving a degraded core would occur during the cold shutdown condition that would lead to offsite doses in excess of the EPA PAG's thus necessitating the use of an offsite emergency response organization.

826. Suffolk County's witness, Mr. Minor, raised the concern that degraded core accidents could occur during the transition from full power to cold shutdown that could result in offsite doses in excess of EPA PAG limits. Tr. 15,600-601, 15,619 (Minor). LILCO's witness, Dr. Cordaro, conceded that such accidents could occur in the descension from full

power to cold shutdown. Tr. 15,477 (Cordaro). Although he acknowledged having not any calculations to verify it, the NRC staff witness testified that he would expect that such degraded core accidents, even though highly unlikely, are more probable from an intermediate power condition than from a cold shutdown condition. Tr. 15,671, 15,676-677 (Hodges). The Board notes the absence of any sound quantitative basis in the record for the judgments that have been expressed on this matter. Nevertheless, there is no disagreement that the Shoreham plant can be brought to cold shutdown in 12 to 16 hours, or even faster in the event that were necessary. LILCO Ex. 73 at 4; Tr. 15,662 (Hodges); Tr. 15,612-613 (Minor). LILCO's proposed license condition would require it to either start bringing the Shoreham plant to cold shutdown 24 hours before the start of a strike by LILCO union members or immediately start bringing the plant to cold shutdown if LILCO has less than 24 hours notice of when the strike is to begin. LILCO Ex. 71 at 3-4. As we noted earlier, it is very likely that LILCO would receive at least 24 hours notice before the actual start of a strike because of the circumstances that surround a union decision to strike. Consequently, the record shows that it is more reasonable to expect the Shoreham plant would be in a cold shutdown condition prior to a strike by LILCO union employees and thus the LERO organization would be available to respond in the unlikely event a degraded core accident occurred during the descent to cold shutdown. Moreover, the Board does not find this concern to be of major significance since (1) the Shoreham plant can be brought to cold shutdown relatively quickly should that become necessary in the event of a strike by LILCO union employees, and (2) the occurrence of a degraded core acci-

dent during the transition from fuel power to cold shutdown is highly unlikely.

C. Language of Proposed License Condition

827. With respect to the language of LILCO's proposed license condition, Suffolk County's witness, Mr. Minor, found it unacceptable contending that it was too broad in that accurate definitions were not provided for (1) the beginning and ending of the strike, (2) the two exceptions, and (3) the term "union". Tr. 15,605-608 (Minor). In its September 11, 1984 letter to the Board, the NRC staff accepted LILCO's proposed license condition as adequate. Further, NRC staff witnesses, Messrs. Hodges, Quay and Sears found the license condition to be acceptable. Tr. 15,682. Mr. Hodges explained that his judgment was based on the risk involved for cold shutdown, even if there were a strike, where the likelihood of a severe accident damaging the fuel or melting the core is extremely small. Tr. 15,684. In his judgment, that risk is smaller than a similar situation where the plant is operating at full power. Id. Based on our review of LILCO's proposed license condition, we do not find it unacceptably ambiguous as to its essential requirement that the Shoreham plant be brought to cold shutdown and maintained in that condition during a strike by LILCO union employees. See LILCO Ex. 71 at 3-4. The two exceptions to this requirement require LILCO to make written application to the NRC staff for its approval. Id. The NRC staff would examine the potential releases from the proposed operations in terms of the EPA PAG limits to determine whether approval is warranted. Tr. 15,679 (Quay). The application of such a specific standard by the

NRC staff should be straightforward and is a matter that clearly falls within the conduct of the NRC staff's normal regulatory function. There is no evidence in this record to suggest otherwise. It is not a matter that raises a significant health and safety concern. Accordingly, the Board is of the view that Mr. Minor's concerns are basically semantic in nature and we find that the essential requirements of LILCO's proposed license condition are sufficiently clear so as not to present an undue risk to the public health and safety.

D. Regulatory Standard

828. 10 C.F.R. Section 50.47(a)(1) of the Commission's regulations provide that no operating license for a nuclear power reactor will be issued unless a finding is made that there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. However, the Commission's emergency planning regulations do not provide any specific guidance as to how this standard is to be applied in a situation involving a strike at an operating plant. Moreover, there is no NRC regulatory guidance concerning the standards that should be applied as to whether a plant should be shutdown or allowed to operate where there is a strike at an operating plant. Tr. 15,684 (Hodges/Sears).

829. In order to provide some means for determining whether a cold shutdown condition presents an unacceptable risk from the standpoint of protecting the health and safety of the public, we examined the comparison of a plant operating at low power (up to 5% of rated power) and at cold shutdown after full power operation. Tr. 15,537-539,

15,620, 15,685-686. This was done since under the Commission's emergency planning regulations, a license may be issued authorizing fuel loading and/or low power operations (up to 5% of the rated power) without requiring that an offsite emergency response organization be in place. See 10 C.F.R. § 50.47(d). In promulgating this low-power emergency planning requirement, the Commission based its decision on, inter alia, the following three considerations:

First, the fission product inventory during low power testing is much less than during higher power operation due to the low level of reactor power and short period of operation. Second, at low power there is a significant reduction in the required capacity of systems designed to mitigate the consequences of accidents compared to the required capacities under full power operation. Third, the time available for taking actions to identify accident causes and mitigate accident consequences is much longer than at full power.

