6236

DOCKETED
USNRC
'88 MAY 10 A11:56
OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

LBP-88-13

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

James P. Gleason, Chairman
Dr. Jerry R. Kline
Mr. Frederick J. Shon

SERVED MAY 10 1988

In the Matter of LONG ISLAND LIGHTING COMPANY (Shoreham Nuclear Power Station, Unit 1)	Docket No. 50-322-OL-3 (Emergency Planning) May 9, 1988

PARTIAL INITIAL DECISION ON SUITABILITY OF RECEPTION CENTERS

Introduction

This is a Partial Initial Decision on offsite emergency planning issues pertaining to the application of the Long Island Lighting Company (LILCO) for an operating license at Unit 1 of the Shoreham Nuclear Power Station (Shoreham). The decision addresses the adequacy of three reception centers proposed by LILCO for public use in the event of a radiological emergency at Shoreham. The adequacy of the centers are evaluated for compliance with NRC regulatory standards on emergency planning codified in 10 C.F.R. § 50.47, Appendix E, and the criteria of NUREG-0654, FEMA-REP-1, Rev. 1. Also, the dictates of the Appeal Board

8805170246 880509
PDR ADOCK 05000322
G PDR

D502

in Long Island Lighting Co., (Shoreham Nuclear Power Station, Unit 1), ALAB-832, 23 NRC 135 (1986) and ALAB-855, 24 NRC 792 (1986) are required to be considered. Proposed findings of fact and conclusions of law were submitted by LILCO, New York State, Suffolk County, and the Town of Southampton (Governments) (Intervenors) and the Nuclear Regulatory Staff (Staff). All of the proposed findings of fact and conclusions of law have been considered. Any such finding or conclusion not incorporated directly or inferentially in this Partial Initial Decision is rejected as unsupported in fact or law or unnecessary to the rendering of this decision.

History

Reception center issues have plowed a lengthy and complicated furrow in this proceeding over the past four years. In its initial emergency scheme, LILCO designated five primary and backup facilities in Suffolk County as relocation centers. These were to serve as reception centers for registering, monitoring and decontaminating evacuees and as temporary shelters for housing, feeding and sanitary facility purposes.[1] Subsequently, and allegedly due to opposition to LILCO's emergency plan by the Governor of New York and Suffolk County officials, several

---

1 LILCO Exh. EP-1 at 4.2-1, 4.2-3.

relocation centers became unavailable.[2] LILCO thereupon revised its plan to provide for separate reception centers and temporary shelter facilities (congregate care centers) to accommodate evacuees. Hearings were held but as LILCO declined to identify the reception centers until after it completed negotiations, a void in the record was noted by the Board on the matter.[3] Subsequently, the record was reopened after the Veteran's Coliseum in Nassau County was identified by LILCO as its designated center. After a hearing and a Licensing Board decision approving the functional adequacy of the Coliseum, the Appeal Board remanded the issue with directions to broaden the scope to determine whether there were any factors, including location, that might make the Coliseum unsuitable to serve as a sole reception center for emergency planning zone (EPZ) evacuees.[4] Prior to the remanded hearing, however, the Nassau County government adopted a resolution resulting in the Coliseum also becoming unavailable to LILCO. Applicant then moved again to reopen the record after substituting three LILCO operating facilities in place of the Coliseum. Granted by the Board, the motion was aimed at the presentation of evidence in support of these facilities, all in Nassau County, to be utilized as reception centers. Bellmore,

---

2 Cordaro, et al., ff. Tr. 14,707 at 13-14.

3 Tr. 15,713.

4 ALAB-832, 23 NRC 135, 162 (1986).

Hicksville and Roslyn in the Towns of Hampstead, Oyster Bay and North Hampstead, respectively, are the designated facilities.

In convening a hearing on the new reception centers, the Licensing Board included for litigation those issues remanded by the Appeal Board in ALAB-832, issues raised by Intervenors that were considered relevant to the proceedings and an issue concerning the proper population planning basis for monitoring evacuees, which was affirmed by the Appeal Board in ALAB-855, 24 NRC 792, 801 (1986). Also see Board Memorandum and Order (Rulings on LILCO Motion to Reopen Record and Remand of Coliseum Issue), December 11, 1986 (unpublished). Testimony was received on the following issues:

1. The adequacy of LILCO's planning basis--the number of people expected to seek monitoring at LILCO's new reception centers;

2. Whether transportation and traffic problems might develop as a result of the reception centers' locations and their distance from the EPZ;

3. Whether the reception centers' locations might create problems in regard to the evacuation shadow phenomenon;

4. Whether the distance of the reception centers from the plume EZP would increase exposure to radiation causing an additional problem;

5. Whether LILCO's proposed monitoring procedures were adequate;

6. The staffing requirements given the new scheme;

7. The adequacy of evacuation routes to the three LILCO reception centers including the effects of traffic congestion on the way to and in

the vicinity of the facilities, and LILCO's Revision 8 proposal to employ traffic guides on Nassau County roadways;

8. LILCO's proposal to transport all evacuees travelling on buses to the parking lot next to the Hicksville facility, when that facility itself is also proposed by LILCO to be the local emergency response organization (LERO) relocation center;

9. Whether the proposal to send evacuees to LILCO parking lots could or would ever be implemented in a way to protect the public health and safety.

We combine, in our decision below, the issues litigated in the following manner: planning basis issues (1); traffic related issues (2 and 7); distance of reception centers from EPZ issues (3 and 4); monitoring related issues (5, 6, 8 and 9); and a zoning issue referenced by Applicant and Intervenors in proposed findings.

1. PLANNING BASIS ISSUES

Introduction

At the outset, we agree with Staff and Governments that this issue, the number of evacuees for whom monitoring must be provided, is fundamental to the question of the suitability of the reception centers. Staff Proposed Findings at 6; Governments Proposed Findings at 19. It is clear that many other matters, for example, staffing requirements, space requirements and traffic flow, all hinge to a considerable extent

upon the number of people and vehicles that can be expected to come to the reception centers.

A brief procedural history of the matter may be useful here. In our Concluding Partial Initial Decision on Emergency Planning (CPID), 22 NRC 410, 417, we stated:

> We accept LILCO's planning basis for the number of evacuees who might seek shelter, be processed through the relocation center and, according to NUREG-0654 § II.J.12, must thus be monitored. [The estimate was 32,000 or 20% of the EPZ population.] The record is unclear as to how the Coliseum could accommodate the evacuees of the general population who will seek monitoring and processing, aside from those seeking shelter. We therefore find that LILCO's failure to plan for those of the general population who seek only monitoring and processing constitutes a defect in the Plan.

Before the Appeal Board, LILCO claimed that this matter had not been properly raised in the original contentions and the Appeal Board remanded the issue for a determination by this Board as to whether the issue was "reasonably embraced within the concerns" which had been originally presented to us for litigation. 24 NRC 421.

We then issued our Clarifying Decision on Remand (Monitoring of Evacuees), 24 NRC 561, 571 wherein we stated:

> After analysis of the issue on remand, the Board adheres to its findings as stated in its concluding partial initial decision. We conclude that Contentions 24.0 and 75 taken together properly raised the issue of population planning basis for evacuees arriving at a reception center, that LILCO had a fair opportunity to litigate the matter, and that when the smoke had cleared it had simply failed to carry its burden of proof on that point. In reaching this conclusion, the Board never found it possible to adopt any parties' views as to what the correct number should be in the planning basis for radiological monitoring. This remains true to this day; there is simply no basis to decide it in the record.

The Appeal Board then issued ALAB 855, affirming our position and saying:

> Surely, the need of evacuees for monitoring and decontamination services does not hinge to any extent upon whether they have been able to make their own sheltering arrangements. This being so, it seems beyond serious dispute that monitoring and decontamination services must be regarded as within the "range of protective actions" that 10 CFR 50.47(b)(10) requires be developed for all members of the public within the EPZ.

24 NRC 800, footnote omitted, emphasis in original.

The Appeal Board directed us to proceed to consider the motion to reopen the record for the purpose of considering the substitution of other facilities for the Nassau Coliseum. While the Appeal Board regarded the Applicant's estimate of the number of persons who will need monitoring and decontamination as well as shelter (20% of the total of 160,000 or 32,000) as being "of dubious validity" the Board noted that "LILCO may reassert the claim before the Licensing Board. Alternatively, it may proffer a new estimate." 24 NRC 801.

Accordingly, we accepted evidence on the number of evacuees which each of the parties believed LILCO must be prepared to accommodate.

Identification of Witnesses

LILCO presented the testimony of Douglas M. Crocker, Dale E. Donaldson, Diane P. Dreikorn, Edward B. Lieberman, Dr. Roger E. Linnemann, Dr. Michael K. Lindell, Dr Dennis S. Mileti, and Richard J. Watts (LILCO Exh. 1), and the rebuttal testimony of Dr Michael K. Lindell (LILCO Exh. 50). Suffolk County presented the testimony of Dr. Stephen Cole, Dr. Susan C. Saegert, Dr. James H. Johnson, Jr., Dr. David Harris, Dr. Martin Mayer, Gregory C. Minor, and Steven C. Sholly, (SC

Exh. 13); rebuttal testimony of Gregory C. Minor and Steven C. Sholly (SC Exh. 14); and testimony of Dr. James H. Johnson, Jr. and Dr. Susan C. Saegert (SC Exh. 15). FEMA presented the testimony of Dr. Thomas E. Baldwin, Ihor W. Husar, and Joseph H. Keller (FEMA Exh. 2). The NRC Staff presented the testimony of Falk Kantor and Lewis G. Hulman (Staff Exh. 5).

LILCO's Position

LILCO relies upon a FEMA internal memorandum (the so-called "Krimm Memorandum", FEMA Exh. 1) for its position that Criterion J.12 of NUREG-0654 requires sufficient resources to monitor about 20% of the total population of the EPZ in 12 hours.[5] The criterion itself actually says only:

---

5 That memorandum says:

> The State and local radiological emergency preparedness plans should include provisions at relocation center(s) in the form of trained personnel and equipment to monitor a minimum of 20 percent of the estimated population to be evacuated.
>
> For highly improbable radiological releases involving high levels of radiation encompassing a relatively large area, it may be necessary to monitor a greater number of evacuees beyond 20 percent of the population. In such a situation, State and local governments would be expected to develop and implement ad hoc response measures, supplemented, if needed, by Federal and private sector resources.

FEMA Exh. 1 at 2.

> Each organization shall describe the means for registering and monitoring of evacuees at relocation centers in host areas. The personnel and equipment available should be capable of monitoring within about a 12-hour period all residents and transients in the plume exposure EPZ arriving at relocation centers.

NUREG-0654 at 65.

LILCO, the NRC Staff, and FEMA all believe that an appropriate planning basis for the purpose of determining the resources in people and instruments that should be committed to monitoring is that one should plan on monitoring 20% of the EPZ population in about 12 hours. LILCO Exh. 1, Crocker, et al. at 10; FEMA Exh. 2 Baldwin, et al. at 7; Tr. 19,221 (Kantor). One of LILCO's witnesses, Mr. Donaldson, a former NRC employee, had been a member of a team that developed a "precursor" document to NUREG-0654. He recalled that, although the group did not have a particular number in mind when that document was written, it was their belief that "only a small percentage" of the EPZ would require monitoring. LILCO Exh. 1 at 8.

The Applicant points out (LILCO Proposed Findings at 15-16) that the regulations do not require dedication of enough resources to handle all possible accidents, the emphasis being on prudent risk reduction measures. Citing Southern California Edison Co. (San Onofre Nuclear Generating Station), CLI-83-10, 17 NRC 528, 533. And LILCO also offers the limited size of the EPZ itself as compelling the notion that something less than a "worst case" is a suitable basis for compliance with the regulations (LILCO Proposed Findings at 15).

LILCO notes that the "Krimm Memorandum," introduced both by FEMA (as FEMA Exh. 1) and by LILCO (as Att. L to LILCO Exh. 1), was prepared

by FEMA's Policy Development Branch and is FEMA's national policy. Tr. 18,314 (Keller); Tr. 18,440 (Husar); Tr. 18,346, 18,465 (Keller). That memorandum was based upon FEMA's review of "[p]revious experience gathered on evacuating responses to a variety of natural and technological emergencies." LILCO Proposed Findings at 16, citing FEMA Exh. 1.

LILCO does not dispute that there may be circumstances under which more than 20% of the EPZ population may require monitoring, but characterizes such circumstances as highly improbable, again citing the Krimm Memorandum (LILCO Proposed Findings at 17). But LILCO believes that planning for monitoring 20% of the EPZ population, like planning for the evacuation of a 10-mile radius, is the resource commitment required by the regulations.

LILCO also points out the result of a calculation by the Staff's witness, Lewis G. Hulman, (Staff Exh. 5). LILCO Proposed Findings at 17-18. Mr. Hulman attempted to calculate the fraction of the population that could be expected to be contaminated in a severe accident. That is, he tried to determine how many people would be likely to need monitoring, rather than how many would seek it. He performed what he termed a "footprint assessment," calculating the conditional probability of the number of people within the 10-mile EPZ who could be within the plume. Staff Exh. 5 (Hulman) at 1. He used three different scenarios, Cases 1, 2, and 3. Id. at 6 ff. The first case calculated the number of people covered by a plume of width twice the Gaussian diffusion parameter centered in each of sixteen 22.5 degree sectors, adding to

that the population in the sector within two miles of the plant, and used meteorological data to compute a weighted fraction of the time that various numbers of people would be exposed. Id. at 5-6. In Case 2 it was assumed the plume would expand without the restrictions of Case 1, and in Case 3 the exposed population included all the people from two to ten miles in each sector plus all those within two miles to be considered at risk,and weighted the probabilities according to the time the wind blows in each direction. Id. at 7. His ultimate conclusion was that "[e]ven in the most conservative of the three cases, the planning basis of 20% would be a conservative estimate of the number of people who might be within the plume." Id. at 9.

As we discuss infra, Suffolk County witnesses Gregory Minor and Steven Sholly criticized Mr. Hulman's analysis on the ground that he had ignored the effects of shifting wind and precipitation. SC Exh. 14. LILCO would have us accept Mr. Hulman's work as lending support to the 20% requirement nonetheless, since Mr. Hulman himself acknowledged these omissions and opined that his other conservatisms more than offset them. LILCO Proposed Findings at 18-19, citing Staff Exh. 5 at 8 and Tr. 19,211, 19,223 and 19,228.

LILCO would also have us discount the position of New York State (discussed in some detail below) to the effect that emergency plans should be able to accommodate 100% of the population of the EPZ. LILCO Proposed Findings at 23-24. LILCO points out that FEMA witnesses testified that other local plans in New York do not achieve that goal. See Tr. 18,381 (Keller, Husar); Tr. 18,371; 18,379; 18,472; 18,481-83

(Keller). And LILCO points out that at least one exchange in the transcript between one of the Licensing Board Judges and a New York witness could be taken to mean that New York policy anticipates only that some sort of reserve monitoring capacity, not the capacity available early in an emergency, would permit 100% monitoring. LILCO Proposed Findings at 24, citing Tr. 18,238-39.

Finally, LILCO discounts the "monitoring shadow" theory of Suffolk County, a theory described in some detail below, saying that because the Board has already concluded that, in the case of the "evacuation shadow" the results of polls have "no literal predictive validity," we must reach the same result here. LILCO Proposed Findings at 25-28, citing 21 NRC 644, 667, 655-71. LILCO believes that the present polling data, even supplemented by the "focus group" study discussed below, cannot be used to predict the behavior of large groups of people in an emergency. And LILCO suggests that the "monitoring shadow" and "evacuation shadow" phenomena, that were exhibited at TMI-2, point in very divergent directions since only a tiny fraction of those in the surrounding area availed themselves of monitoring, while those who evacuated constituted a substantial fraction. LILCO Proposed Findings at 28-29, citing LILCO Exh. 1 at 15; Tr. 17,499 (Mileti); Tr. 19,195 (Kantor).

Governments' Position

The Governments start by pointing out a phrase from a Commission decision, Southern California Edison Co. (San Onofre Nuclear Generating

Station, Units 2 & 3), CLI-83-10, 17 NRC 528, 536, n. 12, wherein the Commission said that NUREG-0654 Section II.J.12:

> requires relocation centers capable of registering and monitoring all residents and transients in the plume exposure EPZ . . .

While they admit that the statement "arguably constitutes dicta," the Governments urge us to give it weight in our decision (Governments Proposed Findings at 27-28). That we decline to do.[6] We do indeed regard the statement as obiter dicta. We believe that the Commission was merely restating in abridged form the guidance offered in the NUREG document and that the words of the document itself, "all residents and transients in the EPZ arriving at relocation centers," properly govern.

