RELATED CORRESPONDENCE

LILCO, November 18, 1983

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

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

TESTIMONY OF MATTHEW C. CORDARO, RUSSELL R. DYNES, WILLIAM G. JOHNSON, DENNIS S. MILETI, JOHN H. SORENSEN, AND JOHN A. WEISMANTLE ON BEHALF OF THE LONG ISLAND LIGHTING COMPANY ON PHASE II EMERGENCY PLANNING CONTENTION 25 (ROLE CONFLICT)

Hunton & Williams
P.O. Box 1535
707 East Main Street
Richmond, Virginia 23212
(804) 788-8200

DATED: November 18, 1983

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PURPOSE

The intervenors' Contention 25 is entitled "Role Conflict of Emergency Workers." The contention alleges that "Role conflict . . . creates the possibility that significant numbers of emergency personnel will look to the needs of their families or others for which they have responsibility (including themselves) before they report (if at all) to their designated emergency response positions or otherwise respond to a request by LILCO for assistance."

This testimony will establish the following propositions:

1. It is important to distinguish between "role strain" (or "role conflict"), which is a state of mental stress caused by worry about one's family and intimates in an emergency, and "role abandonment," which is the act of abandoning one's emergency job. Role strain, the mental state, will quite possibly exist in emergency workers. But role abandonment will not occur, if these workers have a clear idea of their emergency role and are properly trained for it.

2. A second important distinction is between people in general (members of the public) and people who have clearly defined and clearly understood emergency roles. People who are "emergency workers," by which we mean people who (1) have clearly defined emergency roles and (2) have been properly trained to perform those roles, do not abandon their jobs, though they may suffer great mental stress from concern for their families while they do those jobs. People who do not have a clearly defined emergency role (non-emergency workers), on the other hand, tend to go home and take care of their families first and then, oftentimes, to volunteer for emergency duty.

3. The accident at Three Mile Island did not cause role abandonment by emergency workers. Although there are some

reports that a few healthcare professionals did not show up for work the weekend after the accident, these were not people who had clearly defined emergency roles for a radiological emergency. At no time was there a medical emergency at TMI.

4. Reasonable steps can be taken in emergency planning to ease the mental stress of role strain. The most important thing that can be done is to define clearly the emergency workers' roles and to reinforce those roles in training. LILCO has done this. Moreover, LILCO has taken steps to alleviate role strain by (1) providing a relocation center for the families of emergency workers and (2) developing an "Emergency Worker Tracking System" to enable emergency workers to get word from their families that all is well.

5. In this particular proceeding, moreover, the issue of "role conflict" amounts to a tempest in a teapot, because very few of the LILCO emergency workers (only about 3.6 percent at present) have families within the 10-mile EPZ.

6. Suffolk County has conducted an opinion survey of school bus drivers and volunteer firemen in an attempt to show that many of these people would abandon their roles. However, this survey has essentially no probative value, because polls are not capable of predicting behavior in emergencies. Moreover, the survey was technically flawed.

7. Emergency workers in the EPZ will be equipped with and trained to use dosimeters, so they will be able to detect whether or not they are receiving doses of radiation. This makes untenable Suffolk County's claim that the unique "invisible" character of radiation might cause emergency workers to refuse to enter the EPZ out of fear for their own safety.

8. The behavior of emergency workers on Long Island in an emergency would not be fundamentally different from the behavior of emergency workers anywhere else in the country.

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AND JOHN A. WEISMANTLE
ON BEHALF OF THE LONG ISLAND LIGHTING COMPANY
ON PHASE II EMERGENCY PLANNING CONTENTION 25
(ROLE CONFLICT)

I. Identification of Witnesses

1. Q. Please state your names and business addresses.

A. My name is Matthew C. Cordaro; my business address is Long Island Lighting Company, 175 Old Country Road, Hicksville, New York 11801.

My name is Russell R. Dynes; my business address is Department of Sociology, University of Delaware, Newark, Delaware 19711.

My name is William G. Johnson; my business address is Bill Johnson & Associates, 367 Summit Avenue, Fleetwood, New York 10052.

My name is Dennis S. Mileti; my business address is Department of Sociology, Colorado State University, Fort Collins, Colorado 80523.

My name is John H. Sorensen; my business address is Oak Ridge National Laboratory, P.O. Box X, Bldg. 4500 North, Room H 11c, Oak Ridge, Tennessee 37830.

My name is John A. Weismantle; my business address is Long Island Lighting Company, 100 East Old Country Road, Hicksville, New York 11801.

2. Q. Please summarize your professional qualifications and your role in emergency planning for the Shoreham Nuclear Power Station.

A. [Cordaro] I am Vice President, Engineering, for LILCO. My professional qualifications are attached to this testimony (Attachment 1). I am sitting on this panel to provide the LILCO management perspective on emergency planning and to answer any questions pertinent to management. My role in

emergency planning for Shoreham is to ensure that the needs and requirements of emergency planning are being met and that the technical direction and content of emergency planning are being conveyed to corporate management.

[Dynes] I am Professor and Chairman, Department of Sociology, University of Delaware. My professional qualifications are attached to this testimony (Attachment 2). My familiarity with the issues surrounding role conflict stems from a knowledge of the research literature on emergencies plus my own research on emergencies of all kinds over the past twenty years. I have been Co-Director of the Disaster Research Center at Ohio State University, and in that capacity I studied the responses of communities to at least 100 emergencies at the sites of the hazards. I was also the head of the Kemeny Commission's Task Force on Emergency Response and Preparedness.

[Johnson] I am President of Bill Johnson and Associates, Inc., a polling and survey research firm. My professional qualifications are attached to this testimony (Attachment 3). My familiarity with the issues surrounding role conflict stems from my

experience in polling and survey research, including a survey I conducted for LILCO about emergency planning for Shoreham.

[Mileti] I am Associate Professor of Sociology at Colorado State University. My professional qualifications are attached to this testimony (Attachment 4). My familiarity with the issues surrounding role conflict stems from a knowledge of the theoretical and empirical literature in the emergency behavior area and from my own research experience. In particular, I have investigated behavioral aspects of the Three Mile Island accident.

[Sorensen] I am a Research Staff Scientist with the Research Analysis Group, Energy Division, Oak Ridge National Laboratory. My professional qualifications are attached to this testimony (Attachment 5). My familiarity with the issues surrounding role conflict stems from my knowledge of the theoretical and empirical literature in the emergency behavior area and from my own research. In particular, I have done studies for the NRC on the Three Mile Island accident.

[Weismantle] I am employed by LILCO as Manager of the Local Emergency Response Implementing Organization (LERIO). My professional qualifications are attached to this testimony (Attachment 6). I am responsible for developing and implementing the offsite emergency response plan for Shoreham.

II. Contention 25

3. Q. Are you familiar with Contention 25?

A. [All witnesses] Yes.

4. Q. What is Contention 25?

A. [All witnesses] Contention 25 reads as follows:

> Contention 25. Intervenors contend that the LILCO Plan fails to comply with 10 CFR Sections 50.47(a)(1), 50.47(b)(1) and 50.47(b)(3), because the Plan fails to address the problem of emergency worker role conflict. Intervenors contend that a substantial number of the emergency workers relied upon under the LILCO Plan will resolve such conflicts by attending to their other obligations prior to, or in lieu of performing the emergency functions assigned to them by LILCO. In the absence of such workers, the LILCO Plan cannot and will not be implemented, and there can be no finding of compliance with 10 CFR Sections 50.47(a)(1), 50.47(b), and NUREG 0654 Section II. The emergency workers likely to experience role conflict, the type of conflict, and the effect of such conflict upon the implementability of the LILCO

Plan are set forth in paragraphs A-F below.

Contention 25.A. The LILCO Plan is premised on the belief that LILCO personnel in command and control positions, as well as those assigned to perform other emergency response functions, will be willing to report promptly for duty in the event of a radiological emergency. Intervenors contend that LILCO employees located outside the EPZ at the time of an emergency will be reluctant to leave a relatively safe area outside the EPZ to enter a more dangerous area within the EPZ to exercise command and control, supervisory, or other emergency responsibilities. Other LILCO employees, including those located in the EPZ, or whose families are located in the EPZ, will also be reluctant to report for emergency duty without first having attended to the safety of their own families. The "Emergency Worker Tracking System," which LILCO asserts will "ensure that LILCO-employed the immediate families of all emergency workers are provided for throughout the incident" (Plan, at 2.1-7 and 2.1-8), has not even been developed yet, and therefore cannot be relied upon by LILCO to eliminate role conflict of LILCO personnel. Thus, Intervenors contend that LILCO has failed to ensure that LILCO-employed emergency workers will in fact report promptly to perform emergency responsibilities and thus the LILCO Plan is not capable of implementation.

Contention 25.B. The LILCO Plan fails to take into account the role conflict that is likely to be experienced by BNL personnel upon whom LILCO exclusively relies for all offsite accident and dose assessment and projection functions, and for all command, control and coordination functions, and for all command, control and coordination functions related to offsite accident assessment and the decision to recommend particular protective

actions to the LILCO Director of LERO. Such BNL personnel are likely to have families located in or near the EPZ and therefore are likely to attend to the safety of their families prior to, or in lieu of, reporting for emergency duty. Without BNL personnel, neither offsite accident and dose assessment and projection, nor recommendation of protective actions will be performed.

Contention 25.C. The LILCO Plan fails to take into account the role conflict that will be experienced by school bus drivers. In fact, a substantial number of school bus drivers are likely to attend to the safety of their own families before they report (if they report at all) to perform the bus driving duties which LILCO assumes will be performed. Role conflict of school bus drivers will mean that neither school buses nor school bus drivers will be available to implement the LILCO Plan. Without an adequate number of buses or bus drivers, LILCO will be incapable of implementing the following protective actions:

1. early dismissal of schools (necessary under the LILCO Plan to permit school children to be sheltered or to evacuate with their parents);

2. evacuation of schools;

3. evacuation of persons without access to cars; and

4. evacuation of persons in special facilities.

Contention 25.D. The LILCO Plan fails to take into account the role conflict that is likely to be experienced by teachers, other school employees, and crossing guards. In fact, a substantial number of such personnel are likely to attend to the safety of their own families rather than remaining at the schools or at their posts in the event of an

emergency. Accordingly, there is no assurance that under the LILCO Plan adequate personnel will be available to supervise children, including those required to walk home, during the early dismissal process, during school evacuations, or in the event that children are sheltered in the schools. As a result, the following protective actions could not and would not be implemented:

1. early dismissal of schools;

2. sheltering of school children in schools; and

3. evacuation of schools.

Contention 25.E. The LILCO Plan fails to take into account the role conflict that is likely to be experienced by (a) the non-LILCO personnel who, under the LILCO Plan, are expected to drive ambulances or rescue vehicles and to provide the necessary medical and paramedical support services in the buses, ambulances, railroad cars and airplanes to be used in evacuating special facilities and handicapped persons at home; or (b) Long Island Railroad (LIRR) personnel, private airplane crews and employees of an unnamed lumber company who, under the LILCO Plan, are expected to perform substantial and essential roles in the proposed evacuation of special facilities and the handicapped. (See Appendix A, at IV-185 to 192). A substantial number of such individuals will attend to the safety of their own families prior to, or in lieu of reporting to perform emergency services. Without such personnel, the following actions could not and would not be implemented:

1. evacuation of special facilities;

2. evacuation of handicapped persons at home; and

3. transport of contaminated injured persons, or persons injured during the evacuation, to hospitals for treatment.

Contention 25.F. The LILCO Plan fails to take into account the role conflict that is likely to be experienced by the non-LILCO volunteers who are expected, under the LILCO Plan, to staff the relocation centers. LILCO identifies the ARC as the lead agency responsible for the total operation of the relocation centers. (Plan, at 2.2-1, 3.6-7 and 4.2-1). LILCO also relies on the ARC for other specific actions in the relocation centers, such as medical and counseling support. (Plan, at 4.2-1). The Salvation Army also is designated as assisting the ARC. (Plan, at 2.2-1). The LILCO Plan also asserts that LILCO will rely on groups such as churches, industries, and select volunteers, to provide additional services. (Plan, at 4.2-1). The relocation centers will not be adequately staffed, however, because the ARC personnel and other volunteers relied upon by LILCO are likely to attend to the safety of their own families prior to or in lieu of reporting to perform emergency duties. Without such personnel, the relocation centers will not be available or functioning when needed.

III. The Meaning of "Role Conflict"

5. Q. What is "role conflict"?

A. [Dynes, Mileti, Sorensen]. The notion of "role conflict" is a concept in the social sciences based on the following ideas. Individuals in society play many different roles, and each role has

certain rights and obligations in particular social relationships. Because each person plays many different roles, the rights and obligations of one role may be consistent with or reinforcing of the rights and obligations of another. Or the rights and obligations of one role may be irrelevant to those of another role. Or (and here is the crux of the present issue) the rights and obligations of one role may "conflict" with the rights and obligations of another role.

The idea of role "conflict" is frequently cited. Unfortunately, the idea is often used uncritically, as an either-or matter in which a person must choose between two or more roles. "Conflict" implies equally weighted contradictory alternatives, requiring a person to choose one role to play while abandoning another. <u>This condition is rarely, if ever, found in actual social life</u>.

6. Q. Do you prefer a different term?

A. [Dynes, Mileti] A much more adequate term would be role "strain," which denotes the difficulty felt by an individual in fulfilling different role obligations at the same time. Role "strain" is

preferable because it describes more accurately the actual conditions that people experience in all of social life, not just those of emergencies. Role "strain" is something with which people cope in most social situations and is a permanent feature of social life.

7. Q. How did the idea of "role conflict" get started?

A. [Dynes, Mileti] The seed of the present controversy over role conflict of workers in radiological emergencies may be found in the widely-quoted article by Lewis Killian, "The Significance of Multi-Group Membership in Disaster," American Journal of Sociology, January 1952, pp. 309-314. Killian's article was one of the first major publications on behavior in disasters that had widespread distribution among social scientists, and it provides an unusually vivid illustration of the purported consequences of role conflict. As a result, it has been used repeatedly to explain the concept in introductory textbooks and has recently been used to support a hypothesized "problem" for emergency planning, that is, that the ability of emergency workers to do their emergency jobs during a radiological emergency at a nuclear power plant might initially be "paralyzed" by family obligations.

8. Q. I take it other sociologists have picked up Killian's idea?

A. [Dynes, Mileti] Yes, but there have been some misunderstandings. What was intended by Killian as a mere illustration of a concept has now been distorted into the status of a universal truth about behavior in emergencies, primarily by those who have not read Killian's article carefully.

Killian illustrated several different potentional "role conflict" situations. Several of these were situations in which people involved had no definite responsibilities in the emergency social system (that is, in the mobilization of community resources to deal with the emergency). Since these people had no specific disaster responsibilities, it is difficult to know exactly what it was that their "family" obligations are supposed to have prevented them from doing.

Thus, Killian's examples stood for the simple proposition that, if people have no definite "role" in an emergency, it will be unclear to them what they should do. Significantly, in the illustrations Killian used (which were case studies), those who

did have occupational roles relevant to the emergency performed them and even expressed concern that they could not do more. In addition, Killian, while seeming to present cases of potential conflict, pointed out that none of this had any real effect on the operation of the emergency social system. An accurate reading of Killian's original article is that while people will express anxiety about potential conflicting obligations in emergencies, they will perform those roles that are more immediately relevant to the emergency social system.

In short, role strain (or what is called "role conflict" by some) is what is experienced by people who find themselves in a situation where the demands of different roles are being made on them at the same time. Role strain (or "conflict") does not imply that one role's obligations will be serviced while another's are abandoned.

IV. Is "Role Conflict" a Problem?

9. Q. Can you give us an example of role conflict?

A. [Dynes, Mileti] Most of the examples used to illustrate role conflict are based on classic stereotypes of family life that are, in reality, quite atypical.

The classic stereotype postulates the following hypothetical family and social situation: an employed (and competent) male whose place of employment is separated from the location of his unemployed (and incompetent) wife, who is with their small (and anxious) children. The family's location is in potential danger. This isolated family segment is presumed to lack alternative sources of immediately available support, such as kin or neighbors. Further, it is presumed that there will be a lack of communication lines, thus making it impossible for the husband to obtain knowledge about the safety of the rest of the family while on the job. Finally, it is presumed that the employee-husband has a vague and perhaps inconsequential emergency responsibility.

From this mix of assumptions, one might prophesy that the strong, competent husband might leave his post and go home to take care of his family, or delay doing anything, until he somehow was

personally assured that his wife and children were being taken care of. If he did leave or delay, the organization would lose an employee, albeit one who lacked organizational commitment and perhaps adaptability. That loss, however, is unlikely to be particularly significant to the operation of the organization. On the other hand, the individual might return in a few minutes to assume his role.

Moreover, there are several other factors that make this situation more hypothetical than real. In the first place, families with an employed male and unemployed wife with small children at home constitute only about 13 percent of American families according to the 1980 census. This suggests that the family system visualized in the classic "role conflict" example is an atypical living arrangement.

10. Q. How closely do LERO workers fit this stereotype?

A. [Cordaro, Weismantle] Only 56 of the 1551 LILCO emergency workers live in the 10-mile EPZ. Consequently, no more than 56 LILCO employees at present are likely to have families that might be affected during an emergency at Shoreham.

11. Q. Is it possible that some of the emergency workers would experience role strain during a radiological emergency at the Shoreham station?

A. [Dynes, Mileti]. It is important to distinguish between role strain, which is a mental state (a feeling of unease) and role abandonment, which is a type of behavior. We expect that emergency workers would experience some role strain during an emergency at Shoreham. But this does not mean that they would abandon their emergency roles and jobs because of it.

12. Q. Do you have any data to support this view?

A. [Dynes] Yes. Research conducted on the actual behavior of people who have definite organizational responsibilities in emergencies shows that emergency workers who have a clear idea of their emergency roles do their emergency jobs. Over the years, the Disaster Research Center at Ohio State University has conducted interviews with personnel in emergency organizations affected by a variety of emergency situations. While many of these interviews have concentrated on officials in top or key positions in the emergency social system, a considerable

number have also been conducted with middle- and lower-level employees. In other words, the interviews included not just police chiefs but sergeants and patrolmen; not just physicians, but nurses and attendants; not just heads of public works departments, but supervisors and crew members. The number of such interviews is now over 6000.

13. Q. What do these interviews show?

A. [Dynes] In all these interviews I have been unable to find even one example of emergency role abandonment. Nor have I found any instance where the functioning of an emergency organization was undercut by personnel not reporting to duty. Indeed, what often occurs is that there is an oversupply of personnel, which requires effective procedures to assure the efficient use of available personnel.

14. Q. Will the LERO workers have a clear idea of their emergency roles?

A. [Cordaro, Weismantle] Yes. In the first place, LILCO is a public service company, and our employees are aware that they have an obligation to serve the community and that this obligation exists around the clock.

In the second place, familiarity with emergency response is a regular part of employment with LILCO in view of the nature of our business, which must cope with, for example, equipment malfunctions, hurricanes, and ice storms. Our major emergencies generally cover time periods in excess of 12 or 16 hours, and our employees are accustomed to the idea that they may be called for emergency duty at any time.

In the third place, where LERO is concerned the LILCO Transition Plan and procedures clearly set out the emergency organization and the personnel requested to respond. LERO training further clarifies and defines emergency roles and emphasizes their importance.

Also, LILCO is preparing a brochure for the families of the LERO workers. This brochure will help to make both the workers and their families aware of the importance of their emergency roles.

15. Q. Is there anything special about emergency situations that might alleviate role strain?

A. [Dynes, Mileti] The absence of evidence of persons abandoning emergency roles over a wide range of

emergency events in the past suggests that there are certain structural changes in the community during emergencies that reduce role strain. Role obligations are based on values and, during "normal" times, people expend effort on achieving many different values, some potentially contradictory. An emergency changes this process dramatically, because in an emergency some values become clearly more important than others.

This phenomenon is the development of what has been called the "emergency consensus." In this consensus, protection for threatened people has the highest priority. Conversely, other traditional values -- for example, making money and enjoying leisure activities -- become drastically less important. This temporary shift in values simplifies the role obligations of people -- some of their roles become more important while others are not important at all, preventing potential role strain and releasing people to concentrate on the critical tasks of the emergency. Those with emergency roles will fulfill them, rather than ignore the emergency in order to fulfill family obligations. The value priorities in an emergency thus simplify, rather than aggravate, role strain for community members.

16. Q. How does the "emergency consensus" affect emergency workers in particular?

A. [Dynes, Mileti] The emergency consensus enhances the responsibility of those in emergency organizations. Those individuals who work for organizations that have emergency responsibilities have clear expectations of what their appropriate behavior should be in such situations.

17. Q. Does knowing his role in advance allow the emergency worker to better prepare for an emergency?

A. [Dynes, Mileti] Yes. Knowing his role prior to an emergency allows an emergency worker to make family contingency plans. (For example, he can plan so that the same child-care arrangements will be continued; so that relatives or neighbors will assume responsibility; so that wives are competent to deal with the situation; and so forth.)

18. Q. Are LERO workers instructed to plan for their families?

A. [Cordaro, Weismantle] Yes. The LERO emergency worker family brochure, mentioned above, will advise the workers to make personal plans for the

safety of their families in the event of a radiological emergency at Shoreham.

19. Q. Has LILCO made any special provisions for seeing to the safety of the families of LERO workers?

A. [Cordaro, Weismantle] Yes. A special relocation center for the families of LERO workers (both LILCO employees and others) will be set up in an emergency. This center is discussed in OPIP 4.2.1 (Rev. 2).

20. Q. Do the LERO workers know about the relocation center for their families?

A. [Cordaro, Weismantle] Yes. The emergency worker family brochure, mentioned above, will tell about the special relocation center. One of the training videotapes also addresses this relocation center.

21. Q. Is there anything else about emergency workers that makes them less susceptible to role abandonment?

A. [Dynes, Mileti] Emergency workers are less likely than the general public to abandon their jobs because their jobs provide them with information about the emergency that may help them to assure themselves that their families are safe. They are

more likely to have accurate knowledge of the scope of the risk and therefore more able to assess the probability of "danger" to separated family members. Also, they are more likely to have the means to update information about the risk to their separated family members.

22. Q. Are LERO workers able to get information about their families' safety?

A. [Cordaro, Weismantle]. Yes. The Emergency Worker Tracking System was developed for the families of LERO personnel as a means of establishing contact with LERO workers during an emergency at the Shoreham Station.

23. Q. How does the Tracking System work?

A. [Cordaro, Weismantle] The Family Tracking Center is located in the Information Services Department at Hicksville. The Center will be activated by the Family Tracking Center Coordinator upon notification of a radiological emergency at the Shoreham Station, in accordance with OPIP 3.3.2, Notification of Emergency Response Personnel.

The LERO Family Tracking System will enable members of the LERO workers' families to relay messages to LERO workers regarding their location and well-being and make inquiries regarding the LERO workers' status. Messages received from LERO workers' families will be relayed to LERO workers by the Family Tracking Center operators through "contact points" in the field. The contact point is the coordinator of a specific group of LERO workers at a specific location. For example, the bus dispatcher at the Patchogue Staging Area will serve as the contact point for all bus drivers assigned to this staging area operation.

The contact point telephone number is listed in a computerized printout along with all information related to LERO workers' involvement in emergency operations (such as their functions and locations) and is used by operators to track down particular LERO workers.

A message from a LERO worker's family is called into the applicable contact point by an operator and is conveyed to the emergency worker. Upon completing this action, the contact point reports back to the Family Tracking Center operator, who

will inform the worker's family that their message has been received.

24. Q. Drs. Dynes and Mileti, do you think the pre-emergency family plans and the Emergency Worker Tracking System will be effective in preventing "role conflict" from interfering with the response to a radiological emergency at Shoreham?

A. [Dynes, Mileti] In our opinion, "role strain" would occur during an accident at Shoreham. It would be a mental process, however, and would not result in role abandonment or interfere with the ability of emergency organizations to do their emergency work. We hold this opinion independent of the existence of the Emergency Worker Tracking System.

At the same time, however, emergency workers do need to feel assured that their families can tend to their own safety. Both seeking assurance that families are safe and doing one's emergency job go on at the same time in emergencies. This is likely to be easier for emergency workers to accomplish if in advance of an emergency they have prepared their own personal plans for how their families will seek

safety without them. It will also be easier for them to accomplish because of the Emergency Worker Tracking System. In our opinion, the existence of both pre-emergency family plans and the Emergency Worker Tracking System would be comforting for emergency workers during an emergency. That is, they would help to more quickly relieve the mental concern that has been labeled as "role conflict" by some and "role strain" by others.

These two efforts (the Emergency Worker Tracking System and pre-emergency family plans) are simply extra insurance that role abandonment (which would have been very unlikely to occur even without them) will not occur. Their real contribution will be in making it easier for emergency workers to feel comfortable in knowing that family safety is assured as they perform their emergency jobs.

25. Q. What else about emergency workers makes them able to experience role strain without abandoning their emergency jobs?

A. [Dynes, Mileti] A major factor explaining why individuals fulfill their role obligations, in spite of great personal danger, is because of the

cohesiveness of the work group. A person maintains his or her responsibilities because he or she does not wish to let others down. In situations where the emergency role takes on added importance, it is reasonable to suggest that this sense of obligation to the group is also strengthened. In addition, since part of the traditional image of husband and father includes the obligation to perform adequately the necessary work-related emergency roles, the traditional role should be reinforcing rather than conflicting.

26. Q. How cohesive is the LERO work group?

A. [Weismantle] from observing drills and exercises and from feedback I have received from the LERO workers, I can testify that LERO is a highly motivated, dedicated group. All LILCO workers in LERO were advised that participation is purely voluntary. Some LERO volunteers have stressed loyalty to the company or the community as a reason for volunteering or have said that being a LERO worker is their way of helping to ensure that their families are safe.

LILCO is not a large company as utilities go, and the average length of service of LILCO employees is over 15 years, so LILCO people get to know one another in the course of their employment. Also, generally the LERO workers who perform a particular function are coworkers in their ordinary LILCO jobs. (For example, most LERO traffic guides were chosen from LILCO's Customer Relations Department, and almost all the bus drivers were chosen from LILCO's Underground Lines division.)

27. Q. Okay. But suppose the worst happens and some emergency workers don't show up for awhile. What would be the likely result?

A. [Dynes, Mileti] The classic stereotyped image of role "conflict" postulates the importance of speed and the potential effects of loss of personnel. In most emergency situations, the value of speed is highly exaggerated. The more important factor is to be efficient in dealing with real problems, rather than to be fast at solving irrelevant problems.

In addition, there is the implicit notion that somehow there will be problems created by the loss of personnel. This has not been evident in other emergency situations.

[Weismantle] Also, it is not essential that every single LERO worker be available at all times. LERO contains more than the bare minimum number of people needed to staff the emergency response positions, since some excess of personnel is necessary to compensate for people who are unavailable because of illness, vacation, and so forth.

28. Q. Might we expect that volunteers would help the emergency response efforts?

A. [Dynes, Mileti] The notion that needed emergency work is not done because of the absence of critical personnel has generally been found to be false. In emergencies with a focused disaster agent such as an explosion, search and rescue efforts are usually done by those already on the scene. They do not wait for physicians, etc. Usually by the time physicians get to the site, all the victims are on the way to a location where proper medical care can be obtained, such as a hospital. Work does not wait for certain people to report; it goes on anyway.

29. Q. Would you expect that some of the volunteers would be local government employees such as police officers?

A. [Dynes, Mileti] Yes.

30. Q. Are you familiar with Suffolk County Resolution No. 111-1983?

A. [Dynes, Mileti] Yes. A copy of the resolution is attached to this testimony (Attachment 7).

31. Q. Assuming that this resolution forbids Suffolk County personnel from taking part in an emergency response, what would be its effect on Suffolk County employees such as police officers if there were a radiological emergency at Shoreham?

A. [Dynes, Mileti] People who are trained emergency workers do emergency work in emergencies. Police officers would do police work if there were an emergency at Shoreham, firemen would do their jobs, and so on. A law will not keep people who have dedicated their lives to providing public safety from providing public safety when an emergency occurs.

What is likely, however, is that anyone who attempted to keep workers like police from participating in a real emergency would become the target of public outcry.

32. Q. In their draft emergency plan of November 1982, Suffolk County's consultants proposed assembling a team of specially recruited, trained, and motivated "emergency response drivers" to drive evacuation buses. What do you think of this suggestion?

A. [Dynes, Mileti, Sorensen] Assembling specially recruited, trained, and motivated drivers to drive evacuation buses is exactly what LILCO has done. These "special" drivers are part of the Local Emergency Response Organization that LILCO has put together. With adequate training, the ability to understand risk, and a means to know that their family's safety is not a problem, these bus drivers will drive the evacuation buses.

This specially assembled team, however, is only a good idea insofar as it is part of LERO. It would be a foolish idea to provide such a team if emergency response were being addressed by local government organizations. In that case, it would be

more prudent to train, impart the ability to understand risk, and provide a means for checking on family safety to people who routinely drive buses.

33. Q. Can you summarize why you do not expect role strain to prevent an adequate emergency response?

A. [Dynes, Mileti] The potential of role strain for reducing the effectiveness of an emergency response can be mitigated by the organizational and occupational assignment of emergency responsibility. Assigning clear responsibility creates clear direction for behavior and increases the probability, and usually ensures, that individuals will perform these responsibilities. This is evidenced by the high performance levels exhibited in emergencies by members of emergency organizations like police and fire departments, public works departments, highway departments, emergency medical personnel, hospital personnel, and other workers with clear emergency responsibility.

Also, assigning clear responsibility makes it clear to emergency workers that they have responsibilities to their coworkers. Not showing up for work would make things more difficult for others.

Finally, knowing his or her role in advance allows the emergency worker to arrange to avoid role "conflict" and indeed to fill the role of family member more effectively than if he or she were not an emergency worker. The worker can preplan for his family's safety. If he is home when called upon to respond to an emergency, he can implement the previously worked-out plan and make adjustments to it to fit the specific situation. In this way, the male has the opportunity to play the strong husband and father role and then to extend those obligations in the context of his emergency organization responsibilities. Also, because of his organizational ties he is more likely to receive information about the nature of the emergency and the nature of the risk, which should allow him to fulfill his family obligations more effectively.

34. Q. How do you make sure the emergency worker does all these things?

A. [All witnesses] Such performance levels are ensured by training. Training provides the context for those individuals to preplan activities that allow them to implement their emergency roles, such as providing back-up and supplementary options for continuing family responsibility.

In particular:

(1) Training gives the emergency worker a clear idea of what is expected of him -- of what his emergency role is.

(2) Training makes the worker aware that the community and his coworkers depend on him.

(3) Training makes the worker aware of such things as the LERO family relocation center, the Emergency Worker Tracking System, and the other communications networks available to them for getting information about the emergency.

(4) Training informs the worker about the nature of the radiation risk and about the procedures to be used in dealing with that risk, such as the use of dosimeters.

35. Q. We've focused mostly on LILCO employees. What about the other people addressed by Contention 25, such as DOE personnel, Red Cross workers, and so on?

A. [Cordaro, Weismantle] Let us take each category of personnel in turn:

Contention 25.A Contention 25.A addresses LILCO personnel. These have already been covered.

Contention 25.B Contention 25.B covers DOE personnel from Brookhaven National Laboratory. What has been said above about "emergency workers" in general is especially true of the DOE personnel. First, the DOE people are part of a FRMAP team that is prepared to respond to emergencies at nuclear plants around the country. This is a well-established federal program with roles and lines of authority clearly designated. The FRMAP team members know they could be called at any time to respond to a radiological emergency. Second, DOE has its own training program. Third, the DOE people are radiation experts and thus understand the risk as well as anyone could. Finally, the FRMAP response is exercised in real-world incidents (including Three Mile Island).

Contention 25.C Contention 25.C covers school bus drivers and evacuation bus drivers. Of the school bus drivers included in the survey commissioned by Suffolk County only 3 percent said they would immediately leave the evacuation zone. Twenty-four percent said they would first report to work; 69 percent said they would first make sure that their families were safely out of the evacuation zone;

and 4 percent volunteered that they would first check on their families and then report to work.

Although we do not believe, based on the advice of our behavioral consultants, that a survey of this type can accurately predict emergency behavior, we find comfort in the fact that even if it did, the results of the County's survey do not suggest a massive defection of school bus drivers, particularly when you consider that "making sure that one's family is safely out of the evacuation zone" might be done by a single phone call in some instances. Moreover, LILCO will offer basic radiological training to school bus drivers and will reimburse them for their time spent in such training.

As for evacuation bus drivers, our plan calls for them to be trained LILCO volunteers. In addition, we plan to offer basic radiological training to the bus drivers who work for companies that will supply LERO with buses. These drivers could be another source of personnel, on an ad hoc basis, to implement an evacuation. Finally, evacuation bus drivers will be provided dosimeters.

Contention 25.D Contention 25.D covers school teachers, other school employees, and crossing guards. The schools in the 10-mile EPZ already have early dismissal plans, and the school districts are developing emergency plans of their own, which are to cover radiological emergencies. Even if some school teachers did desert their classes, we believe there would be enough left to successfully oversee early dismissal.

[Mileti] I have no doubt that many school teachers can be found that will testify in advance that they will desert their classes in a radiological emergency. (This would also be the case in the vicinity of other nuclear reactors besides Shoreham, I am sure.) I also have no doubt that in a real radiological emergency most school teachers would remain with their charges at least long enough to see them safely dismissed or safely onto evacuation buses, particularly if those charges were small children. (It would be well to remember that students range from toddlers up to adolescents; some students are more needful of teacher supervision than others.)

Contention 25.E Contention 25.E covers ambulance drivers, rescue vehicle drivers, paramedics, Long Island Railroad personnel, etc. Ambulance drivers will be provided under letters of agreement with the ambulance companies. Under the emergency plan they will be doing the same sort of thing they do ordinarily (that is, driving ambulances). They will be offered basic radiation training, reimbursed for their time spent in training sessions, and provided with dosimeters in an emergency. Even if the expected number of ambulance drivers did not report for duty, it would only mean that it would take longer to evacuate the special groups. It would not mean that the emergency response effort would fail.

Contention 25.F Contention 25.F covers the Red Cross and Salvation Army. (The LILCO Transition Plan no longer relies on churches, industries, and other volunteers.) In the first place, the Red Cross's only responsibility is to set up and run relocation centers outside the EPZ. If some Red Cross personnel were delayed for a few hours by family obligations, it would not make the emergency response ineffective.

Also, the Red Cross has developed its own training program for radiological emergencies. LERO will review this program and, after consultation with the Red Cross, provide any supplemental training that may be necessary.

Also, the manning of relocation centers does not require large numbers of Red Cross personnel. It is the Red Cross's practice to use volunteers from among the evacuees themselves to do much of the work at the centers; a much smaller number of Red Cross personnel organize and supervise the work. This practice makes good sense, because the more evacuees that come to the relocation centers, the larger is the pool from which to draw people to work at the centers.

The Red Cross activated two relocation centers during the Three Mile Island accident, one at Hershey and one in York County.

Finally, there is no question that Red Cross personnel have a clear understanding of their "roles" in an emergency. The responsibilities and organization of the Red Cross are set out in some detail in its "Disaster Services Regulations and Procedures" (ARC 3027, May 1980).

As for the Salvation Army, its role is to support the Red Cross, including providing clothing for evacuees. It is almost inconceivable that role abandonment by Salvation Army personnel would materially affect the public health and safety.

36. Q. You've described in some detail the ways in which, and the reasons why, emergency workers act in emergencies. Do you think there is anything unusual about Long Island or Suffolk County that would make these principles of behavior inapplicable there?

A. [Dynes, Mileti] No.

37. Q. If it's true, as you say, that emergency workers generally do not abandon their jobs, why do people seem to accept so readily the notion that "role conflict" will be a problem in emergencies?

A. [Dynes, Mileti] Often, subsequent to an emergency, there will be stories about cases where individuals did not fulfill their emergency roles. (Some of these rumors are likely to be reported in hearings as fact.) It is highly unlikely that such anecdotes are based in empirical reality, but the retelling makes them a part of the post-emergency

"reality." Such stories, in the absence of evidence, are perhaps best seen as moral tales, rather than as reflections of reality. They represent, as a part of the oral tradition, the lore that emergency responsibility is important and that the lack of attention to it has unfortunate results. Thus, such stories tend to reinforce role obligations for the future rather than describe examples of failures in past behavior. The certainty with which people defend such stories gives clues to the moral nature of their purpose.

V. Suffolk County's Theory of "Role Conflict"

A. Expert Opinion

38. Q. We have discussed at some length why you believe that role strain and role abandonment will not prevent an effective emergency response. It will now be necessary to go into why Suffolk County and the other intervenors in this case think otherwise. Obviously some sociologists believe that "role conflict" could be a real problem in a radiological emergency. Do most of the people who have studied disasters agree with Suffolk County or with you?

A. [Mileti]. It is difficult to answer this question, because I have not conducted a survey of the opinions of all people who have studied disasters. I do know, however, the opinions of some disaster researchers. This "sample" is limited to those persons with whom I have discussed the topic.

For example, last summer the Natural Hazards Information Center at the University of Colorado held its annual national conference on hazards. The theme was human-made hazards. One session of the conference was devoted to "role conflict" simply because it has been a popular current issue in reference to human-made hazards. (The County's consultant Dr. Erikson was unable to attend this session). The consensus of those in attendance at this "role conflict" session was that role conflict -- and by implication role abandonment -- is not a real issue in natural or human-made emergencies.

[Dynes] This question brings up an interesting point. Some scholars study emergencies after they happen and try to reconstruct what they think happened at the time. By contrast, there are researchers who have focused research on actual

behavior in emergencies with long research experience in a wide variety of emergencies, such as the Disaster Research Center and the Natural Hazards group in Colorado. Researchers who have had extensive experience in observing emergency behavior (Quarentelli, Dynes, and Drabek) have indicated that role conflict is a non-problem.

39. Q. Suffolk County's consultant Dr. Erikson has said that there have been a number of occasions in human history in which the first thing people did in response to a crisis was to go home and take care of their families. He has cited the cases of Seveso, a town in northern Italy where a fire in a chemical plant occurred; Hiroshima and Nagasaki; and the disaster at Buffalo Creek. (As to Buffalo Creek, Dr. Erikson has said that "to the extent that the people who lived in that area under other circumstances would have been emergency workers, I can say that they went home first and took care of other duties, volunteered for other duties only afterwards.")[1] Do you agree that these four examples

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[1] Deposition of Kai T. Erikson, Pacific Gas and Electric Co. (Diablo Canyon Nuclear Power Plant, Units 1 and 2), Doc. Nos. 50-275 OL & 50-323 OL, Tr. 21 (Dec. 14, 1981).

show that "role conflict" can hinder an emergency response?

A. [Mileti]. I agree with Dr. Erikson that there have been occasions in human history in which the first thing "people" did in an emergency was go home and take care of their families. (This behavior often occurs when home is next door, or when "taking care of family" means asking the simple question, "Is everyone okay?") I disagree, however, that the cases he references -- or others that I imagine could be referenced -- mean anything in reference to the behavior of emergency workers for an accident at Shoreham. The reason that Dr. Erikson and I disagree on this latter point is simple. I do not believe it is fair to point to examples of how non-emergency workers behaved and to generalize to emergency workers.

Emergency workers who have a clear notion of what their emergency role is perform their jobs in emergencies. People who are not emergency workers and who have no emergency roles, or whose emergency roles are unclear, do in fact opt for more "certain" roles in disasters -- for example, the role of father. After that role has been played, then

these people often volunteer for "volunteer emergency work." The key question to address in understanding how Dr. Erikson and I have come to disagree on the meaning of a disaster like the one that occurred in Seveso is whether that disaster tells us anything about the behavior of trained emergency workers or about the process by which the non-emergency worker public comes to volunteer for emergency work.

B. Cited Examples of "Role Conflict"

40. Q. Let's take the specific examples I mentioned. What about Seveso?

A. [Mileti] Seveso is a town in Northern Italy that had a chemical plant (owned, I believe, by a Swiss company). The plant had an explosion, and the contamination released was severe; the town is still abandoned because it was so severely poisoned.

Reportedly the first thing that people did in this emergency was go home to reunite with their families. But this is not an example of role abandonment on a communitywide basis. In fact, it merely suggests that in an emergency non-emergency workers

do not do emergency work first. The company that owned the plant, I imagine, did not think that there could ever be an accident. There were no emergency jobs. There was no designated emergency plan, there had never been emergency planning, and consequently there were no predesignated emergency workers. It is hard to see how this case, in which there were no designated emergency workers, illustrates role abandonment by emergency workers.

41. Q. Is the Buffalo Creek disaster evidence for role abandonment in emergencies?

A. [Mileti] The Buffalo Creek disaster, a devastating flood that was studied by Suffolk County's consultant Dr. Erikson, likewise does not illustrate role abandonment by emergency workers. In fact, the situation at Buffalo Creek was somewhat similar to the one at Seveso. Non-emergency workers (that is, public volunteers without emergency roles) did other things before volunteering for public service as volunteer emergency workers. I believe that it has also been reported that street cleaners delayed in providing this disaster service a few hours. However, there is no evidence of which I am aware that documents or even suggests that these people

were trained in terms of an emergency role or knew that they had one. And in any event, debris clearance never has high priority in the initial stages of response to an emergency.

42. Q. How about Hiroshima and Nagasaki?

A. [Mileti] The cases of Hiroshima and Nagasaki have also been suggested as cases in which emergency workers abandoned their emergency roles. The explosion of a nuclear bomb wreaks such widespread devastation, death, and loss as to be a class apart from emergencies like those that could occur because of most natural and other human-made emergencies.

I have recently been to Japan and conducted investigations of the Hiroshima and Nagasaki atomic bomb holocausts. I talked with several Japanese social scientist colleagues and several survivors of the Hiroshima A-bomb, and I have read the results of the work by The Committee for the Compilation of Materials on Damage Caused by the Atomic Bombs in Hiroshima and Nagasaki to bring together much of what is known about these events. Their book, entitled Hiroshima and Nagasaki: The Physical,

Medical and Social Effects of the Atomic Bombings, was published in Japanese in Tokyo by Iwanami Publishers in 1979. The English translation appeared in 1981.

The results of these investigations have led me to conclude that neither the Hiroshima nor the Nagasaki holocaust provides any evidence of role abandonment by emergency workers. Both A-bombs destroyed all emergency organizations in both cities. The few emergency worker survivors (a handful of medical personnel and firefighters) quickly began to do emergency work. Eventually volunteers emerged from other areas to offer what aid they could.

Hiroshima and Nagasaki were in designated air defense zones during World War II. As a consequence they had special military police garrisons, police guards, civil defense systems, government conscripted worker teams, local neighborhood associations, first aid teams, relief teams, sanitation teams, emergency hospitals, first aid stations, and refuge shelters.

The atomic bombs, however, almost totally destroyed both cities. All these emergency organizations were rendered useless by the damage from the bombs. The systems established for dealing with air raids and other emergencies were destroyed and were thus unable to give the aid needed by those who did survive the holocausts. In Hiroshima, for example, the above-referenced work says there were 2.31 deaths per 4.88 persons (the size of the average household) in the central bombed area. Other survey estimates suggest that death rates could have been even higher. For example, T. Kawai, K. Harada, and N. Tanaka, Changes in the Social Life of Atomic Bomb Survivors (1,2) Social Reconstruction Process Observed in Hiroshima Urban District Case Report Survey, Hogaku Kenkyu (translation: Journal of Law, Politics, and Sociology), Vol. 42, pages 1340 and 1472 (1969), estimates that in the Kan'on district (about a kilometer west of the epicenter) the death rate was 54% of all household members.

The Committee for the Compilation of Materials on Damage Caused by the Atomic Bombs in Hiroshima and Nagasaki (1981) at page 379 gives further estimates

of how all-pervasive was the death of emergency workers: 93% of nurses and 90% of doctors in Hiroshima were either killed or injured. The Committee concludes (also at page 379) that "eighteen emergency hospitals and thirty-two first aid clinics were destroyed; and most of the personnel needed to restore them to use were killed or injured. As approximately 90% of all medical personnel in the city were dead or disabled, and the hospitals were destroyed or damaged, all medical care was thrown into confusion."

The Japanese army sent in a medical unit. Doctors and other volunteers came in from Ninoshima. The day of the bombing also saw other medical personnel arrive from the army sanitorium in Saijo and from medical associations in Onomichi City and Toyota and Yamagata Counties. The next day even more volunteers arrived.

The Hiroshima and Nagasaki holocausts are not examples of the abandonment of medical roles by emergency workers. They are examples of the complete destruction of a community's emergency organizations and the almost total death or injury of all emergency workers. A team of medical worker

survivors from the local medical association in Nagasaki ". . . quickly assembled at Katsuyama Primary School northeast of the City Hall . . . Fear of spreading fires forced them to move to Irabayashi Primary School; but by evening the number of patients exceeded a thousand, and available medical supplies were exhausted" (The Committee for the Compilation of Materials on Damage Caused by the Atomic Bombs in Hiroshima and Nagasaki (1981) at page 382). It seems the few medical workers who did survive did not abandon their emergency roles but quickly assembled to perform them. The scale of the emergency, however, was too large for them to be successful.

Other emergency workers in Nagasaki were more fortunate in that more firefighting capabilities (equipment and personnel) were available. These emergency workers assembled two hose companies under the direct control of the Nagasaki Fire Department "soon after the bombing" (cf. pages 202-204 of Nagasaki Shiyakusho, Nagasaki Genbaku Sensaishi [Translation: Record of the Nagasaki A Bomb War Disaster RNAWD], Vol. 1, published by Nagasaki Koskusai Bunka Kaisan [Translation: Nagasaki International Cultural Hall] 1977.

Emergency work was scantly performed in Hiroshima and Nagasaki because few emergency workers survived the holocaust and not because of role abandonment.

In short, Seveso, Hiroshima, Buffalo Creek, and Nagasaki provide no evidence that trained emergency workers do not do their emergency jobs or perform emergency roles in emergencies.

C. A Review of the Literature on Role Conflict

43. Q. You seem very certain that role abandonment would not occur during a radiological emergency at Shoreham. Yet the County's consultants believe otherwise. How is the Board to decide which group of experts is right? To put it another way, how can two groups of sociologists and geographers come to opposite conclusions on the basis of the same body of evidence?

A. [Dynes, Mileti, Sorensen]. In the first place, we do not disagree with the County's consultants on some of the fundamental ideas. For example, the idea that people occupy a variety of social roles is an old and now standard view among sociologists.

We also agree that at any one time a person can be in a position of having different roles compete for his attention. This theme is often repeated in the work of sociologists and has surfaced in the general sociological literature, as well as the specialized disaster and emergency literature. Some of the general literature on the topic includes, for example, Stephen Marks, "Multiple Roles and Role Strain," American Sociological Review 42:921-936, 1977; Sam D. Sieber, "Toward a Theory of Role Accumulation," American Sociological Review 39:567-578, 1974; Jean Lipman-Blumen, "Role Differentiation as a System Response to Crisis," Sociological Inquiry 43:105-129, 1973; Derek Pugh, "Role Activation Conflict," American Sociological Review 31:835-842, 1966; and Howard J. Ehrlich, James W. Rinehart and John C. Howell, "The Study of Role Conflict: Explorations in Methodology," Sociometry 24:85-97.

1. The First Generation: Killian's 1952 Article and Its Progeny

44. Q. Where, then, do you disagree?

A. [Dynes, Mileti] Where we start to disagree with

Suffolk County is in the interpretation and significance of the "first generation" of the literature of role conflict, beginning with Killian's seminal 1952 article, "The Significance of Multi-Group Membership in Disaster," previously mentioned (Question 7 above).

Killian's work had but one purpose: to develop a typology of role conflict. That is, he sought not to document the occurrence of role conflict in a particular situation, but rather to describe a concept that he thought important to the sociological enterprise. He did this so well that his work has become a classic in sociology.

The one among the four types of role conflict that Killian described that is of interest here is conflict between family and work groups. Disasters provide the discipline with a good example in which to illustrate role conflict and to enable students to "imagine" role conflict by thinking about having a family at home when disaster strikes while being at work and having an emergency job.

45. Q. I take it that some part of Killian's article is susceptible to misinterpretation?

A. [Dynes, Mileti] Yes. At page 311, Killian reported what appears to be a conclusion from empirical evidence about how people resolved having different roles compete for their attention in the emergency/disaster he studies. He states that "The great majority of persons interviewed who were involved in such dilemmas resolved them in favor of the family, or, in some cases, to friendship groups. Much of the initial confusion, disorder and seemingly complete disorganization reported in disaster communities was the result of families to find and rejoin their families" (p. 311). But it is important to note that Killian stated in his article, after describing the hypothetical examples of role conflict, that "in none of the four communities studied did the disastrous consequences contemplated above seem to have materialized."

46. Q. Did other researchers reach similar conclusions?

A. [Dynes, Mileti] Yes, five in particular: Instituut Voor Sociaal Onderzoek Van Het Nederlandse Volk Amsterdam (1955), Moore (1958),

Fogleman (1958), Form and Nosow (1958), and Moore again (1963).

47. Q. What was the first of these, the study by the Instituut Voor Sociaal?

A. [Dynes, Mileti] In 1955 there appeared Studies in Holland Flood Disaster 1953, a study performed by the Institute Voor Sociaal Onderzoek Van Het Nederlandse Volk Amsterdam and published in four volumes by the National Academy of Sciences - National Research Council in Washington, D.C. On page 11 of Volume IV, the researchers conclude two things that seemingly reinforce the notion presented by Killian, although no actual evidence for this interpretation is provided by the authors. They conclude that "The choice of most men was to be with their families rather than fulfilling the tasks which they should have done in their positions as members of another group" and "The number of men in rescue and aid work increased, if they knew that their wives and children were safe."

48. Q. What was the 1958 Moore study?

A. [Dynes, Mileti] Harry E. Moore in 1958 in Tornadoes Over Texas, Austin: University of Texas Press at page 245 reported that:

> efforts to reunite the family were the first things done in many cases. Until this was done everything else was postponed and reported to have been insignificant.

Moore also provided three examples of how key officials fell prey to role conflict. He recounts that (1) the mayor, on becoming aware of the disaster while driving home, went home, picked up his wife, and started out to see what had happened; (2) the director of civil defense was at the scene when the impact fell, and after making calls to alert several disaster agencies, he reassured himself of the safety of his family by first telephoning and then by going home; and (3) the city manager, also close to the scene, checked with his wife by telephone in the course of his official activities to see whether she was injured; he was able to do this because he was at police headquarters, which had special telephone lines.

49. Q. Describe the Fogleman study.

A. [Dynes, Mileti] Also in 1958, we were provided more of what seemed to be accounts of role abandonment because of role conflict in emergencies. Charles W. Fogleman, in his dissertation, "Family and Community in Disaster: A Social - Pychological

Study of the Effects of a Major Disaster Upon Individuals and Groups," at Louisiana State University in Baton Rouge, stated at page 343 that "For many of the husbands/fathers the role of protector structured activity during impact."

50. Q. What about Form and Nosow?

A. [Dynes, Mileti] In 1958, William H. Form and Sigmund Nosow, in a book entitled Community in Disaster (New York: Harper and Brothers), provided some generalizat ons that seemed to sum up all the "evidence" accumulated. They say, at page 66, that "Help for family members close friends, and neighbors comes first, then, but apparently only then, other victims can be looked after;" and at pages 114-115, that "only half of those persons (belonging to disaster orientated organizations) . . . sought to relate their activities to occupational organizational statuses;" and at page 102, that "greater conflict exists for those who have injured family members than for those who do not;" and at page 103 that "women experienced more conflict than men;" and at page 109, that "those who experienced . . . conflict showed a greater concern for family, neighbors and friends."

51. Q. The last example you mentioned was another study by Moore. What was it?

A. [Dynes, Mileti] In 1963, Harry E. Moore and his colleagues again claimed that role conflict, or the presence of conflicting obligations, is an important consideration for some persons in disasters. This was based on the study Before the Wind: A Study of Response to Hurricane Carla, published by the National Academy of Sciences - National Research Council, Washington, D.C.

52. Q. Do these studies support Suffolk County's position?

A. [Dynes, Mileti] These works (Killian, 1952; Instituut Voor Sociaal, 1955; Moore, 1958; Fogleman, 1958; Form and Nosow, 1958; and Moore, 1963) and perhaps a few others provide the "evidence" that role conflict exists in emergencies and can result in role abandonment. The picture provided by them has been summarized in overviews of disaster books (for example, Allen H. Barton, Communities in Disaster: A Sociological Analysis of Collective Stress Situations, Garden City, New York: Doubleday and Co., Inc., 1969) and literature synthesis monographs (for example, Dennis S.

Mileti, Thomas E. Drabek, and J. Eugene Haas, Human Systems in Extreme Environments: A Sociological Perspective (Boulder, Colorado: Institute of Behavioral Science 1975) and is referenced uncritically in most introductory textbooks on sociology.

If we were to base our judgment about role conflict only on these early empirical works that provide, seemingly, "accounts" of role abandonment or conflict or both, we would be left with the impression that (1) emergencies yield role conflict, (2) role conflict yields role abandonment, (3) role abandonment yields social disorganization, and (4) emergency planning that relies on "locals" cannot work because role abandonment can keep locals from doing their emergency work. This, indeed, is the conventional wisdom of people who speculate about human behavior based on lay impressions, or based on a selective reading of old literature, or based on the reading of a college freshman textbook.

2. The Second Generation: Killian's 1954 Article and Its Progeny

53. Q. You imply that there are additional studies.

A. [Dynes, Mileti] Knowledge about role conflict and

its related concepts (for example, role stress, role abandonment, and so forth) does not end with the studies listed above. Other questions need to be answered before we can conclude that nuclear power accidents would result in emergency workers not doing their jobs. For example, is the behavior being reported that of people who (by whatever means) know that they have an emergency job, or of people who do not know that they have an emergency job but who outside observers judge should have thought one up during an emergency? (The "outside observers" could be sociologists expecting to find "social disorganization" (as the field of disaster research was called by some when it first began), or anyone else.) Is role conflict or strain something that results in playing only one role to the exclusion of another, or can it be and is it resolved by playing both? Even if there really are cases of people who knew they had an emergency job leaving that job, did they leave without regard for whether or not the emergency work could get done by others, or was it clear before they left that others staying on the job would be able to handle it?

The answers to questions like these will help us understand whether role abandonment occurs in emergencies; whether early accounts of role abandonment were based, for example, on researchers observing persons who did not know they had emergency jobs; why role abandonment occurs if it does; and if and how it can be managed in emergency preparedness, if it is a problem.

It is quite interesting that the scholar who gave us the concept of role conflict in disasters and emergencies was also the first to step forward to begin a clarification of what really goes on in emergencies with respect to role conflict and role abandonment. Too many people, however, ignore this second generation of research, begun by Killian himself, and as a result they never gain a good understanding of the phenomenon.

In 1954 (only two years after his first article on role conflict) Lewis M. Killian published a paper entitled "Some Accomplishments and Some Needs in Disaster Study," The Journal of Social Issues X: 66-72. In this work, the field was provided some important insights (before the other studies "documenting" role conflict/abandonment past Killian's

original work in 1952 were ever performed) that, unfortunately, went ignored. Had the Instituut Voor Sociaal, Moore, Fogleman and Nosow, and others taken account of Killian's second article, they might have better understood what they reported as "role abandonment" in their own studies.

Killian's 1954 article addressed whether or not role conflict will result in role abandonment during emergencies. He wrote, on page 69, that "The possession by the individual of a clear conception of a role which he can or should play seems to be conducive to organized adaptive behavior." What Killian was saying is that emergencies are not social disorganization, and role conflict does not result in role abandonment if emergency workers are provided -- before an emergency -- with a clear idea of what their emergency roles are.

This idea was an influential one in the 1950's, for few communities in America had emergency plans that gave would-be emergency workers a clear idea of what their roles would be in an emergency or even of whether they had one. This pioneering insight was part of the spark that started emergency planning in the nation for all sorts of emergencies.

Nevertheless, those who observed the behavior of would-be emergency workers in emergencies that took place in communities without good plans (and without clear emergency roles for emergency workers) and who had not read or had ignored Killian's second article concluded that "role abandonment" was a characteristic of emergencies. What they were actually observing was people who did not have clear emergency roles doing other things. These observations were not of role abandonment, since one can't really be said to "abandon" a role if he does not know that he has it. Killian also points out in this second article that role conflict can contribute to "personal disorganization" or "anxiety" while emergency workers do their work.

These insights given us in 1954 by Killian himself still hold true today. Role conflict does not result in role abandonment if would-be emergency workers have a clear idea of what their emergency roles are. Role conflict does result in the mental need of people to know that their loved ones are safe; if plans do not address how this can be accomplished, workers will "improvise" a way of finding out while doing their work. But emergency

plans can attempt to provide a means whereby this can be accomplished. Without planning, role conflict can, indeed, produce role abandonment. However, with planning, role conflict simply produces concern for loved ones. Plans can seek to address these concerns.

54. Q. Does this view rest on more than just Killian's 1954 article?

A. [Dynes, Mileti] This more informed view rests on more than Killian's 1954 article. For example, in 1961 Charles E. Fritz wrote another classic piece of literature in the field in which he tried to bring things up-to-date. It was titled, simply, "Disaster" (pages 651-694 in Merton and Nisbet (eds.) Contemporary Social Problems, New York: Harcourt).

On page 675 of this book (which itself has become a classic textbook on social problems), Fritz addresses how families, emergency jobs, people with emergency jobs, and people without emergency jobs all relate. In essence, what Fritz (who was until recently on the National Academy of Sciences' National Research Council in the "disaster-research"

component) said was this: (1) All people are concerned for loved ones in disaster. (2) Most people do not have emergency roles, and these people are torn between loyalty to intimates and loyalty to the community; most of these people first tend to their intimates and only then volunteer for emergency work. (3) People with clearly defined emergency jobs, however, do these jobs, but with a considerable degree of personal stress until they are assured of the safety of intimates. (4) Special provisions can be made to assure emergency workers of family and intimate safety and remove this stress for them. Consequently, (5) role conflict for emergency workers that have a clear notion of their emergency role is a mental and not a behavioral phenomenon.

55. Q. What other support is there for this view?

A. [Dynes, Mileti] In 1963 another piece of research on disasters was performed. It looked at many things, including role conflict and abandonment. It was Fred L. Bates et al., The Social and Psychological Consequences of a Natural Disaster, published by the National Academy of Sciences - National Research Council, Washington, D.C. Bates

and his colleagues (perhaps because they had read Killian's 1952 article but not Killian's 1954 publication or Fritz's piece in Merton and Nisbet's book) expected to find that organizational personnel with disaster responsibilities would experience intense conflict and perhaps even abandon their work roles in order to be with their families. They found, however, a lack of role conflict (they meant lack of role abandonment) during both the warning (before) and post-impact (after) disaster periods. Perhaps Bates happened to do his study in a community with a good pre-emergency plan, under which workers knew their roles.

At about the same time (1962), Meda White wrote a report at the University of Chicago. It was entitled Role Conflict in Disasters: Not Family but Familiarity First. White did her work eight years after these disasters occurred, so she was researching the disasters in communities with emergency plans of the generally unsatisfactory sort that were to be found in the early 1950's. Nevertheless, she found in research on three different emergencies that 82% of the people studied contributed to disaster activity first over the family and

that this rose to 89% after the first four hours of the disaster. She concluded that "role certainty" is a requisite for what emergency workers do in an emergency. That is, people seek role certainty in emergencies. If the emergency work role is uncertain, people will opt for family roles, which are more clearly known and certain. However, if emergency roles can be made "certain," then people will do their emergency jobs.

56. Q. How can you make emergency roles more certain?

A. [Mileti] By training. Good training breeds emergency role certainty, which leads to people doing their emergency jobs.

57. Q. Did Killian's second article succeed in setting the record straight?

A. [Dynes, Mileti] Killian's second article was in a journal read by fewer scholars than his first; Fritz's work was in a sophomore text book; awareness of Bates et al.'s work was confined to "disaster specialists" who would have access to an Academy report, as was White's; and so these works were sought out by only the most committed scholars. It is little wonder, then, that only sociologists who

had "disasters" as their area of prime interest and specialty thought role conflict was not a real problem in emergencies where roles were defined and workers properly trained.

Those whose experience with the concept was more limited continued to think of it as a major problem. To this day, an occasional sociologist, unfamiliar with the history, theory, and substance of disaster research, may do a piece of "disaster research" in which, after observing someone who he believes has or should have an emergency role (but who does not himself know that he has an emergency role), the sociologist concludes that role abandonment has occurred. This mistake can be made even by trained sociologists, and the risk of error is even greater when one takes the word of the uninformed and untrained person (for example, a medical administrator) as evidence of role abandonment.

3. The Third Generation: Dynes and Quarantelli

58. Q. Is that all there is on the subject?

A. [Dynes, Mileti] No. There is a third generation of work in sociology about role conflict, strain, and abandonment in emergencies that must also be addressed.

In a book titled Organized Behavior in Disaster (Lexington, Mass.: D.C. Health), Russell Dynes tried to set the record straight in 1970. In a different way, he reported the knowledge reviewed above. Citing Killian's statement, set out above, that "in none of the four communities studied did the disastrous consequences contemplated above seem to have materialized," Dynes explained as follows:

> Part of the explanation of the fact that the "disastrous consequences contemplated" did not materialize is that the abandonment of organizational roles simply does not occur. While such conflict is theoretically possible and while individuals are obviously confronted with the choice of alternative actions, it seems clear that they do not abandon their roles in disaster-relevant organizations.

59. Q. Is there any more literature we should know about?

A. [Dynes, Mileti] Perhaps the most all-inclusive work on role conflict/abandonment ever performed was written by E. L. Quarantelli (and co-authored

by Russell Dynes). It is titled Structured Factors in the Minimization of Role Conflict: A Re-Examination of Significance of Multiple Group Membership in Disasters and is currently unpublished, but it is available as Preliminary Paper 49 from the Disaster Research Center at Ohio State University. This work looked at 150 different disaster events and over 6000 emergency workers. (These intervenors are referred to in Question 12 above.) The conclusion, reported on page 3, was that role conflict was not a serious problem in the loss of manpower in emergency situations.

Six emergency events were examined in more detail. In these events, no one at work when the emergency began abandoned his emergency job. A dozen people, however, left their jobs temporarily; they were not needed for the organization to do its work. The conclusion of this work was that role abandonment is absent in emergencies because of social changes that occur in communities when emergencies begin; for example, other family members pick up internal obligations to the family, kin, neighbors, and so on, which allows other family members to participate in emergency roles.

The original question put to us asked for guidance on choosing between the views of two groups of experts who held opposing views. We cannot tell you how many scholars hold one view and how many the other, because we have not polled our colleagues for their opinions. But we can say -- and the reason for this claim should be obvious from the preceding sections of our answer -- that there would likely be some who hold an uninformed opinion that rests on what came from Killian's 1952 journal article. Then there would be consensus among those familiar with all the work in this field that role abandonment simply does not happen if people have a clear idea about what their emergency job is.

D. Three Mile Island

60. Q. Was "role conflict" or "role strain" a problem at Three Mile Island? Please describe what information is available about how emergency workers responded (or failed to respond) during the accident.

A. [Dynes, Mileti, Sorensen] As far as we know, there is no information about the phenomenon of "role strain" or "role conflict" in emergency workers during the Three Mile Island accident. Remember

that these concepts refer to mental "feelings" about concern for doing one's job and concern for intimates (for example, family members). No one knows what was in emergency workers' minds during the accident.

61. Q. Okay, what about role abandonment?

A. [Dynes, Mileti] Information is available about how emergency workers actually behaved during the emergency (that is, information about role abandonment), but even this information is sparse, because apparently no one conducted a full-scale study of role abandonment per se.

There is a short passage in the Report of the President's Commission on Three Mile Island (the Kemeny Report)[2] that apparently reflects claims that some hospital workers left their jobs. The passage likely rests on what has been written about hospital workers in two medical publications. This information is discussed elsewhere in this testimony (Questions 63-66), so we will not go into it here.

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[2] "A substantial number of other persons [that is, other than pregnant women and preschool children], including health professionals, voluntarily left the area around the plant during the weekend of March 30 through April 1." J. G. Kemeny et al., Report of the President's Commission on theAccident at Three Mile Island, 41 ¶ 17 (Oct. 1979).

62. Q. Do you have any first-hand knowledge about role abandonment at TMI?

A. [Mileti]. The only other information about role abandonment at Three Mile Island that I know about has not yet been written up or published, because I developed it in preparing this testimony. I realized that very little information had ever been gathered about emergency workers and role abandonment during the Three Mile Island accident. I also recalled that on my several trips to Three Mile Island in 1979 and 1980 I had had informal conversations with all sorts of people about a variety of topics. On occasion, I asked people if emergency workers had showed up for work during the accident. As I recall these conversations, all the people I queried said that as far as they knew, emergency workers had done their jobs.

These conversations were hardly a "study." Because of their limited usefulness, I decided that it would be more helpful if someone simply phoned a variety of emergency organizations in Pennsylvania that would have had emergency responsibilities during the Three Mile Island accident and ask whether role abandonment occurred or not. Luckily, a Ph.D.

candidate in the Department of Sociology at Colorado State University was interested enough in the idea to call and talk to several emergency organizations in Pennsylvania. This student had helped me do other work on Three Mile Island and was familiar with the accident, its timing, and the TMI research that has been done; he is currently working under my direction on a dissertation that uses organizations as the unit of analysis.

My instructions to him were simple: (1) call a variety of organizations that would have had emergency responsibilities of some sort during the Three Mile Island accident in the 0- to 5-mile ring around TMI; (2) be sure to include some local schools to find out about the behavior of teachers, bus drivers, and other school personnel before the schools were closed; (3) speak to someone high enough up in the organization to know about all the parts of the organization, but not so high up that he would not know about workers; (4) make sure that the organizational respondent had actually been present during the accident; and (5) ask if "role abandonment" had occurred in the organization, how many people it had involved, the total number of

emergency workers in the organization (so we could get an idea about what proportion of each organization abandoned their roles) and why individuals abandoned their emergency jobs.

This student phoned and questioned about a dozen organizations of his own choosing. These included five police departments, a spokesperson for a 100-plus-man volunteer fire force, a representative of the Middletown inclusive school district (who was asked about both teachers and bus drivers), civil defense, the State Troopers, the National Guard, the Pennsylvania Emergency Management Agency, and the personnel department for the entire Commonwealth of Pennsylvania bureaucracy in Harrisburg.

Not one case of role abandonment was reported by any organizational respondent in reference to teachers, bus drivers, the police, civil defense, the State Troopers, the National Guard, or the Pennsylvania Emergency Management Agency. The Commonwealth of Pennsylvania did report a 12-13% absentee rate on the Friday and Monday of the "TMI weekend"; however, they also reported that a 10% absentee rate is normal before and after any weekend. (In any event, general state employees are

hardly "emergency workers.") Also, the spokesperson for the volunteer fire department reported that "a few who wanted to leave the area did." These few evacuating volunteer firemen cannot be characterized as having "abandoned their roles"; there is no reason to believe they were called upon to fight fires during the TMI accident or that their presence was crucial to the functioning of local fire units.

This "study" -- if you can call it a study -- was hardly an elaborate one. However, it does provide some information about role abandonment -- or rather the lack of it -- among trained emergency workers, teachers, and school bus drivers during the Three Mile Island accident.

63. Q. The County's consultant Dr. Johnson has cited several studies of the behavior of health workers during the TMI accident. What are those studies?

A. [Dynes, Mileti] There were two papers, both written by hospital personnel about their perceptions about staffing in hospitals in the area around Three Mile Island. One was written by Christopher Maxwell, "Hospital Organization Response to the

Nuclear Accident at TMI: Implications of Future Orientated Disaster Planning," American Journal of Public Health, Volume 72, 1982, pp. 275-279. The other was by J. Stanley Smith and J.H. Fischer, "Special Communications: TMI: The Silent Disaster," Journal of the American Medical Association, Volume 245, April 24, 1983, pp. 1656-59. These two articles are personal accounts by administrators who worked at hospitals in the area around TMI and were at work during the TMI accident.

64. Q. What in your judgment do those papers tell us about "role conflict"? Do they support the County's thesis that "role conflict" makes the problem of emergency response to a radiological emergency difficult or impossible?

A. [Dynes, Mileti] The articles describe the effects of the confused and often conflicting information given to the public following the TMI accident, but they do not support the proposition that role abandonment was a problem among emergency workers during the TMI accident.

65. Q. What cautions should we keep in mind when we read papers such as these?

A. [Mileti] First, in all emergencies -- including the accident at Three Mile Island -- large numbers of people abandon their jobs. But it is important not to confuse the behavior of non-emergency workers with the behavior of emergency workers. "Routine" jobs are typically abandoned in emergencies, while emergency jobs are typically performed. The assumption should not be made that the behavior of workers described in these publications was the behavior of emergency workers. At no time was there a medical emergency at Three Mile Island.

Second, the aftermath of an emergency is always filled with stories that often become incorporated into folklore. That these stories exist does not mean that the events or interpretations of the events that they portray are true. Stories such as these are based on the interpretations by untrained lay observers of phenomena that may or may not be consistent with the way they are labeled. For example, the abandonment of factory work roles by workers in an emergency could be seen as "role

conflict" and abandonment by some, but not be seen in the same way by those seeking to examine the behavior of emergency workers in an emergency.

Stories about other unreal emergency behavior -- for example, panic, looting, and so forth -- often are told by the untrained observer after an emergency. The more informed observer, however, is rarely as biased in interpreting the behavior that underlies these myths.

For example, a man arrested for "looting" while sifting through the rubble of his own house for personal objects may be seized because the police expect to find looters. Onlookers who observe the arrests are quick to spread the myth that looting is going on. Their interpretation of the arrest -- erroneous on many fronts -- could well end up in the written record about what happened during the emergency. The written record and oral stories about looting, then, perpetuate the myth, alter the expectations of others about future emergencies, and result (in the example just cited) in still more erroneous expectations and arrests in subsequent emergencies.

Third, the published stories about "role abandonment" of medical personnel that have been provided us give little if any background with which to interpret their descriptions of the behavior of medical personnel. Suppose, for example, that a flood were coming, that there were a hospital situated in the flood plain, and that evacuation advisements were issued for people in the flood plain. Under these circumstances, would evacuating medical personnel be "abandoning roles," or would they be engaging in perfectly reasonable and appropriate behavior? We can answer this question only if we first know what circumstances prevailed when they left. "Role abandonment" would correctly characterize their leaving if they did so while knowing that their assigned role was to help evacuate patients and if they also knew that coworkers left behind would be incapable of performing the emergency duties that had to get done. But leaving could hardly be considered role abandonment if it were done without knowledge that they had an emergency role.

Fourth, the published stories about "role abandonment" of medical personnel in hospitals should not be interpreted in the absence of knowledge about the role of emergency information in determining the behavior of people in emergencies. The importance of information is addressed in LILCO's written testimony on the "shadow phenomenon" (Contention 23), but it is relevant to "role conflict" as well. For example, the uninformed may wonder why people who were not pregnant or young (the two groups advised to leave during Three Mile Island) also evacuated. The answer is simply that the public is not the military and cannot be expected to obey instructions blindly if a different course of action appears more rational in light of their perceptions of the risk. The advisement that some selected subpopulations should leave a definitive geographical area was also news to others in that area that they could exposed to some risk. Those who would have us use a military paradigm with which to evaluate public response at Three Mile Island would conclude that there was "overresponse" because more than the young and the pregnant left. Those who understand that people respond in emergencies on the basis of situational perceptions

of risk, on the other hand, would understand that evacuation advisements were a source of risk information for everyone in the area that was to be evacuated and not only for the pregnant and the young. This would be as true for workers doing routine hospital work as it would be for anyone else.

Fifth, one should also keep in mind, before turning to these published comments, that descriptive evidence of any sort is not a good predictor of future events unless it takes into account the determinants of these events. For example, the fact that a particular airliner has crashed in the past does not mean that others will crash. Rather, one has to investigate why the airliner crashed -- and why others do not -- and generalize to the future only on the basis of the determinants of successful versus unsuccessful flights. That is, one needs to determine that when x, y, and z exist, then an airliner can crash. One should never speculate about future events without considering the established, valid predictors of those events, because the determinants of what one is speculating about could well be different from one event to another.

66. Q. With these thoughts in mind, how do you interpret the two articles?

A. [Mileti] The two articles are personal accounts by people who worked in local hospitals in the area around TMI and who were there during the accident. I have read these accounts carefully and also have had a research assistant call Dr. Smith and Mr. Maxwell to ask some questions. Neither of these articles suggests that trained emergency workers did not do their emergency jobs during the Three Mile Island accident. There are several reasons why I hold this opinion.

These hospitals were not in the 0-5 mile TMI planning zone. For that reason, none of them had a radiological emergency plan that clearly specified emergency roles for workers. At the same time, the public information at the time suggested that "risk" did exist at the location of the hospitals. Dr. Smith reported that about 50 percent of the staff left who were specialists and not in a role of responsibility for activities that would include, for example, patient evacuation. Others stayed and eventually got involved in patient evacuation. Also, division chiefs and other higher

authorities stayed to oversee evacuation work that was likewise clearly part of their job. Put simply, the people who left did so because they had no emergency role. In addition, week-end staffing is only one-third of regular staffing anyway. Dr. Smith reported that the evacuation weekend coincided with a national physicians meeting in another state, and many people were away attending the meeting. Mr. Maxwell reported that his hospital had no radiological emergency plan, that few workers knew if they had a role or not, and that the normal reduction in staffing for weekends largely affected how many people were at work in these hospitals.

What I conclude from these publications and conversations with their authors is that hospitals can have a hard time performing an emergency act like evacuation if they do not have an emergency plan assigning emergency roles to would-be emergency workers. Evacuation of these hospitals occurred when normal staffing was down to one-third; the other two-thirds of the staff were somewhere else (a convention, at home, or evacuating themselves) and did not perceive themselves as having an

emergency role because no plan ever gave them one. Since they knew that they had no emergency roles and perceived their routine place of routine work to be an "evacuation area," they cannot be faulted for not going to their routine jobs on Monday morning. These cases showed no incidents of role abandonment; they do, however, document a lack of planning and its consequences.

E. Opinion Surveys

67. Q. Do you believe it is necessary, for a good emergency plan, to conduct a poll of how people think they might respond in the event of a radiological emergency?

