EMERGENCY PLANNING: THE CASE OF DIABLO CANYON NUCLEAR POWER PLANT

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SUMMARY

This study was undertaken to demonstrate how the behavioral profile of communities should be incorporated into the process of emergency response planning, and to test the level of preparedness of people living near the Diablo Canyon Nuclear Power Plant site. It specifically examines the social planning problems involved in responding to modern hazards. A telephone survey was administered to sample households in San Luis Obispo County. The interviews provided data on residents' attitudes toward and awareness of issues regarding emergency planning for the Diablo Canyon Power Plant, and therefore provided insights into the perceptions, preferences, knowledge, and levels of confidence of affected citizens. It was found that the San Luis Obispo County Nuclear Power Plant Emergency Response Plan inadequately addresses the behavioral components that contribute to plan effectiveness and that citizens are not prepared for an emergency at the plant.

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PREFACE

This paper is one in a series on research in progress in the field of human adjustments to natural hazards. It is intended that these papers be used as working documents by those directly involved in hazard research and as information papers by the larger circle of interested persons. The series was started with funds from the National Science Foundation to the University of Colorado and Clark University, but it is now on a self-supporting basis. Authorship of the papers is not necessarily confined to those working at these institutions.

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INTRODUCTION

Planning for protection from hazards is a recent development; comprehensiveness in hazard planning is newer still. Comprehensiveness means integrating physical, social, and economic concerns. It means combining technology with judgment and priorities. It calls for a well-rounded approach that incorporates various elements into the evaluation process. Finally, it requires a continuous process of review.

Nuclear power plants are defined by the California State Office of Planning and Research (1980, p. 133) as a "potentially hazardous facility;" they pose a definite risk to the surrounding environment. Yet communities cannot always control the placement of nuclear plants, any more than they can determine the course of a flood, hurricane, or fire. A case study approach, using the San Luis Obispo area as a laboratory, and the county's emergency response plan for the Diablo Canyon Nuclear Power Plant as the issue, provides an opportunity to examine policy development for emergency planning for such facilities.

Diablo Canyon Nuclear Power Plant is located in the county of San Luis Obispo, California, on approximately 750 acres of land adjacent to the coastline. The plant contains two reactor units of the pressurized water type. Each unit has the capability of producing over one thousand megawatts of power. At the time of this study the facility, which is owned by Pacific Gas and Electric Company (PG&E), was under review by licensing boards, and PG&E anticipated authorization of a low-power test license.

Construction of the plant began in 1968, and early projections estimated completion sometime in 1971. Ten years later, because of serious setbacks, neither of the domed units had begun to produce power. There had been a significant degree of debate over the potential dangers associated

with nuclear power generation at the Diablo Canyon site, and the long-term problems related to radiation and its effect upon the environment are still largely unresolved.

The site of Diablo Canyon is adjacent to growing communities as well as heavily used recreational and coastal areas. All levels of government have recognized the need to protect these areas and their inhabitants from potential radiation exposure, and have developed warning systems and evacuation plans. A final emergency response plan for the county has been adopted, but fulfillment of legislative requirements is not necessarily synonymous with successful preparedness of the public. The nuclear power emergency response plan for San Luis Obispo County focuses on bureaucratic solutions; human behavioral characteristics have been largely ignored.

Planning Approaches and Research Objectives

Once policies have been established, an emergency response plan can be developed in several different ways and take several different forms.

Approach A. The first approach is administratively centered; it utilizes planning from the top down, and emphasizes logistics and lines of authority. It favors well-trained officials and allows a more exact synchronization of administration, particularly in communications, transportation, and supplies, which tend to demand centralized authority. Roles (as well as task functions) are clearly defined. This approach assumes that reactions are highly predictable and that orders will be followed.

Approach B. The second method is decentralized; it utilizes planning from the bottom up, and emphasizes individual and small-group decision making. It relies heavily upon informed citizenry and outreach programs, and assumes that plan effectiveness stems from individuals' actions rather

than from central organization. This approach is highly dependent upon external systems such as transportation and communications.