The Governments attack the applicability of the Krimm Memorandum on five rather overlapping grounds. First, they note that the memorandum derived its figure, 20%, from previous experience in which "from 3 to 20% of the evacuees arrived at relocation centers or shelters" (Governments Proposed Findings at 28-29, citing FEMA Exh. 1 at 1). This, the Governments believe, forms little basis for the memorandum's

---

6 We decline; but not for the reason which LILCO offers us. LILCO cites ALAB-855, 24 NRC 792, 799, where the Appeal Board, in dealing with the Commission's statement, find "no occasion to exploit . . . the bounds of our obligation to give effect to a Commission pronouncement that, albeit clear-cut, might not have been essential to the decision where it is found." LILCO's Proposed Findings at 9. We note that the Appeal Board's statement was, in context, made in the course of a finding against LILCO and was followed one page later (24 NRC 800) by the words cited in our introductory matter requiring that monitoring and decontamination be developed for all members of the public in the EPZ.

conclusion that the upper limit of that range is an appropriate value for accommodating those who would seek monitoring. Indeed, the Governments say, the use of sheltering data to estimate the monitoring requirement is precisely the practice which this Board and the Appeal Board found unsatisfactory. Governments Proposed Findings at 29-30. And they cite testimony which indicates that it is in fact upon the number of people who have sought shelter in emergencies that the Krimm figure is based. Id. citing Tr. 18,321-323 (Keller); Tr. 18,356-361 (Husar).

Second, they assert that by relying on shelter-seeking data, the Krimm Memorandum neglects the fact that more than 20% of the EPZ population may be advised to seek monitoring by emergency broadcast system (EBS) messages. Id., citing OPIP 3.6.1 at 2; NY Exh. 1 (Papile) at 8). The Governments point out that in the exercise of the LILCO Plan held on February 13, 1986, the scenario called for instructing approximately 60% of the summertime population to report to a reception center for monitoring. Governments Proposed Findings at 32, citing NY Exh. 1 at 9.

Third, the Governments note that the Krimm Memorandum does not address the "monitoring shadow" phenomenon, a concept the Governments and their witnesses believe very important. Governments Proposed Findings at 32. They cite FEMA witness Keller at Tr. 18,324 for the notion that the memorandum does not in fact address this concept, but they omit the statement by Mr. Keller on the next page of the transcript (Tr. 18,325) where he states that the upper end of the experiential

range was selected because "some people may go to the reception center to allay their fears," an idea that, in our view, is virtually indistinguishable from that of the monitoring shadow.

Fourth, they allege that the Krimm Memorandum fails to support a 20% planning basis because it ignores the fact that the reception centers will be performing a dual function, both sheltering and monitoring. They cite LILCO's own witnesses (LILCO Exh. 1, Att. P OPIP 4.2.3 at 3, 7; Tr. 17,438 (Crocker); LILCO Ex.1 at 3) for the fact that the reception centers will serve both needs. FEMA's witness, Mr. Keller, agrees. Tr. 18,328-329. Thus the Governments would have us find that the total of people seeking both shelter and monitoring could be larger than the planning basis.

Finally, the Governments would question the origins of the Krimm Memorandum. The memorandum was written in response to an inquiry by one of FEMA's witnesses, Mr. Keller. FEMA Exh. 1, Keller letter. Mr. Keller sought guidance since, inter alia, he expected the issue of the planning basis to surface in this hearing. He wrote to Mr. Stewart Glass, then Regional Counsel for FEMA Region II, and Mr. Krimm, Assistant Associate Director for Natural and Technological Hazards in the Office of State and Local Programs and Support, FEMA Headquarters, issued the memorandum addressed to Division Chiefs of the corresponding Divisions in the FEMA Regional Offices. FEMA Exh. 1; Tr. 18,313 (Husar). The Governments point out that FEMA Guidance Memorandum IT-1, which is official guidance, establishes a hierarchy for FEMA guidance documents and sets forth a procedure by which such documents are to be

developed and promulgated. Governments Proposed Findings at 34-35, citing Tr. 18,162 (Papile); Tr. 18,193-196 (Baranski); SC Exh. 18. Because a memorandum from an Assistant Associate Division Director does not fit into the official FEMA guidance schema and is not generated according to FEMA's official method for developing guidance, the Governments would not have us give the Krimm Memorandum substantial weight. Governments Proposed Findings at 37.

The Governments see the testimony of Mr. Donaldson, author of a "precursor document" to NUREG-0654, as offering scant support for LILCO's view. They point out that Mr. Donaldson's draft did not include the language in Section J.12, (LILCO Exh. 1 at 8 (Donaldson)), that he did not have a specific number of people in mind when he wrote the draft, (Id.; Tr. 17,449), and that the Steering Committee that worked on the document after him used it in ways unknown to him and did not consult him on the number of people who might be expected to arrive at reception centers. Id. They would have us give the Donaldson testimony no weight. Governments Proposed Findings at 40.

The Governments also discount Mr. Hulman's testimony. Their primary objection to it is that it speaks only of the number of people who might be contaminated, not to the number who might seek monitoring for reasons associated with their own fears or worries, "behavioral" reasons in the Governments' argot. Governments Proposed Findings at 53, citing Tr. 19,198-199 (Hulman, Kantor).

Further, the Governments would fault Mr. Hulman's analysis because it does not account for either wind shifts or precipitation. Again, Mr.

Hulman admits this (Staff Exh. 5 (Hulman) at 8; Tr. 19,200 (Hulman)), but believes he has "more than offset these limitations." Staff Exh. 5 (Hulman) at 8. The Governments' witnesses, however, regard the omissions as serious. SC Exh. 14 (Minor and Sholly) at 5. They point out the "substantial chance" (about 86%) that some wind shift will occur in a six hour period. Tr. 17,941 (Minor). And they criticize Mr. Hulman for having failed to use computer codes, despite their existence, that would account for wind shift (Governments Proposed Findings at 54, n. 36, citing Tr. 19,200; 19,226-7 (Hulman).

The Governments would also have us believe that the failure of Mr. Hulman's analysis to allow for the fact that evacuation itself could increase the number of people exposed during a wind shift is a serious flaw and that Mr. Hulman admitted as much under cross examination. Governments Proposed Findings at 54-55, citing Tr. 19228-9 (Hulman); SC Exh. 14 (Minor and Sholly) at 5-6. Actually, at the point cited in the transcript, Mr. Hulman spent most of his time protesting that an increase in exposure due to wind shift during an evacuation is very unlikely.

Finally, the Governments would have us reject Mr. Hulman's ultimate conclusion, based on his graphs, of persons exposed as a function of time fraction (conditional probability). He pointed out that his results support a conclusion that the 20% planning basis is conservative (overestimates the number contaminated) 90% of the time. The Governments would use these same curves to point out that if one wished to cover the situation 95-98% of the time, the number of people could more than

double. Governments Proposed Findings at 55, citing SC Exh. 14 (Minor and Sholly) at 6; Staff Exh. 5 (Hulman) at Fig. 2.

While the State and County agree that the 20% planning figure is too small, they appear to differ on the question of what a proper figure would be. The State witnesses testified that a prudent plan would permit monitoring of at least 100% of the population in the EPZ. NY Exh. 1 at 7-10.[7] The County witnesses, on the other hand, espouse a complex theory, similar to the one we dealt with under the rubric "Shadow Phenomenon" in our PID. 21 NRC 644, 655. There the matter involved the "evacuation shadow", a hypothesized large number of people who might evacuate from areas where no evacuation was ordered. Here the County witnesses hypothesize that a large number of people would appear and request monitoring, even though they came from areas where monitoring had not been advised. They call this the "monitoring shadow" and distinguish it from the evacuation shadow, although they assert that the two have similar roots. Governments Proposed Findings at 56, citing SC Exh. 13 at 13-18, 27; Tr. 17,933 (Cole, Johnson, Saegert).

---

7 As we noted above, LILCO would interpret certain of the New York witnesses' responses as evidence that the State really only expects a capability for expansion to 100% monitoring. Note, however, that the Governments, in their Proposed Findings, specifically attribute a 100% requirement to the State (Governments Proposed Findings at 25), although State plans do not necessarily fulfill that requirement at other plants in the State. Tr. 18,381-382 (Keller, Husar); Tr. 18,238-239 (Papile).

The Governments point out that witnesses for FEMA and the Staff agree that people might seek monitoring even though they did not come from an area where occupants had been advised to seek it. Tr. 19,198 (Kantor); 18,330-331 (Keller, Baldwin, Husar). While LILCO's witnesses took the position that such a monitoring shadow can be controlled by proper dissemination of good emergency information,[8] the Governments believe that the only reliable way to estimate the extent of the monitoring shadow is by surveying the population in advance. Governments Proposed Findings at 55-59, 67-69. To this end the County presented the results of a survey conducted by the County's witness Dr. Stephen Cole. SC Exh. 13 (Cole, et al.) at 13-16 and Exh. 8 thereto at 8. The survey asked 1500 respondents by telephone how they would respond to a series of the EBS messages that were actually used in the February 13, 1986, exercise of the plan.[9] Dr. Cole's results indicated that 50% of "all Long Island households" would go to the specific center mentioned in the EBS messages. That would represent more than 1.3 million people. Governments Proposed Findings at 59, citing SC Exh. 13 (Cole, et al.) at 16-17. While the Governments point out that they do

---

8 This is a position not inconsistent with that adopted by this Board in reference to the "evacuation shadow," which all agree is an analogous phenomenon. Cf. 21 NRC 644, 670.

9 There is some dispute between the County and LILCO as to how accurately the messages used in the survey represented those used in the exercise. LILCO Proposed Findings at 28; citing Tr. 17,819 (Cole); Cordaro, et al., ff. Tr. 1470 at 27; Tr. 10,498 (Weismantle).

not take the position that a full 1.3 million people would report for monitoring to the reception centers, they do believe that far more than the 20% of the EPZ population should be the planning basis. Id.

The Governments would thus have us find that Dr. Cole's survey has established that a large monitoring shadow would result from a radiological emergency. They would also have us delve into the reason for the "shadow." They note that it is well established in the record of this case that people fear radiation. Governments Proposed Findings at 65, citing Tr. 17,983 (Kline); SC Exh. 13 at 26-27; LILCO Exh. 6 at 464; Tr. 17,849 (Saegert). And they see confirmation of their theories in other work by Dr. Cole. In addition to the survey, Dr. Cole conducted group interviews of the type known as "focus groups," wherein he examined "the monitoring shadow and the fear which drives it." Governments Proposed Findings at 66, citing SC Exh. 13 at 31-33; Tr. 17,824-25 (Cole). During these group sessions, recordings of the EBS messages from the February 13, 1987 exercise were played to the group, and the group then discussed the individual participants' perceptions of and attitudes toward a Shoreham accident and how they would react. SC Exh. 13 at 32. Analysis of the transcripts of these group interviews by Suffolk County's witnesses, Drs. Cole, Saegert, and Johnson, led these witnesses to conclude that there is a deep-seated fear of radiation on Long Island, that some Long Islanders believe that if there is any accident at Shoreham they will be exposed to radiation, that the fear would not be based upon objective or quantitative notions of the amount of radiation involved, (any amount is dangerous), and that in the event

of an accident many people will believe that their lives are in grave danger. SC Exh. 13 at 33-35. Thus many will seek monitoring (Id. at 36). In short, it is the Governments' position that the primary motivator in an emergency is preexisting fear.

As to the effect upon people's behavior of messages that may be broadcast at the time of the emergency, the Governments believe that will be minimal. They particularly discount the notion that members of the public not advised to seek monitoring will not do so. LILCO's messages, they believe, will not overcome the strong fear of radiation. The County's experts have examined the EBS messages in LILCO's Plan and the messages broadcast during the February 13 exercise, and those experts conclude that the messages do nothing to calm the fear or to explain why only some people might have become contaminated. Governments Proposed Findings at 70, citing SC Exh. 13 at 42. The EBS messages tell those outside the 10-mile zone that they are safe, but because many members of the public are predisposed to believe differently, they are likely to seek monitoring at the reception centers. Tr. 17,972 (Johnson). The Governments find further support for their theory that predisposition dominates emergency information in an article from the magazine Nuclear Safety, written by LILCO's witness Dr. Lindell. There, Dr. Lindell opined that the evacuation overresponse at TMI resulted "as much from prior public perception of the risks of nuclear power" as from conflicting information, and he said that

ensuring consistency of information solved "only part of the problem."[10] Governments Proposed Findings at 71, citing LILCO Exh. 6 at 466; see also Governments Proposed Findings at 66, n. 44.

NRC Staff's Position

The Staff's position (and apparently that of FEMA) is very close to that of LILCO To begin with, the Staff would accept the Krimm Memorandum as reliable guidance. Staff Proposed Findings at 9-12. The Staff particularly regards the 20% figure as reasonable in view of the calculation by its witnesses of the number of people who could potentially be affected by a release. Id. at 12, citing Staff Exh. 5 (Hulman) at 1; (Kantor) at 7; Staff Proposed Findings at 18-19. The Staff even parses the Krimm Memorandum closely, noting that the memorandum speaks of "20 percent of the population to be evacuated," and observing that, since LILCO's plan calls for evacuating only part of the EPZ under some circumstances, providing for 20% of the total EPZ population could, in some cases, more than satisfy the requirement.

---

10 Dr. Lindell was permitted to present rebuttal testimony to answer the Governments' implication during the hearing that his presented testimony was inconsistent with his Nuclear Safety article. He explained that to the extent that his magazine article studied behavioral intentions and risk perceptions it did so to help planners to understand what types of cues or characteristics of the hazard would be most salient to local residents; it was not his intent to predict future behavior from such surveys. LILCO Exh. 50 at 2; Tr. 17,771-73 (Lindell).

Staff Proposed Findings at 11. We agree, but we cannot see why having too great a capability under some special circumstances could lead to any problem.

Like LILCO, the Staff would have us note the fundamental similarity of the "evacuation shadow" and the "monitoring shadow" phenomena. On the basis of that similarity, the Staff would have us hark back to the decision we previously rendered (21 NRC 644, 655-71), in which we discounted predictions of such a shadow by polling techniques similar to those of Dr. Cole in the present case. Staff Proposed Findings at 14-16. The Staff notes that, in ordering a hearing held on the present question, we had distinguished between the two phenomena in question, but, with the evidence now in place, the Staff would have us find that the predictive value of public opinion polls should be given little weight and the number of people to be provided for should be assumed to be "a function of" those advised to evacuate. Id. at 16. The Staff would have us find that 20% is a reasonable upper bound for that function. Id. at 16-17. The Staff cites its own witness, Mr. Kantor, for the notion that offsite response organizations need not be capable of monitoring 100% of the EPZ population. Id. at 17, citing Staff Exh. 5 (Kantor) at 4.

It is also the Staff's position that a 20% base, expandable for the worst possible accidents, is a capability consistent with the general thinking embodied in NUREG-0654, and that the 12-hour period for monitoring mentioned in Section J.12 thereof is based not on

radiological health and safety considerations but is intended "to provide a recommended objective for planning purposes." Id.

Board Decision

We have given the positions of the parties and the portions of the record which support them careful consideration. After having duly accepted evidence on the matter of the monitoring shadow, we are convinced that the matter of that shadow's size is governed by factors not substantially different from those that govern the evacuation shadow. That is, the tendency of people to seek monitoring when not advised to be monitored is, for practical purposes, influenced by considerations very like those that influence a decision to evacuate when not so instructed. The chief among these factors are predisposition due to fear of the hazard involved, and the information supplied at the time of the incident. "Information" in this sense includes both the official offerings and the rumors currently flying. We see, at this juncture, no immediate way to predict the behavior,and we are still convinced, as we were in our earlier PID, that Dr. Cole's polling techniques tell only what the situation is now, not what it will be at some undetermined future date. See 21 NRC 644, 667.

Faced with a situation where no firm predictions are possible, we choose to accept the opinions of those who deal professionally with the business of emergency planning. In particular, we give great weight to the policies of FEMA, and, for that reason, to the guidance expressed in

the Krimm Memorandum. The fact that the result of that memorandum jibes with the result of the Staff's analysis of the population fraction at risk we regard as fortuitous, but it is comforting to know that the plan provides for monitoring a number of people near the maximum that could be expected in all but the most severe accidents if it complies with the FEMA guidance.

We recognize the fact that, as the Governments would have it, the Krimm Memorandum is based upon figures for those reporting to shelters, but we recognize also that those figures were adjusted upwards in a manner consistent with the best judgment of an emergency planning professional. In short, we conclude that a figure of 20% of the EPZ population, expandable in extreme cases, is a defensible figure for the number of people for which planners must provide a twelve-hour monitoring capacity.

We must again caution, as we did in our earlier PID, that confused or conflicting information (or instructions) could cause a monitoring shadow that would lead to the swamping of the monitoring capacity, and we note that the results of the exercise hearing (LBP-88-2, 27 NRC 85, February 1, 1988) are not such as to give great confidence that communication to the public will be clear and concise. Nevertheless, if one assumes that proper communication is indeed possible and will be required before licensing, we believe that provision of monitoring

capacity for 20% or more of the EPZ population within 12 hours will satisfy the guidance expressed in NUREG-0654, II.J.12.[11]

---

11 We note a divergence between the positions of the Staff and LILCO on the matter of the applicability of this ruling. The Staff would have us find that capacity for "up to 30% monitoring with ad hoc measures to expand" the capability is adequate for a finding limited specifically to Shoreham. Staff Proposed Findings at 20, n. 8. LILCO would have us rule that 20% is adequate. LILCO's Reply to Staff Proposed Findings at 5. Since the testimony of the Staff and FEMA supports the 20% figure, we see no reason to limit our finding as the Staff requests.

2. TRAFFIC RELATED ISSUES

The traffic issues that arise in this case originate from the Appeal Board's remand on reception center issues wherein it found that evidence on traffic had been improperly excluded from our consideration of the functional adequacy of the Nassau Coliseum to serve as a reception center. In its remand order, the Appeal Board observed:

> But manifestly, a reception center that is beyond the reach of the persons it is set up to serve cannot fulfil its intended purpose, no matter how well the facility might be designed and equipped.