A. [Dynes, Johnson, Mileti, Sorensen] No, it is not necessary, for several reasons. First, polls are premised on the notion that statements about current attitudes or thoughts about future behavior can be used to predict actual future behavior. This assumption is wrong where the future behavior is behavior in an emergency situation. Most social scientists would say that people's attitudes and their speculation about future behavior are an imperfect predictor of behavior. Asking a person to

make a "cold" judgment about how one might hypothetically react in a complex future situation, and giving him a few seconds to answer, is not a good predictor of future behavior.

Behavior in an emergency is a social process and is situationally determined (husbands talk to wives, neighbors, employees, etc.; wives talk to husbands, neighbors, etc.). In that process, which is social in nature, notions as to appropriate ways to act emerge. It is easy in advance of the actual situation to say "I'm not going to respond," because responding is troublesome -- it takes energy. But faced with a threat (confirmed by the social process) and defined appropriate action (for example, sheltering or assuming one's post), the trouble is worth it, and the action takes place.

Second, the factors that influence human response to emergencies are relatively well-known and accepted as valid by most scientists in this area. These factors can be addressed in an emergency plan to help achieve good response when the plan is put into operation. An attitude or opinion profile or catalogue of behavioral intentions would not appreciably help address these factors in the plan

or upgrade good organizational or public response were the plan ever activated. In fact, a compilation of behavioral intentions -- which is certain to be wrong when compared to actual emergency behavior -- could hurt planning because it would lead plans to be based on incorrect assumptions about behavior.

Third, a plan is primarily composed of the actions of organizations, not individual persons. The plan does not depend on "public" opinion, or on an individual's opinion; it depends on an organization functioning to do the work and give public information.

Fourth, the purpose of polls is presumably to obtain information and avoid unfounded assumptions. Far from relying on any lack of information or untested assumptions, LILCO's emergency planning efforts in reference to role "conflict" rest upon the substantial evidence of how emergency workers have dealt in previous natural and so-called "technological" disasters. That evidence clearly establishes that most emergency workers can be relied upon to do their jobs promptly and effectively when duty calls, and that role "conflict" does not hinder overall group performance.

In general, then, a poll is unnecessary (1) because it is not a valid and reliable instrument for predicting future behavior, (2) because it would not upgrade the list of factors a plan should address, (3) because a plan is mostly based on the actions of organizations, and (4) because past experience suggests that emergency workers perform their assignments.

This is not to say that particular types of surveys might not make important contributions to emergency planning. For example, a survey could be used to identify people who are willing to perform volunteer emergency work. The people identified by the survey could then be given an emergency role and trained. Also, a survey could be useful to help identify facts important to know about for planning; for example, the identification of people with special evacuation needs.

68. Q. Mr. Johnson and Dr. Mileti, have you reviewed the County's survey of bus drivers and volunteer firemen in Suffolk County?

A. [Johnson, Mileti] Yes.

69. Q. What is your opinion of that survey? Does it have any shortcomings?

A. [Johnson, Mileti] Questions 12 through 19 on the survey instrument for volunteer firemen and Questions 7-11 on the survey for school bus drivers are the same as questions 11-16 and 18-19 of the County's survey of the public in general, and thus are subject to the same criticisms as have been mentioned for those questions in LILCO's written testimony on Contention 23.

Question 20 of the survey of volunteer firemen is as follows:

> 20. Assuming that the Shoreham nuclear power plant is licensed and begins to operate, we are interested in knowing what you think you would do if there was an accident at the plant. Suppose that you were at work on a weekday morning and there was an accident at Shoreham. Everyone living within 10 miles of the plant was advised to evacuate. Volunteer firemen were expected to help with the evacuation. What do you think you would do first?
>
> 1 = first, you would report to the fire station so that you could help with fire fighting and evacuation in the evacuation zone.

2 = first, you would make sure that your family was safely out of the evacuation zone

3 = first, you would leave the evacuation zone to make sure that you were in a safe place

4 = first, you would do something else (specify) _____.

The response categories to this question are neither mutually exclusive nor exhaustive. Also, the question itself tends to confuse respondents by asking what they think they would do "first." A volunteer fireman could both check to see that his or her family was safely out of the evacuation zone and also help with firefighting and evacuation in the evacuation zone. It is conceivable that a volunteer fireman could be working outside of the so-called evacuation zone when an accident took place. No effort was made to determine if the volunteer fireman does in fact normally work outside the 10-mile evacuation zone.

Question 21 states as follows:

21. If there was a nuclear accident at Shoreham requiring the evacuation of people within a ten mile zone, how dangerous do you think it would be for you to spend a day working within the evacuation zone?

It is impossible to determine what is meant by the term "spend a day working within the evacuation zone." If this was meant to mean a 24-hour day, an 8-hour day, or somewhere in between, it should have been so stated. The way the question is worded now would be subject to different interpretations by different responders.

Question 12 of the school bus driver questionnaire states as follows:

> . . . Suppose that you had completed your morning run on a school day and there was an accident at Shoreham. Everyone living within ten miles of the plant was advised to evacuate. Schoolbus drivers were expected to help evacuate school children. What do you think you would do first?
>
> 1. report to duty so that you could pick up school children in the evacuation zone and drive them to a shelter.
>
> 2. go to make sure that your family members were safe.
>
> 3 leave the evacuation zone to make sure that you were in a safe place.
>
> 4. do something else _____. (Please specify)

Once again, the suggested response categories are neither mutually exclusive nor exhaustive. Also,

if everyone were advised to evacuate, why would school bus drivers be expected to help evacuate school children? The same comments apply to question 13 of the County survey.

Question 14 asks "how dangerous" does the respondent think it would be to spend "several hours" driving school children out of the evacuation zone. The term "several" in this question leaves much to the imagination of the school bus drivers.

Finally, a serious problem with the survey is that it was self-administered; that is, respondents were given the survey instrument and asked to complete it. It is very possible that the respondents' answers to particular questions were influenced by information or questions that occurred later in the questionnaire.

70. Q. The County polled the opinions of volunteer firemen. What firemen were polled?

A. [Cordaro, Weismantle]. The poll was done by phone to 291 firemen at Miller Place, Ridge, Rocky Point, Sand Beach, and Riverhead.

71. Q. What were the firemen told to assume?

A. [Cordaro, Weismantle] Among other things, they were told (in Question 18) to suppose that volunteer firemen were expected to help with the evacuation.

72. Q. Have these volunteer firemen been assigned a clear role in helping with an evacuation?

A. [Cordaro, Weismantle] No.

73. Q. Did emergency workers abandon their emergency roles during the Ginna steam generator tube rupture incident on June 25, 1982?

A. [Weismantle] No, not at all, as indicated in the NRC report on the Ginna accident, NUREG-0909 (Attachment 8).

F. The "Uniqueness" of Radiation

74. Q. What is your opinion of the County's theory that radiological emergencies are "unique," so that experience with, for example, hurricanes and floods provides little guidance?

A. [Dynes, Mileti, Sorensen]. The ability to transfer the principles of human behavior in emergencies is

questioned by some as not being applicable in emergencies that involve nuclear power plants. There are two forms of this argument. The first (more extreme) position is simply that radiation is so unique that it produces its own unique set of laws of human behavior. The claim is that radiation is different enough from the risks posed in other types of emergencies that human behavior would also be different.

The determinants of human behavior in emergencies in contemporary America are, however, transferable across emergency types. This is not to say that the descriptive accounts of how people respond to emergencies will be the same from one emergency to another; but the reasons why people respond in different ways to emergencies -- the determinants of behavior -- are consistent across emergency types. The position that radiological events are unique argues against the basic premise on which the social sciences rest: that there are knowable reasons and patterns in human behavior that are discoverable through systematic scientific inquiry. The position is also contradicted by empirical evidence.

75. Q. What is the second form of the argument?

A. [Dynes, Mileti, Sorensen] Other people adhere to a position that seems more viable, but only on the surface. They agree that there are determinants of human behavior in emergencies and that these are knowable, but they argue that people are fearful enough of radiation because of its "unique" characteristics that, while the ordinary principles that explain human behavior will still apply, the behavior itself will be different from behavior in nonnuclear emergencies.

This proposition has some elements of truth. It is true, for example, that radiation is invisible, unlike tornadoes and hurricanes. It also may well be that public understanding of the risks of nuclear power is different from that of the risks associated with, for example, floods. The potential list of "differences" that could be developed is quite long.

However long the list, it is not true that the "qualities" of the determinants of behavior in the human response equation are different for nuclear plant emergencies as opposed to other types. For

example, the "unique invisible character of the radiation hazard" is not unique in terms of explaining human response in emergencies. The "character of the hazard" has long been included in the catalogue of factors taken into account to understand human behavior in emergencies. It is a well-established determinant of human response. On this factor, nuclear reactor accidents are something like a flash flood that occurs on a sunny day. If radiological emergencies are unique, it is only because the "values" or "quantities" that the determinants of human response can take are unique -- or further from the mean -- and not because the list of relevant determinants is unique.

76. Q. Do you think, then, that the same fundamental principles of emergency planning that you discussed earlier apply in radiological emergencies?

A. [Dynes, Mileti, Sorensen] Yes. What is important for preparedness to ensure public safety in emergencies of all sorts -- including anticipating the response of emergency workers -- is that the factors that determine behavior are known and transferable across emergency types. Put simply, the "what," "how," "when," "where" and "why" of

emergency preparedness are known, and planners can take into account variation in the "quantity" of each determinant across different types of emergencies to draft sound plans for response in nuclear power plant emergencies. All types of emergency workers -- including those who have unique jobs and those who do not, those who work in shifts and those who do not; etc. -- will be able to get the necessary emergency jobs done in a nuclear power plant emergency if plans adequately address the important factors.

77. Q. What are those factors again?

A. [Dynes, Mileti, Sorensen] The key factors or determinants that, if adequately addressed in a plan, will lead to emergency workers performing their emergency jobs in a nuclear power plant emergency are (1) adequate training so that the workers clearly understand that they have an emergency job and what that job requires them to do and so that they develop an understanding of the importance of their jobs for overall community safety and to their work group; (2) enabling workers to understand what risks they are and are not taking while doing their work (for example, providing

pre-emergency education about radiation, the use of dosimeters, or other ways to achieve this same objective); and (3) recognizing that workers will be concerned about the safety of their families and will want to be able to check on them and, thereby, feel comforted as they do their jobs.

[Mileti] Finally, as for the "unique" nature of radiation, I find persuasive what Dr. Sidney Lecker testified in the Indian Point proceeding:

> I find it simply incredible -- as a matter of psychology or even common sense -- to assert that a firefighter would be more afraid to enter a potentially contaminated area with a dosimeter than he would be to enter a blazing building in danger of imminent collapse.[3]

G. Fear for One's Own Safety

78. Q. Contention 25.A suggests not only that LILCO employees would try to protect their families, but that they might neglect their emergency duties to save themselves. Apparently the County feels that LILCO emergency workers would be afraid to enter the EPZ in an emergency. What is your opinion of this claim?

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[3] Licensee's Testimony of Sidney Lecker, M.D., Consolidated Edison Co. of New York et al. (Indian Point, Unit Nos. 2 and 3), Doc. Nos. 50-247 SP and -286 SP, at 12 (June 7, 1982).

A. [Dynes, Mileti, Sorensen] The supposition that emergency workers would not do their emergency jobs because they would rather "save" themselves is unfounded. This is not to say that emergency workers ordinarily will remain in buildings that are, for example, under flood waters or demolished by an earthquake. At the same time, the history of emergencies catalogues many acts of bravery where both trained and volunteer emergency workers have put themselves in extreme jeopardy in order to help others. It would be foolhardy to plan for emergency workers to do work that would result in their death or other extreme personal consequences; but it is a fact that in an emergency some few would almost certainly step forward to volunteer for such duty.

79. Q. Can emergency planners do anything to prevent circumstances from arising in which emergency workers would fail to perform out of fear for their own safety?

A. [Dynes, Mileti, Sorensen] Yes, they can take into account the factors that ensure that emergency workers do their emergency jobs, and they can take pains to understand the circumstances under which

it would be imprudent to assure that emergency workers would perform (even though some workers would undoubtedly perform even then).

80. Q. What factors and circumstances do you mean?

A. [Dynes, Mileti, Sorensen] The record is clear that emergency workers do their jobs when they understand that they have an emergency job to do, when they understand what that job requires of them, and when they have a sense of the importance of their job for overall community safety and to their work group. These understandings can be produced in different ways. For example, people who hold jobs that are in the routine of everyday life comparable to their emergency roles -- for example, firemen -- bring these understandings to the emergency setting. But these understandings can also be developed, for those whose emergency roles are different from their daily ones, through training. Adequate preparedness with emergency workers of the latter type is not impossible, but it is more demanding of those who would develop plans and be prepared.

Also, the behavior of emergency workers, like that of people generally, depends on their situational perception of "risk" or "hazard." It is quite possible that an emergency worker would not perform a certain act if he believed that performing it would result in his own death. It is also the case that radiation is invisible (emergency workers cannot see the hazard) unlike, for example, fires, where people can see the location and intensity of the flames.

This difference between radiation and fire does not, however, mean that emergency workers would assume the worst about the hazard, come to believe that it would result in their own death, and flee their posts to protect themselves. The reason is that emergency workers can be trained and equipped to accurately assess the risk. Emergency workers can be trained about radiation (they need not be kept ignorant of it); emergency workers can be provided dosimeters (a way can be provided for them to "see" the hazard); and emergency workers are able to hear emergency information that will keep them informed about the situation.

[Cordaro, Weismantle] Since the LERO workers responding into the EPZ have received basic radiological training and have access to direct-reading dosimetry, they will be able to determine for themselves if they are in any "danger." In addition, no LERO worker is expected to receive more than 5 rem wholebody, which is the limit of the EPA PAG's for the general population.

81. Q. Does some threshold of risk exist beyond which it would be foolish to expect that emergency workers would do their jobs?

A. [Dynes, Mileti, Sorensen] The notion of such a threshold, it should be pointed out, does not mean that emergency work would not go on beyond it. Rather, it simply suggests that a good plan would not expect work to be performed by everyone beyond that threshold.

To the best of our knowledge this concept has never been studied, and no conclusion can be made about its character, perhaps because it has never been reached in a real emergency, and thus it is outside the realm of human experience.

However, we can say that there is no reason to believe such a theoretical threshold will be exceeded by LERO emergency workers. LILCO's LERO plan provides for a low-level threshold of radiation exposure beyond which an emergency worker exits from duty and is replaced. This threshold is the same as that established for the general public. Dosimeters provide for making this threshold "real" for workers in the emergency, and training ensures that they understand the meaning of the low-level threshold. An emergency at Shoreham, therefore, would not provide the context in which imaginations about an unknown risk could run wild, leading emergency workers to conclude that doomsday was upon them. The hazard would be both knowable and known. Emergency workers would therefore behave in rational and orderly ways and perform their jobs not without regard for personal safety, but rather with information about it.

82. Q. Is there any empirical evidence that LILCO employees are capable of performing in emergencies?

A. [Cordaro, Weismantle] Yes. We would point out, first of all, that the company is required to perform extraordinary service in times of

storm-induced power outages. Some idea of the scope of the effort can be from our general procedures for storm restoration (Attachment 9 to this testimony).

It is completely unjustifiable to claim, as Contention 25.A does, that our employees will fail to do their duty out of cowardice. The fact of the matter is that Long Island Lighting Company employees have a proven track record of emergency response, and this is typical of utilities in general.

LILCO is part of a Mutual Assistance Roster made up of 92 member companies of the Edison Electric Institute. Under this arrangement our company has responded to requests for help from other companies. The latest occasion was prompted by a request from Pennsylvania Power and Light Company during October 1980; we sent 20 line crews and their supervisors to Lancaster, Pennsylvania to assist service restoration following a storm that affected the PP&L system.

In turn, we have asked others for help -- for example, during the ice storm that devastated Long Island on January 13, 1978. Probably the worst type

of storm we can experience on Long Island is an ice storm; it is worse than a hurricane in its destructiveness, and it subjects restoration crews to conditions that are both hazardous and physically debilitating.

The ice storm of 1978 interrupted electric service to over 300,000 LILCO customers. The ensuing restoration took 138 hours and involved 606 LILCO crews, assisted by 408 crews from 17 outside utilities and contractors. A total of 18,671 individual repair jobs were completed.

Work was conducted in frozen conditions with shifts of 12 to 16 hours each common for all workmen. Many LILCO workers had no electricity in their own homes, but no one deserted his assignment. Over 5,400 LILCO employees and retirees participated, manning substations, answering phones, surveying, and doing the many other tasks that go into a complete restoration effort.

This effort was an example of dedication that refutes the idea that our people will leave their posts or fail to respond. LILCO employees have always responded and stuck to their jobs; we have no

reason to believe they will do otherwise in the future.

As far as directing traffic and dealing with the public, this is an everyday function for LILCO crews, and they are very successful at the task.

During snowstorms, when most companies are closing and advising their employees to stay home, the vast majority of LILCO employees come to work as expected. Any emergencies that arise are handled as at any other time.

In addition, a considerable number of LILCO employees are actively engaged in community work, and many are volunteer firemen and paramedics. There are many incidents of LILCO employees going beyond the call of duty, often at risk to themselves, to perform a rescue task while others only stand and watch. Listed below are a few incidents:

- On July 14, 1977, a LILCO crew responded to a situation in Massapequa where two workmen were collapsed at the bottom of a newly constructed manhole. At the risk of the life of the crew foreman, the crew succeeded in rescuing one of the men.

- On January 24, 1978, a passing LILCO crew noticed a car stuck in a snow bank. The car seemed to be filled with smoke and the crew stopped to

investigate. They found two women inside overcome. They applied mouth-to-mouth resuscitation and saved both women.

- On January 19, 1979, a LILCO crewman observed a young man acting suspiciously near a work location in Bellmore. He investigated and discovered the man had set fire to a motel. He reported the fire, recorded the license number of the truck used by the arsonist, and led police to the arsonist. A serious fire was prevented and the arsonist was apprehended.

- On April 23, 1980, at the request of the Suffolk County Fire Dispatcher, a crew and a supervisor were sent with a 150-foot Condor Aerial Lift to assist in the rescue of workmen who had collapsed inside a 200-foot-high water tank in Centereach. They responded quickly and worked through the night with rescue teams. In recognition, the Public Safety Committee of the Suffolk County Legislature issued proclamations to each of the LILCO people involved for "dedication in service to the people of Suffolk County." Each of the LILCO people also received commendations from the police and fire departments.

- On November 17, 1981, a LILCO crew sized up a situation involving a burglar and the Suffolk County Police. Using the aerial lift, the crew foreman from a strategic height spotted the burglar and guided the police to his hiding place. The crew foreman was commended by the Suffolk County Police Commissioner for this act.

- In the summer of 1983, a LILCO supervisor on his way home from work spotted a house on fire. He alerted the Bay Shore Fire Department and then ran into the house and saved the life

of a little boy. He received an official commendation from the Bay Shore Fire Department.

The list could be continued. During 1982, 430 letters commending LILCO employees for everything from assisting motorists to returning lost wallets were received by our President and Chief Executive Officer. Through July of 1983, 234 such letters had been received.

83. Q. Please summarize your testimony.

A. [All witnesses] A large body of historical evidence shows that the functioning of emergency organizations is not hampered by the failure or delay of emergency workers in performing their jobs. In spite of role "strain," such workers perform effectively. While role abandonment may be theoretically possible, it is certainly rare, and consequently it is not something that reduces organizational effectiveness. What is more, training for emergency work can reduce role strain and enhance the effective performance of emergency workers.

PROFESSIONAL QUALIFICATIONS

MATTHEW C. CORDARO
Vice President of Engineering
LONG ISLAND LIGHTING COMPANY

My name is Matthew C. Cordaro. My business address is Long Island Lighting Company, 175 East Old Country Road, Hicksville, New York 11801. I am currently Vice President of Engineering and have held this position since the spring of 1978. As Vice President of Engineering, I am responsible for all of LILCO's engineering activities. This includes responsibility in the areas of facility planning and engineering for nuclear and fossil electric generating plants, as well as electric and gas transmission and distribution systems. In addition, I am responsible for assessing the environmental impacts of all LILCO operations.

I received my Bachelor of Science degree in Engineering Science from C. W. Post College in 1965. I received my Master of Science degree in Nuclear Engineering from New York University in 1967. I received my Doctorate in Applied Nuclear Physics from the Cooper Union School of Engineering and Science in 1970. I was awarded the Atomic Energy Commission Special Fellowship in Nuclear Science and Engineering.

My past professional affiliations include a position as Guest Research Associate at Brookhaven National Laboratory, Adjunct Associate Professor of Nuclear Engineering at Polytechnic

Institute of New York and Adjunct Assistant Professor at C. W. Post College.

I joined LILCO in 1966 and from 1966 to 1970 I held the positions of Assistant Engineer (1966), Associate Engineer (1967), Nuclear Physicist (1968) and Senior. Environmental Engineer (1970). In these earliest positions with LILCO I was involved as a principal in all phases of nuclear power plant design, licensing and fuel management. I was also a lead witness for the Company in Federal and State licensing proceedings for the Shoreham and Jamesport Nuclear Power Stations.

In 1972 I assumed the position of Manager of Environmental Engineering. In this capacity I was responsible for the environmental impact of all LILCO operations. This position involved the supervision, administration and direction of all environmental programs aimed at demonstrating compliance with applicable standards.

I am a member of a number of related professional organizations including: the Board of Directors, Adelphi University's Center on Energy Studies; and the Council of Overseers, C. W. Post College. Other related professional affiliations are: Chairman, Technical Advisory Group to the National Environmental Studies Project of the Atomic Industrial Forum; Vice Chairman, Environmental Steering Committee of the Atomic Industrial Forum; the Long Island Association of Commerce and Industry Environmental Committee; the Advisory Board to

Environmental Technology Seminar; and the Environment and Energy Committee of the Edison Electric Institute. I have also been a member of the Research Planning Advisory Committee for the New England River Basins Commission Study of Long Island Sound, the Marine Advisory Council to the New York State Sea Grants Seminar, and the Nassau-Suffolk Health Systems Agency (HSA), Suffolk County Council.

In addition, I am a member of the American Nuclear Society, and the Health Physics Society.

My most recent publications include a paper on methodology for power plant site selection, papers presented at the World Energy Conference on space heating alternatives and power plant cooling systems, a paper related to power plant waste heat utilization, and a paper on the transportation of nuclear wastes. I was co-author of a paper presented at the International Meeting of LWR Severe Accident Evaluation entitled "Mitigating Severe Accident Consequences at the Shoreham BWR." I have also published journal articles in the fields of environmental science and nuclear science, as well as numerous studies and reports related to the environmental effects of energy production.

I have been called upon to interface with the media on numerous occasions. This includes newspaper interviews and radio and television appearances. I have also testified many times before administrative bodies, legislative commissions and congressional committees.

PROFESSIONAL QUALIFICATIONS

RUSSELL R. DYNES

Chair, Department of Sociology

UNIVERSITY OF DELAWARE

My name is Russell R. Dynes and my business address is the Department of Sociology, University of Delaware, Newark, Delaware 19711. I presently hold the position of Chair and Professor, Department of Sociology.

I received my A.B. and my Master of Arts degree from the University of Tennessee in 1948 and 1950, respectively. I was awarded my Doctorate degree in 1954 from the Ohio State University.

From 1948 to 1950 I was a Graduate Assistant and Instructor at the University of Tennessee. I was then a Graduate Assistant and Assistant Instructor at the Ohio State University from 1951 to 1952 and, subsequently, an Instructor there from 1952 to 1956. From 1956 to 1960, still at Ohio State, I held the position of Assistant Professor. In the summer of 1958 I served as a Visiting Professor at Capital University. I then returned to Ohio State where I was an Associate Professor from 1960 to 1965. In 1964 I was employed by the Air Shams University and Arab States Center for

Education in Community Development in the United Arab Republic as a Fulbright Professor. I served in this capacity for one year. Once again I returned to the Ohio State University where I was a Professor from 1965 to 1977. From December of 1971 through March of 1972 I was again a Fulbright Professor. During this time I was employed by the Center for Advanced Study in Sociology, University of Delhi.

I have held several administrative positions including: Co-Director of the Disaster Research Center at the Ohio State University from 1964 to 1977; Chair, Department of Sociology, also at Ohio State, from 1974 to 1977; and Executive Officer of the American Sociological Association from 1977 to 1982.

From 1964 to 1965 I received a Fulbright Award and was a Senior Lecturer in the United Arab Republic. In 1969 I was awarded the Alpha Kappa Delta Graduate Teaching Award. I again received a Fulbright Award as a Senior Lecturer in India from 1971 to 1972. I received an Honorary Faculty Membership and an Honorary Lifetime Faculty Award from the Defense Civil Preparedness Agency Staff College in 1973 and 1974, respectively. In 1976 I became an honorary member of Phi Kappa Phi. In addition, I am an Honorary Member of the International Disaster Institute in London.

From 1949 to 1950 I served as Project Director of the Cooperative Study between the University of Tennessee and the Tennessee Department of Welfare. I was Co-Director of the

Study of Industrial Migrants in the Ohio Atomic Area, sponsored by the National Council of Churches of Christ in America, from 1954 to 1955. From 1955 to 1956 I held the position of Project Director for the School Community Development Study entitled, "Educational Changes in a Transitional Community," sponsored by the Kellog Foundation, the Ohio State University. As a Research Associate at the School of Aviation Medicine, Air University, Randolph Field, Texas, from 1953 to 1957 I was involved in research concerning the "Relationship Between Sociological Background Factors and the Psychiatric Fitness of Air Force Personnel."

I then held the position from 1957 to 1959, of Project Supervisor of the Wellsville Project, Community and Regional Planning and Development, Engineering Experiment Station, at the Ohio State University. In 1956, I was Faculty Supervisor of the Social Science Research Council Undergraduate Research Stipend. From 1955 to 1960 I supervised several projects sponsored by the Graduate School of Ohio State. Also at Chio State, from 1963 to 1977, I served as Co-Director of the Disaster Research Center. In this same time period, from 1963 to 1969, I was the co-principal investigator of a study entitled, "Laboratory Simulation Studies of Organizational Behavior Under Stress." This study was conducted at the Ohio State University Research Foundation, sponsored by the Office of Aerospace Research, Air Force.

From 1965 to 1966 I was a Fellow at the American Research Center in Egypt. Subsequently, from 1967 to 1971, I was the Principal Investigator of a study conducted by the Office of Water Resources Research, Department of Interior, entitled, "Community Reaction to Water Resource Problems in Relation to Planning." I simultaneously served from 1966 to 1968 as the Principal Investigator of a study conducted by the College of Commerce and Administration Grant entitled, "Restudy of a Transitional Community."

I served as Co-Principal Investigator of a variety of studies, including: from 1968 to 1971, a study conducted by the Mershon Social Science Foundation entitled, "Cross Cultural Studies of Disaster"; from 1968 to 1974, a study sponsored by the National Institute of Mental Health entitled, "Organizational Response to Major Community Crises"; from 1963 to 1977, a Department of Defense study entitled, "Organizational Functioning in Disaster," conducted by the Office of Civil Defense; from 1970 to 1971 I studied "Police Behavior in a College Riot" for the Law Enforcement Assistance Administration; from 1974 to 1975, I was involved in two different studies, "Delivery of Mental Health Services in the Xenia Disaster," for the State of Ohio Department of Mental Health and Mental Retardation an "Organizational Communication and Decision Making in Disaster," for the Advanced Projects Research Agency; I then spent two years, from 1975 to 1977, as

the co-principal investigator of a study entitled, "Delivery of Emergency Medical Services in Disaster," sponsored by the Bureau of Health Services Research, Health Resources Administration, National Institute of Health, Department of Health, Education and Welfare; in addition, I was involved in two studies for the National Institute of Mental Health entitled, "Development of Baseline Information of Mental Health Disaster Assistance/Crises Intervention Needs and Resources," and "Delivery of Mental Health Services in Disaster," from 1976 to 1977 and 1976 to 1979, respectively. Finally, I have served as the principal investigator of various projects related to the activities of the American Sociological Association, NSF, NIE, FIPSE, and Lilly since 1977.

Since 1956 I have participated in a number of professionally related workshops and conferences, including: the Conference on Social Theory, Emory University, 1956; a Seminar on "Interpretations of Religion in Sociological Theory," University of North Carolina, 1959; Workshop on Crisis Research, sponsored by the University of Pittsburgh and the System Development Corporation, Newport Beach, California, December, 1976; Workshop on Sociological Aspects of Water Resources Research, Utah State University, May, 1968; Caribbean Regional Seminar on Pre-Disaster Preparedness, Port-of-Spain, Trinidad, June, 1968; IIIeme Seminaire Sur La Planification Des Secours En Cas De Catastrophes Naturelles,

Port-au-Prince, Haiti: June, 1970; "Methodological Issues in Comparative Research," Institute of Comparative Sociology, Indiana University, Bloomington, Indiana, April, 1971; Seminar on Organizational and Community Responses to Disasters, sponsored by the National Science Foundation and Japan Society for Promotion of Science, Columbus, Ohio, September, 1972; NIMH Continuing Education Seminar in Emergency Mental Health Services, Washington, D.C., June 22-24, 1973; Invitational Conference, "The Assessment of Social Impacts of Oil Spills," The Institute on Man and Science, Rensselaerville, New York, Septmber 25-28, 1973; International Conference of Disaster Researchers, sponsored by the Centre d'Etudes Psychosociologiques des Sinistres et de leur Prevention, Paris, France, September 5-6, 1974; Second National Conference on Reduction of Natural Hazards, University of Colorado, Boulder, Colorado, June 22-25, 1975; Third National Conference, June 30-July 2, 1976; First National Social Scientists Conference, U.S. Army Corps of Engineers, Memphis, Tennessee, September 20-24, 1976; Workshop on Issues and Options in Disaster Management, Office of Technology Assessment, Washington, D.C., March, 1978; Workshop, Functions and Effects, Emergency Preparedness, National Governors Association, Washington, D.C., May 25-26, 1978; Workshop, Fire Safety and Disaster Preparation, Intergovernmental Science, Engineering and Technology Panel, American Association for the Advancement of

Science, March, 1979; and Conference, Social and Economic Effects of Earthquakes and Planning to Mitigate their Impacts, Yugoslav Association of Self-Managed Communities for the Interest for Scientific Research and U.S. National Science Foundation, Lake Bled, July, 1981.

In addition, I served as Delegate to the International Consultation on the Sociology of Religion, Georgetown University, September, 1962; Principal Lecturer, Seminar on the Sociological Aspects of Collective Stress, sponsored by Patina University, A. N. Sinha Institute and the U.S. Educational Foundation in India, Patna, Bihar, India, March, 1972; participant and consultant, "Interorganizational and Interagency Relations in Major Disasters," National Emergency Planning Establishment, Government of Canada, Arnprior, Ontario, October 22-24, 1974; Seminar Leader, "Civil Military Relations in Crises," Foreign Area Officers Course, Army Civil Affairs School, Fort Bragg, North Carolina, December 17-18, 1975; and Organizer, Workshop on Directions in Applied Sociology, American Sociological Association, Washington, D.C., December, 1981.

I have also had numerous occasions to appear as a lecturer at conferences, workshops and symposiums, including the following: National Center for Social and Criminological Research, Cairo, U.A.R.; American University in Cairo, UNESCO Arab States Center, Sirs-el-layyan, U.A.R.; Canadian Emergency

Measures Organization, Arnprior, Ontario; Temple University Medical School MEND Symposium; Office of Civil Defense Staff College, Battle Creek, Michigan; National Association of State Defense Directors; Symposium on Law Enforcement Science and Technology; American Hospital Association; U.S. Department of State; Canadian Department of Health and Welfare; Centre d'Etudes Psychosociologiques des Sinistres et de leur Prevention, Paris, Frnce; School of Aviation Medicine, San Antonio, Texas; Institute of Disaster Preparedness, University of Southern California; Institute of Government, University of Georgia; Seminar on Church Response to U.S. Disasters and Emergencies, Church World Service, Pittsburgh and Denver; Region II, VIII, Defense Civil Preparedness Agency, Olney, Maryland, Portland, Oregon; U.S. Civil Defense Council, Region I; University of Michigan; University of Nebraska-Omaha; University of Akron; University of Delaware; Central States Faculty Conferences, Oberlin College and Purdue University; Danforth Conference, Lake Forest College; Auburn University; Kentucky Wesleyan University; University of Tennessee; University of Cincinnati; Kent State University; University of Toledo; Wooster College; Utah State University; Cornell University; Pennsylvania State University; Washington University at St. Louis; Air Force Academy; Denison University; University of Illinois; Ghandi Peace Foundation; Rajasthan University; Jawaharal Nehru University; Poona University;

Mysore University; University of Kerala; Madras University; Osmania University; Panjab University; Tribhuvan University, Nepal; Government Men's College, Lahore, Pakistan; University of North Carolina-Greensboro; Old Dominion University; Wichita State University; Oak Ridge Laboratories; University of Notre Dame; University of Tennessee-Martin.

My professional affiliations include memberships in the following: American Academy of Political and Social Sciences; American Association of University Professors, Elected Board Member, 1970-71; Ohio State University; American Sociological Association (ASA), Chair; Ad hoc Committee advising on participation of sociologists in Fulbright-Hays Programs (in conjunction with the Committee on International Exchange of Persons), 1968; ASA, Member, Committee on the Development of World Sociology, two terms Co-Chair, Liaison with National and International Organization; ASA, Committee on Committees, 1975, Elected 1974; ASA, Member, Committee on Regional Affairs, 1974-77; International Sociological Association participation at Evian, France, 1966; Varna, Bulgaria, 1970; Toronto, Canada, 1974; Uppsala, Sweden, 1978; Mexico City, Mexico, 1982; North Central Sociological Association (NCSA), Program Chair, 1958; NCSA Vice-President, 1970-71; NCSA President Elect, 1971-72; NCSA President, 1972-73; NCSA Representative to American Sociological Association, 1974; Ohio Council on Family Relations, Program Chair, 1957 and Executive Committee,

1965-68; Religious Research Association, Program Chair, 1968 and Associate Editor, 1968-77; and Society for the Scientific Study of Religion, Treasurer, Elected 1976-79.

I have also presented papers and/or chaired sessions of various annual meetings of: American Sociological Association, International Sociological Association, Religious Research Association, Ohio Council on Family Relations, Society for the Scientific Study of Religion, American Society of Criminology, American Water Resources Association, Society for the Study of Social Problems, Southwestern Sociological Society, Pacific Sociological Society, Southern Sociological Society, International Congress of Learned Societies in the Field of Religion, North Central Sociological Association.

My undergraduate teaching experience included courses such as Intorductory Sociology, Social Problems, Family, Race and Ethnic Relations, Community, Stratification, Religious Institutions, American Society, Comparative Social Organization, and Senior Seminar. The graduate courses I taught comprised Structural Sociology, Seminar in Sociology of Religion, Seminar in Stratification, Qualitative Methods, and Pro-Seminar. In addition, I served as Advisor for about 20 completed Doctorate degrees and Dissertation and General Examinations Committees for about 40 Doctorate degrees. I was also Major Advisor for several Master of Arts degrees and for several Undergraduate Honors Program and Theses.

My professional activities include the following:

Danforth Associate, 1958-, Co-Chair, Ohio Conference, 1963.

Member, Mayor's Faculty Advisory Committee, 1967-68.

Member, Sociology Advisory Committee, Committee on International Exchange of Persons (reviews awards under Fulbright-Hays Program).

Member, Developmental Task Force, Social Science Committee, University Council on Water Resources Research, 1970.

Consultant, Stanford Research Institute, 1971.

Convener, Board of External Examiners, University of Madras, India.

Board of Adjudicators, Graduate School, University of Kerala, India.

National Academy of Sciences/National Research Council

Member, Advisory Committee on Emergency Housing, Building Research Advisory Board, 1972.

Chair, Committee on International Disaster Assistance, Commission on Sociotechnical Systems, 1976-79

Publications of the Committee:

The U.S. Government Foreign Disaster Assistance Program (Washington: National Academy of Sciences, 1978, 168 pp.).

The Role of Technology in International Disaster Assistance (Washington: National Academy of Sciences, 1978, 102 pp.).

Assessing International Disaster Needs (Washington: National Academy of Sciences, 1978).

Liaison Member, International Disaster Assistance Panel, United Nations Association of the United States of America (for NAS/NRC).

Executive Committee, Academic Freedom Clearinghouse, ACLU, New York

Executive Committee, Council of Secretaries, American Council of Learned Societies, 1980-1982

Executive Committee, National Humanities Alliance, 1981-1982

Chair, Executive Committee, Consortium of Social Science Associations, 1981-1982

Executive Committee, AAAS Consortium of Affiliates for International Programs

Board of Directors, Fulbright Alumni Asscciation, 1980-83

Chair, NATO Fellowship Committee, Committee on International Exchange of Scholars, 1980

Consultant - Departmental Reviews - Wooster College, Denison University, Cleveland State University, Virginia Commonwealth University, University of Texas - San Antonio

Consultant - Stanford Research Institute, "Technology Assessment of Earthquake Prediction," 1974-76

- President's Reorganization Project, "Federal Emergency Preparedness and Response Study," 1977-78

- Federal Disaster Assistance Administration, Housing and Urban Development

- "Cuban Refugee Camp Consolidation," Federal Emergency Management Agency, 1980.

- Home Heating Emergencies, Community Services Administration

- Shaw, Pittman, Potts and Trowbridge, Washington

Head, Task Force on Emergency Response and Preparedness, The President's Commission on the Accident at Three Mile Island, 1979

Over the years, I have edited a variety of materials. My background in editing has included the following:

Editor, The Ohio Valley Sociologist, 1958-63.

Editor, Newsletter, Ohio Council of Family Relations, 1960-64.

Editor, Special Issue, "On the Sociology of Religion," Sociological Focus, Volume 2, No. 1, 1968. (also Editor's Introduction, pp. 1-2).

Editor, Consultant on social problems concepts, Dictionary of Modern Sociology, Littlefield, Adams and Co., 1969, Thomas F. Hoult, ed.

Co-Editor, Special Issue, "Organizational and Group Responses to Community Disaster," American Behavioral Scientist, Volume 13, No. 3 (January-February), 1970

Co-Editor, Special Issue, "Dynamics of Organizational Involvement and Change in Civil Disturbances," American Behavioral Scientist, Volume 16, No. 3 (January-February), 1973.

Associate Editor, Review of Religious Research, 1968-77.

Co-Editor, Disaster Research Center Series, 1964-1977.

Reviewer for a number of journals ranging from Journal of Scientific Study of Religion to Science.

Editor, ASA Footnotes, 1977-1982.

A list of my publications, incorporating books, chapters, monographs, reports, and articles, includes:

Publications:

Books:

1964 Social Problems: Dissensus and Deviation in an Industrial Society. New York: Oxford University Press. 594 pp. (Co-author).

1969 Deviance: Studies in the Process of Stigmatization and Societal Reaction. New York: Oxford University Press. (Co-author).

1970 Organized Behavior in Disaster. Lexington: D.C. Heath. 236 pp. (Republished 1976).

1975 Social Movements, Violence and Change: The May Movement in Curacao. Columbus: The Ohio State University Press. (Co-author).

1975 Deviance: Definition, Management and Treatment, New York: Oxford University Press. (Co-author).

1982 Sociology in Applied Settings, (tentative title) (Howard Freeman, Russell R. Dynes, Peter Rossi, William Foote Whyte, eds).

Chapters, Monographs, and Reports:

1951 Homes for the Homeless in Tennessee. Knoxville: The University of Tennessee. Publication ofthe Bureau of Sociological Research, The University of tennessee Record Extension Series, Volume 27, No. 4, 67 pp. (with William E. Cole).

1954 "The Urban Class System" and "The Urban Religions." Pp. 115-141 and 191-209 in William E. Cole (ed.), Dynamic Urban Sociology. Harrisburg: Stackpole Press.

1955 Mobile Industrial Workers and the Church: A Study of People on the Move in Ohio's Atomic Area. National Council of Churches, Division of Home Missions. 31 pp.

1956 Consequences of Population Mobility for School and Community Change. Columbus: School-Community Development Study, The Ohio State University. 132 pp.

1957 Social Factors Related to Adaptability of Air Force Pilot Trainess. Columbus: Research Foundation, The Ohio State University. 176 pp. (with Alfred Clarke and John Cuber).

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1982 No. 40 in Edward Tiryakian, The Phenomenon of Sociology, New York, Irvington Publishers.

PROFESSIONAL QUALIFICATIONS

WILLIAM G. JOHNSON

President

BILL JOHNSON & ASSOCIATES, INC.

My name is William G. Johnson and my business address is Bill Johnson & Associates, Inc., 367 Summit Avenue, Fleetwood, New York 10552. I am currently the President of Bill Johnson & Associates, Inc., and have held this position since 1982.

I earned my Bachelor of Arts degree in Political Science from Yale University in 1966. Prior to this, in 1964, I attended the University of Michigan Survey Research Center Summer Program in Research Methodology.

From 1975 to 1976, I was employed as Project Director of Welfare Research, Inc., in Albany, New York. Subsequently, from 1976 to 1982, I was Executive Vice President of Century Opinion Polls, Inc., located in Great Neck, New York. As I mention above, I have been President of Bill Johnson & Associates, Inc. since 1982.

PROFESSIONAL QUALIFICATIONS

DENNIS S. MILETI

Associate Professor

Department of Sociology

COLORADO STATE UNIVERSITY

My name is Dennis S. Mileti and my business address is Department of Sociology, Colorado State University, Fort Collins, Colorado 80523. I am presently a tenured Associate Professor at Colorado State specializing in those areas of study dealing with complex organizations, hazards, policy and methods. I have held this position since 1978. Prior to this appointment, from 1974 to 1978, I held the position of Assistant Professor. I was also an Instru tor for one year in the Department of Sociology at the University of Colorado, Boulder, from 1971 to 1972. I have taught numerous undergraduate courses. including Introduction to Sociology, Complex Organizations, Sociology of Natural Hazards, Research Methods, Demographic Process, and Social Change. In addition, I have taught courses at the graduate level such as Advanced Quantitative Analysis, Research Methods I and II, Demography and Population, and Complex Organizations.

I received my Bachelor of Arts degree in Sociology in 1968 from the University of California, Los Angeles. In 1971 I was awarded a Master of Arts degree in Sociology from California State University, Los Angeles. I completed my doctorate degree in Sociology in 1974 at the University of Colorado, Boulder.

In 1975 I was appointed Visiting Assistant Professor at the University of Southern California Graduate School of Public Administration. During this year I offered an Intensive Seminar Program sponsored by the University. From 1978 to 1979 I was an Invited Instructor for the Chautaugua Short Course Program sponsored by the American Association for the Advancement of Science. In 1981 I was appointed Policy Analyst for the Seismic Safety Commission by the State of California. During the year I served this appointment I was on leave from my university duties.

I am a member of the American Sociological Association; the International Sociological Association; the Pacific Sociological Association; the Midwest Sociological Society; the American Association for the Advancement of Science; the Earthquake Engineering Research Institute; the New York Academy of Sciences; and the American Association for the Advancement of Science. In addition, I have been a member of sev- eral committees since 1976, including:

1983-date	Front Range Consortium on Natural Hazards Studies, Colorado State University, University of Colorado, University of Denver.
1983-date	International Sociological Association, Research Committee on Disasters.
1982-1983	Pacific Sociological Association, Nominations Committee for the Standing Committees for 1983.
1982-date	Earthquake Engineering Research Institute, Chair, Committee on Social Science Research, Berkeley.

1981-1983	U.S. Geological Survey, Advisory Panel on the Earthquake Studies Program, U.S. Department of the Interior.
1981-1982	Pacific Sociological Association, Program Committee for the 1982 Annual Meetings in San Diego.
1981-1982	Governor's Emergency Task Force on Earthquakes, Threat Assessment Committee, State of California, Sacramento.
1981-1982	Governor's Emergency Task Force on Earthquakes, Disaster Reconstruction Committee, State of California, Sacramento.
1980-1981	Governor's Science and Technology Advisory Council, Committee on Uranium Mill Tailing Relocation. State of Colorado, Denver.
1979-year	American Association for the Advancement of Science, Committee on Intergovernmental Research and Development on Fire Safety and Disaster Preparedness, Washington, D.C.
1976-78	National Academy of Sciences, National Research Council, Commission on Sociotechnical Systems, Committee on Socioeconomic Effects of Earthquake Prediction, Washington, D.C.

The following comprises a current 1982-83 listing of my profes- sional and academic publications to date:

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Mileti, Dennis S., Doug Timmer and David F. Gillespie
1982 "Intra and interorganizational determinants of decentralization," Pacific Sociological Review 25(2): 163-183.

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1981 "The multidimensionality of organizational size," Sociology and Social Research 65(4): 400-414.

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1980 "Stress and transformation," Journal of Social Research 21(2): 139-147.

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1982 Organizational Behavior and Interorganizational Relations: Implications for Nuclear Power Plant Emergencies and Preparedness. Oak Ridge, Tennessee: Oak Ridge National Laboratories.

Mileti, Dennis S., Donald M. Hartsough and Patti Madson
1982 The Three Mile Island Incident: A study of Behavioral Indicators of Human Stress. Washington, D.C.: Shaw, Pittman, Potts and Trowbridge.

Mileti, Dennis S., and Arthur Svenson
1981 Earthquake Prediction-Warning Response for Emergency Organizations to the Prediction Terminology. Van Nuys: Southern California Earthquake Preparedness Project.

Santopolo, Frank, and Dennis S. Mileti
1980 Impacts of Population Growth in Agricultural Colorado Communities. Fort Collins: Colorado State University Experiment Station Bulletin.

Committee on Fire Safety and Disaster Preparedness
1979 Fire Safety and Disaster Preparedness. Washington, D.C.: American Association for the Advancement of Science.

Committee on Socioeconomic Effects of Earthquake Prediction
1978 A Program of Studies on the Socioeconomic Effects of Earthquake Prediction. Washington, D.C.: National Academy of Sciences-National Research Council.

Haas, J. Eugene, and Dennis S. Mileti
1976 Socioeconomic Impact of Earthquake Prediction on Government, Business and Community. Boulder: Institute of Behavioral Science.

Mileti, Dennis S., and David F. Gillespie
1976 Interorganizational Relations and Community Service Delivery Systems. Boulder: Center for Action Research.

Erickson, Neil, John Sorensen and Dennis S. Mileti
1975 Landslide Hazards in the United States: A Research Assessment. Boulder: Institute of Behavioral Science.

Mileti, Dennis S.
1975 Disaster Relief and Rehabilitation in the United States. Boulder: Institute of Behavioral Science.

Ayre, Robert, Dennis S. Mileti and Patricia Trainer
1975 Earthquake and Tsunami Hazards in the United States: A Research Assessment Boulder: Institute of Behavioral Science.

Book Reviews

Mileti, Dennis S.
1982 "A review of Unequal Care: Interorganizational Relations in Health Care by M. Milner, Jr. New York: Columbia University Press, 1980." Social Forces 60(3): 943-944.

Mileti, Dennis S.
1982 "A review of Whistle Blowing: Loyalty and Dissent in the Corporation by Alan Westin (Ed.). New York: McGraw-Hill, 1981." Sociology: A Review of New Books 7(2).

Mileti, Dennis S.
1980 "A review of Aftermath: Communities After Natural Disasters by H. Paul Friesema et al. Beverly Hills: Sage Publications, 1979 and After the Clean-up: Long-range Effects of Natural Disasters by James Wright and Peter Rossi et al. Beverly Hills: Sage Publications, 1979." Journal of the American Planning Association. (October): 484-485.

Mileti, Dennis S.
1976 "A review of A Sociology of Organizations by J. Eldridge and A. Crombie. New York: International Publications, 1975." Contemporary Sociology 5(6): 784.

PROFESSIONAL PAPERS AND PRESENTATIONS

Conference Papers

Mileti, Dennis S.,
1983 "Social Impact and Use of Earthquake Prediction -- Warnings," Paper presented to the U.S.-Japan seminar on practical approaches to earthquake prediction and warning, Tokyo: November 1983.

Mileti, Dennis S., Donald M. Hartsough, Patti Madson and Rick Hufnagel
1983 "The Three Mile Island incident: a study of unobtrusive indicators of human stress," paper presented to the Disasters and Hazards Research Session of the Midwest Sociological Society, Kansas City: April.

Hufnagel, Rick, and Dennis S. Mileti
1983 "Organizational and environmental catastrophe: factors affecting organizational response to a predicted earthquake," paper presented to the Disasters and Hazards Research Session of the Western Social Science Association, Albequergue: April.

Mileti, Dennis S.
1982 "Earthquake prediction response: cultural comparisons between Japan and the United.States," paper presented to the Disaster Research Session of the International Sociological Association, Mexico City: August.

Mileti, Dennis S.
1982 "Influencing corporate decisions on the use of microzonation information." paper presented to the Third International Conference on Microzonation, Seattle: June.

Mileti, Dennis S.
1982 "Earthquake prediction and warnings: the human equation," paper presented to the Conference on Hazards Research, Policy Development, and Implementation Incentives: Focus on Urban Earthquakes, Policy Research Center at the University of Redlands, Redlands: June.

Mileti, Dennis S.
1982 "Public perception of seismic hazards," paper presented to the Seismological Society of America, Anaheim: April.

Williams, Gary, Frank Santopolo and Dennis S. Mileti
1980 "Perception of growth impacts in energy impacted communities," paper presented to the Rural Sociological Society, Ithaca: August.

Mileti, Dennis S.
1980 "Planning initiatives for seismic hazard mitigation," paper presented to the Conference on Social and Economic Impacts of Earthquakes on Critical Lifelines of the American Society of Civil Engineer, San Francisco: May.

Timmer, Doug, and Dennis S. Mileti
1980 "Interorganizational and structural determinants of decision making," paper presented to the Session on Complex Organizations of the Midwest Sociological Society, Milwaukee.

Williams, Gary, Dennis S. Miti and Frank Santopolo
1980 "Community growth and impacts," paper presented to the Western Social Science Association, Alburquque: April.

Mileti, Dennis S.
1980 "Human response to earthquake prediction," paper presented to the Status of Knowledge Session of the Conference on Earthquake Prediction Information, Los Angeles: January.

Williams, Gary, and Dennis S. Mileti
1979 "Perceptions of growth impacts in non-metropolitan Colorado," paper presented to the Impacts Session of the Conference on Regional Migration Trends, St. Louis: October.

Mileti, Dennis S., and Gary Williams
1979 "Resident perceptions in growth impacted western agricultural communities," paper presented to the Rural Sociological Society, Vermont: August.

Gillespie, David F., Dennis S. Mileti and Stan Eitzen
1979 "The epihenominality of organizational size," paper presented to the Session on Complex Organizations of the Midwest Sociological Society, Milwaukee: April.

Mileti, Dennis S., Janice R. Hutton and John Sorensen
1979 "Social factors and response to earthquake prediction," paper presented to the International Symposium on Earthquake Prediction, UNESCO, Paris: April.

Hutton, Janice, R., Dennis S. Mileti, and John Sorensen
1979 "Factors affecting earthquake warning system effectiveness," paper presented to the International Symposium on Earthquake Prediction, UNESCO, Paris: April.

Sorensen, John, Janice R. Hutton and Dennis S. Mileti
1979 "Institutional management of risk information following earthquake predictions," paper presented to the International Symposium on Earthquake Prediction, UNESCO, Paris: April.

Mileti, Dennis S., and Janice Hutton
1978 "Social aspects of earthquakes," paper presented to the State of the Art Session of the Second International Conference on Microzonation, San Francisco: November.

Mileti, Dennis S., and David F. Gillespie
1978 "Organizational size, complexity and decision making," paper presented to the Organizations Session of the American Sociological Association, San Francisco: September.

Gillespie, David F., and Dennis S. Mileti
1978 "Corporate size as work," paper presented to the Organization of Work Session of the American Sociological Association, San Francisco. September.

Mileti, Dennis S., and David F. Gillespie
1978 "Action postulates in organization-environment relations," paper presented to the Organizations-Environment Session of the Midwest Sociological Society, Omaha: April.

Gillespie David F., and Dennis S. Mileti
1978 "Size and organizational differentiation," paper presented to the Formal and Complex Organizations Session of the Pacific Sociological Association, Spokane: April.

Mileti, Dennis S., and Patricia Harvey
1977 "Correcting for the human factor in tornado warnings," paper presented to the Conference on Severe Local Storms of the American Meteorological Society, Omaha: October.

Mileti, Dennis S., and David F. Gillespie
1977 "Organization and environment adaptation-manipulation," paper presented to the Organizational Relations Session of the Amercian Sociological Association, Chicago: September.

Hutton, Janice R., and Dennis S. Mileti
1977 "The uses and abuses of scenarios in policy research," paper presented to the Social Policy Session of the American Sociological Association, Chicago: September.

Gillespie, David F., and Dennis S. Mileti
1977 "Organizational growth and managerial efficiency," paper presented to the Social Organization/Formal/Complex Session of the Pacific Sociological Association, Sacramento: April.

Mileti, Dennis S., and David F. Gillespie
1977 "Organizational manipulation and adaptation to complex environments," paper presented to the Complex Organizations Session of the Midwest Sociological Society, Minneapolis: April.

Gillespie, David F., Dennis S. Mileti and J. Eugene Haas
1976 "Size and structure in complex organizations," paper presented to the Organizational Change Session of the American Sociological Association, New York City: August.

Mileti, Dennis S.
1976 "Learning theory and disaster warning response," paper presented to the Issues in Environmental

Analysis Session of the Society for the Study of Social Problems, New York City: August.

Haas, J. Eugene, and Dennis S. Mileti
1976 "Consequences of earthquake prediction on other adjustments to earthquakes," paper presented to the Australian Academy of Science, Canberra: May.

Mileti, Dennis S., and J. Eugene Haas
1976 "A methodology for future collective events," paper presented to the Collective Behavior Session of the Midwest Sociological Society, St. Louis: April.

Gillespie, David F., and Dennis S. Mileti
1976 "Operations technology and organizational structure," paper presented to the Formal Organizations Session of the Midwest Sociological Society, St. Louis: April.

Haas, J. Eugene, and Dennis S. Mileti
1976 "Assessing the consequences of earthquake prediction" paper presented to the Social Risk Session of the American Association for the Advancement of Science, Boston: February.

Mileti, Dennis S., and David F. Gillespie
1975 "Technological uncertainty in organization-environment relations," paper: presented to the Formal Organizations Session of the American Sociological Association, San Francisco: August.

Mileti, Dennis S., and David F. Gillespie
1975 "A resolution of inconsistencies between size, complexity and the administrative component in organizations," paper presented to the Formal Organizations Session of the Midwest Sociological Society, Chicago: April.

Mileti, Dennis S., and David F. Gillespie
1975 "Technology and the study of organizations," paper presented to the Formal Organizations Session of the Pacific Sociological Association, Victoria: April.

Mileti, Dennis S., and David F. Gillespie
1975 "An interaction model for organization-environment relations," paper presented to the Interorganizational Relations Session of the Midwest Sociological Society, Omaha: April.

Mileti, Dennis S., and David F. Gillespie
1974 "A formalization of organization-environment dependencies," paper presented to the Formal Organizations Session of the Pacific Sociological Association, San Jose: March.

Farhar, Barbara, and Dennis S. Mileti
1974 "Value and role issues for the involved social scientist," paper presented to the Applied Session of the Pacific Sociological Association, San Jose: March.

Mileti, Dennis S.
1973 "Drowing: a communications disease," paper presented to the Mass Communictions and Public Opinion Session of the Amercian Sociological Association, New York City: August.

Mileti, Dennis S., and Sigmund Krane
1973 "Response to impending system stress," paper presented to the What Do We Know Session on Human Behavior in Disaster of the American Sociological Association, New York City: August.

Mileti, Dennis S.
1973 "A paradigm and sociology of knowledge for theories of natural law," paper presented to the Theory Session of the Midwest Sociological Society, Milwaukee: April.

Mileti, Dennis S.
1972 "Response to hazards warnings," paper presented to the Organizational and Community Response to Disaster Seminar at the Disaster Research Center of the Ohio State University, Columbus: July.

Speeches and Guest Lectures

"Human Respose to Disasters," American Red Cross, Mile High Chapter Boulder Region, Boulder: October 1983.

"The Use of Earthquake Prediction-Warnings," Colloquium on Earthquake Prediction Research in the United States, Earthquake Research Institute, University of Tokyo: November 1983.

"Public Response to Flood Disasters," Conference on the Need for Team Work in Managing Flood Hazards, Associaton for State Floodplain Managers, Sacramento: April 1983.

"Integrated Emergency Management: Challenges and Opportunities," Natural Hazards Research Applications Workshop, Boulder: July 1983.

"Natural hazards, disasters and public policy," Environmental Management Institute University of Southern California, Los Angeles: April, 1982.

"Myths of disaster response," Earthquake Planning Conference for Business and Industry, Los Angeles: May, 1982.

"Communicating lessons learned from social science research on earthquakes," Workshop of Identifying and Disseminating Lessons Learned from Recent Earthquakes," Earthquake Engineering Research Institute. Los Altos: December, 1982.

"Social causes of earthquake prediction-warning response: implications for the design of California's warning system and information dissemination," Southern California Earthquake Preparedness Project, Van Nuys: October, 1981.

"Assessment of research on natural hazards: what have we learned and what problems demand further attention," Natural Hazards Research Applications Workshop, Boulder: July, 1981.

"Disaster reconstruction: patterns to guide planning," Governor's Task Force for Earthquake Emergency Preparedness, Committee on Long Range Reconstruction, Sacramento: July, 1981.

"Socio-cultural dimensions of earthquake risk," Governor's Emergency Task Force on Earthquakes, General Assembly, Sacramento: May, 1981.

"Interorganizational relations and service delivery systems," Health Sciences Center, University of Colorado, Denver: October, 1980.

"Social response to earthquake prediction: local policy issues," Southern California Emergency Services Association, Montebello: February, 1980.

"Human response to weather-borne hazards warnings," Department of Atmospheric Sciences, Colorado State University: October, 1979.

"Natural hazards, disasters and social research," Department of Sociology, University of Denver: December, 1980, 1979.

"Measuring implementation of public policy for floodplain land use controls," Natural Hazards Research Applications Workshop, Boulder: August, 1978.

"Socioeconomic effects of earthquake prediction and state policy," Conference on State Policy for Earthquake Prediction Technology, Boulder: November, 1977.

"Population, resources and policy for social change," College of Natural Resources, Colorado State University: September, 1977; February, 1978; February, 1980.

"The behavior of government and corporate organizations in an earthquake prediction," American Society for Public Administration, Colorado Chapter, Denver: April, 1976.

"The social and economic aspects of scientifically credible earthquake predictions," California State Seminar on Emergency Preparedness and Earthquake Prediction, Palm Springs: June, 1976.

"Preparing to make use of earthquake predictions," Emergency Preparedness Commission for the County and Cities of Los Angeles, Montebello: February, 1976._

"The social organization of hazard warning systems," Engineering Foundation Conference on Decision Making for Natural Hazards, Pacific Grove: March, 1976.

"Briefing on the likely social and economic impacts of earthquake prediction," Governor's Conference Room, Sacramento: May, 1975; Mayor's Conference Room, Los Angeles: October, 1975.

"Social, economic and legal aspects of earthquake prediction," General Assembly of the International Union of Geodesy and Geophysics, Grenoble: September, 1975.

"Earthquake prediction and its implications for emergency preparedness," Center for Community Studies, Tokyo: September, 1975.

"Social impacts of earthquake prediction: implications for policy," California Water and Power Earthquake Engineering Forum, San Francisco: April, 1975.

Since 1972 I have been awarded numerous research grants and contracts, including:

1983-1984	Principal Investigator, "Research and Applications for Emergency Preparedness," Contract for Long Island Lighting Company.
1982-1983	Associate Investigator, "Organizational Interface for Nuclear Reactor Emergency Preparedness," Subcontract for Oak Ridge National Laboratories for the Nuclear Regulatory Commission.
1981-date	Principal Investigator, "Nuclear Hazard Warnings and Emergency Evacuation Preparedness," contract for Pacific Gas and Electric Company.
1980-1981	Principal Investigator, "Power and Networks in Local Land Use Policy Decisions," Colorado State University Experiment Station.
1979-date	Principal Investigator, "Behavioral Aspects of the Three Mile Island Incident and Restart," contract for General Public Utilities and Metropolitan Edison.
1977-1980	Principal Investigator, "Impacts of Migration on Non-metropolitan Areas in the West," U.S. Department of Agriculture Regional Project, Colorado State University Experiment Station.
1977-1979	Principal Investigator, "Adoption ad Organizational Implementation of Policy for Community Land Use Regulations," multidisciplinary grant from the National Science Foundation.
1975-1977	Coprincipal Investigator, "Socioeconomic, Political and Organizational Response to Earthquake Prediction," multidisciplinary grant from the National Science Foundation.
1972-1974	Research Sociologist, "Assessment of Research on Natural Hazards," multidisciplinary grant from the National Science Foundation.

Other professional services I have engaged in include the following:

Organizer and Presider

Session on Earthquake Hazard Reduction: Is the National Earthquake Hazard Reduction Program Meeting its Congressional Mandate, Seventh Annual Workshop on Natural Hazards Research Applications, Boulder: July, 1982; Session on Disasters and Cataclysms: Can Sociology Help, Pacific Sociological Association, San Diego: April, 1982; Session on Collective Behavior, American Sociological Association, New York: August, 1980; Session on Complex Organizations, Pacific Sociological Association, San Francisco: April, 1980; Session on Complex Organizations, Western Social Science Association, Tempe, 1976.

Discussant

Session on Public Response to Earth Science Information, Natural Hazards Research Applications Workshop, Boulder: July, 1980; Session on Warning Systems, National Conference on Natural Hazards, Boulder: June, 1976; Session on Warning Systems, National Conference on Natural Hazards, Boulder: July, 1975; Session on Disaster Relief and Warning Systems, National Conference on Natural Hazards, Estes Park: June, 1973.

Participant

Review Panel, Corresponding Member, Task Group on Social and Economic Aspects of Earthquakes, National Academy of Sciences, National Research Council, Commission on Sociotechnical Systems, Washington, D.C.: 1982; Workshop on Disseminating Lessons Learned from Recent Earthquakes, Earthquake Engineering Research Institute, Los Altos: December, 1982; Tennessee Valley Authority Flood Plain Evaluation Panel, Boulder: November, 1982; Earthquake Prediction Warning Task Force Workshop, Southern California Earthquake Preparedness Project, Asilomar: December, 1981; Symposium on Earthquake Prediction, Preparedness and Human Response, San Fernando: June, 1976; Seminar on Disaster Research, Colorado State University, Fort Collins: February, 1975; Symposium on Complex Organizations: Research and Applications, Western Social Science Association, El Paso: April, 1974.

Editorships

Corresponding editor on Hazards and Disaster, Environmental Sociology, Newsletter of the Section on Environmental Sociology of the American Sociological Association, 1981-date; Guest editor, special issue on Environmental Stress, Threat and Social System Response, Mass Emergencies 1(4): 247-346, 1976.

Testimony

Nuclear Regulatory Commission in the matter of pre-emergency public education and information for emergency planning at the Waterford Three nuclear reactor, New Orleans: February, 1983; Suffolk County Legislature, State of New York, in the matter of emergency planning at the Shoreham nuclear reactor, Suffolk: January, 1983; Nuclear Regulatory Commission in the matter of Emergency planning at the Diablo Canyon nuclear reactor, San Luis Obispc: January, 1982; Senate Subcommittee on Science, Technology and Space in the matter of the National Earthquake Hazards Reduction Act, Washington, D.C.: April, 1980; Nuclear Regulatory Commission in the matter of the impact of floating nuclear plants on tourist behavior, Bethesda: May, 1977 and July, 1978.

Legislative and Program Reviews

Earthquake Hazards Reduction Program, U.S. Congressional Panel, Federal Emergency Management Agency, 1983-82; Earthquake Hazards Reduction Program of the U.S. Geological Survey, 1982; Final Regulations for Floodplain Management and Protection of Wetlands, Federal Emergency Management Agency, Federal Register 176(45): 59520-59538, 1980; Applied Research Program Evaluation, National Science Foundation, 1979-78.

Proposal Reviews

Sociology Program, National Science Foundation, 1982-81; Design Research Program, National Science Foundation, 1982; Civil and Environmental Engineering Program of the Earthquake Hazards Mitigation Program, National Science Foundation, 1983-81; Division of Problem Focused Research, National Science Foundation, 1980; Division of International Programs, National Science Foundation, 1987; Division of Advanced Environmental Research and Technology, National Science Foundation, 1978-76.

Article Reviews

Risk Analysis, 1983: The Environmental Professional, 1983.

Sociology and Social Research, 1982-81, 1979-78, 1976; Social Forces, 1980; The Environmental Professional, 1982; The Environmental Frofessional, 1982; The Social Science Journal, 1981-77; Bulletin of the Seismological Society of America, 1982; Sociological Focus 1980; Human Relations 1978-77; Mass Emergencies, 1978, 1976-75; Policy Analysis 1978; The Sociological Quarterly, 1975.

Other Reviews

L. Lave and D. Epple, "Future Scenarios," Chapter 21 in R.W. Kates (Ed.) Climate Impact Assessment: Studies of the Interaction of Climate and and Society. Geneva, for the International Council of Scientific Union's Scientific Committee on Problems of the Environment, 1982; Study on Earthquake Hazards Information Dissemination: Charleston, South Carclina. Reston for the U.S. Geological Survey, 1982.

Department and University Service

Ad hoc Committee on Research Space, 1983; Department Executive Committee, 1983-83, 1980-77; Department ad hoc Committee on Research Space, 1983; Department Five-Year Review Committee 1982; Department Comprehensive Examination Committee, 1983-75; Department Evaluation of Independent Study Courses, 1978; University Committee on Ethnic Studies, 1976-74; University Committee on Latin American Studies, 1975-74.

PROFESSIONAL QUALIFICATIONS

JOHN H. SORENSEN

Research Associate

OAK RIDGE NATIONAL LABORATORY

My name is John H. Sorensen and my business address is Oak Ridge National Laboratory, P.O. Box X, Bldg. 4500 North, Room H 11c, Oak Ridge, Tennessee 37830. I am currently a Research Associate in the Resource Analysis Group of the Energy Division at Oak Ridge National Laboratory.

I was awarded my Bachelor of Arts degree in Geography and Economics in 1973 from Clark Univeristy. In 1974, I earned my Master of Arts degree in Geography from the University of Colorado. The title of my master's thesis was "Nuclear Energy in Light of Resource Management Experience." In 1977, I earned my Doctor of Philosophy degree in Geography, also from the University of Colorado. My dissertation was entitled "Interaction of Adjustments to Natural Hazard."

My professional and current interests include the following:

(1) In general, assessment of the manner in which societies respond to risk from natural and man-induced hazards, with emphasis on the social consequences and associated implications for public policy.

(2) Social and economic aspects of environmental and resource management issues.

(3) Development and management of energy resources.

The following is an account of my research experience:

Research Associate, Oak Ridge National Laboratory, Current.

Principal Investigator/Project Leader for:

"Organization Interface in Reactor Emergency Planning," NRC, 1982-83, $125,000;

"Human Factors in Incident Alert Notification," NRC, 1982-83, $150,000;

"Social and Psychological Impacts of Restarting TMI Unit 1," NRC, 1982, $300,000;

"Test Exercises for Energy Emergency Planning," DOE, 1981-82, $250,000;

"Carrying Capacity and Energy Facility Siting," DOE, 1981, $275,000.

Project participation:

"Development of Efficiency Research and Implementation Planning Tools for Navy Shore Facilities," NCEL, 1983;

"Environmental Impacts of the Commercial and Apartment Building Conservation Service," DOE, 83;

"Technical Assistance for State Energy Emergency Planning," DOE, 1980-81;

"Incentives for Siting Radioactive Waste Facilities," ONWI, 1981;

"Analysis of the Applicability of the TMI Action Plan to the Ft. St. Vrain HTGR," NRC, 1981-82;

"Societal Implications of Decommissioning Energy Facilities," ORNL Seed Money Grant, 1982;

"Environmental Impacts of Solvent Refined Coal Demonstration Plants," DOE, 1981.

Research Associate, Environmental Center, University of Hawaii, 1980. Chiefly responsible for preparing official university reviews of State and Federal Environmental Assessments and Environmental Impact Statements. Responsibilities also included preparing testimony and testifying at State Legislative Hearings.

Consultant, Woodward Clyde Consultants, San Francisco. "Analysis of the Adoption and Implementation of Community Land Use Regulations for Floodplains," supported by the National Science Foundation (1977-79).

Research Associate, "Coastal Zone Management in Hazardous Areas," Institute of Behavioral Science, University of Colorado, supported by the Office of Coastal Zone Management (1976-77).

University Researcher, "Socio-economic and Political Consequences of Earthquake Prediction," Institute of Behavioral Science, University of Colorado, supported by the National Science Foundation (1975-76).

Research Assitant, "Assessment of Research on Natural Hazards," Institute of Behavioral Science, University of Colorado, supported by the National Science Foundation (1973-74).

In 1974, I was employed as a Teaching Assistant in the Department of Geography at the University of Colorado. The course I taught was entitled "Environmental Quality and Human Choice." From 1977 to 1980, I was a Visiting Assistant

Professor in the Department of Geography at the University of Hawaii. The courses I taught included: Geography and Contemporary Society; Conservation and Resource Management; Hazard and Human Decisions; Seminar on Behavioral Science Aspects of Environmental Impact Assessment; Field Camp; and Environment and Culture.

The following list comprises books, monographs, papers, book chapters, articles reprinted, and reports that I have had published:

Books/Mongraphs

(with Mileti, Dennis and Janice Hutton), Earthquake Prediction Response and Options for Public Policy, Boulder: University of Colorado, Institute of Behavioral Science, Program on Technology, Environment and Man, Mongraph No. 31, 1981.

(with Mitchell, J. Kenneth), Coastal Erosion Hazard in the United States: A Research Assessment, Boulder: University of Colorado, Institute of Behavioral Science, Program on Technology, Environment, and Man, Mongraph No. 014, 1975.

(with Ericksen, Neil and Dennis Mileti), Landslide Hazard in the United States: A Research Assessment, Boulder: University of Colorado, Institute of Behavioral Science, Program on Technology, Environment, and Man, Monograph, No. 016, 1975.

Published papers and Book Chapters

"Organizational Interaction in Radiological Emergency Planning" Papers and Proceedings of Applied Geography Conferences Vol. 6, 1983, pp. 282-290.

"Public Hazard Education and Earthquake Mitigation Policy" In D. Nilson and R. Andrews (eds), Planning for Disasters: Policies, Barriers, and

Incentives. Port Washington, N.Y.: Kennikat Press, Forthcoming.

"Evaluating the Effectiveness of Warning Systems for Nuclear Power Plant Emergencies: Criteria and Application" in M. Pasqualetti and D. Pijawka (eds.), Nuclear Power: Assessing and Managing Hazardous Technologies. Boulder: Westview, Forthcoming.

"Knowing How to Behave Under the Threat of Disaster," Environment and Behavior Vol 15, No. 4, pp. 438-57.

(with Carnes, S. et al.) "Incentives and Nuclear Waste Siting: Prospects and Constraints," Energy Systems and Policy, Forthcoming.

(with Carnes, S. and J. Soderstrom) "Sweet for the Sour: Incentives in Environmental Mediation," Environmental Management, Forthcoming.

"Managing Energy Emergencies," Geoforum Vol 14, No. 1, 1983, pp. 15-24.

"Emergency Planning for Rare Events: Some Behavioral Science Lessons for Volcano Hazard Management," in R. Martin and J. Davis (eds.), Status of Volcanic Prediction and Emergency Response Capabilities in Volcanic Hazard Zones of California. Sacramento: California, Division of Mines and Geology (Special publication No. 63), 1982, pp. 153-168.

(with Hutton, Janice and Dennis Mileti), "Institutional Management of Risk Information Following Earthquake Predictions," in K. Oshida (ed.), Earthquake Prediction, Tokyo, Japan: Terra Scientific Publishing (for UNESCO), Forthcoming.

(with Hutton, Janice and Dennis Mileti). "Social Factors Affecting the Response of Groups to Earthquake Prediction: Implications for Public Policy," in K. Oshida (ed.), Earthquake Prediction, Tokyo, Japan: Terra Scientific Publishing (for UNESCO), Forthcoming.

(with Hutton, Janice and Dennis Mileti), "Factors Affecting Earthquake Warning--Dissemination System Effectiveness," in K. Oshida (ed.), Earthquake

Prediction, Tokyo, Japan: Terra Scientific Publishing (for UNESCO), Forthcoming.

(with Carnes, S. et al.) "Framework for Evaluating the Utility of Incentive Systems for Radioactive Waste Repository Siting," in R. Post (ed.), Waste Isolation in the U.S. and Elsewhere, Technical Programs and Public Communications, Tucson: University of Arizona, 1982.

"Alternative Means of Coping with National Energy Emergencies," in R. Fazzolare and C. Smith (eds.), Beyond the Energy Crisis: Opportunity and Challenge. Oxford: Pergamon Press, 1981, pp. 385-395.

(with Copenhaver, E. et al.) "Review of Institutional and Socioeconomic Issues for Radioactive Waste Repository Siting," in P. Hoffman (ed.), Advances in the Science and Technology of the Management of High-Level Nuclear Wastes. Columbus: Office of Nuclear Waste Isolation, forthcoming.

Emergency Response to the Mt. St. Helens Eruption: March 20 to April 10, 1980. Natural Hazards Working Paper Number 43. Boulder: University of Colorado, Institute for Behavioral Science, 1981.

(with Hutton, Janice and Dennis Mileti), "Earthquake Prediction and Public Reaction'" in T. Rikitake (ed.), Current Research in Earthquake Prediction, Tokyo, Japan: Center for Academic Publications, 1981, pp. 129-166.

"Earthquake Prediction: A Socioeconomic View," Issues in Engineering-- Journal of Professional Activities, American Society of-Civil Engineers, Vol 106, No. E13, July 1980, pp. 257-263.

(with Gersmehl, Phillip), "Volcanic Hazard Warning System: Persistence and Transferability," Environmental Management, March 1980 Vol 4, No. 2, pp. 125-136.