Approach C. In essence, this approach is a combination of the first two. It limits administration to a framework focusing upon the most technical issues. The substance of effective response rests in the self-help choices of the public under general government supervision.

A conceptual framework for emergency response has been developed to illustrate the variables and parameters in the planning process (see Figure 1). Alternative choices will influence components of the system to different degrees. The acceptable plan is one in which the most vital components are most positively affected. An important part of the evaluation process is assessing the degree of importance of each variable.

Within this framework, the existing emergency response plan is called the independent variable. Its values determine the outcome (dependent variable), and, in the system illustrated, that outcome is a measure of overall effectiveness. Constraints are beyond the control of the independent variable: the degree of danger is a measure of the seriousness of the incident; human errors and technical malfunctions complicate that intensity; and environmental conditions like weather, topography, and other potential hazards compound the problem of response.

Intervening and bridging variables of the system also contribute to effectiveness. Implementation, an intervening variable, is the actual carrying out of the plan. Response, a bridging variable, is the result of the plan's implementation combined with the public's readiness. The level of preparedness, another bridging variable, denotes not only the intensity of readiness, but the type as well. Bridging variables are referred to as intermediate outcomes.

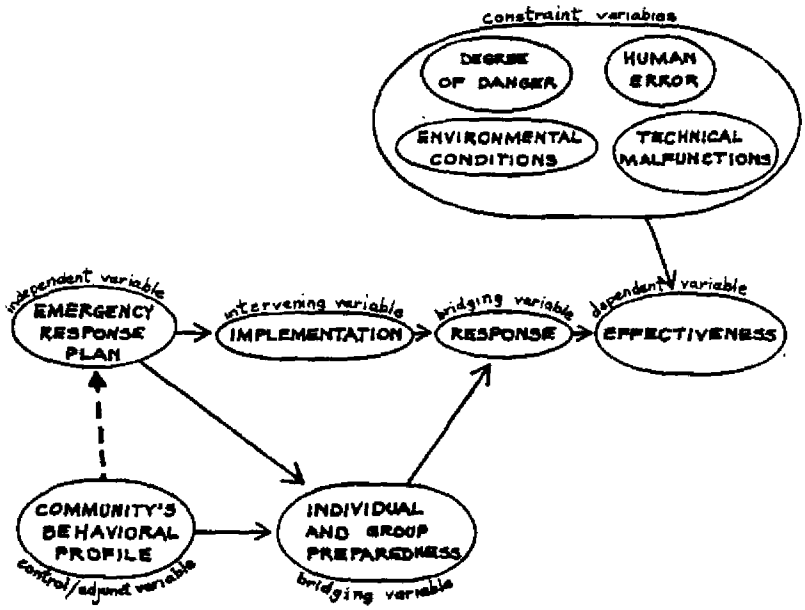

FIGURE 1

A CONCEPTUAL FRAMEWORK FOR VARIABLES
OF AN EMERGENCY PLANNING SYSTEM

In contrast to the constraints that cannot be controlled, the adjunct variable is responsive to the independent variable, and also affects the level of preparedness. The community's behavioral profile is the adjunct variable in this framework.

The aim of this study is to link the community's behavioral profile to the emergency response plan and the level of preparedness. No attempt will be made at analyzing the need for nuclear power or the veracity of scientific data concerning radiation exposure. The focus is on the social planning problems involved in responding to modern hazards. To be effective, any emergency plan must consider the people for whom it is designed. This includes those people's perceptions of need, preferences, confidence, and knowledge of what to do. An effective plan for emergency response can only evolve from and reflect the integration of expertise with those perceptions.