ALAB-832, 23 NRC 135, 161-62 (1986).

The issues in the remand hearing that relate directly to traffic problems associated with reception centers are:

> Whether transportation and traffic problems might develop as a result of the reception centers' locations and their distance from the plume EPZ.
>
> The adequacy of evacuation routes to the three LILCO facilities proposed as reception centers, including the effects of traffic congestion on the way to and in the vicinity of the facilities, and LILCO's Revision 8 proposal to employ traffic guides on Nassau County roadways.

Memorandum and Order (Rulings on LILCO Motion to Reopen Record and Remand of Coliseum Issue), December 11, 1986, at 7, 18 (unpublished).

A number of other issues raised by the Appeal Board or the Intervenors potentially impacting the road capacity assessment--including shadow evacuation, LILCO's monitoring procedures, and its staffing requirements--are considered and resolved herein separately. This is necessary due to the inherent complexity of what became a multiparameter problem in litigation.

Although Intervenors expressed numerous detailed concerns about road capacity, it was apparent from the outset that a principal element of disagreement about traffic focused on the planning basis that defined the number of evacuees that would have to be accommodated at the reception centers rather than the intrinsic capacity of the highway system to carry traffic. See NY Exh. 5 at 39 (Hartgen and Millspaugh). Put in simplest terms, the streets and highways to be used to access the reception centers would accommodate the additional traffic if the traffic demand is not too great. If, on the other hand, the traffic demand for service is much higher than LILCO plans because background traffic will be higher than normal or shadow evacuation occurs, congestion in streets and highways might prevent access of some persons to the reception centers within the time prescribed in NUREG-0654 Section J.12.

Intervenors presented their case on traffic in a manner that could not be rigorously compared with LILCO's assessment because their planning basis assumptions were entwined with their traffic analyses. None of the cases they presented in their prefiled testimony corresponded directly with the case LILCO presented and we are therefore precluded from making symmetrical comparisons of the respective positions. NY Exh. 5 Hartgen and Millspaugh. Because LILCO carries the burden of proof in this proceeding, we first assess the validity of traffic analysis presented under its planning basis taking into account any controverting evidence presented by intervenors. We examine

separately the validity of the planning bases of the parties to determine whether LILCO's planning requires modification. In this decision, we find that LILCO's planning basis is adequate. Supra. There is therefore no need to determine here whether the traffic consequences that result from Intervenors' traffic scenarios will make LILCO's facilities unsuitable as reception centers.

LILCO's Traffic Analysis

LILCO's analysis of traffic was presented by Mr. Edward Lieberman, Vice President of KLD Associates, a witness in these proceedings whom the Board found to be well qualified in the field of traffic engineering. LILCO Exh. 1 (Crocker, et al.) Att. C. The analyses of traffic expected to travel to one of LILCO's three reception centers after departing the western boundary of the EPZ was contained in three documents prepared by Mr. Lieberman. LILCO Exh. 1 (Crocker, et al.) Att. M, S, and T. KLD TR-192 reported on assignment of evacuees to the road system from the EPZ to the reception centers and provided a preliminary road capacity analysis. Subsequently, KLD submitted KLD TR-201 and shortly thereafter KLD TR-201A which contained revisions including a ramp capacity analysis not in KLD TR-201. Throughout the proceeding LILCO relied primarily on its analysis in KLD TR-201A and its findings therein were the principal subjects of dispute on traffic issues.

As noted, supra, LILCO relied on FEMA guidance contained in the "Krimm Memorandum" for its planning basis for the number of evacuees that would have to be monitored at the reception centers in an emergency. FEMA Exh. 1 (Baldwin, Husar and Keller); App Exh. 1, at 9 (Crocker, et al.). That guidance asserts that planning to monitor 20% of the EPZ population would be an adequate basis. However KLD performed additional analyses based on an assumption that 30% of the EPZ population would be monitored. According to LILCO's plan it would take steps to expand its monitoring capability on an ad hoc basis if more than 30% of the EPZ population sought monitoring in an emergency. Id. at 4, 52-55.

In performing its analysis, KLD made route assignments from the EPZ to the three centers, considered traffic congestion on the main east-west routes from the EPZ to the vicinity of the three reception centers, assessed traffic problems at intersections on the local streets that would be used to access the three centers, estimated the time it takes to monitor vehicles, and considered dispersion of traffic exiting from each center. KLD assumed without numerical analysis that traffic on the major routes between the EPZ and the reception centers would flow at "Level of Service F" (LOS F) which is described in the Highway Capacity Manual (HCM) as a condition where the volume of traffic (V) demanding space on the highway exceeds its capacity (C) and breakdown of flow occurs. That condition is determined analytically when the volume to capacity ratio exceeds one (V/C greater than 1). The effect of LOS F is congested flow characterized by low average traffic speed, stop and

go traffic and formation of traffic queues. Average highway speeds under those conditions are known from experience to be in the range of 17-30 miles per hour. KLD estimated the volume of evacuation traffic that would actually be serviced under those conditions assuming that the entire EPZ population evacuates and either 20% or 30% of the population goes to the three reception centers. In so doing, KLD first analyzed cases where either 50% or 100% of the measured peak period background traffic could also be on the roads when an evacuation began but later accepted that 100% of background should be used in its analysis.

After performing its traffic analysis, KLD reached the conclusion that the monitoring rates at each of the three reception centers and not highway capacity, control the rate at which evacuees can be serviced (monitored, decontaminated if needed, and assigned to congregate care centers if requested). They found further that the hourly monitoring capacity was sufficient to process 30% of the evacuees in less than the 12 hours called for in NUREG-0654 Section J.12 and that in fact LILCO's ultimate capacity for monitoring would permit it to monitor about 46% of all of the evacuees from a complete evacuation of the EPZ in that time period. An important finding from the analysis is that although traffic congestion would exist on the roads and highways, congestion would not prevent the timely monitoring of all evacuees expected to arrive at reception centers under the planning basis even though there would be delaying effects relative to unimpeded traffic flow. Indeed KLD assumed that traffic will be congested on the major routes from the EPZ and the analyses show that local streets and intersections would be congested

and that lines of waiting traffic will form at the entrances to each of the reception centers. Such lines, however disagreeable to evacuees, are an advantage to the monitoring process according to KLD since they provide a continuous supply of cars to the reception centers that keeps them working at full capacity until the monitoring task is finished. Tr. 18,581 (Lieberman). In LILCO's view, since the reception centers have more than the requisite capacity to monitor its specified planning basis for evacuees, there is no need to expand the capacity of the centers themselves simply because they are rate controlling under its plan. LILCO Exh. 1 at 3-4; 30-32 (Crocker, et al.). Although there was some disagreement about decontamination rates, all parties came to accept that monitoring and not the other services of reception centers controlled their capacity.

KLD performed its traffic analysis by first assigning traffic from various entry points within the EPZ to major highways and then assigning routes to the reception centers. Routing assignments were made to maximize available reception center capacity and road capacity. According to KLD, the routes were also chosen for simplicity so that evacuees could successfully follow them in an evacuation. The State claims however that the maximization of capacity utilization that was achieved by this exercise was only a theoretical benefit that might not be achieved in practice. Individuals might not follow their assigned routes in an evacuation with the result that some routes will be over-utilized and some under-utilized, causing congestion and delay not accounted for in the KLD analysis. KLD believes however that route

switching by evacuees will be minimal and in any event will tend to balance out with no net adverse impact on highway congestion. LILCO Exh. 26 at 4-5 (Lieberman).

LILCO's analysis of traffic capacity employed standard procedures specified in the 1985 HCM, published by the Transportation Research Board. These procedures were programmed for computer use by the Federal Highway Administration and this software was used for the studies contained in KLD TR-201 and 201A. Intervenors did not challenge the use of the HCM software and in fact used it themselves in their effort to rebut LILCO's case. The substance of Intervenors case against LILCO was that the analyses done by KLD were improper because it had used unrealistic EPZ population estimates for evacuating traffic or faulty traffic data bases or assumptions in its analyses. Intervenors produced a number of analyses, using their own models and the HCM software, showing that if different data were used or different assumptions made, the results would show a less favorable traffic flow than found by KLD. This, in turn, would render the reception center plan unworkable. NY Exh. 6 at 16 (Hartgen and Millspaugh).

The analysis performed by KLD required KLD to obtain field data on traffic before it could run the HCM software. Field data was collected on background traffic flow during peak periods using machines to record the flow and on traffic signal timing by direct observation and measurement. KLD also obtained data on turn movements of existing traffic at key intersections that would be utilized by evacuating traffic to approach the reception centers.

Intervenors assert that these efforts resulted in unreliable data that could not be used to plan for monitoring at reception centers. According to Intervenors, machine counts of traffic turn movements are more reliable than counts taken by observers over short intervals and should have been used to estimate turn movements. Similarly, it was alleged, KLD could have used actual traffic signal settings supplied by the State to estimate "green time" for evacuation traffic, but in many cases it did not. The field data collected by observers was unreliable, assert Intervenors, because the signals are traffic actuated and exact estimates of maximum green time cannot be obtained by this method. Additionally, LILCO's assertion of adequacy rests also on monitoring times at reception centers which intervenors claim to be seriously understated. NY Exh. 5 at 55-56; 61-63; 67 (Hartgen and Millspaugh).

Intervenors' Position

The State presented testimony of expert witnesses Dr. David Hartgen and Mr. Robert C. Millspaugh who conducted their own traffic analysis of the reception center plan using a traffic model termed CARS. NY Exh. 5, Exhs. 1 & 2 to testimony at 33 (Hartgen and Millspaugh). The State assessed 8 cases or scenarios which it said constitute a sensitivity analysis that reveals the impact of assumptions on the estimated volume of traffic that would have to be served in an emergency. The cases started with a low estimate consisting of 30% of the EPZ population and background traffic at 50% of normal. Traffic volume was increased in

successive cases culminating in three that used projections of 150% of normal background combined with other assumptions such as the anticipated volume after five years of projected population growth. NY Exh. 5 at 33-41, Att. 10-13, (Hartgen and Millspaugh).

Results of the analyses were expressed in part as the ratio of volume of traffic divided by the capacity of the specific road link being analyzed (V/C ratio). This ratio is assertedly important to traffic analyses because its magnitude corresponds to the degree of expected traffic congestion. When V/C=1, traffic congestion occurs because the demand for capacity is equal to actual road capacity. When V/C exceeds 1 for a link, forced flow, congestion and queueing occurs (LOS F). The State's analyses show that long traffic queues would exist on the roadways after 12 hours. NY Exh. 5 at 61; 67; 70 (Hartgen and Millspaugh).

The V/C ratio cannot physically exceed one on any real roadway because that would indicate the impossible situation where more traffic passes along a road than it can accommodate. Nevertheless it is reasonable to compute a ratio greater than one and the result is meaningful because the projected demand ((V)olume) in an emergency may well exceed the existing road capacity for substantial periods of time.

The State's results show at least some intersections on routes leading to reception centers as having projected V/C values near one or larger for each of the cases it considered. Not surprisingly, the number of such instances increased with the State's assumption of severity of demand. In the State's case, DOT 4, for example, which

assumed 100% background traffic, 50% of the EPZ population going to centers, and 50% evacuation shadow, the State found 22 intersections on routes to the reception centers for which demand would exceed their respective capacities. Queues of three miles would form taking longer than 12 hours to dissipate if this case materialized in an actual evacuation. NY Exh. 5 at 43 (Hartgen and Millspaugh).

The State analyzed three critical intersections, one near each of the reception centers, found high V/C ratios for each and projected, that in an emergency, long traffic queues would form and still remain after 12 hours. The State assumed higher and in its view more realistic traffic demand than LILCO did in its analysis of the same intersections.

The State's critique of KLD's analyses was based primarily on its view that KLD should have used a larger planning basis to assess the traffic flow in an emergency. The several cases it analyzed differed from one another, and LILCO's, primarily in the assumptions made initially as to how many vehicles would be on the road. The value of the exercise, Intervenors claim, is that it demonstrates the sensitivity of the conclusions to the input assumptions. Thus, in their view, we cannot accept LILCO's analysis because even though it shows that traffic congestion will not be a factor in the Applicants' ability to monitor the number of evacuees in their planning basis, the conclusion is unreliable and would change for the worse if one of the State's more realistic planning bases were used instead. While at first glance the dispute between the parties appears to be a war of computer models, in reality it is not. It is instead a conflict over subjective assumptions

to be used in computer models. The Intervenors use their analyses to press their views that we should reject FEMA's (and LILCO's) planning basis because a large shadow evacuation will take place, or because more than 20% or 30% of evacuees from the EPZ will seek monitoring in an emergency.

The litigation also produced an array of detailed technical disputes on narrow issues related to quantitative traffic assessment through prefiled testimony, cross examination of experts and a flurry of rebuttal and surrebuttal testimony filed by LILCO, the Staff, and the State. These are all considered in this decision to the extent parties briefed them in their proposed findings.[12]

The State claims that KLD erred in its analysis by assuming that vehicles would make left turns in two lanes instead of one as permitted by lane markings and signals at the intersections of Route 107 and Old Country Road serving the Hicksville center and at the Long Island Expressway (LIE) eastbound service road and Willis Avenue serving Roslyn. Such turns are said to be both dangerous and illegal because they conflict with oncoming traffic and drivers have obstructed views.

---

12 Intervenors did not brief several of these issues in dispute and we consider them abandoned. These include: effects of road construction, gridlock, average highway speed, delay times calculated by HCM software, time distribution of traffic demand, HCM procedures, effects of truck traffic, the State's use of average annual daily traffic data, right turn on red, and capacity of the Meadowbrook Parkway ramp. Intervenors Proposed Findings at 169, n. 133.

While police control might improve the situation, Intervenors claimed that police control in an emergency would not be available because LILCO has no agreement with the Nassau County Police Department to implement its emergency plan. Governments Proposed Findings at 243-245. Additionally, it is stated, the police have not reviewed the plan so that they could not make it work even if they do agree to participate.

The Intervenors also claim error because LILCO did not consider future growth in traffic congestion which is likely to be worse than now. Error is also alleged regarding LILCO's assessment of traffic within the reception centers themselves and of traffic exiting the centers. The interiors of the centers are said to have obstructions and equipment in place which will slow the circulation of traffic. Traffic exiting the centers will encounter congestion causing traffic to backup into the centers which will reduce their capacity to monitor. NY Exh. 5 at 55-58 (Hartgen and Millspaugh).

The foregoing factors assertedly combine to show that LILCO's reception center plan is unacceptably faulty and that traffic congestion will prevent LILCO from monitoring the population it has planned and certainly any larger and more realistic population volume. Therefore, in Intervenors' view, the plan should be rejected.

Staff Position on Traffic Issues

Dr. Thomas Urbanik II presented testimony on traffic issues on behalf of the NRC Staff. Dr. Urbanik is an Associate Traffic Engineer

with Texas A&M University who has previously been accepted as a qualified expert in the Shoreham proceedings. Staff Exh. 3, 4. (Urbanik).

Dr. Urbanik reviewed, on behalf of the NRC Staff, the analyses performed by KLD Associates reported as KLD TR-192 and KLD TR-201. These documents, in Dr. Urbanik's judgement, were found to follow a traditional traffic engineering approach of estimating traffic demand and capacity in order to ascertain the magnitude of potential problems. According to Dr. Urbanik, the KLD analysis was a standard analysis that meets a simple test of reasonableness and it properly relied on the HCM for calculating the capacities of the roadways. Staff Exh. 3 at 4-6.

In rebuttal testimony, Dr Urbanik opined that the CARS model employed by the State experts is a transportation planning model for use in assessing land use impacts of proposed developments. The CARS model is not a traffic operational tool and cannot be used to predict driver behavior on a link specific basis. It was a misuse of the model to use it for detailed traffic analysis in this proceeding although it can be used to identify alternatives on a broad scale. On the other hand, Dr. Urbanik agrees with New York experts that congestion will be extensive and that delays will be substantial. He finds however that the notion of level of service or V/C ratio is largely irrelevant because the roads retain the capacity to function even under severe loading. The Long Island Expressway, for example, has level of service F (V/C over 1) every day for substantial periods. Nevertheless, thousands of people use it and make it to work each day. The level of service designation

is, in reality, a measure of convenience or quality in negotiating the highways and not an indicator of gridlock or breakdown of function. Staff Exh. 4 at 2-3 (Urbanik).

The successful implementation of LILCO's reception center plan depends on the capacity of the proposed reception centers to service the anticipated number of evacuees and on the capacity of the road and highway system between the EPZ and the centers to deliver the evacuees within the time prescribed by NUREG-0654 Section J.12. The time requirements however are not directly related to protection of public health but are a means of assuring that adequate resources exist to implement the reception center plan. Tr. 19,225-26 (Kantor). We resolve issues related to each component in the following sections.