(with White, Gilbert), "Natural Hazards: A Cross-Cultural Perspective," in I. Altman, A. Rapaport and J. Wohwill (eds.), Human Behavior and the Environment: Environment and Culture, New York: Plenum Press, 1980, pp. 279-318.

Articles Reprinted

(with Hutton, Janice and Dennis Mileti), "Institutional Management of Risk Information Following Earthquake Predictions," in Song, Shouquan and LiHuaying (eds.), A Collection of Papers On World Seismo-Sociology, Beijing, China: Institute of Geophysics, State Seismological Bureau (Reprinted in Chinese), pp. 119-126.

(with Hutton, Janice and Dennis Mileti), "Factors Affecting Earthquake Warning Dissemination System Effectiveness," in Song Shouquan and Li Huaying (eds.), A Collection of Papers On World Seismo-Sociology, Beijing, China: Institute of Geophysics, State Seismological Bureau (Reprinted in Chinese), pp. 139-143.

(with Hutton, Janice and Dennis Mileti), "Social Factors Affecting the Response of Groups to Earthquake Prediction: Implications for Public Policy," in Song Shouquan and Li Huaying (eds.), A Collection of Papers on World Seismo-Sociology, Beijing, China: Institute of Geophysics, State Seismological Bureau. (Reprinted in Chinese), pp. 17-22.

"Earthquake Prediction: A Socioeconomic View," Recent Developments in World Seismology, 1982, No. 5, Published by the Institute of Geophysics, State Seismological Bureau, Beijing, China (Reprinted in Chinese), pp. 20-23.

Reports

(with others) Restarting TMI Unit One: Social and Psychological Impacts, Oak Ridge: Oak Ridge National Laboratory, Report No. 5891, 1983.

(with others) Commercial and Apartment Conservation Service Program: Final Environmental Impact Statement, U.S. Department of Energy (DOE/EIS-0050), August, 1983.

(with Carnes, S. et. al.) Incentives and the Siting of Radioactive Waste Facilities. Oak Ridge: Oak Ridge National Laboratory, Report No. 5880, 1982.

Evaluation of the Emergency Warning System at the Ft. St. Vrain Nuclear Power Plant, Oak Ridge: Oak Ridge National Laboratory, Report No. 8171, 1982.

(with others) "Socioeconomic Impacts," in Final Environmental Impact Statement, Solvent Refined Coal-II Demonstration Plant, U.S. Department of Energy, (DOE/EIS-0069), January, 1981.

(with Collins, Nancy), Preliminary Considerations for State Energy Emergency Planning, Oak Ridge: Oak Ridge National Laboratory, Technical Memorandum No. 7876, 1982.

(with Mileti, Dennis, Janice Hutton, William Lord and Marvin Waterstone), Analysis of Adoption and Implementation of Community Land Use Regulations of Floodplains, a final report to the National Science Foundation, San Francisco: Woodward-Clyde Consultants, November, 1979.

(with White, Gilbert, et al.), Natural Hazard Management In Coastal Areas, Washington, D.C.: U.S. Department of Commerce, Office of Coastal Zone Management, 1976.

(with Huffaker, Michael, et al.), Southeast Boulder County: Land Use and Environmental Impact, Boulder: University of Colorado, Department of Geography and Boulder County Planning Department Joint Publication, 1973.

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"Public Hazard Education and Earthquake Mitigation Policy," Paper presented at the workshop on Hazards Research, Policy Development.

"Decisions in Emergencies: A Comparison of Volcano Hazard in Hawaii and the Cascades," paper presented at the Fourth Annual Applied Geography Conference, Tempe, Arizona, October 22-25, 1981 (By Invitation).

"Managing Energy Emergencies," paper prepared for the 77th Annual Meetings of the Association of American Geographers, Los Angeles, April 1981.

"Hurricane Management: The Issues of Inexperience," paper presented at the 76th Annual Meetings of the Association of American Geographers, Louisville, April, 1980.

"Emergency Response at Mt. St. Helens," Presented at 5th Natural Hazards Workshop, Boulder, Colorado, July, 1980 (By Invitation).

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"Earthquake Prediction: Balancing Social Response with Scientific Risk," paper prepared for the 75th Meetings of the Association of American Geographers, Philadelphia, 22-25 April, 1979. Abstract: p. 218 of the Program Abstracts.

(with Hutton, Janice and Dennis Mileti), "Social Factors Affecting the Response of Groups to Earthquake Prediction: Implications for Public Policy," paper presented at the International Symposium on Earthquake Prediction, UNESCO, Paris, France, 2-6 April, 1979. Abstract: p. 65 of the Abstract of Contributed Papers.

(with Hutton, Janice and Dennis Mileti,) "Institutional Management of Risk Information Following Earthquake Predictions," paper presented at the

International Symposium on Earthquake Prediction, UNESCO, Paris, France, April 1-6, 1979. Abstract: p. 92 of the Abstracts of Contributed Papers.

(with Hutton, Janice and Dennis Mileti), "Factors Affecting Earthquake Warning--Dissemination System Effectiveness," paper presented at the International Symposium on Earthquake Prediction, UNESCO, Paris, France, April 2-6, 1979. Abstract: p. 97 of the Abstract of Contributed Papers.

"Contextual Factors in Community Decision Making: A Geographical Perspective," paper presented for the "Workshop on Community Adoption of Land Use Controls for Floods," sponsored by the National Science Foundation, San Francisco, January 16-17, 1978 (By Invitation).

"The Role of Communication in Community Hazard Adjustment Decisions," paper prepared for the "Workshop on Community Adoption of Land Use Controls for Floods," sponsored by the National Science Foundation, San Francisco, 16-17 January, 1978 (By Invitation).

"Resource Management Experiences with Implications for Nuclear Power Development Decisions," paper presented at the 52nd Annual Meeting of the Southwestern and Rocky Mountains Division, A.A.A.S., Tucson, Arizona, 28 April - 1 May, 1976. Abstract: p. 77 of the Journal of the Arizona Academy of Science, April 1976.

My other professional activities have included the following:

Review of Natural Hazards in Australia, edited b R. Heathcote and B. Thom, in Geographical Review, July 1981, pp. 370-371.

Manuscript Reviews, The Professional Geographer, 1982.

Manuscript Reviews, The Environmental Professional, 1982.

Proposal Reviews for Directorate for Engineering and Applied Sciences, National Science Foundation, 1980, 1981, 1982.

Corresponding Member, International Geographical Union, Working Group on Environmental Perception, current.

Member, Environmental Studies Advisory Committee, University of Hawaii, 1979-80.

Member, Hurricane Warning Advisory Group, National Weather Service, Honolulu, 1979-80.

"Adjusting to Natural and Nuclear Hazards," Department of Physics, University of Colorado Fall Physics Colloquium, 1975.

Review of Commmunity Response to Coastal Erosion, by J.K. Mitchell in The Professional Geographer, November, 1975, pp. 501-502.

PROFESSIONAL QUALIFICATIONS

JOHN A. WEISMANTLE

Manager
Power Engineering Department

LONG ISLAND LIGHTING COMPANY

My name is John A. Weismantle and my business address is Long Island Lighting Company (LILCO), 100 East Old Country Road, Hicksville, New York 11801. I have been an employee of LILCO since 1969.

I was awarded my Bachelor of Science degree with a Pre-Engineering major from Columbia College in New York City in 1963. I subsequently ea. .ed two degrees in Mechanical Engineering from Columbia School of Engineering in New York City -- a Bachelor of Science degree in 1964 and a Master of Science degree in 1965. In 1970, I was again awarded a Master of Science degree, this time in Nuclear Engineering Science, from Long Island University in Brookville, New York.

I was employed by LILCO in 1969 as Section Head of the Power and Instrumentation division. I remained in this capacity through 1973. In this position, I assumed a wide range of responsibilities related to new and existing steam plants, a new nuclear plant and gas turbines. These responsibilities included acting as Project Coordinator for Northport Units 3 and 4 (two 400 MW oil-fired units) and lead mechanical engineer for these units. I also served as lead mechanical engineer on balance of plant for the 820 MW Shoreham Nuclear Power Station as

well as Project Engineer for Holbrook Power Station (500 MW of gas turbines).

As Section Head of the Power and Instrumentation Division, my special assignments included acting as Chairman of the Engineering Productivity Task Force and as a member of the Construction Manpower Task Force. In both of these positions the conclusions and recommendations I proffered were accepted.

In 1974, I served as Licensing Engineer for the Jamesport Nuclear Power Station. This was a full-time special assignment to direct completion of State Siting and NRC Construction Permit Applications which were behind schedule. I was responsible for direction and coordination of internal departments and numerous consultants. In this capacity, I saw to it that the lost time was made up and that applications were submitted by the original deadline.

From 1974 to 1975, I was the Manager of the System Planning Division. As Manager of this division, I was responsible for generation, bulk transmission and interconnection planning. I had direct supervisory responsibility over 12 graduate engineers plus support personnel.

In 1975, I assumed the position of Project Manager for the Jamesport Nuclear Power Station. I remained in this position until 1977, assuming responsibility for two 1150 MW PWR nuclear units. At the time I assumed this position, the project was in the state and federal licensing stage with

preliminary engineering and construction planning proceeding. Eventually, under my management, a single 800 MW coal unit received a State Siting Certificate.

From 1977 to 1978, I served as LILCO's first Research and Development Director. In addition to organizing a corporate Research and Development program, developing a five year plan, and establishing procedures, I represented LILCO on external Research and Development committees. One of my special assignments involved acting as Chairman of the LILCO Load Management Task Force, where my conclusions and recommendations were accepted.

From 1978 to 1981, I was Manager of LILCO's Planning Department. In this capacity, I was responsible for short term and long range planning of LILCO's electric facilities and corporate Research and Development function. The Planning Department comprises three divisions - System Planning (involving sub-transmission and interconnections), Area Planning (involving sub-transmission and distribution), and Research and Development. I had direct supervisory responsibility over a staff of 30 graduate engineers plus support personnel. Furthermore, I directed preparation of a wide range of technical and economic reports in addition to serving as a member of the LILCO ad hoc task force on coal.

As Manager of the Planning Department, I represented LILCO on the following industry committees: the EEI System Planning Committee, ESEERCO Administrative Committee, NYPP Generation Planning Advisory Subcommittee, and EPRI Advanced Power Systems Task Force (Chairman of Clean Gaseous Fuels Program Committee).

Since 1981, I have held the position at LILCO of Manager of the Power Engineering Department. In this capacity, I am responsible for the Port Jefferson Coal Conversion conceptual design, cost estimate, and license, all of which is currently undergoing the state licensing process. In addition, I am responsible for all major capital (above $25,000) improvement projects for existing fossil plants. Other responsibilities include the fields of gas system planning and engineering, mechanical engineering -- Shoreham support, and direct supervisory responsibility for a staff of over 35 graduate engineers plus support personnel.

In my current capacity, I represent LILCO on EEI Prime Movers Committee and EPRI Fossil Fuel Power Task Force.

Since June 1982, I have worked on a special assignment at LILCO. I am responsible for the satisfactory implementation of onsite and local emergency plans. In carrying out this assignment, I report to the Vice President of Engineering who has corporate lead responsibility for emergency preparedness. I am currently full-time manager of the Local Emergency Response

Implementing Organization, a group of about 30 professionals plus support personnel.

In connection with my professional experience and qualifications, I have prepared and presented testimony on a wide range of technical and economic issues at numerous proceedings, including the 1979 State Energy Master Plan hearings, in electric rate cases (involving corporate capital budget and Research and Development programs), and in hearings before the State Siting Board, the Nuclear Regulatory Commission, State Legislative Commissions (involving cogeneration and Research and Development), and the Federal Energy Regulatory Commission.

I have been a licensed Professional Engineer in the State of New York since 1970. My professional affiliations include membership in the American Society of Mechanical Engineers, and past membership on the Power Test Code Committee -- Condensers and Feedwater Heaters, and the Executive Committee, Long Island Section.

ntro. Res. No. 1196-83
ntroduced by Legislators Wehrenberg, Caracappa, D'Andre, Geise, Allgrove, Bachet Prospect, Foley, Nolan, Blass, Rizzo, LaBua, Devine, Hariton, Beck

RESOLUTION NO. 111 - 1983, CONSTITUTING THE FINDINGS AND DETERMINATIONS OF SUFFOLK COUNTY ON WHETHER A LEVEL OF EMERGENCY PREPAREDNESS TO RESPOND TO A RADIOLOGICAL ACCIDENT AT THE SHOREHAM NUCLEAR POWER STATION CAN PROTECT THE HEALTH, WELFARE AND SAFETY OF THE RESIDENTS OF SUFFOLK COUNTY

WHEREAS, Suffolk County has a duty under the Constitution of the State of ew York, the New York State Municipal Home Rule Law, and the Suffolk County harter to protect the health, safety, and welfare of the residents of Suffolk ounty; and

WHEREAS, the Long Island Lighting Company ("LILCO") is constructing and esires to operate the Shoreham Nuclear Power Station ("Shoreham"), located on he north shore of Long Island near the town of Wading River, a location which s within the boundaries of Suffolk County; and

WHEREAS, a serious nuclear accident at Shoreham could result in the elease of significant quantities of radioactive fission products; and

WHEREAS, the release of such radiation would pose a severe hazard to the ealth, safety, and welfare of Suffolk County residents; and

WHEREAS, in recognition of the effects of such potential hazard posed by horeham on the duty of Suffolk County to protect the health, safety, and el re of its citizens, this Legislature on March 23, 1982, adopted Resolution o. 262-1982, which directed that Suffolk County prepare a "County Radiological mergency Response Plan to serve the interest of the safety, health, and welfare f the citizens of Suffolk County .."; and

WHEREAS, in Resolution 262-1982, the Legislature determined that the plan eveloped by the County "shall not be operable and shall not be deemed adequate nd capable of being implemented until such time as it is approved by the uffolk County Legislature"; and

WHEREAS, in adopting Resolution 262-1982, the Legislature found that earlier planning efforts by LILCO and County planners (the "original planning data") were inadequate because they failed to address the particular problems posed by conditions on Long Island and further failed to account for human behavior during a radiological emergency and the lessons of the accident at Three Mile Island; and

WHEREAS, on March 29, 1982, Peter F. Cohalan, Suffolk County Executive, acting to implement Resolution 262-1982, by Executive Order established the Suffolk County Radiological Emergency Response Plan Steering Committee ("Steering Committee") and directed it to prepare a County plan for submittal to the County Executive and County Legislature; and

WHEREAS, the Steering Committee assembled a group of highly qualified and nationally recognized experts from diverse disciplines to prepare such County pla and

WHEREAS, such highly qualified experts worked in a diligent and conscientious effort at a cost in excess of $500,000 to prepare the best possible plan for Suffolk County, and particularly to ensure that such plan took into account all particular physical and behavioral conditions on Long Island that affect the adequacy of the emergency response plan; and

WHEREAS, the analyses, studies, and surveys of such experts included:

(a) Detailed analyses of the possible releases of radiation from Shoreham;

(b) Detailed analyses of the radiological health consequences of such radiation release on the population of Suffolk County, giventhe meterological, demographic, topographical, and other specific local conditions on Long Island;

(c) A detailed social survey of Long Island residents to determine and assess their intended behavior in the event of a serious accident at Shoreham;

(d) A detailed survey of school bus drivers, volunteer firemen, and certain other emergency response personnel to determine whether emergency personnel intend to report promptly for emergency duties, or instead to unite with their own families, in the event of a serious accident at Shoreham;

(e) Detailed estimates of the number of persons who would be ordered to evacuate in the event of a serious accident at Shoreham, as well as the number of persons who intend to evacuate voluntarily even if not ordered to do so;

(f) Detailed analyses of the road network in Long Island and the time required to evacuate persons from areas affected by radiation releases;

(g) Detailed analyses of the protective actions available to Suffolk County residents to evacuate or take shelter from such radiation releases; and

(h) Analysis of the lessons learned from the accident at Three Mile Island on local government responsibilities to prepare for a radiological emergency; and

WHEREAS, on May 10, 1982, LILCO, without the approval or authorization of the Suffolk County Government, submitted to the New York State Disaster Preparedness Commisssion ("DPC") two volumes entitled "Suffolk County Radiological Emergency Response Plan" and containing the original planning data, as further revised and supplemented by LILCO, and requested the DPC to review and approve such LILCO submittal as the local radiological emergency response plan for Suffolk County; and

WHEREAS, in Resolutions 456-1982 and 457-1982, the County further addressed the matter of preparing for a radiological emergency at Shoreham and emphasized that:

(a) The LILCO-submitted document was not and will not be the County's Radiological Emergency Response Plan; and

(b) The County's Radiological Emergency Response Planning Policy, as enunciated in Resolution 456-1982, is as follows:

Suffolk County shall not assign funds or personnel to test or implement any radiological emergency response plan for the Shoreham Nuclear Plant unless that plan has been fully developed to the best of the County's ability.

Suffolk County shall not assign funds or personnel to test or implement any radiological emergency response plan for the Shoreham Nuclear Plant unless that plan has been subject of at least two public hearings, one to be held in Riverhead, and one to be held in Hauppauge.

Suffolk County shall not assign funds or personnel to test or implement any radiological emergency response plan for the Shoreham Nuclear Plant unless that plan has been approved, after public hearings, by the Suffolk County Legislature and the County Executive; and

WHEREAS, on June 9, 1982, the DPC rejected the LILCO-submitted document or the reason that it was deficient; and

WHEREAS, on October 6, 1982, LILCO, again without the approval or uthorization of the Suffolk County Government, submitted to the DPC an amended ersion of the previously submitted LILCO document which had been rejected by he DPC; and

WHEREAS, on December 2, 1982, the Draft County Radiological Emergency esponse Plan authorized by Resolution 262-1982 was submitted to the County eg lature for review and public hearings as specified in Resolutions 262-1982, 56-1982, and 457-1982; and

WHEREAS, in January 1983, the Legislature held hearings on the Draft ounty plan, which hearings included:

(a) More than 1,590 pages of transcripts;

(b) Detailed written statements and oral testimony of County expert consultants who prepared the Draft County plan;

(c) Detailed written statements and oral testimony of LILCO officials and expert consultants retained by LILCO;

(d) Detailed written statements and oral testimony of the Suffolk County Police Department, the County Health Department, the County Social Services department, and the County Public Works Department, all of which would have indispensable roles in responding to a radiological emergency at Shoreham;

(e) Detailed written statements and oral testimony of organizations in Suffolk County concerned with radiological emergency preparedness; and

(f) Extensive presentations by hundreds of members of the general public; and

WHEREAS, members of the Legislature also travelled to and held public hearings in the vicinity of the Three Mile Island Nuclear Power Plant to gain information on the lessons to be learned by local governments from the accident at Three Mile Island; and

WHEREAS, the Draft County plan identifies evacuation and protective sheltering as the two primary protective actions which would need to be implemented in the event of a serious accident at Shoreham; and

WHEREAS, evacuation of Suffolk County residents in the event of a radiological emergency could take as much time as 14-30 hours because of various factors, including: the limited number of appropriate evacuation routes in Suffolk County; difficulties in mobilizing police and other emergency personnel; difficulties ensuing from spontaneous evacuation of large numbers of County residents, thus creating severe traffic congestion; and unavilability of alternate evacuation routes for persons residing east of Shoreham and thus the necessity for such persons during an evacuation to pass by the plant and possibly through the radioactive plume; and

WHEREAS, evacuation times in excess of 10 hours -- and certainly evacuation times in the range of 14-30 hours -- will result in virtual immobilization of evacuation and high exposure of evacuees to radiation such that evacuees' health, safety, and welfare would not be protected; and

WHEREAS, protective sheltering is designed to protect persons from excessive radiation exposure by such persons staying indoors until radiation with the greatest danger to health has passed; and

WHEREAS, if protective sheltering were ordered for Suffolk County residents, unacceptable radiation exposure would still be experienced by substantial portions of the Suffolk County population, thus making it impossible to provide for the health, welfare, and safety of these residents; and

WHEREAS, the document submitted by LILCO to the DPC without County approval or authorization is deficient because it does not deal with the actual local conditions, physical and behavioral, on Long Island that would be encountered during a serious nuclear accident at Shoreham; and

WHEREAS, the document submitted by LILCO to the DPC without County approval or authorization does not ensure that effective protective action by persons subject to radiation exposure, in the form of evacuation or sheltering, would be taken in event of a serious nuclear accident at Shoreham, and thus such document, even if implemented, would not protect the health, safety, and welfare of Suffolk County residents; and

WHEREAS, the extensive data which the Legislature has considered make clear that the site-specific circumstances and actual local conditions existing on Long Island, particularly its elongated east/west configuration which requires all evacuation routes from locations east of the plant to pass within a zone of predicted high radiation, the ineffectiveness of protective sheltering, the severe traffic congestion likely to be experienced if a partial or complete evacuation were ordered, and the difficulties in ensuring that emergency personnel will promptly report for emergency duties, preclude any emergency response plan, if implemented, from providing adequate preparedness to protect the health, welfare, and safety of Suffolk County residents; now, therefore, be it

RESOLVED, that the draft County plan submitted to the County Legislature n December 2, 1982, if implemented, would not protect the health, welfare, and afety of Suffolk County residents and thus is not approved and will not be mplemented; and be it further

RESOLVED, that the document submitted by LILCO to the DPC without the ounty approval or authorization, if implemented, would not protect the health, elfare, and safety of Suffolk residents and thus will not be approved and will ot be implemented; and be it further

RESOLVED, that since no local radiological emergency response plan for a erious nuclear accident at Shoreham will protect the health, welfare, and afety of Suffolk County residents, and since the preparation and implementation f any such plan would be misleading to the public by indicating to County esidents that their health, welfare, and safety are being protected when, in act, such is not the case, the County's radiological emergency planning process s hereby terminated, and no local radiological emergency plan for response to n accident at the Shoreham plant shall be adopted or implemented; and be it urther

RESOLVED, that since no radiological emergency plan can protect the ealth, welfare, safety of Suffolk County residents and, since no radiological mergency plan shall be adopted or implemented by Suffolk County, the County xecutive is hereby directed to take all actions necessary to assure that ctions taken by any other governmental agency, be it State or Federal, are onsistent with the decisions mandated by this Resolution.

DATED: February 17, 1983

APPROVED BY:

Peter Cohalan

County Executive of Suffolk County

Date of Approval: 2/23/83

Most of the radionuclides released from Ginna were released during the first 3 hours of the event. During this period the wind was blowing toward the southeast. Snow and the moist cold air caused a large fraction of the radioiodines and particulates released from Ginna to deposit on the Ginna site, rather than to remain airborne beyond the site boundary. The Task Force estimated that airborne releases to an owner-controlled, unrestricted area exceeded the limits in 10 CFR 20. Other offsite releases were estimated to be less than 25% of the limit for unrestricted areas. All releases would result in doses which were significantly less than the 10 CFR 100 guidelines.

Potential health impacts from the estimated doses and predicted exposures were insignificant compared with the natural incidence of cancer fatalities and genetic abnormalities.

1.3.4 Institutional Response

Various organizations, including the licensee, State and local governments, NRC, and other Federal agencies responded to the event at Ginna.

The licensee had primary responsibility for resolving the conditions that existed at the plant. Prescribed initial notifications by the licensee to the State, local counties, and NRC were completed very early in the event, and interactions throughout the event were maintained among all the participants.

The Nuclear Regulatory Commission, using the resources of the Senior Resident Inspector, the Region I Base and Site Teams, and the Headquarters Executive and Analytical Teams, monitored the licensee's actions in response to the event to assure that these actions were correct and appropriate.

The State of New York and Wayne and Monroe Counties were promptly notified by the licensee. They responded by activating their Emergency Operations Centers and sending representatives to the site. Monroe County also fielded offsite radiological monitoring teams and reported results back to the Emergency Operations Center throughout the day. Twice during the first day of the event,

the Governor of New York was briefed by the NRC Chairman on the status of the event.

The Federal Emergency Management Agency (FEMA) was notified of the event by NRC. FEMA then coordinated the Federal agency nontechnical response, both from their Headquarters and from their Region II facility in New York City. Agencies contacted by FEMA were: the U.S. Department of Agriculture, the Department of Energy, the Coast Guard, the Department of Housing and Urban Development, the Department of Transportation, the National Oceanic and Atmospheric Administration, Environmental Protection Agency, General Services Administration, Department of Health and Human Services, and the Department of Defense. Each of the agencies notified was prepared to respond in accordance with the responsibilities defined in the National Radiological Emergency Prepared/Response Plan.

1.3.5 Post-Event Activities

After the plant was placed in cold shutdown, the licensee established conditions to support the identification of the ruptured tube in the affected steam generator. On January 31, the plant staff completed purging hydrogen and other noncondensible gases which had accumulated in the B steam generator as a result of the reactor coolant system inleakage, to the waste gas system. On February 1, the plant staff completed a reactor coolant system and B steam generator drain-down procedure. Aside from a reactor coolant system deboration event that occurred during a subsequent steam generator flush operation on February 3 and 4, no major problems were encountered by the plant staff.

The licensee determined that the ruptured tube was located at row 42, column 55 (R42C55) on the hot-leg side of the steam generator by a hydrostatic test. Nondestructive examinations of this tube, including eddy-current, radial profilometry, fiber optics, and visual inspections, determined that the rupture was about 4 in. long and 0.7 in. wide at its center. The rupture was centered at about 5 in. above the tubesheet. The rupture was fish-mouth-shaped and was later determined to be pointing outward along tube column 55. The tube appeared ballooned at the rupture location and had a wall thickness at the center of the

Long Island Lighting Company Storm Conditions of Readiness
Emergency Restoration Procedure
Operations Manual For Condition I - "Red" Rev. 6-1-82

Section A: General Procedures
Procedure No.A-100: Overview of Emergency Restoration Procedure
Operations Manual for Condition I - "Red"

1. SCOPE

This manual is a guide for handling the most severe "Storm Conditions of Readiness" called Condition I - "Red"; it deals with system disasters and hurricanes and permits the utilization of all part or any part of the entire personnel complement of LILCO to be mobilized, depending on the magnitude of the disaster. Lesser type Transmission and Distribution (T&D) emergencies are dealt with as follows:

- Condition II - Blue; Major Storm
- Condition III - White; Normal Coverage & Minor Storms

2. OBJECTIVES

The objectives of the plan for Condition I - "Red" are:

A. First call out the number of people required to secure information on the extent of the damage.

B. Call out such persons as are necessary to achieve efficient service restoration.

C. Open channels of communications to keep interested parties aware of the service restoration progress.

3. Organization of the Emergency Restoration Procedure

The Emergency Restoration Procedure is divided into an Operations Organization and a Communications Organization.

It provides for assignment of specific individuals to positions in each organization and also provides instructions for calling them out when and where they are needed.

The Emergency Restoration Procedure Operations manual for Condition I - "Red" outlines the general details for mobilizing the Operations and Communications Organizations. It also contains the complete instructions for utilizing the Operations Organization in Condition I - "Red". The Communication's Organization instructions are contained in the Emergency Communications Manual for Condition I - "Red".

The organizations are displayed in a chart on page A-100-13.

4. THE OPERATIONS ORGANIZATION

This organization is under the direction of the Chief Operations Coordinator who is responsible to the Vice President Transmission and Distribution for the restoration of transmission and distribution facilities; in his absence, to the Senior Vice President - T&D and Operations. The restoration of generation, transmission and substation facilities is carried out under the direction of the System Operations Department working in liaison with the Operations Organization.

The Chief Operations Coordinator is the Manager of the Customer Service Department and his alternate is the Manager of the Overhead Lines Department. They establish General Headquarters in Operations Building #1 at Hicksville.

A. The Customer Service Department is responsible for control of:

- o the operation of all electric distribution facilities
- o survey of damage
- o assignment of damage repairs
- o Storm Progress Reports

B. The Overhead Lines Department is responsible for the control of all repair forces with the exception of Customer Service Department personnel unless they are specifically assigned to the Overhead Lines Department.

C. Special Assistants are assigned to the Chief Operations Coordinator's headquarters reporting to two System Coordinators; one is responsible for survey and operations coordination, and the other is responsible for crew coordination. They handle special overhead or underground problems, industrial relations, radio and telephone communication, statistics, stores, transportation, payroll, petty cash, emergency assistance from other utilities and lodging for "foreign" crews. These Special Assistants have the authority for the transfer of personnel, vehicles, or equipment to the Operations Organization. Other assistants may be assigned to Headquarters as required.

D. Under the Emergency Restoration Procedure, the Electric System is divided into four divisions coinciding with the normal Customer Service Department division boundaries. Division Headquarters for the Operations Organization are established at Hewlett, Hicksville, Brentwood and Riverhead. Each Division is directed by a Division Operations Coordinator, who is normally the

Manager of the Customer Service Division, with an Alternate Division Operations Coordinator, who is normally the Manager of the Overhead Lines Division. He is responsible to the Chief Operations Coordinator for the restoration of facilities in his Division.

The Division Operations Coordinator has a staff, reporting to the Operations Staff Coordinator and consists of a Transmission Coordinator, a Statistician, representatives from the Transportation Department and Claims Department, and other coordinators and representatives as required. The Operations Staff is responsible for the coordination of the various functions applicable to each member and are described in detail in Section C-100.

The Alternate Division Operations Coordinator is normally concerned with Crew Control activities and has an organization consisting of a Staff and Public Works Coordinator, Line and Tree Crew Coordinator, and a Two-man "Make-up" Crew Coordinator.

Each Division is sub-divided into Substation groups, each of which is under the direction of a Group Coordinator; he is responsible to the Division Operations Coordinator for the coordination of all Substation activities in his group. His duties are described in Section C-100.

Each Group is further sub-divided into Substation Areas with Restoration Teams assigned to that location. It is under the control of a Substation Area Coordinator (SAC) who is directly responsible to the Group Coordinator for the restoration of facilities in his particular area. His duties are fully described in Section D-100.

Each Substation "Restoration Team" consists of the following:

- o A Substation Area Coordinator (SAC) in charge.
- o An Alternate Substation Area Coordinator (ASAC).
- o Substation Statistical Clerk
- o Survey Teams for Surveying Damage (Two Persons Per Team).

"Restoration Teams" are utilized to perform two principle functions, if required:

- o Conduct a "Rapid" Survey.
- o Take "Local Control" of substations, when ordered to do so.

When all "Restoration Teams" are utilized, more than 1,300 personnel are involved.

5. THE COMMUNICATIONS ORGANIZATION

This organization is under the direction of a Chief Communications Coordinator who is the Manager of the Customer Relations Department; his Alternate assumes responsibility in his absence. The Chief Communications Coordinator establishes headquarters in Room 210 of Operations Building #1 at Hicksville; he reports to the Vice President of Customer Relations and his major responsibilities are:

- Mobilization of the Communications Organization
- Receiving and handling customer calls and customer inquiries at the Divisional Callboards and District Offices.
- Maintaining communication and liaison with the Media and Municipal Officials.

Special Assistants have been designated to handle the dissemination of all public information and the distribution of dry ice.

Division Communication Coordinators at Hewlett, Hicksville, Brentwood and Riverhead are responsible to the Chief Communications Coordinator. Each Division Communications Coordinator has an Alternate Coordinator who will assume all duties and responsibilities in his absence.

The Mineola Communications Coordinator at the Executive Offices in Mineola is directly responsible for the establishment and operation of the Customer Call organization in the Mineola Office. He has the same organization as the four Division Communications Coordinators except he is not required to screen customer call tickets. He reports to the Chief Communications Coordinator and is assisted in his work by Communications Control Assistants and Municipal Liaison Representatives.

For complete details on the functioning of the "Communications Organization" see Emergency Communications Manual For Condition I - "Red".

6. APPLICATION OF THE EMERGENCY RESTORATION PROCEDURE

The general plan is to initially call out the number of people required to secure information on the extent of the damage and then call out such persons as are necessary to achieve efficient service restoration.

When an emergency is imminent, the System Operations Department assigns personnel to each of the Substation Areas for transmission switching and for reporting feeder breaker lockouts or other damage so that the extent and severity of the emergency can be quickly evaluated. This information serves as a basis for action relative to applying the appropriate steps of the Emergency Restoration Procedure. See GO-10235, Distribution Lookout Information Coordination in Section B-200.

There are two ways in which the Emergency Restoration Procedure may be applied:

- When a "Complete" application of emergency restoration is indicated, the Emergency Restoration Procedure is put into effect immediately in its entirety.

- When a "Partial" application of emergency restoration is indicated, the Emergency Restoration Procedure is put into effect in a step-by-step manner. Personnel are called out and assigned as conditions warrant in affected areas.

A. "Complete" Application of Emergency Restoration Procedure

In cases of this kind, it is the responsibility of the Vice President - Transmission and Distribution (Alternate is the Senior Vice President - T&D and Operations) to declare the Emergency Restoration Procedure to be in force immediately in its entirety. At this time, the Emergency Restoration Executive Notification Procedure will be implemented as outlined on page A-100-14.

All persons indicated on the Executive Notification Procedure Chart transmit the notification through administrative channels within their respective organizations.

The Emergency Restoration Procedure then becomes effective as set up on the chart on page A-100-13, and the regular channels of organization are superseded by the channels of authority established in the Emergency Restoration Procedure. When called out, all employees assigned to the Emergency Restoration Procedure report to their emergency locations. Persons so assigned continue to report to their designated locations until such time as they are reassigned or released through official Emergency Restoration Procedure channels.

Mobilization of personnel assigned to the Emergency Restoration Procedure, and instructions as to where and when to report, are initiated by the two Chief Coordinators (Operations and Communications) through the channels of the Emergency Restoration Procedure as follows:

Operations personnel see section A-200 of the Emergency Restoration Procedure Operations Manual for Condition I - "Red".

Communications personnel see Emergency Communications Manual for Condition I - "Red".

B. "Partial" Application of Emergency Restoration Procedure

The Chief System Operator advises the Manager of the System Operations Department of the extent of transmission trouble as well as Substation feeder breaker lockouts and breaker operations from reports received from personnel previously assigned to substations. He in turn advises the Chief Operations Coordinator of this activity, who is also appraised of customers out of service by the Customer Service Department.

Based on this information, the Chief Operations Coordinator informs the Vice President - Transmission and Distribution of the overall state of the electric system, The Vice President - Transmission and Distribution may decide to apply the Emergency Restoration Procedure in a step-by-step manner, and the procedure will be implemented in only those areas that are affected in order to initiate efficient restoration of service.

The Vice President - Transmission and Distribution and the Vice President - Customer Relations, each notify the same key managerial personnel they are responsible for notifying when a complete emergency restoration procedure is indicated (see Page A-100-14). It may become necessary to call upon any or all persons in their organizations who have Emergency Restoration Procedure assignments. These persons, in turn, transmit the notification through administrative channels within their respective organizations.

Mobilization of personnel assigned to the Emergency Restoration Procedure, and instructions as to where and when to report, are initiated by the Chief Operations Coordinator and are outlined in section A-200, "Mobilization of Personnel". The number of people called out will depend upon damage reported to the System Operations Department and the Customer Service Department as successive steps in the implementation of the "Partial" procedure are carried out.

If damage to the system is extensive enough, the "Partial" procedure may be superseded by the "Complete" procedure, declared in accordance with the preceeding paragraph A.

C. Activation of Substations During "Complete" or "Partial" Mobilization

When Substation Area Coordinators are activated under a "Complete" or "Partial" application of the Emergency Restoration Procedure, they will function as follows:

Substation Area Coordinators called out report to their designated substation and initiate a "Rapid Survey" of the distribution circuits. This is accomplished by use of the survey teams in order to assess the degree of damage and the extent of trouble. The damage is reported by the Substation Area Coordinator to the Group Coordinator and is evaluated to determine the following:

- The designation of substations that will be used to control repair operations.
- The number of crews that will be required at each of these locally-controlled substations.

While the "Rapid Survey" is in progress, all repair operations are controlled from the centralized Division Headquarters.

The Division Operations Coordinator may recommend placing certain substations in his Division under "Local Control" of the Substation Area Coordinator, if the damage report indicates the need; however, repair crews should be available to be assigned to these stations at the time they are placed on "Local Control".

When the amount of damage is determined to be sufficient to require a specific substation to be placed on "Local Control", the Division Operations Coordinator confers with the Chief Operations Coordinator and obtains agreement on which stations are to be placed on "Local Control".

The Emergency Restoration Procedure is said to be in effect at that substation after the Division Operations Coordinator informs the Group Coordinator to advise the Substation Area Coordinator to request "Local Control" authority from the System Operator, and this authority is transferred as each Substation Area Coordinator makes his request to the System Operator. The date and time of each transfer is logged by the System Operator and also by the Substation Area Coordinator in the Substation Log Book.

The Substation Area Coordinator of each substation placed on "Local Control" is authorized to perform three specific functions which include:

- o Operation of distribution feeder breakers.
- o Operation of distribution line sectionalizing devices.
- o Assignment of jobs to repair crews and coordination of their movement within the geographic limits of the substation feeders.

The Emergency Restoration Procedure as utilized in this manner under "Condition I - Red" provides for an organization that further decentralizes each Division into local substation control organizations responsible for the restoration of all customers supplied from each substation. There are presently over 100 of these Local control units on the system.

Severe storms do not always cause heavy damage to all parts of the system; therefore, the Emergency Restoration Procedure has been made flexible so that it can be activated only in those portions of the territory that suffer heavy damage. Some portions of the system may be under "Local" substation control, while other portions remain under "Central" control.

Repair crews are only assigned to a substation after the substation has been placed under "Local Control". All other repair crews remain under division control and are coordinated by the console operators located at the division headquarters.

7. PRINCIPLE RESTORATION ACTIVITIES

A. Survey

Of prime importance is the establishment and dispatch of survey teams so that the extent of the damage can be established as quickly as possible. Having this information, it can then be determined what steps are necessary to effect service restoration efficiently as well as to estimate the time required to reestablish normal service (see Section D-300 for Survey details.)

B. Restoration of Transmission Facilities

Transmission circuits are restored concurrently with the survey in order to reestablish adequate transmission facilities as determined by the Chief System Operator. Transmission restoration is carried out in accordance with instructions received from the System Operator's office and in accordance with a detailed procedure appearing in Section C-200.

1. Hazardous Conditions

Concurrently with the restoration of transmission facilities, all known hazardous conditions are made safe or protection is provided against personal injury and property damage if the condition cannot be cleared up at once.

2. Generating Station Shut-Down

The complete loss of a generating station may require the restoration of transmission circuits between other stations on the line and the station which is shut down. During such restoration, it may be necessary to disconnect load from the circuit being restored so as to supply the required capacity to the station affected. The restoration of such transmission facilities is made under the direction of the System Operations Department.

3. Restoration of Substations

Concurrently with both the survey and with the restoration on transmission facilities, Substations are re-energized under the direction of the System Operations Department as is the normal procedure. Repairs to substation facilities are made under the direction of the System Operator through the Substation Maintenance Division Manager assigned to the System Operations Department.

C. Restoration of Distribution Facilities

Distribution facilities are re-established in the following sequence:

1. Return circuit breakers to service on all locked-out circuits as soon as possible. Circuit mains will be sectionalized as required in order to achieve this.

2. Restore all primary feeder mains as rapidly as possible.

3. Restore primary branch circuits.

4. Restore service to "Critical Facility" customers, as required, in areas where the primary has been restored and secondary distribution can be energized. For further details on "Critical Facility" customers see Section D-500.

5. Restore service to all transformers and secondaries.

6. Restore all services that are not energized in steps 1 to 5 above.

D. RESTORATION OF STREET LIGHTING FACILITIES

Restoration of remaining street light facilities will normally start after transmission and distribution facilities have been completely re-established. The emergency will not be considered over until street light facilities have been restored to normal operation.

E. OUTSIDE ASSISTANCE

When it is necessary to request assistance from other utilities or organizations outside the Company, such requests are passed through proper channels to the Vice President - Transmission and Distribution.

Approval of the Vice President - Transmission and Distribution is required prior to calling out any electric construction contractors already working on the property to assist in emergency restoration operations.

The Long Island Lighting Company "Rules for Safe Operation" shall be followed at all times. The only exception to this shall be when use of a different procedure or practice will afford more protection than is provided by following a LILCO rule.

After the declaration of an emergency has been made, the Vice President - Transmission and Distribution, or his delegate, confers with the Division Plant Superintendents of the New York Telephone Company, or their delegates, so that the "Joint Restoration Procedure" of the two companies can be made operative (see Section D-600).

F. Although the purpose of this Emergency Restoration Procedure is to accomplish the restoration of electric service as rapidly as possible after a disaster, it must be understood that the maximum efficiency of our activities can be achieved only by the use of approved work methods and procedures. Therefore, all supervisory and physical workers must be aware that all operations performed under emergency conditions are to be performed in a safe and efficient manner. Violation of safe working rules will not be tolerated.

G. DECLARATION OF "END OF EMERGENCY"

When restoration of distribution and street light facilities has progressed to the degree that the regular service force can carry on, the Vice President - Transmission and Distribution declares the emergency ended. This declaration does not automatically release the personnel working under the Emergency Restoration Procedure. Such personnel are released through the channels of the Emergency Restoration Procedure Organizations as quickly as regular procedures can be re-established.

H. REVISION TO EMERGENCY RESTORATION PROCEDURES

This manual includes various material pertinent to placing this procedure in effect. This material may be added to or deleted as directed by the Manager of the Customer Service Department; however, all material so contained will be maintained on a current basis, being revised as often as found necessary. Detailed organization charts of personnel to be assigned to the Emergency Restoration Procedure are included and these charts will be revised periodically, especially prior to periods of anticipated emergencies such as the annual hurricane season or prior to the periodic "Field Exercise".

RELATED CORRESPONDENCE

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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Before the Atomic Safety and Licensing Board

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

TESTIMONY OF MATTHEW C. CORDARO, RUSSELL R. DYNES, WILLIAM G. JOHNSON, DENNIS S. MILETI, DAVID N. RICHARDSON, JOHN H. SORENSEN, AND JOHN A. WEISMANTLE ON BEHALF OF THE LONG ISLAND LIGHTING COMPANY ON PHASE II EMERGENCY PLANNING CONTENTIONS 23 (SHADOW PHENOMENON) AND 65.C.2 AND 65.F (PANICKED DRIVERS)

Volume I of II - Testimony

Hunton & Williams
Post Office Box 1535
707 East Main Street
Richmond, Virginia 23212
(804)788-7200

DATED: November 18, 1983

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

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PURPOSE

The intervenors contend in Contention 23, Shadow Phenomenon, that many more people than are asked to evacuate in an emergency will evacuate, causing traffic congestion and confusion and, therefore, making evacuation of the EPZ impossible. They further contend that public opinion polls can be used to estimate the number of people likely to evacuate as part of the "shadow." This testimony will establish the following propositions:

1. Contrary to the intervenors' assertion, what some call the "shadow phenomenon" is not a problem in an emergency, and will not impede timely evacuation in the event of an accident at Shoreham.

2. Response to an emergency is situational, that is, people respond based upon the circumstances that exist at the time of an emergency and the information given them during an emergency.

3. Polls asking people to predict their behavior in an emergency are useless as tools for predicting response because polls cannot reflect the situational factors that would determine behavior in an emergency.

4. The Johnson and Yankelovich, Skelly & White polls further illustrate that polls cannot be used to accurately predict human behavior in an emergency, by showing that even slightly changing the questions asked on a poll will produce different responses.

5. Actual behavior in all kinds of emergencies studied by behavioral experts over the years indicates that given accurate, consistent information, people respond rationally in an emergency.

The intervenors also contend in Contentions 65.C.2 and 65.F that drivers will panic or become hostile in an emergency, causing accidents, congestion, and confusion. Studies of human behavior during emergencies show that the contrary is true -- that people pay more attention to their driving during an emergency and drive at slower speeds, thereby reducing the normal accident rate rather than raising it. In addition communities tend to pull together in an emergency, resulting in helpful rather than hostile behavior.

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Attachment 12	Bill Johnson & Associates Questionnaires

Attachment 13 — Yankelovich, Skelly & White, Inc. Status Report on Public Response to Emergency Planning Efforts

Attachment 14 — Excerpts on Driver Behavior During Emergencies

Attachment 15 — LERO Evacuation Plan Appendix A, IV-746, V-6.

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I. Identification of Witnesses

1. Q. Please identify yourselves.

A. My name is Matthew C. Cordaro; my business address is Long Island Lighting Company, 175 Old Country Road, Hicksville, New York, 11801.

My name is Russell R. Dynes; my business address is Department of Sociology, University of Delaware, Newark, Delaware, 19711.

My name is William G. Johnson; my business address is Bill Johnson & Associates, 367 Summit Avenue, Fleetwood, New York, 10052.

My name is Dennis S. Mileti; my business address is Department of Sociology, Colorado State University, Fort Collins, Colorado, 80523.

My name is David N. Richardson; my business address is Yankelovich, Skelly & White, Inc., 969 High Ridge Road, Stamford, Connecticut, 06905.

My name is John H. Sorensen; my business address is Oak Ridge National Laboratory, Building 4500 North, Room H-11C, P.O. Box X, Oak Ridge, Tennessee, 37830.

My name is John A. Weismantle; my business address is Long Island Lighting Company, 100 East Old Country Road, Hicksville, New York, 11801.

2. Q. Please summarize your professional qualifications and your role in emergency planning for the Shoreham Nuclear Power Station.

A. [Cordaro] I am Vice President, Engineering, for LILCO. My professional qualifications are attached to this testimony (Attachment 1). I am sitting on this panel to provide the LILCO management perspective on emergency planning, and to answer any questions pertinent to management. My role in emergency planning for Shoreham is to ensure that the

needs and requirements of emergency planning are being met, and that the technical direction and content of emergency planning are being conveyed to corporate management.

[Dynes] I am Professor and Chairman, Department of Sociology, University of Delaware. My professional qualifications are attached to this testimony (Attachment 2). My familiarity with the issues surrounding "shadow phenemonon" stems from a knowledge of the research literature of emergencies plus my own research on emergencies of all kinds over the past twenty years. I have been Co-Director of the Disaster Research Center at Ohio State University. In that capacity I studied the responses of communities to at least 100 emergencies at the sites of the hazards. I also served as head of the Kemeny Commission's Task Force on Emergency Response and Preparedness at Three Mile Island.

[Johnson] I am President of Bill Johnson and Associates, Inc., a polling and survey research firm. My professional qualifications are attached to this testimony (Attachment 3). My familiarity with the issues surrounding "shadow phenomenon" stems from my years of experience in polling and survey

research, including a survey I conducted for LILCO about emergency planning for Shoreham.

[Mileti] I am Associate Professor of Sociology at Colorado State University. My professional qualifications are attached to this testimony (Attachment 4). My familiarity with the issues surrounding "shadow phenomenon" stems from a knowledge of the theoretical and empirical literatures in the emergency behavior area, and from my own research experience. In particular, I have investigated behavioral aspects of the Three Mile Island accident.

[Richardson] I am a Vice President of Yankelovich, Skelly & White, Inc., a polling and survey research firm. My professional qualifications are attached to this testimony (Attachment 5). My familiarity with the issues surrounding "shadow phenomenon" stems from my work on the Yankelovich, Skelly & White poll of Long Island completed in May, 1983 for LILCO. I am sitting with this panel to answer any questions regarding that poll.

[Sorensen] I am a Research Staff Scientist with the Research Analysis Group, Energy Division, Oak Ridge National Laboratory. My professional qualifications are attached to this testimony

(Attachment 6). My familiarity with the issues surrounding "shadow phenomenon" stems from my knowledge of the theoretical and empirical literature in the emergency behavior area and from my own research. In particular, I have done studies for the NRC on the Three Mile Island accident.

[Weismantle] I am employed by LILCO as Manager of the Local Emergency Response Implementing Organization (LERIO). My professional qualifications are attached to this testimony (Attachment 7). I am responsible for developing and implementing the Local Emergency Response Plan for Shoreham.

II. Contention 23 -- Shadow Phenomenon

3. Q. What is Contention 23?

A. [All witnesses] The first paragraph of Contention 23 reads as follows:

> Contention 23: The Evacuation Shadow Phenomenon
>
> Contention 23. Intervenors contend that in the event of an accident at Shoreham, there would be large numbers of persons who would evacuate voluntarily (the "evacuation shadow" phenomenon), even if not ordered to do so. LILCO has failed to take into account adequately the evacuation shadow phenomenon, thus resulting in a failure to comply with 10 C.F.R.

> Sections 50.47(a)(1), 50.47(b)(10), 50.47(c)(2), and NUREG 0654, Section II.D. The specific deficiencies in the LILCO Plan which result from its failure to take into account the evacuation shadow phenomenon are set forth in detail in paragraphs A-J below.

Of the specific alleged deficiencies, the Licensing Board has admitted five: Contentions 23.A, 23.B, 23.C, 23.D, and 23.H. These specific alleged deficiencies will be discussed below.

Contention 23 ends with a statement of "Basis for Contention 23," which reads as follows:

> Basis for Contention 23.
>
> There is demonstrated reason to be concerned about the evacuation shadow phenomenon, which is the propensity for people to evacuate from areas perceived to be dangerous, even though such evacuation may not be ordered or recommended. During the TMI accident, large numbers of people evacuated voluntarily. Whereas the TMI evacuation order recommended that 2500 pregnant women and preschool children within 5 miles of the plant leave as a precaution, in fact over 144,000 people left and traveled long distances. The TMI accident thus documented the existence of the evacuation shadow phenomenon. The reasons for voluntary evacuation are several, including the public's fear of a radiological emergency, heightened by its perception that such emergencies are unlike other disasters.
>
> A survey of Long Island residents conducted by Social Data Analysts and reviewed by Drs. James Johnson and

> Donald Zeigler, Suffolk County Consultants, has indicated that in the event of a radiological emergency at Shoreham, the evacuation shadow would be quite large. In fact, voluntary evacuees will outnumber, by many times, the number of persons who will evacuate because they are ordered to do so. For instance, 31,000 families live within 10 miles of the Shoreham plant. If there were a recommendation to evacuate only the 10-mile EPZ around Shoreham, approximately 432,000 families (about half the population of Long Island) would attempt to evacuate. Even if a sheltering recommendation were made only for the population within five miles of the plant, approximately 217,000 families would attempt to evacuate.

III. The Meaning of "Shadow Phenomenon"

A. Behavior on Long Island and Elsewhere

4. Q. Do you understand the intervenors to be claiming in Contention 23 that human behavior on Long Island is different from human behavior elsewhere?

A. [All witnesses] No. The following is an exact quote from Suffolk County's answers to one of our interrogatories:

> It is the County's position that human behavior in Suffolk County during a radiological emergency is likely to be fundamentally similar to human behavior elsewhere during a radiological emergency. The unique local conditions on Long Island,

including its geography, and the perception of the population of Suffolk County regarding Shoreham and LILCO may exacerbate the patterns of behavior that will occur.

5. Q. Regardless of what Suffolk County may think, do you believe that human behavior in a radiological emergency on Long Island would be fundamentally different from human behavior elsewhere under similar circumstances?

A. [Dynes, Mileti, Sorensen] No.

B. "Shadow," "Overreaction," and Overresponse

6. Q. Is the concept of what some people call the "shadow phenomenon" or "overreaction" in disasters familiar to you?

A. [Dynes, Mileti, Sorensen] Yes, the concept is quite familiar to us. It is only one extreme tail of a distribution of responses to emergencies ranging from underresponse (people refusing to leave an unsafe area when advised to do so) to overresponse (people leaving a safe area when not advised to do so). Overresponse has been referred to in this NRC licensing proceeding as "overreaction" or "the evacuation shadow

phenomenon," which, it is alleged, "is the propensity for people to evacuate from areas perceived to be dangerous, even though such evacuation may not be ordered or recommended." Most investigators of behavioral emergencies have been interested in the entire range of responses to an emergency, instead of singling out a particular subpart of the range (in this case, overresponse) for attention.

"Overreaction" is a judgmental labeling of behavior. Someone who did not experience the disaster may label a response as "overreaction" because, looking at the situation in retrospect, he might not have taken the same action, or the evidence available after the emergency does not seem consistent with the behavior during the emergency. That outside person, however, has different types of information than a person responding at the time of the emergency, and often cannot appreciate the situational factors that caused the response to the emergency. In that sense, it is erroneous to label a response as either "overreaction" or "underreaction" when that response was consistent with the information being received at the time of the emergency. For that reason, we do not embrace the term "overreaction." Nor do we accept "shadow

phenomenon," because the behavior being described by that term is not a "phenomenon." To avoid confusion in this testimony, however, we will use the terms "overreaction" and "shadow phenomenon" though we do not adopt these labels as our own.

7. Q. Is the position of the Suffolk County government in this case likely to worsen the problem of overresponse if a radiological emergency actually occurs? By the "position of the Suffolk County government" I mean the refusal of the government to participate in emergency planning, and the statements by government officials that Shoreham is unsafe and should not be allowed to operate and that emergency preparedness is impossible.

A. [Dynes, Mileti, Sorensen] The position of Suffolk County certainly has been publicized and likely has caused some people in the public to now think that Shoreham is unsafe when they would not have thought so were it not for the County. At the same time, there are undoubtedly some who were pushed in the opposite direction by County's position, and hold fast to their view that Shoreham is safe. Public statements like those that have been made by the County can entrench opinion in both directions.

The pre-emergency perceptions held by the public regarding Shoreham's safety were likely altered in some way by the County's position. Any good information system should assume a variety of pre-emergency risk perceptions among the local population, and therefore, the design of the emergency information system at Shoreham is not different because of the County's opinions. But those who would implement the emergency information system are more aware of its importance for a good public response because of the County's position. Ironically, the County's position may serve to reduce overresponse by underscoring the importance of the public emergency information system.

C. Overresponse and Panic

8. Q. Is overresponse the same as panic or hysteria? That is, are people who evacuate unnecessarily likely to do so with some self-control, or on the other hand are they likely to panic and rush headlong for the exits?

A. [Dynes, Mileti, Sorensen] Overresponse -- including the behavior of people who researchers characterize as having evacuated unnecessarily and who are part of a so-called "overreaction" or

"shadow phenomenon" -- is not panic or hysteria. On the contrary, overresponse is quite rational and reasoned behavior for the people engaged in that response, because it is consistent with the perceptions of risk that some people may hold during an emergency.

Panic, hysteria, and other irrational behavior are characterized by a loss of control or rationality. Panic and hysteria -- which are antisocial behaviors -- cannot occur merely on the basis of situational perceptions of high risk. Even people who over-perceive the risk or hazard present in an emergency, and who evacuate unnecessarily as a result, act in quite controlled and adaptive ways that are rationally consistent with their situational perceptions of risk.

The notion that overreaction is not panic, hysteria, or aberrant behavior is borne out by studies of how people respond in actual emergencies. For example, Dennis Mileti, Donald Hartsough and Patti Madson wrote a report entitled The Three Mile Island Incident: A Study of Behavioral Indicators of Human Stress in 1982. In this work, they examined the frequency of automobile accident rates

before, during, and after the TMI accident. They concluded that there was no evidence to suggest that accidents increased during the evacuation despite the fact that automobile travel in the area likely was up because of evacuation. If the 141,500 overresponders at TMI were panic-stricken, hysterical or the like, surely traffic accidents during evacuation would have shown some decisive increase. In fact, traffic accidents were, for all practical purposes, the same as if no emergency were occurring.

For that matter, Suffolk County's consultants have said the following:

> The spatial pattern, as inferred from the locations of these sites, suggests a calm and orderly movement rather than a hysterical flight.

D. Ziegler, S. Brunn, and J. Johnson, Jr., Evacuation from a Nuclear Technological Disaster 7 (Attachment 4 to Suffolk County's Phase I Testimony on Contentions EP 2B and 5B, Oct. 12, 1982).

There are many other studies in which researchers have found that overresponse may have occurred, but not panic in an emergency, including the pioneering works on the topic of panic in emergencies written

by Enrico L. Quarantelli, "The Nature and Conditions of Panic," American Journal of Sociology 60:267-275, 1954 and "The Behavior of Panic Participants," Sociology and Social Research 41:187-194, 1957.

9. Q. Under what circumstances would we expect members of the public to panic in an emergency?

A. [Dynes, Mileti] Members of the public do not panic in emergencies of the type being considered in this hearing; that is, emergencies that involve a community or neighborhood. However, it is true that most people believe that panic occurs in all sorts of emergencies. This myth is perpetuated by, for example, Hollywood movies that have "panic" in their scripts. Hollywood and most people, however, are simply wrong.

It is small wonder, therefore, that many of the researchers who began disaster research were surprised at not finding panic at the disasters they investigated. These researchers, for example, include Robert Kutak, "The Sociology of Crisis: The Louisville Flood of 1937," Social Forces 17:66-72, 1938; Enrico Quarantelli, "The Nature and Conditions of Panic," American Journal of Sociology

60:267-275, 1954; Charles Fritz and Eli Marks, "The NORC Studies of Human Behavior in Disaster," The Journal of Social Issues x(3):26-41, 1954; William Form and Sigmund Nosow, Community in Disaster. New York: Harper, 1958; and Samuel Prince, who in 1920 completed his doctoral dissertation, "Catastrophe and Social Change, Based Upon a Sociological Study of the Halifax Disaster," at Columbia University on a human-made disaster.

Other, more current research has provided additional evidence about panic. Enrico L. Quarantelli has performed the most systematic analysis of panic. In 1964 he wrote a chapter titled "The Behavior of Panic Participants," pp. 69-81 in D. P. Schultz (ed.), Panic Behavior, New York: Random House, in which he offers several conclusions about panic. The panic participant (1) "acts in a non-social manner in his flight behavior" (page 78), (2) "perceives a specific threat to physical survival" (page 73), (3) "is future-threat rather than post-danger orientated" (page 74), (4) "is nonrational in his flight behavior" (page 76), (5) "is relatively aware of his activities" (page 75), and (6) "is acutely self-conscious and fearful" (page 75).

In addition, in 1975, Dennis Mileti, Thomas Drabek and J. Eugene Haas wrote a monograph entitled Human Systems in Extreme Environments. Boulder, Colorado: Institute of Behavioral Science. That text (page 58) attempted to define the conditions or determinants of panic in emergencies, concluding that three conditions were critical for panic to occur: (1) a person perceives that a specific threat to his "physical survival" is imminent and, as a result of this situational perception, that person becomes fearful of his physical survival; (2) there are escape routes that, if traversed, are perceived as being able to offer "safety"; and (3) those escape routes are seen to be blocked or closing off such that they cannot be traversed.

These determinants of panic need not produce panic. (For example, the determinants have prevailed on sinking ships, yet survivors' stories indicate that panic did not occur.) However, these determinants must exist for panic to arise. These determinants would not exist in an evacuation from the areas around a nuclear plant such as Shoreham, because people would be leaving an open geographic area (rather than, for example, a closed building) and their escape routes would not be blocked.

As a widely-cited study of evacuation risks prepared by Joseph Hans and Thomas Sell for the Environmental Protection Agency summed it up:

> Numerous studies, both in other countries and in the United States, which have investigated the reactions in many types of emergency situations, have essentially dispelled the so-called "myths of panic."
>
> . . . .
>
> The idea that people will panic in the face of great threat or danger is very widespread. However, it is not borne out in reality.
>
> . . . .
>
> No panic or hysteria has been observed in evacuation.

J. Hans and T. Sell, Evacuation Risks - an Evaluation 43, 45, 54 (EPA 1974).

IV. Is "Shadow Phenemonen" a Problem?

10. Q. Is overresponse unique to radiological disasters?

A. [Dynes, Mileti, Sorensen] No. People behave in emergencies -- including radiological emergenciess -- in ways consistent with their perception of risk. People may evacuate (and have evacuated in some past emergencies) "safe" areas, for example, because they think, based on the situation, that

those safe areas are hazardous. The so-called "shadow phenomenon" is one of many outcomes of this principle. The behavior is not unique to nuclear power plant emergencies, nor was it discovered by investigation of what occurred during the Three Mile Island accident, although it is the case that some have sought to label what they thought they discovered at Three Mile Island as the "shadow phemonenon."

11. Q. When else has "overreaction" or "shadow phenomenon" been studied by behavioral scientists?

A. [Dynes, Mileti, Sorensen] The long-established principle that people behave in emergencies in ways consistent with their situational perceptions of risk -- including overreaction and the "shadow phenomenon" -- has been researched in a variety of types of emergencies. The effect of situational risk perceptions on how people respond was examined in reference to a natural disaster, for example, in W. C. Menninger [illegible]logical Reactions in an Emergency (Flood)," American Journal of Psychiatry 109 (August 1952), and in reference to a human-made emergency in Lewis M. Killian, A Study of Response to the Houston, Texas Fireworks Explosion, National

Academy of Sciences -- National Research Council Disaster Study #2, Washington, D.C.: National Academy of Sciences, 1956. It was also discussed in Charles E. Fritz and Harry B. Williams, "The Human Being in Disasters: A Research Perspective," The Annals of the American Academy of Political and Social Science 309 (January 1957), 42-51. These early works have been followed by literally dozens of investigations on how situational risk perception influences behavior in an emergency.

But few investigators have considered overreaction a problem, because that behavior typically means that people who are already safe are seeking "safety." Thus, the goal of emergency response -- enhancing public safety -- is achieved by overreaction.

V. Suffolk County's Theory of "Shadow Phenemonon"

A. The Response Process in an Emergency

12. Q. How can studies of overreaction be used in emergency planning for Shoreham?

A. [Dynes, Mileti, Sorensen] The point of most of the research since the 1950's on how the public

responds in emergencies has been to discover why people responded in an emergency as they did. Very few researchers have used their research merely to describe overreaction (or any other kind of reaction) and then to assume inappropriately that the described public response would occur in the same way in a future emergency involving the same disaster agent. Nor have researchers made judgments about what the appropriate response would have been.

As one might expect, studies of overresponse, and the analyses performed by the investigators, are of varied quality; some are good studies, some are poor, and many fall somewhere in-between. Nevertheless, there are many studies of sufficient quality across a variety of emergency types to provide, when viewed collectively, both scholars and planners with sound knowledge about how and why the public comes to respond in emergencies. The results of these works provide insight that should prove valuable to those preparing a plan to help the public respond safely in a future community-wide emergency, including one occurring because of an accident at a nuclear power plant.

13. Q. What do these studies show about how and why people respond to emergencies?

A. [Dynes, Mileti, Sorensen] They offer insight about why some people come to overperceive risk in an emergency while others do not.

Response to emergencies is not well-represented by a simple stimulus-response model of human behavior. For example, it would be an oversimplification to suppose that if one person is fearful of emergencies before one occurs while another is not, the former person will "overrespond" in an emergency while the latter will "underrespond." People make decisions in an emergency about how to respond. When confronted with emergency information (like warnings, or evacuation advisements), people consider various aspects of the decision confronting them before they act. This decision-making process contains the following steps: (1) hear, (2) understand, (3) believe, (4) personalize, (5) decide, and (6) respond (which may or may not be an "overreaction").

1. Hear

14. Q. Please describe the "hear" element of decision-making in an emergency.

A. [Dynes, Mileti, Sorensen] The first stage of public response in an emergency is hearing that the emergency is going on, through emergency information in the form of a "public warning" like a siren or an EBS message. It cannot be assumed that by broadcasting a public emergency warning that all people will hear it. Even when it is physically possible for people to hear the warning, it may, so to speak, fall on deaf ears. People may fail to listen because of habituation (for example, they never really listen to television) or selective perception (for example, they hear only what they want to hear). The failure to hear precludes warning or emergency response.

2. Understand

15. Q. Please describe the "understand" element of decision-making in an emergency.

A. (Dynes, Mileti, Sorensen] The second stage of public response in emergencies is that once heard, the

emergency information (or warning) must be understood. This does not mean an understanding of what is said, but rather attachment of meaning to the message. For example, a flood warning may be understood as a wall of water to one person, but ankle-high runoff to another. Ashfall may be construed as a suffocating blanket of coverage or a light dusting of powder. A fifty-percent probability may be understood as a certainty by some or as unlikely by others. A message that said "an accident happened at Shoreham" and nothing else could be understood as involving no risk by some, but a threat to human life by others. In each of these examples, people are attaching meanings to a message. Depending upon his perception of risk, however, each person understands the message to mean something different.

In addition, understanding is connected to people's frames of knowledge and references. For example, it may be difficult for someone to understand a nuclear power plant warning when they do not understand much about ionizing radiation. Emergency information must be written to provide a public with accurate and common understandings of the situation in an emergency. The differing understandings that

might emerge among people if an emergency occurred can be avoided with proper planning.

3. Believe

16. Q. Please describe the "believe" element of decision-making in an emergency.

A. [Dynes, Mileti, Sorensen] Once the warning (emergency information) is understood, it is necessary for people to believe that the warning is real and that the contents of the message are accurate. Believability is influenced by the method and contents of public emergency information, the consistency of the information, and the situation in which it is made.

4. Personalize

17. Q. Please describe the "personalize" element of decision-making in an emergency.

A. [Dynes, Mileti, Sorensen] Once people believe the warning, they consider its implications for themselves and their social group (usually their family). If people do not think that emergency information was meant for them, (the

"it-can't-happen-to-me" syndrome), they likely will ignore it. If people think they are the intended targets of the emergency information (the "it-must-be-me" syndrome), they may act accordingly.

Personalization can lead to both underresponse and overresponse in emergencies. When emergency information is not clear in describing the location of the risk, for example, people misunderstand the implications of the information and consequently may over- or underrespond.

5. Decide

18. Q. Please describe the "decide" element of decision-making in an emergency.

A. [Dynes, Mileti, Sorensen] When a person has heard the emergency information, formed an understanding of what is being said, believed what is being said, and established the belief that he or she will be personally affected, that person must then decide what to do. The guidance provided in emergency information has an effect on the decision, as do other factors.

6. Respond

19. Q. How are these factors useful in understanding overreaction?

A. [Dynes, Mileti, Sorensen] People usually follow their decision about responding, unless constraints prevent them from doing so (for example, lacking an automobile in which to evacuate). But what happens at each step or link in the chain of factors (which can end in overreaction) is the result of interaction between those who send emergency information (the "sender") and those in the public who receive it (the "receiver").

[Weismantle] These sender determinants are taken into account in the sample EBS messages for Shoreham (Attachment 8).

a. Sender Determinants

20. Q. What "sender" characteristics may affect the hear-understand-believe-personalize-decide-respond sequence?

A. [Mileti, Sorensen] Sender factors are largely informational or related to emergency information. There are ten of them, as follows. First is the

source of the information. Emergency public information or warnings must seem credible and reliable to the people receiving them. People have different views about who is credible and who is not. To alleviate the possibility that any one source could be perceived as non-credible, any warning message should contain endorsement by a mix of scientists, organizations, and officials. (This particular factor will be discussed in detail in testimony on Contention 15, Credibility.)

[Weismantle] In this regard, the EBS messages for Shoreham reflect a recommendation for protective action based on consultation with scientists, public agencies, the utility, and representatives of government should they choose to participate.

[Mileti, Sorensen] Second, a warning message is best if it contains consistency in the information it gives and the tone used to give it. Inconsistency in the tone or information in a message creates confusion and uncertainty among recipients. The message also should be consistent in the way it conveys information about the level of risk. For example, a message should not say "something bad is happening but there is no cause for concern."

Rather, it should say how concerned people should be in light of the situation.

Message consistency is a determinant of understanding and belief. In a study of the Rio Grande Flood, Roy Clifford found that inconsistent information caused confusion and people were less likely to understand or believe that a flood was going to occur. The Rio Grande Flood: A Comparative Study of Border Communities. Natural Research Council Disaster Study No. 7, Washington, D.C.: NAS/NRC, 1956. Charles Fritz reached the same finding in a study of warning response in a range of disasters reported in "Disasters Compared in Six American Communities," Human Organization, Vol. 16 (Summer) p. 6-9, 1957.

[Weismantle] The EBS messages for Shoreham tell people what happened at the plant and what to do about it. Those two pieces of information mesh.

[Mileti, Sorensen] Third is the accuracy of what is said in an emergency message. A warning message must contain timely, accurate, and complete data. If people learn or suspect that they are not receiving the "whole truth," they are likely to ignore instructions about how to respond, and respond instead in ways consistent with their suspicions.

Accuracy also effects understanding and belief. For example, Dennis Mileti, Thomas Drabek and Gene Haas state that the past errors in disaster warnings can cause people not to believe subsequent warnings (Human Systems in Extreme Environments, Boulder: University of Colorado, Institute of Behavioral Science, 1975.)

[Weismantle] The EBS messages contain a complete range of information for the public including the measured amount of radiation released at various distances from the plant. The messages contain the time that the emergency was declared as well as the time of the radiation release. This is followed by recommended public protective actions and directions as to how the protective actions should be carried out. There is no additional information that the public would need for an accurate message.

[Mileti, Sorensen] Fourth is the clarity of the emergency information. A warning message must be worded clearly in simple language that can be understood so that people know what is happening and what they should do about it. A lack of clarity in a message can lead to people misunderstanding the message.

[Weismantle] The EBS messages are worded in a clear, precise, unambiguous manner to minimize confusion. In straightforward language, the messages directly tell the public the level of the emergency, what it means, the level of risk, and the recommended public protective actions. There is no room for confusion.

[Mileti, Sorensen] Fifth, a message should convey a high level of certainty about the events taking place and what people should do. Even if there is a low-probability or ambiguous situation, the message about it should be stated with certainty (even about the ambiguity).

Certainty determines the level of belief in a warning and affects decision-making. In a study of response to earthquake prediction, Dennis Mileti, Janice Hutton, and John Sorensen (Earthquake Prediction Response and Options for Public Policy, Boulder: University of Colorado, Institute of Behavioral Sciences, 1981) found that warnings become more believable as the probabilities attached to them become greater. If warnings are certain, decisions to respond are more likely.

[Weismantle] The messages for Shoreham are written in declarative sentences with specific and definite information. The messages will be discussed with radio broadcasters so that they will be delivered in a manner that conveys certainty.

[Mileti, Sorensen] Sixth, sufficient information should be given in a message so that the public has an idea of exactly what is happening. Not knowing, or feeling that one has insufficient information, creates confusion, uncertainty, and anxiety. While the message must not overwhelm people with too much detail, it should contain enough information so that the public's first response is not to fill the information void with uninformed misperceptions or fears.

The amount of information provided affects understanding, personalization, and decision-making. A study of family response to hurricane and flood warnings conducted at the University of Minnesota (Robert Leik, T. Michael Carter and John Clark, "Community Response to Natural Hazard Warnings" Unpublished Final Report, 1981) found that general and vague warnings caused people not to take protective actions. In a study of response to the Mt.

St. Helen's Eruption (R. Perry and M. Greene, Citizen Response to Volcanic Eruptions, New York: Irvington Press, 1983) it was found that more detailed information led to higher levels of perceived risk, and therefore to protective action being taken.

[Weismantle] All information necessary for the public to make an informed decision about what actions to take is included in each message for Shoreham -- the emergency level; what it means; whether radiation has been released, and if so, how much, and what that means; the fact that an emergency response organization is in place to assist the public; the names and/or positions of those involved in developing public protective action recommendations, and what those recommendations are; a listing of the zones affected and what the shelter area and evacuation area boundaries are; how often additional information will be forthcoming; and where such information can be obtained.

[Mileti, Sorensen] Seventh, a message must contain a clear statement of guidance about what people should do about the event being described, and how long a time they have in which to act. Guidance is

often necessary to encourage people to take the proper action. A study of the Big Thompson Canyon Flood (Eve Gruntfest, "What People Did During the Big Thompson Flood," Natural Hazard Working Paper #32, Boulder: University of Colorado, Institute of Behavioral Science, 1977) found that people who received warnings during the flood were not necessarily advised on what to do. As a consequence, many who were warned attempted to drive out of the canyon and were killed.

[Weismantle] The messages for Shoreham clearly and concisely tell people what they should do and when they should do it. For example, Message F tells people within the appropriate zone that they should evacuate as soon as possible, what they should take with them, and how long they could be away from their homes. Specific information is included for people needing special assistance. The messages tell the public whether schoolchildren have been released from school. For those not having a readily available emergency procedures brochure, the message will tell the public in what direction they should travel.

[Mileti, Sorensen] Eighth, the frequency of public messages should be referenced so that people will be informed about when they will hear the message, or a new message, again. This information can reduce anxiety created by not knowing when one can confirm what is happening or learn more details. As well, frequent messages can help reduce the effect of misinformation and misperceptions. Frequency affects hearing, understanding, believing, and deciding, and is thus important at most stages of response. Numerous studies underscore the importance of repeated hearing of a warning as a condition for response.

[Weismantle] The EBS messages for Shoreham will be repeated at a specific time frequency, as so stated at the end of each message.

[Mileti, Sorensen] Ninth is the specification of location in the message. The emergency warning information should clearly state the areas affected or potentially affected by the event. People must be told, and need to know, if they are the intended recipient of the message or not.

Identifying a location is important in determining belief and personalizing a warning. For example,

James Diggory ("Some Consequences of Proximity to a Disaster Threat," Sociometry, Vol. 19 (March), pp. 47-53, 1956), showed that the greater the proximity to a threatened area, the more likely a message will be believed. Other studies show that more location-specific messages lead to greater levels of personalized risk (R. Perry and M. Greene, Citizen Response to Volcanic Eruptions, New York: Irvington Press, 1983).

[Weismantle] The messages for Shoreham clearly outline the area affected by the emergency, both by zone designation and by boundaries. Further, the messages clearly state that those people outside the designated boundaries are not affected.

[Mileti, Sorensen] Tenth, the channel of information plays an important role in warning response. Effective warnings will use a range of possible channels instead of a single channel. This helps in reaching as many people as possible in a short amount of time.

[Weismantle] While there is currently only one radio station that has signed a letter of agreement with LILCO to broadcast EBS messages, at least three more have verbally agreed to do so and as

many as 10 stations will probably be included in the final emergency broadcast system. The more stations that broadcast the message, the more the messages will be confirmed through informal channels such as neighbors and relatives.

b. Receiver Determinants

21. Q. What characteristics of or surrounding the "receiver" may affect his response?

A. [Dynes, Mileti, Sorensen] These fall into five general categories. First, physical characteristics of an emergency and the setting of a receiver of emergency information can interact with sender factors. For example, the visibility of the hazard is a physical characteristic. It is difficult (or at least more difficult), for example, to have a public believe a flood warning on a sunny day. Such "environmental cues" are important for confirming the threat. It is, therefore, important when no cues exist, as in a radiological emergency at a nuclear power plant, to use an artificial means to break a routine-appearing environment. Sirens can help accomplish this.