REASON IN RETROSPECT

Behavioral Research in Hazard Response

> The pre-eminence of prudence means that realization of the good presupposes knowledge of reality. He alone can do good who knows what things are like and what their situation is. The pre-eminence of prudence means that so-called "good intentions" and so-called "meaning well" by no means suffice. Realization of the good presupposes that our actions are appropriate to the real situation, that is, to the concrete realities which form the "environment" of a concrete human action; and that we therefore take this concrete reality seriously, with clear-eyed objectivity. (Schumacher, 1960)

> As potential hazards give rise to more complex emergency responses, preparedness agencies should devote more attention to methods of assessing, predicting and guiding public behavior in relation to disaster response planning. (Chanault et al., 1979, p. 140)

The need for prudence is particularly acute in emergency planning. The body of knowledge surrounding such planning is limited. In the 1960s and '70s, due to increased social awareness, there was some research on behavioral response to hazards. Originally, the development of nuclear power and nuclear weapons created interest in programs of civil defense. Today, a resurgent interest has developed as the result of recent disasters and near disasters. The once narrow field dominated by military and peacekeeping agents is now being examined by social scientists and psychologists, and their findings can be incorporated into any comprehensive emergency plan.

Five phases of a public emergency. One particularly useful finding of social scientists and disaster research specialists is a series of discernible phases in emergencies that can be used as a framework for study. Five phases that are commonly recognized are illustrated in Figure 2.

Pre-impact phase - The pre-impact period is described by Healy (1969, p. 275) as a time when the probability of danger is high. It is an early

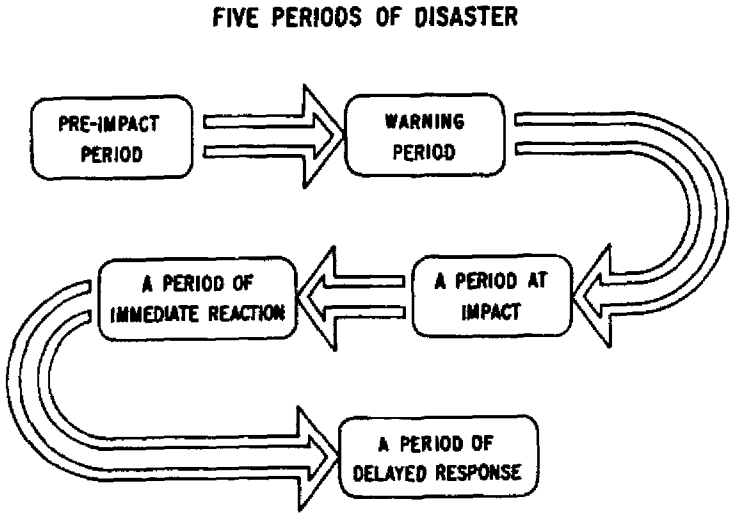

FIGURE 2

THE FIVE PHASES OF DISASTER

(Healy, 1969, p. 275)

warning phase that may last from hours to months, and examples might include a tornado watch, an approaching storm, or a pre-avalanche condition. For a radiation emergency, the phase might be initiated by a technical malfunction or recognition of an unusual event, but it is not likely that everyone would be cognizant of the threat.

Warning phase - When the danger becomes an impending reality, the seconds or hours before impact are referred to as the warning period. It calls for the implementation of emergency plans and conveyance of information to the public (Healy, 1969, p. 276). Reactions may vary, but generally it is a time of action and stress.

A study of response during this phase was conducted after the 1969 tsunami in Hilo, Hawaii (Lachman et al., 1961). A group was organized by the Hawaii Division of the Hawaiian Academy of Sciences to look into

warning response behavior. Sirens provided warning for more than four hours before the wave hit, and investigations showed that nearly all of the islanders heard the sirens. However, interpretation of their meaning varied, as shown in Table 1. The actions taken in response to the sirens were also tested in the survey. Researchers found three general categories of people. The "do nothing" group (15% of those queried) thought that they were in a safe place. The group was described as being either elderly, disabled, or "too tired" to respond. A larger group (32%) evacuated during the warning period. They were described as having "a desire for safety, awareness of danger, and fear" (Lachman, 1961, p. 1407). The final category, those who waited, made up the largest proportion of the population (44.5%). Their reasons for inaction ranged from thinking that there would be a more final notification to, once again, believing that for the time being they were safe. A statistical breakdown of the responses found in the Hawaiian study is shown in Table 2. The reactions to the warning appeared to result from a combination of perceptions, resources, and information.