Reception Center Capacity

LILCO designed its reception center operations to perform monitoring of 30% of evacuees from the EPZ even though FEMA guidance endorses a figure of 20% as being adequate. The three monitor centers--Hicksville, Bellmore and Roslyn--will provide a total of 63 monitoring stations, each of which according to plan can monitor a vehicle and its occupants in 100 seconds. App Exh. 1 at 4, 41 (Crocker, et al.). The total hourly capacity to monitor was calculated to be 1152 vehicles at Hicksville, 576 at Roslyn, and 540 at Bellmore. Id. at 32. At those rates, 30% of 58,000 vehicles from a full EPZ evacuation could be monitored in times ranging from about 6 1/2 hours at Roslyn to 9 3/4

hours at Bellmore. Id. at 33. While these are estimates for clear weather, LILCO could also monitor 30% of evacuees under 12 hours in inclement weather. Id. at 33.

At the indicated monitoring rates, FEMA's planning guidance of 20% of EPZ evacuees could be monitored in somewhat more than 6 hours at all three locations. Id. at 37. If more than 30% of evacuees arrive, LILCO will implement backup procedures by calling on INPO (Institute of Nuclear Power Operations) and Department of Energy for additional assistance. LILCO Exh. 1 at 52 (Crocker, et al.). The centers and roads however have the ultimate capacity of serving about 46% of the EPZ population in 12 hours. LILCO Exh. 26 at 5 (Lieberman).

Intervenors raised many detailed issues concerning reception center capacity in their prefiled testimony. NY Exh. 5 at 53-73 (Hartgen and Millspaugh). However they briefed only five issues related to capacity in their proposed findings. Governments Proposed Findings at 220-228. The capacity of the centers to serve evacuees found by LILCO is inaccurate, Intervenors claim, because the 30% planning basis is too small, monitoring will take longer than 100 seconds per vehicle, long lines will backup into intersections, exiting traffic will backup into the centers themselves, and the centers have obstructions that will interfere with internal circulation.

The Board addresses and resolves issues of planning basis, time required for monitoring, queueing at intersections, and internal obstructions at the centers elsewhere in this decision.

The Board accepts FEMA's and LILCO's planning basis of 20% of the EPZ population as appropriate for assessing the capacity of reception centers. It accepts as additional evidence of adequacy the fact that the centers can monitor 30% of the EPZ population before assistance is requested and that the ultimate capacity of the centers without assistance would permit monitoring of about 46% of the EPZ population within 12 hours. Infra.

The Board finds separately that queueing at intersections or the blockage of upstream intersections by evacuation traffic streams has no bearing on the capacity of the centers to monitor at the planned rate. Finally, we find separately that LILCO has remedied or commits to remedy deficiencies related to internal obstructions at the centers. Infra.

Intervenors asserted in prefiled testimony that it is possible that traffic exiting reception centers could encounter congestion causing it to back up into the sites and thus set the rate limiting times for servicing evacuees. No evidence, beyond a general assertion of opinion, was cited. NY Exh. 5 at 58, 68, 72. LILCO considered exit streets and traffic control strategies and concluded that they would be adequate to service exiting traffic. LILCO Exh. 26 at 37 (Lieberman); Tr. 18,659-60; 18,706-711 (Lieberman). It is a simple inference from the record that street capacity available to service incoming traffic is reasonably similar to that available to service outgoing traffic and that departing traffic cannot for reason of inherent limited street capacity be the rate limiting step in the overall process of serving evacuees. Provisions for active traffic control on outbound routes must

be made however to avoid conflict between incoming and outgoing traffic at critical intersections. Tr 18976-80; 18983, 18985, 19138-39 (Urbanik). KLD recommends police control of critical intersections in an emergency although it structured its analysis to demonstrate that adequate capacity exists generally without additional control. LILCO Exh. 1 (Crocker, et a.) Att. T at 33. The Board accepts, that with police control of exiting traffic, no restriction of reception center capacity will occur which is sufficient to disturb LILCO's conclusion that reception centers are the rate determining step in the overall processing of evacuees. We provide later in this decision for a requirement that LILCO inform the Nassau County Police Department of the provisions of its reception center plan which we expect will include requirements for control of traffic exiting reception centers.

The Board accepts LILCO's capacity analysis for reception centers as reasonable and finds no need to alter its estimates of average time to process evacuees.

Route Assignments

LILCO is said to have erred in its original route planning along major highways which assigned residents of the EPZ to one of the three reception centers using predesignated routes. The error arises according to Intervenors because there is no assurance that evacuees will actually follow their assignments. This is assertedly true because the routes are not simple and people may perceive for themselves a

better route to take to one of the centers. This will allegedly cause additional congestion and delay in reaching the reception centers. NY Exh. 5 at 13 (Hartgen and Millspaugh).

LILCO asserted that a conscious effort was made in planning to keep the routes as simple as possible and that in any event the routes are not complex. Moreover, there is no reason to conclude that route switching by evacuees will cause delay because any that occurs will tend to balance out among designated routes and travelling on unassigned routes will be a benefit by reducing traffic on assigned routes. Finally, LILCO claims, the highways have substantial excess capacity over the planning basis of 20%, which was endorsed by FEMA, to be able to accommodate reasonable imbalances caused by some people choosing different paths. LILCO Exh. 26 at 5 (Lieberman); Tr. 19,025-28 (Urbanik); Tr. 17,641-43 (Crocker).

Litigation of this question degenerated into a subjective dispute over whether the routes to the reception centers are simple. We did not find it illuminating. LILCO used prominent routes that actually exist between the EPZ and the reception centers in its analysis. There is no evidence that it selected non-feasible routes for planning. KLD TR-192 at 3-7. There is also excess highway capacity (30%) beyond LILCO's planning basis and FEMA's to accommodate traffic imbalances. Its assignment of routes appears reasonable because its choices are constrained by the existing highway system. It is immaterial to our decision whether or not the routes are simple or whether some other routes might have been chosen. We regard the traffic analysis that

LILCO performed as an assessment of the capability of evacuees to reach the reception centers within the time required. The analysis was not a prescription of a single acceptable means for doing so. There is no record basis for believing that projected dose reduction could be improved by further analysis and there is therefore no regulatory basis to inquire further on speculative questions about the future behavior of evacuees or to attempt to predict with precision how a future evacuation will play out. The Board concludes that LILCO's traffic assignment process was reasonable and does not raise serious questions regarding the overall validity of its traffic assessment for reception centers.

Highway Capacity Estimates

LILCO began its overall capacity analysis with the assumption that the major highways between the EPZ and the reception centers would flow at Level Of Service F (forced flow) in an emergency and that average vehicle speeds would be about 17-20 miles per hour based on experience and technical references. Tr. 18,643-46 (Lieberman). The NRC Staff agreed that that speed was reasonable for those conditions. Tr. 19,123 (Urbanik). KLD calculated the actual hourly volume of traffic that could pass over those routes at those average speeds although in reality forced flow traffic can move at speeds of up to 30 mph. App Exh. 1 Att. T at 21-25 (Crocker, et al.); LILCO Exh. 26 at 6-8 (Lieberman); LILCO Exh. 51 at 9-10 (Lieberman); Tr.18,645-46 (Lieberman). Intervenors were dissatisfied because no analysis of capacity was made for routes between

the EPZ and the reception centers and because KLD had just assumed that these routes would not be the limiting factor. It is claimed that such factors as number of lanes, lateral clearance, number of trucks and others could cause a reduction of freeway capacity by 30%. NY Exh. 5 at 13 (Hartgen and Millspaugh); NY Exh. 7 at 18-19 (Hartgen and Millspaugh).

LILCO asserted that it had already assumed worst case conditions during peak background flow conditions. Tr. 18,644-46 (Lieberman). Further since the highways are already assumed to be operating at LOS F, where demand exceeds capacity and queues form according to the HCM, the question of capacity really focuses on the capacity of the on-ramps between the EPZ and the reception centers. LILCO Exh. 26 at 7; Tr. 18,973 (Urbanik). The on-ramp capacity will be severely restricted in flow for non-EPZ travelers because the highways will be congested from evacuation traffic originating further east. LILCO Exh. 1 Att. T at 13 (Crocker, et al.).

The Board concludes that LILCO's assumption of worst case conditions of traffic flow along the major routes between the EPZ and the reception centers is acceptable as the assumption of an expert based on experience and technical literature. The assumption was reasonable because a detailed analysis would not have shown any important additional information that was not already included in the assumption. Tr. 18,645-46 (Lieberman). The experts have said repeatedly that LOS F traffic moves but at lower speeds than normal, that highways retain capacity to serve vehicles and that additional

demand does not cause failure of function either at intersections or on highways. Tr. 19,121-23 (Urbanik). Although Intervenors experts repeatedly asserted or promoted an inference that highways under those service conditions would break down or become unworkable, they were unable to support that view under cross examination. Tr. 18,794-96 (Hartgen and Millspaugh). The main effect of additional traffic demand on saturated roads is to cause queuing, and that effect will be felt at the access routes between the EPZ and the centers and not on the highway itself which is already assumed to be at capacity. LILCO Exh. 26 at 33 (Lieberman).

LILCO assumed LOS F for the LIE which did not require further capacity reduction and it found that Intervenors had used a 7.5% reduction factor in their analysis, which actually would result in higher estimated capacities for the LIE than are used in the Shoreham plan. LILCO Exh. 51 at 17-18 (Lieberman). Intervenors could not quantitatively support a larger reduction, did not use 30% capacity reduction in their own analysis and declined to brief the effects of truck traffic in their proposed findings because it was a matter of lesser significance. See footnote 12.

The Board concludes that Intervenors criticism of LILCO's highway assessment was lacking in credibility and that LILCO has adequately explained the reasons for making the assumptions that it used in the traffic analysis of major routes. LILCO's consideration of major routes is adequate to establish that they constitute no barrier to evacuees reaching reception centers in the numbers LILCO plans for and that the

rate of transport on major highways will not limit the overall rate with which they can be served at reception centers.

Capacities of Local Streets and Intersections

LILCO's analytical approach for local traffic was to estimate the existing peak period background traffic on many local streets and intersections, add to it the projected evacuation traffic volume, and then determine with the HCM traffic model whether the capacity is sufficient, with both components present, to deliver the evacuees to the centers within about twelve hours. That basic approach is not disputed. Neither is the validity of the HCM traffic model. Therefore the validity of LILCO's conclusions depends on whether the input data and assumptions used for modeling are accurate and whether its interpretations are reasonable. If they are, the results are valid.

After performing the traffic analysis, LILCO found that the streets and intersections in the vicinity of each center would be congested, that traffic would move more slowly than normal, that lines of waiting traffic would form temporarily at key intersections near each center and that nevertheless, the capacity of the local streets and intersections exceeded the capacity of the reception centers to monitor evacuees. Therefore the capacity of the local roads would not limit LILCO's ability to timely monitor the number of evacuees in its plan. Tr. 18,585, 18,735-38 (Lieberman); App Exh. 1 Att. T at 12-13, 26 (Crocker, et al.).

Before the HCM traffic model could be used to assess the capacity of streets in the vicinity of the centers, it was necessary to collect a substantial volume of traffic data in the field. Measured parameters needed for the analysis were background traffic volume, geometry of intersections and approach lanes, signal timing at key intersections, and frequency of left and right turn movements by background traffic. Data collection was the responsibility of LILCO's consultant, KLD Associates. Id. at 16.

There is no dispute concerning the accuracy of the measured volume of peak background traffic although there was speculative testimony that something other than 100% of the measured background traffic should be used in the analysis of projected evacuation traffic volume. LILCO analyzed some examples using 50% of background and Intervenors analyzed some examples using 150% of background. Neither party had strong empirical reasons for doing so although both presented arguments that their approach was defensible. NY Exh. 5 at 39, 44-45 (Hartgen and Millspaugh); Tr. 18,838-39 (Hartgen); App Exh. 1 Att. M at 15; Att. T at 20 (Crocker, et al.). The Board concludes that the least speculative analysis is the most reliable and that an acceptable traffic analysis should be based on 100% of the actually measured peak background traffic. Tr. 19,111-112 (Urbanik). The examples that LILCO relies on in its most recent analyses use that number. LILCO Exh. 1 Att. T at 20, 26 (Crocker, et al.).

Intervenors raised a host of objections to LILCO's traffic analysis based on perceived errors in analysis and on its alleged failure to take

contingencies for future traffic flow into account: in a future emergency, background traffic near the reception centers will be higher than normal (NY Exh. 5 at 17.); county traffic volumes will grow in the future (Id.); shadow evacuation will cause more traffic than that for which LILCO plans (Id. at 19); a delay analysis was not performed and drivers will be frustrated (Id. at 22); traffic signals may malfunction on the day of the emergency (Id. at 23); KLD should have used highest traffic flow expected (Id. at 24); queues and gridlock may form at intersections (Id. at 24); there will be future road repairs which could affect future capacity (Id. at 26); KLD employed a meaningless approach to its analysis of capacity and queues in an emergency (Id. at 29); KLD used faulty turn movement data (NY Exh. 6 at 4); there was impermissible assumption of left turn movements from 2 lanes (Id. at 7-8); departure volumes instead of approach volumes were used at intersections (Id. at 9); improper assumptions about right turn on red were used (Id. at 9); there was use of improper signal timing data (Id. at 10); truck traffic was underestimated (Id. at 10); the number of congested intersections were underestimated (Id. at 13); there were improper conclusions drawn from the ramp capacity analysis of KLD TR-210A (NY Exh. 7 at 10); and there was improper analysis of the consequences of Level-of-Service F (Id. at 12-13).

Intervenors specifically abandoned several of these issues in their proposed findings (see footnote 12) and ignored others without comment. Therefore not all require resolution in this decision.

Intervenors also challenged LILCO's conclusions with calculations of their own showing that there would be many instances where intersections would have V/C ratios equal to one or greater. They produced a total of 8 scenarios using a model termed "CARS" which was criticized by the Staff and Applicant as inappropriate for the intended purpose. NY Exh. 5 at 33, 39-40; Staff Exh. 4 at 2-3; LILCO Exh. 26 at 27. Intervenors used the HCM model, utilized by LILCO, for detailed analyses of several intersections.

Intervenors also performed an analysis of three critical intersections, one near each center, the results of which are alleged to be indicative of what is likely to occur at most critical intersections. The locations were identified as: (1) Rt. 107- Old Country Road (to Hicksville); (2) Rt. 27-Newbridge Road (to Bellmore); and (3) Long Island Expressway-Willis Avenue (to Roslyn). NY Exh. 5 at 46-50 (Hartgen and Millspaugh). The substance of Intervenors' concern, which was meant to be illustrative of the local road network in general, is that KLD improperly analyzed left turn movements, found V/C ratios that were too small, and that long queues will form which will take up road space causing gridlock. Id. In rebuttal testimony, Intervenors added the intersection of Meadowbrook Parkway southbound exit ramp to eastbound Route 27 (to Bellmore) and the intersection of Old Country Road and South Oyster Bay Road (to Hicksville) to their list of concerns. The substance of their criticism is that these intersections will be well over capacity for a substantial period of time in an evacuation. NY Exh. 6 at 14-15 (Hartgen and Millspaugh).

Intervenors declined to brief their concerns about Meadowbrook Parkway ramp in their proposed findings claiming that this was a matter of lesser importance. See footnote 12. As to the other intersections, the Board treats them as illustrative of the alleged problems generally applicable to traffic near reception centers. The issues cited for these intersections are that they will be over capacity (V/C greater than 1), they will be congested, long queues will form, planned left turns are improper or illegal and that they will in some manner fail to function as planned. These are the most significant alleged problems with LILCO's traffic analysis in general. Our resolution of these problems will be inclusive of the named intersections cited by Intervenors, however, because they are cited as illustrative examples we see no need to focus undue separate attention on them.

Intervenors relied on the computed V/C ratio as an indicator of function for intersections alleging variously that when the ratio approached or exceeded 1, the intersections would perform poorly, break down, or cease functioning (NY Exh. 5 at 33, 40, 47, 50, 74; NY Exh. 6 at 6, 8, 12, 13, 16; NY Exh. 7 at 9, 13). LILCO acknowledged that delays occur when V/C is greater than 1, however it asserted that it has already accounted for that in its analysis which shows that there will be congestion on the highways and streets.

Intervenors effectively ended their quantitative analyses of intersections with the determination of the V/C ratio. They relied thereafter on subjective interpretations which invariably took the form of assertions that where the ratios were greater than 1, congestion

would be worse than LILCO found or that traffic service will break down and the reception center plan will be unworkable. NY Exh. 6 at 12 (Hartgen and Millspaugh); Tr. 18,784-86; 18,793, 18,795 (Hartgen). Intervenors did not systematically calculate the actual volume of traffic that could be served under the difficult conditions that both parties agree will prevail. Tr. 18,781-800, 18,805, 18,820, 18,895 (Hartgen and Millspaugh). LILCO however, did compute the amount of traffic that could be served under congested conditions for the local road network. LILCO Exh. 51 at 16 (Lieberman)

We reject Intervenors assertions of breakdown of intersection function where it is based on subjective interpretation of large V/C ratios because quantitative analysis shows that road capacity exists to serve traffic even when V/C ratios are 1 or more. Even if Intervenors computations of V/C are correct for critical intersections, ratios above 1 are not indicators of total breakdown of the traffic system. Tr. 19,048-49 (Urbanik). The HCM refers to breakdown of flow, not function. NY Exh. 7 at 13 (Hartgen and Millspaugh). What is indicated by high ratios is that traffic will be congested, it will move in stop and go fashion at reduced average speed and queues will form. While possibly inconvenient to motorists this does not imply cessation of service.