Environmental cues can affect believing, personalizing and deciding. For example, people often wait to evacuate in a hurricane until they see the weather change. Location is another type of physical factor that affects beliefs and personalization. This was evident at TMI, where perceived physical distance from the plant was a strong predicter of evacuation behavior.

Second, social setting factors characterize the context in which the emergency information is received. Such factors include whether the family is united or not when the sirens sound, what activities are being performed at that time, and what others are doing to respond.

Social setting affects beliefs, decisions, and response. Raymond Mack and George Baker (The Occasion Instant, National Research Council Disaster Study No. 15, Washington, D.C.: NAS/NRC, 1961) reported that family unity at the time of a warning increases the likelihood of belief. Thomas Drabek and John Stephenson ("When Disaster Strikes," Journal of Applied Social Psychology, Vol. 1, No. 2, pp. 187-203, 1971) note that families who are united at the time of a warning are more likely to

respond to the warning. The importance of family unity in evacuation decisions at nuclear power plants is substantiated in the NRC Telephone Survey at TMI, in which only 10.6% of the sample of households had some members evacuating and some members staying. This means almost 90% of the households behaved as family units. In addition, neighbors and friends evacuating are major influences in decisions to evacuate. In an article by Cutter and Barnes ("Evacuation Behavior and Three Mile Island," Disasters Vol. 6, pp. 116-124, 1982), it was noted that for some people at TMI, evacuation behavior was associated with knowing a neighbor had evacuated.

Third, social ties can effect decisions to respond to warnings. Ronald Perry found that as family cohesion increased, the likelihood of evacuating in response to a flood warning increased ("Incentives for Evacuation in Natural Disaster," Journal of the American Planning Assocation, Vol. 45, No. 4, pp. 440-7, 1979). This is also true for nuclear emergencies. John Sorensen and Brad Richardson ("Evacuation Behavior at TMI Review and Reexamination," Unpublished Paper, Oak Ridge National Laboratory, 1983) found that knowing someone who worked

at Metropolitan Edison was related to the decision not to evacuate during TMI.

Fourth, social structural characteristics of the receiver can influence the receiver; for example, age, resources, gender, or socioeconomic class.

Age of a warning recipient is related to hearing, believing and behavior. Dennis Mileti found in a study of the Rapid City Flood that older people are less likely to hear a warning regardless of its source (Natural Hazard Warning Systems in the United States: A Research Assessment, Boulder: University of Colorado, Institute of Behavioral Science, 1975). And in an analysis of the NRC survey data, John Sorensen and Brad Richardson found that older people were less likely to evacuate at TMI ("Evacuation Behavior at TMI Review and Reexamination," Unpublished Paper, Oak Ridge National Laboratory, 1983), which is consistent with other studies of TMI evacuation.

Gender has been found to be related to warning beliefs. Women are more likely to believe a warning than men. The basis for this association, however, is not well understood.

Fifth, physiological characteristics of the receiver, like hearing ability and other unique impediments, influence reception. While such factors seem obvious, they have never been investigated on a systematic basis.

Sixth, psychological characteristics of the receiver, for example, cognitive abilities, personality, or attitudes can also influence reception. Limitations in cognitive abilities to process information are a contraint to all people receiving warnings. Variations in that ability affect understanding and deciding. When people are provided with too much information, they have difficulties in integrating the information to arrive at a decision.

Personality is also related to decision and behavior. The personality factor most investigated in the context of warning response is "locus of control." Simplistically stated, people with an "internal" locus of control are very self-determined; people with an "external" locus of control are characterized by fatalistic views. Thus, "internal" people feel they have control over their behavior, and "external" people feel their fate is in the hands of others. Several research studies have

demonstrated that people with an internal locus of control are more likely to respond to a warning than people with an external locus of control.

Finally, pre-warning perceptions play a role in hearing and decision-making. People filter information to conform with their existing views (selective perception). Thus, without adequate emergency information, people may disregard warnings if their risk perceptions are extremely biased. Pre-warning perceptions may also influence decision-making. For example, people who view floods as threatening are more likely to evacuate. As discussed further below, John Sorensen's and Brad Richardson's analysis of the TMI survey data from NRC suggests, however, that pre-accident perceptions are not directly associated with evacuation behavior.

B. The Causes of Overresponse

22. Q. Taking the response process into account, what, then, are the causes of overresponse?

A. [Dynes, Mileti, Sorensen] That is a difficult question to answer in the abstract. People who overrespond in an emergency (1) over-perceive the risk in understanding the meaning of the emergency;

and/or (2) for some reason do not believe the official emergency information, thereby leaving a void to be filled with wrong beliefs or rumor; and/or (3) personalize the risk information that is intended for others; and/or (4) make the wrong decision about what to do in response to the emergency. These are the direct causes of overresponse. Research has taught us several important points about how these causes come to prevail in an emergency.

First, the reasons why some people may and others may not overperceive risk in an emergency are not the result of a single cause. For example, one study may show that factor x affected overperceptions of risk, while other research may have found that factor y affected overperceptions of risk. It may be not that these researchers are reporting conflicting results, but that x and y both affect overperceptions. At the same time, it may be that the relationship among x, y and overperceptions disappears when factor z is examined. Whatever the specifics about a relationship, postulating a single cause for overresponse is inappropriate, because multiple factors operate in emergency situations.

Second, research has taught us that sometimes the causes of overresponse prevail in an emergency and sometimes they do not. This suggests that the causes of overresponse can be managed by emergency planning.

Third, research provides evidence that both sender and receiver factors are important to understanding why the direct causes of overresponse can or cannot exist in an emergency.

1. Perceiving a Greater Risk than Exists

23. Q. What, then, do we know about how (1) people overperceive risk in understanding in an emergency, (2) people come not to believe official information and fill the void with misinformation, (3) people personalize risk when it is not directed at them, and (4) people decide to do the wrong thing in response to an emergency? First, why might people overperceive the risk?

A. [Dynes, Mileti, Sorensen] People perceive inflated risks in an emergency largely due to past experience -- people think future or current emergencies are like past ones. If the past emergency was more serious than the current, overresponse results.

But if the emergency information program is implemented well in an emergency, it is possible to help people with biasing experiences or beliefs come to more accurately understand the true meaning of the emergency. Thus, emergency information consistency (inconsistency leaves the door open for pre-emergency perceptions to influence situational risk perceptions), accuracy (the idea that information has been withheld can escalate risk perceptions as people assume the worst), clarity (if information cannot be understood it is replaced with other perceptions), certainty (if the official sources "aren't sure" about what it is they are saying, people will fill in the gap with their own notions), and frequency (if information is not repeated enough to elicit confirmation, other information -- misperceptions, rumors, etc. -- could take precedence) are vital to an accurate understanding of risk.

2. Not Believing Information Provided

24. Q. How do people come not to believe emergency information?

A. [Dynes, Mileti, Sorensen] Social cues, environmental cues, gender, emergency experience, role, socioeconomic status, family unity, and prior perceptions affect whether a person beieves emergency information. The source (a range of senders enhances belief in a heterogeneous population), consistency (consistency within and between messages enhances message belief through confirmation), accuracy (things do not seem to be withheld), certainty (the people giving the message seem to be confident about what they are saying), detail (gaps are not left in what is said), and frequency (repeated frequently, the information becomes "confirmed") of the information affect believability.

If these factors are addressed in an emergency information program, it is possible to help people come to believe official information more than rumors and prior perceptions despite differences among receivers, and thereby to reduce overresponse in nuclear power plant emergencies.

3. Personalizing Risk Inappropriately

25. Q. How might people personalize risk that is not really "risky" to them?

A. [Dynes, Mileti, Sorensen] Inappropriate personalization of risk can be caused if the emergency information does not contain a precise indication of the area-at-risk. If the location is not clearly indicated, people may assume that they are affected even if they are safe and in an area not at risk. Inappropriate personalization can be affected by a person's prior experience, personality, social and environmental cues, and pre-emergency perceptions. Ronald Perry and colleagues found that experience was associated with personalization of risk in evacuation decision-making (Evacuation Planning in Emergency Management, Lexington, Mass: Lexington Books, 1981). Both social and environmental cues help define personal risk. False cues could lead to higher levels of personalization. (A steam release from a power plant could be falsely interpreted as a cue of radiation release.) Personality factors, such as locus of control, have been linked to personalizing warnings. (People with fatalistic views due to an "external" locus of control are less likely to personalize a warning.)

4. Doing the Wrong Thing

26. Q. How might people decide to the wrong thing?

A. [Dynes, Mileti] Cues (both social and environmental), confirmation of information, social setting, social class, pre-emergency perceptions, proximity to the risk, and experience can affect people's decisions. The emergency information provided and the characteristics of the hazard also make some decision outcomes possible or impossible (for example, the amount of time to respond).

If sender factors (consistency, location, accuracy, believability, and so on) are handled well, and the message provides guidance (who should do what), people come to make better decisions about what to do in an emergency at a nuclear power plant. This will reduce overresponse.

27. Q. Would you sum up what you've just said?

A. [Dynes, Mileti, Sorensen] Providing good emergency information to a public can help people form more accurate perceptions during the emergency. This is as true for one kind of person as it is for another. Providing proper information also can help people come to do the most appropriate thing in

response to an emergency. It can, for example, reduce "overresponse" to an emergency at a nuclear power plant.

C. How Emergency Planning Can Affect Response

28. Q. You place a lot of emphasis on the emergency information system, don't you?

A. [Dynes, Mileti, Sorensen] Yes. Note what the County's consultants have said about the TMI overresponse:

> The reasons given by members of the residual population for not evacuating were varied (Table II). The most frequently given explanation was that no order to evacuate was issued. The NRC study also found this response to be the most frequent argument for staying. The existence of many conflicting reports was the second-most frequently cited reason for not evacuating. Paradoxically this was also the second-most widely cited reason among the persons who chose to evacuate. Conflicting information was thus used by some residents to justify a decision to leave and by others to justify a decision to stay.

Ziegler, Brunn, and Johnson, "Evacuation From a Nuclear Disaster" 5-6 (Attachment 4 to Suffolk County's Phase I Testimony on Contentions EP 2B and 5B, Oct. 12, 1982).

29. Q. Dr. Mileti, apparently we can expect that there will be some overreaction in a radiological emergency. How do we as emergency planners go about limiting or controlling the overreaction?

A. [Mileti] Emergency planners should work toward reducing "wrong decisions" about what to do in an emergency, by helping people come to have accurate perceptions about the emergency that is taking place. Planners can encourage appropriate response to an emergency if they will do the following:

1. Abandon the pervasive popular myths about how and why publics behave in emergencies that one might believe having been raised in American culture.

2. Find out how and why the public actually does behave in emergencies. This knowledge will be needed for planning, because plans have a better chance of working if they are based on realistic notions about public emergency response than if they were based on popular myths about public emergency response.

3. Resist the temptation to replace knowledge about public emergency behavior with

conjecture, superstition, or personal hunches; the latter may make more "intuitive" sense but still will be wrong.

4. Devise, through preparedness, an emergency public information system that tells people in an emergency (in such a way that they come to believe it) what they need to know in order to form situational perceptions that lead them to act so as to maximize public safety. This involves:

   -- connecting, in an appropriate fashion, the people and organizations who must communicate with one another to get the information to the public;

   -- trying to eliminate the effects of personality on these interorganizational communications; and

   -- paying keen attention to the following things about what is said to the public: (a) source, (b) consistency, (c) accuracy, (d) clarity, (e) certainty, (f) level of information, (g) guidance, (h) frequency, and (i) location.

5. Assume that, in an emergency, people will be immersed in an "information soup" composed mostly of misinformation, and take steps so that the public will not believe the inaccurate information.

6. In addition, while the evidence suggests that the effectiveness of pre-emergency public education in altering public emergency response has varied, I would still recommend that some public education program be carried out in the local community.

30. Q. What features have been incorporated into the LILCO Transition Plan to encourage appropriate response to an emergency?

A. [Weismantle] In order to ensure an effective public information program, the LERO Plan incorporates the following features:

A. Sample emergency broadcast system (EBS) messages, which will provide frequent, consistent, accurate, credible information to the public during the early stages of an emergency.

B. An Emergency News Center that will activate during an emergency. This news center, with space for 300 reporters, will be a single focal point for all information disseminated to the public concerning the incident. Both governmental and utility

officials will be represented, and they will coordinate their statements so that the public does not receive conflicting information.

C. A public information brochure (distributed annually) that details what information will be broadcast, how to receive this information, and what to do when a message is heard.

D. Annual briefings for the news media to ensure that they are acquainted with the emergency plans and are aware of appropriate contacts for release of public information during an emergency.

These arrangements, consistent with NUREG-0654 criteria, will ensure that should an emergency occur at Shoreham, the public will receive the most up-to-date information from a single reliable source, encouraging appropriate response.

D. Three Mile Island

31. Q. Suffolk County relies heavily on the experience at Three Mile Island for the proposition that people

will overreact in a radiological emergency. The County notes that whereas the TMI evacuation order recommended that only 2,500 pregnant women and preschool children within five miles of the plant leave as a precaution, in fact over 144,000 people left and traveled long distances. How do you explain what appears to be a large overreaction that occurred at Three Mile Island?

A. [Dynes, Mileti, Sorensen] The overreaction of people at Three Mile Island (141,500 more people evacuated than were advised to) was what one would expect given the public information presented at TMI. From the public's point of view, the emergency information at TMI was (1) grossly inconsistent, leading people not to trust information sources and to conclude that the risk was not really known -- that anything could happen, including an explosion; (2) inaccurate, because it kept changing so rapidly, giving people the impression that information was being withheld; (3) not certain, again because people in authority seemed not to know what was going on; (4) of insufficient detail to help people understand exactly what was going on; (5) giving incomplete guidance -- telling pregnant women and small children to leave a neighborhood, but not

explaining the risk, if any, to other adults and children; and (6) riddled with rumors that were not laid to rest, resulting in the Catholic Church publicly granting general absolution of sins, one assumes in preparation for death.

One might suggest that response at Three Mile Island was not high at all, given that the information to the public was of the sort to cause many to personalize high levels of perceived risk. It is, then, surprising that only 144,000 people responded to the conflicting information by leaving the area.

32. Q. Can you describe the messages that the public were receiving during the Three Mile Island accident?

A. [Cordaro, Weismantle] We have compiled a summary of the messages going out to the public during the TMI accident (Attachment 9 to this testimony).

33. Q. What was the result of those messages?

A. [Dynes, Mileti, Sorensen] As a result of the messages, the perceptions of risk that people held during the Three Mile Island incident, and on which their stress and behavior rested, were largely inconsistent with the objective risks that actually existed. It is unfortunate that no study of risk

perceptions of residents was systematically performed. A recent poll (Field Research Corporation, 1980) suggests that perceived risk is on its way down, but we can only estimate what it was during the incident. Risk perceptions were likely gross overestimates of objective risk for most, underestimates for a few, and accurate for the fewest. The attached chart (Attachment 10) catalogues as best as possible given existing research the objective risk, information about it, and the perception of risk by the population at TMI. It is apparent that confusing and inconsistent information was a source of misperceptions of risk. Three Mile Island was a public information disaster.

34. Q. You say that the TMI overreaction is largely explainable by the conflicting, confusing, and frightening information given. The County says that the overreaction was due to the fact that this was a radiological emergency. Since TMI was both a radiological emergency and an emergency characterized by poor information, how is the Board to know which of you is more nearly right?

A. [Dynes, Mileti, Sorensen] First, the "overreaction" at Three Mile Island was not as

large as some like to claim that it was. Knowledgeable people in public positions announced during TMI that a particular geographical area was at risk when they advised pregnant women and small children to leave. That statement was risk information for other adults and children over age five as well as for the people to whom it was directed. It was, in fact, information that their neighborhood was "risky." (Emergency information like this should be analyzed and planned for, not in terms of what officials say, but rather in terms of what a public hears.)

Therefore, the notion that the evacuation of some children over five, non-pregnant women, and adult males must be characterized as "overresponse" is not the case. Given how people "hear" emergency risk information in emergencies, the people who <u>did not</u> leave the area could be characterized as "underresponders." The case was somewhat the same for people in neighboring areas.

A social scientist should not go about finding out why people behave as they do by asking them "why did you do it?" Such a method would be like a physician asking a patient "why are you sick?"

Nevertheless, it is useful not to look at "perceptions" of TMI, but rather to look at the findings from research that was performed because of the accident. One piece of the research that helps explain why people behaved the way they did at TMI involves a telephone survey of evacuees.

Cynthia B. Flynn conducted a telephone survey of local TMI residents for the NRC. The first report from her work (Three Mile Island Telephone Survey: Preliminary Report on Procedures and Findings, Washington, D.C.: U.S. Nuclear Regulatory Commission, 1979) found that the following percentages represent the several reasons why people said they left:

91% -- the situation seemed dangerous
83% -- confusing information
76% -- avoid forced evacuation
61% -- to protect children
28% -- pressure from someone outside
8% -- to protect pregnancy
5% -- going on a trip anyway

It seems that 83% of the people who left listed "confusing information" as a reason for leaving. An analysis of the TMI emergency information from a "what does the public hear?" point of view suggests that no one really knew what was going on during the emergency, thus yielding a high risk perception

despite the factors that the County's consultants argue are the "unique" characteristics of radiation. It is likely that the "situational" perceptions account for the most frequently given evacuation reason: 91% said the situation seemed dangerous. No respondents reported saying "the unique character of radiation" or "my generic pre-emergency fear of radiation." Situational risk perceptions formed on the basis of bad information at TMI caused people to evacuate.

Further evidence of confusing information being disseminated during the accident at TMI is found in a study by M. Stephens and N. Edison, "News Media Coverage of Issues During the Accident at Three Mile Island," Journalism Quarterly, Summer, 1982. Their data show splits in the news coverage between reassuring and alarming statements on a range of safety issues including preparedness, evacuation, and chance of a meltdown. Some news sources were actually stating a need for "total evacuation of the immediate area," and many were emphasizing the possibility of a meltdown. This conflicting information contributed to situational risk perceptions at TMI.

To explore one of the possible interpretations of the responses listed above, however, assume hypothetically that 17% of the people who evacuated unnecessarily at TMI (100% less the 83% who reported "confusing information" as a reason for leaving) left because of a "fear over the unique character of radiation" and independent of the emergency information disseminated during the accident. Seventeen percent of 141,500 people (the alleged "shadow" at TMI) equals 24,055 people who could have been evacuating at TMI solely because of a general fear of radiation. The remaining 117,445 admit to being influenced by the emergency public information.

This hypothetical discussion is meant only to underscore that emergency public information does influence what people do in radiological emergencies. People who live through emergencies, and social scientists who study emergency behavior, know this to be true. Emergency information, if handled well, can be used to help would-be overresponders and would-be underresponders come to make better decisions about what tc do in an emergency. This is the lesson of Three Mile Island, and it should not be ignored.

Further support for the notion that emergency-specific information and not the "uniqueness" of radiation is an important determinant of response to an emergency at a nuclear power plant comes from additional analyses of the NRC data base.

It is possible to statistically determine whether general attitudes towards nuclear power "caused" people to evacuate, or if other factors were more significant "causes" of that behavior. To do so, we can statistically model the causes of evacuation through path analysis using multiple regression techniques. Path analysis allows us to test specific hypotheses about what factors may have caused people to evacuate, and what the strength of the relationships are. For example, John Sorensen and Brad Richardson (in an unpublished paper "Evacuation Behavior at TMI: Review and Reexamination" Oak Ridge: Oak Ridge National Laboratory, 1983) have used a path model to test relationships between evacuation and ten variables hypothesized to cause evacuation. The data used were from the NRC survey. The analysis supports the idea that accident-specific situational risk perceptions play a dominant role in evacuation decisions. Four variables affecting evacuation at TMI are

(1) Pre-accident fears of radioactive emissions;

(2) Satisfaction with information about the accident;

(3) Attitudes towards the usefulness of information provided by Met. Ed.; and

(4) Perceived seriousness of the threats from the accident.

The Sorensen and Richardson analysis demonstrates that only 3 of these factors had direct effects on evacuation: perceived threat (4), attitudes towards information (3) and satisfaction with information (2) were all significant (at the .01 level) causes of evacuation. Pre-accident fear of radiation was not a significant cause of evacuation. It was, however, a significant cause of the other three accident-specific factors. Consequently, while pre-accident fear helps shape how people use information and perceive the threat of an accident, it does not directly cause evacuation. This has tremendous significance. If information-related variables and situational risk perceptions cause evacution in a nuclear emergency, it is possible to use a warning system to create accurate risk perceptions through good warning information principles, and, therefore, decrease or avoid over- or underreaction.

35. Q. Is TMI the only example of a radiological emergency that might tell us what happens in such an emergency?

A. [Mileti, Sorensen] No. An example of a successful public information program during an actual emergency that did not result in any public overreaction is the one in use at the Ginna Nuclear Power Plant, 18 miles outside Rochester, New York. This emergency reached a Site Area level on January 25, 1982. Due to a steam generator-tube rupture, a release of radiation took place, and about 150 workers were evacuated offsite. Information about the emergency was communicated to the public as part of the warning message. If pre-accident fear of radiation is a main cause of evacuation in a nuclear power plant accident, people would be expected to evacuate having heard that a release of radiation had occurred. If the "shadow phenomenon" prevailed at Ginna, people would have evacuated even if they were not ordered to do so. In fact, if we use TMI as a means of predicting response, we would have expected between 40 and 50 percent of the 45,000 people within the Ginna 10-mile EPZ to have left.

But the public information program at Ginna disseminated factual, timely information to a population that had received an education about radiation and emergency planning, and the overreaction that some have projected did not occur. (The attached Associated Press article (Attachment 11) details the community's reaction to events at the local nuclear power plant.)

The implementation of an effective public information program in the vicinity of the Ginna power plant shows how the overreaction exhibited by the public after the emergency at Three Mile Island can be avoided.

E. Public Response at Shoreham

36. Q. Dr. Mileti, did you have any part in the development of the public information program used in the emergency plan for Shoreham?

A. [Mileti] Yes. I reviewed the emergency broadcast system messages and offered comments to LILCO about how I thought they could be improved, based on knowledge in the social sciences about what sort of emergency informatin will help the public come to respond well in an emergency.

37. Q. How did LILCO take Dr. Mileti's advice into account?

A. [Weismantle] Dr. Mileti's input was used in many sections of the plan, including in drafting the EBS messages and the public information brochure. Based upon Dr. Mileti's review, the pre-written EBS messages were substantially revised to make them more effective. Th' essages provide detailed, specific information to the public. These messages were incorporated as part of Revision 2 of the Emergency Plan. Dr. Mileti's sugge tions to improve the information presented in the public information brochure were also incorporated.

38. Q. [Dynes, Mileti, Sorensen] Will the LERO plan be effective in preventing the kind of overreaction that occurred at Three Mile Island?

A. [Dynes, Mileti, Sorensen] Yes. It is inconceivable that the volume of overreaction that occurred at Three Mile Island could happen in an emergency at Shoreham, for two reasons.

First, we as a nation adopted many changes in emergency preparedness requirements for nuclear power plants as a result of the experience at TMI. Some

of these requirements (for example, official public emergency information must be consistent) will do much to help keep overreaction down in future emergencies. The changes in emergency planning regulations and guidelines made since TMI make it erroneous to use TMI to predict future responses. For example, a study done by John Sorensen (Evaluation of the Emergency Warning System at the Ft. St. Vrain Nuclear Power Plant, Oak Ridge National Laboratory Technical Memorandum No. 8171, 1982), analyzed whether social science principles were reflected in a nuclear power plant offsite warning system that complied with post-TMI requirements, and concluded that many of the factors necessary were embodied in the planning system, and others could be easily incorporated.

Second, the situational determinants of overresponse (the factors of emergency information discussed above) have been vigorously addressed in the public information messages provided in the LERO plan. The LERO EBS messages (Attachment 8) are some of the best that exist in terms of helping the public come to respond appropriately.

Some overreaction as well as underreaction might still occur in an accident at Shoreham, despite the excellent public information program. But it would not be nearly as large as the overreaction at TMI, due to the emergency information system for the public described in the LERO plan.

F. Opinion Surveys

39. Q. Apparently both LILCO and the County agree that some overreaction could occur. Presumably the amount of overreaction (that is, the number of people who would evacuate needlessly) will affect some features of the emergency response. For example, the more people that evacuate, the more crowded the highways may become and the longer evacuation may take. Is it not then desirable to be able to predict statistically how much of an overreaction we can expect? Is it possible to make such a prediction reliably? If so, how do we do it?

A. [Dynes, Mileti, Sorensen] It might be desirable to predict the amount of overreaction that could be expected. But it is not possible to do so, because the volume of overresponse would be the direct consequence of what went on at the time of the

accident, including how consistent was the emergency information, how accurate, its clarity, its frequency, how specific it was about the location of the threat, and the other factors discussed in this testimony. While one can judge how well these factors have been addressed in an emergency plan, and can offer an informed judgment about future overreaction generally based upon the plan, ("it could be high" or "it could be minimal"), it is impossible to make a statistical prediction about the volume of future overreaction. The precise statistical effects of the determinants on overresponse (for example, that the clarity of the message relates to overresponse with a standardized regression coefficient x) are unknown. That they have an effect, and the direction of that effect, are known, but not the size of the effect.

Because situational factors will determine overresponse, it is also not possible to describe the factors in a local population as it exists now (such as gender, age, pre-emergency attitudes, and the like) and use these characteristics to predict the amount of overresponse. Nor can behavioral intentions (obtained, for example, through public opinion polls) be used for predictions; they will

not determine actual public response in an emergency.

Reliable statistical predictions of overreaction, underreaction, or emergency behavior for planning purposes are well beyond the state-of-the-art in the social and behavioral sciences.

1. Attempts to Use Polls to Predict Behavior

40. Q. Suffolk County has commissioned an opinion poll to ask the people of Long Island how they think they would react in a radiological emergency. From this poll, the County concludes that if there were a recommendation to evacuate the ten-mile EPZ, approximately 432,000 families (about half the population of Long Island) would attempt to evacuate. First, can one predict the response of the public in a radiological emergency with opinion polls of the type Suffolk County is using on Long Island?

A. [Dynes, Mileti] No. Some County consultants claim that their poll is the "best" available information. In fact, it is the worst available (and worst conceivable) information that could be assembled from which to offer judgments about public response in a future emergency at Shoreham.

41. Q. Why?

A. [Dynes, Mileti] For decades, social scientists have questioned the validity of inferring behavior from answers to questions on surveys and polls. This has been the case regardless of whether the answers to questions are called attitudes, opinions, beliefs, notions, or intentions.

Since the time the first work was done on how well attitudes and behavior relate to one another (see, R. T. LaPierre, "Attitudes versus Actions," Social Forces 13:230-237, 1934), the great majority of investigators who have looked at the question have concluded that there is only a weak relationship, if any, between attitudes and actual human behavior (see, A. W. Wicker, "Attitudes versus Actions: The Relationship to Attitude Objects," Journal of Social Issues 25:44-78, 1969). A few scholars recently have suggested that the failure of this research to illustrate that attitudes and behavior covary is not because there is not a theoretical relationship between the two, but rather because researchers have measured the attitudes and the behavior which they seek to compare in an inappropriate way. (See C. A. Kiesler and P. Munson,

"Attitudes and Opinions," Annual Review of Psychology 26: 415-456, 1975; R. C. Dillehay, "On the Irrelevance of the Classical Negative Evidence Concerning the Effect of Attitudes on Behavior," American Psychologist 28:887-891, 1973; C. A. Kielser, B. Collins and N. Miller, Attitude Change: A Critical Analysis of Theoretical Approaches, New York: Wiley, 1969). These recent papers suggest that there is a relationship between attitudes and behavior, but that it does not appear in the studies because researchers have not done quality research and have not measured reliability, category width, change in attitude object, item difficulty, factor structure of attitude and behavioral syndromes, the effect of non-attitudinal contributions to answers to questions about attitudes, and so on.

But while most social scientists are of the opinion that attitudes do play some sort of role in shaping behavior because it makes "theoretical" sense, they do not think that attitudes and behavior covary, based upon 50 years of empirical evidence to the contrary.

The minority of scholars who profess that attitudes and behavior would eventually be shown to empirically covary if only researchers would stop doing bad research, still await empirical proof of their belief. Interestingly, even these scholars begin with the admission that "a host of 'other factors' can influence a person's behavior to make it inconsistent with a reported attitude" (see, M. Rokeah and P. Kliejunas, "Behavior as a Function of Attitude Toward Object and Object Toward Attitude," Journal of Personality and Social Psychology, 1972; A. W. Wicker, "An Examination of the 'Other Variables' Explanation of Attitude-Behavior Inconsistency," Journal of Personality and Social Psychology 19:18-30, 1971). They claim that one might be able to increase the chances that an attitude will correspond in some empirical way to behavior if, perhaps, verbal measures were taken that tried to take these other factors into account. For example, instead of asking "do you like pretzels?" and correlating (to no empirical avail) the answers to pretzel purchasing, one should ask "do you plan on buying pretzels?" and correlate answers with actual pretzel purchasing behavior. The latter approach, it is claimed, allows the respondent

to be able to "take the other non-attitudinal things into account" when coming up with the answer. Since "other factors" beyond attitudes affect behavior, this scheme would enable the researcher to measure, in one simple question, all those "other factors" and the attitude at once. Some who advocate this method of "let the respondent do the measuring of sets of factors" hope that this method might show covariation of answers to questions with actual real-world behavior.

This method, and several varieties of it, goes by many names. One name is "intentions-to-behave" (see, M. Fishbein and I. Ajzen, Belief, Attitude and Behavior. Reading, Mass: Addison-Wesley, 1975). The "behavioral intentions" method of attempting to find attitudinal/behavioral covariation is straightforward in logic: "ask someone if they would do something, and if they do not change their mind, then you will find that they may do what they said they would do." The method may work, but only for familiar behaviors (like buying peanut butter). Underlying the method is the supposition that the respondent can take all "other factors" into account when coming up with a guessed-at future behavior. When the respondent does not know what the

"other factors" are that he might take into account, the result is a wrong guess -- the result that has been found in studies over the last 50 years -- and the answers to questions do not correspond to actual behavior.

Another set of researchers (M. Snyder and W. B. Swann, "When Actions Reflect Attitudes: The Politics of Impression Management," Journal of Personality and Social Psychology, 1976) go one step further than Fishbein and Ajzen. They suggest -- perhaps because the respondent may not know all the "other factors" to consider -- that the researcher provide the respondent the context in which to provide an answer, that is, tell the respondent what are all the "other factors." Yet another pair of researchers (see, J. M. Piccolo and J. Louvier, "Information Integration Theory Applied to Real-World Choice Behavior," Great Plains-Rocky Mountain Geographical Journal 6: 49-63, 1977) go even further and suggest that respondents should be asked to engage in information-integration tasks that more closely resemble the real world. None of these minority of scholars claims that attitudes (regardless of what label for them is currently being used) and behavior covary. These minority of

scholars who cling to the unproven hope that answers to questions will someday covary with actual behavior only do so by thinking that one can provide a way to allow a respondent to take all "other factors" into account before he guesses at his future behavior.

"Other factors" can be taken into account by respondents on familiar behaviors for which the respondent knows what are all the other factors. This is why voting polls sometimes are used to accurately predict future behavior: the "other factors" typically have their effect on voting long before a pollster calls or they go into a voting booth. Last minute changes-of-mind usually are random enough to cancel themselves out, and the prediction by the pollster prevails. But where the respondent is inexperienced with the behavior in question, and has no notion of how relatively important all those "other factors" are (or even what they are), he cannot take them into account in predicting his future behavior. As a result, his prediction will be inaccurate.

Parts of this testimony define what would be "other factors" that are relevant to a person pondering

action in a real emergency. These "other factors" were not provided to the respondents in the County poll. The "other factors" that it would be necessary to have respondents consider -- what research over 30 years shows as the causes of evacuation in actual emergencies -- were largely ignored in the County poll. However, even had they been included, the poll's results could not be used to predict actual emergency behavior. Polling for people's guesses about evacuation based on information about "other factors" is impossible, because one cannot convey over the telephone the relative influences of the "other factors" present in an emergency setting.

Emergency situations, by definition, are quite different from the routines of everyday life. In addition, they are socially complex situations in which human behavior results from a social process. For example, people behave in way determined by the social character of the communication of emergency information which they hear (it must be confirmed, for example), group cohesion (who they are with), and a variety of other factors. Factors such as these -- which are the actual determinants of public emergency behavior -- are not likely

known to people before they enter an emergency situation. They certainly were not part of the County poll -- nor could they be. The verbal predictions of future emergency behavior given to a pollster are not based in the social reality of an actual emergency. The County poll is perhaps the worst information available about how people will actually behave in a real emergency at Shoreham.

42. Q. Mr. Johnson, what insight into the capability of opinion surveys to predict human behavior can you give by reference to past opinion surveys? Have any past surveys failed to predict human behavior adequately?

A. [Johnson] The opinion polling profession has a checkered record when it comes to accurately predicting future human behavior, due to a variety of factors. If the survey instrument that is used to measure opinions is itself flawed, then the results and subsequent predictions of future behavior are more likely than not to be wrong. If respondents to a survey don't answer the questions truthfully, or if they inadvertently give incorrect answers, then survey predictions may also be wrong. Opinion surveys have a greater chance of correctly

measuring future human behavior if they are asking questions on topics about which the respondent is familiar. For example, polls sometimes can be used to predict voting behavior when they are conducted immediately prior to an election that has a high degree of saliency in the minds of the respondents. But these political polls can also be inaccurate. The night before the 1980 New York State Democratic presidential primary, a reputable national pollster predicted in The New York Daily News based on a poll taken the day before the election that Jimmy Carter would beat Ted Kennedy 56% to 36%, with 8% undecided. The actual results were reversed: Kennedy 59% and Carter 41%.

More recently, a Newsday poll conducted by Dr. Stephen Cole (who conducted the County's surveys on emergency planning) indicated that Mario Cuomo had a lead of 9 percentage points over his gubernatorial rival, Lewis Lehrman, with less than a week to go before the election. After allocating the undecided, the poll indicated that Cuomo would beat Lehrman 54% to 44%, or by a margin of ten points. In fact, Cuomo beat Lehrman by slightly more than 3 percentage points. The same poll indicated that Florence Sullivan, the Republican opponent of New

York Senator Daniel Patrick Moynihan, was receiving the support of 23% of the state's voters with less than a week to go before the election. In the actual election, Sullivan was supported by more than 34%.

In all of these examples, the error was far in excess of the polls' so-called sampling error. The polling profession is fraught with examples too numerous to mention of the fallibility of opinion polling to accurately predict voting behavior. Predicting voting behavior from results of a poll is child's play, however, compared to predicting the actual responses of individuals in an emergency.

43. Q. Dr. Mileti, the County has hired learned people who are saying that polls are a useful predictor of behavior in emergencies. You and Dr. Dynes say that polls aren't useful for this purpose. How is the Board to decide between these two competing positions? For example, is there any way the Board can get an idea of what the better-informed opinion is? Barring that, how is the Board to know what the majority of experts in the field believe?

A. [Mileti] Let me say point blank that how people think they might behave in a future emergency while in the comfort of their living rooms and how they will actually behave in a future emergency are not the same. Everyone in the social sciences in this area of expertise knows this to be true. The real and only difference between what Dr. Dynes and I have said and what the County's consultants have said is that the County's consultants think that what a person says he will do will conform with his actual behavior if, in the interim, he does not change his mind. The County's consultants have pointed to election polls and market research to support their argument.

There is no question that if you ask someone on the eve of an election who he will vote for, and he does not change his mind between then and the time he votes, then you can predict voting behavior. Or in market research, you can ask people if they like ginger ale or cola and use the answers to decide what type of soda pop a company should come out with; if the people do not change their minds then your marketing choice is likely a good one. Voting, soda pop preferences, party affiliations, and a host of other things people are familiar with are

often carried through in their actions, and experience shows that voting and market patterns predicted in polls sometimes are borne out in the election or the supermarket. But experience also shows that actions taken in emergencies are not those predicted by the County's poll. An intention to evacuate in an emergency is not the same as an intention to vote Republican, for example, because the decision to evacuate is the result of factors present during an emergency. The odds that people would change their minds about voting once they are in the voting booth are small; the odds that they would change their minds about evacuation once they are in the midst of an emergency are almost certain, due to the nature of the factors that determine emergency behavior (which are explained at length above).

You have asked me to provide a way whereby the Board can get an idea of what is the opinion of the majority of experts in the field about whether polls can be used to predict behavior in an emergency. One way to do this is to review the studies of evacuation performed in the social sciences. Most of these studies were funded by some agency, for example the National Science Foundation. If

"what would you do if" studies were good predictors of actual behavior, surely they would have been done more often, because surveys before the fact are much less expensive to conduct than "go-and-see" research where one travels to actual disaster sites and finds out what people actually did. Reviewing the evacuation studies performed in the social sciences is no small chore, since there are now about 800 publications in this area of inquiry,and a good many of these (I estimate about 100-125 publications) deal with evacuation in some way. A subset of these are data-gathering research reports, but of these, only a handful are "what-would-you-do-if" studies. In fact, I was co-principal investigator of the largest "what would you do if" study I believe the National Science Foundation has ever funded; however, the report clearly points out that one cannot predict human behavior from what people told us they would likely do. The bulk of studies funded in evacuation research -- I estimate about 95% -- were "go-and-see" and not "what-would-you-do-if" studies. The results of this rough counting of peer review opinion should speak louder than words for what experts in this field think of the value of "what-would-you-do-if" studies of evacuation.

2. Using the County's Survey to Predict Behavior

44. Q. Dr. Mileti, the County asserts that its emergency-planning polls asking people to predict their behavior were there an accident at Shoreham are reliable because the results closely match what actually happened at TMI. The County cites the following comparison of TMI behavior with intended behavior at Shoreham:

TABLE 4.3

COMPARISON OF ACTUAL EVACUATION BEHAVIOR AT TMI AND INTENDED EVACUATION BEHAVIOR AT SHOREHAM (SCENARIO 2)

Distance	TMI[1] (N=1454)	Shoreham[2] (N=2502)
0-5	58.9	56.8
6-10	49.1	53.7
11-15	32.7	49.5
15-25	11.8	33.1
25-40	3.1	29.1
40+	.7	25.2

What is your analysis of this comparison? Does it

1/ Source: Flynn, 1979.

2/ Compiled by authors from Shoreham Evacuation Survey, June, 1982.

really show that the Suffolk County poll is an accurate predictor of public response?

A. [Mileti] The notion that the percentage estimates of the persons who predicted in response to the County poll that they would evacuate closely match the percentage estimates of evacuees from TMI is unfounded. But even if the TMI data and County poll numbers were identical, their match would not provide any evidence that the County-sponsored poll was reliable in predicting future behavior. Nevertheless, let us examine the table.

The table compares six sets of numbers based upon geographical areas defined by the distance from the plants. I will report the TMI numbers first, followed by the Long Island estimates. For the 40-mile-and-beyond set, the numbers are 0.7 (less than 1) and 25.2; for the 25-40 mile set, the numbers are 3.1 and 29.1; for the 15-25 mile set, the numbers are 11.8 and 33.1; and for the 11-15 mile set, the numbers are 32.7 and 49.5. All of these sets of numbers are different. It does seem that the 6-10 mile number set, 44.1 and 53.7, and the 0-5 mile set, 58.9 and 56.8, are for all practical purposes the same.

The match (or non-match) of these numbers is irrelevant to a proof that the County-sponsored poll is a valid predictor of future behavior. What is interesting in these numbers is not whether they match (a grammar school student could see that two are close and four are not) but that the pattern in both sets of numbers is the same. The pattern in the TMI data reveals that distance from the source of hazard influenced evacuation behavior. That is, people in the 0-5 mile area at TMI were more likely to evacuate than people in the 6-10 mile area who, in turn, were more likely to evacuate than people in the 11-15 mile area, and so forth. The identical pattern was observed in the data gathered in the County's "behavioral intentions" poll of Long Island residents. The question becomes, therefore, does the occurrence of this same pattern mean that the County-sponsored poll is a valid and reliable predictor of future human behavior?

The answer to that question is no. The social sciences have recognized for some time that distance from the hazard affects perception of the hazard or risk, and that perception of the risk affects behavior. These relationships are discussed in different ways by James C. Diggory in "Some

Consequences of Proximity to a Disaster Threat," Sociometry XIX (March) :47-53, 1956; Benjamin McLuckie, "Italy, Japan and the United States Effect of Centralization of Disaster Responses 1964-1969," The Disaster Research Center Historical and Comparative Disasters Series, No. 1. Columbus, Ohio: Disaster Research Center, The Ohio State University, 1977 (see esp. page 97); Dennis S. Mileti, Janice Hutton, and John Sorensen, "Earthquake Prediction Response and Options for Public Policy," Boulder, Colorado: Institute of Behavioral Science 1981; J. Eugene Haas, Harold Cochrane "Consequences of a Cyclone on a Small City," Ekistics 44 (260): 45-50, 1977; Harold Foster, "Disaster Planning: The Preservation of Life and Property," New York, Heidelberg, Berlin: Springler-Verlag; and many others. The notion that distance to or from the hazard impacts upon behavior was more recently "re-discovered" by Donald Ziegler, Stanley Brunn, and James Johnson, Jr. in "Evacuation from a Nuclear Technological Disaster," Geographical Review 71(1):1-16, 1981, although it is unclear whether these scholars realized why distance and behavior covaried in the emergency that they studied.

One could take the common-sense pattern that would be found in the covariation of distance from the risk or hazard and evacuation (or any other protective emergency behavior) in any emergency, and find that people closer to the risk respond more frequently than people farther away. A distance-by-evacuation matrix could be prepared for a flood in 1932, a hurricane in 1956, the County data on predicted evacuation response, and an earthquake prediction in 1990, and any of these data could be used to suggest that the County-sponsored poll was "valid." What was "discovered" at TMI is not unique to nuclear power plant emergencies; rather, it is found in all emergencies both natural and technological.

45. Q. How is it that a "behavioral intentions" poll can detect this pattern that would likely arise in an emergency, yet not be able to predict with any degree of confidence actual future public behavior?

A. [Dynes, Mileti] The answer is simple: human beings are rational. Let us suppose you were asked "If an earthquake were predicted for Los Angeles in three days, would you evacuate?" Would you be more likely to speculate "yes" if you were in Los

Angeles when asked, than if you were in Santa Barbara? Would you be more likely to speculate "yes" if you were in Santa Barbara, than if you were on Long Island? The geographical locations are exaggerated in this example, but the point is that (1) distance from a hazard is related to hazard perception, (2) hazard perception is related to behavior, including evacuation, and (3) the effect of distance or common sense on hazard perception operates as much in "behavioral intention" polls as it does in real emergencies.

The data in the County's TMI table, however, do provide clear evidence of how foolish it would be to predict from the County's poll -- or any poll -- how many people would evacuate in a future, real emergency at Shoreham. Three Mile Island stands as one of the nation's biggest information disasters (if not the biggest). The information given at TMI encouraged people to over-perceive risk, and subsequently, to overrespond. It is inconceivable that public information in any future emergency could be as bad. (In fact, at Shoreham, it would certainly be better.) Yet, the behavioral intention estimates at Shoreham taken from the County's poll (for example, 25.2 for the 40 mile range versus less

than 1 for TMI) show how much the predicted response at Shoreham exaggerates what happened at TMI. In my opinion, the percentage of people who "overresponded" at TMI is as "bad" or as "large" as it ever would be during any conceivable emergency.

3. A Review of the County Survey

46. Q. Have you reviewed the questions in the poll that Suffolk County commissioned (that is, the poll conducted by Social Data Analysts)?

A. [Johnson, Mileti] Yes.

47. Q. Are there any characteristics of the questions asked that might cause the poll to be biased?

A. [Johnson, Mileti] Yes. The bias in the poll renders the responses invalid. It is unfortunate that this questionnaire has been placed in the public's eye (through these hearings) as an example of social science research.

Most of the bias in the interview schedule is in the first parts of the instrument. This is unfortunate because bias early in an instrument not only affects answers to the biased questions but can carry to subsequent questions which, taken alone, may not themselves be biasing.

The introductory paragraph to the survey is as follows:

> Hello, my name is _____, and I am calling for Suffolk County. We are doing a survey on some current social problems facing people living on Long Island.

Shoreham Evacuation Survey, May 19, 1982, p. 1.

First, the paragraph identifies the person and group doing the survey as Suffolk County. This is a potential source of bias if the respondent identified Suffolk County as having a position on any of the questions asked about in the poll. Second, the introductory paragraph claims that the survey is on social problems. This is a potential source of bias because it teaches the respondent that the pollsters perceive whatever issues follow as problems.

The introduction to the first series of questions (nos. 6, 8, 9, and 10) reads as follows:

> Considering where you live now, how worried are you about the effects of each of the following on the health and well-being of your family?

The structured response categories given were:

1 = very worried
2 = somewhat worried
3 = not too worried

The first series of questions implies a correct answer when they ask ". . .how worried are you about . . . ." The word "worried" is an answer and not a question. It therefore leads the respondent to an opinion of "worried." In addition, the range of possible answers for these questions is biasing. The substantive choices given the respondent are all states of "worry," thereby not allowing a "not worried at all" choice, but, more importantly, biasing the respondent to think he should be worried. The bias in questions 6, 7, 8, 9 and 10, coupled with the bias in the substantive answer choices to questions 6, 7, 8, 9 and 10 is substantial. The bias from these first questions alone is sufficient to render the rest of the responses biased, even if subsequent questions are not in-and-of-themselves biasing.

This line of questioning continues with the next series of questions (questions 11-14), which are prefaced by the following paragraph:

> In general, how dangerous do you think it would be to live near each of the following:

The structured response categories are as follows:

> 1 = very dangerous

2 = dangerous
3 = not too dangerous

The question "how dangerous do you think . . ." implies an answer by use of the word "dangerous." It therefore leads the respondent to an opinion of "dangerous." In addition, the range of possible answers for these questions is biasing. The substantive choices given the respondent are all some form of perceived danger. Respondents are not permitted a "not dangerous at all" choice.

Question 15 forces the respondent to select a general value position on nuclear power:

15. Would you describe yourself as:

1. a supporter of nuclear power plants as a means of providing electricity.

2. an opponent of nuclear power plants, or

3. you haven't made up your mind yet on this issue?

Shoreham Evacuation Survey p.2.

The answers given to this question would contain bias because respondents heretofore have literally been "instructed" that this is a social problem for which some state of "worry" should exist because some state of "danger" is present, and then are

forced to become a "supporter" of nuclear power, an "opponent," or else claim that their minds are not yet made up. This dichotomization of opinion on an issue on which opinions range along a continuum is biasing, because whichever position is chosen, respondents will remember their selection and labor to be as consistent as possible with their choice in answering all subsequent questions.

The next question ("16. Do you think that LILCO should complete and operate the Shoreham Nuclear Power Plant?") points out by inference -- remember that the introductory paragraph identified that the poll was being done by a political decision-making group (Suffolk County) -- that the poll could be a way to voice a political opinion about operation of the plant and, perhaps, affect the actual decision of whether or not the plant receives a license. The strong implications that a nuclear power plant gives off worrisome amounts of radiation, and that it is dangerous to live in the vicinity of a nuclear power plant, inevitably had an effect on the answers to this question.

Question 18 is biased. It suggests that all plants "pollute" the air, rather than asking respondents

for their perception of pollution which might not be -- until a respondent heard the question -- a perception of the lesser of evils.

Question 19 ("During normal operation, does a nuclear power plant give off a dangerous level of radiation?") leads the respondent and, therefore, contains bias because the question uses the value-laden term "dangerous."

Question 20 reads as follows:

> 20. When the nuclear accident took place at Three Mile Island which of the following happened?
>
> 1 = no one died but some people became ill
>
> 2 = only a few people became ill
>
> 3 = no one was hurt although the long term effects are unknown
>
> 4 = you're not sure

The answer choices for Question 20 are a textbook example of bias. All possible choices are in some way negative (except the last choice, which suggests that the respondent has not as yet heard of or learned of the negative impacts of TMI on health). In addition, there is little substantive difference between response categories 1 and 2.

Both introduce the concept of illness in connection with nuclear power plants. Response Category 3 should have ended after "no one was hurt;" there was no need to introduce the idea of possible long-term unknown effects. Needless to say, the response categories are neither mutually exclusive nor exhaustive. But more importantly, when asked about the effects of TMI, a situation in which no one has been shown to have been hurt or injured due to radiation exposure, respondents are introduced to words such as "died," "ill," "hurt," and "long term unknown effects." Intentionally or not, the introduction of these words contributes to a further biasing in the mind-set of the respondents.

Questions 30, 34, and 38 ask the respondents to predict how they would behave in the event of hypothetical accidents at an unspecified time in the future:

1 = go about your normal business, or

2 = stay inside your home, or

3 = leave your home and go somewhere else

These response categories are neither mutually exclusive nor exhaustive -- it is possible to go

about normal business by staying home or by leaving and going somewhere else.

In the first scenario, Question 30, respondents are told that "all people who lived within five miles of the plant were advised to stay indoors." Respondents living more than five miles from the plant are asked to speculate about their future behavior, but are not given any indication of what they might be advised to do in an emergency. In the second scenario, Question 34, respondents are told that "all pregnant women and pre-school children living within five miles of the plant were advised to evacuate and everyone living between six and ten miles from the plant were advised to remain indoors." Respondents living more than 10 miles from the plant, and respondents living within 5 miles of the plant who are neither pregnant women nor pre-school children are not given any instruction.

In the third scenario, Question 38, respondents are told that "everyone living within ten miles of the plant was advised to evacuate." Once again, those living more than ten miles from the plant are not told what they would be advised to do in the event of such an accident.

Another methodological problem with these three questions is that the way they are asked, in terms of scenarios of increasing severity, can create in the minds of some people the idea that they are referring to the same accident, which is becoming increasingly severe with each new scenario. Thus, some people undoubtedly indicated that they would leave because they thought the accident was becoming more serious all the time, and that they would get out while they still could.

In addition, the answers from which a person is asked to choose in each of these questions do not well reflect the range of things people actually do in emergency situations. And the answers from respondents will be biased based on prior questions (nuclear plants are "problems" -- from the introductory paragraph -- that people should "worry" about -- from question 9 -- because they are "dangerous" -- from question 14 -- and accidents at them make people ill -- from question 20), resulting in a likely increase in the number of people who say they will evacuate in an emergency.

As a result of the bias in the questionnaire, there is no basis for accepting the answers given to any

of the questions in this study as valid. "Evacuation estimates" gained from this study would grossly overestimate the number of intended evacuees as compared to estimates obtained using a bias-free instrument. The bias in this instrument has created, one might say, a "response shadow effect" that would lead people to speculate that they would evacuate when they would not so speculate were the instrument bias-free. But, as previously stated, "intentions to evacuate" measured in this or even in a bias-free schedule would not shed any light on actual evacuation behavior.

48. Q. In addition to the County questionnaire, is there anything about the way the County survey was conducted that might affect the results of the County's poll?

A. [Johnson, Mileti] Yes. The report of the poll claims that it was conducted on a "random sample" where everyone living in the polling area has a known, non-zero chance of being included in the sample. A random sample in a survey allows us to generalize the results not just for those persons interviewed but to the population at large; without a random sample, survey results cannot be

generalized beyond those who participated in the poll. The County poll's sampling procedure contained a technical flaw (explained below) that violates random selection principles.

The sampling scheme used in the County poll generated a random sample of telephone numbers. But the person who was interviewed at those telephone numbers was not selected randomly, because the person who happened to answer the phone was the one interviewed. Thus, by being home and willing to answer the phone, respondents selected themselves for inclusion in the sample. This self-selection by respondents for sample inclusion violates random sampling procedures. Consequently, the sample obtained from the County poll was not random, and does not represent some larger group.

This is not an uncommon flaw in social research performed by some; however, that many make this mistake does not make it any less of a mistake.

4. <u>The Poll Conducted by Johnson for LILCO</u>

49. Q. Mr. Johnson, have you conducted a poll about emergency planning for Shoreham yourself?

A. [Johnson] Yes.

50. Q. How did you happen to do work on emergency planning for the Shoreham Station?

A. [Johnson] While working as a consultant for the New York Power Authority and Consolidated Edison in connection with the Indian Point hearings, I was given a copy of the reports prepared for Suffolk County by Steven Cole concerning the three studies he did for them. It was thought that these might be introduced as evidence into the Indian Point hearings. While reviewing the materials, I discovered several major methodological deficiencies, including a flaw in three of the questions in the attitude study of accidents. I felt these deficiencies drastically biased the results.

51. Q. What was your purpose in doing the survey for LILCO?

A. My purpose was to show that by giving people additional information in questions, their responses would change. My operating thesis was that if respondents were given additional information, that is, information that would be given to them in the event of an actual emergency at Shoreham, then

their predictions of what they would do in an emergency would change.

52. Q. How did you develop the survey questions?

A. [Johnson] In order to replicate the County survey as much as possible, I used the same questions, with the exception of questions 30-34 and 38. In order to show the flaw in the Cole questionnaire, there were three different versions of the questionnaire (Forms A, B, and C) administered to respondents (Attachment 12). Forms A and B give additional information to the respondents on questions 30-34 and 38; Form C is identical to the County's survey in all respects. In Form A the additional information is given as part of the original question; in Form B, this additional information is given in the form of an additional question that was asked only of those respondents who indicated they would "leave home and go somewhere else," or else were uncertain as to what they would do with regard to the various scenarios. The pretest questions for all three revisions paralleled the County questionnaire with one other exception: where the introduction to the County survey indicated that the study was being performed

by Suffolk County, it was changed to reflect the fact that my company was doing the interviewing.

53. Q. How did you conduct the survey?

A. The survey was conducted by telephone out of my phone bank in Mt. Vernon, New York, using trained professional interviewers who work for my company. They were at all times closely supervised and monitored. To avoid bias, the interviewers were not told that the survey was being conducted for LILCO; nor do I usually tell interviewers who is sponsoring a survey. The 900 respondents interviewed, 300 respondents from the eastern Suffolk area, 300 from western Suffolk, and 300 from Nassau County, were randomly selected from households on Long Island using the most recent Cole's Directory (a "reverse" directory showing phone numbers matched to street addresses); the definition of what constituted eastern and western Suffolk was taken from the County survey. Within each of the areas, 100 respondents were asked each of the three forms of the questionnaire. In an effort to ensure that the samples were as much like the County's samples as possible, respondents for each of the three forms were matched by gender and the street on which they

lived. Upon completion, each survey was reviewed by a supervisor and by me. The completed surveys were then sent to CRC Information Systems, Incorporated, where they were keypunched, verified, and tabulated by computer.

54. Q. Did this survey conform to the customary professional standards of your profession?

A. Yes, with the exception of the questionnaire used in the interviews (which was essentially the County survey questionnaire). That the standards were followed is perhaps best illustrated by the sampling methodology where, as explained previously, only neighbors of the same gender living on the same street as those people interviewed by the County were interviewed to obtain in the survey I performed as matched a sample to the County survey as possible. The professional interviewers I used don't live in the area serviced by LILCO, which eliminates possible interviewer bias. Each questionnaire was verified after keypunching (100% verification as opposed to accepted industry standards of 25% verification). These methods ensure that the method used in conducting the survey conforms to the customary professional standards.

In order to replicate the County study as much as possible, however, I used the survey instrument used in the County survey. It is my opinion, for the reasons Dr. Mileti and I previously stated, that this instrument does not conform to customary professional standards of the survey research profession. In that respect, therefore, the survey I performed does not meet the standards of my profession.

55. Q. Mr. Johnson, what did your survey reveal?

A. [Johnson] The results indicated that if additional information about the emergency is given in questions asking people to predict how they would react, their responses change. By advising people living outside the zone to be evacuated in the hypothetical scenarios as to the appropriate response to the hypothetical emergency, the number of people who said they would leave when they were not advised to do so dropped significantly.

5. <u>The Poll Conducted by Yankelovich for LILCO</u>

56. Q. What was the object of the survey that, Yankelovich, Skelly & White did for LILCO?

A. [Richardson] Yankelovich, Skelly & White (YSW) accepted the assignment to conduct this survey as a regular commercial assignment in which we understood that the client sought a high-quality research product. Two circumstances made this assignment somewhat special at the time. One was that we understood the study results would probably be introduced at these hearings, and the second was that the study would also probably be contrasted with another survey of the same population. These circumstances caused us to take slightly longer than we normally do before accepting the assignment so that we could assure ourselves (1) that our independence in conducting the research was guaranteed; (2) that we could conduct the research with all the appropriate safeguards that would make it methodologically defensible; and (3) that we had the freedom to pursue any line of questioning that we believed might add some knowledge and raise the level of the debate about the Shoreham plant. In retrospect, I feel we achieved all three of these objectives.

First, while we have enjoyed a relatively good client relationship, we have never had cause for concern about our independence as a research

organization to conduct and analyze this study as we saw fit.

Second, as for methodological safeguards, we expanded on a number of already-rigorous quality-control procedures routinely used by Yankelovich, Skelly and White so that the implementation of all phases of the study was carefully done and checked.

The importance of the third objective stems from YSW's self-characterization as an essentially policy-oriented research organization that conducts surveys in order to provide data for our policy studies. We had done a number of studies specifically related to utilities and nuclear plant operations, and an ongoing analysis of the public climate had persuaded us that the safety and efficiency of nuclear power plant generators is one of the more important public policy issues in the United States today. As we indicated in the report itself, we saw this study as an opportunity to explore a number of issues related to a controversial topic, and, we hoped, to shed some light on it.

Our specific study goals, as we stated in our report, were to:

> ...Assess the current state of public readiness, namely awareness of, knowledge and concerns about the plant.
>
> ...Determine responsiveness of the public to hypothetical emergency plans and instructions.
>
> ...Identify appropriate communications vehicles, the types of information people need, and credibility of various authorities.
>
> ...Generate data to help planners anticipate specific public needs in the event of different types of emergencies.

Given the substance of this discussion, we should be clear about what this survey was not intended to do. I quote from our report introduction:

> It is important to begin with a statement of the basic assumptions guiding this study. The feasibility of plans for coping with all possible emergencies that might affect residents around the plant is one of the central issues influencing licensing proceedings. Clearly the public response to those plans is all-important. However, it is not possible at this time to assess through a survey exactly how the public might respond to an emergency situation. The primay prerequisite for an appropriate public response -- dissemination and publicizing of emergency response information and directions -- has not taken place. Nevertheless, it is important to understand at this point how receptive the public will be to those plans and what concerns or questions are likely to guide their actions.

We have subsequently had some disagreements with other LILCO witnesses about what exactly is the "primary prerequisite for an appropriate public response." I happily acknowledge that, as a survey researcher (not a sociologist, geographer, or emergency-planning expert), I have learned a great deal from the behavioral scientists on this issue. We have never disagreed with the behavioral scientists, however, that a survey such as the one we performed for LILCO cannot accurately predict what people will do in an emergency. Throughout the study YSW performed for LILCO, YSW hoped to refocus attention on what, in our view, a survey such as this can show, namely, the current state of mind of the residents of the area, in the hope that appropriate information and education can be provided to them.

I would like to add one caveat at this point in defense of our industry. It is a fact that there is a growing market in business for research projecting future behavior in a variety of subject areas. That market is testimony, I think, to at least some degree of success by survey researchers in predicting behavior on certain topics. Professionals generally acknowledge, however, our

limitations in predicting behavior, and projecting emergency behavior is clearly one of those areas beyond our reach at this time.

57. Q. How did you go about developing the questions for the survey? What did you do to ensure that they would be fair and unbiased and professionally sound questions?

A. [Richardson] As to the substance of the questionnaire, we tried to be sure that each question was as neutrally worded as possible, that questions asking for opinions provided balanced positive and negative responses, that questions introduced early in the interview were not of a type that might bias responses to subsequent questions, and that where there were lists of items, they were balanced between negative and positive.

Procedurally, the following elements of the sample design and basic sampling procedures for the Yankelovich survey were developed to deliver findings which could be compared to findings from the County survey:

-- The definition of each of the 5 area zones to be sampled independently -- by postal zips.

-- The number of interviews to be obtained within each zone -- approximately 500 in each.

-- The use of a random digit sampling procedure to include households with unlisted telephone numbers along with those listed in telephone directories.

-- The selection of one individual, 18 or older, in each sampled household.

The two surveys used almost identical numbers of sample telephone listings (11,039 on the Yankelovich survey and 10,948 on the County survey) to complete similar numbers of interviews (2,676 on the Yankelovich survey and 2,595 on the County survey). The sample weighting procedure used on the Yankelovich survey also followed the precedent of weighting by individual zip codes in 3 of the area zones, as on the County survey.

Those aspects of sampling on which the Yankelovich survey differed from the County survey include:

-- For respondent selection within sampled households, the Yankelovich procedure was to select one person at random from among all eligible adults available in the household.

-- Weights for each zip code -- and combinations of zip codes -- were derived using updated U.S. Census counts.

-- Households with multiple telephone numbers, which automatically are included in the sample in greater proportions than their actual incidence among total households, were adjusted downward into their proper proportion. Thus, respondents in households with multiple phone numbers were adjusted to 8% of the total sample -- down from the 12% actually interviewed.

-- A sample balancing procedure was included to align sample distributions on age, sex and household size to actual U.S. Census distributions on those key demographic classifications.

58. Q. What questions did you ask, how was the survey conducted, and what were the results? Did the survey conform to the usual standards of your profession?

A. [Richardson] The questions asked and the results obtained are all described in the report on the survey attached to this testimony (Attachment 13). We asked questions covering the following topics: awareness of the plant and its status; concern about the plant and the firmness of that concern; personal emergency planning behavior; reactions to specific emergency scenarios; family needs/capabilities in an emergency; awareness and credibility of information sources on nuclear power issues and Shoreham; beliefs about nuclear power; general attitudes about nuclear power; and

demographic traits. As we explained in our report, part of YSW's purpose was to understand why people hold particular views, so we examined answers to many of these items in tandem.

The results of the study are described in detail in the YSW report, and summarized in the overview to the report. Several points deserve highlighting:

1. The Shoreham plant is highly visible in this area.

2. Many people say they have at least some concerns about the plant.

3. Many people say they are very fearful about nuclear power plants -- even when operating normally. Those fears appear to be based on beliefs about nuclear power that most experts would consider inaccurate.

4. Yet, only a handful of people in the two counties say they have done any personal emergency planning related to the plant; those who say they have tend to be at the extreme -- the most fearful or the most sanguine.

5. A substantial majority indicate a strong desire for more emergency planning information; many say they have found media coverage informative, but most don't consider it fully adequate, and a substantial minority express concerns about media bias against the plant.

6. While projected behavior is affected by people's perceived proximity to the plant, there is substantial variation in projected reactions to emergencies depending on how much information is provided to respondents in the questions.

G. The "Uniqueness" of Radiation

59. Q. Suffolk County alleges that among the reasons for voluntary evacuation are the public's fear of a radiological emergency and its perception that radiological emergencies are unlike other disasters. The County says that reasons why it thinks radiological disasters are unique are (1) that the public associates nuclear energy with nuclear weapons, (2) that radiation cannot be detected by the senses, (3) that because the survivors have no sure way of knowing if the danger is over or how much damage has been done, the event is "never quite over," and (4) that the federal government has failed to convince the public that it can protect the public from the hazards of nuclear power. Also, NUREG-0396 observes that "Reactors are unique in this regard: radiation tends to be perceived as more dangerous than other hazards because the nature of radiation effects are less commonly understood and the public generally associates radiation effects with the fear of nuclear weapons effects." My question is this: do you agree that these "unique" features of radiological emergencies make a significant difference in the kind or amount of overreaction that we can expect from the public?

A. [Dynes, Mileti, Sorensen] No. It is true that the risks and hazards of nuclear energy are perceived by some members of the public as different from other hazards. In NRC proceedings like this one, for example, some are quick to classify dozens of different geological and climatological hazards as "natural" and therefore in a single category separate those from a radiological emergency at a nuclear power plant. But all hazards have similarities and dissimilarities with others; in that sense each hazard is unique.

Some guidance to counter these notions is provided in the work of Paul Slovic, Baruch Fiochhoff, and Sarah Lichenstein ("Rating the Risks," Environment, Vol. 21, No. 3, 1979) and R. Kates and C. Hohenemser ("Characterizing Perceived Risks," Technological Hazard Management, Cambridge, MA: Oclgesehlager, Gunn and Hain, 1981). Their work demonstrates that when people evaluate hazards on the basis of 7 to 18 characteristics, no two hazards have identical profiles, but many hazards display similarities on any single characteristic. Furthermore, their analysis shows that people tend to discriminate along two dimensions of hazards, the first what the authors labeled "known vs.

unknown risks," and the second what the authors labeled "dread." Nuclear hazards, nerve gas, terrorism, and crime possess an "unknown" character, but so do hazards such as oral contraceptives, lasers, food coloring, and laetril. One significance of this work is that it demonstrates that nuclear power is not so unique that people cannot compare it to other hazards in a rational manner.

The physical, factual, and perceptual character of radiation can be acknowledged in an emergency plan and, consequently, can be managed to ensure public safety. We have suggested elsewhere in this testimony that the factors that determine human behavior in emergencies are known, and that those are transferable across emergency types. The "unique" aspects of radiation could work to increase overresponse in an emergency if the needs of the public in reference to emergency information during an emergency went ignored. However, if the emergency public information system in a radiological emergency were a good one, as it is at Shoreham, overresponse in a radiological emergency would be minimized.

In answer to your question, then, the "unique" aspects of radiation could cause a greater amount of "overreaction" than some other hazards (but not necessarily more than all other hazards) if the role of emergency public information in determining public emergency response were ignored. However, overresponse in a radiological emergency can be minimized if emergency public information is well handled.

H. Contention 23.A -- Evacuation When Sheltering is Advised

60. Q. Dr. Mileti, Contention 23.A alleges that sheltering would not work because many people told to shelter would evacuate instead. It reads as follows:

> Contention 23.A. A protective action recommendation of sheltering under the LILCO plan would not and could not be implemented because a substantial number of people in the 10 mile EPZ who are advised to shelter will choose to evacuate instead. Vehicles provide little if any protection from a passing plume. Thus, even if a sheltering recommendation were made because plume passage were imminent, a substantial number of people would receive little if any protection from the plume. Therefore, a protective action recommendation of sheltering will not constitute an adequate protective measure and the Plan thus fails to comply with 10 CFR Sections 50.47(a)(1) and 50.47(b)(10), and NUREG 0654 Sections J.9 and J.10.

Here the contention is not that the overreactors would slow evacuation times, because no evacuation would be in progress. It is rather that the evacuees would be outside in the plume instead of inside sheltering and would thus receive higher doses than if they followed instructions. Do you have anything to say about this particular subpart of the contention that you have not already said above?

A. [Mileti] Some people almost certainly would evacuate when shelter advisements were issued if this very real potential problem were not addressed in planning. Inappropriate action could result in some people being exposed (if a radioactive plume passed) were they in the process of evacuating when they should better be engaged in sheltering behavior. People, however, are not stupid. As explained at length above, people behave in emergencies in ways that are rationally consistent with their situational perceptions. The key to helping people take proper protective action in an emergency (which is what they think they are doing when they do things that some outside observers would label as "over-response") is to provide them with the appropriate kind of emergency information

that covers the what, how, when, where and why of the situation. If the emergency information given includes the proper information and is delivered in the appropriate manner, the what, how, when, where and why of the situation will not be determined by people's preconceived fears, notions, biases and perceptions. Instead, it will yield much more accurate perceptions of the situation, and "overresponse" can be dramatically minimized.

We have described above how emergency public information can achieve this objective with proper planning. The public emergency information system for Shoreham, especially the emergency broadcast system messages, is designed to help people form situational perceptions that would not lead to a decision to evacuate when sheltering is appropriate. These messages provide information, for example, about risk (in the air) that is consistent with guidance about response (stay away from the outdoors).

I. Contention 23.B -- "Voluntary" Evacuees at the Outset of an Emergency

61. Q. Contention 23.B alleges that any notice to the public of any sort of Shoreham emergency would cause

"a substantial portion of the population" to evacuate voluntarily. If the event were then to escalate and a sheltering recommendation were then to be made, the contention goes on, the voluntary evacuees would be unable to shelter because they would be in transit and thus subject to exposure to the passing radioactive plume:

> Contention 23.B. Even if an initial announcement regarding a Shoreham emergency indicates that persons in certain portions of the EPZ need not take any protective action, a substantial portion of the population, upon learning of the existence of an emergency at Shoreham, will decide to evacuate. If the event then were to escalate and a sheltering recommendation were then to be made, the voluntary evacuees would be unable to shelter because they would be in transit in their vehicles and sheltering would not be an available protective action. Thus, they would be subject to exposure to the passing radioactive plume. The LILCO Plan thus fails to provide reasonable assurance that adequate protective measures can and will be taken, in violation of 10 CFR Sections 50.47(a)(1) and 50.47(b)(10), and NUREG 0654 Sections J.9 and J.10.

For all practical purposes this contention seems to be about the same as 23.A. Do you have anything to say about it that you have not already said above?

A. [Mileti] My answer to this question is identical to my answer to the previous question, except, of course, that the question references people who evacuate when they are not told to shelter instead of those who evacuate when they are told to shelter. There are, however, a few other things that I must add.

First, it should be pointed out that the use of the term "voluntary evacuation" in describing "overreaction" or the "shadow phenomenon" is somewhat inaccurate. Virtually all evacuation in emergencies is voluntary; people never are forceably removed. E. L. Quarantelli (Evacuation Behavior and Problems: Findings and Implications from the Research Literature, Ohio State University, Disaster Research Center, Miscellaneous Report #27, 1980), notes that in all of the DRC field studies of disaster no cases of forceable removal were found. A more accurate term would be "non-officially sanctioned evacuation." This type of behavior, according to Quarantelli, is common. It has been documented in "many cases" that evacuation starts or occurs without official recommendations.

Second, the overresponse referred to in the scenario in Contention 23.B is likely not as much a potential real issue as the overresponse discussed in Contention 23.A. Emergencies are not the same thing as a race in which a bell goes off and the public jumps at the gate. The statement that a "substantial portion of the population, upon learning of the existence of an emergency at Shoreham, will decide to evacuate" does not reflect the way the public behaves in an emergency.

The first response of people to any announcement of an emergency at Shoreham will not be to evacuate. The first response will be to get more information -- to turn on the radio, or do any number of other things in order to hear the message again. A first announcement will result in people seeking more information. Hearing sirens will result in seeking more information in the form of words, for example, the radio. Put simply, I doubt if anyone upon first learning of an emergency at Shoreham will decide to evacuate as an "automatic reflex" as suggested in the contention. I reach this conclusion assuming a full mix of local residents in terms of pre-emergency risk perceptions: the fearful, the apathetic and the ones in the middle.

J. Contention 23.C -- The Influence of Neighbors

62. Q. This contention alleges that people not located in a zone recommended to be evacuated will see their immediate neighbors evacuating and so will evacuate themselves, even though not asked to. The contention reads as follows:

> Contention 23.C. The LILCO Plan proposes an EPZ consisting of 19 separate zones. In a radiological emergency requiring evacuation of the EPZ, it is LILCO's strategy to conduct "a systematic area-by-area evacuation downwind of the reactor." (Plan, Appendix, A, at I-5). The Plan is unrealistic in expecting to evacuate only certain zones within LILCO's 10-mile EPZ without expecting residents of bordering zone(s) and probably other zones as well, also to evacuate. People not located in a zone recommended to be evacuated will not wait while their immediate neighbors evacuate in response to a protective action recommendation. This is particularly so for people who live close to the plant. Accordingly, LILCO's plan for staged evacuation of the inner EPZ zones is unworkable and thus not in compliance with 10 CFR Sections 50.47(a)(1) and 50.47(b)(10), and NUREG 0654 Sections II.J.9 and J.10.

The contention reasons that staged evacuation will not work. Presumably the implication is that, if LILCO is going to recommend an evacuation at all, it needs to recommend evacuation of a full circle

of some radius around the plant. Do you have any comment on this contention other than the remarks you have made above?

A. [Mileti, Sorensen] What people see going on around them can affect their situational risk perceptions and, subsequently, their behavior in the emergency. If this were not taken into account in a plan, therefore, it is likely that people who see their neighbors evacuating would use that information to form situational risk perceptions that would lead them to evacuate, too.

At the same time, however, everyone is a neighbor to someone else. If this "influence of evacuating neighbors" were the only thing operating in an emergency to influence risk perceptions and consequential public response, evacuation in emergencies would spread from one household to another without end. This has not been the case in any prior emergency that has been examined including, for example, Three Mile Island. The "influence of evacuating neighbors" can operate in an emergency, but at the same time it does not operate for everybody and, eventually, it has no spreading effect. This is because social and physical barriers

isolate people from one another. Not everyone will follow the lead of a neighbor if they see themselves as different from that neighbor. Other factors make this "domino" theory unrealistic as well. For example, some neighborhoods are isolated by barriers such as roads or commercial property. The interaction effects postulated in the contention would be isolated by such barriers.

Without a plan that addressed the key factor that influences a public's situational risk perception -- emergency information -- it is not only likely but is probable that secondary factors would set the stage for the public's perception of situational risk, including the influence of evacuating neighbors. But plans help manage the situational perceptions of risk (and subsequent behavior like evacuation) that a public forms if an emergency exists. We need not, therefore, accept the influence of evacuating neighbors as a "law of science" operating in all emergencies; we also need not accept the influence of other secondary factors on what a public perceives in an emergency like, for example, misperceptions, superstition, distrust, and others.

If emergency information to the public is sound, it can help people come to perceive what is the risk in the emergency, who is at risk, and who should take action (or who need not do anything) because of it. Information of this sort can help the public, therefore, come to perceive and behave in more appropriate ways and dramatically reduce the effect of factors like evacuating neighbors. Nevertheless, there would still be some who could be influenced by evacuating neighbors and themselves evacuate as a consequence. With good public emergency information the number of these overresponders would likely not be high.