Impact phase - The impact period is the climactic moment of the disaster. Reactions to this phase are often measured by the degree of confusion or shock, which authorities agree are of short duration (Healy, 1969, p. 277). Studies by Bristow repeat the findings of Healy in characterizing impact behavior.

> During the actual occurrence of the disaster, there is almost an overwhelming tendency on the part of those in the area to watch its visible elements: be it a fire, tidal wave, or dam collapse. This period of shock, confusion, disorientation, or hypnosis is usually quite short for most persons. The actual occurrence of the disaster may, in some cases, have a settling and motivating effect on those persons whose activities and reactions were not considered satisfactory during the warning phase. (Bristow, 1972, p. 70)

Immediate Response	Total Sample N	Total Sample %	Nonevacuees N	Nonevacuees %	Evacuees N	Evacuees %
Did nothing (continued normal routine)	44	15.0	40	23.3	4	3.3
Evacuated	94	32.0	12	7.0*	82	67.2
Waited (for advice, information, etc.)	131	44.5	100	58.1	31	25.4
Other (returned home, etc.)	25	8.5	20	11.6	5	4.1
Total	294	100.0	172	100.0	122	100.0

* Represents individuals who evacuated upon hearing the siren but returned home prior to time of impact.

TABLE 1

INTERPRETATION OF SIRENS BY VICTIMS
OF THE 1960 HILO, HAWAII TSUNAMI

(Lachman et al., 1961)

Interpretation	Total Sample N	Total Sample %	Nonevacuees N	Nonevacuees %	Evacuees N	Evacuees %
Alert	14	4.8	10	5.9	4	3.3
Warning	13	4.5	8	4.7	5	4.1
Preliminary signal preceding evacuation signal	71	24.4	55	32.4	16	13.2
Evacuation signal	84	28.9	10	5.9	74	61.2
Signal to await further information	26	8.9	24	14.1	2	1.7
Signal to make preparations	18	6.2	12	7.1	6	5.0
Subjective meaning not ascertainable	65	22.3	51	30.0	14	11.6
Total	291	100.0	170	100.1	121	100.1

TABLE 2

CATEGORIES OF REACTIONS TO WARNING SIGNALS
DURING THE HILO, HAWAII TSUNAMI

(Lachman et al., 1961)

Reports of the eruption of Mount St. Helens described the same reactions Bristow and Healy had found. On May 18, 1980, a 14,000 foot plume erupted from the volcano--the largest eruption on the North American continent in modern times. A Washington newspaper, on the day of the eruption, described the bewilderment, shock, and feelings of awe demonstrated by victims during the event. "Helicopter pilots had to persuade, entice, and threaten volcano watchers before they would break from their magnetic attraction to Mount St. Helens and flee from approaching disaster" (Spokane Daily Chronicle, May 18, 1980, p. 1). Rationality returned to the victims in a matter of minutes, and they then sought escape routes.

Immediate reaction phase - The phase of immediate reaction to a disaster is also referred to as the recoil period. Healy (1969, p. 277) identifies it as the victims' attempts to understand what has just happened, and as their initial recovery from shock. Healy and others associate this period with the need for people to locate family members and friends. He states (p. 278) that "much of the worried behavior of survivors will be motivated by this concern. This highlights the importance of the family relationship." A study of a 1957 Louisiana hurricane (Audrey) also found that, "If the family had become separated, this seemed to push most other thoughts from their minds" (Fogelman and Parenton, 1959, p. 131).