Queue Formation

The main consequence of conditions where V/C ratios are greater than 1 is that the fraction of traffic in excess of road capacity forms

queues at the bottlenecks which in this analysis will be at highway entrance ramps and approaches to signal controlled intersections. LILCO Exh. 1 Att. T at 12-26 (Crocker, et al.). Results from the traffic analyses of both LILCO and the State show that traffic queues will form upstream from many local intersections in an emergency. Tr. 18,581, 18,735-38 (Lieberman); Tr. 18,794-97 (Hartgen). The experts differ in their opinions concerning the likely length of queues and their impact on the workability of the reception center plan. Queues found by Intervenors were substantially longer than those found by LILCO. However this resulted from postulated planning bases that anticipate more evacuating vehicles than LILCO does. NY Exh. 5 at 39-45 (Hartgen and Millspaugh).

The Board does not accept Intervenors queues of extraordinary estimated length for the purpose of assessing LILCO's plan because they are based on an assumption of effectively unlimited population of evacuating vehicles. Intervenors estimated queue lengths by determining the hourly excess of demand, assigning the excess to queues and multiplying the hourly excess by 12 to obtain a resultant queue after 12 hours. No allowance was made for the likelihood that the demand will not be constant for that period because Intervenors assumed a very large excess population over that anticipated from the EPZ. NY Exh. 5 at 48-49 (Hartgen and Millspaugh). LILCO allowed for a pulse-like distribution of demand arising from the EPZ over a 6 or 9 hour period. In this model, which we take to be more realistic, vehicle demand rises to a maximum and then declines as the evacuation of the EPZ is completed

and demand for service is satisfied. LILCO Exh. 1 Att. T at 26-29 (Crocker, et al.). The queues follow the same pattern, first growing and then dissipating in the 6 hour scenario, while none form in the 9 hour scenario.

The Board accepts the findings of both parties that queues will form at intersections near the reception centers but does not accept that queue formation will directly inhibit or interfere with the planned monitoring operations at the three reception centers. The monitoring operations will draw vehicles from the head of the queues near the reception centers while later arriving vehicles will join queues at the tail end. Tr. 18,577 (Lieberman); Tr. 19,085-86 (Urbanik). An intersection serves traffic at its capacity from the front end of the queue even though drivers within the queue may perceive that traffic has stopped. Tr. 19,048-49 (Urbanik). The length of queues therefore has no generally applicable bearing on the rate with which the monitoring operation can be conducted or on the further capacity reduction of intersections already saturated.

Further, Intervenors' finding that long queues will form is consistent with LILCO's finding that monitoring capacity within the reception centers is the rate limiting process for serving evacuees. The queues form a ready reservoir of vehicles to supply the centers. Put simply, the centers can not run out of work to do while vehicles waiting for service are present. Tr. 18,581 (Lieberman).

Intervenors object that queues will back up from the centers to block upstream intersections. LILCO found that the queues will not be

long enough for that to happen but in any event police control will be present to prevent it if they are wrong in their assessment. Tr. 18,586-88; 18,738 (Lieberman). The validity of LILCO's assessment however is not dependent on prevention of blockage in upstream intersections. The only meaningful blockage is that which would interfere with another evacuation stream going to another center with sufficient impact that the inflow rate becomes less than the monitoring rate for that center. That is unlikely. Tr. 18,586-87 (Lieberman); LILCO Exh. 1 Att. T at 27 (Crocker, et al.). Traffic backup affects the total capacity of the intersection, not the capacity for evacuation traffic. If upstream intersections become clogged with evacuation traffic, the impact will be predominantly on the crossing traffic not going to reception centers. Tr. 19,013 (Urbanik).

The Board concludes that queuing under emergency conditions is not a serious concern for monitoring evacuees except under speculative circumstances. Police control will lessen the likelihood that intersecting queues could interfere with evacuation traffic flows among centers. The testimony of opposing parties combines to convince us that evacuation traffic will dominate the scene for many hours (6-9 hours in LILCO's scenario) in the vicinity of reception centers. It is reasonable to infer that purposes of other travellers might well be temporarily frustrated by the traffic congestion. Even if true, this has no bearing on dose reduction and we may not deny or condition a nuclear power plant operating license for the purpose of preventing that possibility.

The Board concludes from the queue analysis of opposing parties, that LILCO correctly found that the ultimate capacity to monitor the number of evacuees in its plan depends on the rate with which the reception centers can monitor them, and not the capacity of the road system to deliver evacuees to the centers.

Signal Timing

The capacity of intersections for evacuation traffic depends on the degree and mode of traffic control that can be relied upon. In LILCO's analysis that control will be provided by traffic signals and the Nassau County police. In LILCO's view and the Staff's, the performance or timing of traffic signals is largely irrelevant to the question of intersection capacity in an emergency because the police will adjust capacity to take account of the evacuation traffic. Tr. 18,738-39 (Lieberman); Tr. 19,096-98 (Urbanik). No party has alleged that key intersections near reception centers lack the intrinsic capacity to serve the evacuation flow. The litigation addressed the effectiveness of control that can be relied upon. Intervenors focused this part of their critique on the alleged inadequacy of LILCO's assessment of traffic signal function in an evacuation, since they deny that police have familiarity with the appropriate control strategies or that they will even agree to participate in a radiological emergency.

The Board is not permitted to consider the possibility that police will not assist the public in a Shoreham emergency. CLI-86-13; 10

C.F.R. § 50.47(c). That fact standing alone might be sufficient to resolve any issue related to capacity of intersections since no party thought that police control would be ineffective except on grounds of unfamiliarity with LILCO's plan which is easily remedied.

Nevertheless, LILCO performed an analysis of traffic signals as part of the overall traffic analysis for reception centers, the issue was vigorously litigated, and the parties submitted proposed findings on the issue. The Board concludes that issues surrounding traffic signal timing should be resolved on the merits because there could be some intersections which would go untended by police for reasons other than recalcitrance (Tr. 19140 Urbanik) and because traffic signal data formed a part of the input to the HCM model that LILCO relied on for its demonstration of adequacy of the reception center plan.

In the absence of police, the capacity of signal controlled intersections depends on the amount of green time that will be available to evacuees who will be travelling in preferred directions towards the reception centers. Maximum and minimum green time was measured, by KLD observers at the intersections studied, for the initial analyses. Later the State supplied actual signal settings which KLD compared with its measured values. LILCO Exh. 26 at 14; Tr. 18,744 (Lieberman). KLD used the State data in a subsequent analysis, unless the field data showed that longer green time actually existed than was shown in the State records. Tr. 18,606 (Lieberman). More weight was given to the measured values because signal dial setting records are not always accurate. Tr. 18,607 (Lieberman).

Intervenors claim that actual signal settings should have been used for signal timing in that the settings would provide more accurate data than field measurements. NY Exh. 5 at 22; NY Exh. 6 at 10; NY Exh. 7 at 9 (Hartgen and Millspaugh). The State experts claim this to be so because the signals are traffic actuated, and the green time in any particular direction varies, between preset limits, as a function of actual traffic flow. Because the signals have variable timing, an observer allegedly cannot reliably obtain maximum green times from field measurements. Tr. 18,892 (Millspaugh).

LILCO asserted that, even if true, the error is not large enough to alter its conclusion that monitoring rates at reception centers are the rate limiting step in the process. Tr. 18,745 (Lieberman). Additionally, says LILCO, the signal settings are sometimes changed in the field without record and the State records might not be reliable. Tr. 18,607 (Lieberman). The NRC staff agreed. Tr. 19,115-116 (Urbanik). The State could not confirm that its signal records were accurate. Tr. 18,888 (Millspaugh). The State experts pointed to several intersections where they thought that KLD had used values that overstate green time and thereby inflate the capacity of the intersection. NY Exh. 6 at 10; NY Exh. 7, n. 5.

The Board concludes that the record is inconclusive regarding the possible existence of error in the signal timing used to analyze the capacity at some specific locations because there are possible sources of error both in direct measurement and in the State records. The NRC Staff asserted however, that field measurements are accurate at actuated

signals if queues are present when the measurements are made. Tr. 19,115-16 (Urbanik). KLD says that it took measurements while heavy traffic was present so that the signals would be actuated to their maximum phase duration. Tr. 18607 (Lieberman). There is evidence therefore that the signal measurements taken by KLD were reasonably accurate, although uncertainty remains because the measured values do not always agree with the State signal settings which might themselves be in error. The Board concludes, from the fact that the actuated signals have a preset upper limit of green time, that the most probable systematic error, if any at all exists, is by underestimating rather than overestimating maximum green time.

If measured values have systematic error, it is likely to be by generally underestimating maximum green times since a capable worker could not observe more green time than the actual (as opposed to the nominal) preset upper limit of the signal would permit. The only uncertainty is whether measurements were taken at the signal's preset maximum. If they were not, the measured values would be shorter than the true values. The likelihood of this kind of error is small however, because measurements taken of traffic actuated signals where queues are present, would likely be with the signal activated to its longest phase. Moreover, the error of underestimation is harmless to LILCO's capacity analysis. KLD was therefore reasonable in favoring measured times where they exceeded the State's recorded signal settings.

The likely direction of possible error in measurement favors LILCO's case because if the true maximum green times are in reality

longer than LILCO used in its analysis the capacity of the respective intersections would be somewhat larger than LILCO found. Further, the magnitude of error in the opposite direction, asserted by Intervenors for specific intersections, would not reduce the intersection capacity enough to alter the conclusion that reception centers are the rate limiting step in the overall monitoring process. Tr. 18,608-10 (Lieberman).

The Board finds no evidence however, that the existing signal phases near reception centers are optimal for the special case presented by an evacuation. LILCO's analysis is therefore accepted as a general demonstration of capacity of intersections to cope with evacuation traffic and not a specific prediction of future events. Police should be present at key intersections in an actual emergency to assure that their capacity is fully utilized for moving evacuees towards reception centers. The Board concludes that any possible errors in the signal timing data used by LILCO are not of such magnitude as to invalidate its conclusion, that controlled intersections in the vicinity of reception centers have the capacity to serve the traffic flow encompassed within its planning basis.

Turn Movements

Part of the intersection capacity estimate depends on the proportion of traffic making turn movements rather than passing straight

through the intersection. LILCO measured background flow using traffic counting machines that use a tube placed in the road to detect passing vehicles. At several intersections the tube was placed in a lane that permitted drivers to turn or go straight after the tube was passed. The machines could not record the proportion of turning vehicles. Tr. 18,634-36, 18,741 (Lieberman); Tr. 19,117 (Urbanik). The missing information was obtained by observers who recorded the proportion of turning vehicles at intersections. Tr. 18 639-40 (Lieberman). Intervenors fault this procedure, arguing that turn movements obtained by machine should have been used because such data is more accurate than data taken by observers for short time periods. Intervenors allege that LILCO's use of observer data resulted in biasing estimated capacities of some critical intersections to make LILCO's case appear more favorable. NY Exh. 7 at 5 (Hartgen and Millspaugh). LILCO asserted there were intersections where the machine could not distinguish turning movements and that, when it modified its initial estimates with observer data, it found 13 of 28 cases where turn movements were lower than originally estimated and 15 of 28 cases where the turn frequency was higher. When all the data is considered, no bias is evident. LILCO Exh. 51 at 2 (Lieberman).

The Board finds no evidence that LILCO's turn movement data were deliberately biased to make its traffic analysis appear more favorable than warranted. LILCO has adequately explained why it was necessary to supplement traffic data obtained by machine with turn movement data obtained by observers. The actions taken by LILCO in revising its

estimates of turn movements were efforts to refine a complicated analysis. It was not credible for Intervenors to assert that machine data is invariably more accurate for turn movements considering the obvious limitations of the counting machines for distinguishing turns in lanes that permit either straight through or left turn movements. The Board concludes there is nothing in LILCO's assessment of background turning traffic that causes doubt concerning the capacity of critical intersections to serve reception centers at the required rates.

The State argued that the plan is unworkable at some critical intersections because LILCO assumed that left turns required to reach reception centers are planned from two lanes instead of one as permitted by lane markings and signals. The critical locations were identified as the intersection of Route 107 and old Country Road and the intersection of the LIE South Service Road and Willis Avenue. NY Exh. 6 at 6-7 (Hartgen and Millspaugh). LILCO asserted that it is reasonable to assume left turns from two lanes in an emergency even though not permitted routinely, and that police will be present to control this movement. LILCO Exh. 51 at 3 (Lieberman); Tr. 18,534-41 (Lieberman). However the adequacy of intersection capacity is not dependant on an assumption of the use of two lanes at critical intersections since the left turn capacity of one lane is adequate to serve the centers if police traffic control is present. Tr. 19,097-98 (Urbanik). The NRC Staff in fact asserted repeatedly that control at critical intersections should be provided. Tr. 18,981, 18,986, 19,150 (Urbanik). Intervenors do not disagree with the conclusion but assert that police participation

in emergency response in Nassau County cannot be assured because there are no agreements between the County and LILCO and the County police have not reviewed the plan. Tr. 18,660 (Lieberman); Tr. 19,147-49 (Urbanik); SC Exh. 22; Governments Proposed Findings at 244, 245, 246.

A flurry of controversy erupted as to whether KLD had conducted its analysis of traffic under the assumption that police control would be unnecessary for implementation of the reception center plan. It appears that active control was not assumed for the purposes of the analysis although police control was recommended. LILCO Exh. 1 Att. T at 33 (Crocker, et al.). The Staff was uncertain on the question of how the analysis was conducted although it was certain that police control of, at least, a few intersections would be necessary. Tr. 18,980-82, 18,986-88, 18,998-19,001, 19,109-10, 19,129-30 (Urbanik).

In the circumstances of this case, it was reasonable for KLD to conduct its analysis as it did, even though police control of traffic in an emergency is clearly preferable to not having it. The analysis performed by KLD is a worst case analysis that shows in LILCO's view that the system would work adequately with traffic signal control alone. Even though that result might be valid however, all experts agree that police control will produce a more satisfactory result. KLD's analytical approach was consistent with its uncertainty, which was shared by all parties and the Board, as to how the legal authority and government participation questions in this case would ultimately be resolved. However, it is not for technical witnesses to resolve those issues either explicitly or implicitly in testimony. The witness

apparently did the best he could under the circumstances. That effort did not result in bias however because the analysis presented was less favorable to LILCO's case than one assuming police control would have been. The matter of the assumptions used in KLD TR-201A is now immaterial to the resolution of issues because the testimony demonstrated convincingly that police control of critical intersections should be provided in an emergency.

The Board concludes that LILCO's estimate of capacity of critical intersections was not dependent on its assumption of left turns from two lanes since, with police control, adequate capacity to serve reception centers exists even if turns from one lane are assumed. The Board agrees with Dr. Urbanik that police presence at key intersections in an emergency renders technical disputes about left turns from one or two lanes, or about signal timing, inconsequential. Tr. 18,977, 19,007, 19,137 (Urbanik). The dispute about the number of left turn lanes to be utilized reduces to a question of intersection management in an emergency, which is a part of what police do. The evidence shows that intersections throughout the network have the capacity to deliver traffic to the reception centers at a rate well in excess of that needed to keep them continuously supplied with vehicles during an emergency. LILCO Exh. 1 Att. T at 21- 25 (Crocker, et al.). This is also true for critical intersections even if the police decide at the time of an emergency to restrict turning movements to one lane. The Board concludes that LILCO's capacity analysis of key intersections in the vicinity of reception centers during an emergency was reasonable, and

with police control at critical intersections, adequate capacity exists to accommodate the number of evacuees in LILCO's plan.

Participation of Nassau County Police

The Board gives no credence to the possibility that Nassau County Police will not provide assistance to the public in an actual emergency because the "best efforts" assumption of the Commission and the regulations prohibit such consideration. CLI-86-13; 10 C.F.R. § 50.47(c). See also SC Exh. 22 ¶¶ 2 and 3 and Tr. 19,177-78. LILCO plans to request the assistance of the Nassau County Police Department in an emergency. LILCO Exh. 1 at 37 (Crocker, et al.). The record does not reflect whether the Nassau County Police have reviewed the plan for reception centers or are familiar with its provisions. That deficiency can be remedied by providing the police with copies of the most current plan and keeping them informed of changes as they occur. However, prior familiarization or training of police, though desirable, is not crucial to implementation of traffic control. Tr. 18,982 (Urbanik). The Board therefore directs that LILCO provide current copies of its emergency plan as it pertains to reception centers to the Nassau County Police Department. LILCO is also directed to consult directly with the Nassau County Police Department to inform them of the provisions of its emergency plan that involve police participation. Confirmation of these actions prior to the issuance of any operating license is delegated to the NRC staff, however refusal of local government agencies to

participate in planning will not in itself prevent the issuance of an operating license if the NRC requirements for emergency planning are otherwise adequately met. 10 C.F.R. § 50.47(c).

Future Traffic Growth

The State experts argued that traffic is growing annually both within the EPZ and outside it and that LILCO's traffic analysis should have taken account of the growth projected for Nassau and Suffolk Counties. NY Exh. 5 at 17 (Hartgen and Millspaugh).

LILCO and the NRC staff claim that it is inappropriate to consider future growth because emergency planning is an ongoing process. Staff Exh. 3 at 6 (Urbanik); LILCO Exh. 26 at 9 (Lieberman). LILCO claims further, that even if we were to consider projected traffic growth, its magnitude is not as large as Intervenors claim. LILCO and the Staff state that growth in Nassau County where the reception centers are located will be only a few percent over the next five years. LILCO Exh. 26 at 10, Att. A; Tr. 18,617 (Lieberman); Tr. 19,131 (Urbanik).