47 Fed. Reg. 30233 (1982).

830. For the fission product inventory, the analyses done by LILCO showed that the fission product inventory of halogens and inert gases at cold shutdown is initially higher than the inventory for 5% power operation. With the passage of time this relationship reverses itself. LILCO Ex. 81; Tr. 15,631-634 (Stergakos). However, LILCO analyses did not consider the long-lived isotopes, which might be released in the event of substantial core damage. Tr. 15,644 (Stergakos). With regard to the time available to mitigate the consequences of an accident, the record shows that the time available is in the same range for 5% operation and cold shutdown after full power operation. Tr. 15,688-689 (Hodges); Tr. 15,542 (Rigert). As the time period before the postulated accident occurs increases for these two conditions, the time to respond

for the cold shutdown condition would generally be less than the time to respond for a severe accident occurring at the 5% power condition. Tr. 15,689-690 (Hodges). However, for both conditions, there is a fairly substantial period of time to respond to the event so that the overall risk is very small. Tr. 15,703 (Hodges). With respect to the capacity of systems to mitigate the consequences of accidents, there are more systems available for a successful response to an accident at cold shutdown than at 5% operation. Tr. 15,690 (Hodges); Tr. 15,622 (Minor); see Tr. 15,545 (Rigert). Moreover, the unions representing LILCO employees who are members of LERO have taken the position that they would not object to any of its members volunteering for LERO assignments. Tr. 15,701-02 (Sears). Based on these considerations, the NRC Staff concluded that cold shutdown was substantially as safe as 5% power operation. Tr. 15,700 (Sears); Tr. 15,705-706 (Hodges). Suffolk County's witness, Mr. Minor, acknowledged that for the three areas we examined there are advantages to having the reactor in cold shutdown over 5% operation although he felt the two conditions are not fully comparable. Tr. 15,626-627 (Minor). Although we acknowledge that the comparison between 5% operation and cold shutdown after full power operation may not be fully comparable for the three factors that were examined, it does provide a way of determining the relative safety of the cold shutdown condition. Based on the record as a whole, we believe the record shows that cold shutdown after full power operation is substantially as safe as operation at 5% power.

E. Conclusion

831. LILCO's commitment to accept the proposed license condition renders our second issue moot. Consequently, based on the foregoing reasons, the Board concludes that placing the Shoreham plant in cold shutdown in accordance with LILCO's proposed license condition either upon notice that a strike will occur or during a strike by LERO workers would give reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency.

CONCLUSIONS OF LAW

The Board has considered the entire record in this off-site emergency planning proceeding, except for matters relating to Contentions 1-10 the legal authority contentions which are the subject of LILCO's motion for summary disposition. Except for issues raised by Contentions 1-10, the Board concludes, in accordance with 10 C.F.R. § 2.760a and Section VIII of Appendix A to Part 50, that the LILCO sponsored off-site emergency response plan, with specific respect to all matters placed in controversy, complies with the applicable provisions of 10 C.F.R. § 50.47 and 10 C.F.R. Part 50, Appendix E, and, subject to further Staff and FEMA findings, provides reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. This decision does not authorize issuance of a license to operate the Shoreham facility at the present time, and is further conditioned upon Applicant meeting the obligations and conditions imposed by the foregoing findings.

Effectiveness and Review of Initial Decision. This Partial Initial Decision is effective immediately and will constitute the final decision of the Commission 45 days after the date hereof, unless a party appeals or seeks a stay. Pursuant to 10 C.F.R. § 2.762, an appeal from this Partial Initial Decision may be taken by filing a notice of appeal with the Atomic Safety and Licensing Appeal Board within 10 days after service of this decision. A brief in support of an appeal must be filed within 30 days after the filing of the notice of appeal (40 days if the appellant is the NRC staff). Within 30 days after the period for filing and service

of the briefs of all appellants has expired, any party not an appellant may file a brief in support of or in opposition to the appeal. The NRC Staff may file a responsive brief within 40 days after the period for filing and service of the briefs of all appellants has expired.