K. Contention 23.H -- Perimeter Control

63. Q. Contention 23.H alleges that the LILCO plan fails to provide adequate EPZ perimeter control. The contention reads as follows:

> Contention 23.H. The LILCO plan fails to provide adequate measures at the EPZ parameter to control access to evacuated areas, contrary to the requirement of NUREG 0654 Section II.J.10.j. As a result, voluntary evacuees from the East End whose shosen evacuation routes may cross the EPZ perimeter, may travel into contaminated areas and receive health-threatening radiation doses and add to congestion within the EPZ. Thus, the Plan fails to comply with

10 CFR Sections 50.47(a)(1), 50.47(b)(10), and NUREG 0654 Sections II.J.9 and J.10.

Dr. Mileti, do you have any comment on the contention that voluntary evacuees from the East End may travel into contaminated areas and receive health-threatening doses and add to congestion within the EPZ?

A. [Mileti] There are more ways to control EPZ perimeter access than posting guards on perimeter boundaries. In fact, the best way does not involve guards at all -- if someone wanted to go in, I suspect they could find a way to go in no matter how many guards are posted. The best way to keep safe people out of an unsafe area is to give them sufficient information so that they do not want to enter the area in the first place.

This contention assumes that "safe" East Enders would come to act either irrationally on the basis of the public information about risk disseminated at the time, or not believe that information and perceive that they were both being lied to about risk and that they were at risk. In other words, this contention assumes that East Enders would evacuate. Two questions, therefore, should be

addressed: (1) will East Enders evacuate? and (2) if they do, would they enter an "unsafe" area on their journey from safety in search of perceived safety?

This contention, like so many others raised in this hearing in regard to the so-called "shadow phenomenon," assumes that planning will not exist (or at least that planning cannot help address how a public behaves in an emergency) prior to an accident at Shoreham. It also seems to assume that percentages, trends, and other ways to describe how and what the public did in response to Three Mile Island will hold in other emergencies (for example, people in "safe" areas will evacuate at Shoreham).

I have no doubt that some East Enders would evacuate -- some entering "dangerous" areas as they did so -- if the public information that went out during an emergency at Shoreham said no more than "an accident at Shoreham happened, people within 10 miles east of Shoreham should evacuate, everybody else stay tuned." I also have no doubt that some East End evacuation would occur if we replaced the word "people" in the above message with "pregnant women and small children." This message implies

some risk to people but gives no detail about who, why, when, and so forth. It suggests -- or might suggest to some -- that the East End could become dangerous.

East Enders need not be given these vague uncertain "impressions" about risk in an accident at Shoreham. In fact, as stated several times in this testimony, the plan at Shoreham is to issue messages to the public that make it very clear as to what is the risk, where it is and where it is not, who should and need do what, who does not, and why. Because of the emergency public information at Shoreham, East Enders would not perceive themselves at risk and few, if any, would evacuate. Feelings of being "trapped" with no place to go, therefore, would not likely emerge, since people likely would not perceive themselves to be at risk.

Assume for a moment that some East Enders would, in fact, evacuate. These persons would be doing so because they would perceive themselves to be currently, or eventually, at risk. Despite this concern -- or over-concern -- for their safety, it is alleged that these safety-seekers would ignore public information about what are the dangerous areas

and head straight into them. It is inconceivable that the hypothetical East Ender evacuee who is hyperconcerned for his safety to the point that he evacuates even though emergency information has said that his neighborhood was safe, would then ignore information that pointed out the known unsafe areas. Public emergency information at Shoreham is planned to make it quite clear which areas are "dangerous." This information would be cause for any East Ender engaged in evacuation to choose another, safe route.

VI. Contention 65 -- Panicked Drivers

64. Q. What is Contention 65.C.2?

A. Contention 65.C.2 reads as follows:

Contention 65.C.2

> 2. LILCO's attempted use of traffic controls may cause aggressive behavior on the part of those attempting to take protective actions. This aggressive behavior will stem in part from fear of a radiological emegency (which is perceived by the popul tion to be different from other emergencies) and in part from confrontations that will result when motorists wish to travel contrary to the directions of the LILCO traffic guide, or are stopped by guides for screening. Conflicts between motorists and traffic guides will result

in traffic blockages, confusion, accidents and possibly injuries, all of which will increase congestion.

65. Q. Dr. Mileti, would motorists behave agggressively toward LERO workers guiding traffic and performing other functions during an emergency?

A. [Mileti] No. The notion that people become aggressive in emergencies is unfounded. In a community emergency, people become more helpful to each other. If an emergency at Shoreham were to occur, LERO workers would be defined by the population as people there to help, and would be treated as such. The evacuees would take the information offered by LERO workers and use it. They would not initiate conflicts.

66. Q. Does LILCO intend that LERO workers "screen" motorists or prevent them from going in a particular direction?

A. [Weismantle] No. This notion of "screening" was deleted from the Addendum to Appendix A, p. IV-23 in Revision 2 of the Plan.

67. Q. Contention 65.F reads as follows:

Contention 65.F

> Behavior research demonstrates that stress and anxiety induced by a radiological emergency at Shoreham will diminish driving skills and awareness, and impede the processing of information necessary for a driver to make decisions and drive properly. The geography of Long Island, with its narrow, limited land area, may create a feeling of being "closed-in," which may increase the likelihood of poor driver behavior. Decreased driving skills and driver awareness will cause confusion, congestion and accidents and, if properly taken into account, would increase LILCO's evacuation times. LILCO, however, has failed to take these factors into account in its evacuation time estimates.

68. Q. Will the stress and anxiety induced by a radiological emergency likely "diminish driving skills and awareness, and impede the processing of information necessary for a driver to make decisions and drive properly?"

A. [Mileti, Sorensen] The stress and anxiety in a human population experiencing an emergency will indeed increase. However, the behavioral consequences of increased stress and anxiety levels are not necessarily "negative." It is quite possible to hypothesize that impairment of judgment could occur

because of increased stress and anxiety. An equally plausible hypothesis is that added stress and anxiety levels may increase vigilance and would result in better driving skills.

Data collected from the Three Mile Island accident and cleanup well documented increased stress levels in the population. (See, for example, Andrew Baum et. al. "Chronic and Acute Stress Associated with the Three Mile Island Accident and Decontamination," Draft Report, U.S. Nuclear Regulatory Commission, 1981.)

In a study done by Dennis Mileti, Donald Hartsough, and Patti Madson entitled The Three Mile Island Incident: A Study of Behavioral Indicators of Human Stress, 1982, data were examined that included the frequency of accident rates before, during, and after the TMI accident. There was no evidence to suggest that accidents increased during the evacuation, despite the fact that commutation in the area was likely up because of evacuation. This increased traffic volume on highways from evacuation, with no evidence of increased accident levels during evacuation, suggests that increased stress may have led to enhanced driving skills and

awareness among the population under stress rather than diminished skills and awareness.

This conclusion about the TMI accident is supported by other evacuation studies. In an extensive review of evacuation behavior, E. Quarantelli notes:

> A strong theme is that withdrawal movement is almost always orderly in getting people away from an actual or potentially dangerous location. This runs counter to widely held views among some disaster planners and emergency organization personnel that there is a need to be concerned about evacuation turning into disorderly flight is not wild panic.

Evacuation Behavior and Problems: Findings and Implications From the Research Literature. 109, Ohio State University Disaster Research Center, Miscellaneous Report #27, 1980.

It has been noted by many studies that accidents and traffic jams are not problems in vehicular evacuations. Moore, et al (Before the Wind, Disaster Study 19, Washington: National Research Council, 1963) specifically investigated accidents and auto breakdowns in evacuation from Hurricane Carla. It was found that only .6 percent of the evacuees either witnessed or were in an accident or breakdown.

69. Q. Will the geography of Long Island create a feeling of being "closed in" and increase the likelihood of poor driver behavior?

A. [Mileti, Sorensen] Being "closed in" can only have a negative effect on driving behavior if it is itself a part of the complex of determinants that would lead people to panic. Emergencies have occurred in locations where geographical features have actually isolated a portion of the population from evacuation routes or from safe locations. These features created conditions in which perceptions of being "closed in" would be most likely, for example, in the Hawaiian Islands where there is no practical means of moving large numbers of people to a safer location. Hurricanes also isolate people on barrier islands, such as in Galveston, Texas. In floods, such as the one in Big Thompson Canyon, groups of people were stranded until the flood receded. While the effects of isolation have not been investigated in detail for these types of events, general investigations of disaster response for these events have been made. Studies of those situations, however, parallel disaster studies in general in suggesting that people have not panicked, even when they have been "closed in."

For example, the National Academy of Science Report, Hurricane Iwa, Hawaii, November 23, 1982 (Washington NAS Press, 1983) notes that people were cut off from evacaution routes, but no evidence of panic was noted. Similar findings can be found in a study by Eve Gruntfest, "What People Did During the Big Thompson Flood," Natural Hazard Working Paper No. 32. Boulder: University of Colorado Institute of Behavioral Sciences, 1977.

Because panic is the mechanism that would link perceptions of being "closed in" to poor driving behavior and because the determinants of panic would be absent in any emergency at Shoreham, it is extremely unlikely that being "closed in" would result in poor driver behavior.

70. Q. Dr. Mileti, in a radiological emergency, are decreased driving skills and driver awareness likely to cause confusion, congestion, and traffic accidents?

A. [Mileti] The accumulated evidence would suggest that driving skills and driver awareness would not decrease in a radiological emergency. It is, therefore, not the case that the "state" of driving skills and driver awareness would cause confusion, congestion, and traffic accidents.

Hypothetically, however, if driving skills and driver awareness go down in a population (for whatever reason), I would assume that an increase in traffic accidents would have to be the consequence.

71. Q. What does the rest of the witness panel have to say about this?

A. [Weismantle] Based on studies by recognized authorities, it is doubtful that a radiological emergency would cause decreased driving skills resulting in confusion, congestion and traffic accidents. Observations at emergencies in various parts of the country, the south, mid-west, south-west and west coast, refute the myth that evacuees become panic-stricken or disoriented. Attachment 14 to this testimony supports our conclusion.

Additionally, evacuating traffic will be moving at a rate so slow that accidents, if there were any, would be of a minor nature. This is borne out by Attachment 15 to this testimony, from Appendix A of the LERO Evacuation Plan.

72. Q. Does anybody else have anything to say?

A. [Cordaro, Weismantle] Yes. It will hardly have escaped the Board's notice that the intervenors in

this proceeding are putting forth the most derogatory possible picture of the people of Long Island, alleging that the public will be panicky, hysterical, irrational, selfish, accident-prone, larcenous, and defiant of law and authority. In our judgment it is a disservice to the public to provide this view of the people who are our neighbors.

Worse, it is misleading, based on the facts presented in this testimony. It is also a challenge to the idea, embodied in the NRC regulations, that radiological emergency planning is a useful exercise. If human behavior prevents an adequate emergency response on Long Island, with its good roads, highly-paid police force, good communications systems, and educated, mobile population, then human behavior makes emergency planning impossible everywhere. This idea is fundamentally at odds with the NRC regulations.

LILCO, November 18, 1983

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RELATED CORRESPONDENCE

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

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

TESTIMONY OF MATTHEW C. CORDARO, RUSSELL R. DYNES, WILLIAM G. JOHNSON, DENNIS S. MILETI, DAVID N. RICHARDSON, JOHN H. SORENSEN, AND JOHN A. WEISMANTLE ON BEHALF OF THE LONG ISLAND LIGHTING COMPANY ON PHASE II EMERGENCY PLANNING CONTENTIONS 23 (SHADOW PHENOMENON) AND 65.C.2 AND 65.F (PANICKED DRIVERS)

Volume II of II - Attachments

Hunton & Williams
Post Office Box 1535
707 East Main Street
Richmond, Virginia 23212
(804)788-7200

DATED: November 18, 1983

PROFESSIONAL QUALIFICATIONS

MATTHEW C. CORDARO
Vice President of Engineering
LONG ISLAND LIGHTING COMPANY

My name is Matthew C. Cordaro. My business address is Long Island Lighting Company, 175 East Old Country Road, Hicksville, New York 11801. I am currently Vice President of Engineering and have held this position since the spring of 1978. As Vice President of Engineering, I am responsible for all of LILCO's engineering activities. This includes responsibility in the areas of facility planning and engineering for nuclear and fossil electric generating plants, as well as electric and gas transmission and distribution systems. In addition, I am responsible for assessing the environmental impacts of all LILCO operations.

I received my Bachelor of Science degree in Engineering Science from C. W. Post College in 1965. I received my Master of Science degree in Nuclear Engineering from New York University in 1967. I received my Doctorate in Applied Nuclear Physics from the Cooper Union School of Engineering and Science in 1970. I was awarded the Atomic Energy Commission Special Fellowship in Nuclear Science and Engineering.

My past professional affiliations include a position as Guest Research Associate at Brookhaven National Laboratory, Adjunct Associate Professor of Nuclear Engineering at Polytechnic

Institute of New York and Adjunct Assistant Professor at C. W. Post College.

I joined LILCO in 1966 and from 1966 to 1970 I held the positions of Assistant Engineer (1966), Associate Engineer (1967), Nuclear Physicist (1968) and Senior. Environmental Engineer (1970). In these earliest positions with LILCO I was involved as a principal in all phases of nuclear power plant design, licensing and fuel management. I was also a lead witness for the Company in Federal and State licensing proceedings for the Shoreham and Jamesport Nuclear Power Stations.

In 1972 I assumed the position of Manager of Environmental Engineering. In this capacity I was responsible for the environmental impact of all LILCO operations. This position involved the supervision, administration and direction of all environmental programs aimed at demonstrating compliance with applicable standards

I am a member of a number of related professional organizations including: the Board of Directors, Adelphi University's Center on Energy Studies; and the Council of Overseers, C. W. Post College. Other related professional affiliations are: Chairman, Technical Advisory Group to the National Environmental Studies Project of the Atomic Industrial Forum; Vice Chairman, Environmental Steering Committee of the Atomic Industrial Forum; the Long Island Association of Commerce and Industry Environmental Committee; the Advisory Board to

Environmental Technology Seminar; and the Environment and Energy Committee of the Edison Electric Institute. I have also been a member of the Research Planning Advisory Committee for the New England River Basins Commission Study of Long Island Sound, the Marine Advisory Council to the New York State Sea Grants Seminar, and the Nassau-Suffolk Health Systems Agency (HSA), Suffolk County Council.

In addition, I am a member of the American Nuclear Society, and the Health Physics Society.

My most recent publications include a paper on methodology for power plant site selection, papers presented at the World Energy Conference on space heating alternatives and power plant cooling systems, a paper related to power plant waste heat utilization, and a paper on the transportation of nuclear wastes. I was co-author of a paper presented at the International Meeting of LWR Severe Accident Evaluation entitled "Mitigating Severe Accident Consequences at the Shoreham BWR." I have also published journal articles in the fields of environmental science and nuclear science, as well as numerous studies and reports related to the environmental effects of energy production.

I have been called upon to interface with the media on numerous occasions. This includes newspaper interviews and radio and television appearances. I have also testified many times before administrative bodies, legislative commissions and congressional committees.

ATTACHMENT 2

PROFESSIONAL QUALIFICATIONS

RUSSELL R. DYNES

Chair, Department of Sociology

UNIVERSITY OF DELAWARE

My name is Russell R. Dynes and my business address is the Department of Sociology, University of Delaware, Newark, Delaware 19711. I presently hold the position of Chair and Professor, Department of Sociology.

I received my A.B. and my Master of Arts degree from the University of Tennessee in 1948 and 1950, respectively. I was awarded my Doctorate degree in 1954 from the Ohio State University.

From 1948 to 1950 I was a Graduate Assistant and Instructor at the University of Tennessee. I was then a Graduate Assistant and Assistant Instructor at the Ohio State University from 1951 to 1952 and, subsequently, an Instructor there from 1952 to 1956. From 1956 to 1960, still at Ohio State, I held the position of Assistant Professor. In the summer of 1958 I served as a Visiting Professor at Capital University. I then returned to Ohio State where I was an Associate Professor from 1960 to 1965. In 1964 I was employed by the Air Shams University and Arab States Center for

Education in Community Development in the United Arab Republic as a Fulbright Professor. I served in this capacity for one year. Once again I returned to the Ohio State University where I was a Professor from 1965 to 1977. From December of 1971 through March of 1972 I was again a Fulbright Professor. During this time I was employed by the Center for Advanced Study in Sociology, University of Delhi.

I have held several administrative positions including: Co-Director of the Disaster Research Center at the Ohio State University from 1964 to 1977; Chair, Department of Sociology, also at Ohio State, from 1974 to 1977; and Executive Officer of the American Sociological Association from 1977 to 1982.

From 1964 to 1965 I received a Fulbright Award and was a Senior Lecturer in the United Arab Republic. In 1969 I was awarded the Alpha Kappa Delta Graduate Teaching Award. I again received a Fulbright Award as a Senior Lecturer in India from 1971 to 1972. I received an Honorary Faculty Membership and an Honorary Lifetime Faculty Award from the Defense Civil Preparedness Agency Staff College in 1973 and 1974, respec-ively. In 1976 I became an honorary member of Phi Kappa Phi. In addition, I am an Honorary Member of the International Disaster Institute in London.

From 1949 to 1950 I served as Project Director of the Cooperative Study between the University of Tennessee and the Tennessee Department of Welfare. I was Co-Director of the

Study of Industrial Migrants in the Ohio Atomic Area, sponsored by the National Council of Churches of Christ in America, from 1954 to 1955. From 1955 to 1956 I held the position of Project Director for the School Community Development Study entitled, "Educational Changes in a Transitional Community," sponsored by the Kellog Foundation, the Ohio State University. As a Research Associate at the School of Aviation Medicine, Air University, Randolph Field, Texas, from 1953 to 1957 I was involved in research concerning the "Relationship Between Sociological Background Factors and the Psychiatric Fitness of Air Force Personnel."

I then held the position from 1957 to 1959, of Project Supervisor of the Wellsville Project, Community and Regional Planning and Development, Engineering Experiment Station, at the Ohio State University. In 1956, I was Faculty Supervisor of the Social Science Research Council Undergraduate Research Stipend. From 1955 to 1960 I supervised several projects sponsored by the Graduate School of Ohio State. Also at Ohio State, from 1963 to 1977, I served as Co-Director of the Disaster Research Center. In this same time period, from 1963 to 1969, I was the co-principal investigator of a study entitled, "Laboratory Simulation Studies of Organizational Behavior Under Stress." This study was conducted at the Ohio State University Research Foundation, sponsored by the Office of Aerospace Research, Air Force.

From 1965 to 1966 I was a Fellow at the American Research Center in Egypt. Subsequently, from 1967 to 1971, I was the Principal Investigator of a study conducted by the Office of Water Resources Research, Department of Interior, entitled, "Community Reaction to Water Resource Problems in Relation to Planning." I simultaneously served from 1966 to 1968 as the Principal Investigator of a study conducted by the College of Commerce and Administration Grant entitled, "Restudy of a Transitional Community."

I served as Co-Principal Investigator of a variety of studies, including: from 1968 to 1971, a study conducted by the Mershon Social Science Foundation entitled, "Cross Cultural Studies of Disaster"; from 1968 to 1974, a study sponsored by the National Institute of Mental Health entitled, "Organizational Response to Major Community Crises"; from 1963 to 1977, a Department of Defense study entitled, "Organizational Functioning in Disaster," conducted by the Office of Civil Defense; from 1970 to 1971 I studied "Police Behavior in a College Riot" for the Law Enforcement Assistance Administration; from 1974 to 1975, I was involved in two different studies, "Delivery of Mental Health Services in the Xenia Disaster," for the State of Ohio Department of Mental Health and Mental Retardation an "Organizational Communication and Decision Making in Disaster," for the Advanced Projects Research Agency; I then spent two years, from 1975 to 1977, as

the co-principal investigator of a study entitled, "Delivery of Emergency Medical Services in Disaster," sponsored by the Bureau of Health Services Research, Health Resources Administration, National Institute of Health, Department of Health, Education and Welfare; in addition, I was involved in two studies for the National Institute of Mental Health entitled, "Development of Baseline Information of Mental Health Disaster Assistance/Crises Intervention Needs and Resources," and "Delivery of Mental Health Services in Disaster," from 1976 to 1977 and 1976 to 1979, respectively. Finally, I have served as the principal investigator of various projects related to the activities of the American Sociological Association, NSF, NIE, FIPSE, and Lilly since 1977.

Since 1956 I have participated in a number of professionally related workshops and conferences, including: the Conference on Social Theory, Emory University, 1956; a Seminar on "Interpretations of Religion in Sociological Theory," University of North Carolina, 1959; Workshop on Crisis Research, sponsored by the University of Pittsburgh and the System Development Corporation, Newport Beach, California, December, 1976; Workshop on Sociological Aspects of Water Resources Research, Utah State University, May, 1968; Caribbean Regional Seminar on Pre-Disaster Preparedness, Port-of-Spain, Trinidad, June, 1968; IIIeme Seminaire Sur La Planification Des Secours En Cas De Catastrophes Naturelles,

Port-au-Prince, Haiti: June, 1970; "Methodological Issues in Comparative Research," Institute of Comparative Sociology, Indiana University, Bloomington, Indiana, April, 1971; Seminar on Organizational and Community Responses to Disasters, sponsored by the National Science Foundation and Japan Society for Promotion of Science, Columbus, Ohio, September, 1972; NIMH Continuing Education Seminar in Emergency Mental Health Services, Washington, D.C., June 22-24, 1973; Invitational Conference, "The Assessment of Social Impacts of Oil Spills," The Institute on Man and Science, Rensselaerville, New York, Septmber 25-28, 1973; International Conference of Disaster Researchers, sponsored by the Centre d'Etudes Psychosociologiques des Sinistres et de leur Prevention, Paris, France, September 5-6, 1974; Second National Conference on Reduction of Natural Hazards, University of Colorado, Boulder, Colorado, June 22-25, 1975; Third National Conference, June 30-July 2, 1976; First National Social Scientists Conference, U.S. Army Corps of Engineers, Memphis, Tennessee, September 20-24, 1976; Workshop on Issues and Options in Disaster Management, Office of Technology Assessment, Washington, D.C., March, 1978; Workshop, Functions and Effects, Emergency Preparedness, National Governors Association, Washington, D.C., May 25-26, 1978; Workshop, Fire Safety and Disaster Preparation, Intergovernmental Science, Engineering and Technology Panel, American Association for the Advancement of

Science, March, 1979; and Conference, Social and Economic Effects of Earthquakes and Planning to Mitigate their Impacts, Yugoslav Association of Self-Managed Communities for the Interest for Scientific Research and U.S. National Science Foundation, Lake Bled, July, 1981.

In addition, I served as Delegate to the International Consultation on the Sociology of Religion, Georgetown University, September, 1962; Principal Lecturer, Seminar on the Sociological Aspects of Collective Stress, sponsored by Patina University, A. N. Sinha Institute and the U.S. Educational Foundation in India, Patna, Bihar, India, March, 1972; participant and consultant, "Interorganizational and Interagency Relations in Major Disasters," National Emergency Planning Establishment, Government of Canada, Arnprior, Ontario, October 22-24, 1974; Seminar Leader, "Civil Military Relations in Crises," Foreign Area Officers Course, Army Civil Affairs School, Fort Bragg, North Carolina, December 17-18, 1975; and Organizer, Workshop on Directions in Applied Sociology, American Sociological Association, Washington, D.C., December, 1981.

I have also had numerous occasions to appear as a lecturer at conferences, workshops and symposiums, including the following: National Center for Social and Criminological Research, Cairo, U.A.R.; American University in Cairo, UNESCO Arab States Center, Sirs-el-layyan, U.A.R.; Canadian Emergency

Measures Organization, Arnprior, Ontario; Temple University Medical School MEND Symposium; Office of Civil Defense Staff College, Battle Creek, Michigan; National Association of State Defense Directors; Symposium on Law Enforcement Science and Technology; American Hospital Association; U.S. Department of State; Canadian Department of Health and Welfare; Centre d'Etudes Psychosociologiques des Sinistres et de leur Prevention, Paris, Frnce; School of Aviation Medicine, San Antonio, Texas; Institute of Disaster Preparedness, University of Southern California; Institute of Government, University of Georgia; Seminar on Church Response to U.S. Disasters and Emergencies, Church World Service, Pittsburgh and Denver; Region II, VIII, Defense Civil Preparedness Agency, Olney, Maryland, Portland, Oregon; U.S. Civil Defense Council, Region I; University of Michigan; University of Nebraska-Omaha; University of Akron; University of Delaware; Central States Faculty Conferences, Oberlin College and Purdue University; Danforth Conference, Lake Forest College; Auburn University; Kentucky Wesleyan University; University of Tennessee; University of Cincinnati; Kent State University; University of Toledo; Wooster College; Utah State University; Cornell University; Pennsylvania State University; Washington University at St. Louis; Air Force Academy; Denison University; University of Illinois; Ghandi Peace Foundation; Rajasthan University; Jawaharal Nehru University; Poona University;

Mysore University; University of Kerala; Madras University; Osmania University; Panjab University; Tribhuvan University, Nepal; Government Men's College, Lahore, Pakistan; University of North Carolina-Greensboro; Old Dominion University; Wichita State University; Oak Ridge Laboratories; University of Notre Dame; University of Tennessee-Martin.

My professional affiliations include memberships in the following: American Academy of Political and Social Sciences; American Association of University Professors, Elected Board Member, 1970-71; Ohio State University; American Sociological Association (ASA), Chair; Ad hoc Committee advising on participation of sociologists in Fulbright-Hays Programs (in conjunction with the Committee on International Exchange of Persons), 1968; ASA, Member, Committee on the Development of World Sociology, two terms Co-Chair, Liaison with National and International Organization; ASA, Committee on Committees, 1975, Elected 1974; ASA, Member, Committee on Regional Affairs, 1974-77; International Sociological Association participation at Evian, France, 1966; Varna, Bulgaria, 1970; Toronto, Canada, 1974; Uppsala, Sweden, 1978; Mexico City, Mexico, 1982; North Central Sociological Association (NCSA), Program Chair, 1958; NCSA Vice-President, 1970-71; NCSA President Elect, 1971-72; NCSA President, 1972-73; NCSA Representative to American Sociological Association, 1974; Ohio Council on Family Relations, Program Chair, 1957 and Executive Committee,

1965-68; Religious Research Association, Program Chair, 1968 and Associate Editor, 1968-77; and Society for the Scientific Study of Religion, Treasurer, Elected 1976-79.

I have also presented papers and/or chaired sessions of various annual meetings of: American Sociological Association, International Sociological Association, Religious Research Association, Ohio Council on Family Relations, Society for the Scientific Study of Religion, American Society of Criminology, American Water Resources Association, Society for the Study of Social Problems, Southwestern Sociological Society, Pacific Sociological Society, Southern Sociological Society, International Congress of Learned Societies in the Field of Religion, North Central Sociological Association.

My undergraduate teaching experience included courses such as Intorductory Sociology, Social Problems, Family, Race and Ethnic Relations, Community, Stratification, Religious Institutions, American Society, Comparative Social Organization, and Senior Seminar. The graduate courses I taught comprised Structural Sociology, Seminar in Sociology of Religion, Seminar in Stratification, Qualitative Methods, and Pro-Seminar. In addition, I served as Advisor for about 20 completed Doctorate degrees and Dissertation and General Examinations Committees for about 40 Doctorate degrees. I was also Major Advisor for several Master of Arts degrees and for several Undergraduate Honors Program and Theses.

My professional activities include the following:

Danforth Associate, 1958-, Co-Chair, Ohio Conference, 1963.

Member, Mayor's Faculty Advisory Committee, 1967-68.

Member, Sociology Advisory Committee, Committee on International Exchange of Persons (reviews awards under Fulbright-Hays Program).

Member, Developmental Task Force, Social Science Committee, University Council on Water Resources Research, 1970.

Consultant, Stanford Research Institute, 1971.

Convener, Board of External Examiners, University of Madras, India.

Board of Adjudicators, Graduate School, University of Kerala, India.

National Academy of Sciences/National Research Council

Member, Advisory Committee on Emergency Housing, Building Research Advisory Board, 1972.

Chair, Committee on International Disaster Assistance, Commission on Sociotechnical Systems, 1976-79

Publications of the Committee:

The U.S. Government Foreign Disaster Assistance Program (Washington: National Academy of Sciences, 1978, 168 pp.).

The Role of Technology in International Disaster Assistance (Washington: National Academy of Sciences, 1978, 102 pp.).

Assessing International Disaster Needs (Washington: National Academy of Sciences, 1978).

Liaison Member, International Disaster Assistance Panel, United Nations Association of the United States of America (for NAS/NRC).

Executive Committee, Academic Freedom Clearinghouse, ACLU, New York

Executive Committee, Council of Secretaries, American Council of Learned Societies, 1980-1982

Executive Committee, National Humanities Alliance, 1981-1982

Chair, Executive Committee, Consortium of Social Science Associations, 1981-1982

Executive Committee, AAAS Consortium of Affiliates for International Programs

Board of Directors, Fulbright Alumni Association, 1980-83

Chair, NATO Fellowship Committee, Committee on International Exchange of Scholars, 1980

Consultant - Departmental Reviews - Wooster College, Denison University, Cleveland State University, Virginia Commonwealth University, University of Texas - San Antonio

Consultant - Stanford Research Institute, "Technology Assessment of Earthquake Prediction," 1974-76

- President's Reorganization Project, "Federal Emergency Preparedness and Response Study," 1977-78

- Federal Disaster Assistance Administration, Housing and Urban Development

- "Cuban Refugee Camp Consolidation," Federal Emergency Management Agency, 1980.

- Home Heating Emergencies, Community Services Administration

- Shaw, Pittman, Potts and Trowbridge, Washington

Head, Task Force on Emergency Response and Preparedness, The President's Commission on the Accident at Three Mile Island, 1979

Over the years, I have edited a variety of materials. My background in editing has included the following:

Editor, The Ohio Valley Sociologist, 1958-63.

Editor, Newsletter, Ohio Council of Family Relations, 1960-64.

Editor, Special Issue, "On the Sociology of Religion," Sociological Focus, Volume 2, No. 1, 1968. (also Editor's Introduction, pp. 1-2).

Editor, Consultant on social problems concepts, Dictionary of Modern Sociology, Littlefield, Adams and Co., 1969, Thomas F. Hoult, ed.

Co-Editor, Special Issue, "Organizational and Group Responses to Community Disaster," American Behavioral Scientist, Volume 13, No. 3 (January-February), 1970

Co-Editor, Special Issue, "Dynamics of Organizational Involvement and Change in Civil Disturbances," American Behavioral Scientist, Volume 16, No. 3 (January-February), 1973.

Associate Editor, Review of Religious Research, 1968-77.

Co-Editor, Disaster Research Center Series, 1964-1977.

Reviewer for a number of journals ranging from Journal of Scientific Study of Religion to Science.

Editor, ASA Footnotes, 1977-1982.

A list of my publications, incorporating books, chapters, monographs, reports, and articles, includes:

Publications:

Books:

1964 Social Problems: Dissensus and Deviation in an Industrial Society. New York: Oxford University Press. 594 pp. (Co-author).

1969 Deviance: Studies in the Process of Stigmatization and Societal Reaction. New York: Oxford University Press. (Co-author).

1970 Organized Behavior in Disaster. Lexington: D.C. Heath. 236 pp. (Republished 1976).

1975 Social Movements, Violence and Change: The May Movement in Curacao. Columbus: The Ohio State University Press. (Co-author).

1975 Deviance: Definition, Management and Treatment, New York: Oxford University Press. (Co-author).

1982 Sociology in Applied Settings, (tentative title) (Howard Freeman, Russell R. Dynes, Peter Rossi, William Foote Whyte, eds).

Chapters, Monographs, and Reports:

1951 Homes for the Homeless in Tennessee. Knoxville: The University of Tennessee. Publication ofthe Bureau of Sociological Research, The University of tennessee Record Extension Series, Volume 27, No. 4, 67 pp. (with William E. Cole).

1954 "The Urban Class System" and "The Urban Religions." Pp. 115-141 and 191-209 in William E. Cole (ed.), Dynamic Urban Sociology. Harrisburg: Stackpole Press.

1955 Mobile Industrial Workers and the Church: A Study of People on the Move in Ohio's Atomic Area. National Council of Churches, Division of Home Missions. 31 pp.

1956 Consequences of Population Mobility for School and Community Change. Columbus: School-Community Development Study, The Ohio State University. 132 pp.

1957 Social Factors Related to Adaptability of Air Force Pilot Trainess. Columbus: Research Foundation, The Ohio State University. 176 pp. (with Alfred Clarke and John Cuber).

1959 "The Relation of Community Characteristics to Religious Organization and Behavior." Pp. 253-268 in Marvin Sussman (ed.), Community Structure and Analysis. New York: Thomas Y. Crowell Co.

1960 "The Inner City Church." Pp. 15-18 in John Lane Williams (ed.), Our Mission to the City. Report of Methodist Inner City Conference.

1964 "Some Preliminary Observations in Organizational Responses in the Emergency Period after the Niigata, Japan Earthquake of June 16, 1964." Research Report #11, Disaster Research Center, 49 pp. (with J. E. Haas and E. L. Quarantelli). (Republished in entirety in Japanese by Japanese Government.

1964 "Some Preliminary Observations of the Response of Community Organizations Involved in the Emergency period of the Alaskan Earthquake." Working Paper #2, Disaster Research Center, 28 pp. (with J. E. Haas and E. L. Quarantelli).

1966 Observations on Social Change. Sirs-el-layyan, UAR: Arab States Center for Education for Community Development. 44 pp. (in English and Arabic).

1967 Acceptance of Change, Part I. Sirs-el-layyan, UAR: Arab States Center for Education for Community Development. 29 pp. (with Louis K. Meleika).

1968 The Functioning of Established Organizations in Community Disasters. Report Series No. 1. Columbus: Disaster Research Center. 52 pp. (with George Warheit).

1968 "Operational Problems of Organizations in Disasters." Pp. 151-176 in 1967 Emergency Operations Symposium. Santa Monica: System Development Corporation.

1969 Community Priorities in the Anchorage, Alaska Earthquake, 1964. Monograph Series No. 4. Columbus: Disaster Research Center. 173 pp. (with Daniel Yutzy, major author and William Anderson).

1969 The Functioning of Expanding Organizations in Community Disasters. Report Series No. 2. Columbus: Disaster Research Center. 82 pp.

1969 Organized Behavior in Disaster: Analysis and Conceptualization. Columbus: Disaster Research Center. 254 pp. (Republished 1970. Lexington: D.C. Heath).

1970 "Different Types of Organizations in Disaster Response and Their Operational Problems." In Robert Brictson (ed.), Emergency Operations. Los Angeles: Tinnon-Brown. (with E. L. Quarantelli).

1970 Disruption on the Campuses of Ohio Colleges and Universities, Spring, 1970. Report prepared for the Ohio Concil of Churches and Ohio Board United Ministries in Higher Education. 119 pp. (with E. L. Quarantelli). (Several sections of this have been reprinted elsewhere.)

1971 "Community Conflict: An Explanation of Its Absence in Natural Disaster." Pp. 220-204 in Clagett G. Smith (ed.), Conflict Resolution: Contributions of the Behavioral Sciences. Notre Dame: University of Notre Dame Press. (with E. L. Quarantelli).

1971 Jan. Environment Crises. Columbus: Water Resources Center, The Ohio State University. 91 pp. (with Dennis Wenger).

1971 Dec. A Model of Community Problem Solving and Selected Empirical Applications. Columbus: Water Resources Center, The Ohio State University. 153 pp. (with Dennis Wenger).

1972 "Cross Cultural Perspective on Disaster." Pp. 235-257 in Proceedings of the Japan-United States Disaster Research Seminar: Organizational and Community Responses to Disaster. Columbus: Disaster Research Center.

1972 A Perspective on Disaster Planning. Report Series No. 11. Columbus: Disaster Research Center. 94 pp. (with E. L. Quarantelli and Gary Kreps).

1972 "Police Department Planning for Civil Disturbances: Organizational Factors Involved in Changes." Pp. 76-88 in F. Adler and G. O. W. Mueller (eds.), Politics, Crime and the International Scene: An Inter-American Focus. Hato Rey, PR: North South Press. (with M. Brooks and E. L. Quarantelli).

1972 May Police Perspectives and Behavior in a Campus Disturbance. Columbus: Disaster Research Center. 166 pp. (with E. L.

Quarantelli and James L. Ross).

1974 "Organizations as Victims in American Mass Racial Disturbances: A Reexamination." Pp. 121-142 in E. C. Viano and Israel Drapkin (eds.), Victimology. Volume 4. Lexington: D. C. Heath. (with E. L. Quarantelli).

1974 "Police Perspectives and Behavior in a Campus Disturbance." In Donal MacNamara and Marc Riedel (eds.), Police: Perspectives, Problems and Prospectives. New York: Praeger. (with E. L. Quarantelli and James L. Ross).

1974 The Role of Local Civil Defense in Disaster Planning. Report Series No. 16. Columbus: Disaster Research Center. 105 pp. (with E. L. Quarantelli).

1975 The Delivery of Mental Health Services in the Xenia Tornado. Columbus: Disaster Research Center. 280 pp. (with E. L. Quarantelli and others).

1975 "Rapport sur les activities du Disaster Research Center." Pp. 23-44 in Les Comportements Associes Aux Catastrophes. (Table Ronde de Centre National de la Recherche Scientifique) Paris: Institut International de Feu. (in French and English) (with E. L. Quarantelli).

1976 "Emergency Disaster Plans for Vocational Schools." Pp. 151-161 in Developing the Leadership Potential of Urban Vocational Education Administrators. 1976 National Leadership Seminar for Administrators of Vocational Education in April. (with E. L. Quarantelli).

1976 "The Family and Community Context of Individual Reactions to Disaster." Pp. 231-245 in H. J. Parad, H. L. P. Resnick, and Libbie Parad (eds.), Emergency and Disaster Management. Bowie: Charles Press Publishers. (with E. L. Quarantelli).

1976 May Organizational Communications and Decision Making in Crises. Columbus: Disaster Research Center. 58 pp. (with E. L. Quarantelli).

1977 "Crises and Disaster Research." In Annual Review of Sociology. Volume 3. Palo Alto: Annual Reviews Inc. (with E. L. Quarantelli).

1978 "Interorganizational Relations in Communities Under Stress." Pp. 50-64 in E. L. Quarantelli (ed.), Disaster: Theory and Research. London: Sage Studies in Sociology.

1979 "Helping Behavior in Large Scale Disasters." In Jacqueline MacCauley and David Horton Smith (eds.), Handbook of Informal Participation. San Francisco: Jossey-Bass. (with E. L. Quarantelli).

"Disasters and Emergency Medical Services." In Proceedings of First International Symposium on Emergency Medical Services (forthcoming).

1979 Report of the Emergency Preparedness and Response Task Force, Staff Report to the President's Commission on the Accident at Three Mile Island, Washington, U.S. Government Printing Office, 168 pp.

1981 "The Contributions of the Social Sciences to the Evaluation of Emergency Preparedness and Response" in D. Sills, C. Wolff and E. Shelanski, (eds.) The Accident at Three Mile Island: The Human Dimension, Boulder, Westview Press.

1981 "Biography of a Collegue" in R. Huff and I. Barak-Glantz (eds.) The Mad, The Bad and The Different, Lexington, Lexington Books (with Alfred Clarke).

1982 "Models of Emergency Planning: Contributions From the Social Sciences" in Proceedings of the Third International Conference: Social and Economic Effects of Earthquakes and Planning to Mitigate Their Effects. (forthcoming).

1982 "Perspectives on Applied Educational Programs" in Freeman et al., Sociology in Applied Settings, (with Irwin Deutscher).

Articles:

1954 "Preference for Male and Female Children: Traditional or Affectional." Marriage and Family Living 16:128-130 (May). (with Simon Dinitz and Alfred Clark).

1954 "Toward the Sociology of Religion." Sociology and Social Research 38:227-232.

1955 "Church-Sect Typology and Socio-Economic Status." American Sociological Review 20:555-560.

1956 "Levels of Occupational Aspiration and Selected Aspiration and Selected Aspects of Family Affection." American Sociological Review 21:212-215.

1956 "Sectarianism, Ruralality and Migration." Rural Sociology 21:25-28 (March).

1957 "The Consequences of Sectarianism for Social Participation." Social Forces 5:331-334.

1957 "Correlates of Marital and Se Roles." The Graduate School Record, The Ohio State University 2:9-10 (December). (with Alfred Clarke and Simon Dinitz).

1959 "Levels of Aspiration and Family Affection: Religious Preference as a Variable." The Ohio Journal of Sciences 59:103 (March). (with Alfred Clarke and Simon Dinitz).

1963 "Student, Faculty and the Nature of the University." Faculty Forum, Volume 25, May.

1965 "The Religious Interpretation of Disaster." Topic 10:34-48 (Fall). (Washington, PA: Washington and Jefferson College) (with Daniel Yutzy).

1965 "Three Ladies of Sirs-el-layyan." Viewpoints (Washington: Friends of the Middle East), Volume 5, No. 9 (November).

1966 "Natural Disaster as a Social Science Field." National Review of the Social Sciences 3:85-94. (also summary in Arabic).

1966 Theoretical Problems in Disaster Research." Bulletin of Business Research 41:7-9 (September).

1967 Administrative, Methodological and Theoretical Problems of Disaster Research." Indian Sociological Bulletin 4.4: 215-227 (July). (with E. L. Quarantelli and J. E. Haas).

1967 "Impact of Disaster on Community Life." EMO National Digest 7:10-13 (April).

1967 "Societal and Community Problems in Disaster." EMO National Digest 7:16-18 (October).

1968 "The Church in Higher Educa' on." Leader 10:1-6 (April).

1968 "Collective Stress and Its Relation to Water Resource Planning." Proceeding f Workshop on Sociological Aspects of Water Resources Research, Utah State University.

1968 "Group Behavior Under Stress: A Required Convergence of Organizational and Collective Behavior Perspectives." Sociology and Social Research 52:416-429. (with E. L. Quarantelli).

1968 "Looting in Civil Disorders: An Index of Social Change." The American Behavioral Scientist, Volume 2, March. (with E. L. Quarantelli).

1968 "Looting in Civil Disturbances and Disasters." Trans-Action 5:9-14 (May). (with E. L. Quarantelli).

1968 "Redefinitions of Property Norms in Community Emergencies." International Journal of Legal Research 3: 100-112 (December). (with E. L. Quarantelli).

1968 "A Sociologist Looks at Water Resources Research." Proceedings of the Water Resources Colloquium. Institute for Research on Land and Water Resources, Pennsylvania State University.

1969 "Dissensus and Consensus in Community Emergencies: Patterns of Looting and Property Norms." IL Politico, Revista di Science Politiche 34:276-291. (with E. L. Quarantelli) (inclues an Italian summary).

1969 "Organizations in Disaster." EMO National Digest 9:12-13 (April-May). (with George Warheit).

1969 "Looting Patterns in Community Disasters and Disturbances." Proceedings of the Third National Symposium on Law Enforcement and Technology. Chicago: IIT Research Institute. pp. 323-327 (with E. L. Quarantelli).

1970 "Editors' Introduction." American Behavioral Scientist 13:325-330. (with E. L. Quarantelli).

1970 "Organization as Victim in Mass Civil Disturbances." Issues in Criminology 5:181-193 (Summer). (with E. L. Quarantelli).

1970 "Organizational Involvement and Changes in Community Structure in Disaster." American Behavioral Scientist 13:430-439.

1970 "Property Norms and Looting: Their Patterns in Community Crises." Phylon 31:168-182 (Summer). (with E. L. Quarantelli).

1971 "Factors in Community Perception of Water Resources Problems." Water Resources Bulletin 7:644-651. (with Dennis Wenger).

1972 "The Principle of Least Interest, Dating Behavior and Family Integration Settings." Journal of Marriage and Family 34:269-272. (with K. Eslinger and Alfred C. Clarke).

1972 "When Disaster Strikes (It Isn't Much Like What You've Heard About)." Psychology Today 5:66-70 (February). (with E. L. Quarantelli).

1973 "Editors' Introduction." American Behavioral Scientist 16:305-311. (with E. L. Quarantelli).

1973 "On Institutionalization of Sociology in the United States." Sociological Focus 6:i-xxvi (Summer).

1973 "Organizational and Political Transformation of a Social Movement: A Study of the 30th of May Movement in Curacao." Social Forces 51:330-341. (with William Anderson).

1973 "Postscripts to a Presidental Address." Footnotes 1:8 (November).

1974 "Counterrioters in Urban Disturbances: Opponents or Supporters of the Status-Quo?" Society 11:50-55 (March-April).

1974 "Police Perspectives and Behavior in a Campus Disturbance." Journal of Police Science and Administration 2:344-351. (with E. L. Quarantelli and James L. Ross).

1974 "Sociology as a Religious Movement: Thoughts on its Institutionalization in the United States." The American Sociologist 9:167-176 (November).

1974 "The Sociology of Religion of Charles Glock: Review Essay." Journal of Scientific Study of Religion 12:466-469.

1975 "The Comparative Study of Disaster: A Social Organizational Approach." Mass Emergencies 1:21-31.

1976 "Civil Disturbances and Social Change: A Comparative Analysis of the United States and Curacao." Urban Affairs Quarterly, September. (with William Anderson).

1976 "Community Conflict: Its Presence and Absence in Natural Disaster Situations." Mass Emergencies 1:139-152. (with E. L. Quarantelli).

1976 "The Impact of Devotionalism and Attendance on Ordinary and Emergency Helping Behavior." Journal of Scientific Study of Religion 15:47-59 (March). (with Lynn Nelson).

1977 "A Background Note on the Preliminary Findings and Impressions of the DRC Studies." Mass Emergencies 2:147-150).

1978 "Organizational Adaptation to Crises." Disasters, Volume 3, No. 1, March. London: International Disaster Institute. (with Benigno Aguirre).

1978 "Participation of Sociologists in the Fulbright Program", FOOTNOTES, November.

1980 "Sociology in China: Its Restoration and Future Role", FOOTNOTES, October.

1981 "The View From Inside", The American Sociologist, 16:97-101, May.

Reprints of Articles:

1957 No. 3 in J. Milton Yinger. Religion, Society and the Individual. New York: Macmillan.

1962 No. 4 in John F. Cuber and Peggy Harroff. Readings in Sociology. New York: Appleton Century. And in Bartlett H. Strudley. Society and Self: A Reader in Social Psychology. New York: Free Press.

1963 No. 9 in Grappling With Ideas. Menominie: Stout State College.

1966 No. 14 in Roles des Agences Familiales Dans Les Disasters. Ottawa: Ministre de la Sante-nationale et du Bein-etre.

1967 No. 3 in Dwight Dean and Donald Valdes. Experiments in Sociology. New York: Appleton Century. And in Marvin Shaw and Jack Wright. Scales for the Measurement of Attitudes. New York: McGraw-Hill.

1968 No. 4 in Robert Rankin and Ritchie Lowery. Sociology: A Science of Society. New York: Charles Scribners Sons.

1968 No. 20 in New Society (August 8th). And in Don Bowen and Louis Mascotti. Riots and Rebellion. Beverly Hills: Sage. And in Survival, Volume 4, No. 6 (December).

1968 No. 21 in Current (August).

1969 No. 3 in John Robinson and Phillip Shaver. Measures of Social Psychological Attitudes. Ann Arbor: Institute of Social Research.

1969 No. 20 in Simon Dinitz, et. al. Deviance. New York: Oxford Unversity Press.

1969 No. 21 in Rodney Allen and Charles Adair. Violence and Riots in Urban America. Columbus: Charles Jones.

1969 No. 17 in Faculty Forum (March). And in The Christian (April).

1970 No. 21 in James Short, Jr. Modern Criminals. Chicago: Aldine. And in Bobbs Merrill Reprint Studies in Black History, BC 72.

1971 No. 20 in Nils Bateman and David Petersen (eds.). Targets for Change: Perspectives on an Active Sociology. Waltham: Xerox.

1971 No. 21 in H. Taylor Buckner. Deviance: Reality and Change. New York: Random House.

1971 No. 30 in James Geschwender. The Black Revolt. New York: Prentice-Hall.

1972 No. 4 in Robert Rankin and Ritchie Lowry. Sociology: Social Science and Social Concern. New York: Charles Scribners Sons. (also in paperback).

1972 No. 20 in A. Birenbaum and E. Sagarin. Social Problems: Private Troubles and Public Issues. New York: Scribners.

1972 No. 21 in James Conyers and Morris Medley. Sociology in the Seventies. New York: Wiley. And in Ralph Turner and Lewis Killian. Collective Behavior. New York: Prentice-Hall.

1972 No. 33 in Readers Digest (July).

1973 No. 28 in Walter Reckless. The Crime Problem. New York: Appleton Century.

1973 No. 33 in New Society (January 4th).

1973 No. 31 in Impact of Water Resources Development. New York: Environment Information Center.

1973 No. 32 in Women, A Random House Annual, 1972. New York: Random House.

1973 Pp. 4-10 of Social Problems in Clifford Bryan. Social Change, Conflict and Education: A Foundations Text and Reader. Columbus: Charles Merrill.

1973 No. 21 in James Short, Jr. (ed.), Law and Order: Modern Criminals. Transacton (2nd ed.).

1973 No. 21 in Peter Rossi (ed.), Ghetto Riots. Transacton (2nd ed.).

1974 No. 20 in Stuart Palmer (ed.), New Ferspectives on Deviance. Chicago: Aldine.

1974 No. 28 in Emilio Vivano and Israel Drapkin (eds.), Victimology. Lexington: D. C. Heath.

1975 No. 30 in Simon Dinitz, et. al. Deviance: Definition, Management, Treatment. New York: Oxford University Press.

1975 No. 37 in Volume in honor of....

1975 No. 33 published as "Wenn Die Katastrophe Kommt: Wie Sich Dann Wirklich Vernalten, Psychology Heute, June.

1979 No. 21 in Robert L. Ellis and Marcia J. Lipetz, Essential Sociology, Glenview, Illinois, Scott Foresman and Co.

1982 No. 40 in Edward Tiryakian, The Phenomenon of Sociology, New York, Irvington Publishers.

PROFESSIONAL QUALIFICATIONS

WILLIAM G. JOHNSON

President

BILL JOHNSON & ASSOCIATES, INC.

My name is William G. Johnson and my business address is Bill Johnson & Associates, Inc., 367 Summit Avenue, Fleetwood, New York 10552. I am currently the President of Bill Johnson & Associates, Inc., and have held this position since 1982.

I earned my Bachelor of Arts degree in Political Science from Yale University in 1966. Prior to this, in 1964, I attended the University of Michigan Survey Research Center Summer Program in Research Methodology.

From 1975 to 1976, I was employed as Project Director of Welfare Research, Inc., in Albany, New York. Subsequently, from 1976 to 1982, I was Executive Vice President of Century Opinion Polls, Inc., located in Great Neck, New York. As I mention above, I have been President of Bill Johnson & Associates, Inc. since 1982.

PROFESSIONAL QUALIFICATIONS

DENNIS S. MILETI

Associate Professor

Department of Sociology

COLORADO STATE UNIVERSITY

My name is Dennis S. Mileti and my business address is Department of Sociology, Colorado State University, Fort Collins, Colorado 80523. I am presently a tenured Associate Professor at Colorado State specializing in those areas of study dealing with complex organizations, hazards, policy and methods. I have held this position since 1978. Prior to this appointment, from 1974 to 1978, I held the position of Assistant Professor. I was also an Instructor for one year in the Department of Sociology at the University of Colorado, Boulder, from 1971 to 1972. I have taught numerous undergraduate courses. including Introduction to Sociology, Complex Organizations, Sociology of Natural Hazards, Research Methods, Demographic Process, and Social Change. In addition, I have taught courses at the graduate level such as Advanced Quantitative Analysis, Research Methods I and II, Demography and Population, and Complex Organizations.

I received my Bachelor of Arts degree in Sociology in 1968 from the University of California, Los Angeles. In 1971 I was awarded a Master of Arts degree in Sociology from California State University, Los Angeles. I completed my doctorate degree in Sociology in 1974 at the University of Colorado, Boulder.

In 1975 I was appointed Visiting Assistant Professor at the University of Southern California Graduate School of Public Administration. During this year I offered an Intensive Seminar Program sponsored by the University. From 1978 to 1979 I was an Invited Instructor for the Chautaugua Short Course Program sponsored by the American Association for the Advancement of Science. In 1981 I was appointed Policy Analyst for the Seismic Safety Commission by the State of California. During the year I served this appointment I was on leave from my university duties.

I am a member of the American Sociological Association; the International Sociological Association; the Pacific Sociological Association; the Midwest Sociological Society; the American Association for the Advancement of Science; the Earthquake Engineering Research Institute; the New York Academy of Sciences; and the American Association for the Advancement of Science. In addition, I have been a member of sev- eral committees since 1976, including:

1983-date	Front Range Consortium on Natural Hazards Studies, Colorado State University, University of Colorado, University of Denver.
1983-date	International Sociological Association, Research Committee on Disasters.
1982-1983	Pacific Sociological Association, Nominations Committee for the Standing Committees for 1983.
1982-date	Earthquake Engineering Research Institute, Chair, Committee on Social Science Research, Berkeley.

1981-1983	U.S. Geological Survey, Advisory Panel on the Earthquake Studies Program, U.S. Department of the Interior.
1981-1982	Pacific Sociological Association, Program Committee for the 1982 Annual Meetings in San Diego.
1981-1982	Governor's Emergency Task Force on Earthquakes, Threat Assessment Committee, State of California, Sacramento.
1981-1982	Governor's Emergency Task Force on Earthquakes, Disaster Reconstruction Committee, State of California, Sacramento.
1980-1981	Governor's Science and Technology Advisory Council, Committee on Uranium Mill Tailing Relocation. State of Colorado, Denver.
1979-year	American Association for the Advancement of Science, Committee on Intergovernmental Research and Development on Fire Safety and Disaster Preparedness, Washington, D.C.
1976-78	National Academy of Sciences, National Research Council, Commission on Sociotechnical Systems, Committee on Socioeconomic Effects of Earthquake Prediction, Washington, D.C.

The following comprises a current 1982-83 listing of my profes- sional and academic publications to date:

PUBLICATIONS

Books and Monographs: Discipline Focus

Mileti, Dennis S., John Schneider and Stan Eitzen
1984 Graduate Research Methods in the Social Sciences. (in progress).

Gillespie, David F., and Dennis S. Mileti
1979 Technostructures and Interorganizational Relations. Lexington, Massachusetts: Lexington Books.

Gillespie, David F., Dennis S. Mileti and Ronald Perry
1976 Organizational Response to Changing Community Systems. Kent, Ohio: Kent State University Press.

Monographs: Applied Focus

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Gillespie, David F., and Dennis S. Mileti
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1978 "Organizational technology and environment adaptation-manipulation," Scottish Journal of Sociology 2(2): 205-219.

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Mileti, Dennis S.
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Mileti, Dennis S., Donald M. Hartsough and Patti Madson
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Committee on Fire Safety and Disaster Preparedness
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Committee on Socioeconomic Effects of Earthquake Prediction
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1976 Interorganizational Relations and Community Service Delivery Systems. Boulder: Center for Action Research.

Erickson, Neil, John Sorensen and Dennis S. Mileti
1975 Landslide Hazards in the United States: A Research Assessment. Boulder: Institute of Behavioral Science.

Mileti, Dennis S.
1975 Disaster Relief and Rehabilitation in the United States. Boulder: Institute of Behavioral Science.

Ayre, Robert, Dennis S. Mileti and Patricia Trainer
1975 Earthquake and Tsunami Hazards in the United States: A Research Assessment Boulder: Institute of Behavioral Science.

Book Reviews

Mileti, Dennis S.
1982 "A review of Unequal Care: Interorganizational Relations in Health Care by M. Milner, Jr. New York: Columbia University Press, 1980." Social Forces 60(3): 943-944.

Mileti, Dennis S.
1982 "A review of Whistle Blowing: Loyalty and Dissent in the Corporation by Alan Westin (Ed.). New York: McGraw-Hill, 1981." Sociology: A Review of New Books 7(2).

Mileti, Dennis S.
1980 "A review of Aftermath: Communities After Natural Disasters by H. Paul Friesema et al. Beverly Hills: Sage Publications, 1979 and After the Clean-up: Long-range Effects of Natural Disasters by James Wright and Peter Rossi et al. Beverly Hills: Sage Publications, 1979." Journal of the American Planning Association. (October): 484-485.

Mileti, Dennis S.
1976 "A review of A Sociology of Organizations by J. Eldridge and A. Crombie. New York: International Publications, 1975." Contemporary Sociology 5(6): 784.

PROFESSIONAL PAPERS AND PRESENTATIONS

Conference Papers

Mileti, Dennis S.,
1983 "Social Impact and Use of Earthquake Prediction -- Warnings," Paper presented to the U.S.-Japan seminar on practical approaches to earthquake prediction and warning, Tokyo: November 1983.

Mileti, Dennis S., Donald M. Hartsough, Patti Madson and Rick Hufnagel
1983 "The Three Mile Island incident: a study of unobtrusive indicators of human stress," paper presented to the Disasters and Hazards Research Session of the Midwest Sociological Society, Kansas City: April.

Hufnagel, Rick, and Dennis S. Mileti
1983 "Organizational and environmental catastrophe: factors affecting organizational response to a predicted earthquake," paper presented to the Disasters and Hazards Research Session of the Western Social Science Association, Albequerque: April.

Mileti, Dennis S.
1982 "Earthquake prediction response: cultural comparisons between Japan and the United.States," paper presented to the Disaster Research Session of the International Sociological Association, Mexico City: August.

Mileti, Dennis S.
1982 "Influencing corporate decisions on the use of microzonation information." paper presented to the Third International Conference on Microzonation, Seattle: June.

Mileti, Dennis S.
1982 "Earthquake prediction and warnings: the human equation," paper presented to the Conference on Hazards Research, Policy Development, and Implementation Incentives: Focus on Urban Earthquakes, Policy Research Center at the University of Redlands, Redlands: June.

Mileti, Dennis S.
1982 "Public perception of seismic hazards," paper presented to the Seismological Society of America, Anaheim: April.

Williams, Gary, Frank Santopolo and Dennis S. Mileti
1980 "Perception of growth impacts in energy impacted communities," paper presented to the Rural Sociological Society, Ithaca: August.

Mileti, Dennis S.
1980 "Planning initiatives for seismic hazard mitigation," paper presented to the Conference on Social and Economic Impacts of Earthquakes on Critical Lifelines of the American Society of Civil Engineer, San Francisco: May.

Timmer, Doug, and Dennis S. Mileti
1980 "Interorganizational and structural determinants of decision making," paper presented to the Session on Complex Organizations of the Midwest Sociological Society, Milwaukee.

Williams, Gary, Dennis S. Miti and Frank Santopolo
1980 "Community growth and impacts," paper presented to the Western Social Science Association, Alburquque: April.

Mileti, Dennis S.
1980 "Human response to earthquake prediction," paper presented to the Status of Knowledge Session of the Conference on Earthquake Prediction Information, Los Angeles: January.

Williams, Gary, and Dennis S. Mileti
1979 "Perceptions of growth impacts in non-metropolitan Colorado," paper presented to the Impacts Session of the Conference on Regional Migration Trends, St. Louis: October.

Mileti, Dennis S., and Gary Williams
1979 "Resident perceptions in growth impacted western agricultural communities," paper presented to the Rural Sociological Society, Vermont: August.

Gillespie, David F., Dennis S. Mileti and Stan Eitzen
1979 "The epihenominality of organizational size," paper presented to the Session on Complex Organizations of the Midwest Sociological Society, Milwaukee: April.

Mileti, Dennis S., Janice R. Hutton and John Sorensen
1979 "Social factors and response to earthquake prediction," paper presented to the International Symposium on Earthquake Prediction, UNESCO, Paris: April.

Hutton, Janice, R., Dennis S. Mileti, and John Sorersen
1979 "Factors affecting earthquake warning system effectiveness," paper presented to the International Symposium on Earthquake Prediction, UNESCO, Paris: April.

Sorensen, John, Janice R. Hutton and Dennis S. Mileti
1979 "Institutional management of risk information following earthquake predictions," paper presented to the International Symposium on Earthquake Prediction, UNESCO, Paris: April.

Mileti, Dennis S., and Janice Hutton
1978 "Social aspects of earthquakes," paper presented to the State of the Art Session of the Second International Conference on Microzonation, San Francisco: November.

Mileti, Dennis S., and David F. Gillespie
1978 "Organizational size, complexity and decision making," paper presented to the Organizations Session of the American Sociological Association, San Francisco: September.

Gillespie, David F., and Dennis S. Mileti
1978 "Corporate size as work," paper presented to the Organization of Work Session of the American Sociological Association, San Francisco: September.

Mileti, Dennis S., and David F. Gillespie
1978 "Action postulates in organization-environment relations," paper presented to the Organizations-Environment Session of the Midwest Sociological Society. Omaha: April.

Gillespie David F., and Dennis S. Mileti
1978 "Size and organizational differentiation," paper presented to the Formal and Complex Organizations Session of the Pacific Sociological Association, Spokane: April.

Mileti, Dennis S., and Patricia Harvey
1977 "Correcting for the human factor in tornado warnings," paper presented to the Conference on Severe Local Storms of the American Meteorological Society, Omaha: October.

Mileti, Dennis S., and David F. Gillespie
1977 "Organization and environment adaptation-manipulation," paper presented to the Organizational Relations Session of the Amercian Sociological Association, Chicago: September.

Hutton, Janice R., and Dennis S. Mileti
1977 "The uses and abuses of scenarios in policy research," paper presented to the Social Policy Session of the American Sociological Association, Chicago: September.

Gillespie, David F., and Dennis S. Mileti
1977 "Organizational growth and managerial efficiency," paper presented to the Social Organization/Formal/Complex Session of the Pacific Sociological Association, Sacramento: April.

Mileti, Dennis S., and David F. Gillespie
1977 "Organizational manipulation and adaptation to complex environments," paper presented to the Complex Organizations Session of the Midwest Sociological Society, Minneapolis: April.

Gillespie, David F., Dennis S. Mileti and J. Eugene Haas
1976 "Size and structure in complex organizations," paper presented to the Organizational Change Session of the American Sociological Association, New York City: August.

Mileti, Dennis S.
1976 "Learning theory and disaster warning response," paper presented to the Issues in Environmental

Analysis Session of the Society for the Study of Social Problems, New York City: August.

Haas, J. Eugene, and Dennis S. Mileti
1976 "Consequences of earthquake prediction on other adjustments to earthquakes," paper presented to the Australian Academy of Science, Canberra: May.

Mileti, Dennis S., and J. Eugene Haas
1976 "A methodology for future collective events," paper presented to the Collective Behavior Session of the Midwest Sociological Society, St. Louis: April.

Gillespie, David F., and Dennis S. Mileti
1976 "Operations technology and organizational structure," paper presented to the Formal Organizations Session of the Midwest Sociological Society, St. Louis: April.

Haas, J. Eugene, and Dennis S. Mileti
1976 "Assessing the consequences of earthquake prediction" paper presented to the Social Risk Session of the American Association for the Advancement of Science, Boston: February.

Mileti, Dennis S., and David F. Gillespie
1975 "Technological uncertainty in organization-environment relations," paper: presented to the Formal Organizations Session of the American Sociological Association, San Francisco: August.

Mileti, Dennis S., and David F. Gillespie
1975 "A resolution of inconsistencies between size, complexity and the administrative component in organizations," paper presented to the Formal Organizations Session of the Midwest Sociological Society, Chicago: April.

Mileti, Dennis S., and David F. Gillespie
1975 "Technology and the study of organizations," paper presented to the Formal Organizations Session of the Pacific Sociological Association, Victoria: April.

Mileti, Dennis S., and David F. Gillespie
1975 "An interaction model for organization-environment relations," paper presented to the Interorganizational Relations Session of the Midwest Sociological Society, Omaha: April.

Mileti, Dennis S., and David F. Gillespie
1974 "A formalization of organization-environment dependencies," paper presented to the Formal Organizations Session of the Pacific Sociological Association, San Jose: March.

Farhar, Barbara, and Dennis S. Mileti
1974 "Value and role issues for the involved social scientist," paper presented to the Applied Session of the Pacific Sociological Association, San Jose: March.

Mileti, Dennis S.
1973 "Drowing: a communications disease," paper presented to the Mass Communictions and Public Opinion Session of the Amercian Sociological Association, New York City: August.

Mileti, Dennis S., and Sigmund Krane
1973 "Response to impending system stress," paper presented to the What Do We Know Session on Human Behavior in Disaster of the American Sociological Asscciation, New York City: August.

Mileti, Dennis S.
1973 "A paradigm and sociology of knowledge for theories of natural law," paper presented to the Theory Session of the Midwest Sociological Society, Milwaukee: April.

Mileti, Dennis S.
1972 "Response to hazards warnings," paper presented to the Organizational and Community Response to Disaster Seminar at the Disaster Research Center of the Ohio State University, Columbus: July.

Speeches and Guest Lectures

"Human Respose to Disasters," American Red Cross, Mile High Chapter Boulder Region, Boulder: October 1983.

"The Use of Earthquake Prediction-Warnings," Colloquium on Earthquake Prediction Research in the United States, Earthquake Research Institute, University of Tokyo: November 1983.

"Public Response to Flood Disasters," Conference on the Need for Team Work in Managing Flood Hazards, Associaton for State Floodplain Managers, Sacramento: April 1983.

"Integrated Emergency Management: Challenges and Opportunities," Natural Hazards Research Applications Workshop, Boulder: July 1983.

"Natural hazards, disasters and public policy," Environmental Management Institute University of Southern California, Los Angeles: April, 1982.

"Myths of disaster response," Earthquake Planning Conference for Business and Industry, Los Angeles: May, 1982.

"Communicating lessons learned from social science research on earthquakes," Workshop of Identifying and Disseminating Lessons Learned from Recent Earthquakes," Earthquake Engineering Research Institute. Los Altos: December, 1982.

"Social causes of earthquake prediction-warning response: implications for the design of California's warning system and information dissemination," Southern California Earthquake Preparedness Project, Van Nuys: October, 1981.

"Assessment of research on natural hazards: what have we learned and what problems demand further attention," Natural Hazards Research Applications Workshop, Boulder: July, 1981.

"Disaster reconstruction: patterns to guide planning," Governor's Task Force for Earthquake Emergency Preparedness, Committee on Long Range Reconstruction, Sacramento: July, 1981.

"Socio-cultural dimensions of earthquake risk," Governor's Emergency Task Force on Earthquakes, General Assembly, Sacramento: May, 1981.

"Interorganizational relations and service delivery systems," Health Sciences Center, University of Colorado, Denver: October, 1980.

"Social response to earthquake prediction: local policy issues," Southern California Emergency Services Association, Montebello: February, 1980.

"Human response to weather-borne hazards warnings," Department of Atmospheric Sciences, Colorado State University: October, 1979.

"Natural hazards, disasters and social research," Department of Sociology, University of Denver: December, 1980, 1979.

"Measuring implementation of public policy for floodplain land use controls," Natural Hazards Research Applications Workshop, Boulder: August, 1978.

"Socioeconomic effects of earthquake prediction and state policy," Conference on State Policy for Earthquake Prediction Technology, Boulder: November, 1977.

"Population, resources and policy for social change," College of Natural Resources, Colorado State University: September, 1977; February, 1978; February, 1980.

"The behavior of government and corporate organizations in an earthquake prediction," American Society for Public Administration, Colorado Chapter, Denver: April, 1976.

"The social and economic aspects of scientifically credible earthquake predictions," California State Seminar on Emergency Preparedness and Earthquake Prediction, Palm Springs: June, 1976.

"Preparing to make use of earthquake predictions," Emergency Preparedness Commission for the County and Cities of Los Angeles, Montebello: February, 1976.

"The social organization of hazard warning systems," Engineering Foundation Conference on Decision Making for Natural Hazards, Pacific Grove: March, 1976.

"Briefing on the likely social and economic impacts of earthquake prediction," Governor's Conference Room, Sacramento: May, 1975; Mayor's Conference Room, Los Angeles: October, 1975.

"Social, economic and legal aspects of earthquake prediction," General Assembly of the International Union of Geodesy and Geophysics, Grenoble: September, 1975.

"Earthquake prediction and its implications for emergency preparedness," Center for Community Studies, Tokyo: September, 1975.

"Social impacts of earthquake prediction: implications for policy," California Water and Power Earthquake Engineering Forum, San Francisco: April, 1975.

Since 1972 I have been awarded numerous research grants and contracts, including:

1983-1984	Principal Investigator, "Research and Applications for Emergency Preparedness," Contract for Long Island Lighting Company.
1982-1983	Associate Investigator, "Organizational Interface for Nuclear Reactor Emergency Preparedness," Subcontract for Oak Ridge National Laboratories for the Nuclear Regulatory Commission.
1981-date	Principal Investigator, "Nuclear Hazard Warnings and Emergency Evacuation Preparedness," contract for Pacific Gas and Electric Company.
1980-1981	Principal Investigator, "Power and Networks in Local Land Use Policy Decisions," Colorado State University Experiment Station.
1979-date	Principal Investigator, "Behavioral Aspects of the Three Mile Island Incident and Restart," contract for General Public Utilities and Metropolitan Edison.
1977-1980	Principal Investigator, "Impacts of Migration on Non-metropolitan Areas in the West," U.S. Department of Agriculture Regional Project, Colorado State University Experiment Station.
1977-1979	Principal Investigator, "Adoption ad Organizational Implementation of Policy for Community Land Use Regulations," multidisciplinary grant from the National Science Foundation.
1975-1977	Coprincipal Investigator, "Socioeconomic, Political and Organizational Response to Earthquake Prediction," multidisciplinary grant from the National Science Foundation.
1972-1974	Research Sociologist, "Assessment of Research on Natural Hazards," multidisciplinary grant from the National Science Foundation.

Other professional services I have engaged in include the following:

Organizer and Presider

Session on Earthquake Hazard Reduction: Is the National Earthquake Hazard Reduction Program Meeting its Congressional Mandate, Seventh Annual Workshop on Natural Hazards Research Applications, Boulder: July, 1982; Session on Disasters and Cataclysms: Can Sociology Help, Pacific Sociological Association, San Diego: April, 1982; Session on Collective Behavior, American Sociological Association, New York: August, 1980; Session on Complex Organizations, Pacific Sociological Association, San Francisco: April, 1980; Session on Complex Organizations, Western Social Science Association, Tempe, 1976.

Discussant

Session on Public Response to Earth Science Information, Natural Hazards Research Applications Workshop, Boulder: July, 1980; Session on Warning Systems, National Conference on Natural Hazards, Boulder: June, 1976; Session on Warning Systems, National Conference on Natural Hazards, Boulder: July, 1975; Session on Disaster Relief and Warning Systems, National Conference on Natural Hazards, Estes Park: June, 1973.

Participant

Review Panel, Corresponding Member, Task Group on Social and Economic Aspects of Earthquakes, National Academy of Sciences, National Research Council, Commission on Sociotechnical Systems, Washington, D.C.: 1982; Workshop on Disseminating Lessons Learned from Recent Earthquakes, Earthquake Engineering Research Institute, Los Altos: December, 1982; Tennessee Valley Authority Flood Plain Evaluation Panel, Boulder: November, 1982; Earthquake Prediction Warning Task Force Workshop, Southern California Earthquake Preparedness Project, Asilomar: December, 1981; Symposium on Earthquake Prediction, Preparedness and Human Response, San Fernando: June, 1976; Seminar on Disaster Research, Colorado State University, Fort Collins: February, 1975; Symposium on Complex Organizations: Research and Applications, Western Social Science Association, El Paso: April, 1974.

Editorships

Corresponding editor on Hazards and Disaster, Environmental Sociology. Newsletter of the Section on Environmental Sociology of the American Sociological Association, 1981-date; Guest editor, special issue on Environmental Stress, Threat and Social System Response, Mass Emergencies 1(4): 247-346, 1976.

Testimony

Nuclear Regulatory Commission in the matter of pre-emergency public education and information for emergency planning at the Waterford Three nuclear reactor, New Orleans: February, 1983; Suffolk County Legislature, State of New York, in the matter of emergency planning at the Shoreham nuclear reactor, Suffolk: January, 1983; Nuclear Regulatory Commission in the matter of Emergency planning at the Diablo Canyon nuclear reactor, San Luis Obispo: January, 1982; Senate Subcommittee on Science, Technology and Space in the matter of the National Earthquake Hazards Reduction Act, Washington, D.C.: April, 1980; Nuclear Regulatory Commission in the matter of the impact of floating nuclear plants on tourist behavior, Bethesda: May, 1977 and July, 1978.

Legislative and Program Reviews

Earthquake Hazards Reduction Program, U.S. Congressional Panel, Federal Emergency Management Agency, 1983-82; Earthquake Hazards Reduction Program of the U.S. Geological Survey, 1982; Final Regulations for Floodplain Management and Protection of Wetlands, Federal Emergency Management Agency, Federal Register 176(45): 59520-59538, 1980; Applied Research Program Evaluation, National Science Foundation, 1979-78.

Proposal Reviews

Sociology Program, National Science Foundation, 1982-81; Design Research Program, National Science Foundation, 1982; Civil and Environmental Engineering Program of the Earthquake Hazards Mitigation Program, National Science Foundation, 1983-81; Division of Problem Focused Research, National Science Foundation, 1980; Division of International Programs, National Science Foundation, 1987; Division of Advanced Environmental Research and Technology, National Science Foundation, 1978-76.

Article Reviews

Risk Analysis, 1983: The Environmental Professional, 1983.

Sociology and Social Research, 1982-81, 1979-78, 1976; Social Forces, 1980; The Environmental Professional, 1982; The Environmental Professional, 1982; The Social Science Journal, 1981-77; Bulletin of the Seismological Society of America, 1982; Sociological Focus 1980; Human Relations 1978-77; Mass Emergencies, 1978, 1976-75; Policy Analysis 1978; The Sociological Quarterly, 1975.

Other Reviews

L. Lave and D. Epple, "Future Scenarios," Chapter 21 in R.W. Kates (Ed.) Climate Impact Assessment: Studies of the Interaction of Climate and and Society. Geneva, for the International Council of Scientific Union's Scientific Committee on Problems of the Environment, 1982; Study on Earthquake Hazards Information Dissemination: Charleston, South Carolina. Reston for the U.S. Geological Survey, 1982.

Department and University Service

Ad hoc Committee on Research Space, 1983; Department Executive Committee, 1983-83, 1980-77; Department ad hoc Committee on Research Space, 1983; Department Five-Year Review Committee 1982; Department Comprehensive Examination Committee, 1983-75; Department Evaluation of Independent Study Courses, 1978; University Committee on Etnnic Studies, 1976-74; University Committee on Latin American Studies, 1975-74.