Prior to the hearing, the Board admitted Intervenors' testimony on future traffic growth over LILCO's motion to strike because we are obligated to assure ourselves that there are no barriers to emergency planning that cannot be removed prior to license issuance. We observed, however, that LILCO was generally correct in its assertion that future developments must be addressed in the future. Memorandum and Order (Ruling on LILCO's Motion to Strike the Testimony of David T. Hartgen

and Robert C. Millspaugh) at 5, June 22, 1987 (unpublished). There was speculative testimony in the hearing over likely future growth rates, however, Intervenors assert in their proposed findings only that it is not imprudent to consider the matter and that significant future growth can be expected. Governments Proposed Findings at 267. The Governments asserted that the magnitude of projected growth in Suffolk County could be about 22% by the year 2010. NY Exh. 7 at 19 (Hartgen and Millspaugh). Intervenors' testimony even if accepted as true falls far short of demonstrating a future barrier to implementation of LILCO's emergency plan because LILCO has demonstrated a greater excess capacity over its planning basis than the alleged population growth.

The Board concludes that LILCO's emergency planning for reception centers was correctly based on current traffic data because reasonably predictable growth presents no barrier to future emergency response. NRC guidance provides for future developments by requiring that emergency plans be reviewed and updated periodically. NUREG-0654, Section II.P.4 provides: "Each organization shall update its plan and agreements as needed, review and certify it to be current on an annual basis." Section II.P.9 provides in pertinent part: "Each licensee shall arrange for and conduct independent reviews of the emergency preparedness program at least every 12 months." In the absence of uncorrectable barriers, the foregoing guidance applies, and makes clear that the Staff is correct in its assessment that emergency planning is an ongoing process. LILCO will be obligated to periodically review and update its planning for reception centers if an operating license for

Shoreham is issued. Intervenors' assertion that projected growth in traffic on Long Island must be considered prior to licensing is correct, but in the absence of barriers, the regulatory scheme for periodically updating the plan is the applicable provision for changing conditions during the term of the license.

Board Decision

This is the second occasion we have had to probe the intricacies of the Long Island highway system and its likely function in a radiological emergency. The results we find are similar to those found the first time. As in our Partial Initial Decision, we find that Intervenors have proved again that uncertainty exists in predicting how traffic will flow in an actual emergency. Many different but plausible scenarios exist that could materialize in an emergency, some worse than others, but they are all in some measure speculative and not subject to rigorous proof. LILCO has proved that the existing highway and road system has the capacity to deliver the number of evacuees within its planning basis to the reception centers within the time limits prescribed by NUREG-0654, II.J.12 and that it has assigned an adequate level of resources to accommodate the number of evacuees in its plan. Infra. Whatever uncertainties still remain, we are now confident that traffic performance in an emergency has been probed to bedrock. Experts from both sides resorted to speculative answers to traffic questions as the inquiry increasingly focused on minutiae and departed from the settled

knowledge of the engineering professions. We have therefore reached the limits of what expert testimony can reliably contribute, if the goal is to predictively resolve all uncertainties about traffic flow in an emergency.

We conclude however that that is not the proper goal of our inquiry. A fair demonstration of capability based on existing highway capacity and adequate prior allocation of resources is all that can reasonably be demanded in assessing LILCO's plan because this is all the regulations require and all that we can scrutinize without resorting to speculation. That task is formidable however and we are aware that experts are not immune from error in performing it. However, in overview, we find that the State experts lost credibility by their assertion of comprehensive error that found fault with LILCO's analysis at virtually every step. Our findings could not confirm the existence of wholesale error in LILCO's analysis and the record is inconclusive even on individual computations or observations where error might exist. Even a first reading of the KLD traffic analysis would reveal to a professional that it was at least carefully done by experts in the field and worthy of being taken seriously even if there might be individual points of error or technical disagreement. We expected but did not receive from State experts, a discriminating analysis that would bring to focus significant error or bias if it existed. The State review was not only not discriminating but it brought into litigation every arguable fault, whether significant or not, and in that respect it

comported more with the controversial nature of litigation than with objective standards of technical peer review.

When stripped of the imperatives for advocacy however, the findings of the opposing experts regarding technical aspects of traffic movements toward reception centers reasonably coincide. Painted in broad strokes, and with only insignificant variation, the experts from both sides produce an emergency traffic picture characterized by congested, slow moving, stop and go traffic with frequent queues. Both sides find that traffic queues will extend upstream from key intersections and that police control and direction of traffic will be needed to facilitate turns and to keep intersections clear. The disagreement reduced to conflicting opinions about planning details and subjective interpretations of severity and consequences of those conditions during an emergency.

The subjective opinions of Intervenors' experts also lost a measure of credibility, in the Board's view, on the question of the consequences of congestion on traffic movement. Their testimony, taken as a whole, invited the Board to a concluding inference that when traffic demand reaches or exceeds road capacity (V/C=1), street and intersection function is effectively lost or grossly diminished so that LILCO's plan would be unworkable. In reality however, the road network retains capacity to function under those conditions. We expect experts in the field to know that. It is the road capacity that exists under congestion (as opposed to full unimpeded capacity) that LILCO relies on for its conclusion of adequacy of traffic flow in emergency conditions.

Intervenors experts did not explicitly acknowledge that reality, but instead emphasized subjectively that traffic conditions will virtually always be worse than LILCO found. LILCO's consultant, however, candidly acknowledged the results of its analytical findings that showed difficult, congested traffic conditions in an emergency. The Board concludes that the KLD analysis was not biased to favor LILCO's prospects for gaining regulatory approval of its plan.

The standard of decision we employ is one of reasonable assurance that public health and safety can be protected in an emergency. The standard of public health protection is that the plan be adequate to achieve an unquantified dose reduction to the public in an emergency. Those standards do not require the submission of a theoretically optimal plan nor do they require resolution of all predictive uncertainty about how future emergencies will unfold. The standards can be met by a practical demonstration of existing capability, without regard to all possible future contingencies, if the underlying analysis is reasonable and does not depend on flawed or distorted data or assumptions. We conclude that LILCO's traffic analysis was grounded on reasonable assumptions, data, techniques of analysis and interpretations even though other data and methods might have been used. We have not found gross or disabling error in its analysis. The Board is convinced from LILCO's analysis that sufficient highway and reception center capacity exists so that traffic problems will not frustrate the timely monitoring of the number of evacuees in LILCO's plan. The Board therefore finds reasonable assurance that implementation of LILCO's

reception center plan would achieve significant dose reduction, for affected populations, in an emergency at Shoreham. The concern of the Appeal Board that caused this issue to be remanded, we believe, has also been resolved. LILCO's reception centers are not beyond the reach of the persons they are set up to serve. The overall analysis further shows that LILCO's choice of reception centers was not flawed on account of transportation or traffic problems that might arise from their location and distance from the EPZ. We determined separately in this decision that LILCO's planning basis was adequate and that there is no regulatory reason for requiring that some other planning basis be adopted. There is therefore no need to scrutinize with equal care the traffic consequences of Intervenors' traffic models which were based on larger populations than used by LILCO. The Board finds reasonable assurance that the traffic plan for reception centers LILCO submitted is workable and would help assure the degree of protection of public health and safety required by NRC regulations.

3. DISTANCE OF RECEPTION CENTERS FROM EPZ ISSUES

Two additional issues designated for hearing relating to the location of the reception centers were:

> Whether the [reception centers'] location[s] might create problems in regard to the evacuation shadow phenomenon; and whether the distance of the [reception centers] from the plume EPZ would increase exposure to radiation, causing additional problems.

We address each of these matters in turn.

The Shadow Evacuation Phenomenon

The presence or absence of a shadow evacuation has, of course, been the subject of extensive litigation in this case, and our earlier Partial Initial Decision addressed it. 21 NRC 644 at 655-671. There, however, we dealt with the phenomenon as it would be met were there no aggravating circumstances. Here, Intervenors allege that the placing of the reception centers at a considerable distance from the EPZ will increase the chance that a shadow evacuation will occur. They reason that evacuees seeking to escape a disaster will attempt to find a place of refuge which is far enough from the danger. With the reception centers located 40 miles from the plant, many people between the plant and the reception centers will perceive that they are in an unsafe area because the designated safe refuge centers are farther from the plant than they are. SC Exh. 15 (Johnson and Saegert) at 10, 12. The result will be a greater tendency to evacuate, and an expansion of the geographic scope of the evacuation shadow phenomenon. Id. at 11-12.

The County's witnesses believe that what they call "spatial factors" are important in determining behavior in a radiological emergency, where environmental cues, such as flood waters or noxious gases, do not provide sensory evidence defining the zone of risk. Id. at 11. In the absence of such cues, they believe the location of the reception centers will become a "primary objective factor" in defining the zone of risk. Id.

The County's witnesses also argue that the reception centers will constitute a "locally unwanted land use" in the view of the people in surrounding towns. The centers will be perceived as presenting a threat to those in the towns and, in the event of a radiological emergency, people will attempt to evacuate from the areas surrounding the centers, adding to the congestion and further delaying the arrival of the evacuees from the EPZ. Id. at 17-19. NY Exh. 5 Att. 3-6 is cited for the fact that the surrounding area is heavily developed.

LILCO's witnesses tell us that the perceived area of risk (and hence the "shadow") is determined by the information the public hears, not by the position of reception centers or shelters. LILCO Exh. 1 (Mileti) at 25. LILCO would also characterize as "circular" the reasoning of County witness Johnson, who believes that the reason the reception center at TMI was little used was that people saw it as too close (ten miles) to the plant, but who also believes that the distance of a reception center will help define the zone of risk. LILCO Proposed Findings at 37, citing Tr. 17,883, 17,885; LILCO Exh. 9. We do not think such reasoning necessarily circular; the County's witnesses have

repeatedly expressed the view that people so fear radiation that ten miles seems close in a nuclear accident. The notion that, for larger distances, the public might view the position of a reception center as a factor in determining "how far is far enough" is not illogical.

LILCO would also have us decide that Intervenors' argument about the position of reception centers is a challenge to the Commission's rule that the EPZ should extend "about ten miles." LILCO Proposed Findings at 37. We do not see it as such a challenge. We see the dispute as centered around the issue of human behavior and the need to provide for an enhanced degree of voluntary evacuation.

As to the theory that this "local unwanted land use" will cause people to evacuate the area around the reception centers, LILCO's witnesses believe that the evidence is "overwhelming" that people do not flee from places simply because those places involve some sort of radiological activity. LILCO Exh. 1 at 23 (Lindell, Mileti). They note that experience at TMI, Love Canal and Times Beach showed people only leave hazardous areas after the hazard has been defined by an "authoritative source." Id.

The NRC Staff treats the "shadow evacuation" phenomenon as simply part of the overall traffic picture. The Staff points out that the traffic analyses that LILCO relies upon assume Level of Service F on all roads along the evacuation routes. Staff Proposed Findings at 44-45, citing LILCO Exh. 26 (Lieberman) at 11. Thus the bulk of any "shadow" traffic would enter the highways behind vehicles from the EPZ and would have a limited effect on those vehicles' arrival times. Id. The

Staff's witness on traffic matters testified that "shadow" traffic in general has been considered in evacuation time estimates. Id.; Staff Exh. 3 (Urbanik) at 5; Tr. 19,014-15.

Board Decision on Evacuation Shadow Phenomenon

We treated the evacuation shadow phenomenon extensively in our earlier Partial Initial Decision (21 NRC 644 at 655-671). There we found that "a rational public will behave predominantly in accordance with public information that is disseminated at the time an emergency happens." (Id. at 670). We do not believe that so small (and likely so recondite) a matter as the distance from the EPZ to the reception centers could shake our earlier conviction to any great degree. We noted then, and we repeat here, that a "shadow" could develop if confused or conflicting information is disseminated to the public, but we do not think that distance to the reception centers will be the straw that breaks the informational camel's back.

The Staff's argument we regard as a makeweight. It is hard to see how the minor effect we would expect from an evacuation shadow could strongly influence transit times in the face of a Level of Service F assumption on the part of the planners.

Here we find LILCO has carried the day.

The Increase in Radiation Exposure

Intervenors' witness Dr. Radford notes that the dose an individual receives from radioactive contamination is a function not only of the amount of radioactive material deposited but also of the time that elapses before the contamination is removed. Governments Exh. 16 (Radford) at 32. Thus any delay in decontamination will be reflected in an increase in dose for the people who receive contamination in the EPZ. If the arrival of contaminated individuals at the reception (and decontamination) centers is delayed because these centers are far from the EPZ, their dose will be increased. Dr. Radford then calculates, for an individual whose dose would have totaled five rad after a delay of ten hours, the dose would total ten rad after a delay of twenty hours. Similarly, lengthening the time until decontamination from ten to twenty hours would turn a ten rad dose into a twenty rad dose. Id. at 34.[13] Dr. Radford then asserts that these increases would increase the chance that an individual would develop cancer by 3.5% and 7% respectively. Id. He gives no reason why his assumed doses are in the region of one-half to one rad per hour, nor does he explain what the corresponding

---

13 As LILCO correctly points out in its proposed findings, this assumption of a linear relation between dose and time is an approximation. It would only be correct for contamination composed of radioisotopes of relatively long half-life, that is, half life long compared to the times used in the example. For shorter-lived materials the increase in dose would be less. LILCO Proposed Findings at 35.

doses from plume or ground contamination exposure would be. He says only that the doses due to contamination "could be highly significant in comparison to the direct radiation from the plume." Id. at n. 85.

LILCO's witnesses, Linnemann and Watts, testified that, on the contrary, "[a]s a general matter, the dose received from the contamination on a person's body is small compared to the dose he received from having been in the plume in the first place, even if it is several hours before he or she gets decontaminated." LILCO Exh. 1 (Linnemann, Watts) at 38. On the basis of the scenario used in the February 1986 exercise, these witnesses calculated the dose an individual would receive during a twenty hour delay for decontamination after a three hour exposure to the plume. They used standard health physics formulas. Dose from the plume prior to evacuation under these circumstances would be 180 mrem; that from the residual contamination prior to its removal would be nine mrem, about five percent of the plume dose. Id. They also calculate the increase in thyroid dose due to delay in decontamination for the same scenario. They obtain similar results--about a four percent increase. Id. at 39. These witnesses stress that the additional doses would not result in any "acute, detectable" effects on the whole body or the thyroid gland. Id.

While Intervenors' witnesses do not credit the calculations of witnesses Linnemann and Watts, they produce no real alternative. They simply state that higher doses are "entirely possible" but present no scenario for evaluation. SC Exh. 16 (Radford) at 35. Cross examination of FEMA witnesses elicited the fact that the particulate release

postulated for the February 1986 exercise was not very high, although the iodine release was substantial. Tr. (Keller) at 18,413-4. During that same cross examination the FEMA witness opined that the incremental exposure incurred by delay in decontamination would "[g]enerally speaking . . . not be a medically significant increase," although there might be some scenarios wherein people located especially close to the plant in a very severe accident would experience a significant dose increment. Tr. (Keller) at 18,415.

Board Decision on Increased Exposure to Radiation

We are faced here by a direct conflict in the testimony of expert witnesses, the County's witness saying that the distance to the reception centers could result in significantly increased doses and LILCO's witnesses (and FEMA's) saying that such a result is extremely unlikely. In order to resolve the conflict, we must look quite closely at the basic assumptions involved in the two positions. To begin with, all the witnesses assumed delays of twenty hours, a very substantial delay considering the distances involved. Secondly, the County's witness assumed larger releases than did the witnesses for LILCO, releases much larger, indeed, than those hypothesized for the exercise of February 1986. Finally, and perhaps most important, the two groups of witnesses applied different standards to the determination of what is "significant": LILCO (and FEMA) deem an increment of exposure "significant" only if it is large enough to cause immediate medical

damage. Tr. 18,294 (Keller); LILCO Exh. 1 (Linnemann) at 39. The County's witnesses deem a dose increment "significant" if it causes a few percent increase in the probability of cancer. SC Exh. 16 (Radford) at 34-35. The County's witnesses also envision far larger releases than LILCO's witnesses, but without enlightening us as to how those very large releases could come about.

We cannot believe that the Commission's standard of "no undue hazard to the health and safety of the public" could be meant to establish a requirement that there be no increment whatever in projected cancer probabilities for conceivable accidents whatever their size. Such a standard could not be met for any plant. Indeed, the Commission's Policy Statement on Safety Goals for the Operations of Nuclear Power Plants (51 Fed. Reg. 30,028) suggests that even the risk of prompt fatalities would not be excluded for extremely improbable accidents.

We accordingly find that the fact that the reception centers at Shoreham are located some forty miles from the plant does not, through the mechanism of delay in decontamination and the resulting possible increase in radiation dose, disqualify them from their intended use.

4. MONITORING RELATED ISSUES

The issues considered involving LILCO's plan to send evacuees to its newly proposed shelters and the adequacy of staffing allocations raised questions concerning the viability of LILCO's monitoring and decontamination procedures. During the hearing, changes to accommodate adverse FEMA RAC comments were made to Revision 8 of LILCO's emergency plan and admitted into evidence without objections. February 1987 Revision, Att. P to LILCO Exh. 1.