The majority of people recoiling from the impact of a disaster seem to engage in some activity. The productiveness of these actions depends upon their level of psychological stability or rationality. However, the degree of that rationality is a point on which new research and older theories differ.

The time of immediate reaction is also marked by the complete mobilization of emergency operations. Understanding the nature of human response at this phase, as well as during the warning period, can contribute heavily to the success of an emergency plan.

Delayed response phase - Delayed response, the final stage described by Healy (p. 249), encompasses the remainder of the recovery period. It may have a duration of weeks to months, and includes the re-establishment of community networks. A detailed study of this phase, concentrating on the experience of four communities, has been done by Friesma and others (1979). Typically, social and economic change were apparent in communities, but long term effects were not found to be as consequential as short term effects.

> Natural disasters cause deaths, injuries, property losses, and anguish. Many disaster losses are preventable. These are short term problems which deserve serious policy attention. When they occur, the role of disaster agencies in responding to the immediate needs of the victim can surely be improved. (Friesema et al., 1979, p. 179).

The disaster stages of pre-impact, warning, impact, immediate reaction, and delayed response are generally agreed upon by experts. Although the duration varies in different emergencies, the sequence remains intact. Each phase is typified by behavior patterns that vary primarily as a function of personality and social environment, not as a function of the hazard itself.

Generalized response categories. Healy (1969, p. 281) adapted material provided by the American Psychiatric Association and reduced a complex spectrum of response behavior to a manageable list of five categories:

1. Normal reaction
2. Depressed reaction
3. Overactive responses

4. Bodily reactions

5. Individual panic or blind flight

Normal reactions are those usually elicited during the five phases of a disaster. Individuals function reliably in the warning stage, experience a brief period of shock and bewilderment at impact, and resume rational decision making at some time during the post-impact phases. **Depressed reactions**, also referred to as the "disaster syndrome," occur largely after the phenomenon, and are characterized by dependency in the victim (Quarantelli, 1960, pp. 72-73). He or she can lose all initiative, and become incapable of making decisions. In contrast, **overactive response** is characterized by hyperactivity, excess involvement, and pertinaciousness. **Bodily reactions** occur temporarily, even in normal response, but in more severe cases appear earlier, last longer, and are more disabling. **Panic** or **blind flight** is characterized by a complete unawareness of reality and loss of judgment. Healy (1969, p. 285) identifies four factors characterizing a panic situation: partial entrapment, perceived threat, breakdown of escape means (real or imaginary), and breakdown in communication. These reactions and assumptions about them are continually being tested and modified as the limited body of knowledge about disaster response behavior expands.

Dispelling some past tenets. Policies, plans, and programs concerning hazards have been developed, in the past, based upon assumptions about human behavior in disasters. As these assumptions are examined and empirical knowledge takes their place, pragmatic applications should be re-examined. Field research within the last two decades has shown that the majority of people exposed to extreme hazards are resilient; they exhibit initative and employ critical judgment. This contrasts with the historical image of panic, bewilderment, and dependency following disasters--the

"disaster syndrome," an image that is still used as a basic premise in emergency policy formation. In his guidebook for emergency and disaster planning, even Healy states that

> The majority of people confronted with sudden danger will be stunned and bewildered. They are often unable to make decisions and are usually docile and suggestible. They will admit to a state of fear in describing their reactions. Although they recognize danger, they are relatively incapable of utilizing the information for constructive purposes. Their docility and suggestibility clearly demonstrate that they are unable to make decisions. (Healy, 1969, p. 272)

Yet this assertion has been questioned and finally refuted by researchers. Journalistic reports of mass panic have been discounted by follow-up research (U.S. Department of Defense, 1972a). Quarantelli (1960, p. 72) investigated stories of panic in hurricanes, dam breaks, explosions, war-time attacks, and even following the notorious Halloween broadcast of "War of the Worlds;" he identified very few cases of panic behavior.