PROFESSIONAL QUALIFICATIONS

DAVID N. RICHARDSON

Vice President

YANKELOVICH, SKELLY AND WHITE, INC.

My name is David N. Richardson. My business address is Yankelovich, Skelly and White, Inc., 575 Madison Avenue, New York, NY, 10022. My areas of expertise involve extensive experience directing large-scale government and private sector research projects addressing social policy and marketing topics, particularly in the area of survey methodology and experimental design.

I was awarded a Bachelor of Arts degree in Political Science from Yale University in 1972 and a Master of Arts degree in Public Affairs from the University of Minnesota, School of Public Affairs, in 1974.

I am currently the Vice President of Yankelovich, Skelly and White, Inc. From 1978 to the present, my positions with Yankelovich, Skelly and White, Inc. have included serving as Project Manager and Lead Researcher on studies for the U.S. Department of Justice, The New York State Department of Commerce, The Power Authority of the State of New York, the Internal Revenue Service, and private sector clients. I am responsible for study design, field and data processing management, and reporting.

From 1975 to 1978, I held the position of Project Manager at Mathematica Policy Research in Princeton, New Jersey.

As Project Manager on research projects for the U.S. Department of Labor, the U.S. Department of Health, Education and Welfare, and the County of Los Angeles, I was responsible for general management of research activities, data processing, data collection and survey coordination.

From 1974 to 1975, I was employed by Indiana University in the capacity of Field Coordinator/Project Manager. Here I managed a group of sixty persons in the Gary Income Maintenance Experiment involved in data collection activities.

My publications and reports since 1974 include the following:

"Sentence Decision Making: The Logic of Sentence Decisions and the Extent and Sources of Disparity." - Joint Author, Journal of Criminal Law and Criminology. May, 1981.

"Offender Perspectives on the Sentencing Process," Federal Sentencing Guidelines Research Project, August, 1980.

"Sentencing Goals and Their Application in the Federal Courts," Federal Sentencing Guidelines Research Project, August, 1980.

"The Public and the Courts: Developing the Partnership." Court Management, September, 1981.

The Small Business Response to Export Trading Combinations, National Association of State Development Agencies, November, 1982.

"An Introduction to Large-Scale Social Experimentation," June, 1974.

"Hawthorne Effects in the Gary Income Maintenance Experiment," Final Report on the Analysis of the Gary Income Maintenance Experiment, March, 1978.

"Sample Representatives and Labor Market Characteristics in the Gary Income Maintenance Experiment," in Final Report on the Analysis of the Gary Income Maintenance Experiment, March, 1978.

Professional papers I have published since 1981 include:

"Attitudes About Crime and Criminal Behavior: What Deters Crime?" Presented to Law and Society Association, June, 1982.

"Sentencing: Judicial and Public Views About Appropriate Sanctions," Presented to Law and Society Association, June, 1982.

"Developing Home-Grown Business: The Key Economic Development Strategy of the '80's," Presented to National Association of State Development Agencies, November, 1981.

"An Empirical Approach to Improving IRS Tax Forms," Presented to American Statistical Association, August, 1983.

PROFESSIONAL QUALIFICATIONS

JOHN H. SORENSEN

Research Associate

OAK RIDGE NATIONAL LABORATORY

My name is John H. Sorensen and my business address is Oak Ridge National Laboratory, P.O. Box X, Bldg. 4500 North, Room H 11c, Oak Ridge, Tennessee 37830. I am currently a Research Associate in the Resource Analysis Group of the Energy Division at Oak Ridge National Laboratory.

I was awarded my Bachelor of Arts degree in Geography and Economics in 1973 from Clark Univeristy. In 1974, I earned my Master of Arts degree in Geography from the University of Colorado. The title of my master's thesis was "Nuclear Energy in Light of Resource Management Experience." In 1977, I earned my Doctor of Philosophy degree in Geography, also from the University of Colorado. My dissertation was entitled "Interaction of Adjustments to Natural Hazard."

My professional and current interests include the following:

(1) In general, assessment of the manner in which societies respond to risk from natural and man-induced hazards, with emphasis on the social consequences and associated implications for public policy.

(2) Social and economic aspects of environmental and resource management issues.

(3) Development and management of energy resources.

The following is an account of my research experience:

Research Associate, Oak Ridge National Laboratory, Current.

Principal Investigator/Project Leader for:

"Organization Interface in Reactor Emergency Planning," NRC, 1982-83, $125,000;

"Human Factors in Incident Alert Notification," NRC, 1982-83, $150,000;

"Social and Psychological Impacts of Restarting TMI Unit 1," NRC, 1982, $300,000;

"Test Exercises for Energy Emergency Planning," DOE, 1981-82, $250,000;

"Carrying Capacity and Energy Facility Siting," DOE, 1981, $275,000.

Project participation:

"Development of Efficiency Research and Implementation Planning Tools for Navy Shore Facilities," NCEL, 1983;

"Environmental Impacts of the Commercial and Apartment Building Conservation Service," DOE, 1983;

"Technical Assistance for State Energy Emergency Planning," DOE, 1980-81;

"Incentives for Siting Radioactive Waste Facilities," ONWI, 1981;

"Analysis of the Applicability of the TMI Action Plan to the Ft. St. Vrain HTGR," NRC, 1981-82;

"Societal Implications of Decommissioning Energy Facilities," ORNL Seed Money Grant, 1982;

"Environmental Impacts of Solvent Refined Coal Demonstration Plants," DOE, 1981.

Research Associate, Environmental Center, University of Hawaii, 1980. Chiefly responsible for preparing official university reviews of State and Federal Environmental Assessments and Environmental Impact Statements. Responsibilities also included preparing testimony and testifying at State Legislative Hearings.

Consultant. Woodward Clyde Consultants, San Francisco. "Analysis of the Adoption and Implementation of Community Land Use Regulations for Floodplains," supported by the National Science Foundation (1977-79).

Research Associate, "Coastal Zone Management in Hazardous Areas," Institute of Behavioral Science, University of Colorado, supported by the Office of Coastal Zone Management (1976-77).

University Researcher, "Socio-economic and Political Consequences of Earthquake Prediction," Institute of Behavioral Science, University of Colorado, supported by the National Science Foundation (1975-76).

Research Assitant, "Assessment of Research on Natural Hazards," Institute of Behavioral Science, University of Colorado, supported by the National Science Foundation (1973-74).

In 1974, I was employed as a Teaching Assistant in the Department of Geography at the University of Colorado. The course I taught was entitled "Environmental Quality and Human Choice." From 1977 to 1980, I was a Visiting Assistant

Professor in the Department of Geography at the University of Hawaii. The courses I taught included: Geography and Contemporary Society; Conservation and Resource Management; Hazard and Human Decisions; Seminar on Behavioral Science Aspects of Environmental Impact Assessment; Field Camp; and Environment and Culture.

The following list comprises books, monographs, papers, book chapters, articles reprinted, and reports that I have had published:

Books/Mongraphs

(with Mileti, Dennis and Janice Hutton), Earthquake Prediction Response and Options for Public Policy, Boulder: University of Colorado, Institute of Behavioral Science, Program on Technology, Environment and Man, Mongraph No. 31, 1981.

(with Mitchell, J. Kenneth), Coastal Erosion Hazard in the United States: A Research Assessment, Boulder: University of Colorado, Institute of Behavioral Science, Program on Technology, Environment, and Man, Mongraph No. 014, 1975.

(with Ericksen, Neil and Dennis Mileti), Landslide Hazard in the United States: A Research Assessment, Boulder: University of Colorado, Institute of Behavioral Science, Program on Technology, Environment, and Man, Monograph, No. 016, 1975.

Published papers and Book Chapters

"Organizational Interaction in Radiological Emergency Planning" Papers and Proceedings of Applied Geography Conferences Vol. 6, 1983, pp. 282-290.

"Public Hazard Education and Earthquake Mitigation Policy" In D. Nilson and R. Andrews (eds), Planning for Disasters: Policies, Barriers, and

Incentives. Port Washington, N.Y.: Kennikat Press, Forthcoming.

"Evaluating the Effectiveness of Warning Systems for Nuclear Power Plant Emergencies: Criteria and Application" in M. Pasqualetti and D. Pijawka (eds.), Nuclear Power: Assessing and Managing Hazardous Technologies. Boulder: Westview, Forthcoming.

"Knowing How to Behave Under the Threat of Disaster," Environment and Behavior Vol 15, No. 4, pp. 438-57.

(with Carnes, S. et al.) "Incentives and Nuclear Waste Siting: Prospects and Constraints," Energy Systems and Policy, Forthcoming.

(with Carnes, S. and J. Soderstrom) "Sweet for the Sour: Incentives in Environmental Mediation," Environmental Management, Forthcoming.

"Managing Energy Emergencies," Geoforum Vol 14, No. 1, 1983, pp. 15-24.

"Emergency Planning for Rare Events: Some Behavioral Science Lessons for Volcano Hazard Management," in R. Martin and J. Davis (eds.), Status of Volcanic Prediction and Emergency Response Capabilities in Volcanic Hazard Zones of California. Sacramento: California, Division of Mines and Geology (Special publication No. 63), 1982, pp. 153-168.

(with Hutton, Janice and Dennis Mileti), "Institutional Management of Risk Information Following Earthquake Predictions," in K. Oshida (ed.), Earthquake Prediction, Tokyo, Japan: Terra Scientific Publishing (for UNESCO), Forthcoming.

(with Hutton, Janice and Dennis Mileti). "Social Factors Affecting the Response of Groups to Earthquake Prediction: Implications for Public Policy," in K. Oshida (ed.), Earthquake Prediction, Tokyo, Japan: Terra Scientific Publishing (for UNESCO), Forthcoming.

(with Hutton, Janice and Dennis Mileti), "Factors Affecting Earthquake Warning--Dissemination System Effectiveness," in K. Oshida (ed.). Earthquake

Prediction, Tokyo, Japan: Terra Scientific Publishing (for UNESCO), Forthcoming.

(with Carnes, S. et al.) "Framework for Evaluating the Utility of Incentive Systems for Radioactive Waste Repository Siting," in R. Post (ed.), Waste Isolation in the U.S. and Elsewhere, Technical Programs and Public Communications, Tucson: University of Arizona, 1982.

"Alternative Means of Coping with National Energy Emergencies," in R. Fazzolare and C. Smith (eds.), Beyond the Energy Crisis: Opportunity and Challenge. Oxford: Pergamon Press, 1981, pp. 385-395.

(with Copenhaver, E. et al.) "Review of Institutional and Socioeconomic Issues for Radioactive Waste Repository Siting," in P. Hoffman (ed.), Advances in the Science and Technology of the Management of High-Level Nuclear Wastes. Columbus: Office of Nuclear Waste Isolation, forthcoming.

Emergency Response to the Mt. St. Helens Eruption: March 20 to April 10, 1980. Natural Hazards Working Paper Number 43. Boulder: University of Colorado, Institute for Behavioral Science, 1981.

(with Hutton, Janice and Dennis Mileti), "Earthquake Prediction and Public Reaction'" in T. Rikitake (ed.), Current Research in Earthquake Prediction, Tokyo, Japan: Center for Academic Publications, 1981, pp. 129-166.

"Earthquake Prediction: A Socioeconomic View," Issues in Engineering-- Journal of Professional Activities, American Society of-Civil Engineers, Vol 106, No. E13, July 1980, pp. 257-263.

(with Gersmehl, Phillip), "Volcanic Hazard Warning System: Persistence and Transferability," Environmental Management, March 1980, Vol 4, No. 2, pp. 125-136.

(with White, Gilbert), "Natural Hazards: A Cross-Cultural Perspective," in I. Altman, A. Rapaport and J. Wohwill (eds.), Human Behavior and the Environment: Environment and Culture, New York: Plenum Press, 1980, pp. 279-318.

Articles Reprinted

(with Hutton, Janice and Dennis Mileti), "Institutional Management of Risk Information Following Earthquake Predictions," in Song, Shouquan and LiHuaying (eds.), A Collection of Papers On World Seismo-Sociology, Beijing, China: Institute of Geophysics, State Seismological Bureau (Reprinted in Chinese), pp. 119-126.

(with Hutton, Janice and Dennis Mileti), "Factors Affecting Earthquake Warning Dissemination System Effectiveness," in Song Shouquan and Li Huaying (eds.), A Collection of Papers On World Seismo-Sociology, Beijing, China: Institute of Geophysics, State Seismological Bureau (Reprinted in Chinese), pp. 139-143.

(with Hutton, Janice and Dennis Mileti), "Social Factors Affecting the Response of Groups to Earthquake Prediction: Implications for Public Policy," in Song Shouquan and Li Huaying (eds.), A Collection of Papers on World Seismo-Sociology, Beijing, China: Institute of Geophysics, State Seismological Bureau. (Reprinted in Chinese), pp. 17-22.

"Earthquake Prediction: A Socioeconomic View," Recent Developments in World Seismology, 1982, No. 5, Published by the Institute of Geophysics, State Seismological Bureau, Beijing, China (Reprinted in Chinese), pp. 20-23.

Reports

(with others) Restarting TMI Unit One: Social and Psychological Impacts, Oak Ridge: Oak Ridge National Laboratory, Report No. 5891, 1983.

(with others) Commercial and Apartment Conservation Service Program: Final Environmental Impact Statement, U.S. Department of Energy (DOE/EIS-0050), August, 1983.

(with Carnes, S. et. al.) Incentives and the Siting of Radioactive Waste Facilities. Oak Ridge: Oak Ridge National Laboratory, Report No. 5880, 1982.

Evaluation of the Emergency Warning System at the Ft. St. Vrain Nuclear Power Plant, Oak Ridge: Oak Ridge National Laboratory, Report No. 8171, 1982.

'with others) "Socioeconomic Impacts," in Final Environmental Impact Statement, Solvent Refined Coal-II Demonstration Plant, U.S. Department of Energy, (DOE/EIS-0069), January, 1981.

(with Collins, Nancy), Preliminary Considerations for State Energy Emergency Planning, Oak Ridge: Oak Ridge National Laboratory, Technical Memorandum No. 7876, 1982.

(with Mileti, Dennis, Janice Hutton, William Lord and Marvin Waterstone), Analysis of Adoption and Implementation of Community Land Use Regulations of Floodplains, a final report to the National Science Foundation, San Francisco: Woodward-Clyde Consultants, November, 1979.

(with White, Gilbert, et al.), Natural Hazard Management in Coastal Areas, Washington, D.C.: U.S. Department of Commerce, Office of Coastal Zone Management, 1976.

(with Huffaker, Michael, et al), Southeast Boulder County: Land Use and Environmental Impact, Boulder: University of Colorado, Department of Geography and Boulder County Planning Department Joint Publication, 1973.

(assisting Kasperson, Roger), Decentralized Water Reuse Systems in a Water Scarce Environment: The Tourist Industry in St. Thomas, Virgin Islands, Caribbean Research Institute, Water Pollution Report No. 13, 1971.

Conference Papers

"Organizational Interaction in Radiological Emergency Planning," Paper presented at the Sixth Annual Applied Geography Conference, Toronto, October, 1983 (By Invitation).

"Perceived Risks of Restarting TMI Unit One Nuclear Power Plant," Paper presented at the 79th Annual Meetings of the Association of American Geographers, Denver, Colorado, April, 1983.

(with Soderstrom, Jon), "Forecasting Social and Psychological Impacts of Restarting TMI-1: Theory and Methods," Paper presented at the Third International Forum on the Human Side of Energy, Knoxville, TN, August 2-3, 1982 (By Invitation).

"Public Hazard Education and Earthquake Mitigation Policy," Paper presented at the workshop on Hazards Research, Policy Development.

"Decisions in Emergencies: A Comparison of Volcano Hazard in Hawaii and the Cascades," paper presented at the Fourth Annual Applied Geography Conference, Tempe, Arizona, October 22-25, 1981 (By Invitation).

"Managing Energy Emergencies," paper prepared for the 77th Annual Meetings of the Association of American Geographers, Los Angeles, April 1981.

"Hurricane Management: The Issues of Inexperience," paper presented at the 76th Annual Meetings of the Association of American Geographers, Louisville, April, 1980.

"Emergency Response at Mt. St. Helens," Presented at 5th National Hazards Workshop, Boulder, Colorado, July, 1980 (By Invitation).

(with Murton, Brian), "Natural Hazard Education in Hawaii," paper prepared for the Meetings of the National Council of Geographic Education, Mexico City, November 1979 (by Invitation).

"Earthquake Prediction: Balancing Social Response with Scientific Risk," paper prepared for the 75th Meetings of the Association of American Geographers, Philadelphia, 22-25 April, 1979. Abstract: p. 218 of the Program Abstracts.

(with Hutton, Janice and Dennis Mileti), "Social Factors Affecting the Response of Groups to Earthquake Prediction: Implications for Public Policy," paper presented at the International Symposium on Earthquake Prediction, UNESCO, Paris, France, 2-6 April, 1979. Abstract: p. 65 of the Abstract of Contributed Papers.

(with Hutton, Janice and Dennis Mileti,) "Institutional Management of Risk Information Following Earthquake Predictions," paper presented at the

International Symposium on Earthquake Prediction, UNESCO, Paris, France, April 1-6, 1979. Abstract: p. 92 of the Abstracts of Contributed Papers.

(with Hutton, Janice and Dennis Mileti), "Factors Affecting Earthquake Warning--Dissemination System Effectiveness," paper presented at the International Symposium on Earthquake Prediction, UNESCO, Paris, France, April 2-6, 1979. Abstract: p. 97 of the Abstract of Contributed Papers.

"Contextual Factors in Community Decision Making: A Geographical Perspective," paper presented for the "Workshop on Community Adoption of Land Use Controls for Floods," sponsored by the National Science Foundation, San Francisco, January 16-17, 1978 (By Invitation).

"The Role of Communication in Community Hazard Adjustment Decisions," paper prepared for the "Workshop on Community Adoption of Land Use Controls for Floods," sponsored by the National Science Foundation, San Francisco, 16-17 January, 1978 (By Invitation).

"Resource Management Experiences with Implications for Nuclear Power Development Decisions," paper presented at the 52nd Annual Meeting of the Southwestern and Rocky Mountains Division, A.A.A.S., Tucson, Arizona, 28 April - 1 May, 1976. Abstract: p. 77 of the Journal of the Arizona Academy of Science, April 1976.

My other professional activities have included the following:

Review of Natural Hazards in Australia, edited b R. Heathcote and B. Thom, in Geographical Review, July 1981, pp. 370-371.

Manuscript Reviews, The Professional Geographer, 1982.

Manuscript Reviews, The Environmental Professional, 1982.

Proposal Reviews for Directorate for Engineering and Applied Sciences, National Science Foundation, 1980, 1981, 1982.

Corresponding Member, International Geographical Union, Working Group on Environmental Perception, current.

Member, Environmental Studies Advisory Committee, University of Hawaii, 1979-80.

Member, Hurricane Warning Advisory Group, National Weather Service, Honolulu, 1979-80.

"Adjusting to Natural and Nuclear Hazards," Department of Physics, University of Colorado Fall Physics Colloquium, 1975.

Review of Commmunity Response to Coastal Erosion, by J.K. Mitchell in The Professional Geographer, November, 1975, pp. 501-502.

PROFESSIONAL QUALIFICATIONS

JOHN A. WEISMANTLE

Manager
Power Engineering Department

LONG ISLAND LIGHTING COMPANY

My name is John A. Weismantle and my business address is Long Island Lighting Company (LILCO), 100 East Old Country Road, Hicksville, New York 11801. I have been an employee of LILCO since 1969.

I was awarded my Bachelor of Science degree with a Pre-Engineering major from Columbia College in New York City in 1963. I subsequently earned two degrees in Mechanical Engineering from Columbia School of Engineering in New York City -- a Bachelor of Science degree in 1964 and a Master of Science degree in 1965. In 1970, I was again awarded a Master of Science degree, this time in Nuclear Engineering Science, from Long Island University in Brookville, New York.

I was employed by LILCO in 1969 as Section Head of the Power and Instrumentation division. I remained in this capacity through 1973. In this position, I assumed a wide range of responsibilities related to new and existing steam plants, a new nuclear plant and gas turbines. These responsibilities included acting as Project Coordinator for Northport Units 3 and 4 (two 400 MW oil-fired units) and lead mechanical engineer for these units. I also served as lead mechanical engineer on balance of plant for the 820 MW Shoreham Nuclear Power Station as

well as Project Engineer for Holbrook Power Station (500 MW of gas turbines).

As Section Head of the Power and Instrumentation Division, my special assignments included acting as Chairman of the Engineering Productivity Task Force and as a member of the Construction Manpower Task Force. In both of these positions the conclusions and recommendations I proffered were accepted.

In 1974, I served as Licensing Engineer for the Jamesport Nuclear Power Station. This was a full-time special assignment to direct completion of State Siting and NRC Construction Permit Applications which were behind schedule. I was responsible for direction and coordination of internal departments and numerous consultants. In this capacity, I saw to it that the lost time was made up and that applications were submitted by the original deadline.

From 1974 to 1975, I was the Manager of the System Planning Division. As Manager of this division, I was responsible for generation, bulk transmission and interconnection planning. I had direct supervisory responsibility over 12 graduate engineers plus support personnel.

In 1975, I assumed the position of Project Manager for the Jamesport Nuclear Power Station. I remained in this position until 1977, assuming responsibility for two 1150 MW PWR nuclear units. At the time I assumed this position, the project was in the state and federal licensing stage with

preliminary engineering and construction planning proceeding. Eventually, under my management, a single 800 MW coal unit received a State Siting Certificate.

From 1977 to 1978, I served as LILCO's first Research and Development Director. In addition to organizing a corporate Research and Development program, developing a five year plan, and establishing procedures, I represented LILCO on external Research and Development committees. One of my special assignments involved acting as Chairman of the LILCO Load Management Task Force, where my conclusions and recommendations were accepted.

From 1978 to 1981, I was Manager of LILCO's Planning Department. In this capacity, I was responsible for short term and long range planning of LILCO's electric facilities and corporate Research and Development function. The Planning Department comprises three divisions - System Planning (involving sub-transmission and interconnections), Area Planning (involving sub-transmission and distribution), and Research and Development. I had direct supervisory responsibility over a staff of 30 graduate engineers plus support personnel. Furthermore, I directed preparation of a wide range of technical and economic reports in addition to serving as a member of the LILCO ad hoc task force on coal.

As Manager of the Planning Department, I represented LILCO on the following industry committees: the EEI System Planning Committee, ESEERCO Administrative Committee, NYPP Generation Planning Advisory Subcommittee, and EPRI Advanced Power Systems Task Force (Chairman of Clean Gaseous Fuels Program Committee).

Since 1981, I have held the position at LILCO of Manager of the Power Engineering Department. In this capacity, I am responsible for the Port Jefferson Coal Conversion conceptual design, cost estimate, and license, all of which is currently undergoing the state licensing process. In addition, I am responsible for all major capital (above $25,000) improvement projects for existing fossil plants. Other responsibilities include the fields of gas system planning and engineering, mechanical engineering -- Shoreham support, and direct supervisory responsibility for a staff of over 35 graduate engineers plus support personnel.

In my current capacity, I represent LILCO on EEI Prime Movers Committee and EPRI Fossil Fuel Power Task Force.

Since June 1982, I have worked on a special assignment at LILCO. I am responsible for the satisfactory implementation of onsite and local emergency plans. In carrying out this assignment, I report to the Vice President of Engineering who has corporate lead responsibility for emergency preparedness. I am currently full-time manager of the Local Emergency Response

Implementing Organization, a group of about 30 professionals plus support personnel.

In connection with my professional experience and qualifications, I have prepared and presented testimony on a wide range of technical and economic issues at numerous proceedings, including the 1979 State Energy Master Plan hearings, in electric rate cases (involving corporate capital budget and Research and Development programs), and in hearings before the State Siting Board, the Nuclear Regulatory Commission, State Legislative Commissions (involving cogeneration and Research and Development), and the Federal Energy Regulatory Commission.

I have been a licensed Professional Engineer in the State of New York since 1970. My professional affiliations include membership in the American Society of Mechanical Engineers, and past membership on the Power Test Code Committee -- Condensers and Feedwater Heaters, and the Executive Committee, Long Island Section.

EBS SAMPLE MESSAGES

There are ten different types of messages which may be broadcast, depending on the accident classification. They are as follows:

A - Alert (No Radiological Release)
B - Alert (Radiological Release)
C - Site Area Emergency (No Radiological Release)
D - Site Area Emergency (Radiological Release)
E - General Emergency (Sheltering)
F - General Emergency (Sheltering and Evacuation)
G - General Emergency (Evacuation)
H - Termination of Emergency
I - Test of the EBS
J - Spurious Activation of Prompt Notification Sirens

EBS SAMPLE MESSAGES
(continued)

MESSAGE A - ALERT (NO RELEASE OF RADIATION)

An Alert condition was declared at (time) today at the Shoreham Nuclear Power Station. No release of radiation has occurred. No release of radiation is imminent.

This Alert is one of several possible emergency classifications and involves conditions which could, but may not, eventually jeopardize the nuclear plant's safety system.

The Director of Local Response for emergencies at the Shoreham Nuclear Power Station, (name), has consulted with (names, titles) _____ scientists, _____ LILCO officials and _____ officials from _____ public agencies and has recommended the following public action:

1. Schools within the 10-mile emergency planning zone must immediately implement their early dismissal plans. The dismissal of school children is part of the emergency plan adopted before Shoreham was put in operation. It does not mean that a release of radiation is imminent. Parents should not drive to school to meet their children.

2. People within the 10-mile emergency planning zone should refer to their Shoreham Public Emergency Procedures Brochure to determine the planning zone in which they live. Knowing what planning zone you are in is not needed now, but it could be useful in helping you understand future messages.

3. Keep tuned to this emergency broadcast station for the latest official information.

The 10-mile emergency planning zone around Shoreham is bounded by Riverhead to the east, Port Jefferson to the west and Sunrise Highway to the south.

If you are not within these boundaries, there is no reason for you to take any action.

EBS SAMPLE MESSAGES
(continued)

MESSAGE A - ALERT (NO RELEASE OF RADIATION)
(continued)

If you are located within the 10-mile planning zone and do not have a Shoreham Public Emergency Procedures Brochure, public information and a map of the zone are included in a special insert of the Suffolk County Telephone Book.

Once again, the Shoreham Nuclear Power Station is in an Alert condition. There has been no release of radiation. No release of radiation is imminent.

This message will be repeated every fifteen minutes over this station unless new information is available sooner.

EBS SAMPLE MESSAGES
(continued)

MESSAGE B - ALERT (RELEASE OF RADIATION)

An Alert condition was declared at (time) today at the Shoreham Nuclear Power Station. A small release of radiation occurred at (time), but it does not pose an immediate danger to people near the plant. The released radiation is limited to the plant site.

This Alert is one of several possible emergency classifications and involves conditions which could, but may not, eventually jeopardize the nuclear plant's safety system.

The Director of Local Response for emergencies at the Shoreham Nuclear Power Station, (name), has consulted with (names, titles) _____ scientists, _____ LILCO officials and _____ officials from _____ public agencies and has recommended the following public action:

1. Schools within the 10-mile emergency planning zone must immediately implement their early dismissal plans. The dismissal of school children is part of the emergency plan adopted before Shoreham was put in operation. It does not mean that a release of radiation is imminent. Parents should not drive to school to meet their children.

2. People within the 10-mile emergency planning zone should now refer to their Shoreham Public Emergency Procedures Brochure to determine the planning zone in which they live. Knowing what planning zone you are in is not needed now, but it could be useful in helping you understand future messages.

3. Keep tuned to this emergency broadcast station for the latest official information.

The 10-mile emergency planning zone around Shoreham is bounded by Riverhead to the east, Port Jefferson to the west and Sunrise Highway to the south.

If you are not within these boundaries, there is no reason for you to take any action.

EBS SAMPLE MESSAGES
(continued)

MESSAGE B - ALERT (RELEASE OF RADIATION)
(continued)

If you are located within the 10-mile planning zone and do not have a Shoreham Public Emergency Procedures Brochure, public information and a map of the zone are included in a special insert of the Suffolk County Telephone Book.

Once again, the Shoreham Nuclear Power Station is in an Alert condition. There has been a small release of radiation, but it does not pose any hazard to people near the plant.

This message will be repeated every fifteen minutes over this station unless new information is available sooner.

EBS SAMPLE MESSAGES
(continued)

MESSAGE C - SITE AREA EMERGENCY (NO RELEASE)

A Site Area Emergency condition was declared at (time) today at the Shoreham Nuclear Power Station. No release of radiation has occurred. No release of radiation is imminent.

This Site Area Emergency is one of several possible emergency classifications and indicates that a major plant safety system has failed/could fail (select one).

The Local Emergency Response Organization for residents living in the 10-mile emergency planning zone around Shoreham has been activated and will continue to monitor the incident until the malfunction at the plant is corrected.

The Director of Local Response for emergencies at the Shoreham Nuclear Power Station, (name), has consulted with (names, titles) _____ scientists, _____ LILCO officials and _____ officials from _____ public agencies and has recommended the following public action:

1. Schools within the 10-mile emergency planning zone must immediately implement their early dismissal plans. The dismissal of school children is part of the emergency plan adopted before Shoreham was put in operation. It does not mean that a release of radiation is imminent. Parents should not drive to school to meet their children.

2. People within the 10-mile emergency planning zone should now refer to their Shoreham Public Emergency Procedures Brochure to determine the planning zone in which they live. Knowing what planning zone you are in is not needed now, but it could be useful in helping you understand future messages.

3. Keep tuned to this emergency broadcast station for the latest official information.

The 10-mile emergency planning zone around Shoreham is bounded by Riverhead to the east, Port Jefferson to the west and Sunrise Highway to the south.

If you are not within these boundaries, there is no reason for you to take any action.

EBS SAMPLE MESSAGES
(continued)

MESSAGE C - SITE AREA EMERGENCY (NO RELEASE)
(continued)

If you are located within the 10-mile planning zone and do not have a Shoreham Public Emergency Procedures Brochure, public information and a map of the zone are included in a special insert of the Suffolk County Telephone Book.

Once again, the Shoreham Nuclear Power Station is in an Site Area Emergency condition. There has been no release of radiation. No release of radiation is imminent.

This message will be repeated every fifteen minutes over this station unless new information is available sooner.

EBS SAMPLE MESSAGES
(continued)

MESSAGE D - SITE AREA EMERGENCY (RADIATION RELEASE)

A Site Area Emergency was declared at (time) today at the Shoreham Nuclear Power Station. This Site Area Emergency is one of several possible emergency classifications and indicates that a major plant safety system has failed/could fail (select one).

A release of radiation occurred at (time), but it does not pose an immediate health danger to people within the area. The amount of released radiation measured at 0 - 2 miles is _____ millirem, 2 - 5 miles is _____ millirem, and 5 - 10 miles is _____ millirem. The U.S. Environmental Protection Agency recommends sheltering for doses of 1,000 millirem or larger and evacuation for doses 5,000 millirem or larger.

The Local Emergency Response Organization for residents living in the 10-mile emergency planning zone around Shoreham has been activated and will continue to monitor the incident until the malfunction at the plant is corrected.

The Director of Local Response for emergencies at the Shoreham Nuclear Power Station, (name), has consulted with (names, titles) _____ scientists, _____ LILCO officials and _____ officials from _____ public agencies and has recommended the following public action:

1. Schools within the 10-mile emergency planning zone:

   a. (During a rapidly occurring emergency) Children at Wading River School have been sheltered and all other schools in the 10-mile EPZ were asked to implement their early dismissal plans.

   b. (During an escalating emergency) All schools in the 10-mile EPZ were asked at (time) to implement their early dismissal plans.

   Parents should not drive to school to meet their children.

EBS SAMPLE MESSAGES
(continued)

MESSACE D - SITE AREA EMERGENCY (RADIATION RELEASE)
(continued)

2. People within the 10-mile emergency planning zone should now refer to their Shoreham Public Emergency Procedures Brochure to determine the planning zone in which they live.

3. (During an escalating emergency) School children were released at (time) and should be home by now. As a precaution, only, it is suggested that residents in planning zones (identify by letter and simple boundaries) shelter, that is, to remain indoors, close all windows and doors, turn off air condition ers/heaters, extinguish all fires, and close fireplace dampers.

4. Keep tuned to this emergency broadcast station for the latest official information.

The 10-mile emergency planning zone around Shoreham is bounded by Riverhead to the east, Port Jefferson to the west, and Sunrise Highway to the south.

If you are not within these boundaries or within the planning zones mentioned, there is no reason for you to take any action. Based on the present plant and weather conditions, it is unlikely that the radiation will reach you. If these conditions change in the future, these recommendations may change and we will inform you immediately.

If you are located within the 10-mile planning zone and do not have a Shoreham Public Emergency Procedures Brochure, public information and a map of the zone are included in a special insert of the Suffolk County Telephone Book.

Once again, the Shoreham Nuclear Power Station is in a Site Area Emergency. There has been a small release of radiation, but it does not pose an immediate hazard to any people near the plant. As a precautionary measure, only, it is advised that people in planning zones (identify) shelter, that is, remain indoors with outside ventilation sources closed off.

This message will be repeated every fifteen minutes over this station unless new information is available sooner.

EBS SAMPLE MESSAGES
(continued)

MESSAGE E - GENERAL EMERGENCY (SHELTERING)

A General Emergency condition was declared at (time) today at the Shoreham Nuclear Power Station. This General Emergency condition is one of several possible emergency classifications and indicates that there has been a failure in plant safety systems.

A release of radiation occurred at (time), but it does not pose an immediate health danger to people within the area. The amount of released radiation measured at 0 - 2 miles is _____ millirem, 2 - 5 miles is _____ millirem, and 5 - 10 miles is _____ millirem. The U.S. Environmental Protection Agency recommends sheltering for doses of 1,000 millirem or larger and evacuation for doses 5,000 millirem or larger.

The Local Emergency Response Organization for residents living in the 10-mile emergency planning zone around Shoreham has been activated and will continue to monitor the incident until the malfunction at the plant is corrected.

The Director of Local Response for emergencies at the Shoreham Nuclear Power Station, (name), has consulted with (names, titles) _____ scientists, _____ LILCO officials and _____ officials from _____ public agencies and has recommended the following public action:

1. Schools within the 10-mile emergency planning zone:

   a. (During a rapidly occurring emergency) Children at Wading River School have been sheltered and all other schools in the 10-mile EPZ were asked to implement their early dismissal plans.

   b. (During an escalating emergency) All schools in the 10-mile EPZ were asked at (time) to implement their early dismissal plans.

   Parents should not drive to school to meet their children.

EBS SAMPLE MESSAGES
(continued)

MESSAGE E - GENERAL EMERGENCY (SHELTERING)
(continued)

2. People within the 10-mile emergency planning zone should now refer to their Shoreham Public Emergency Procedures Brochure to determine the planning zone in which they live.

3. (During an escalating emergency) School children were released at (time) and should be home by now. As a precaution, only, it is suggested that residents in planning zones (identify by letter and simple boundaries) shelter, that is, to remain indoors, close all windows and doors, turn off air conditioners/heaters, extinguish all fires, and close fireplace dampers.

4. Keep tuned to this emergency broadcast station for the latest official information.

The 10-mile emergency planning zone around Shoreham is bounded by Riverhead to the east, Port Jefferson to the west, and Sunrise Highway to the south.

If you are not within these boundaries or within the planning zones mentioned, there is no reason for you to take any action. Based on the present plant and weather conditions, it is unlikely that the radiation will reach you. If these conditions change in the future, these recommendations may change and we will inform you immediately.

If you are located within the 10-mile planning zone and do not have a Shoreham Public Emergency Procedures Brochure, public information and a map of the zone are included in a special insert of the Suffolk County Telephone Book.

Once again, the Shoreham Nuclear Power Station is in a General Emergency. There has been a release of radiation, but it does not pose an immediate hazard to any people near the plant. As a precautionary measure, only, it is advised that people in planning zones (identify) shelter, that is, remain indoors with outside ventilation sources closed off.

This message will be repeated every fifteen minutes over this station unless new information is available sooner.

EBS SAMPLE MESSAGES
(continued)

MESSAGE F - GENERAL EMERGENCY (SHELTERING & EVACUATION)

A General Emergency condition was declared at (time) today at the Shoreham Nuclear Power Station. This General Emergency condition is one of several possible emergency classifications and indicates that there has been a failure in plant safety systems.

A release of radiation occurred at (time), but it does not pose an immediate health danger to people within the area. The amount of released radiation measured at 0 - 2 miles is _____ millirem, 2 - 5 miles is _____ millirem, and 5 - 10 miles is _____ millirem. The U.S. Environmental Protection Agency recommends sheltering for doses of 1,000 millirem or larger and evacuation for doses 5,000 millirem or larger.

The Local Emergency Response Organization for residents living in the 10-mile emergency planning zone around Shoreham has been activated and will continue to monitor the incident until the malfunction at the plant is corrected.

The Director of Local Response for emergencies at the Shoreham Nuclear Power Station, (name), has consulted with (names, titles) _____ scientists, _____ LILCO officials and _____ officials from _____ public agencies and has recommended the following public action:

1. Schools within the 10-mile emergency planning zone:

   a. (During a rapidly occurring emergency) Children at Wading River School have been sheltered and all other schools in the 10-mile EPZ were asked to implement their early dismissal plans.

   b. (During an escalating emergency) All schools in the 10-mile EPZ were asked at (time) to implement their early dismissal plans.

   Parents should not drive to school to meet their children.

EBS SAMPLE MESSAGES
(continued)

MESSAGE F - GENERAL EMERGENCY (SHELTERING & EVACUATION)
(continued)

2. People within the 10-mile emergency planning zone should now refer to their Shoreham Public Emergency Procedures Brochure to determine the planning zone in which they live.

3. (During an escalating emergency) School children were released at (time) and should be home by now. As a precaution, only, it is suggested that residents in planning zones (identify by letter and simple boundaries) shelter, that is, to remain indoors, close all windows and doors, turn off air condition ers/heaters, extinguish all fires, and close fireplace dampers.

4. People within emergency planning zones (identify by zone letter and simple boundaries) should evacuate as soon as possible away from Shoreham. Relocation centers and evacuation routes are listed in the Shoreham Public Emergency Procedures Brochure.

If you do not have the brochure readily available, proceed in a southerly or westerly direction. You will be directed along evacuation routes by trained traffic guides who know which way you should go.

If any people who have been advised to evacuate do not have their own transportation and cannot obtain a ride from a neighbor or someone else, special buses are available to pick you up and transport you to a relocation center.

Before you leave your home or business, make sure you have closed all windows and doors, turned off all appliances, extinguished any fires, and closed fireplace dampers. Lock all doors when you leave and take blankets and pillows with you for your own use and any medication that you regularly take. You could be away for several days.

If you have a bedridden, handicapped, or other person in your home who needs special evacuation assistance and who has not previously registered with the Local Emergency Response Organization (LERO), please call (phone number). If you have previously registered, there is no need to call now, help will soon be on its way.

EBS SAMPLE MESSAGES
(continued)

MESSAGE F - GENERAL EMERGENCY (SHELTERING & EVACUATION)
(continued)

The 10-mile emergency planning zone around Shoreham is bounded by Riverhead to the east, Port Jefferson to the west, and Sunrise Highway to the south.

If you are not within these boundaries or within the planning zones mentioned, there is no reason for you to take any action of sheltering or evacuation. Based on the present plant and weather conditions, it is unlikely that the radiation will reach you. If these conditions change in the future, these recommendations may change and we will inform you immediately.

If you are located within the 10-mile planning zone and do not have a Shoreham Public Emergency Procedures Brochure, public information and a map of the zone are included in a special insert of the Suffolk County Telephone Book.

Once again, the Shoreham Nuclear Power Station is in a General Emergency condition. There has been a release of radiation, but it does not pose an immediate hazard to any people near the plant. People living in the emergency planning zones (identify by zone letter and simple boundaries) are advised to evacuate as soon as possible away from Shoreham. Relocation centers and evacuation routes are listed in the Shoreham Public Emergency Procedures Brochure. As a precautionary measure, only, it is advised that people in planning zones (identify) shelter, that is, remain indoors with outside ventilation sources closed off.

This message will be repeated every fifteen minutes over this station unless new information is available sooner.

EBS SAMPLE MESSAGES
(continued)

MESSAGE G - GENERAL EMERGENCY (EVACUATION)

A General Emergency condition was declared at (time) today at the Shoreham Nuclear Power Station. This General Emergency condition is one of several possible emergency classifications and indicates that there has been a failure in plant safety systems.

A release of radiation occurred at (time), but it does not pose an immediate health danger to people within the area. The amount of released radiation measured at 0 - 2 miles is _____ millirem, 2 - 5 miles is _____ millirem, and 5 - 10 miles is _____ millirem. The U.S. Environmental Protection Agency recommends sheltering for doses of 1,000 millirem or larger and evacuation for doses 5,000 millirem or larger.

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The Director of Local Response for emergencies at the Shoreham Nuclear Power Station, (name), has consulted with (names, titles) _____ scientists, _____ LILCO officials and _____ officials from _____ public agencies and has recommended the following public action:

1. Schools within the 10-mile emergency planning zone:

   a. (During a rapidly occurring emergency) Children at Wading River School have been evacuated or sheltered and all other schools in the 10-mile EPZ were asked to implement their early dismissal plans.

   b. (During an escalating emergency) All schools in the 10-mile EPZ were asked at (time) to implement their early dismissal plans.

   Parents should not drive to school to meet their children.

EBS SAMPLE MESSAGES
(continued)

MESSAGE G - GENERAL EMERGENCY (EVACUATION)
(continued)

2. People within the 10-mile emergency planning zone should now refer to their Shoreham Public Emergency Procedures Brochure to determine the planning zone in which they live.

3. People within emergency planning zones (identify by zone letter and simple boundaries) should evacuate as soon as possible away from Shoreham. Relocation centers and evacuation routes are listed in the Shoreham Public Emergency Procedures Brochure.

If you do not have the brochure readily available, proceed in a southerly or westerly direction. You will be directed along evacuation routes by trained traffic guides who know which way you should go.

If any people who have been advised to evacuate do not have their own transportation and cannot obtain a ride from a neighbor or someone else, special buses are available to pick you up and transport you to a relocation center.

Before you leave your home or business, make sure you have closed all windows and doors, turned off all appliances, extinguished any fires, and closed fireplace dampers. Lock all doors when you leave and take blankets and pillows with you for your own use and any medication that you regularly take. You could be away for several days.

If you have a bedridden, handicapped, or other person in your home who needs special evacuation assistance and who has not previously registered with the Local Emergency Response Organization (LERO), please call (phone number). If you have previously registered, there is no need to call now, help will soon be on its way.

EBS SAMPLE MESSAGES
(continued)

MESSAGE G - GENERAL EMERGENCY (EVACUATION)
(continued)

The 10-mile emergency planning zone around Shoreham is bounded by Riverhead to the east, Port Jefferson to the west, and Sunrise Highway to the south.

If you are not within these boundaries or within the planning zones mentioned, there is no reason for you to take any action of evacuation. Based on the present plant and weather conditions, it is unlikely that the radiation will reach you. If these conditions change in the future, these recommendations may change and we will inform you immediately.

If you are located within the 10-mile planning zone and do not have a Shoreham Public Emergency Procedures Brochure, public information and a map of the zone are included in a special insert of the Suffolk County Telephone Book.

Once again, the Shoreham Nuclear Power Station is in a General Emergency condition. There has been a release of radiation, but it does not pose an immediate hazard to any people near the plant. As a precautionary measure only, it is advised that people in planning zones (identify by letter and simple boundaries) evacuate as soon as possible away from Shoreham. Relocation centers and evacuation routes are listed in the Shoreham Public Emergency Procedures Brochure.

This message will be repeated every fifteen minutes over this station unless new information is available sooner.

Information Released to

the Public During TMI

In chronological order, the following information was released to the public according to the Report of the President's Commission on the Accident at Three Mile Island (the "Kemeny Report"):

Wednesday, 3/28/79

8:25 a.m.	A WKBO newscast reported that the plant was shut down because of a problem with a feedwater pump, and that there was no danger to the public.
9:06 a.m.	An Associated Press dispatch, distributed nationwide, quoted the Pennsylvania State Police as stating that a General Emergency exists at the plant but that no radioactive material had leaked.
ca. 11:00 a.m.	According to a report by an unidentified local radio station, radioactive particles had been released.
Between 11:00 a.m. and noon	Lt. Governor Scranton called a press conference to announce an incident at TMI Unit 2. The public was informed that everything was under control, that a small release had occurred but there was no danger to public health, and that no increase in radiation levels had been detected.
4:30 p.m.	Lt. Governor called a second press conference to announce that the situation was "more complex" than the utility, Met Ed, first led him to believe, that Met Ed had given out conflicting information, that the extent of the release was not yet known, that it had occurred from 11:00 a.m. until 1:30 p.m., and that there was as yet no significant health risk.
7:00 p.m.	On the CBS Evening News, Walter Cronkite announced that what had happened at TMI was "the first step in a nuclear nightmare".

7:30 p.m.	The Mayor of the town of Goldsboro and council members went from door-to-door to talk to the town's residents. When residents asked whether they should evacuate, the mayor answered "Use your own judgment. We dare not tell you to leave your homes."
Thursday, 3/29/79	
Time Uncertain	The Pennsylvania Department of Environmental Resources issued a press release stating that radioactive wastewater from TMI would be released into the Susquehanna River.
Late Afternoon	Governor Thornburg called a press conference to announce that the danger was over for residents of the surrounding area.
Friday, 3/30/79	
ca. 9:30 a.m.	Station WHP broadcast a warning from the Dauphin County Office of Emergency Preparedness that evacuation might be necessary.
ca. 11:00 a.m.	Governor issued an advisory asking everyone within a 10 mile radius to remain indoors.
ca. 12:30 p.m.	Governor advised 1) evacuation of pregnant women and preschool children within 5 miles of the plant, and 2) closing all schools in that area.
After 8:30 p.m.	Governor and NRC held joint press conference to announce that 1) a general evacuation was unnecessary, and 2) people within 10 miles of the plant need no longer remain indoors.
Saturday, 3/31/79	
2:45 p.m.	NRC Chairman told news reporters that an evacuation out to 10 or 20 miles might be necessary owing to the possibility of a hydrogen explosion.
8:23 p.m.	Associated Press distributed a news bulletin stating that a hydrogen explosion could occur in 2 days time, according to interviews with NRC officials.

late evening	Governor held a press conference at which he announced that there was no longer any danger of a hydrogen explosion.
Monday, 4/2/79	
Sometime that morning	NRC held a press conference at which it announced that the hydrogen bubble was shrinking but made no acknowledgement that it had erred in concluding that the bubble had been close to exploding.
Monday, 4/9/79	Governor officially lifted his advisory thereby allowing pregnant women and preschool children to return home.

ATTACHMENT 10

WO:5Distress
November 16, 1983

PHSYCHOLOGICAL DISTRESS: PUBLIC PERCEPTION OF ACCIDENT

Time	Source of Info	Nature/Impact Of Info	Description
9:02 a.m. Wednesday March 28	AP National Bulletin	Awareness of accident for some	Accident at TMI; no radiation released; general emergency declared; details not known; company spokesman unavailable.
10:30 a.m.	NRC public announcement [Bethesda?]	Awareness of potentially serious accident for some	NRC had received preliminary informatin that there had been a release of radioactivity inside the reactor containment building; measurements to determine whether there had been an offsite release were being made; some reactor coolant water had been released into the containment building; ECCS being used to provide water to the reactor; the reactor had been shut down.
10:55 a.m.	Lt. Governor Scranton press conference -- response to media question by William Dornsife, State Bureau of Radiation Protection (BRP)	False; alarming	Small amounts of radioiodine had been detected by Met Ed's monitoring teams.
11:45 a.m.	Met Ed Public statement	Informational; described as reducing Met Ed credibility	Although above background radiation detected at Observation Center, Met Ed press release said: no recordings of any significant levels of radiation and none were expected outside the plant; no evacuation of the public needed.

1:15 p.m.	News Media briefing by Herbein at Observation Center	Reduced Met Ed Credibility	No mention of venting to the atmosphere which was stopped by Herbein because of his uncertainty about whether steam was radioactive. [True?]
4:30 p.m.	Lt. Gov. Press Conference	Expressly in conflict with Met Ed; explanation of radiation leak incorrect; reduced credibility of Met Ed	Situation at TMI more complex than the State had been led to believe originally,; but State officials believed that there still was no danger to public health. Met Ed had given misleading information to the state and to the public, but Lt. Gov. hadjust met with company officials and hoped that this press conference would clear up any questions. Radiation had been released from 11:00 a.m. until 1:30 a.m., approx., while the plant was venting steam as part of the emergency cooling process. Apparently a leak in the primary system had allowed radioactivity to get into the steam. [False.] State had not been aware of the release until near the time it was halted. Radiation levels were below any existing or proposed emergency action levels, but that the State was concerned because any increased exposure constitutes a danger to health.
5:00 p.m.	NRC public announcement	False explanation	Low levels of radiation had been measured offsite, but these levels were believed to be principally attributable direct radiation coming from the containment building rather than from the release of radioactive materials into the environment. [Source was radioactive gas emitted from plant.]

10:00 p.m.	Lt. Gov. press Conference	In conflict with 5:00 p.m. NRC Statement	No radioactive leakage from reactor containment; however, there was radioactivity in aux bldg, and there was some dispersion of the material into the atmosphere when the aux bldg was vented.
Thursday, March 29 5:15 p.m.	Gov. Thornburgh Press Conference	In conflict with earlier NRC report [NRC Headquarters briefing of Hart Subcommittee?] and Dept. of Agriculture begin to test milk; outside feeding of cows stops; milk sales drop	No human error; danger over for people offsite.
12:00 a.m.	Press release, issued by Clifford Jones, Secretary of PA Dept. of Environmental Resources (DER)	[Was this misused by press?]	Discharge by Met Ed of industrial wastewater containing small concentrations of xenon into the Susquehanna; no harmful radioactive pollutants into river.
Thursday March 29 afternoon	Harrisburg radio station interview with Dr. Steinglass of U. of Pittsburgh	Calls to local authorities with questions about what to do; confusion and uncertainty	Recommendation for the evacuation of pregnant women and preschool children. Radio announcer mistakenly calls it an order to evacuate
Thursday March 29 afternoon	Representative of Dept. of Health, Pennsylvania	Confusion and inconsistency	In response to Steinglass, states that evacuation is not necessary.
Friday March 30			
Early morning (after 8:00 a.m.)	A helicopter (Met Ed?] monitoring the release of gas into atmosphere when transferring non-condensible gases (from primary coolant system) in makeup tank to another tank and transfer system leaked	In conflict with later statements	Spike measured of 1200 mrem at 8:00 a.m. [Wrong?]

Early morning	Dauphin County Civil Defense Director	Telephone calls increase to six times the usual to authorities	Informs public that an evacuation could possibly be ordered. Directions given on where to go and what to do. Emphasis on that it's not an order.
10:25 a.m.	Gov. Thornburgh live broadcast	Alarming. People frightened of being prisoners in their own homes; many evacuated; many hoseholds argue about evacuation	People within 10 mile radius should stay indoors and keep windows closed. [Hendrie had advised Governor that people within 5 miles of the plant in the downwind direction should be told to stay indoors.]
11:00 a.m.	Press conference, Herbein	In conflict with earlier report; hospitals reduce population to only emergency cases	Planned venting procedure led to the release of between 300 and 350 mrem per hour. Herbein did not respond to reporters' contentions that plant officials had told State that the release had been controlled. Herbein said he had not heard of the 1200 mrem measurement, but did not dispute the readng.
12:30 p.m.	Press Conference, Thornburgh	Alarming; families in turmoil; Freuhauf closes because rumors rampant and employees upset; schools close, children disturbed by teachers and parents in tears; pregnant women report stress; major evacuation; some amazed that others were evacuating; card party at Elks Club not cancelled	President agreed with Gov. that no reason for panic or implementation of emergency measures, and that Denton should be dispatched to the site as President's personal representative. However, evacuation recommended for pregnant women and preschool age children within 5 miles of TMI. Also, schools closed within 5 mile radius. "Stay indoors" adviscry extended "until further notice." (The PA Emerg. Mgmt. Agency had already sent a teletype to the counties lifting the first advisory.)

Mid-day	Briefing at NRC at its Bethesda press center - statements of Dudley Thompson, a member of the NRC senior technical staff	Alarming; gas bubble more frightening to people than anything else yet; prisoners worry about being left behind.	Although there was no imminent possibility of a meltdown, it could happen if conditions worsened.
12:00 - 1:00 p.m.	Met Ed News Center Staff	In conflict with earlier NRC statement	Based on current plant parameters, the possibility of a meltdown was extremely remote.
6:30 p.m.	NRC public announcement, by Hendrie	Reassuring, but confusing; the conflicting information incited most evacuees to leave; thought no one knew wat was/could happen	There was no imminent danger of a core melt. Additional NRC technical experts, headed by Harold Denton, had reached the site earlier that day.
8:30 p.m.	Press conference, Thornburgh and Denton	Reassuring, but some threat remained;waffling about evacuation prompted more people to do so, as did conflicting reports about danger	Thornburgh: No evacuation order was necessary; however, Governor's earlier recommendation regarding pregnant women and preschool age children staying out of the 5-mile radius would remain in effect at least until Saturday. Denton: No possibility of an explosion in the reactor vessel; possibility of a core meltdown very remote.
Saturday, March 31	Met Ed news conference, Herbein	Met Ed credibility reduced	Herbein stated that he personally felt that the crisis was over. The hydrogen bubble had been reduced by a third since Friday.
12:00 a.m.	Denton press conference, NRC news center at Middletown Borough Hall	In conflict with Met Ed statement; reduced Met Ed credibility	Refuted Herbein statement that the crisis was over; not over until the reactor in a cold shutdown condition.
2:45 p.m.	NRC news conference, Bethesda, by Hendrie	Confusing; partially incorrect	Reactor was stable; fuel continuing to cool; evacuation was a possibility that would have to be kept in mind in considering the steps to be taken; evacuation might turn out to be a prudent precautionary measure; evacuation would be considered as far out as

			20 miles. When asked about Herbein's statement that bubble had decreased in size by one third, he said that Herbein was not talking about the bubble in the reactor [incorrect], but another bubble in the pressurizer.
5:00 p.m.	Press released by Gov. Thornburgh	Uncertainty;churches grant general absolution of sins to the local masses	Evacuation advisory for pregnant women and preschool age children would remain in effect for at least another night. Wider evacuations were unnecessary.
8:20 p.m.	AP bulletin cleared by the NRC	Alarming	Warned that the hydrogen bubble showed signs of becoming potentially explosive.
Shortly after 8:20 p.m.	AP bulletin announcing statement by unnamed NRC source	Alarming	The bubble could explode in a couple of days.
Evening[?]	Met Ed News Center, technical personnel	In conflict with NRC	Statement re steps Met Ed was taking to reduce bubble; open disagreement with NRC--bubble could not explode because there was neither oxygen generation nor source of ignition.
Evening[?]	NRC onsite technical personnel	In conflict with NRC	Openly disagreed with NRC statement re bubble oploding. [This disagreement repeated during later news conference held by Thornburgh and Denton.
11:00 p.m.	Thornburgh/Denton press conference	Reassuring	Thornburgh: There had been a number of erroneous or distorted reports during the day; during his briefings with Denton he had been assured that no imminent catastrophe was foreseeable; Thornburgh appealed to hose who had reacted or overreacted to the day's reports to listen carefully to Denton's statements.
		Reassuring	Denton: No near term possibility of a hydrogen explosion in either the

			containment or the reactor vessel; he had been in touch with the Washington offices, and there was essential agreement on the plant status and the courses of action open; he said that reporters were overplaying minor contradictions; he didn't know how to solve that problem, except by issuing statements from only one point. He said that there was "no physical possibility" of a hydrogen explosion.
Sunday, April 1 7:00 p.m.	Thornburgh press release	Uncertainty; old people's homes begin evacuation; minister announces that he felt people were living in the last days	State offices would be open on Monday, April 2; however, he extended the advisory made to pregnant women and mothers with preschool age children to stay out of the area within 5 miles of the plant. Recommended that schools within the same area remain closed until further notice.
Monday, April 2 12:00 a.m.	Denton news conference	Uncertainty	Bubble was sufficiently reduced so as not to be a problem. He did not say that the NRC had been wrong in its assumption about the possible explosiveness of bubble. He did say that the staff had been very conservative in its calculations.

Services of Mead Data Central

16TH STORY of Level 2 printed in FULL format.

ATTACHMENT 11

The Associated Press

The materials in the AP file were compiled by The Associated Press. These materials may not be republished without the express written consent of The Associated Press.

January 26, 1982, Tuesday, PM cycle

SECTION: Domestic News

LENGTH: 420 words

HEADLINE: Business As Usual For Small Community

BYLINE: By CYNTHIA BENJAMIN, Associated Press Writer

DATELINE: ONTARIO, N.Y.

KEYWORD: Community Reaction

BODY:

Volunteer firefighter Sam Grecko was telling worried callers that the nuclear accident down the road wasn't anything to get alarmed about because that's what he heard on TV.

"It is stable or else I wouldn't be here," he said. "If there was any reason for concern, no one would be here."

The students at Wayne Central High School, after hearing two public address announcements about the alert and radioactive steam release Monday at the Ginna nuclear plant, responded with jokes.

"They'd say, 'Hey, look at you _ you're glowing!' They don't care," said Richard Gallagher, 18, a senior.

And Clarence Lawliss, 44, of nearby Palmyra, said he "spent two years as a state corrections officer and I can tell you it's a lot more dangerous in (prison) than it is out here."

"If you're looking to get rid of dangers, get rid of the prisoners and the cars first," he said. "How many people have been killed at one of these plants?"

After the accident occurred, business went on as usual in the town of 7,200 people about 16 miles north of Rochester.

The only visible concession to the "site emergency" _ three on a scale of four grades of nuclear emergencies _ was the decision to put volunteers at the fire station overnight to take calls.

"I guess they want me to come in to answer the phones because of what happened today," said Grecko, 26. "I don't know for sure."

When the 2,600-student school district let out early, no one believed school officials' claims that it was due to road conditions.

ATTACHMENT 11

LEXIS NEXIS LEXIS NEXIS

Services of Mead Data Central

"It's not like Wayne Central to send kids home. They've only closed once this winter because of the weather," Gallagher said. "But the kids don't care why they closed _ they just wanted to get out early."

"It's no big deal," said Joe Molino, 44. "I was stuck in the driveway within eyesight of the plant when it happened. I was listening to the radio. I don't think it's that big of a deal."

"If I was afraid, I would have moved out of here a long time ago."

School board member Al Brasser said the school switchboard was jammed with calls from worried parents, but today's classes were not called off.

No one in Ontario could think of anyone planning to evacuate.

"Everything I hear on the TV comforts me," Brasser said. "I think the media is blowing this way out of proportion.

"Philosophically, I support nuclear power. Financially, it's the route to go," he said.

"You keep on living here and you don't think about it," Lawliss said. "Just like the people at Three Mile Island. They didn't move out."

LEXIS NEXIS LEXIS NEXIS

Services of Mead Data Central

19TH STORY of Level 2 printed in FULL format.

Proprietary to the United Press International 1982

January 26, 1982, Tuesday, PM cycle

SECTION: Domestic News

LENGTH: 320 words

KEYWORD: Nukeleak

BODY:

As soon as a pipe carrying pressurized, radioactive water burst, the nuclear reactor shut down automatically and about 11,000 gallons of water were injected into the core to prevent overheating. That contaminated water was contained in the plant and was being handled by the facility's purification system.

RGE technicians said they had no trouble in lowering the Ginna reactor's temperature and water pressure and said emergency procedures went smoothly.

Although 100 plant employees were quickly ordered from the area, an evacuation never became necessary, and neighbors of the plant on the shores of Lake Ontario went about their business in surprisingly casual fashion.

Emergency broadcasts interrupted radio and television shows in the Ontario and Rochester areas to explain the accident posed no immediate health danger but to ask that residents stay tuned should the danger increase.

About 15 workers remained inside the reactor building and another 35 stayed in an adjacent emergency center. Low levels of radiation were found on five workers who had been outside at the time of the emissions. They were either wiped with a rag or sent into a shower before going home.

The accident occurred just four days after the utility went through a federally ordered drill at the Ginna plant to test utility and state responses in a nuclear emergency.

''The first thing that went through my mind when I finally realized the situation was 'Thank God we had our drill because this certainly has prepared us all,'' said Peck.

The facility was built by Westinghouse in 1970.

In another nuclear plant steam leak, the Vermont Yankee reactor in Vernon was shut down early today to repair a low-pressure leak on a drain tank, which officials said posed no hazard to public health. Official said the steam in the tank contained a very low amount of radiation and the leak was discovered several days ago.

LEXIS NEXIS LEXIS NEXIS

Sample Point Number _ _ _ 1-3

Respondent Number _ _ 4-5

Sex (1) MALE (2) FEMALE 6

Form (1) A - (2) B (3) C 7

Hello. . .I'm calling from the Summit Research Group. . .we're taking a survey on some current social problems facing people living on Long Island. . .I'd like to ask you some questions. . .first:

Considering where you live now, how worried are you about the effects of each of the following on the health and well-being of your family. . . very worried, somewhat worried, or not too worried. . .for example:

6. Toxic waste from garbage dumps. . .are you very worried about this, somewhat worried, or not too worried?

(1) VERY WORRIED (2) SOMEWHAT WORRIED (3) NOT TOO WORRIED 8

(4) DON'T KNOW (5) REFUSED

7. How about air pollution. . .are you very worried about this, somewhat worried, or not too worried?

(1) VERY WORRIED (2) SOMEWHAT WORRIED (3) NOT TOO WORRIED 9

(4) DON'T KNOW (5) REFUSED

8. What about crime. . .are you very worried about this, somewhat worried, or not too worried?

(1) VERY WORRIED (2) SOMEWHAT WORRIED (3) NOT TOO WORRIED 10

(4) DON'T KNOW (5) REFUSED

9. How about radiation from a nuclear power plant. . .are you very worried about this, somewhat worried, or not too worried?

(1) VERY WORRIED (2) SOMEWHAT WORRIED (3) NOT TOO WORRIED 11

(4) DON'T KNOW (5) REFUSED

10. And what about a fire in your home. . .are you very worried about this, somewhat worried, or not too worried?

(1) VERY WORRIED (2) SOMEWHAT WORRIED (3) NOT TOO WORRIED 12

(4) DON'T KNOW (5) REFUSED

FORM A

In general, how dangerous do you think it would be to live near each of the following. . .very dangerous, dangerous, or not too dangerous. . . or example:

11. An airport. . .do you think it would be very dangerous to live near an airport, dangerous, or not too dangerous?

(1) VERY DANGEROUS (2) DANGEROUS (3) NOT TOO DANGEROUS 13

(4) DON'T KNOW (5) REFUSED

12. What about a mental hospital. . .do you think it would be very dangerous to live near a mental hospital, dangerous, or not too dangerous?

(1) VERY DANGEROUS (2) DANGEROUS (3) NOT TOO DANGEROUS 14

(4) DON'T KNOW (5) REFUSED

13. How about a coal fired power plant. . .do you think it would be very dangerous to live near a coal fired power plant, dangerous, or not too dangerous?

(1) VERY DANGEROUS (2) DANGEROUS (3) NOT TOO DANGEROUS 15

(4) DON'T KNOW (5) REFUSED

14. What about a nuclear power plant. . .do you think it would be very dangerous to live near a nuclear power plant, dangerous, or not too dangerous?

(1) VERY DANGEROUS (2) dangerous (3) NOT TOO DANGEROUS 16

(4) DON'T KNOW (5) REFUSED

15. Would you describe yourself as a supporter of nuclear power plants as a means of providing electricity, or as an opponent of nuclear power plants, or haven't you made up your mind yet on this issue?

(1) SUPPORTER (2) OPPONENT (3) HAVEN'T MADE UP MIND (4) REFUSED 17

16. Do you think that LILCO should complete and operate the Shoreham nuclear power plant?

(1) YES (2) NO (3) DON'T KNOW (4) REFUSED 18

17. Which of the following comes closest to your opinion on nuclear energy. . .all nuclear power plants should be shut down. . .or, those plants which are currently operating should be allowed to continue to operate, but no new plants should be built. . .or, we should continue to build new nuclear power plants?

/1/ SHUT DOWN /2/ OPERATE ONLY EXISTING PLANTS /3/ BUILD NEW PLANTS 19

/4/ DON'T KNOW /5/ REFUSED

18. During normal operation, which type of electricity plant pollutes the air the least. . .an oil-fired plant, or a coal-fired plant, or a nuclear-fired plant, or you're not sure?

/1/ OIL-FIRED /2/ COAL-FIRED /3/ NUCLEAR-FIRED /4/ NOT SURE 20

/5/ ALL ABOUT THE SAME /6/ REFUSED

19. During normal operation does a nuclear power plant give.off a dangerous level of radiation?

/1/ YES /2/ NO /3/ DON'T KNOW /4/ REFUSED 21

20. When the nuclear accident took place at Three Mile Island which of the following happened. . .no one died but some people became ill. . . or, only a few people became ill. . .or, no one was hurt although the long term effects are unknown. . .or, you're not sure?

/1/ NO ONE DIED /2/ FEW BECAME ILL /3/ NO ONE HURT /4/ NOT SURE 22

/5/ REFUSED

21. Do you believe that technical experts are able to accurately evaluate the risks of nuclear power?

/1/ YES /2/ NO /3/ DON'T KNOW /4/ REFUSED 23

22. Does LILCO currently have an operating nuclear power plant on Long Island?

/1/ YES /2/ NO /3/ DON'T KNOW /4/ REFUSED 24

LILCO is currently completing the Shoreham nuclear power plant which is in Suffolk County about 60 miles from New York City. Suppose that LILCO completes this plant and begins to operate it. If there was an accident at the plant how much would you trust each of the following people to tell the truth about the accident. . .for example:

23. The Governor of New York State. . .would you trust the Governor a great deal, somewhat, or not at all to tell the truth about an accident at the plant?

(1) GREAT DEAL (2) SOMEWHAT (3) NOT AT ALL (4) DON'T KNOW (5) REF 2

24. What about a LILCO official. . .would you trust a LILCO official a great deal, somewhat, or not at all to tell the truth about an accident at the plant?

(1) GREAT DEAL (2) SOMEWHAT (3) NOT AT ALL (4) DON'T KNOW (5) REF 2

25. How about an official from the federal Nuclear Regulatory Commission. . . would you trust an official from the federal Nuclear Regulatory Commission a great deal, somewhat, or not at all to tell the truth about an accident at the plant?

(1) GREAT DEAL (2) SOMEWHAT (3) NOT AT ALL (4) DON'T KNOW (5) REF 2

26. What about the Suffolk County Executive. . .would you trust the Suffolk County Executive a great deal, somewhat, or not at all to tell the truth about an accident at the plant?

(1) GREAT DEAL (2) SOMEWHAT (3) NOT AT ALL (4) DON'T KNOW (5) REF 2

27. - 28. As the crow flies, about how many miles do you think your home is from the Shoreham nuclear power plant?

(specify number of miles) _____ (9/9) DK 29-3

29. Would you consider moving if the Nuclear Regulatory Commission granted LILCO a license to begin operating Shoreham?

(1) YES (2) NO (3) DON'T KNOW (4) REFUSED 3

30. Assuming that the Shoreham nuclear power plant is licensed and begins to operate, we are interested in knowing what you would do if there was an accident at the plant. Suppose that you and your family were at home and there was an accident at Shoreham. . .all people who lived within five miles of the plant were advised to stay indoors, while all people who lived more than five miles from the plant were told they could go about their normal business. . .do you think that you and the other members of your family would: go about your normal business, or stay inside your home, or leave your home and go somewhere else?

/1/ NORMAL BUSINESS (skip to 34) /2/ STAY INSIDE HOME (skip to 34) 32

/3/ LEAVE HOME AND GO SOMEWHERE ELSE (ask question 31)

/4/ DON'T KNOW (skip to 34) /5/ REFUSED (skip to 34)

33:

31. Where would you go. . .someplace in Suffolk County, someplace in Nassau County, someplace in New York City, some other place, or you don't know?

/1/ SUFFOLK COUNTY /2/ NASSAU COUNTY /3/ NEW YORK CITY 34

/4/ OTHER (specify) _____

/5/ DON'T KNOW (skip to 33) /6/ REFUSED (skip to 33)

32. In terms of miles, about how far away is this place from your home. . . 10 miles or less, 11 to 20 miles, 21 to 30 miles, 31 to 40 miles, 41 to 50 miles, or more than 50 miles?

/1/ 10 MILES OR LESS /2/ 11 TO 20 MILES /3/ 21 TO 30 MILES 35

/4/ 31 TO 40 MILES /5/ 41 TO 50 MILES /6/ MORE THAN 50 MILES

/7/ DON'T KNOW /8/ REFUSED

33. Which of the following would you be most likely to go to. . . somebody else's home, a public shelter, a hotel or motel, or somewhere else?

/1/ SOMEBODY ELSE'S HOME /2/ PUBLIC SHELTER /3/ HOTEL OR MOTEL 36

/4/ SOMEWHERE ELSE (specify) _____

/5/ DON'T KNOW /6/ REFUSED

34. Suppose that you and your family were at home and there was an accident at the Shoreham nuclear power plant. . .all pregnant women and pre-school children living within five miles of the plant were advised to evacuate and everyone living between six and ten miles from the plant were advised to remain indoors, while everyone living more than ten miles from the plant was told they could go about their normal business. . .would you and other members of your family: go about your normal business, or stay inside your home, or leave your home and go somewhere else?

/1/ NORMAL BUSINESS (skip to 38) /2/ STAY INSIDE HOME (skip to 38) 37

/3/ LEAVE HOME AND GO SOMEWHERE ELSE (ask question 35)

/4/ DON'T KNOW (skip to 38) /5/ REFUSED (skip to 38)

38?

35. Where would you go. . .someplace in Suffolk County, someplace in Nassau County, someplace in New York City, some other place or you don't know?

/1/ SUFFOLK COUNTY /2/ NASSAU COUNTY /3/ NEW YORK CITY 39

/4/ OTHER (specify) _____

/5/ DON'T KNOW (skip to 37) /6/ REFUSED (skip to 37)

36. In terms of miles, about how far away is this place from your home. . . 10 miles or less, 11 to 20 miles, 21 to 30 miles, 31 to 40 miles, 41 to 50 miles, or more than 50 miles?

/1/ 10 MILES OR LESS /2/ 11 TO 20 MILES /3/ 21 TO 30 MILES 40

/4/ 31 TO 40 MILES /5/ 41 TO 50 MILES /6/ MORE THAN 50 MILES

/7/ DON'T KNOW /8/ REFUSED

37. Which of the following would you be most likely to go to. . . somebody else's home, a public shelter, a hotel or motel, or somewhere else?

/1/ SOMEBODY ELSE'S HOME /2/ PUBLIC SHELTER /3/ HOTEL OR MOTEL 41

/4/ SOMEWHERE ELSE (specify) _____

/5/ DON'T KNOW /6/ REFUSED

38. Suppose that you and your family were at home and there was an accident at the Shoreham nuclear power plant. . .everyone living within ten miles of the plant was advised to evacuate, while everyone living more than ten miles from the plant was told they could go about their normal business. . .would you and the other members of your family: go about your normal business, or stay inside your home, or leave your home and go somewhere else?

(1) NORMAL BUSINESS (skip to 43) (2) STAY INSIDE HOME (skip to 43) 42

(3) LEAVE HOME AND GO SOMEWHERE ELSE (ask question 39)

(4) DON'T KNOW (skip to 43) (5) REFUSED (skip to 43)

43

39. Where would you go. . .someplace in Suffolk County, someplace in Nassau County, someplace in New York City, some other place, or you don't know?

(1) SUFFOLK COUNTY (2) NASSAU COUNTY (3) NEW YORK CITY 41

(4) OTHER (specify) _____

(5) DON'T KNOW (skip to 41) (6) REFUSED (skip to 41)

40. In terms of miles, about how far away is this place from your home. . . 10 miles or less, 11 to 20 miles, 21 to 30 miles, 31 to 40 miles, 41 to 50 miles, or more than 50 miles?

(1) 10 MILES OR LESS (2) 11 TO 20 MILES (3) 21 TO 30 MILES 4

(4) 31 TO 40 MILES (5) 41 TO 50 MILES (6) MORE THAN 50 MILES

(7) DON'T KNOW (8) REFUSED

41. Which of the following would you be most likely to go to. . . somebody else's home, a public shelter, a hotel or motel, or somewhere else?

(1) SOMEBODY ELSE'S HOME (2) PUBLIC SHELTER (3) HOTEL OR MOTEL 46

(4) SOMEWHERE ELSE (specify) _____

(5) DON'T KNOW (6) REFUSED

42. When you heard the advisory to evacuate would you: leave immediately, or wait until everyone in your family could assemble and then leave?

/1/ LEAVE IMMEDIATELY /2/ WAIT UNTIL EVERYONE COULD ASSEMBLE 4

/3/ DON'T KNOW /4/ REFUSED

43. In the course of your lifetime, have you ever had to evacuate your home in the face of danger such as a hurricane, flood, or any other danger?

/1/ YES /2/ NO /3/ REFUSED 4

44. Do you have children under the age of 5 living at home with you?

/1/ YES /2/ NO /3/ REFUSED 4

45. Do you have children between the ages of 5 and 17 living at home with you?

/1/ YES (ask question 46) /2/ NO (skip to 47) /3/ REFUSED 5

46. If there was an accident at the Shoreham nuclear power plant and your children were at school in an area that had to be evacuated, would you prefer that your children: be brought home or to a neighbor's by bus, or be bussed to a shelter outside the evacuation area, or be kept at school until you could pick them up?

/1/ BROUGHT HOME/TO NEIGHBOR'S /2/ BUSSED TO SHELTER 5

/3/ KEPT AT SCHOOL /4/ DON'T KNOW /5/ REFUSED

47. Do you currently work full time (30 hours a week or more) for pay?

/1/ YES (ask question 48) /2/ NO (skip to 49) /3/ REFUSED 52

48. About how long does it usually take you to get to work in the morning. . .less than 15 minutes, 15 to 30 minutes, 31 to 60 minutes, 61 to 90 minutes, or more than 90 minutes?