Respectfully submitted,

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Counsel for NRC Staff

Dated at Bethesda, Maryland
this 5th day of November, 1984

TABLE 1
EVACUATION TIME ESTIMATES

CASE 1/	ZONES 2/ EVACUATED	SEASON	WEATHER	CONTROLLED/ UNCONTROLLED	COMPLIANCE/ NON-COMPLIANCE	10-20 MILE SHADOW	OTHER FACTORS CONSIDERED	EVACUATION TIME 3/ (Hours-Minutes)		
								PERCENT OF 50%	POPULATION 20%	EVACUATED 100%
1	E-2	summer	normal	controlled	compliance	0%		1-30	2-30	3-15
2	E-5	summer	normal	controlled	compliance	0%		1-35	3-00	4-10
3	E-10	summer	normal	controlled	compliance	0%		1-35	3-00	4-15
4	W-2	summer	normal	controlled	compliance	0%		1-30	2-30	3-35
5	W-5	summer	normal	controlled	compliance	0%		1-45	3-10	4-15
6	W-10	summer	normal	controlled	compliance	0%		1-55	3-45	4-55
7	C-2	summer	normal	controlled	compliance	0%		1-30	2-25	3-35
8	C-5	summer	normal	controlled	compliance	0%		1-35	2-50	4-00
9	C-10	summer	normal	controlled	compliance	0%		1-40	3-00	4-20
10	All-2	summer	normal	controlled	compliance	0%		1-35	2-35	3-35
11	All-5	summer	normal	controlled	compliance	0%		1-50	3-20	4-20
12	All-10	summer	normal	controlled	compliance	0%		2-00	3-40	4-55
13	E-10	winter	inclement	controlled	compliance	0%		1-45	3-10	4-15
14	E-10	summer	inclement	controlled	compliance	0%		1-50	3-25	4-45
15	W-10	winter	inclement	controlled	compliance	0%		2-10	4-45	6-00
16	W-10	summer	inclement	controlled	compliance	0%		2-10	4-25	6-20
17	C-10	winter	inclement	controlled	compliance	0%		1-50	3-30	5-15
18	C-10	summer	inclement	controlled	compliance	0%		1-55	3-30	4-55
19	All-10	winter	inclement	controlled	compliance	0%		2-20	4-40	6-00
20	All-10	summer	inclement	controlled	compliance	0%		2-20	4-25	6-20

CASE	ZONES EVACUATED	SEASON	WEATHER	CONTROLLED/ UNCONTROLLED	COMPLIANCE/ NON-COMPLIANCE	10-20 MILE SHADOW	OTHER FACTORS CONSIDERED	EVACUATION TIME (Hours-Minutes)		
								PERCENT OF POPULATION EVACUATED		
								50%	90%	100%
21	All-10	summer	normal	controlled	compliance	0%	3-hr loading	2-15	3-50	4-55
22	All-10	summer	normal	controlled	compliance	25%		2-15	4-00	5-15
23	All-10	summer	normal	controlled	compliance	50%		2-20	4-55	6-35
24	All-10	summer	normal	uncontrolled	compliance	0%		2-15	4-10	6-30
25	All-10	winter	inclement	uncontrolled	compliance	0%		2-30	4-45	7-55
26	All-10	summer	normal	uncontrolled	compliance	25%		2-45	5-10	7-00
27	All-10	summer	normal	uncontrolled	compliance	50%		3-10	5-55	7-35
28	All-10	winter	inclement	uncontrolled	compliance	50%		4-55	7-45	10-05
29	All-10	summer	normal	controlled	compliance	0%	4 accidents	2-00	3-40	4-55
30	All-10	summer	normal	controlled	compliance	0%	4 accidents	2-00	3-40	4-55
31	All-10	summer	normal	controlled	non-compliance 25%	0%		2-00	3-45	4-55
32	All-10	summer	normal	controlled	non-compliance 50%	0%		2-00	3-50	5-30
33	All-10	summer	normal	uncontrolled	non-compliance 25%	0%		2-15	3-55	6-30
34	All-10	summer	normal	uncontrolled	non-compliance 50%	0%		2-15	4-00	6-30
35	All-10	summer	normal	controlled	compliance	0%	right-of-way	2-00	3-30	4-30
36	All-10	summer	normal	uncontrolled	compliance	0%	right-of-way	2-00	3-30	4-30

- 1/ Cases 1- 21 are reported in Appendix A; Cases 22-30 are reported in IM-77; and Cases 31-36 are reported in IM-140. For the convenience of all parties, the cases that appear in this table have been renumbered for ease in referencing. Thus, these case numbers will not correspond to the case numbering system used in the three listed reports.
- 2/ Codes in terms of "90° Quadrants - Miles," where E = East, C = Central, W = West and A = All quadrants.
- 3/ "Evacuation time" is defined as the elapsed time from the first notice to evacuate to the passage of the last car out of the EPZ.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

Docket No. 50-322-OL-3
(Emergency Planning)

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW IN THE FORM OF A SUPPLEMENTAL PARTIAL INITIAL DECISION ON EMERGENCY PLANNING" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class or, as indicated by an asterisk, by deposit in the Nuclear Regulatory Commission's internal mail system or as indicated by a double asterisk, by hand delivery, this 5th day of November 1984:

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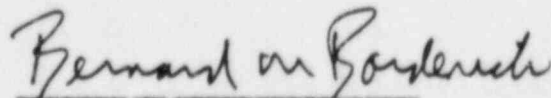
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