The basic LILCO monitoring and decontamination scheme is designed to operate in the following manner: sixty-three (63) monitoring stations for registering, monitoring and decontaminating evacuees are to be established at the Roslyn, Bellmore and Hicksville reception centers, with each station manned by two monitors and a traffic guide. Vehicles are directed by traffic guides to monitoring stations where monitoring of evacuees will be performed while seated in automobiles. Monitors located on both sides of cars will scan the head, shoulders, hands and feet of each passenger while the traffic guide takes a swipe of part of the car's hood and wheel well for signs of contamination. The traffic guide will also record, for registration purposes, each vehicle license plate, number of passengers and whether clear tags for non-contamination have been issued a car and all its passengers. If an automobile or any passenger shows any contamination, everyone in the vehicle will be directed to a decontamination trailer for additional monitoring. It is

planned to monitor all passengers and a vehicle within 100 seconds, the time based on an estimated 2.8 passengers per vehicle.

Evacuees without private transportation will be taken by bus to the Hicksville reception center for monitoring. Each bus passenger will be scanned front and back in an "X" pattern while standing, a procedure completed in 60 seconds of time. If contamination is found, the individual will be sent to the decontamination trailer. The program calls for one trailer to be located at the Bellmore and Roslyn centers and two at Hicksville. Trailers are equipped with showers and wash basins for washing exposed skin surfaces and paper clothing for those requiring it. Detailed information on the decontamination and procedure used for each individual in trailers is to be compiled.

The Applicant contends that 20% of the EPZ population can be monitored through its procedures in five to six hours and over 46% during a 12-hour period.

LILCO presented as witnesses Douglas Crocker, Diane Dreikorn, Dale Donaldson, Michael Lindell, Dennis Mileti, Richard Watts and Roger Linnemann; Intervenors' witnesses for Suffolk County were Edward Radford, Gregory Minor, Susan Saegert, James Johnson, Jr., David Harris and Martin Mayer, and for New York State, James Baranski, Lawrence Czech, and James Papile; FEMA's witnesses were Thomas Baldwin, Ihor Husar and Joseph Keller; the Staff presented no witnesses.

Intervenors' witnesses contested both the procedures used by LILCO for monitoring and decontamination and the time period assigned for completing the process. The Intervenors' case raises the issue whether

limited monitoring of evacuees in automobiles will miss areas of contamination on the lower back, back of legs, abdominal area and the buttocks and it is contended that a scan of the entire body alone will provide assurance that all significant areas of contamination are detected. In proposed findings, Intervenors argue that the limited scanning procedure and in-vehicle monitoring were designed by LILCO to curtail time in order to meet the regulatory 12-hour standard of Section J.12 in NUREG-0654 and that such an expediency is inconsistent with safety standards and cannot be approved. Governments Proposed Findings at 88-91. The claim is made that only a whole body scan will assure contamination detection and that a whole body scan cannot be done correctly in less than two to three minutes per individual. NY Exh. 1 (Papile, et al.) at 23. SC Exh. 16 (Radford, et al.) at 27. Intervenors also contend that thyroid monitoring, only provided in LILCO's plan for persons where contamination has been detected, should be required for all evacuees. Treatment with potassium iodide (KI) can be helpful, Intervenors' allege, if radiation iodine is detected within a few hours after exposure. Tr. 18,040-41 (Radford). The Intervenors also criticize LILCO's automobile monitoring plan stating that adequate procedures require a scan of most of the outside surface of the vehicle as well as the vehicle's trunk. Radford SC Exh. 16 at 12. LILCO's plan is to monitor inside of trunks only if contamination is found on passengers or the vehicle.

The Intervenors also question the ability of LILCO to augment its monitoring personnel if the number of EPZ's population arriving at

reception centers exceeds expectations. In addition to having the resources required to operate monitoring activities at the three reception centers, and an additional 50% of backup monitors to provide relief in cases of stress or fatigue, LILCO claims to have arrangements with INPO and Brookhaven Laboratories to provide additional personnel monitoring assistance if the number of evacuating evacuees reaches 30%. If such additional help is not sufficient, LILCO's fall-back procedure is to monitor only the automobile driver, other passengers from different points of origin, and also passengers who request monitoring. Intervenors question the time required to obtain assistance from INPO and the adequacy of the additional personnel to monitor all evacuees within the required 12-hour period. And LILCO's fall-back procedure does not provide, in their opinion, reasonable assurance that the public health and safety will be protected.

An Intervenors' witness testified that it would take three to five minutes to adequately monitor both a vehicle and its passengers and that traffic obstructions and evacuee delays due to stress and frustration will contribute to making LILCO's 100 second time estimate too low. NY Exh. 5, Atts. 3-6; SC Exh. 16 at 20, Radford, et al. Also, Intervenors' claim as a deficiency the fact that FEMA does not plan to make findings on monitoring time estimates until an exercise is held. Intervenors also question LILCO's registration procedures on grounds that it may become necessary to contact uncontaminated individuals to verify the use of proper monitoring. With regard to decontamination facilities, Intervenors argue that estimates of the number of those requiring

showers are too low, would require more time than provided for, and its backup procedures of sending people to private facilities for showering are inadequate. It claims that delays in detecting cases of contamination will have a public health impact particularly in an accident with significant releases of particulates. SC Exh. 16 (Radford, et al.) at 35. The absence of trained medical personnel and first aid facilities in LILCO's plan, a lack of adequate sanitary facilities and food or water supplies for evacuees, and inadequate sheltering for inclement weather conditions all contribute, in Intervenors' opinion, to negative health consequences. Id. at 36-37; NY Exh. J (Hartgen and Millspaugh) at 68. As a consequence of the deficiencies noted, Intervenors conclude that there is no reasonable assurance that adequate measures to protect the public can be or will be taken at the reception centers.

The Staff indicates in proposed findings that the evidence supports LILCO's staffing procedures and facilities as being adequate and as providing the required reasonable assurance. Staff Proposed Findings at 33, 34 and 37. With regard to time estimates, the Staff points out that LILCO's figures of 100 seconds per vehicle were based on actual test trials and that Intervenors provided no empirical basis for their estimate of three to five minutes. Similarly, allegations concerning evacuees behavior were discounted, on grounds that no supporting data was supplied. See Staff Proposed Findings at 33, citing Tr. 18,029 (Saegert). Since it concluded that LILCO's time estimates were more reasonable, it found that staffing levels were sufficient to provide

monitoring for up to 30% of the EPZ population within the 12-hour period called for by J.12 of NUREG-0654.

In connection with LILCO's monitoring procedure, the Staff pointed out that Intervenors were not opposed to monitoring passengers in automobiles, but merely pointed out certain difficulties connected with it. The Staff noted that FEMA had not reviewed LILCO's revised plan for monitoring but the evidence of record was sufficient for a conclusion that, although imperfect, LILCO's monitoring method was sufficiently accurate to be acceptable. Staff Proposed Findings at 30. The Staff cited favorably LILCO's estimate of the number of contaminated people requiring showering as consistent with the experience of previous incidents. Staff Proposed Findings at 36. The Staff noted that no regulatory requirement exists that a certain number of people must go through decontamination within a particular period of time. Staff Proposed Findings at 34.

It is LILCO's contention that its monitoring method covers those areas where contamination is most likely to be found. They contend that their procedure is conservative in sending all persons for decontamination when any contamination is discovered on any passenger or vehicle and that their 100 second time period has been based on two time trials and a training session. It is also alleged that thyroid monitoring is not likely to be useful by the time that evacuees are at reception centers. Tr. 17,763 (Linnemann); Tr. 18,037-38 (Radford); Tr. 17,572 (Dreikorn); Tr. 17,555 (Watts).

With respect to conditions for becoming contaminated, LILCO refers to testimony by FEMA witness Keller, and its own witness Watts, to the effect that the most likely place to pick up contamination during evacuation was on the hands and feet, areas of the body covered by LILCO's monitoring method. Tr. 18,001 (Keller); Tr. 14,475-76 (Watts). There was testimony that the areas to be surveyed in vehicle passengers were accessible with cooperation from such persons. LILCO's Exh. 1 (Crocker, et al. direct testimony) at 44 and LILCO is also providing a separate monitoring lane for vehicles that due to their model characteristics or number of occupants may be difficult to scan. OPIP 4.2.3 § 5.4.6 (February 1987 Revision). In connection with thyroid contamination, LILCO points to the evidence that it is too late to take any preventive measures when radioactive iodine is in the body and that New York State policy is not to administer potassium iodide (KI) to the public. Tr. 18,037-38 (Radford); LILCO Exh. 1 (Crocker, et al., at 58), Tr. 18,163-64 (Papile).

The Applicant alleges that traffic guides are to be placed strategically to direct evacuees through the facilities, an information sheet will be distributed to evacuees at the centers, EBS stations will also be broadcasting pertinent information, stalled vehicles will be simply pushed out of the way so as to avoid obstructions and these procedures will assist LILCO in meeting its monitoring schedule time. Tr. 18,023-28 (Saegert); LILCO Exh. 1 (Crocker, et al. direct testimony) at 47; Tr. 17,621 (Crocker); Tr. 17,718 (Mileti); see LILCO Proposed Findings at 52-54.

On the question of registration procedures, LILCO claims that its record keeping of full details on individuals going to decontamination trailers and limited record keeping on non-contaminated passengers in vehicles is adequate and in keeping with FEMA testimony that detailed information for evacuees not contaminated is not needed. Tr. 18,274-76 (Keller). If necessary, LILCO testimony states, communication with people in non-contaminated groups can be made through license plate numbers or announcements in newspapers and radios. LILCO Exh. 1 (Crocker, et al. direct testimony) at 47; Tr. 17,715 (Dreikorn). LILCO also contends its monitoring equipment (Eberline RM-14) is a tested and reliable instrument that has been used by industry and also during adverse weather conditions. Tr. 18,435 (Keller); Tr. 17,597-99 (Watts, Dreikorn). LILCO also states there is no requirement for medical personnel to be available at reception centers, that individuals will only be there for a short--15 minute--period of time and most of those monitored will not even get out of their vehicles. LILCO Exh. 1 (Crocker, et al. direct testimony) at 54-55, Att. T at 27. LILCO's testimony indicates that 20% of the EPZ population can be monitored in about 6 hours and 46.6% in about 12 hours. LILCO Exh. 1 (Crocker, et al. direct testimony) Att. T at 26-27; LILCO Exh. 26 (Lieberman Rebuttal Testimony) at 5; Tr. 17,728 (Watts); Tr. 17,744 (Dreikorn).

LILCO contends it has gone beyond the regulatory requirements of Criterion J.12 in establishing several backup procedures in the event that accident conditions require them. These include increasing the number of monitoring stations from 63 to 140 and bringing in additional

monitors from INPO and other federal and private sources. As a secondary backup, as noted, LILCO proposes the alternative of monitoring only the driver or passenger who comes from a different location and anyone else requesting a scan, and finally, as a last alternative, to advise evacuees to proceed to their ultimate destinations to take showers, change clothes, bag old ones and then return for monitoring at a later time if desired. LILCO Exh. 1 (Crocker, et al. direct testimony) at 53, 59; Tr. 17,664-65 (Dreikorn). This later procedure, it is claimed, is consistent with federal guidance in a draft EPA manual (Ch. 7, June 27, 1986). Also see Tr. 17,739 (Watts).

LILCO indicates its more extended method for monitoring bus evacuees who are standing is designed to accommodate the fact that they will be coming from different places, bussed to several different transfer points and possibly encounter exposure to cross-contamination while on the busses. This would, in LILCO's view, increase chances that isolated spots of contamination might not be detected if monitored in the same way as passengers in private vehicles. LILCO Exh. 1 (Crocker, et al. direct testimony) Addendum; Tr. 17,573 (Dreikorn). LILCO contends that having the bus evacuees monitoring station at the center (Hicksville) which is also the locale for the LERO Family Relocation Center is not a problem since only a few hundred family members are expected at the center and the two functions are located in different areas of the facility. LILCO Exh. 1 (Crocker, et al. direct testimony) Att. J; Tr. 18,434 (Keller).

It is contended by LILCO that the monitoring procedures for vehicles is adequate since driving through a radioactive plume or picking up contamination after a plume has passed would result in contaminates being on the hood or wheel well of the vehicles. Tr. 17,557-58 (Dreikorn, Watts . With respect to monitoring the inside of vehicle trunks, LILCO do plan to accomplish this if any contamination is found on the vehicle or its passengers. LILCO Exh. 1 (Crocker, et al. direct testimony) at 46.

In connection with decontamination procedures, LILCO plans to have available 8-10 workers at each trailer. LILCO Exh. 1 (Crocker, et al. direct testimony) at 58. LILCO contends there is no regulation or guidance requiring any particular capacity for decontamination of the public and that its estimate of 10% has not been challenged by any facts. See LILCO Exh. 1 (Crocker, et al. direct testimony) at 57, Tr. 17,683-84 (Watts); Tr. 17,686-88 (Linnemann) and LILCO Proposed Findings at 67-69. LILCO also contends its centers have adequate capacity to shelter evacuees, a plans exist for providing additional sanitary facilities, if required, as well as blankets and supplies. See LILCO Proposed Findings at 69-70.

Board Decision

The regulatory standards and criteria applicable to appropriate procedures for the monitoring of contamination in nuclear incidents are set forth in 10 C.F.R. 50.47(b)(10) and NUREG-0654, J.12.

Intervenors challenge every phase of Applicant's monitoring plan including the adequacy of its proposed monitoring method for vehicles, their occupants and bus passengers, staffing requirements and monitoring time, the decontamination process, registration procedures, backup monitoring provisions, utilization of the Hicksville center for dual functions and the monitoring equipment to be utilized. We treat below, in turn, the sufficiency of LILCO's undertaking to meet NRC's regulatory prescriptions in these areas.

The controversy over LILCO's monitoring method centers around whether a scan of the selected parts of the body--head, shoulders, hands and feet--will miss other areas of possible contamination and whether monitoring of people in vehicles would result in improper scanning and inaccurate results. LILCO's revised provisions for scanning evacuees was designed to overcome deficiencies in its previous method that, in monitoring only the hands and areas around vehicle and driver, did not receive a favorable review from FEMA. Although there is no uniform method required for a monitoring operation, the evidence of record is convincing that medically significant contamination would be unlikely unless it were picked up by the hands and feet, both of which will be scanned by LILCO's procedures. The probabilities of major contamination going undetected on parts of the body or vehicles other than those to be monitored are too low for us to conclude that LILCO's scanning methods are inadequate. And even though FEMA had not been able to review LILCO's February 1987 revision prior to providing testimony at the hearing, its witness (Keller) testified that the Applicant's monitoring

method would most likely detect contamination picked up in the most realistic scenarios, that is people evacuating through a plume or just after a plume had passed before evacuation. Although the Board would have preferred to have FEMA's review of LILCO's revised procedures in the record, the weight of the evidence indicates there is nothing unworkable or fundamentally wrong with its current monitoring proposal. FEMA's witness did testify that any local contamination would probably be picked up from contact with previously contaminated objects but that such contamination would not likely be medically significant. See FEMA Exh. 2 at 19; Tr. 18,395-400 (Keller).

Although LILCO's method of monitoring occupants in vehicles does pose some physical awkwardness, we cannot conclude that individuals seeking monitoring assistance would not cooperate with instructions from monitors, nor can we conclude that its time estimate of 100 seconds per vehicle is erroneous. The evidence reflects that the method was tested during two separate trials and training session and the time estimates are based on those tests.

Intervenors criticism that the time per vehicle must be longer was a general assertion with no supporting evidence that it was based on a realistic trial. SC Exh. 16 at 16; NY Exh. 1 at 23-26 (Hartgen and Millspaugh). Actual monitoring time may vary and is not precisely known, however FEMA has graded an exercise based on 90 seconds per individual albeit without enthusiasm for the accuracy of that number. Tr. 18,420-21 (Keller). According to FEMA, high levels of radiation can be found by monitors in less than 90 seconds, while low levels may

require 90 seconds or more to detect. Tr. 18,391-92, 18,420 (Keller). The monitoring time varies inversely with the radiological threat to public health and safety. Tr. 18,391-93 (Keller). LILCO's time trials show that about 100 seconds are required on an average, but when variation from the average is considered, the longest monitoring times are required to detect the least significant doses.

The Board concludes that monitoring time is not defined by any general technical consensus. Neither does any law of nature govern monitoring time and it is evident that planning can do no more than achieve a rough approximation to the time that might be required in practice. The dispute about monitoring time in this case appears to depend as much on the parties' perceived need for meticulous measurement as on any more fundamental consideration. The initial monitoring to be done at reception centers, however, is a population screening process. Meticulous measurements will be done for those who are found contaminated by the screening process. We infer that, in designing the process, a practical balance must be struck between the need to detect all low level radiation on each individual and the need to process large numbers of individuals. In monitoring however, it is the least doses (those near background) that require the most search time to detect while larger more health threatening doses can be found quickly. Under those circumstances we conclude that more total dose can be saved by a monitoring strategy that favors processing large numbers of people than by one that favors meticulous searches for small amounts of radiation on each individual in the initial screening.