/1/ LESS THAN 15 /2/ 15 TO 30 /3/ 31 TO 60 /4/ 61 TO 90 53

/5/ MORE THAN 90 /6/ DON'T KNOW /7/ REFUSED

49. Are you currently married, single, widowed, or divorced or separated?

/1/ MARRIED (ask question 50) /2/ SINGLE (skip to 52) 54

/3/ WIDOWED (skip to 52) /4/ DIVORCED/SEPARATED (skip to 52)

/5/ REFUSED (skip to 52)

50. (IF MARRIED) Does your spouse currently work full time (30 hours a week or more) for pay?

/1/ YES /2/ NO (skip to 52) /3/ REFUSED (skip to 52) 55

51. About how long does it usually take your spouse to get to work in the morning. . .less than 15 minutes, 15 to 30 minutes, 31 to 60 minutes, 61 to 90 minutes, or more than 90 minutes?

/1/ LESS THAN 15 /2/ 15 TO 30 /3/ 31 TO 60 /4/ 61 TO 90 56

/5/ MORE THAN 90 /6/ DON'T KNOW /7/ REFUSED

52. What is the last grade of school that you completed. . .some high school or less, or are you a high school graduate, or did you complete some college courses, or are you a college graduate?

/1/ SOME HIGH SCHOOL OR LESS /2/ HIGH SCHOOL GRADUATE 57

/3/ SOME COLLEGE /4/ COLLEGE GRADUATE /5/ REFUSED

53. What is your age category. . .under 25, 25 to 35, 36 to 50, 51 to 65, or over 65?

/1/ UNDER 25 /2/ 25 TO 35 /3/ 36 TO 50 /4/ 51 TO 65 58

/5/ OVER 65 /6/ REFUSED

54. What is your total family income. . .under $15,000, $15,000 to $25,000, $26,000 to $35,000, $36,000 to $50,000, or over $50,000?

/1/ UNDER $15K /2/ $15K TO $25K /3/ $26K TO $35K 59

/4/ $36K TO $50K /5/ OVER $50K /6/ REFUSED

55. Would you consider yourself to be politically. . .liberal, middle-of-the-road, or conservative?

/1/ LIBERAL /2/ MIDDLE-OF-THE-ROAD /3/ CONSERVATIVE 60

/4/ DON'T KNOW /5/ REFUSED

56. What is your race. . .white, black, or other?

/1/ WHITE /2/ BLACK /3/ OTHER /4/ DON'T KNOW /5/ REFUSED 61

57. What is your religion. . .Catholic, Protestant, or Jewish?

/1/ CATHOLIC /2/ PROTESTANT /3/ JEWISH /4/ OTHER /5/ NONE 62

/6/ REFUSED

58. In general, would you say you are. . .very religious, somewhat religious, or not religious at all?

(1) VERY RELIGIOUS (2) SOMEWHAT RELIGIOUS (3) NOT RELIGIOUS AT ALL 63

(4) DON'T KNOW (5) REFUSED

59. How long have you lived on Long Island. . .all your life, more than 20 years, 10 to 20 years, 5 to 9 years, or less than 5 years?

(1) ENTIRE LIFE (2) MORE THAN 20 YRS (3) 10 TO 20 YRS 64

(4) 5 TO 9 YRS (5) LESS THAN 5 YRS (6) REFUSED

Thank you very much. . .have a nice day/evening.

Sample Point Number _ _ _ 1-3

Respondent Number _ _ 4-5

Sex (1) MALE (2) FEMALE 6

Form (1) A (2) B (3) C 7

Hello. . .I'm calling from the Summit Research Group. . .we're taking a survey on some current social problems facing people living on Long Island. . .I'd like to ask you some questions. . .first:

Considering where you live now, how worried are you about the effects of each of the following on the health and well-being of your family. . . very worried, somewhat worried, or not too worried. . .for example:

6. Toxic waste from garbage dumps. . .are you very worried about this, somewhat worried, or not too worried?

(1) VERY WORRIED (2) SOMEWHAT WORRIED (3) NOT TOO WORRIED 8

(4) DON'T KNOW (5) REFUSED

7. How about air pollution. . .are you very worried about this, somewhat worried, or not too worried?

(1) VERY WORRIED (2) SOMEWHAT WORRIED (3) NOT TOO WORRIED 9

(4) DON'T KNOW (5) REFUSED

8. What about crime. . .are you very worried about this, somewhat worried, or not too worried?

(1) VERY WORRIED (2) SOMEWHAT WORRIED (3) NOT TOO WORRIED 10

(4) DON'T KNOW (5) REFUSED

9. How about radiation from a nuclear power plant. . .are you very worried about this, somewhat worried, or not too worried?

(1) VERY WORRIED (2) SOMEWHAT WORRIED (3) NOT TOO WORRIED 11

(4) DON'T KNOW (5) REFUSED

10. And what about a fire in your home. . .are you very worried about this, somewhat worried, or not too worried?

(1) VERY WORRIED (2) SOMEWHAT WORRIED (3) NOT TOO WORRIED 12

(4) DON'T KNOW (5) REFUSED

FORM B

In general, how dangerous do you think it would be to live near each of the following. . .very dangerous, dangerous, or not too dangerous. . . For example:

11. An airport. . .do you think it would be very dangerous to live near an airport, dangerous, or not too dangerous?

/1/ VERY DANGEROUS /2/ DANGEROUS /3/ NOT TOO DANGEROUS 13

/4/ DON'T KNOW /5/ REFUSED

12. What about a mental hospital. . .do you think it would be very dangerous to live near a mental hospital, dangerous, or not too dangerous?

/1/ VERY DANGEROUS /2/ DANGEROUS /3/ NOT TOO DANGEROUS 14

/4/ DON'T KNOW /5/ REFUSED

13. How about a coal fired power plant. . .do you think it would be very dangerous to live near a coal fired power plant, dangerous, or not too dangerous?

/1/ VERY DANGEROUS /2/ DANGEROUS /3/ NOT TOO DANGEROUS 15

/4/ DON'T KNOW /5/ REFUSED

14. What about a nuclear power plant. . .do you think it would be very dangerous to live near a nuclear power plant, dangerous, or not too dangerous?

/1/ VERY DANGEROUS /2/ dangerous /3/ NOT TOO DANGEROUS 16

/4/ DON'T KNOW /5/ REFUSED

15. Would you describe yourself as a supporter of nuclear power plants as a means of providing electricity, or as an opponent of nuclear power plants, or haven't you made up your mind yet on this issue?

/1/ SUPPORTER /2/ OPPONENT /3/ HAVEN'T MADE UP MIND /4/ REFUSED 17

16. Do you think that LILCO should complete and operate the Shoreham nuclear power plant?

/1/ YES /2/ NO /3/ DON'T KNOW /4/ REFUSED 18

17. Which of the following comes closest to your opinion on nuclear energy. . .all nuclear power plants should be shut down. . .or, those plants which are currently operating should be allowed to continue to operate, but no new plants should be built. . .or, we should continue to build new nuclear power plants?

(1) SHUT DOWN (2) OPERATE ONLY EXISTING PLANTS (3) BUILD NEW PLANTS 19

(4) DON'T KNOW (5) REFUSED

18. During normal operation, which type of electricity plant pollutes the air the <u>least</u>. . .an oil-fired plant, or a coal-fired plant, or a nuclear-fired plant, or you're not sure?

(1) OIL-FIRED (2) COAL-FIRED (3) NUCLEAR-FIRED (4) NOT SURE 20

(5) ALL ABOUT THE SAME (6) REFUSED

19. During <u>normal operation</u> does a nuclear power plant give off a dangerous level of radiation?

(1) YES (2) NO (3) DON'T KNOW (4) REFUSED 21

20. When the nuclear accident took place at Three Mile Island which of the following happened. . .no one died but some people became ill. . . or, only a few people became ill. . .or no one was hurt although the long term effects are unknown. . .or, you're not sure?

(1) NO ONE DIED (2) FEW BECAME ILL (3) NO ONE HURT (4) NOT SURE 22

(5) REFUSED

21. Do you believe that technical experts are able to accurately evaluate the risks of nuclear power?

(1) YES (2) NO (3) DON'T KNOW (4) REFUSED 23

22. Does LILCO currently have an operating nuclear power plant on Long Island?

(1) YES (2) NO (3) DON'T KNOW (4) REFUSED 24

LILCO is currently completing the Shoreham nuclear power plant which is in Suffolk County about 60 miles from New York City. Suppose that LILCO completes this plant and begins to operate it. If there was an accident at the plant how much would you trust each of the following people to tell the truth about the accident. . .for example:

23. The Governor of New York State. . .would you trust the Governor a great deal, somewhat, or not at all to tell the truth about an accident at the plant?

(1) GREAT DEAL (2) SOMEWHAT (3) NOT AT ALL (4) DON'T KNOW (5) REF

24. What about a LILCO official. . .would you trust a LILCO official a great deal, somewhat, or not at all to tell the truth about an accident at the plant?

(1) GREAT DEAL (2) SOMEWHAT (3) NOT AT ALL (4) DON'T KNOW (5) REF

25. How about an official from the federal Nuclear Regulatory Commission. . would you trust an official from the federal Nuclear Regulatory Commission a great deal, somewhat, or not at all to tell the truth about an accident at the plant?

(1) GREAT DEAL (2) SOMEWHAT (3) NOT AT ALL (4) DON'T KNOW (5) REF

26. What about the Suffolk County Executive. . .would you trust the Suffolk County Executive a great deal, somewhat, or not at all to tell the truth about an accident at the plant?

(1) GREAT DEAL (2) SOMEWHAT (3) NOT AT ALL (4) DON'T KNOW (5) REF

27. - 28. As the crow flies, about how many miles do you think your home is from the Shoreham nuclear power plant?

(specify number of miles) _____ (9/9) DK 29-3

29. Would you consider moving if the Nuclear Regulatory Commission granted LILCO a license to begin operating Shoreham?

(1) YES (2) NO (3) DON'T KNOW (4) REFUSED 3

30. Assuming that the Shoreham nuclear power plant is licensed and begins to operate, we are interested in knowing what you would do if there was an accident at the plant. Suppose that you and your family were at home and there was an accident at Shoreham. . .all people who lived within five miles of the plant were advised to stay indoors. . .do you think that you and the other members of your family would: go about your normal business, or stay inside your home, or leave your home and go somewhere else?

(1) NORMAL BUSINESS (skip to 34) (2) STAY INSIDE HOME (skip to 34) 32

(3) LEAVE HOME AND GO SOMEWHERE ELSE (ask next question)

(4) DON'T KNOW (ask next question) (5) REFUSED (skip to 34)

(IF LEAVE HOME AND GO SOMEWHERE ELSE OR DON'T KNOW) What if people who lived more than five miles from the plant were told they could go about their normal business. . .do you think that you and the other members of your family would: go about your normal business, or stay inside your home, or leave your home and go somewhere else?

(1) NORMAL BUSINESS (skip to 34) (2) STAY INSIDE HOME (skip to 34) 33

(3) LEAVE HOME AND GO SOMEWHERE ELSE (ask question 31)

(4) DON'T KNOW (skip to 34) (5) REFUSED (skip to 34)

31. Where would you go. . .someplace in Suffolk County, someplace in Nassau County, someplace in New York City, some other place, or you don't know?

(1) SUFFOLK COUNTY (2) NASSAU COUNTY (3) NEW YORK CITY 34

(4) OTHER (specify) _____

(5) DON'T KNOW (skip to 33) (6) REFUSED (skip to 33)

32. In terms of miles, about how far away is this place from your home. . . 10 miles or less, 11 to 20 miles, 21 to 30 miles, 31 to 40 miles, 41 to 50 miles, or more than 50 miles?

(1) 10 MILES OR LESS (2) 11 TO 20 MILES (3) 21 TO 30 MILES 35

(4) 31 TO 40 MILES (5) 41 TO 50 MILES (6) MORE THAN 50 MILES

(7) DON'T KNOW (8) REFUSED

33. Which of the following would you be most likely to go to. . . somebody else's home, a public shelter, a hotel or motel, or somewhere else?

(1) SOMEBODY ELSE'E HOME (2) PUBLIC SHELTER (3) HOTEL OR MOTEL 36

(4) SOMEWHERE ELSE (specify) _____

(5) DON'T KNOW (6) REFUSED

34. Suppose that you and your family were at home and there was an accident at the Shoreham nuclear power plant. . .all pregnant women and pre-school children living within five miles of the plant were advised to evacuate and everyone living between six and ten miles from the plant were advised to remain indoors. . .would you and other members of your family: go about your normal business, or stay inside your home, or leave your home and go somewhere else?

(1) NORMAL BUSINESS (skip to 38) (2) STAY INSIDE HOME (skip to 38) 37

(3) LEAVE HOME AND GO SOMEWHERE ELSE (ask next question)

(4) DON'T KNOW (ask next question) (5) REFUSED (skip to 38)

(IF LEAVE HOME AND GO SOMEWHERE ELSE OR DON'T KNOW) What if people who lived more than ten miles from the plant were told they could go about their normal business. . .do you think that you and other members of your family would: go about your normal business, or stay inside your home, or leave your home and go someplace else?

(1) NORMAL BUSINESS (skip to 38) (2) STAY INSIDE HOME (skip to 38) 38

(3) LEAVE HOME AND GO SOMEWHERE ELSE (ask question 35)

(4) DON'T KNOW (skip to 38) (5) REFUSED (skip to 38)

35. Where would you go. . .someplace in Suffolk County, someplace in Nassau County, someplace in New York City, some other place, or you don't know?

(1) SUFFOLK County (2) NASSAU COUNTY (3) NEW YORK CITY 39

OTHER (specify) _____

(5) DON'T KNOW (skip to 37) (6) REFUSED (skip to 37)

36. In terms of miles, about how far away is this place from your home. . . 10 miles or less, 11 to 20 miles, 21 to 30 miles, 31 to 40 miles, 41 to 50 miles, or more than 50 miles?

(1) 10 MILES OR LESS (2) 11 TO 20 MILES (3) 21 TO 30 MILES 40

(4) 31 TO 40 MILES (5) 41 TO 50 MILES (6) MORE THAN 50 MILES

(7) DON'T KNOW (8) REFUSED

37. Which of the following would you be most likely to go to. . . somebody else's home, a public shelter, a hotel or motel, or somewhere else?

(1) SOMEBODY ELSE'S HOME (2) PUBLIC SHELTER (3) HOTEL OR MOTEL 41

(4) SOMEWHERE ELSE (specify) _____

(5) DON'T KNOW (6) REFUSED

38. Suppose that you and your family were at home and there was an accident at the Shoreham nuclear power plant. . .everyone living within ten miles of the plant was advised to evacuate. . .would you and other members of your family: go about your normal business, or stay inside your home, or leave your home and go somewhere else?

/1/ NORMAL BUSINESS (skip to 43) /2/ STAY INSIDE HOME (skip to 43) 42

/3/ LEAVE HOME AND GO SOMEWHERE ELSE (ask next question)

/4/ DON'T KNOW (ask next question) /5/ REFUSED (skip to 43)

(IF LEAVE HOME AND GO SOMEWHERE ELSE OR DON'T KNOW) What if people who lived more than ten miles from the plant were told they could go about their normal business. . .do you think that you and other members of your family would: go about your normal business, or stay inside your home, or leave your home and go somewhere else?

/1/ NORMAL BUSINESS (skip to 43) /2/ STAY INSIDE HOME (skip to 43) 43

/3/ LEAVE HOME AND GO SOMEWHERE ELSE (ask question 39)

/4/ DON'T KNOW (skip to 43) /5/ REFUSED (skip to 43)

39. Where would you go. . .someplace in Suffolk County, someplace in Nassau County, someplace in New York City, some other place, or you don't know?

/1/ SUFFOLK COUNTY /2/ NASSAU COUNTY /3/ NEW YORK CITY 44

/4/ OTHER (specify) _____

/5/ DON'T KNOW (skip to 41) /6/ REFUSED (skip to 41)

40. In terms of miles, about how far away is this place from your home. . . 10 miles or less, 11 to 20 miles, 21 to 30 miles, 31 to 40 miles, 41 to 50 miles, or more than 50 miles?

/1/ 10 MILES OR LESS /2/ 11 TO 20 MILES /3/ 21 TO 30 MILES 45

/4/ 31 TO 40 MILES /5/ 41 TO 50 MILES /6/ MORE THAN 50 MILES

/7/ DON'T KNOW /8/ REFUSED

41. Which of the following would you be most likely to go to. . . somebody else's home, a public shelter, a hotel or motel, or somewhere else?

/1/ SOMEBODY ELSE'S HOME /2/ PUBLIC SHELTER /3/ HOTEL OR MOTEL 46

/4/ SOMEWHERE ELSE (specify) _____

/5/ DON'T KNOW /6/ REFUSED

42. When you heard the advisory to evacuate would you: leave immediately, or wait until everyone in your family could assemble and then leave?

/1/ LEAVE IMMEDIATELY /2/ WAIT UNTIL EVERYONE COULD ASSEMBLE 4

/3/ DON'T KNOW /4/ REFUSED

43. In the course of your lifetime, have you ever had to evacuate your home in the face of danger such as a hurricane, flood, or any other danger?

/1/ YES /2/ NO /3/ REFUSED 4

44. Do you have children under the age of 5 living at home with you?

/1/ YES /2/ NO /3/ REFUSED 4

45. Do you have children between the ages of 5 and 17 living at home with you?

/1/ YES (ask question 46) /2/ NO (skip to 47) /3/ REFUSED 5

46. If there was an accident at the Shoreham nuclear power plant and your children were at school in an area that had to be evacuated, would you prefer that your children: be brought home or to a neighbor's by bus, or be bussed to a shelter outside the evacuation area, or be kept at school until you could pick them up?

/1/ BROUGHT HOME/TO NEIGHBOR'S /2/ BUSSED TO SHELTER 5

/3/ KEPT AT SCHOOL /4/ DON'T KNOW /5/ REFUSED

47. Do you currently work full time (30 hours a week or more) for pay?

/1/ YES (ask question 48) /2/ NO (skip to 49) /3/ REFUSED 5

48. About how long does it usually take you to get to work in the morning. . .less than 15 minutes, 15 to 30 minutes, 31 to 60 minutes, 61 to 90 minutes, or more than 90 minutes?

/1/ LESS THAN 15 /2/ 15 TO 30 /3/ 31 TO 60 /4/ 61 TO 90 5

/5/ MORE THAN 90 /6/ DON'T KNOW /7/ REFUSED

49. Are you currently married, single, widowed, or divorced or separated?

/1/ MARRIED (ask question 50) /2/ SINGLE (skip to 52) 5

/3/ WIDOWED (skip to 52) /4/ DIVORCED/SEPARATED (skip to 52)

/5/ REFUSED (skip to 52)

50. (IF MARRIED) Does your spouse currently work full time (30 hours a week or more) for pay?

/1/ YES /2/ NO (skip to 52) /3/ REFUSED (skip to 52) 5:

51. About how long does it usually take your spouse to get to work in the morning. . .less than 15 minutes, 15 to 30 minutes, 31 to 60 minutes, 61 to 90 minutes, or more than 90 minutes?

/1/ LESS THAN 15 /2/ 15 TO 30 /3/ 31 TO 60 /4/ 61 TO 90 5[illegible]

/5/ MORE THAN 90 /6/ DON'T KNOW /7/ REFUSED

52. What is the last grade of school that you completed. . .some high school or less, or are you a high school graduate, or did you complete some college courses, or are you a college graduate?

/1/ SOME HIGH SCHOOL OR LESS /2/ HIGH SCHOOL GRADUATE 57

/3/ SOME COLLEGE /4/ COLLEGE GRADUATE /5/ REFUSED

53. What is your age category. . .under 25, 25 to 35, 36 to 50, 51 to 65, or over 65?

/1/ UNDER 25 /2/ 25 TO 35 /3/ 36 TO 50 /4/ 51 TO 65 58

/5/ OVER 65 /6/ REFUSED

54. What is your total family income. . .under $15,000, $15,000 to $25,000, $26,000 to $35,000, $36,000 to $50,000, or over $50,000?

/1/ UNDER $15K /2/ $15K TO $25K /3/ $26K TO $35K 59

/4/ $36K TO $50K /5/ OVER $50K /6/ REFUSED

55. Would you consider yourself to be politically. . .liberal, middle-of-the-road, or conservative?

/1/ LIBERAL /2/ MIDDLE-OF-THE-ROAD /3/ CONSERVATIVE 60

/4/ DON'T KNOW /5/ REFUSED

56. What is your race. . .white, black, or other?

/1/ WHITE /2/ BLACK /3/ OTHER /4/ DON'T KNOW /5/ REFUSED 61

57. What is your religion. . .Catholic, Protestant, or Jewish?

/1/ CATHOLIC /2/ PROTESTANT /3/ JEWISH /4/ OTHER /5/ NONE 62

/6/ REFUSED

58. In general, would you say you are. . .very religious, somewhat religious, or not religious at all?

(1) VERY RELIGIOUS (2) SOMEWHAT RELIGIOUS (3) NOT RELIGIOUS AT ALL 63

(4) DON'T KNOW (5) REFUSED

59. How long have you lived on Long Island. . .all your life, more than 20 years, 10 to 20 years, 5 to 9 years, or less than 5 years?

(1) ENTIRE LIFE (2) MORE THAN 20 YRS (3) 10 TO 20 YRS 64

(4) 5 TO 9 YRS (5) LESS THAN 5 YRS (6) REFUSED

Thank you very much. . .have a nice day/evening.

Sample Point Number _ _ _ 1-3

Respondent Number _ _ 4-5

Sex (1) MALE (2) FEMALE 6

Form (1) A (2) B (3) C 7

Hello. . .I'm calling from the Summit Research Group. . .we're taking a survey on some current social problems facing people living on Long Island. . .I'd like to ask you some questions. . .first:

Considering where you live now, how worried are you about the effects of each of the following on the health and well-being of your family. . . very worried, somewhat worried, or not too worried. . .for example:

6. Toxic waste from garbage dumps. . .are you very worried about this, somewhat worried, or not too worried?

(1) VERY WORRIED (2) SOMEWHAT WORRIED (3) NOT TOO WORRIED 8

(4) DON'T KNOW (5) REFUSED

7. How about air pollution. . .are you very worried about this, somewhat worried, or not too worried?

(1) VERY WORRIED (2) SOMEWHAT WORRIED (3) NOT TOO WORRIED 9

(4) DON'T KNOW (5) REFUSED

8. What about crime. . .are you very worried about this, somewhat worried, or not too worried?

(1) VERY WORRIED (2) SOMEWHAT WORRIED (3) NOT TOO WORRIED 10

(4) DON'T KNOW (5) REFUSED

9. How about radiation from a nuclear power plant. . .are you very worried about this, somewhat worried, or not too worried?

(1) VERY WORRIED (2) SOMEWHAT WORRIED (3) NOT TOO WORRIED 11

(4) DON'T KNOW (5) REFUSED

10. And what about a fire in your home. . .are you very worried about this, somewhat worried, or not too worried?

(1) VERY WORRIED (2) SOMEWHAT WORRIED (3) NOT TOO WORRIED 12

(4) DON'T KNOW (5) REFUSED

FORM C

In general, how dangerous do you think it would be to live near each f the following. . .very dangerous, dangerous, or not too dangerous. . . or example:

11. An airport. . .do you think it would be very dangerous to live near an airport, dangerous, or not too dangerous?

/1/ VERY DANGEROUS /2/ DANGEROUS /3/ NOT TOO DANGEROUS 13

/4/ DON'T KNOW /5/ REFUSED

12. What about a mental hospital. . .do you think it would be very dangerous to live near a mental hospital, dangerous, or not too dangerous?

/1/ VERY DANGEROUS /2/ DANGEROUS /3/ NOT TOO DANGEROUS 14

/4/ DON'T KNOW /5/ REFUSED

13. How about a coal fired power plant. . .do you think it would be very dangerous to live near a coal fired power plant, dangerous, or not too dangerous?

/1/ VERY DANGEROUS /2/ DANGEROUS /3/ NOT TOO DANGEROUS 15

/4/ DON'T KNOW /5/ REFUSED

14. What about a nuclear power plant. . .do you think it would be very dangerous to live near a nuclear power plant, dangerous, or not too dangerous?

/1/ VERY DANGEROUS /2/ dangerous /3/ NOT TOO DANGEROUS 16

/4/ DON'T KNOW /5/ REFUSED

15. Would you describe yourself as a supporter of nuclear power plants as a means of providing electricity, or as an opponent of nuclear power plants, or haven't you made up your mind yet on this issue?

/1/ SUPPORTER /2/ OPPONENT /3/ HAVEN'T MADE UP MIND /4/ REFUSED 17

16. Do you think that LILCO should complete and operate the Shoreham nuclear power plant?

/1/ YES /2/ NO /3/ DON'T KNOW /4/ REFUSED 18

17. Which of the following comes closest to your opinion on nuclear energy. . .all nuclear power plants should be shut down. . .or, those plants which are currently operating should be allowed to continue to operate, but no new plants should be built. . .or, we should continue to build new nuclear power plants?

(1) SHUT DOWN (2) OPERATE ONLY EXISTING PLANTS (3) BUILD NEW PLANTS 19

(4) DON'T KNOW (5) REFUSED

18. During normal operation, which type of electricity plant pollutes the air the least. . .an oil-fired plant, or a coal-fired plant, or a nuclear-fired plant, or you're not sure?

(1) OIL-FIRED (2) COAL-FIRED (3) NUCLEAR-FIRED (4) NOT SURE 20

(5) ALL ABOUT THE SAME (6) REFUSED

19. During normal operation does a nuclear power plant give off a dangerous level of radiation?

(1) YES (2) NO (3) DON'T KNOW (4) REFUSED 21

20. When the nuclear accident took place at Three Mile Island which of the following happened. . .no one died but some people became ill. . . or, only a few people became ill. . .or, no one was hurt although the long term effects are unknown. . .or, you're not sure?

(1) NO ONE DIED (2) FEW BECAME ILL (3) NO ONE HURT (4) NOT SURE 22

(5) REFUSED

21. Do you believe that technical experts are able to accurately evaluate the risks of nuclear power?

(1) YES (2) NO (3) DON'T KNOW (4) REFUSED 23

22. Does LILCO currently have an operating nuclear power plant on Long Island?

(1) YES (2) NO (3) DON'T KNOW (4) REFUSED 24

LILCO is currently completing the Shoreham nuclear power plant which is in Suffolk County about 60 miles from New York City. Suppose that LILCO completes this plant and begins to operate it. If there was an accident at the plant how much would you trust each of the following people to tell the truth about the accident. . .for example:

23. The Governor of New York State. . .would you trust the Governor a <u>great</u> deal, <u>somewhat</u>, or <u>not at all</u> to tell the truth about an accident at the plant?

/1/ GREAT DEAL /2/ SOMEWHAT /3/ NOT AT ALL /4/ DON'T KNOW /5/ REF 2

24. What about a LILCO official. . .would you trust a LILCO official a <u>great</u> deal, <u>somewhat</u>, or <u>not at all</u> to tell the truth about an accident at the plant?

/1/ GREAT DEAL /2/ SOMEWHAT /3/ NOT AT ALL /4/ DON'T KNOW /5/ REF 2

25. How about an official from the federal Nuclear Regulatory Commission. . . would you trust an official from the federal Nuclear Regulatory Commission a <u>great</u> deal, <u>somewhat</u>, or <u>not at all</u> to tell the truth about an accident at the plant?

/1/ GREAT DEAL /2/ SOMEWHAT /3/ NOT AT ALL /4/ DON'T KNOW /5/ REF 27

26. What about the Suffolk County Executive. . .would you trust the Suffolk County Executive a <u>great</u> deal, <u>somewhat</u>, or <u>not at all</u> to tell the truth about an accident at the plant?

/1/ GREAT DEAL /2/ SOMEWHAT /3/ NOT AT ALL /4/ DON'T KNOW /5/ REF 28

27. - 28. As the crow flies, about how many miles do you think your home is from the Shoreham nuclear power plant?

(specify number of miles) _____ /9/9/ DK 29-30

29. Would you consider moving if the Nuclear Regulatory Commission granted LILCO a license to begin operating Shoreham?

/1/ YES /2/ NO /3/ DON'T KNOW /4/ REFUSED 31

30. Assuming that the Shoreham nuclear power plant is licensed and begins to operate, we are interested in knowing what you would do if there was an accident at the plant. Suppose that you and your family were at home and there was an accident at Shoreham. . .all people who lived within five miles of the plant were advised to stay indoors. . .do you think that you and the other members of your family would: go about your normal business, or stay inside your home, or leave your home and go somewhere else?

/1/ NORMAL BUSINESS (skip to 34) /2/ STAY INSIDE HOME (skip to 34) 32

/3/ LEAVE HOME AND GO SOMEWHERE ELSE (ask question 31)

/4/ DON'T KNOW (skip to 34) /5/ REFUSED (skip to 34)

33F

31. Where would you go. . .someplace in Suffolk County, someplace in Nassau County, someplace in New York City, some other place, or you don't know?

/1/ SUFFOLK COUNTY /2/ NASSAU COUNTY /3/ NEW YORK CITY 34

/4/ OTHER (specify) _____

/5/ DON'T KNOW (skip to 33) /6/ REFUSED (skip to 33)

32. In terms of miles, about how far away is this place from your home. . . 10 miles or less, 11 to 20 miles, 21 to 30 miles, 31 to 40 miles, 41 to 50 miles, or more than 50 miles?

/1/ 10 MILES OR LESS /2/ 11 TO 20 MILES /3/ 21 TO 30 MILES 35

/4/ 31 TO 40 MILES /5/ 41 TO 50 MILES /6/ MORE THAN 50 MILES

/7/ DON'T KNOW /8/ REFUSED

33. Which of the following would you be most likely to go to. . . somebody else's home, a public shelter, a hotel or motel, or somewhere else?

/1/ SOMEBODY ELSE'S HOME /2/ PUBLIC SHELTER /3/ HOTEL OR MOTEL 36

/4/ SOMEWHERE ELSE (specify) _____

/5/ DON'T KNOW /6/ REFUSED

34. Suppose that you and your family were at home and there was an accident at the Shoreham nuclear power plant. . .all pregnant women and pre-school children living within five miles of the plant were advised to evacuate and everyone living between six and ten miles from the plant were advised to remain indoors. . .would you and other members of your family: go about your normal business, or stay inside your home, or leave your home and go somewhere else?

(1) NORMAL BUSINESS (skip to 38) (2) STAY INSIDE HOME (skip to 38) 37

(3) LEAVE HOME AND GO SOMEWHERE ELSE (ask question 35)

(4) DON'T KNOW (skip to 38) (5) REFUSED (skip to 38)

38

35. Where would you go. . .someplace in Suffolk County, someplace in Nassau County, someplace in New York City, some other place, or you don't know?

(1) SUFFOLK COUNTY (2) NASSAU COUNTY (3) NEW YORK CITY 39

(4) OTHER (specify) _____

(5) DON'T KNOW (skip to 37) (6) REFUSED (skip to 37)

36. In terms of miles, about how far away is this place from your home. . . 10 miles or less, 11 to 20 miles, 21 to 30 miles, 31 to 40 miles, 41 to 50 miles, or more than 50 miles?

(1) 10 MILES OR LESS (2) 11 TO 20 MILES (3) 21 TO 30 MILES 40

(4) 31 TO 40 MILES (5) 41 TO 50 MILES (6) MORE THAN 50 MILES

(7) DON'T KNOW (8) REFUSED

37. Which of the following would you be most likely to go to. . . somebody else's home, a public shelter, a hotel or motel, or somewhere else?

(1) SOMEBODY ELSE'S HOME (2) PUBLIC SHELTER (3) HOTEL OR MOTEL 41

(4) SOMEWHERE ELSE (specify) _____

(5) DON'T KNOW (6) REFUSED

38. Suppose that you and your family were at home and there was an accident at the Shoreham nuclear power plant. . .everyone living within ten miles of the plant was advised to evacuate. . .would you and other members of your family: go about your normal business, or stay inside your home, or leave your home and go somewhere else?

(1) NORMAL BUSINESS (skip to 43) (2) STAY INSIDE HOME (skip to 43) 42

(3) LEAVE HOME AND GO SOMEWHERE ELSE (ask question 39)

(4) DON'T KNOW (skip to 43) (5) REFUSED (skip to 43)

43R

39. Where would you go. . .someplace in Suffolk County, someplace in Nassau County, someplace in New York City, some other place, or you don't know?

(1) SUFFOLK COUNTY (2) NASSAU COUNTY (3) NEW YORK CITY 44

(4) OTHER (specify) _____

(5) DON'T KNOW (skip to 41) (6) REFUSED (skip to 41)

40. In terms of miles, about how far away is this place from your home. . . 10 miles or less, 11 to 20 miles, 21 to 30 miles, 31 to 40 miles, 41 to 50 miles, or more than 50 miles?

(1) 10 MILES OR LESS (2) 11 TO 20 MILES (3) 21 TO 30 MILES 45

(4) 31 TO 40 MILES (5) 41 TO 50 MILES (6) MORE THAN 50 MILES

(7) DON'T KNOW (8) REFUSED

41. Which of the following would you be most likely to go to. . . somebody else's home, a public shelter, a hotel or motel, or somewhere else?

(1) SOMEBODY ELSE'S HOME (2) PUBLIC SHELTER (3) HOTEL OR MOTEL 46

(4) SOMEWHERE ELSE (specify) _____

(5) DON'T KNOW (6) REFUSED

42. When you heard the advisory to evacuate would you: leave immediately, or wait until everyone in your family could assemble and then leave?

/1/ LEAVE IMMEDIATELY /2/ WAIT UNTIL EVERYONE COULD ASSEMBLE 47

/3/ DON'T KNOW /4/ REFUSED

43. In the course of your lifetime, have you ever had to evacuate your home in the face of danger such as a hurricane, flood, or any other danger?

/1/ YES /2/ NO /3/ REFUSED 48

44. Do you have children under the age of 5 living at home with you?

/1/ YES /2/ NO /3/ REFUSED 49

45. Do you have children between the ages of 5 and 17 living at home with you?

/1/ YES (ask question 46) /2/ NO (skip to 47) /3/ REFUSED 50

46. If there was an accident at the Shoreham nuclear power plant and your children were at school in an area that had to be evacuated, would you prefer that your children: be brought home or to a neighbor's by bus, or be bussed to a shelter outside the evacuation area, or be kept at school until you could pick them up?

/1/ BROUGHT HOME/TO NEIGHBOR'S /2/ BUSSED TO SHELTER 51

/3/ KEPT AT SCHOOL /4/ DON'T KNOW /5/ REFUSED

47. Do you currently work full time (30 hours a week or more) for pay?

/1/ YES (ask question 48) /2/ NO (skip to 49) /3/ REFUSED 52

48. About how long does it usually take you to get to work in the morning. . .less than 15 minutes, 15 to 30 minutes, 31 to 60 minutes, 61 to 90 minutes, or more than 90 minutes?

/1/ LESS THAN 15 /2/ 15 TO 30 /3/ 31 TO 60 /4/ 61 TO 90 53

/5/ MORE THAN 90 /6/ DON'T KNOW /7/ REFUSED

49. Are you currently married, single, widowed, or divorced or separated?

/1/ MARRIED (ask question 50) /2/ SINGLE (skip to 52) 54

/3/ WIDOWED (skip to 52) /4/ DIVORCED/SEPARATED (skip to 52)

/5/ REFUSED (skip to 52)

50. (IF MARRIED) Does your spouse currently work full time (30 hours a week or more) for pay?

/1/ YES /2/ NO (skip to 52) /3/ REFUSED (skip to 52) 55

51. About how long does it usually take your spouse to get to work in the morning. . .less than 15 minutes, 15 to 30 minutes, 31 to 60 minutes, 61 to 90 minutes, or more than 90 minutes?

/1/ LESS THAN 15 /2/ 15 TO 30 /3/ 31 TO 60 /4/ 61 TO 90 56

/5/ MORE THAN 90 /6/ DON'T KNOW /7/ REFUSED

52. What is the last grade of school that you completed. . .some high school or less, or are you a high school graduate, or did you complete some college courses, or are you a college graduate?

/1/ SOME HIGH SCHOOL OR LESS /2/ HIGH SCHOOL GRADUATE 57

/3/ SOME COLLEGE /4/ COLLEGE GRADUATE /5/ REFUSED

53. What is your age category. . .under 25, 25 to 35, 36 to 50, 51 to 65, or over 65?

/1/ UNDER 25 /2/ 25 TO 35 /3/ 36 TO 50 /4/ 51 TO 65 58

/5/ OVER 65 /6/ REFUSED

54. What is your total family income. . .under $15,000, $15,000 to $25,000, $26,000 to $35,000, $36,000 to $50,000, or over $50,000?

/1/ UNDER $15K /2/ $15K TO $25K /3/ $26K TO $35K 59

/4/ $36K TO $50K /5/ OVER $50K /6/ REFUSED

55. Would you consider yourself to be politically. . .liberal, middle-of-the-road, or conservative?

/1/ LIBERAL /2/ MIDDLE-OF-THE-ROAD /3/ CONSERVATIVE 60

/4/ DON'T KNOW /5/ REFUSED

56. What is your race. . .white, black, or other?

/1/ WHITE /2/ BLACK /3/ OTHER /4/ DON'T KNOW /5/ REFUSED 61

57. What is your religion. . .Catholic, Protestant, or Jewish?

/1/ CATHOLIC /2/ PROTESTANT /3/ JEWISH /4/ OTHER /5/ NONE 62

/6/ REFUSED

58. In general, would you say you are. . .very religious, somewhat religious, or not religious at all?

(1) VERY RELIGIOUS (2) SOMEWHAT RELIGIOUS (3) NOT RELIGIOUS AT ALL 63

(4) DON'T KNOW (5) REFUSED

59. How long have you lived on Long Island. . .all your life, more than 20 years, 10 to 20 years, 5 to 9 years, or less than 5 years?

(1) ENTIRE LIFE (2) MORE THAN 20 YRS (3) 10 TO 20 YRS 64

(4) 5 TO 9 YRS (5) LESS THAN 5 YRS (6) REFUSED

Thank you very much. . .have a nice day/evening.

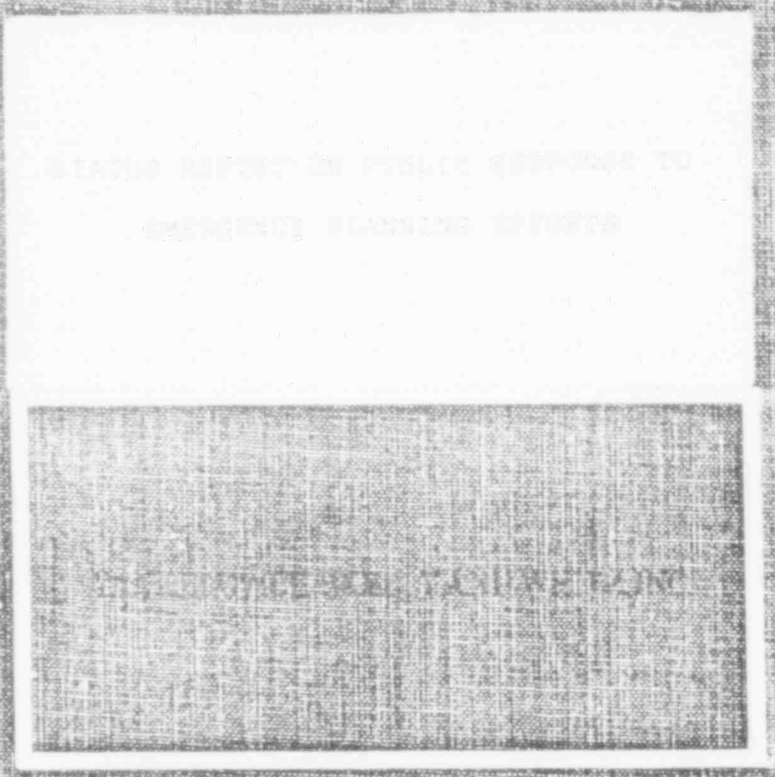


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OVERVIEW

OVERVIEW

This report presents the results of a survey of Suffolk and Nassau County residents designed to assess emergency planning needs associated with the start-up of the Shoreham Nuclear Power Plant in Suffolk County. Because this takes place prior to implementation of any public emergency response plans, the emphasis of the study is on determining the current state of emergency preparedness on the part of the public, instead of trying to estimate exactly how people would respond to a future event about which they currently have very little information. We believe this study provides useful guidance for planning efforts related to the plant.

A sample of 2,625 residents of the two-county area was surveyed in approximately 20-minute interviews conducted between May 5 and May 12, 1983. Respondents were selected using a stratified random sampling approach in a manner that permits very accurate projection to the total Nassau/Suffolk County population as well as to five specific segments within these counties: residents within a 5-mile radius of the plant; residents living 6-10 miles from the plant; the remainder of residents in East and West Suffolk County; and Nassau County residents. All survey procedures have been carefully supervised by YSW staff and the survey instrument was thoroughly reviewed by a number of experts to eliminate any detectable bias.

The results indicate that the Shoreham Nuclear Power Plant is a very high visibility enterprise, with nearly universal awareness throughout Suffolk County and high awareness in Nassau County. Reflecting the extensive debate that has been carried on, it is also a sensitive project. Three of every four people in Suffolk and Nassau Counties have at least some concerns about its opening, and nearly half the residents of Suffolk County are very concerned.

Yet the majority of Suffolk and Nassau County residents, especially those most concerned about Shoreham, appear to be basing their opinions on misconceptions about the actual risks associated with nuclear power plants. Over half believe that nuclear power plants can blow up, over half believe normally operating power plants expose one to more radiation than dental x-rays, and most people agree with several other statements about which there is a great deal of evidence which goes in the opposite direction. Thus, while their concern is logical in light of their beliefs about nuclear power, some of the basis of that concern is open to debate.

One of the more interesting findings of this study is that, although most people in Suffolk and Nassau Counties believe they would be affected by a serious accident at Shoreham, only a handful have done any planning for that contingency. This is not surprising since the plant is not yet opened. At the same time,

though, the majority of the population expresses a strong desire for additional information about emergency planning.

This lack of personal planning, coupled with the high level of fear about nuclear plant operations, is the key to understanding why many people react in an exaggerated and often inconsistent manner when presented with hypothetical scenarios describing emergencies requiring varying public reactions. In each of three scenarios, people living within a specified distance (either 5 or 10 miles) are advised either to stay inside their houses or to evacuate the area. Each time a substantial portion of the population (ranging from about 1 in 10 to more than a third), both inside and outside of the specified area, indicate they would leave their homes and go somewhere else. That this is attributable at least partially to a lack of any serious forethought is apparent when respondents are provided with more specific information telling them they can go about their normal business if they live outside the area. In each case, the proportion of respondents who indicate they would leave the area declines by about a third.

Another indication of the lack of planning and the need for more information is the proportion of people living within 10 miles of the plant--more than 1 in 4--who, when presented with a scenario in which they are advised to evacuate, indicate that they would <u>not</u> do so. This type of response is especially true of some groups, such as older residents.

These findings on reactions to emergency scenarios illustrate the importance of the form and substance of any emergency communications.

In evaluating communications, it is important to distinguish between information dissemination as part of the planning process distinct from the information that would be provided in an actual emergency. In this study, respondents were asked their views and sources of information about emergency planning related to the Shoreham plant. Most people now rely on Newsday and television for information about nuclear power issues. But a large majority (81%) desire more information from the media than they have received to date, and a significant minority (32%) view the coverage to date as biased against the plant. Further, a substantial proportion of the two-county population views neither LILCO nor the Suffolk County Executive as credible sources of information on nuclear power.

This situation poses a challenge for emergency planners. As part of planning efforts it is important to communicate with the public through credible sources, and to make those most closely involved (e.g., LILCO and the Suffolk County Executive) more credible. Accomplishing this is essential to effective communications, and as this study clearly indicates better communication is a necessity. There is a public desire for more information on emergency planning and, judging from responses to the

hypothetical emergencies in this survey, a need for clear guidance on the types of emergencies that could be anticipated and the responses that would be most appropriate.

I. INTRODUCTION AND STUDY PURPOSE

I. INTRODUCTION AND STUDY PURPOSE

This study was commissioned in order to obtain an assessment of the attitudes of Suffolk and Nassau County residents about the Shoreham Nuclear Power Plant and to determine how well people are prepared for the emergency planning effort that must accompany operation of that plant. YSW was pleased to accept this assignment because it provided us with an opportunity to explore a number of important issues related to a clearly controversial event and, we hope, a chance to shed some light on those issues.

It is important to begin with a statement of the basic assumptions guiding this study. The feasibility of plans for coping with all possible emergencies that might affect residents around the plant is one of the central issues influencing licensing proceedings. Clearly the public response to those plans is all-important. However, it is not possible at this time to assess through a survey exactly how the public might respond to an emergency situation. The primary prerequisite for an appropriate public response--dissemination and publicizing of emergency response information and directions--has not taken place. Nevertheless, it is important to understand at this point how receptive the public will be to those plans and what concerns or questions are likely to guide their actions.

The specific study goals are to:

...Assess the current state of public readiness: awareness of, knowledge and concerns about the plant.

...Determine responsiveness of the public to hypothetical emergency plans and instructions.

...Identify appropriate communications vehicles, the types of information people need, and credibility of various authorities.

...Generate data to help planners anticipate specific public needs in the event of different types of emergencies.

In other words, this study attempts to bridge the gap between current public attitudes and emergency response plans by examining the forces underlying those attitudes and identifying some of the questions that will have to be answered in order to develop an effective plan.

The next section of this report briefly describes the methodological approach of the study; a more detailed technical description is appended. Detailed study results and data tables are then presented.

II. STUDY METHODOLOGY

II. STUDY METHODOLOGY

This study is based on a survey of 2,625 adult residents of Suffolk and Nassau Counties. Using a stratified random sample of households with approximately equal numbers of respondents drawn from each of five areas: a zone within a radius of five miles of the Shoreham Nuclear Power Plant; a zone in a radius between six and ten miles of the plant; the balance of the Suffolk County population living east of the plant and the balance living west of the plant; and Nassau County.

The survey was conducted between May 5 and May 12, 1983 by WATS telephone calls made from five facilities located in New Jersey, Pennsylvania, and Minnesota. A random digit dialing procedure was used, drawing from telephone exchanges in each of the five strata. Businesses, research professionals and power company employees were screened out. Interviewers followed a prespecified procedure for selection of a household member to respond to the interview. Interviews lasted 20 minutes on average.

Completed interviews were computer tabulated and assigned to one of the five geographic strata using the zip code provided by respondents (since telephone exchanges are less accurate). A small number of completed interviews outside of the sample area or in

reported zip codes that could not be identified were excluded from the sample used for analysis. Interviews were weighted using standard procedures to bring the sample into the correct proportion of the total population of Suffolk and Nassau Counties. Because the population living close to the plant represents only a fraction of the total population being examined, those survey segments (5 and 10 mile zones) account for less than 4% of the total weighted sample even though based on a larger number of interviews. Sampling and weighting procedures and response figures are discussed in detail in the Appendix A.

The questionnaire for this study was developed after extensive review by YSW survey experts as well as outside reviewers. The intent was to develop an instrument that obtains insightful information on public knowledge, attitudes and behavioral intentions in a manner that reduces any possible bias. Several comments should be made about this.

First, there was a desire to obtain results to several questions that had been asked in the 1982 Suffolk County-sponsored survey of Long Island residents. Consequently, these questions--asking about projected behavior in three specific emergencies--were posed in a manner similar to that prior survey, using the same response codes, even though the response alternatives are not mutually exclusive and thus somewhat confusing. Follow-up questions were also posed presenting respondents with information

more in line with that which would be available in a real emergency notification. Comparisons of these results are discussed in the report.

Second, this survey constituted an attempt to understand, to some extent, why people feel as they do about the Shoreham plant, and where it fits into their lives. Methodological research by YSW has shown that many people express attitudes about specific issues, but those attitudes often are volatile; they are subject to being changed easily. In foreign policy, for example, we have found that people often express attitudes on issues about which they may not have given much thought. To measure this phenomenon, the survey posed a number of questions to determine how salient an issue the Shoreham plant is to residents and how much people have actually planned for possible emergencies. As this report indicates, the responses to these questions provide substantial guidance in understanding attitudes about the plant.

Third, it is always difficult to conduct surveys of highly visible issues because of the potential for publicity influencing respondents. In this case, on the day the interviewing began the Nuclear Regulatory Commission (NRC) warned the operators of the

Indian Point nuclear power plants that the plants might be closed because of deficiencies in their emergency plans. During the course of interviewing there was substantial media attention to that event as well as to the current status of the Shoreham plant and emergency plans.

III. RESULTS

A. Public Awareness, Attitudes and Knowledge

III. RESULTS

A. Public Awareness, Attitudes and Knowledge

Before the public information aspect of the emergency plan for Shoreham is implemented, it is useful to understand the knowledge and attitudes people have about the Shoreham Nuclear Power Plant, nuclear power in general, and the perceived impact of the plant on their lives. Understanding knowledge and attitudes about the plant can help determine what types of information need to be disseminated.

This survey confirms that the debate about, and resulting media attention associated with, Shoreham has created a very high level of awareness of the plant and a diversity of views about its merits and shortcomings. A substantial majority of the populations of Suffolk and Nassau Counties expresses at least moderate concern about the plant. At the same time, it is obvious that people in the area are basing their opinions on widely differing perceptions of the specific risks associated with the operation of the plant.

Specific results are discussed below:

1. Awareness of the Shoreham Nuclear Power Plant is very high (Table 1).

...Nine of every ten adults in Suffolk and Nassau Counties are aware of the existence of the plant, and 9 out of 10 of those aware of it can name it.

- Awareness is at the 99% level within the 10-mile radius of the plant, declining to 81% in Nassau County.

...Most (75%) know that LILCO is responsible for its operation and most (77%) are aware of its current status.

- Ninety-two percent of people living within 10 miles of the plant believe it is either ready to operate or still under construction.

...Most people know approximately how far the plant is from their homes, though some appear either to underestimate or to overestimate the distance (Table 2).

- One-quarter of those within five miles of the plant place themselves farther away.

- Of those living 6-10 miles from the plant, 10% place themselves closer and over a third place themselves farther away.

- About 1 in 10 living at least ten miles from the plant in the balance of Suffolk County believe they are actually within 10 miles of the plant.

  . This is partially explained by the definition of the Emergency Planning Zone used. See Appendix C for further information.

2. The prospect of the Shoreham Nuclear Power Plant beginning to operate is a source of some concern to most people in Suffolk and Nassau Counties (Table 3).

...Three-quarters of residents express concern about the plant opening versus 21% who indicate the prospect of its opening is pleasing.[1/]

...The level of concern is higher in Suffolk County, where half the population indicates they would be very concerned, than in Nassau County where the comparable figure is 38%.

- In addition, those who perceive themselves as close to the plant more often are very concerned about the plant opening than those who perceive themselves as living further away (Table 4.)

1/ As phrased, these responses to this question are not mutually exclusive; people can be pleased about having a new power source, yet still be concerned about the possible risks associated with it.

...Women are much more concerned about the plant opening than are men (Table 5).

...Level of concern about the plant varies somewhat by age of respondent--younger people (under 35) slightly more often report being concerned than those over 35 (Table 6).

- Concern varies little by income or education levels of respondents.

3. Given the very high proportion of the population with some concern about Shoreham, it is important to understand the knowledge base upon which people rely for making these judgments. The survey results suggest that there is a considerable amount of misinformation about nuclear power plants, little certainty and little agreement, even on issues about which experts on both sides of the issue agree.

Respondents in this survey were presented with a series of statements--some phrased in a positive manner and some in a negative manner--about nuclear power plant operations. For several of the statements there is agreement between nuclear energy experts, whether they are nuclear plant opponents or proponents, as to the accuracy of the statements (in particular, an item regarding the possibility of a nuclear plant exploding, and

another item on the relative radiation exposure from dental X-rays and a normally operating nuclear power plant). On the others there is some room for disagreement among experts as to the exact interpretation of the statements.

Irrespective of the agreement or disagreement among experts about the facts in each statement, the majority of respondents expresses views which demonstrate more extreme concerns about nuclear power, women more so than men (Tables 7 and 8).

...For example, half of all respondents believe strongly that a nuclear reactor can blow up.

...More than 4 in 10 believe there would not be sufficient time to evacuate safely in the event of an emergency.

These responses go a long way toward explaining the high level of concern many people have about the plant. Most people hold attitudes consistent with their beliefs. If they believe nuclear plants can blow up, they are concerned about Shoreham Nuclear Power Plant, and so on (Table 9).

TABLE 1

QUESTIONS 4, 6a, 5: AWARENESS OF SHOREHAM NUCLEAR POWER PLANT

(By area of residence)

		Areas				
	Total	5 Mile Zone	6-10 Mile Zone	Balance of: Eastern Suffolk	Balance of: Western Suffolk	Nassau
	%	%	%	%	%	%
Are aware of a nuclear power plant on Long Island	87	99	99	95	93	81
Know that name is Shoreham	77	95	95	87	87	67
Understand LILCO is responsible for plant operation	75	92	88	84	81	67
Believe Plant Is:						
Currently operating	3	1	*	1	2	4
Previously operated, now closed	3	*	2	1	2	4
Ready to operate	48	48	56	52	54	42
Under construction	28	47	36	35	30	26
Uncertain/no answer	5	3	5	6	5	5

* Less than 1%.

TABLE 2

QUESTION 9: PERCEIVED DISTANCE FROM SHOREHAM

(By area of residence[1/])

	Area (By Zip)			
	5 Mile Zone	6-10 Mile Zone	East Suffolk	West Suffolk
	%	%	%	%
Base	100	100	100	100
Distance Respondent Believes Home Is from Shoreham Power Plant				
5 miles or less	72	10	1	3
6 to 10 miles	23	53	6	10
11 to 15 miles	2	23	12	14
16 to 20 miles	*	7	17	20
21 to 30 miles	*	3	23	29
Over 30 miles	-	1	34	14
Uncertain/no answer	2	3	7	10

1/ See Appendix C for further discussion of the specific geographic zone.

* Less than 1%.

TABLE 3

QUESTION 7: REPORTED REACTION IF SHOREHAM PLANT BEGINS TO OPERATE

(By area of residence)

		Areas				
	Total	5 Mile Zone	6-10 Mile Zone	Balance of: Eastern Suffolk	Balance of: Western Suffolk	Nassau
	%	%	%	%	%	%
Base	100	100	100	100	100	100
Very pleased	10	10	5	7	8	11
Moderately pleased	11	12	11	10	11	12
Moderately concerned	33	26	31	26	33	34
Very concerned	42	49	48	53	45	38
Uncertain/ no answer	4	3	5	4	3	5

TABLE 4

QUESTION 7: REPORTED REACTION IF SHOREHAM PLANT BEGINS TO OPERATE

(Among People Living Different Distances From the Plant)

	Perceived Distance From Plant		
	5 Miles or Less	6-10 Mile Zone	10 Miles or More
	%	%	%
Base	100	100	100
Very pleased	11	7	11
Moderately pleased	10	9	12
Moderately concerned	18	34	33
Very concerned	51	48	40
Uncertain/no answer	10	2	4

TABLE 5

QUESTION 7: REPORTED REACTION IF SHOREHAM PLANT BEGINS TO OPERATE

(By sex)

	Men	Women
	%	%
Base	100	100
Very pleased	14	6
Moderately pleased	19	4
Moderately concerned	30	35
Very concerned	32	51
Uncertain/no answer	5	4

TABLE 6

QUESTION 7: REPORTED REACTION IF SHOREHAM PLANT BEGINS TO OPERATE

(By age)

	Age		
	Under 35 Years	35-50 Years	Over 50 Years
	%	%	%
Total	100	100	100
Very pleased	6	10	14
Moderately pleased	10	14	11
Moderately concerned	41	29	27
Very concerned	41	43	41
Uncertain/no answer	2	4	7

TABLE 7

QUESTION 30: BELIEFS ABOUT NUCLEAR POWER PLANTS

	Percent Who Find Statement: Very Believable 6	5	4	3	2	Completely Unbelievable 1
Nuclear reactors can blow up if something goes wrong	41	10	9	14	9	16
A serious nuclear power plant accident is likely to happen no more often than once every 100,000 years of nuclear power plant operation	11	5	7	15	15	46
The exposure to radiation someone receives from normal nuclear power plant operations is less than that received from one dental X-ray	16	9	9	18	13	30
The accident at the Three Mile Island nuclear power plant exposed many people who lived around the plant to high levels of radiation	32	15	13	20	8	11
Because nuclear power plants are designed to contain radiation, you would have ample time to leave the area after notification that there was an accident	15	9	11	22	16	26
Most nuclear power plants cost less money to operate than power plants that use oil as a fuel	22	12	12	18	10	22
Living close to a nuclear power plant is bad for your health in the long term even if there never is an accident	25	10	10	18	13	23

QUESTION: Now I am going to read you a series of statements about nuclear power. After I read each statement would you respond in the following way. Using a 6-point scale, where "6" means very believeable and "1" means completely unbelievable, how do you rate these statements?

TABLE 8

QUESTION 30: BELIEFS ABOUT NUCLEAR POWER PLANTS

(By sex)

	Men		Women	
	Un-believable*	Very Believable**	Un-believable*	Very Believable**
	%	%	%	%
Total	100	100	100	100
Nuclear reactors can blow up if something goes wrong	31	46	20	55
A serious nuclear power plant accident is likely to happen no more often than once every 100,000 years of nuclear power plant operation	60	19	63	13
The exposure to radiation someone receives from normal nuclear power plant operations is less than that received from one dental X-ray	38	32	46	19
The accident at the Three Mile Island nuclear power plant exposed many people who lived around the plant to high levels of radiation	25	37	15	56

Continued...

* Scale responses 1, 2.

** Scale responses 5, 6.

TABLE 8

QUESTION 30: BELIEFS ABOUT NUCLEAR POWER PLANTS
(Continued)

(By sex)

	Men		Women	
	Un-believable*	Very Believable**	Un-believable*	Very Believable**
	%	%	%	%
Total	100	100	100	100
Because nuclear power plants are designed to contain radiation, you would have ample time to leave the area after notification that there was an accident	41	28	44	21
Most nuclear power plants cost less money to operate than power plants that use oil as a fuel	30	42	33	27
Living close to a nuclear power plant is bad for your health in the long term even if there never is an accident	44	32	29	37

* Scale responses 1, 2.

** Scale responses 5, 6.

TABLE 9

QUESTION 7: REACTION TO SHOREHAM NUCLEAR POWER PLANT OPENING

(Aided)

		Beliefs About Impact of Nuclear Power[1]		
	Total	Negative[2]	Moderate	Positive
	%	%	%	%
Base	100	100	100	100
Very pleased to have a new source of power	10	7	9	15
Moderately pleased	11	5	12	13
Moderately concerned about risks associated with it	33	30	33	36
Very concerned	42	51	42	32
Uncertain/no answer	4	7	4	4

1/ Respondents are categorized using responses to three scaled questions: (1) nuclear power plants can blow up; (2) normal nuclear power plant operations expose one to less radiation than dental x-rays; (3) living close to a nuclear power plant is bad for your health in the long-term even if there never is an accident. Responses to the second item were statistically reversed and each respondent's answers to the 3 questions were summed to yield an index score that can be used to describe respondents' beliefs about the potential impact of nuclear power.

2/ Negative group defined as those respondents with scale responses 14-18; moderate are 8-13; positive are 3-7.

B. Indications of Planning by the Public for Emergencies

B. Indications of Planning by the Public for Emergencies

Any survey can provide only general guidance in projecting the future behavior of a population group. In most instances--for example, projections of future investment decisions or future energy use--the responses given by individuals about their intentions are often modified over time by changes in the information available and circumstances involved with the future behavior (energy prices increase, interest rates change, the person loses his job, etc.). This is particularly true when asking people to project how they would behave in a situation (e.g., a power plant emergency) with which they have no prior experience and which, moreover, involves stress. Furthermore, since no instructions have been disseminated to residents of the area regarding what to do in an emergency, most people must react in an information vacuum; lacking specific guidance, their reactions are a relatively close reflection of their more general attitudes about the plant.

This survey provides some indication, however, of how many area residents have done any emergency planning, as well as their projected reactions to several emergency situations involving differing amounts of information.

As one might expect at this stage of the emergency planning process, most people have made no plans regarding what they would do

if there were an emergency at the Shoreham Nuclear Power Plant after it began to operate. This is the case, even though they believe they might be affected by such an emergency. Most people express a strong desire for information that would help them plan for an emergency, regardless of how far they live from the plant. Respondents in this survey were presented with several hypothetical situations describing emergencies of varying seriousness at the power plant and were asked how they thought they might react.

When presented with an abbreviated message concerning an emergency at the plant substantial numbers of people indicate they would react by leaving their homes, even if they live outside the affected area. However, the introduction of additional information specifically directed at people not living close to the plant would cause a significant proportion of these people to change their response to the question (that is, they say they would <u>not</u> leave the area).

Those who are most concerned about the plant opening, who are also the ones negative about nuclear power in general (recall Table 9), react most sharply to hypothetical emergency situations.

Reactions to the hypothetical emergency scenarios also demonstrate in the opposite way the need for additional information about emergency behavior. In each case, a substantial minority

of up to one-quarter of respondents in the area presumably affected by the emergency indicate they would not take the minimum actions advised to protect their safety.

The overwhelming conclusion that these findings and those in the previous section point to is that there is a dearth of information in the hands of area residents on the types of emergencies they might expect, who would be affected and how they should react.

Specific findings are detailed below.

1. Although 9 out of 10 residents living within the 10-mile zone believe they would be affected by a serious problem at the Shoreham Nuclear Power Plant, only about 1 in 10 have done any planning for how they would respond in an emergency.

   ...The proportion of people who believe they would be affected by a problem declines with increasing distance from the plant, dropping to a still-high 64% in Nassau County (Table 10).

   ...But only within the 5-mile range of the plant have as many as 1 in 4 residents done any planning for an emergency.

...Those residents who are most concerned about the prospect of the plant opening are also most likely to believe they would be affected by an emergency and to have done some planning for that contingency, though even among this group only a portion have done some planning (Table 11).

2. Nearly 6 out of 10 residents surveyed indicate a strong desire for additional information on emergency planning (Table 12).

...Those who are concerned about the plant's opening indicate a greater desire for emergency planning information.

...Most people indicate a desire for more information about emergency planning, regardless of whether they live inside or outside the 10-mile zone (Table 13).

- Even those who indicate they have done some planning want more information.

3. When presented with hypothetical scenarios describing potential emergency situations (see Exhibit A), a large proportion of the population both inside and outside the

theoretically affected areas reports that they would either do more or less than the emergency instructions indicated.

...In each of three scenarios describing increasingly severe emergency situations, two-thirds to three-quarters of those people living in unaffected areas indicate they would respond by taking actions that would not be required under the framework of the scenarios (i.e., either staying inside their homes or leaving their homes to get out of the area). (Tables 14, 15, 16).

...However, the introduction of additional information into each scenario explaining that other areas are not affected causes many people in those unaffected areas who believe they would otherwise have left the area to remain (Tables 14, 15, 16).

- In the scenario calling for evacuation of a 10-mile area, the proportion of people outside the area who think they would leave their homes drops by a third from 43% to 29% (Table 16).

EXHIBIT A

Hypothetical Emergency Scenarios

Scenario One:

Understanding that you may not have given this issue much thought to this point, let me pose some hypothetical situations. Suppose that you and your family were at home and there was an accident at the Shoreham Nuclear Power Plant. Some radioactive steam was released into the atmosphere and all people who lived within five miles of the plant were advised to stay indoors for several hours. Given where you live, do you think that you and the other members of your family would be likely to:

Addition to Scenario One: If the announcement included a message that people living more than five (5) miles from the plant were advised they could go about their normal business, again given where you live, is it likely that you would:

Scenario Two:

Suppose that you and your family were at home and there was an accident at the Shoreham Nuclear Power Plant that created a possibility of increasing the level of radiation around the plant. All pregnant women and pre-school children living within five miles of the plant were advised to evacuate and everyone else living within ten miles of the plant was advised to remain indoors. Given where you live, is it likely you and other members of your family would:

Addition to Scenario Two: If the announcement included a message that people living more than 10 miles from the plant were advised they could go about their normal business, again given where you live, is it likely you would:

Scenario Three:

Suppose that you and your family were at home and there was an accident at the Shoreham Nuclear Power Plant that created a greater risk of releasing radiation into the area around the plant. Everyone living within ten miles of the plant was advised to evacuate until the problem was solved. Given where you live, is it likely that you and other members of your family would:

Addition to Scenario Three: In this last situation, if the announcement included a message that people living more than 10 miles from the plant did not need to evacuate, again given where you live, is it likely that you would:

Responses for Each Scenario:

- Do what would normally do
- Stay inside your home
- Leave your home and go somewhere else

4. Several factors have a substantial impact on reactions to these hypothetical emergencies.

...The distance from the plant people perceive themselves to live has a slight influence on reactions (Tables 17, 18).

- People who perceive themselves as living inside the affected zone are more likely to react with actions at least as sharp as those advised.

- People who perceive themselves living outside the affected zone show a commensurately greater likelihood of going about their normal business.

...People who express a high level of concern about Shoreham Nuclear Power Plant are much more likely than others to indicate they would leave the area in any emergency even if they are advised it is not necessary (Table 19).

...Men and women indicate the same propensity to stay and leave, though in each scenario women more often indicate they would stay inside their home while men indicate they would go about their normal business (Table 20).

...Younger people (under 35) are more likely to indicate a propensity to evacuate in all circumstances; older people (over 50) are more likely to stay inside their homes regardless of circumstances (Table 21).

...Those who hold the most negative beliefs about the impact of nuclear power are more likely to say they would leave the area in an emergency when presented with limited information (Table 22).

- But, they respond more appropriately when provided with complete information.

...In the second scenario, responses are clearly affected by the presence of pregnant women or preschool children, the two specifically targeted groups (Table 23).

5. Given the considerable variability in responses to these hypothetical scenarios, it is difficult to make projections to the total population. Further, these projections do not have the type of real-life validation of survey forecasts as is available in other areas--for example, voting behavior or product-purchase behavior--because no empirically-derived and tested model exists.

Understanding this, projections to the total population of the two-county area, using what we understand to be the most realistic emergency communications scenarios, would yield the following results:[1]

...In an emergency where people within five miles of the plant were advised to stay inside and others outside the area advised they could go about their normal business, representatives of approximately 100,000 households in Nassau and Suffolk Counties currently say they would leave their homes and go someplace else.[2] All of these people would be responding with an action more drastic than advised in the emergency notification.

...In an emergency where pregnant women and pre-school children living within five miles are advised to evacuate, all others within ten miles requested to stay indoors, and anyone living further than ten miles from the plant advised

---

1/ Population projections are based on April, 1983 census counts by tract. The projections are based on the percentage of the total survey sample that indicate they would leave their home in each of the three scenarios where full information is provided.

2/ Adjusting for a statistical sampling error of ± 2% on the 12% of the population who think they would leave yields a projection of between 80,000 and 120,000 households.

they can go on with their normal business, approximately 175,000 household representatives currently say they would leave the area.[1] Of these, fewer than 2,000 would be responding as suggested; this group would be the pregnant women and children living within five miles of the plant. The remainder would be reacting more strongly than advised.

...In an emergency where everyone within ten miles is advised to evacuate and others told they don't need to, approximately 245,000 representatives of households currently say they would leave the area.[2] Of these, 18,000 would be responding as instructed; the remainder would be from outside the affected area.[3]

1/ Adjusting for a statistical sampling error of + 3% on the percent who think they would leave would yield a projection range of 150,000 to 200,000 households.

2/ Adjusting for a statistical sampling error of + 3% on the percent who think they would leave would yield a projection range of 220,000 to 270,000 households.

3/ We discovered after completion of this survey that the actual emergency planning zone is slightly different than the one used here. If results are examined using that zone, the number of households responding appropriately (by leaving) in this scenario would rise to 24,000, leaving 221,000 responding with actions more drastic than necessary. See Appendix C for further discussion of the Emergency Planning Zone boundaries.

TABLE 10

QUESTION 10b: PLANNING FOR NUCLEAR PLANT EMERGENCIES

		Areas				
				Balance of:		
	Total	5 Mile Zone	6-10 Mile Zone	Eastern Suffolk	Western Suffolk	Nassau
	%	%	%	%	%	%
Respondents who believe they would be affected by a serious problem at Shoreham/not sure	79	93	94	84	88	70
Have done some personal emergency planning	11	27	17	16	15	6
Have done no planning for emergencies related to Shoreham operations	68	66	77	68	73	64
Respondents who believe they would not be affected by a serious problem at Shoreham	21	7	6	16	12	30

TABLE 11

QUESTION 10b: PLANNING FOR NUCLEAR PLANT EMERGENCIES

		Reaction to Shoreham Opening	
	Total	Pleased	Concerned
	%	%	%
Respondents who believe they would be affected by a serious problem at Shoreham/not sure	79	63	84
Have done some personal emergency planning	11	8	11
Have done no planning for emergencies related to Shoreham operations	68	55	73
Respondents who believe they would not be affected by a serious problem at Shoreham	21	37	16

TABLE 12

QUESTION 11b: PLANNING INFORMATION NEEDS

	Total	Reaction to Shoreham Opening: Pleased	Reaction to Shoreham Opening: Concerned
	%	%	%
Base	100	100	100
In Terms of Planning for Emergencies Related to Shoreham Nuclear Power Plant:			
1 - Definitely need more information	44	26	49
	>58%	>35%	>64%
2 -	14	9	15
3 -	13	21	11
4 -	8	9	7
5 -	7	12	5
6 - Do not need more information	14	23	12
Uncertain/no answer	*	-	1

* Less than 1%.

TABLE 13

QUESTION 11b: PLANNING INFORMATION NEEDS

	Believe Affected by a Nuclear Emergency			
	Live Within 10 Miles		Live over 10 miles	
	Have Planned	Have Not Planned	Have Planned	Have Not Planned
	%	%	%	%
Base	100	100	100	100
In Terms of Planning for Emergencies Related to Shoreham Nuclear Plant:				
1 - Definitely need more information	29	43	37	45
	>44%	>53%	>54%	>60%
2 -	15	10	17	15
3 -	12	15	14	13
4 -	12	8	10	7
5 -	11	5	7	7
6 - Do not need more information	21	18	15	13
Uncertain/no answer	-	1	-	-

TABLE 14

QUESTIONS 12a AND 12b: PROJECTED REACTION TO EMERGENCY SCENARIO ONE[1/]

		Areas				
	Total	5 Mile Zone	6-10 Mile Zone	Balance of: Eastern Suffolk	Balance of: Western Suffolk	Nassau
	%	%	%	%	%	%
Total	100	100	100	100	100	100
Projected Reaction to an Emergency Requiring:						
People Within Five Miles of Plant to Stay Indoors						
Do what would normally do	31	2	12	25	22	40
Stay inside home	49	71	59	59	54	45
Leave home/go somewhere else	17	24	28	12	21	13
Uncertain/no answer	3	3	1	4	3	2
People Within Five Miles of Plant to Stay Indoors and Others are Told to go About Their Normal Activities						
Do what would normally do	32	3	12	26	24	42
Stay inside home	53	71	62	61	56	47
Leave home/go somewhere else	12	22	24	8	16	8
Uncertain/no answer	3	4	2	5	4	3

1/ See Appendix D, item C.

QUESTIONS 14a AND 14b: PROJECTED REACTION TO EMERGENCY SCENARIO TWO[1/]

	Total	Areas				
		5 Mile Zone	6-10 Mile Zone	Balance of: Eastern Suffolk	Balance of: Western Suffolk	Nassau
	%	%	%	%	%	%
Total	100	100	100	100	100	100
Projected Reaction to an Emergency Requiring:						
Evacuation of Pregnant Women/ Preschool Children Within Five Miles and Others Within Ten Miles to Stay Indoors						
Do what would normally do	25	3	7	25	17	33
Stay inside home	44	47	49	49	45	41
Leave home/go somewhere else	28	47	42	22	35	23
Uncertain/no answer	3	3	2	4	3	3
Evacuation of Pregnant Women/ Preschool Children Within Five Miles and Others Within Ten Miles to Stay Indoors; People Outside the Ten-Mile Area Could Continue as Normal						
Do what would normally do	27	5	8	26	20	35
Stay inside home	48	54	54	55	50	45
Leave home/go somewhere else	21	37	35	15	27	15
Uncertain/no answer	4	4	3	4	3	5

1/ See Appendix D, item C.

TABLE 16

QUESTIONS 16 AND 17: PROJECTED REACTION TO EMERGENCY SCENARIO THREE[1/]

		Areas				
	Total	5 Mile Zone	6-10 Mile Zone	Balance of: Eastern Suffolk	Balance of: Western Suffolk	Nassau
	%	%	%	%	%	%
Total	100	100	100	100	100	100
Projected Reaction to an Emergency Requiring:						
Evacuation of Everyone Within Ten Miles of Plant						
Do what would normally do	22	2	5	18	14	29
Stay inside home	31	22	21	39	26	35
Leave home/go somewhere else	43	74	72	39	56	33
Uncertain/no answer	4	2	2	4	4	3
Evacuation of Everyone Within Ten Miles of Plant; People Living Beyond Ten Miles Need not Evacuate						
Do what would normally do	26	5	11	22	19	33
Stay inside home	41	34	32	48	38	43
Leave home/go somewhere else	29	58	54	24	38	20
Uncertain/no answer	4	3	3	6	5	4

1/ See Appendix D, item C.