The Board cannot confidently endorse the precision or accuracy of any particular average monitoring time because the record reflects little empirical basis and no technical consensus to support it. There is no basis for thinking however that LILCO's planning choice of 100 seconds per vehicle and occupants was biased or that it struck the balance between individual and population imperatives improperly. We therefore accept its estimate of 100 seconds as reasonable. Although uncertainty persists, there is no significant remaining opportunity to reduce projected doses to the public by adopting Intervenor's longer monitoring times or by requiring further refinement of LILCO's monitoring time estimates.

The testimony in the record from Intervenors did not erode LILCO's time estimates in any substantial way and Intervenors' own estimate of three to five minutes per vehicle is not based on testing procedures, but more on unverified claims that delays will be caused by vehicle breakdown, behavioral problems and operator fatigue. LILCO's response to the latent potential of these problems is answered satisfactorily in the Board's view, by its answer that any vehicles breaking down will be simply moved out of the path, behavioral problems will be minimized by supplying adequate public information and inspector fatigue will be alleviated by having available an excess number of monitors.

The State expressed concern that the reception center sites are small and filled with obstructions which will cause slow traffic circulation within the sites and lengthen the time needed for processing. NY Exh. 5 at 55 (Hartgen and Millspaugh). LILCO agreed

that improvements are needed at the centers and has made or commits to make changes that eliminate the States concerns. These include widening of a gate at Bellmore, removal of debris from reception center sites, and plans to remove cars and equipment stored on site before evacuees arrive. LILCO Exh. 26 at 35-36 (Lieberman); Tr. 17,646-49 (Crocker). The Board concludes that LILCO's response is adequate.

The adequacy of staff for any monitoring procedure is of course dependent on the number of people that can be monitored in a given period of time. Based on LILCO's time estimates for monitoring, the validity of which we accept here, LILCO calculates it can monitor, with three (3) personnel at each station, 20% of the EPZ population within about 6 hours. We can find no miscalculation in LILCO's figures and conclude that both its staffing arrangements and monitoring method meet NRC's regulatory standards and criterion.

As a final note on LILCO's monitoring method, it is apparently Intervenors' position that, since a whole body scan is a preferred method for the detection of contamination, NRC's regulations, which look to prudent risk reduction measures, require that method if it can be accomplished. We disagree. Planning standards and criteria are developed on the basis of selecting reasonable, but effective, protective response actions and the requirement in monitoring is simply a capability to monitor all EPZ residents and transients arriving at reception centers within a 12-hour period. No requirement exists that we are aware of that dictates a different, even if better, method of detection must be installed even if it is available. This would be

particularly valid, where, as in the present case, no substantial deficiencies are present in the system proposed and where further detailed monitoring of all passengers occurs if a vehicle or anyone in it is found to require decontamination.

The Intervenors also challenge the scanning procedure scheduled for bus carried evacuees at the Hicksville Center, stating that a whole body scan was required here too. LILCO plans contemplate a total of 24 monitors who will scan each bus passenger standing in the same area as those in private vehicles plus doing an X pattern front and back. This is in recognition that such passengers will come from different places of origin and may have been exposed to cross-contamination while on the buses. The time period estimate is 60 seconds per passenger and 11,080 people (8% of EPZ winter-time population) are expected to be monitored well within the 12-hour period standard--about 7.7 hours--of NUREG-0654 Section J.12. It is apparent to the Board that Intervenors' objection in this area, where it submitted no testimony, must fail as it does in the area of passengers on private vehicles. The basis of Intervenors' argument again is the limited method of LILCO's scanning procedures as opposed to a full body scan, as well as the time period allocated for LILCO's preferred method. For substantially the same reasons discussed in connection with scanning of passengers and private vehicles, we find no deficiencies in LILCO's bus monitoring procedures. Nor do we detect any difficulties with assigning bus passengers to the Hicksville Center, the facility programmed to accommodate LERO family members. The testimony indicates that several hundred family members will congregate

at Hicksville, a small percentage of those who would be requiring monitoring or decontamination, and they would be segregated, after monitoring, to a place separated from the monitoring and decontamination facilities operations. We are persuaded also by FEMA's testimony that the adequacy of all reception centers will be evaluated in a future exercise, and that the two functions discussed here should not have a negative impact on each other.

LILCO's decontamination process calls for remonitoring and decontamination of all evacuees sent to any of the four trailers located at three reception center sites. Each trailer contains wash basins, showers, separated to accommodate males and females and separate dressing areas. There are eight to ten LERO workers planned for assisting in the monitoring and decontamination activities at each trailer. Intervenors' objection to LILCO's decontamination process principally concerns the number of people who may require showering. LILCO has provided showers to handle 10% of 32,000 evacuees (planning basis number) over the proscribed 12-hour period at a rate of 15 minutes for showering and subsequent monitoring. It appears evident that this number is more than adequate based as it is on 32,000 evacuees being contaminated, a highly unlikely number. The testimony of LILCO's and FEMA's witnesses agree and is convincing that experience demonstrates the vast majority of people contaminated do not require a full shower, with simple washing effective to remove most contamination.

With regard to other matters raised as objections to LILCO's decontamination procedures, the record is adequate with respect to

arrangements providing solutions to the adequacy of facilities for those waiting to be decontaminated, the availability of sanitary facilities and other supplies that may become necessary.

The Applicant has provided several backup procedures for monitoring and decontamination to be implemented in the unexpected event that the number of evacuees arriving at reception centers exceeds the planning basis. As noted, supra, these range from increasing the number of monitoring stations, to adding more monitors from government and private agencies, to restricting monitoring only to drivers of vehicles and others who come from different places of origin, or, finally to sending people to private facilities for showering before returning for monitoring at a subsequent time. We find no requirement that must be met for backup procedures in emergency planning of reception centers, although we do not discourage planning for them in the event necessity dictates there use. However, we see no need to consider their adequacy in depth in this decision except to state they appear sufficient to address a larger than planned evacuee population if one should develop.

In regard to LILCO's registration procedures, the Applicant's plan to record full details of only those going through the decontamination process is criticized by Intervenors as too limited. In their view, registration names of everyone monitored is necessary to protect public health and safety arguing that all other plans in FEMA's Region II require this data. The FEMA testimony, which we consider persuasive on this issue, is to the effect that detailed information on those not contaminated is not needed. It is needed only for those going through

the decontamination process. It appears to the Board that LILCO's plan to contact non-contaminated individuals, if necessary, through license plates or public service announcements, would more than provide for the unusual event where subsequent communication would be required. LILCO's planned registration procedure is adequate in the Board's judgment.

There are several other areas--lack of medical personnel, thyroid contamination and monitoring equipment--in LILCO's monitoring procedures that raised Intervenors' skepticism. One contention is that the lack of organized medical personnel at reception centers constitutes a deficiency in LILCO's plan. It is not clear to the Board how medical personnel would be helpful at a reception center which basically acts as a screening station to identify those who might require further medical attention. Other regulatory standards and criteria call for reception hospitals to be available to treat severely contaminated individuals, but for most of those arriving at reception centers, the stay will be brief and the washing to remove contamination will be adequate. Where it is not, the reception hospitals with existing radiation treatment equipment will be the place where medically trained personnel will be available and required.

Intervenors' argument that thyroid monitoring for everyone, not just those found contaminated, should be included in LILCO's plan is based on their belief that thyroid contamination poses a substantial threat to public health and safety and can be easily monitored to provide some treatment protection for some of those contaminated. The fact is that neither federal nor New York State standards require

thyroid monitoring and the use of potassium iodide (KI) for treatment is controversial. According to testimony in the record, if radioactive iodine is already in the body, it is essentially too late to take protective measures and if monitoring is done too early, no contamination is likely to be absorbed in the thyroid. Under those circumstances, which we believe to be probable ones, and with the lack of any regulatory requirement, we cannot conclude that LILCO's plan is deficient with respect to thyroid monitoring

And finally, Intervenors refer to the potential for monitoring equipment difficulties as a reason for discounting LILCO's monitoring time estimates of 100 seconds. The record amply demonstrates that the equipment planned for monitoring use, the Eberline RM-14, is simple to use and its reliability has proven itself under various conditions in other nuclear plants. There is also uncontradicted testimony that the alarm on the RM-14 was available and working satisfactorily during training sessions. The Board finds no deficiency with regard to LILCO's monitoring equipment.

In light of the foregoing, the Board concludes that LILCO's Plan for registering, monitoring and decontamination of evacuees during a radiological accident and its facility arrangements are adequate to meet the requirements of NRC's regulatory standards and criteria.

5. ZONING ISSUES

In proposed findings, LILCO and the Governments refer to the applicability of local zoning ordinances and Town Resolutions on the use of three LILCO facilities as radiological emergency reception centers. The parties agree that the Towns of Hampstead, North Hampstead and Oyster Bay (the centers' situs) adopted resolutions declaring LILCO's proposed use of these facilities to be in violation of their respective zoning laws. The Board has been provided with a certified copy of these resolutions by the Governments. The two parties also attest that the Town of Hampstead has an action pending in the State Supreme Court of Nassau County requesting injunctive relief against LILCO in using the Bellmore Center as a reception center.

In all, LILCO asks the Board to find that the Town Board's Resolutions have no conclusive legal status on grounds that there were irregularities in local hearing procedures, that the Towns lack enforcement authority, and finally that the prospective nature of any zoning violations present no current litigable problem. The Applicant also suggests that the Board defer to the State Courts as the proper forum for construing the applicability of local zoning laws and asserts that due process would be denied LILCO by Board enforcement of local government resolutions since no opportunity for a hearing on the issue had been provided. Finally, LILCO alleges that Federal law preempts the town resolutions and, that in any event, application of the "realism" principle enumerated in CLI-86-13 would assure that officials would make

proper arrangements to overcome any legal zoning obstacles during an emergency. LILCO requests Board certification of the preemption issue to the Commission if the Board's rulings are adverse to its position.[14]

The Governments, citing New York State law granting zoning power to the towns, cities and villages of New York, urges the Board to take official notice of the Town Resolutions and provide them with the same respect we did earlier in regard to a New York State Supreme Court decision on legal authority issues. See Governments Proposed Findings at 181, n. 40. In the Governments' view, since town boards have the authority to determine in the first instance the validity of land uses within their borders, and have so determined here, there is no necessity for us to await the outcome of a New York State Court decision for interpretation of local zoning laws and their applicability to the facts herein. LILCO having failed to apply for a zoning variance with any of the three local jurisdictions or not having received a State Court ruling favorable to its proposed use of the property, the Governments conclude we must find LILCO's reception centers inadequate to meet NRC regulations. With regard to the preemption issues, the Governments cite judicial authority previously relied on by the Board, (PID, 21 NRC at 904), and allege that neither the Agency's organic statute nor NRC regulation preempt local zoning laws. See Governments Proposed Findings

---

14 LILCO Proposed Findings at 118-119 and Reply to Governments' Findings at 67-76.

at 182-184. On the applicability of CLI-86-13 to the matter here, the Governments claim that a "best effort" response under these circumstances cannot be construed to legalize an activity illegal under local zoning laws. In our decision below, we have not considered, as appropriate, Intervenors' request of October 1, 1987 to respond to LILCO's Reply Findings. See 10 C.F.R. § 2.754(a)(3)

Background

The issue of possible violations of local zoning ordinances by the proposed use of LILCO's facilities as reception centers was first brought to the Board's attention in a January 22, 1987 pleading of the Intervenors. In a motion for reconsideration of a Board Order on a discovery and hearing schedule, Intervenors suggested that a hearing on the remanded reception center issues be held in abeyance pending some statement from LILCO on a possible substitution for its reception center facilities. The abeyance was required, in the Governments' view, by receipt of notice from two towns that the proposed use of the Bellmore and Roslyn facilities were in violation of town zoning laws. We ruled then that violations of local zoning ordinances are matters to be adjudicated in a State Court and pending such a ruling, we delayed any decision on the issue until all other issues were resolved. See Board Memorandum and Order, February 9, 1987 (unpublished). In the closing minutes of the hearing on the reception center issue, however, the Board and parties were put on notice by Governments' counsel that they

intended to file a pleading dealing with the legality of the use of LILCO reception centers. After discussion among the parties and the Board on whether such a pleading would be considered, the Board stated that it would be bound by its previous Order, supra, and would evaluate any problems raised by the pleading at the time it was submitted. See Tr. 19,243. Both the Applicant and Intervenors have now submitted their contentions on this matter in the context of proposed findings and conclusions of law.

The Staff made no reference to the issue in its proposed findings of fact.

Board Decision

The Board experiences difficulty here in evaluating the Governments' arguments in the context of proposed findings of fact and conclusions of law. Although set forth in form as a legal issue which the Board had previously deferred, the Governments would have us dispose of LILCO's reception center program by taking official notice of the three Town Resolutions and providing them with immunity against confrontation by other parties in the proceeding. This we are not permitted to do. Although the Board is authorized to take official notice of facts such as certified acts of government bodies, parties obviously affected are entitled under 10 C.F.R. § 2.743(c) to an opportunity to confront the facts noticed. That opportunity is not

available through the vehicle of proposed findings submitted to the Board.

Following are the dates where relevant events connected with the Town Resolutions occurred:

° January 14, 1987: Board Order establishing discovery and hearing schedule on reception center issues.

° January 22, 1987: Governments' motion requesting a hearing delay on basis of Town actions giving notice that Bellmore and Roslyn reception centers would violate local zoning laws.

° February 4 and 9, 1987: Board Orders denying Governments' motion and stating it would delay making a decision to see if a State Court ruling on the zoning matter was obtained.

° June 30 - July 30, 1987: Eleven days of hearing on reception center issues with no evidence submitted on Town Board resolutions.

° June 9, 23 and 30, 1987: Town Boards of Hampstead, Oyster Bay and North Hampstead adopt resolutions finding LILCO's proposed use of Bellmore, Hicksville and Roslyn properties as violations of Building Zone Ordinances.

° July 30, 1987: Governments indicate on final day of hearing their intention to submit motion on zoning matter.

° August 14, 1987: Town of Hampstead files suit to enjoin LILCO from using Bellmore property as a reception center.

The Board is not persuaded by the Governments' contention that the Town Government Resolutions can stand procedurally on an equivalent footing with a New York State judicial decision. That argument has no

substance where the Applicant has not had an opportunity to present its side of the issue. The Board is being asked to rule in the Governments' favor on an issue which has no foundation in the record and which other parties have had no opportunity to confront.

We decline to take official notice of the Town Resolutions. The facts concerning the validity of the resolutions are not indisputable and the issue surfaced here on the reception center controversy could have been raised substantively prior to the close of the record. As we have stated, the basic question on zoning use is now before the State Courts, which is the proper forum for the adjudication of local zoning controversies. We see no reason to act contrary to the intent of our Order of February 9 which was to delay any decision on the matter to ascertain whether a proceeding were to be undertaken in a State Tribunal. Such an action has now commenced. In the event a Court decision is made that is adverse to LILCO's position, the subject can be brought to the Board's attention by any party with the filing of proper motions under the Commission's Rules of Practice.

Although a request to take official notice of a Government action can be raised at any time and we do not view it favorably here, we possibly might alternatively consider the Governments' contention as a motion for summary disposition of the issue. However, even if viewed in that form, such a motion could not be successfully maintained in view of LILCO's challenge of its validity and legal conclusiveness. These are material issues which would require litigation. See Applicant's Reply to Governments' Proposed Findings at 70-72.

Although alleged local zoning violations have not been litigated in this proceeding to date, it is possible that a decision by the New York State Courts on the issue may impact the reception center issue. However, the dimensions of any such impact are not before us now and we refrain from any speculation in that regard.

Board Conclusions

The foregoing sets forth the Board's findings of fact. Based on these findings, and upon consideration of the entire evidentiary record in this proceeding, the Board makes the following conclusions of law: the Applicant's planning basis, traffic plan, reception center locations, monitoring, registration and decontamination procedures, staffing plans and provisions for handling evacuees are adequate and satisfy the NRC's regulatory standards and criteria of 10 C.F.R. § 50.47(b) and NUREG-0654, II.J.12.

ORDER

On the basis of the foregoing findings of fact, conclusions of law and opinion, and the entire record, it is this _____ day of May, 1988

ORDERED:

1. The issues remanded by the Appeal Board in ALAB-832, issues raised by Intervenors and a population planning basis issue are resolved in favor of the Applicant as described in this Decision.

2. In accordance with 10 C.F. R. §§ 2.760, 2.762, 2.764, 2.785, and 2.786, as amended, this Partial Initial Decision shall become effective immediately and will constitute, with respect to the matters resolved herein, the final decision of the Commission thirty (30) days after issuance hereof, subject to any review pursuant to the above-cited Rules of Practice. Any party may take an appeal from this Partial Initial Decision by filing a Notice of Appeal within ten (10) days after service of this Decision. Each appellant must file a brief supporting its position on appeal within thirty (30) days after filing its Notice of Appeal (forty (40) days if the Staff is the appellant). Within thirty (30) days after the period has expired for the filing and service of the briefs of all appellants (forty (40) days in the case of the Staff), a party who is not an appellant may file a brief in support of, or in opposition to, any such appeal(s).

THE ATOMIC SAFETY AND
LICENSING BOARD

James P. Gleason, Chairman
ADMINISTRATIVE JUDGE

Dr. Jerry R. Kline
ADMINISTRATIVE JUDGE

Frederick J. Shon
ADMINISTRATIVE JUDGE

Dated at Bethesda, Maryland
this 9th day of May, 1988.