TABLE 17

QUESTION 12a: PROJECTED REACTION TO AN EMERGENCY REQUIRING PEOPLE WITHIN FIVE MILES OF PLANT TO STAY INDOORS

(By perceived/actual distance from plant)

	Zip Code Area	Perceived Distance from Shoreham
	5 Miles or Less	5 Miles or Less
	%	%
Base	100	100
Do what would normally do	2	6
Stay inside home	71	63
Leave home/go somewhere else	24	30
Uncertain/no answer	3	1

TABLE 18

QUESTION 14a: PROJECTED REACTION TO AN EMERGENCY REQUIRING EVACUATION OF PREGNANT WOMEN AND PRESCHOOL CHIDREN LIVING WITHIN FIVE MILES AND OTHERS WITHIN TEN MILES OF PLANT TO STAY INDOORS

(By perceived/actual distance from plant)

	Zip Code Areas Under 10 Miles	Perceived Distance from Shoreham Under 10 Miles
	%	%
Base	100	100
Do what would normally do	6	2
Stay inside home	48	46
Leave home/go somewhere else	44	51
Uncertain/no answer	2	1

TABLE 19

QUESTION 12a: PROJECTED REACTION TO AN EMERGENCY ADVISING PEOPLE WITHIN FIVE MILES OF THE PLANT TO STAY INDOORS

(By concern about Shoreham)

	Population Living Within 5 Mile Zone	
	Reaction to Shoreham	
	Pleased	Concerned
	%	%
Base	100	100
Do what would normally do	4	1
Stay inside home	86	66
Leave home/go somewhere else	10	29
Uncertain/no answer	-	4

TABLE 20

QUESTION 17: PROJECTED REACTION TO AN EMERGENCY ADVISING PEOPLE WITHIN TEN MILES OF THE PLANT TO EVACUATE; ALL OTHERS CAN GO ABOUT NORMAL BUSINESS

(By sex)

	Men	Women
	%	%
Base	100	100
Do what would normally do	31	21
Stay inside home	36	45
Leave home/go somewhere else	28	30
Uncertain/no answer	5	4

TABLE 21

QUESTION 17: PROJECTED REACTION TO AN EMERGENCY ADVISING EVERYONE WITHIN TEN MILES OF THE PLANT TO EVACUATE; PEOPLE LIVING BEYOND TEN MILES NEED NOT EVACUATE

(By age)

	Age		
	Under 35 Years	35-50 Years	Over 50 Years
	%	%	%
Base	100	100	100
Do what would normally do	23	27	28
Stay inside	37	37	48
Leave home/go somewhere else	37	33	17
Uncertain/no answer	3	3	7

TABLE 22

QUESTION 17: PROJECTED REACTION TO AN EMERGENCY ADVISING PEOPLE WITHIN TEN MILES OF THE PLANT TO EVACUATE; PEOPLE LIVING BEYOND TEN MILES NEED NOT EVACUATE

(By beliefs about nuclear power)

	Beliefs About Impact of Nuclear Power[1]		
	Negative	Moderate	Positive
	%	%	%
Base	100	100	100
Projected Reaction to an Emergency Requiring:			
Evacuation of Everyone Within Ten Miles of Plant			
Do what would normally do	16	20	31
Stay inside home	32	32	28
Leave home/go somewhere else	50	44	39
Uncertain/no answer	2	4	2
Evacuation of Everyone Within Ten Miles of Plant; People Living Beyond Ten Miles Need Not Evacuate			
Do what would normally do	22	24	33
Stay inside home	49	41	37
Leave home/go somewhere else	27	30	27
Uncertain/no answer	2	5	3

1/ Respondents are categorized using responses to three scaled questions: (1) nuclear power plants can blow up; (2) normal nuclear power plant operations expose one to less radiation than dental x-rays; (3) living close to a nuclear power plant is bad for your health in the long-term even if there never is an accident. Responses to the second item were statistically reversed and each respondent's answers to the 3 questions were summed to yield an index score that can be used to describe respondents' beliefs about the potential impact of nuclear power. These respondents categorized as negative are most fearful of the impact of nuclear power plants.

TABLE 23

QUESTION 14b: PROJECTED REACTION TO AN EMERGENCY REQUIRING EVACUATION OF PREGNANT WOMEN/PRESCHOOL CHILDREN WITHIN FIVE MILES AND OTHERS WITHIN TEN MILES TO STAY INDOORS; OTHERS COULD CONTINUE AS NORMAL

(By presence of affected groups)[1/]

	Areas			
	5 Mile Zone		6-10 Mile Zone	
	Preschool Children/ Pregnant Women in Household	No Preschool Children/ Pregnant Women in Household	Preschool Children/ Pregnant Women in Household	No Preschool Children/ Pregnant Women in Household
	%	%	%	%
Base	100	100	100	100
Do what would normally do	4	5	6	8
Stay inside home	25	60	38	58
Leave home/go somewhere else	69	31	56	31
Uncertain/no answer	2	4	-	3

1/ The proportion of households containing these groups is 25% within the 5-mile zone and 22% in the 6-10 mile zone.

C. Public Information/Education Issues

C. Public Information/Education Issues

Effective emergency planning requires an understanding of how best to reach the population of the area. This survey reveals two major challenges for planners. First, the area population appears less than completely satisfied by either the completeness or the fairness of news coverage about the plant. Thirty-two percent of the two-county population consider media coverage biased against the plant. Second, no single official source is viewed as highly credible by a majority of the population. LILCO and the Suffolk County Executive each are viewed as highly credible by less than a quarter of the population.

Specifics are the following:

1. The single most important source Suffolk and Nassau County residents rely on for information about nuclear power issues is Newsday, followed by television and the New York City newspapers (Table 24).

   ...Those who are concerned about the opening of Shoreham rely more heavily than those pleased by the prospect of its opening on Newsday and TV for information on nuclear issues (Table 25).

   - While those more favorable about Shoreham report greater reliance on

other sources, especially government agencies.

...Although a significant proportion of Suffolk and Nassau County residents, especially those close to the plant, have received materials about Shoreham from LILCO or from opponents of the plant, only a handful report substantial reliance on those sources for information (Tables 24, 26, 27).

- People with more negative beliefs less often have received brochures on Shoreham either from LILCO or opponents to Shoreham, or have watched news segments.

- More than 2 out of 5 have seen TV special segments or news stories about Shoreham.

2. Even though there obviously has been substantial media attention devoted to the Shoreham plant, most of the two-county residents rate media coverage either incomplete or inadequate. Further, though a plurality rate media coverage of Shoreham to date as balanced in approach, one-third believe that it has been biased against the plant (Tables 28 and 29).

...These views are not substantially different among those groups pleased with and concerned about the plant, though people with more favorable attitudes toward the plant are more likely to believe media coverage has had a bias against the plant (Tables 30 and 31).

3. Of those groups or individuals most closely involved with the Shoreham plant, state health officials, Civil Defense and the Nuclear Regulatory Commission (NRC) are viewed as credible by the largest proportions of the Suffolk and Nassau County populations when nuclear power issues are discussed, though even these groups are considered highly credible by only about half of the population (Table 32).

...The two most active Shoreham participants, LILCO and the Suffolk County Executive, are the least credible of all these sources.

- Their respective rankings vary sharply according to whether they are being rated by people pleased with or concerned about Shoreham, with those most concerned more positive about the County Executive and those less concerned more positive about LILCO (Table 33).

- The Governor and TV or radio reporters get credibility ratings slightly higher than, but within the same range as, LILCO and the Suffolk County Executive.

TABLE 24

QUESTION 33: PRIMARY SOURCES OF INFORMATION ON NUCLEAR POWER ISSUES

		Areas				
	Total	5 Mile Zone	6-10 Mile Zone	Balance of: Eastern Suffolk	Balance of: Western Suffolk	Nassau
	%	%	%	%	%	%
Base	100	100	100	100	100	100
Newsday	34	29	32	22	34	34
Television	19	13	13	15	18	21
New York City newspapers	14	11	7	19	9	18
Governmental agencies	7	5	7	6	7	6
Other local newspapers	5	3	6	7	6	5
Radio	4	5	7	4	4	4
Discussions with friends and neighbors	3	8	3	4	5	1
Suffolk Life	3	9	8	9	4	--
Brochures/mail from utilities	2	4	3	3	1	2
Brochures/mail from nuclear power opponents	1	2	4	2	2	1
Other sources	7	9	9	7	7	7
No answer	1	2	1	2	1	1

TABLE 25

QUESTION 33: PRIMARY SOURCES OF INFORMATION ON NUCLEAR POWER ISSUES

(By concern about Shoreham)

	Reaction to Shoreham Opening	
	Pleased	Concerned
	%	%
Base	100	100
Newsday	30	36
Television	11	21
New York City newspapers	14	14
Governmental agencies	11	5
Other local newspapers	10	4
Radio	5	4
Discussions with friends and neighbors	3	3
Suffolk Life	2	3
Brochures/mail from utilities	3	1
Brochures/mail from nuclear power opponents	**	2
Other sources	11	6
No answer	**	1

** Less than 1%.

TABLE 26

QUESTIONS 34, 35, AND 36: INFORMATION RECEIVED ABOUT THE SHOREHAM POWER PLANT

		Areas				
				Balance of:		
	Total	5 Mile Zone	6-10 Mile Zone	Eastern Suffolk	Western Suffolk	Nassau
Percentage Who:	%*	%*	%*	%*	%*	%*
Have received brochures/mail from LILCO discussing Shoreham	41	82	82	46	46	34
Have received brochures/mail from opponents of Shoreham	28	49	44	39	34	22
Have seen TV specials/news segments about Shoreham	42	49	36	35	45	41

* Multiple responses.

TABLE 27

QUESTIONS 34, 35, and 36a: INFORMATION RECEIVED ABOUT THE SHOREHAM POWER PLANT

(By beliefs about nuclear power)

	Beliefs About Impact of Nuclear Power[1]		
	Negative	Moderate	Positive
Percentage Who:	%*	%*	%*
Have received brochures/ mail from LILCO discussing Shoreham	36	41	46
Have received brochures/ mail from opponents of Shoreham	24	29	31
Have seen TV specials/news segments about Shoreham	34	43	46

* Multiple responses.

1/ Respondents are categorized using responses to three scaled questions: (1) nuclear power plants can blow up; (2) normal nuclear power plant operations expose one to less radiation than dental x-rays; (3) living close to a nuclear power plant is bad for your health in the long-term even if there never is an accident. Responses to the second item were statistically reversed and each respondent's answers to the 3 questions were summed to yield an index score that can be used to describe respondents' beliefs about the potential impact of nuclear power.

TABLE 28

QUESTION 36b: COMPLETENESS OF NEWS MEDIA COVERAGE OF SHOREHAM NUCLEAR POWER PLANT

	Total
	%
Base	100
Informative and complete	11
Informative but not complete	46
Inadequate	35
Uncertain	8

TABLE 29

QUESTION 36c: BIAS OF NEW MEDIA COVERAGE

	Total
	%
Base	100
Biased in favor of the plant	8
Balanced	45
Biased against the plant	32
Uncertain	15

TABLE 30

QUESTION 36b: COMPLETENESS OF NEWS MEDIA COVERAGE OF SHOREHAM NUCLEAR POWER PLANT

	Reaction to Shoreham Opening	
	Pleased	Concerned
	%	%
Base	100	100
Informative and complete	15	10
Informative but not complete	39	48
Inadequate	39	35
Uncertain	7	7

TABLE 31

QUESTION 36c: BIAS OF NEWS MEDIA COVERAGE

	Reaction to Shoreham Opening	
	Pleased	Concerned
	%	%
Base	100	100
Biased in favor of the plant	3	10
Balanced	38	46
Biased against the plant	47	28
Uncertain	12	16

TABLE 32

QUESTION 18: CREDIBILITY OF INFORMATION SOURCES REGARDING NUCLEAR POWER

	Total	Areas				
		5 Mile Zone	6-10 Mile Zone	Balance of: Eastern Suffolk	Balance of: Western Suffolk	Nassau
	%*	%*	%*	%*	%*	%*
Percentage Who Would Rate as Highly Believable Statements About Nuclear Power Issues by 1/:						
Civil Defense	51	43	49	50	49	53
State health officials	51	46	46	47	51	51
The Nuclear Regulatory Commission	44	43	33	38	45	45
The Police	41	42	39	46	38	42
The Governor	32	33	24	35	29	34
TV and radio reporters	30	27	27	28	29	31
The Suffolk County Executive	23	27	25	27	27	21
LILCO	23	24	14	13	21	25

* Multiple responses.

1/ Rated "5" or "6" on a 6-point scale where 1 equals completely unbelievable and 6 equals completely believable.

TABLE 33

QUESTION 18: CREDIBILITY OF INFORMATION SOURCES REGARDING NUCLEAR POWER

(By views about Shoreham)

	Reaction to Shoreham Opening	
	Pleased	Concerned
	%*	%*
Percentage Who Would Rate as Highly Believable Statements About Nuclear Power Issues by[1]:		
Civil Defense	50	51
State health officials	45	52
The Nuclear Regulatory Commission	53	42
The Police	44	39
The Governor	33	31
TV and radio reporters	26	30
The Suffolk County Executive	16	25
LILCO	39	18

* Multiple responses.

1/ Rated "5" or "6" on a 6-point scale where 1 equals completely unbelievable and 6 equals completely believable.

D. Needs of People Living Within Ten-Mile Zone Regarding Evacuation

D. Needs of People Living Within Ten-Mile Zone Regarding Evacuation

In order to anticipate potential population needs in an emergency, people living within ten miles of the plant were asked where they would go in an emergency requiring evacuation, how they would plan to get there and what special needs they might have. Recognizing that most people will have some difficulty answering these questions (especially since most have not planned for this contingency) the answers provide a general indication of needs.

1. If they had to evacuate, about half of the people living within ten miles of the plant would leave Long Island (Tables 34 and 35).

   ...Fourteen percent are uncertain and another 4% indicate they would not leave their homes.

2. The vast majority would travel by car (Table 36).

   ...Three percent would plan to take boats.

   ...Only 1% indicate they would need transportation.

3. About 7% of the households contain a handicapped or disabled person, but only 1% would require some transportation assistance (Tables 37 and 38).

   ...People with school-age children (one-third of the households in the 10-mile zone) would most often prefer to pick their children up at school in an emergency if time permitted, rather than having them bused directly out of the area or brought home (Table 39).

4. Only 7% of the people within the 10-mile zone indicate they would need a public shelter. Nearly 6 out of 10 would plan to go to somebody else's house if they left the area (Table 40).

TABLE 34

QUESTION 20: DESTINATION IN CASE OF AN EMERGENCY

- Population Living Within 10-Mile Zone -

	Total	Areas	
		5 Mile Zone	6-10 Mile Zone
	%	%	%
Some place in Suffolk County	19	19	19
Some place in Nassau County	15	19	13
Some place in New York City	23	18	25
Some other place	25	24	27
Stay at home	4	6	3
Uncertain	14	14	13
Refused	-	-	-

TABLE 35

QUESTION 21: DISTANCE OF EVACUATION DESTINATION FROM RESIDENCE

- Among Those Who Would Evacuate and Live Within 10 Miles of Plant-

	Total	Areas	
		5 Mile Zone	6-10 Mile Zone
	%	%	%
Respondents who would evacuate	82	80	84
10 miles or less	8	8	8
11 - 20 miles	6	7	5
21 - 30 miles	7	7	8
31 - 40 miles	5	7	4
41 - 50 miles	11	9	12
More than 50 miles	42	39	43
Uncertain/no answer	3	3	4

TABLE 36

QUESTION 23: MODE OF TRANSPORTATION

- Among Those Who Live Within Ten Miles of Shoreham and Would Evacuate -

	Total	Areas: 5 Mile Zone	Areas: 6-10 Mile Zone
	%	%	%
Respondents who would evacuate	82	80	84
Car	70	69	70
Boat	3	3	3
Train	2	1	2
Would need transportation	1	1	-
Other means	3	4	4
Uncertain/no answer	3	2	5

TABLE 37

QUESTION 28: SPECIAL CONDITIONS OF HOUSEHOLD MEMBERS

- Population Living Within 10-Mile Zone -

	Total	Areas	
		5 Mile Zone	6-10 Mile Zone
	%	%	%
In need of special medical/ dietary supplies	12	13	11
Disabled or handicapped	7	6	8
Pregnant	3	2	3

TABLE 38

QUESTION 29: TRANSPORTATION NEEDS OF DISABLED/ HANDICAPPED HOUSEHOLD MEMBERS

- Population Living Within 10-Mile Zone -

	Total	Areas	
		5 Mile Zone	6-10 Mile Zone
	%	%	%
Have disabled person in household	7	6	8
Have own transportation	6	4	7
Need special transportation	1	2	1

TABLE 39

QUESTION 27: PREFERRED EVACUATION PROCEDURES FOR SCHOOL-AGE CHILDREN

- Among Those with Children Ages 5-17 Years -

	Total	Areas: 5 Mile Zone	Areas: 6-10 Mile Zone
	%	%	%
Have school-age children	32	26	36
Pick children up from school	20	16	22
Bus children directly out of the area to designated locations	7	7	8
Bring children home	4	2	5
Uncertain/no answer	1	1	1

TABLE 40

QUESTION 22: TYPE OF DESTINATION

- Among Those Who Live Within Ten Miles of Shoreham and Would Evacuate -

	Total	Areas	
		5 Mile Zone	6-10 Mile Zone
	%	%	%
Respondents who would evacuate	83	80	84
Somebody else's home	56	59	54
A hotel or motel	10	4	11
A public shelter	7	9	8
Somewhere else	8	7	9
Uncertain/no answer	2	1	2

IV. APPENDICES

A. Sample Design and Study Methodology

A. SAMPLE DESIGN AND STUDY METHODOLOGY

Sampling Objectives

The sampling plan for this project was designed to meet the following criteria:

...To deliver representative and projectable samples of the general public, 18 years of age or older, who reside in five specified areas in Suffolk and Nassau Counties. The five areas are defined in terms of proximity to the Shoreham Nuclear Power Plant and are:

- Within a five-mile radius of the Shoreham Nuclear Power Plant
- Within a six- to ten-mile radius of the plant
- More than ten miles from the plant and east of the plant
- More than ten miles from the plant, west of the plant and in Suffolk County
- In Nassau County.

...To ensure that each sample was distributed across all neighborhood segments in proportion to the numbers of households in those segments so that the sample yielded a truly reliable cross-section of each area being surveyed.

...To utilize random probability sampling procedures in the stratification and selection of sample households and to include rigid sample controls so as to prevent the introduction of possible bias into any of the samples.

...To include a procedure for randomly selecting one adult 18 years of age or older from among all available in each sample household so that all individuals in the population being surveyed had an appropriate probability of being selected in the sample.

...To provide for the proper inclusion of specific types of households which are inaccurately represented in telephone surveys without the use of sample control procedures; namely, households with unlisted phones, households with multiple phone listings, one-person households, households with all adults at work during the day, and households where adults are not at home.

...To use updated U.S. Census counts to merge the individual samples from each of the specified areas into their proper proportions so that they accurately reflected the totals of Suffolk and Nassau Counties.

...To balance the completed sample on key demographic classification groupings (i.e., age, sex, household size) so that it accurately reflected U.S. Census distribution on those classifications.

...To use the basic definitions of each survey area (i.e., the zip codes to be included and sample sizes) as on the 1982 Suffolk County sponsored survey of Long Island residents.

Sample Design

To meet these criteria YSW developed a sample design based upon the following methodology:

...The universe under study was defined as the general public, 18 years of age or older, living in households within Suffolk and Nassau Counties. Suffolk County was divided into four distinct areas: five-mile, six- to ten-mile, east and west.

...Each of the five specific areas was defined by the zip codes developed in the previous study. Each zip code was checked to ensure that the majority of the population of that zip code resided in the area to which that zip code was assigned.

...All telephone exchanges in Suffolk and Nassau Counties were assigned to one of the five areas. (Exchanges which overlapped areas were assigned to the area which contained the majority of working telephone listings at this stage. However, completed sample households were included in the appropriate area on the basis of actual zip code information obtained during the interview.)

...Within each area, individual components (i.e., city, town) were arrayed by population size to create a comprehensive profile of the distribution of area households.

...The specific sample frame superimposed on that profile consisted of computer tapes which contain information on all active working banks of telephone numbers within exchanges.

...Using a random start and a systematic selection procedure (i.e., every "nth"), an initial sample of telephone numbers was selected and printed on sample control sheets. The arrangement of the sample frame and the systematic procedure with probabilities proportionate to size (in terms of numbers of households within area, exchange, etc.) ensures that the final sample will be accurately distributed over all geographic and population size components.

...The specific telephone numbers for the sample were created from the initial sample by a random digit procedure which automatically provides for approximately equal probabilities of selection among households with unlisted telephones as well as those with listings in telephone directories.

...Predesignated random procedures identified one specific respondent for interview from among all qualified individuals at home in each sampled household. A maximum of four attempts (original call and three callbacks) were made to reach each sample household to interview the selected individual.

Field Procedures

...All interviews were conducted from five central telephone facilities in New Jersey, Pennsylvania and Minnesota from May 5, 1983 to May 12, 1983.

...All interviewers received a detailed briefing session covering all aspects of questionnaire administration and sampling methodology before starting to interview. Interviewers were required to have prior interviewing experience and no interviewer was permitted to complete more than 2% of the total interviews in the study. All interviewers were required to sign a confidentiality statement and a statement verifying that all work was completed according to all specifications.

...YSW professional staff monitored interviews from each of the central telephone facilities to ensure proper procedures were followed. At all interviewing times, at least one trained supervisor was present to review interviews for proper completion and to monitor, at random, interviewers.

...A minimum of 20% of each interviewer's work was independently validated by telephone with the actual respondent.

...2,676 interviews were completed from 11,039 telephone numbers on which a total of 20,663 attempts were made. A detailed breakdown is shown below in a separate table. Of the 2,676 interviews, 51 were rejected because the zip code information was missing or invalid.

...All completed interviews were checked for quality, edited, keypunched and computer tabulated.

Weighting Procedures

Weighting procedures, outlined below, were applied in the tabulating phase of the project to align the final sample of completed interviews to known population sizes and characteristics.

...Some households, in which interviews were completed, had multiple telephone numbers (not extensions on the same line) and therefore had an increased probability of being included in the sample. Interviews with these households were adjusted downward so that their probability of being interviewed was approximately equivalent to those households with only one line.

...To ensure that each area was properly represented in the total sample, a weighting procedure was developed to

project to the total number of households in each area. Data on the number of households are based upon the 1980 U.S. Census. These data were then updated to April, 1983 based on reports from the 1981 and 1982 Sales and Marketing Management Surveys of Buying Power. These data and the weights for each area are shown below in a separate table.

- In three areas (five-mile, ten-mile and east Suffolk), each individual zip code was weighted to reflect the total number of households in that zip code. In three cases, groupings of two or three geographically contiguous zip codes were made to reduce the overall range of weights and thereby improve the efficiency of the sample.

- In west Suffolk, all zip codes were checked to ensure proper representation of each zip code within the area. Zip code 11776 was found to be overrepresented and therefore was weighted individually. The remainder of west Suffolk was divided into the two main postal geographic areas (first three digits of a zip code) and each area was weighted to reflect the total number of households in that postal geographic area.

- Interviews conducted in households in Nassau County were weighted in total to the number of households in Nassau County.

...A sample balancing procedure was applied to the data to adjust the sample, by county, on the following characteristics:

- Sex of respondent.
- Number of people in household.
- Age of respondent.

...As a result of the sample balancing procedure, a small correction weight was applied to each of the five areas to put the areas back into their proper proportion.

DISTRIBUTION OF POPULATION AND SAMPLE

Area	Zip Code	Number of Households April, 1983 1/	Number of Interviews Completed	Weight
5-mile	11778	3,423	200	0.17
	11786	1,370	105	0.13
	11792	1,684	85	0.19
	11961	3,529	132	0.27
		10,006	522	
10-mile	11727	6,668	68	0.97
	11764	2,633	111	0.24
	11766	2,119	59	0.35
	11777	2,737	71	0.39
	11789	2,081	120	0.17
	11933	1,454	15	0.96
	11949	1,565	15	1.04
	11953	2,239	35	0.63
	11980	722	20	0.36
		22,218	514	
East	11901	6,408	51	1.25
	11930	624	12	0.51
	11931	514	2	1.55
	11932	281	18	0.31
	11934	1,921	24	1.10
	11935	1,175	17	0.68
	11937	3,825	45	0.85
	11939	338	3	1.12
	11940	1,174	6	1.10
	11941	653	5	1.29
	11942	1,315	10	1.31
	11944	1,510	12	1.25
	11946	3,833	41	0.93

1/ Based on 1980 U.S. Census data updated to April, 1983 based on the percent change from 12/31/80 to 12/31/81, as reported in the 1981 and 1982 Sales and Marketing Management Surveys of Buying Power.

Continued...

DISTRIBUTION OF POPULATION AND SAMPLE
(Continued)

Area	Zip Code	Number of Households April, 1983 1/	Number of Interviews Completed	Weight
East (Cont'd)	11947	339	4	1.55
	11948	304	6	0.50
	11952	1,637	25	0.65
	11954	1,234	20	0.61
	11955	229	-	-
	11956	177	4	0.44
	11957	409	4	1.02
	11958	300	4	0.75
	11959	456	6	0.76
	11960	422	5	0.83
	11963	2,428	42	0.58
	11964	616	12	0.51
	11965	346	5	0.68
	11968	4,266	49	0.87
	11970	240	1	1.55
	11971	2,087	17	1.22
	11972	360	6	0.60
	11975	193	3	0.64
	11976	506	7	0.31
	11977	478	8	0.60
	11978	1,641	11	1.48
		42,239	485	
West 2/	11776	5,933	135	0.44
	117xx (excluding 11776)	321,776	435	7.40
	119xx	12,224	39	3.11
		339,933	609	
Suffolk County Total:		414,396	2,130	
Nassau County Total:		428,000	495	9.97
Total Suffolk and Nassau Counties:		842,396	2,625	

1/ Based on 1980 U.S. Census data updated to April, 1983 based on the percent change from 12/31/80 to 12/31/81, as reported in the 1981 and 1982 Sales and Marketing Management Surveys of Buying Power.

2/ Includes all zip codes in Suffolk County not classified in the 5-mile, 10-mile or East areas.

ANALYSIS OF TELEPHONE NUMBERS DIALED

	Number
Total Telephone Numbers Attempted	11,039
Nonworking number	1,587
Business/government	444
No answer	2,194
Busy	390
Total Households Contacted	6,434
Deaf/language barrier	196
No adult at home	391
Work for power utility or market research company	53
Total Eligible Households	5,794
Refused interview	2,793
Terminated before completion	325
Completed interviews	2,676

B. Questionnaire

Yankelovich, Skelly and White, Inc.

Study #4026
May, 1983
1-
2-
3-
4-

EMERGENCY PLANNING STUDY

IDENTIFICATION (Complete at end of interview)

Name of Respondent: _____ CF#: [ ][ ][ ] 5- 6- 7-

Respondent Telephone #: _____ Date: [5][ ][ ] Month Day 8- 9- 10-

Interview Started: _____ Interview Completed: _____

Interviewer Name: _____ Interview Lasted: [ ][ ] Minutes 11- 12-

ZIP CODE: COPY ACCURATELY FROM PAGE 6 [ ][ ][ ][ ][ ] 13- 14- 15- 16- 17-

COPY FROM PAGE 12

Sex:
Male.... -1
Female.. -2

SECTION I - BACKGROUND/GENERAL ISSUES

1. I am going to begin by reading you a list of different issues facing Americans. After I have read the list, I would like you to tell me which of these you think is the most serious problem today. (READ LIST; CIRCLE ONE ANSWER UNDER "MOST SERIOUS")

2. Which of these do you think is the least serious problem? (CIRCLE ONE ANSWER UNDER "LEAST SERIOUS")

		Q.1 Most Serious	Q.2 Least Serious
a.	The deterioration of public schools	18-1	19-1
b.	Inflation	-2	-2
c.	The possibility of an accident at a nuclear power plant	-3	-3
d.	Increase in crime	-4	-4
e.	The threat of war	-5	-5
f.	Unemployment	-6	-6

3. Are you aware of any nuclear power plant that is operating or being built on Long Island?

Yes.....20-1
No (SKIP TO Q.7)..... -2

4. What is the name of that plant? (DO NOT READ)

Shoreham.....21-1
Other..... -2
Don't know..... -3

5. Which of the following statements best describes the current status of that nuclear power plant? (READ AND CIRCLE ONE)

Currently operating.....22-1
It was operating, but it has been closed..... -2
It is ready to operate, but has not yet begun to do so..... -3
It is still under construction..... -4
(DON'T READ) ___Don't know..... -5

6a. What organization or company is responsible for building and operating that plant? (DO NOT READ)

Long Island Lighting Company/LILCO/the power company/the electric utility.....23-1
Suffolk County..... -2
The federal government/FEMA..... -3
Con Edison..... -4
Other..... -5
Don't know..... -6

b. What organization or company has the responsibility to see that it is safe? (DO NOT READ)

Long Island Lighting Company/LILCO/the power company/the electric utility.....24-1
Suffolk County..... -2
The federal government/FEMA..... -3
Con Edison..... -4
State Health Department..... -5
Other..... -6
Don't know..... -7

SECTION II - SHOREHAM NUCLEAR POWER PLANT

7. As you may know, the Long Island Lighting Company is currently completing the Shoreham Nuclear Power Plant, which is in Suffolk County about 60 miles from New York City. It is not yet operating. Suppose that it begins to operate, would that make you feel: (READ AND CIRCLE ONE)

Very pleased to have a new source of power.....25-1
Moderately pleased..... -2
Moderately concerned about the risks associated with it..... -3
Very concerned..... -4

(DO NOT READ. SKIP TO Q.9)
Don't know..... -5
Refused..... -6

8a. On a scale of 1 to 6, where "1" means that the issue affects you personally very little and "6" means that you really feel deeply involved in this issue, where would you place yourself when it comes to the issue of opening the Shoreham Nuclear Power Plant? (CIRCLE ONE)

26-6	5	4	3	2	1
Deeply Involved					Very Little

b. On a scale of 1 to 6, where "1" means that you feel you definitely need more information on the issue and "6" means that you do not feel you need to have any more information on the issue, where would you place yourself with respect to opening the Shoreham Nuclear Power Plant? (CIRCLE ONE)

27-6	5	4	3	2	1
Do Not Need More Information					Definitely Need More Information

c. On a scale of 1 to 6, where "1" means that you and your friends and family rarely, if ever, discuss the issue and "6" means that you and your friends and family discuss it relatively often, where would you place yourself with respect to opening the Shoreham Nuclear Power Plant? (CIRCLE ONE)

28-6	5	4	3	2	1
Discuss Often					Discuss Rarely

d. On a scale of 1 to 6, where "1" means that you could change your mind very easily on this issue and "6" means that your mind is made up, where would you place yourself? (CIRCLE ONE)

29-6	5	4	3	2	1
Mind Is Made Up					Change Mind Easily

9. About how many miles would you say your home is from the Shoreham Nuclear Power Plant? (CIRCLE ONE RESPONSE BELOW. DON'T READ. CIRCLE APPROPRIATE CATEGORY.)

5 miles or less.....30-1
6 to 10 miles..... -2
11 to 15 miles..... -3
16 to 20 miles..... -4
21 to 30 miles..... -5
31 to 40 miles..... -6
41 to 50 miles..... -7
More than 50 miles..... -8
Don't know..... -9

10. As part of the process of operating a nuclear power plant, a plan has to be developed to inform people living around the plant about what they should do in the event of a serious problem with the plant. The type of action suggested would depend on the seriousness of the problem--for example people might be asked to stay indoors for a while, or people with certain physical conditions might be told to leave the area for awhile, or in more serious situations, all people living around the plant might be told to leave the area until the problem is solved. Let me ask you some questions about how you feel about this.

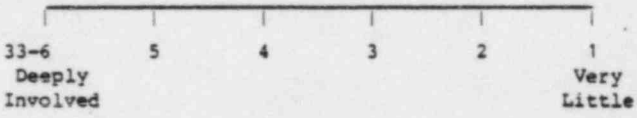
a. First, given where you live, do you think you would be affected if a serious problem developed at the Shoreham Nuclear Power Plant after it started operating?

Yes.....31-1
No (SKIP TO Q.11)..... -2
Not sure..... -3

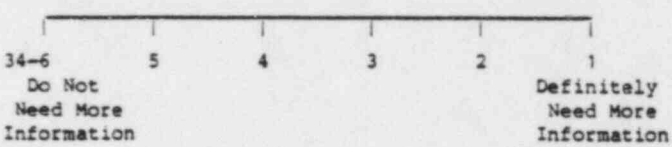
b. Have you done any planning about how you would cope with any emergencies that might arise if the Shoreham Nuclear Power Plant begins operating?

Yes.....32-1
No..... -2

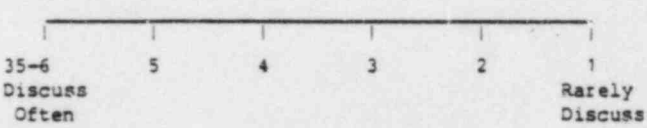
11a. On a scale of 1 to 6, where "1" means that the issue affects you personally very little and "6" means that you really feel deeply involved in this issue, where would you place yourself in terms of personally planning for any emergencies related to the Shoreham Nuclear Power Plant?



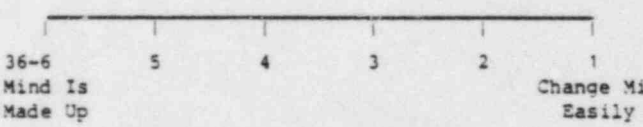
b. On a scale of 1 to 6, where "1" means that you feel you definitely need more information on the issue and "6" means that you do not feel you need to have any more information on the issue, where would you place yourself in terms of planning for any emergencies related to the Shoreham Nuclear Power Plant?



c. On a scale of 1 to 6, where "1" means that you and your friends and family rarely, if ever, discuss the issue and "6" means that you and your friends and family discuss it relatively often, where would you place yourself in terms of planning for any emergencies related to the Shoreham Nuclear Power Plant?



d. On a scale of 1 to 6, where "1" means that you could change your mind very easily on this issue and "6" means that your mind is made up, where would you place yourself regarding what you would do in an emergency? (CIRCLE ONE)



12a. Understanding that you may not have given this issue much thought to this point, let me pose some hypothetical situations. Suppose that you and your family were at home and there was an accident at the Shoreham Nuclear Power Plant. Some radioactive steam was released into the atmosphere and all people who lived within five miles of the plant were advised to stay indoors for several hours. Given where you live, do you think that you and the other members of your family would be likely to: (READ AND CIRCLE ONE)

Do what you would normally do.....37-1
Or, stay inside your home..... -2
Or, leave your home and go somewhere else..... -3

(DON'T READ)
Don't know..... -4
Refused..... -5

b. If the announcement included a message that people living more than five (5) miles from the plant were advised they could go about their normal business, again given where you live, is it likely that you would: (READ AND CIRCLE ONE)

(SKIP TO Q.14)
Do what you would normally do.....38-1
Or, stay inside your home..... -2

Or, leave your home and go somewhere else..... -3

(DON'T READ. SKIP TO Q.14)
Don't know..... -4
Refused..... -5

13. Would everyone leave or would some members of the household stay?

Everyone would leave.....39-1
Some would stay..... -2
Uncertain..... -3

14a. Suppose that you and your family were at home and there was an accident at the Shoreham Nuclear Power Plant that created a possibility of increasing the level of radiation around the plant. All pregnant women and pre-school children living within five miles of the plant were advised to evacuate and everyone else living within ten miles of the plant was advised to remain indoors. Given where you live, is it likely you and other members of your family would: (READ AND CIRCLE ONE)

Do what you would normally do.....40-1
Or, stay inside your home..... -2
Or, leave your home and go somewhere else..... -3

(DON'T READ)
Don't know..... -4
Refused..... -5

b. If the announcement included a message that people living more than 10 miles from the plant were advised they could go about their normal business, again given where you live, is it likely you would: (READ AND CIRCLE ONE)

(SKIP TO Q.16)
Do what you would normally do.....41-1
Or, stay inside your home..... -2

Or, leave your home and go somewhere else..... -3

(DON'T READ. SKIP TO Q.16)
Don't know..... -4
Refused..... -5

15. Would everyone leave or would some members of the household stay?

Everyone would leave.....42-1
Some would stay..... -2
Uncertain..... -3

16. Suppose that you and your family were at home and there was an accident at the Shoreham Nuclear Power Plant that created a greater risk of releasing radiation into the area around the plant. Everyone living within ten miles of the plant was advised to evacuate until the problem was solved. Given where you live, is it likely that you and other members of your family would: (READ AND CIRCLE ONE)

Do what you would normally do	43-1
Or, stay inside your home	-2
Or, leave your home and go somewhere else	-3
(DON'T READ) Don't know	-4
(DON'T READ) Refused	-5

17. In this last situation, if the announcement included a message that people living more than 10 miles from the plant did not need to evacuate, again given where you live, is it likely that you would: (READ AND CIRCLE ONE)

Do what you would normally do	44-1
Or, stay inside your home	-2
Or, leave your home and go somewhere else	-3
(DON'T READ) Don't know	-4
(DON'T READ) Refused	-5

18. I'm going to read the names of several individuals or groups who might give out information about nuclear power. After I read each source would you respond in the following way. Using a 6-point scale where "6" means very believable and "1" means completely unbelievable, how do you rate these information sources? (READ EACH SOURCE AND CIRCLE ONE ANSWER FOR EACH SOURCE BELOW)

	Completely Unbelievable					Very Believeable
	Believable					
LILCO	45-1	-2	-3	-4	-5	-6
The Suffolk County executive	46-1	-2	-3	-4	-5	-6
The Governor	47-1	-2	-3	-4	-5	-6
The Police	48-1	-2	-3	-4	-5	-6
The Nuclear Regulatory Commission	49-1	-2	-3	-4	-5	-6
TV and radio reporters	50-1	-2	-3	-4	-5	-6
State Health officials	51-1	-2	-3	-4	-5	-6
Civil Defense	52-1	-2	-3	-4	-5	-6

19. The following questions are based on various Zip Code areas. Would you please tell me what your Zip Code is? (RECORD CAREFULLY)

Zip Code: [ ][ ][ ][ ][ ]
53- 54- 55- 56- 57-

IF REFUSE TO GIVE ZIP CODE, ASK NAME OF TOWN AND STREET ADDRESS

58-
59- _____
(ENTER NAME OF TOWN)

_____
(STREET ADDRESS)

20. If Shoreham opens and an accident occurs at the plant requiring you to evacuate the area, where do you think you would go? Is it likely you would go to: (READ AND CIRCLE ONE)

Someplace in Suffolk County.....60-1
Someplace in Nassau County..... -2
Someplace in New York City..... -3

Other (SPECIFY)_____ -4

(DON'T READ. SKIP TO Q.26a)
Don't know..... -5
Refused..... -6

21. In terms of miles, about how far away is this place from your home? (DON'T READ; CIRCLE APPROPRIATE CATEGORY)

10 miles or less.....61-1
11 to 20 miles..... -2
21 to 30 miles..... -3
31 to 40 miles..... -4

41 to 50 miles..... -5
More than 50 miles..... -6

(DON'T READ)
Don't know..... -7
Refused..... -8

22. Which of the following would you be most likely to go to? (READ AND CIRCLE ONE)

Somebody else's home.....62-1
A public shelter..... -2
A hotel or motel..... -3
Somewhere else..... -4

(DON'T READ. SKIP TO Q.26a)
Don't know..... -5
Refused..... -6

23. How would you get to that place? (DO NOT READ)

Car.....63-1
Boat..... -2
Train..... -3
Bus..... -4
Ride with friends or relatives..... -5
Would need transportation..... -6
Other..... -7
Don't know..... -8

24. What number of people in this household would leave the house? (DO NOT READ)

One.....64-1
Two..... -2
Three..... -3
Four..... -4
Five..... -5
Six..... -6

Seven..... -7
Eight..... -8
Nine..... -9
Ten or more..... -0
Uncertain..... -x

25. In terms of getting to where you would want to go, do you think because of road or highway traffic, you would have a very difficult time, a moderately difficult time, or would it be relatively easy?

Very difficult.....65-1
Moderately difficult..... -2
Relatively easy..... -3
Don't know..... -4

26a. How many people in total live in this household including yourself? (CIRCLE ONE NUMBER UNDER A BELOW)

b. How many are under 5 years old? (CIRCLE ONE NUMBER UNDER B BELOW)

c. How many are from 5 to 17 years old? (CIRCLE ONE NUMBER UNDER C BELOW)

d. And how many are 18 or older including yourself? (CIRCLE ONE NUMBER UNDER D BELOW)

A	B	C	D
Total	Under 5	5 - 17	18 or older
66-1	67-1	68-1	69-1
-2	-2	-2	-2
-3	-3	-3	-3
-4	-4	-4	-4
-5	-5	-5	-5
-6	-6	-6	-6
-7	-7	-7	-7
-8	-8	-8	-8
-9 or more	-9 or more	-9 or more	-9 or more

NOTE: CHECK TO SEE THAT COLUMNS "B" "C" AND "D" ADD UP TO TOTAL IN COLUMN "A"

27. ASK ONLY OF THOSE WITH CHILDREN 5 - 17--ALL OTHERS GO TO Q.28: If your children were at school and there was an accident requiring evacuation, would you rather have the proper authorities: (READ AND CIRCLE ONE)

Bring your children home.....70-1
Or, bus them directly out of the area to designated locations..... -2
Or, would you pick them up yourself..... -3

28. Is anybody in this household: (READ)

	Yes
a. Pregnant.....	71-1
b. In need of special medical or dietary supplims.....	-2
c. Disabled or handicapped.....	-3
d. None.....	-4

29. IF "YES" TO Q.28 "c," ASK: ALL OTHERS SKIP TO Q.30. Does the disabled/handicapped person have his or her own transportation or would they need special transportation?

Have own.....72-1
Need special..... -2

30. Now I am going to read you a series of statements about nuclear power. After I read each statement would you respond in the following way. Using a 6-point scale, where "6" means very believeable and "1" means completely unbelievable, how do you rate these statements? (READ EACH STATEMENT: CIRCLE ONE ANSWER FOR EACH RESPONSE BELOW)

		Believable: Completly Unbelievable					Very Believable
a.	Nuclear reactors can blow up if something goes wrong.....	73-1	-2	-3	-4	-5	-6
b.	A serious nuclear power plant accident is likely to happen no more often than once every 100,000 years of nuclear power plant operation.....	74-1	-2	-3	-4	-5	-6
c.	The exposure to radiation someone receives from normal nuclear power plant operations is less than that received from one dental X-ray.....	75-1	-2	-3	-4	-5	-6
d.	The accident at the Three Mile Island nuclear power plant exposed many people who lived around the plant to high levels of radiation.....	76-1	-2	-3	-4	-5	-6
e.	Because nuclear power plants are designed to contain radiation, you would have ample time to leave the area after notification that there was an accident.....	77-1	-2	-3	-4	-5	-6
f.	Most nuclear power plants cost less money to operate than power plants that use oil as a fuel.....	78-1	-2	-3	-4	-5	-6
g.	Living close to a nuclear power plant is bad for your health in the long term even if there never is an accident.....	79-1 80-1	-2	-3	-4	-5	-6

31. Some people believe that we should continue to build nuclear power plants in the United States as a source of electric power, while others believe that they create problems for communities and should not be built. Which one of these positions comes closest to how you feel?

	CARD 2
Continue to build.....	5-1
Too many problems/stop building.....	-2
Don't know.....	-3

32. Recognizing the benefits and problems with nuclear power, would you strongly approve, approve, disapprove or strongly disapprove of shutting down existing nuclear power plants in the United States?

Strongly approve.....	6-1
Approve.....	-2
Disapprove.....	-3
Strongly disapprove.....	-4

33. Which one of the following sources do you rely on most for information about nuclear power issues? (READ LIST; CIRCLE ONE)

Newsday	7-1
Suffolk Life	-2
Other local newspapers	-3
New York City newspapers	-4
Radio	-5
Television	-6
Governmental agencies	-7
Brochures or mail from nuclear power opponents	-8
Brochures or mail from utilities	-9
Discuss with friends or neighbors	-0
Other	-x

34. Have you ever received any brochures or mail from LILCO discussing the Shoreham Nuclear Power Plant and its effect on you?

Yes	8-1
No	-2

35. Have you ever received brochures or mail from opponents of the Shoreham Nuclear Power Plant?

Yes	9-1
No	-2

36a. Have you seen any special TV shows or news segments about the Shoreham Nuclear Power Plant in the last few months?

Yes	10-1
No	-2
Don't know	-3

b. How do you feel about the news media coverage of the Shoreham Nuclear Power Plant? Do you think it has been: (READ AND CIRCLE ONE)

	Informative and complete	11-1
	Informative but not complete	-2
	Inadequate	-3
(DON'T READ) ___	Don't know	-4

c. Do you think the news media coverage has been: (READ AND CIRCLE ONE)

	Biased in favor of the plant	12-1
	Balanced	-2
	Biased against the plant	-3
(DON'T READ) ___	Don't know	-4

SECTION III - DEMOGRAPHICS

I'd like to ask you just a few more questions about you and your family.

37. What is your age?

18 - 24 years.....13-1
25 - 34 years..... -2
35 - 49 years..... -3
50 - 64 years..... -4
65 years and over..... -5

38. What is your position in this household?

Male head.....14-1
Female head..... -2
Other male..... -3
Other female..... -4

39. What is your marital status? Are you: (READ OFF)

Single (never married).....15-1
Married..... -2
Widowed..... -3
Divorced, separated..... -4

40. What is your employment status? Are you: (READ OFF AND CIRCLE ONE)

Employed full-time.....16-1
Employed part-time..... -2
Retired..... -3
Unemployed..... -4
Student..... -5
Homemaker..... -6

41. How many cars are there in this household?

One.....17-1
Two..... -2
Three..... -3
Four or more..... -4
None..... -5

42. What level of education have you completed?

Less than high school graduate.....18-1
High school graduate..... -2
Some college or advanced technical/vocational training..... -3
College graduate..... -4
Postgraduate..... -5

43. How long have you lived in this COUNTY? (CIRCLE ONE)

0 - 3 years.....19-1
4 - 6 years..... -2
7 - 9 years..... -3
10 - 15 years..... -4
16 - 20 years..... -5
21 years or more..... -6

44. Did you vote in the most recent county election? (CIRCLE ONE)

Yes.....20-1
No..... -2

45. Do you own or rent your home?

Own.....21-1
Rent..... -2
Other..... -3

46. What is your approximate annual family income? Is it: (READ AND CIRCLE ONE)

Under $15,000.....22-1
$15,000 - 24,999..... -2
$25,000 - 34,999..... -3
$35,000 - 50,000..... -4
Over $50,000..... -5

47a. Does this phone on which we are speaking have a listed or unlisted number?

Listed.....23-1
Unlisted..... -2

b. How many different phones are there in this household; by that, I mean how many different phone numbers, not extensions?

One.....24-1
Two..... -2
Three..... -3
Four..... -4
Five or more..... -5

48. Sex (BY VOICE):

Male.....25-1
Female..... -2

80-2

THANK YOU FOR YOUR COOPERATION

COMPLETE IDENTIFICATION ON FRONT OF QUESTIONNAIRE

C. Classification of Respondents Living Around Actual Emergency Planning Zone Boundary

C. CLASSIFICATION OF RESPONDENTS LIVING AROUND ACTUAL EMERGENCY PLANNING ZONE BOUNDARY

For the purposes of this study, the Emergency Planning Zone (EPZ) was defined as that area comprised of the 13 Suffolk County zip codes which are entirely within a 10-mile radius of the Shoreham Nuclear Power Plant. This is the same definition utilized in the 1982 Suffolk County-sponsored survey of Long Island residents.

In actuality, the true EPZ varies slightly from this to also include portions of nine other zip code areas that are more or less within a 10-mile radius of the Shoreham Nuclear Power Plant.

Inspection showed that 271 of our 2,625 respondents were found to reside in the "partial" zip code areas. In our primary analysis, these individuals were treated as if they were all outside of the EPZ, in either East or West Suffolk, depending upon the zip code. Using zip code information gathered during the interview, Cole's Directory for Suffolk County and detailed maps, we found 67 of these respondents resided in the true EPZ, 118 were outside the zone, and 86 were unable to be located either because they had unlisted phone numbers or their addresses could not be pinpointed on the maps.

While not of critical bearing on this study, we observed how the 185 discernible respondents reported they would react to the emergency scenarios posed in the interview. The unweighted results of this analysis are found in Tables 41, 42 and 43.

The first observation is not surprising. People living within the zone react more drastically to all scenarios than do their counterparts outside the zone. A second observation is that as a group, these 185 respondents seem to react to all scenarios in a manner which more closely resembles people who, in our primary analysis, live within the 13 zip codes presumed to be the EPZ, than do those placed outside the 10-mile zone.

Lastly, if the results of those household representatives who reported in our primary analysis they would leave home or go elsewhere in response to Scenario Three, were adjusted to account for the individuals located inside the true EPZ, the number of people who report acting more extremely than advised would decrease by approximately 6,000 households.

QUESTION 12a: REPORTED REACTION TO EMERGENCY SCENARIO ONE

	AREA	
	Inside 10-Mile Zone	Outside 10-Mile Zone
	%	%
Do what would normally do	7	14
Stay inside home	53	53
Leave home/go somewhere else	36	30
Uncertain/no answer	4	3

QUESTION 12b: REPORTED REACTION TO REVISED SCENARIO ONE

- Among Those Who Would Leave in Scenario One -

	AREA	
	Inside 10-Mile Zone	Outside 10-Mile Zone
	%	%
Do what would normally do	9	16
Stay inside home	54	56
Leave home/go somewhere else	31	23
Uncertain/no answer	6	5

QUESTION 14a: REPORTED REACTION TO EMERGENCY SCENARIO TWO

	AREA	
	Inside 10-Mile Zone	Outside 10-Mile Zone
	%	%
Do what would normally do	4	8
Stay inside home	34	46
Leave home/go somewhere else	58	44
Uncertain/no answer	4	1

QUESTION 14b: REPORTED REACTION TO REVISED SCENARIO TWO

- Among Those Who Would Leave in Scenario Two -

	AREA	
	Inside 10-Mile Zone	Outside 10-Mile Zone
	%	%
Do what would normally do	9	10
Stay inside home	40	53
Leave home/go somewhere else	45	35
Uncertain/no answer	6	2

QUESTION 16: REPORTED REACTION TO EMERGENCY SCENARIO THREE

	AREA	
	Inside 10-Mile Zone	Outside 10-Mile Zone
	%	%
Do what would normally do	-	4
Stay inside home	16	26
Leave home/go somewhere else	82	66
Uncertain/no answer	2	4

QUESTION 17: REPORTED REACTION TO REVISED SCENARIO THREE

- Among Those Who Would Leave in Scenario Three -

	AREA	
	Inside 10-Mile Zone	Outside 10-Mile Zone
	%	%
Do what would normally do	4	6
Stay inside home	33	41
Leave home/go somewhere else	60	48
Uncertain/no answer	3	5

D. Reading of the Tables

A. Presentation of Data

A number of tables represent qualified information. By this we mean that responses to some questions are reported only for respondents who answer a particular way to an earlier query, e.g., only those respondents who indicate they are aware of a nuclear power plant on Long Island are asked if they could name that power plant. In such instances the reduced bases are indicated on the table. The incidence levels of those who respond to the follow-up question are then repercentaged to reflect their comparison to the total population of that particular cell.

B. Rounding of Percentages

All percentages are rounded to whole numbers. Those percentages which are 0.5 or greater are rounded up; those which are 0.4 or less are rounded down. Tables are also reconciled to total 100% in each column. Where necessary the number representing the highest incidence of the response categories is adjusted accordingly.

C. Calculation of Responses to Hypothetical Emergencies

The determination of how many people would respond to specific emergency messages was based on a two-step calculation. For each of the three hypothetical emergencies, respondents were presented with two separate messages. In the first message, incomplete information was provided. In the second, a fuller message was provided. Calculation of responses to the fuller information was based on: first, those people who indicated they would stay home or proceed on their usual business in the first case; and second, the responses to the fuller message provided by those who indicated they would leave in the first instance. (People who indicated they were uncertain were classified as such.) A few individuals living outside the affected area who indicated they would go about their usual business when provided with an incomplete message responded to the complete message by indicating they would leave. This is an inconsistent response and therefore results have been adjusted to exclude such responses. The total population response is not affected in a statistically significant manner by this adjustment.

popular images of disaster behavior. It is to this evaluation that we wish to turn next.

It is important to note at the outset, however, that the term disaster is one of those sponge words in the English language which usually covers anything which a speaker thinks to be unfortunate. As we will use it here, a disaster is an event caused by an agent, i.e., an earthquake, hurricane, flood, fire, etc., which creates extensive physical impact which affects existing social organization. Since various types of agents have differential effects, the modal case used in the subsequent discussion is to look at the actual behavior which occurs as the consequence of sudden and widespread impact in an American urban community, such as an earthquake or tornado striking a large city. What we will have to say, however, has considerable applicability to the consequences of other types of stress agents and, with adjustment for the level of development, also would roughly apply to similar situations in societies other than the United States. In research in other countries, we have always been more impressed by the similarities of disaster behavior than by the differences. In the discussion which follows, although we will at times cite specific studies, we will primarily draw on our knowledge of the research tradition as well as our own personal field experience in examining the validity of the popular images.

Typical Disaster Behavior

1. The idea that people will panic in the face of great threat or danger is very widespread. However, it is not borne out in reality. Insofar

hordes of animal-like creatures fleeing wildly and acting hysterically when they find themselves in danger, what actually happens is somewhat duller but also more reassuring than dramatic license portrays.

2. Just as the panic image of disaster behavior is generally incorrect, so is the view that disasters leave victims dazed and disoriented both at time of impact and in the recovery period. Those who experienced disasters are not immobilized by even the most catastrophic of events. They are neither devoid of initiative nor passively dependent and expectant that others, especially relief and welfare workers, will take care of them and their disaster created needs. In fact, disaster victims sometimes insist in acting on their own even contrary to the expressed advice of the public authorities and formal agencies.

A form of shock reaction, called a "disaster syndrome," has sometimes been observed in the aftermath of relatively sudden and extensive disasters. This reaction involves a state of apathy leading to a regression in normal cognitive processes. However, the "disaster syndrome" does not appear in great numbers of people; seems confined only to the most sudden traumatic kinds of disasters; has been reported only in certain cultural settings; and is generally of short duration, hours only, if not minutes. One study of an extremely extensive tornado, using an area probability sample, found that only 14 percent of all victims may have manifested some aspects of the initial stages of the syndrome.

In general, disaster victims react in an active manner, and do not wait around for assistance by outsiders or offers of aid from organizations. On

Since personal experience with disaster impact is so infrequent and difficult to arrange, the major impressions of disaster behavior come from accounts in the mass media. This is true even for those who are in the impact area and, of course, the media reports are the only initial source for those outside. The major effect of the media coverage is often only to pool other people's misconceptions and to report them. This, in large part, is due to the conditions for the coverage of news as well as to certain well established norms within the mass media industry.

In the first place, reporters also have images of what should happen and, in the absence of contrary evidence, often report these images. For example, during the massive evacuation in Hurricane Carla, a wire service story, carried as a headline in some newspapers stated that in parts of Texas "more than 100,000 persons fled in near panic." A later systematic study showed that this report was false insofar as the conditions of the evacuees was concerned. In fact, the study made of that behavior particularly commented on the extraordinarily low accident rate despite the fact that a half million people fled; involvement in traffic accidents or delays enroute because of them was reported by only .6 percent of the evacuees and no fatalities at all resulted from the massive movement of cars during the evacuation. Given the normal condition of traffic and traffic fatalities this was probably one of the most interesting aspects about this particular instance of disaster behavior. However, the mass media people who reported the story seemed to have presupposed that fleeing people are 'panicky' and reported it as such.

of the National Motor Vehicle Accident Death Rate to estimate the risk of death in an evacuation permits a reasonable approximation of the risk. Furthermore, there does not seem to be any activity with a risk of death, other than motor vehicle transportation, that can be more closely related.

Other justifications for basing risk estimations on the National Motor Vehicle Accident Death Rate follow:

1. Since more than 99 percent of the movement of people in an evacuation is by motor vehicle, the probability is great that accidents could occur involving vehicles.

2. Accident rates at home or work are not comparable to situations encountered away from home at motels or reception centers.

3. A state of "panic" does not exist during an evacuation which would result in reckless and high-speed driving (18). The evacuations were very orderly and vehicle traffic tends to move at relatively low speeds (35 mph is the average). Nationally, 74 percent of traffic accident fatalities occur at speeds greater than 40 mph (18). At least 50 percent of the National Motor Vehicle fatalities have been attributed to drinking (18), whereas drunk-driving has not been observed in evacuations (17). From published reports(16,20) and observations of personnel familiar with evacuation, traffic moves at a much slower rate, and cannot even be compared to commuter traffic leaving a city. The slowdown is caused both by the fact that there is more traffic on the highways and feeder routes and that more personnel are involved in traffic control.

4. The daily death rate per 100,000 persons from all accidents (0.15) is about two times higher than the daily death rate per 100,000 persons from motor vehicle accidents (0.07). All accidents include many situations such as poisoning, railroad deaths, industrial accidents, etc., which would be dissimilar to circumstances in an evacuation. The dissimilarities of conditions of death rate calculated for all accidents with evacuation conditions seem to justify using the lower motor vehicle death rate for predictions of evacuation death risk. However, with the other uncertainties that exist, a factor of two higher in the predictions would not be unreasonable.

injuries that occurred in the events investigated? Most of the questionnaires were completed by persons on a local level who were intimately involved with the particular incidents and their recall of the events was generally very good. Some documentation of the deaths and injuries associated with an evacuation has occurred. These have been reported in "Carla" involving the largest evacuation studied (500,000 persons) (16). Verbal confirmation that no injuries or deaths have resulted from evacuations in one state has been obtained (21). This can be further confirmed because no compensation claims (permissible under law) have been filed to this effect (21).

Deaths

It seems reasonable to conclude that the number of deaths is a fairly accurate number. In most of the incidents investigated, the number of evacuees was less than a few thousand. Because of the relatively small number of people involved, a few deaths would attract sufficient attention, so that the cause of death would be ascertained, recorded, and the results reported. This may not be as true in a large disaster where hundreds of people are killed. That is, in these situations, whether the person died because of something that occurred during the evacuation or for some reason initiated by the disaster probably has less certainty. However, the numbers of these types of disasters are small. Other events which were investigated during the study, although involving the evacuation of a relatively large number of people, had few or no deaths due to the disaster agent. In these situations, again, one or two deaths would stand out.

The general conclusion is that the number of deaths reported during the study is reasonably accurate. It is unrealistic to believe that the reported ten deaths could be low by a significant factor.

Injuries

Although the number of deaths reported appears to be a reasonably accurate reflection of the true number, the reported number of injuries (two) attributed to the evacuation process seems low. This conclusion is based only upon reasonable doubt and cannot be substantiated. The definition of an injury used in the study was an injury serious enough to require medical attention. Even though it is believed that the non-fatal injuries due to vehicle accidents witnessed in the study is lower than normal, it seems logical to assume that other types of injuries do occur that may not have if the people were not evacuated. This is not to imply this rate is higher or lower than normal, but the study data (two injuries) probably has a higher degree of inaccuracy than the death rate.

It is thought that the lack of credibility is not due to the numbers reported by the responders, but that there is no reporting system for injuries comparable to the registry for death. There is not a reliable, established mechanism for collecting injury statistics, unless they are traffic-connected or needed for legal liability. Consequently, unless occurring in significant number and degree, they may be overlooked.

Comparison of predicted and observed risk of injury and death

As an example of an estimation of prediction of death and injury during an evacuation, based on the application of the National Highway Statistics, Hurricane Carla was chosen. This evacuation was not included in the estimate of risk (tables 10, 11, and 13) because the number of persons involved, the average number of miles evacuated, and other details were not known with the desired accuracy. It is used here as a disaster to which a projection of the risk of death and injury might be applied for certain assumptions and compared with actual results which did occur.

Hurricane Carla(16,22,23) affected the states of Texas and Louisiana from September 3 to 14, 1961, and caused the largest evacuation in American History. It was estimated that between 50,000 and 80,000 persons were evacuated in Louisiana and between 300,000 and 800,000, with the most reasonable estimate of 500,000, persons were evacuated in Texas.

The Head of the Texas Department of Public Safety called it "the wettest dry run in mass evacuation in the history of America " (16) In the movement in Texas there was not a single fatality attributable to the evacuation. There was not even a reported major accident (16).

Based upon data obtained from Hurricane Carla and the recommended death and injury prediction, table 16 was derived. As observed in table 16, using the National Motor Vehicle Accident Death and Injury Rate (tables 10 and 13), more deaths and injuries were predicted than observed in one incident only--Hurricane Carla.

If the same rationale were applied to the 63 other events investigated, in all but four, the results would be approximately the same as for Hurricane Carla. The predicted values

There is, furthermore, a frequently overlooked but fundamental difference between panic and flight behavior. The two terms both refer to withdrawal from a situation; they are otherwise not equivalent. [redacted]. But the vast majority of withdrawal behavior takes the form of flight behavior. [redacted]. Drabek in a study of sudden evacuation in the face of an immediate flood threat in the Denver metropolitan area in 1965 found that 92 percent of family members left together, confirming a hypothesis advanced some time ago by Moore in Texas hurricanes that families moved as units and remained together despite public pressure at times to do differently.[3] Even in very precipitous flight, fleeing groups often make attempts to assist strangers in getting away from a seemingly immediately dangerous situation. Mutual aid rather than panicky abandonment of others is a very manifest characteristic of withdrawal behavior in the presence of danger.

Furthermore, [redacted]. Panic episodes tend to be extremely localized, involve very few participants, and are of very short duration. One observer who has been studying panic behavior for the last twenty years suggests that he would be hard pressed (outside of a military context) to cite more than a small handful of clear-cut instances of panic behavior where more than three or four dozen people were involved at the most. The often cited example of the "panicky" reaction to the famous Invasion from Mars broadcast, upon close examination, shows there was extremely little behavior leading to the cessation of traditional role playing or much flight behavior for that matter. In fact, one survey study of the event reported that 84 percent of the audience was in no way even disturbed by the broadcast.[4] Many supposed instances of "mass panic" upon serious examination turn out to be crisis situations where some people were frightened or concerned but whose behavior took forms other than unruly flight or disorganized activity.

Even in those rare situations where panic on a small scale does occur, the majority of persons involved in such situations seldom engage in panic behavior. Even in such historically famous cases as the Cocoanut Grove night club fire, the available evidence fairly clearly suggests that panic was not the modal form of withdrawal even in that highly circumscribed emergency situation; actually many persons died from asphyxiation before they could realize there was danger. The majority that escaped generally sought out alternate escape routes in a reasonable fashion with friends. Here as well as in other similar situations there was none of the widespread contagion that a panicky reaction is supposed to evoke automatically among those exposed to it. There was of course some panic behavior in this situation as well as other famous cases such as the Iroquois Theater fire. But it requires a very unusual set of circumstances involving perceptions of probable personal entrapment within a limited spatial area, possible closing of escape routes, an extremely sudden and very direct threat to life, as well as abandonment of self by others in the immediate vicinity to have the possibility of panic behavior. These are a combination of circumstances that on the whole are usually not present in any degree from most disaster situations.

Sometimes the term panic is also applied to extremely disorganized personal behavior, where the individual almost literally collapses in an hysterical

Flight from a threatening situation involves playing traditional social roles including the taking care of others.

breakdown. This phenomenon so rarely occurs in disaster situations that it is not a practical problem. Of the many possible ways of responding to signs of danger, this is an extremely unlikely probability for any given individual and it is only a highly remote theoretical and statistical possibility if reference is to any large group or aggregation of persons so reacting in a crisis. When people see signs or receive warnings of danger, they generally assess the credibility of the information and the likelihood of danger to themselves and others. If the cues they receive are viewed as credible, alternative courses of action are considered. An old pre-Mao Chinese proverb notes the rational, adaptive nature of one alternative possibility: "Of the thirty-six ways to escape danger, running away is best." Accordingly in some cases endangered persons will see withdrawal from the danger as the most intelligent step possible in the given situation. They will then move out of the situation taking others with them. While this is not as dramatic a picture as one frequently drawn by fiction writers of hordes of animal-like creatures fleeing wildly and acting hysterically when they find themselves in danger, what actually happens is somewhat duller but also more reassuring.

2. Just as the panic image of disaster behavior is generally incorrect, so is the view that disasters leave victims dazed and disoriented both at time of impact and in the recovery period. [redacted] In fact, disaster victims sometimes insist in acting on their own even contrary to the expressed advice of the public authorities and formal agencies.

A form of shock reaction, called a "disaster syndrome," has sometimes been observed in the aftermath of relatively sudden and extensive disasters. This reaction involves an apathetic response and some disorientation in thinking. However, the "disaster syndrome" does not appear in great numbers of people; seems confined only to the most sudden traumatic kinds of disasters; has been reported only in certain cultural settings; and is generally of short duration, hours only, if not minutes. One study of an extremely extensive tornado, using an area probability sample, found that only 14 percent of all victims may have manifested some aspects of the initial stages of the syndrome.[5]

In general, disaster victims react in an active manner, and do not wait around for assistance by outsiders or offers of aid from organizations. On a large scale they show considerable personal initiative and a pattern of self and informal mutual help. When shelter is needed for example, displaced persons seek the aid of and move in with other family members, intimates and neighbors. When about 10,000 were made homeless in a tornado in Massachusetts, less than 5 percent sought aid from and were housed by the public authorities.[6] In the massive evacuation preceding Hurricane Carla mentioned before, more than three-quarters of the evacuees went to other than public shelters; 58 percent in fact went to private homes of friends and relatives.[7] In a California flood, only 9,260 persons out of over 50,000 evacuees registered in the 38 Red Cross shelters available in 13 towns in the disaster area.[8]

This pattern of mutual and self help also prevails in other disaster-related activities besides that of obtaining shelter. In one community emergency after

Those who experienced disasters are not immobilized by even the most catastrophic of events.[20] They are neither devoid of initiative nor passively dependent and expectant that others, especially relief and welfare workers, will take care of them and their disaster created needs

clearly was no evidence of high incidents of serious emotional disorders either in children or adults which could be associated with the disaster.[12] The victims were able to function well in their recovery efforts. Another study showed that in the months following Hurricane Carla, there was not only a drop in neurological and psychiatric classifications in both out-patient as well as in-patient clinics in the impacted areas, but also a diminution of symptoms among neurotic and psychotic patients.[13] In other words, disasters not only fail to evoke paralyzing emotional reactions among previously healthy persons, but they do not even make previously mentally ill or disturbed persons any worse.

These kinds of observations parallel what has been observed also in wartime situations, either among civilians or the military. Even under very severe stress, people do not become either totally irresponsible and dependent, or completely impotent and immobilized. Rather they attempt to solve in an active fashion, especially in conjunction with others, both their short-run and long-run problems in those ways which seem reasonable to them as they perceive the crisis situation. In general, the same can be said of the vast majority of disaster victims as generally has been said of combat soldiers by Gringer and Spiegel: [redacted] "14

3. The assumption that [redacted] are unable to cope with disasters is based both on the notion that these organizations and the communities in which they are located are overwhelmed by disaster impact, and also by the fear that the employees of these organizations are so affected by disaster impact that their efficiency is reduced. Neither of these notions stands up well under close observation.

The notion of communities being overwhelmed is usually derived from overestimating the amount of disaster-occasioned demand on facilities and underestimating the number of resources still available after impact. In all disasters in recent years in the United States, the amount of destruction in relation to total resources is quite low; the same is true with regard to the ratio of casualties to the total population base involved.

For example, Anchorage, the largest city in Alaska, had about 50,000 persons with an additional 50,000 in the surrounding areas, including a large number of military personnel. The metropolitan area did experience extensive property damage in the 1964 Alaskan earthquake, but only one hospital eventually had to be evacuated. The earthquake occurred at 5:36 on a Friday evening. Practically all of the victims of the impact were found and removed before dark on the first night. There were five hospitals in Anchorage, two of them private, and nearly all of the casualties were brought to one hospital. Of its 155 beds, only 75 were occupied at the time of the earthquake. From the time that the first casualty arrived at 6:15 p.m. until midnight, 21 casualties were received; three were dead, seven were admitted and the rest sent home. In the next two days, this hospital handled 89 emergencies; of these 18 were clearly earthquake victims while the rest were "normal" emergencies and persons injured while working with debris. At no time did inpatient census exceed 123 during the emergency. While the death rate in the Anchorage area as a result of the earthquake was finally determined to be seven, this is a much lower figure than initial reports suggested and that most persons remember. (In the entire state, the overall figure was close to 100.)

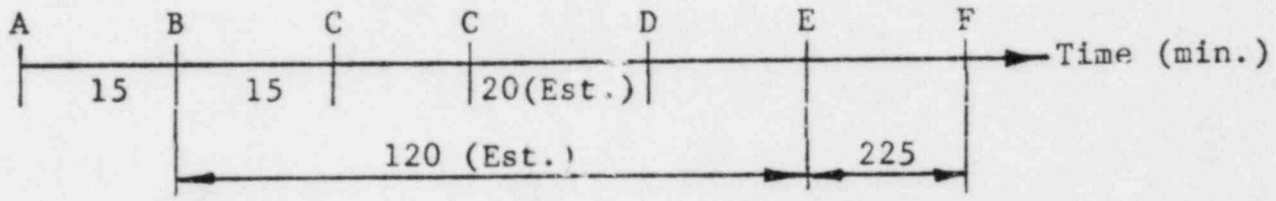
"Under the most harrowing circumstances, they are able to control fear or anxiety, to think clearly and to make appropriate decisions with rapidity."

- Maximize the utilization of the bus fleet. It is assumed that, on the average, the Route Buses will then be only 75 percent full after completing a route. The Transfer Buses, on the other hand, can be filled to capacity.

Bus route travel times are based upon speeds of 7 mph within the service area and computed speeds along the major roads based on Case 12 results. An upper bound of 25 mph is imposed on the trip from the transfer point to the service area and 20 mph for the return trip to the transfer point.

It is estimated that the first buses will arrive at the transfer points within 105 minutes following public notification. The relevant schedule of events is given below:

Event:



Event	Description
A	Declaration of Emergency
B	Notification of Government Agency; Bus Drivers notified
C	Public Notification; Sirens activated
C	Notification for Evacuation to Begin
D	End of Public "Mobilization (Preparation) Time;" Beginning of Public Evacuation
E	Arrival of first Buses at Transfer Points; Beginning of Bus Runs over specified Routes
F	Departure of final buses from Transfer Points to travel to Relocation Centers

On the basis of the operations plan presented earlier and the routing structure and bus route schedules presented in the following tables, the total number of 40-passenger buses required is:

Route Buses	232
Transfer Buses	106
	338

The following tables detail the planned bus operations. Each fleet of buses begin operations at a Transfer Point. The distances of these Transfer Points from the Power Plant are indicated below:

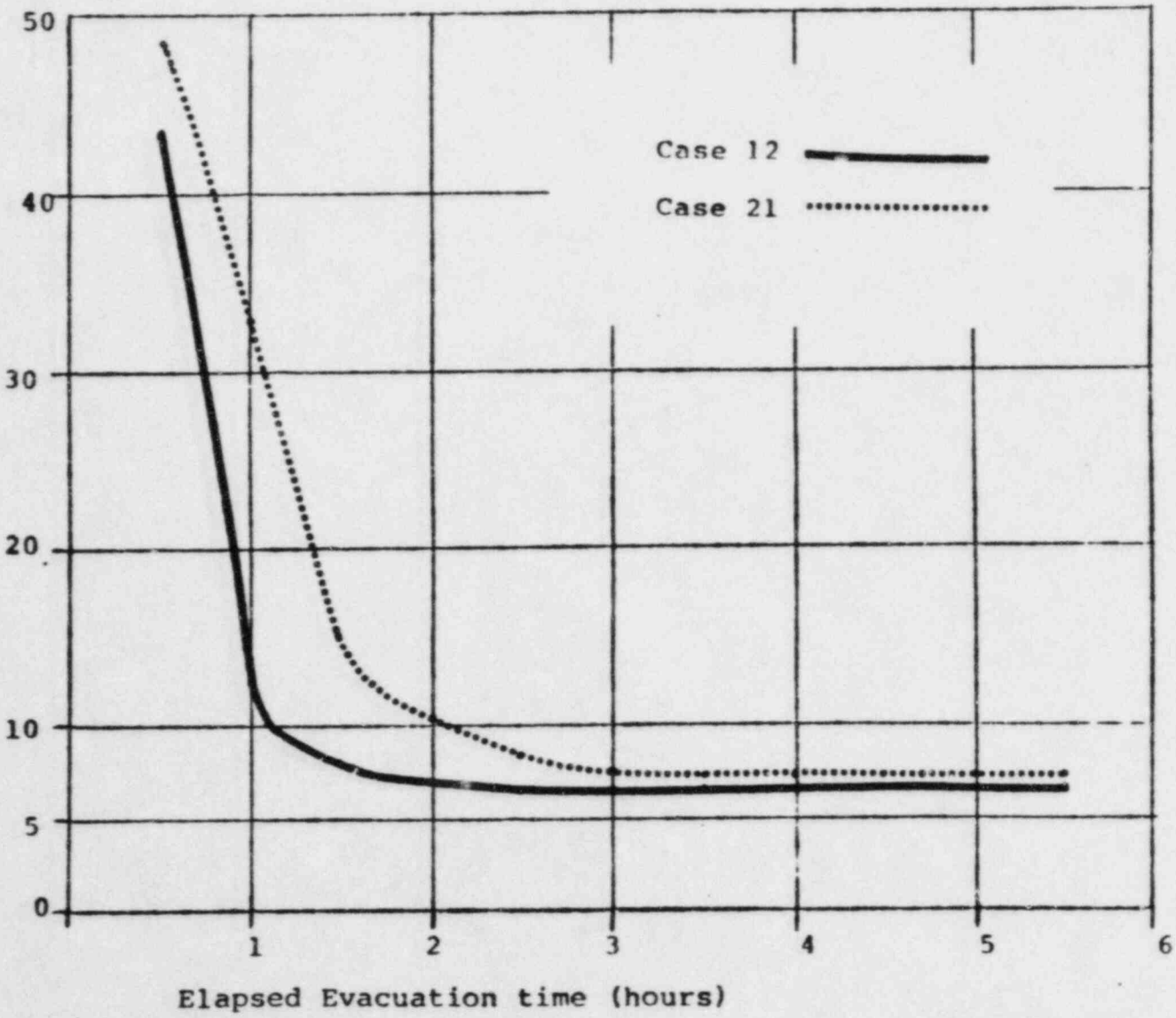


Exhibit 5. Aggregate Speed vs. Elapsed Time