> Additionally, when panic does occur it is seldom on a large scale. Panic flights are almost always highly localized episodes, with few participants, and of short duration. In fact, except for some instances involving armies, the author after eight years of intensively seeking for such cases cannot cite a single clear cut instance where more than three or four score people were involved. (Quarantelli, 1960, p. 72)

The Disaster Research Center at Ohio State University also studied over one hundred natural disasters and concluded that "in general, <u>people react in an active manner</u>. They show considerable personal initiative and a pattern of self and mutual help" (U.S. Department of Defense, 1972a). Although Healy claimed 75%, the Center's research identified under 20% of those studied as being afflicted with the "disaster syndrome" (Quarantelli, 1960, p. 23). The difference between the two opinions may be definitional and/or dependent on the duration of the problem. In contrast to theories which describe long periods of withdrawal behavior, field studies have found that

recovery is swift in most cases, and that the extent of the syndrome is small.

Activities during an emergency are structured around a hierarchy of informal groups and leadership. The primary focus is upon family, then small groups such as neighbors or co-workers. Analyses of responses have found that, when seeking help after a disaster, the order of priorities is usually from the informal to the formal. Membership groups (e.g., churches, clubs) were used only after help was sought from family, neighbors, and close friends. Government agencies were looked to only after other resources had been exhausted (Quarantelli, 1960, p. 75).

Choice factors under stress. Individual and group reactions to hazardous situations have produced theories about how choices are made. Burton, Kates and White, in particular, have related choice theories to reactions during disasters. In The Environment as Hazard, they cite Heberlein as stating that "a major component of any choice is the sense of responsibility that the individual has toward the cause of the situation and the possible remedial action" (Burton et al., 1978, p. 107). They further state that a person's capacity to act is related to his/her sense of efficacy, of confidence in knowing what to do and when to do it. Knowing what to do also affects the development of small groups and leadership that emerge during disasters. Burton, Kates and White also note that choices following disasters are linked to prior experience--an observation supported by Mileti. In examining why some people respond adaptively and others do not, he found that people who were trained or experienced in emergencies maintained greater efficiency. They also seemed to adapt to situations which might have created anxiety or incompetence in others (Mileti, 1975, p. 107). Experts studying the effects of Hurricane Audrey in Louisiana

also found that, "Individuals facing a new situation, even one as dangerous as an impending disaster, tend to react in terms of prior experience and earlier definitions, and in keeping with the organizational framework of their most meaningful groups" (Fogelman and Parenton, 1959, p. 130).

In summary. Reactions to emergencies do vary. Past research and field studies have shown that reactions are contingent upon the stage of the hazard, the personality of the victim, and the choices available to the victim. Choice depends on a complicated set of variables, including an understanding of the nature of the hazard, perceived knowledge of alternative actions, experience, resources, and confidence. Nonetheless, people remain discriminating, making critical judgments based upon their view of the situation. The evidence, then, is that organization at the individual and small group level does not disintegrate. Behavior--including responses to emergencies--is affected by personality, resources, confidence, and knowledge. Yet the development of response planning in the United States has given little notice to the implications of public knowledge and disposition--the public behavioral profile.

A Regulatory Chronicle: Post World War II Agency Development

The postwar "Atoms for Peace" campaign assumed that the industrial use of atomic power was utterly safe. The danger of escape of radiation beyond containment structures was judged to be so slight that emergency plans were a low priority. Until 1974, there was no planning assistance available from federal agencies to support local government endeavors. In addition, no regulatory agency had primary responsibility for off-site nuclear reactor emergencies (Rogovin, 1980).

Early government involvement in response planning centered on civil defense. After World War II, the Defense Civil Preparedness Agency (DCPA),

under the Department of Defense, was the federal arm responsible for that effort. Its primary function was to coordinate federal, state, and local preparedness in case of a nuclear attack upon the United States, although it also performed the perfunctory duty of supporting non-military planning and emergency response under a "dual use" doctrine (Chanault et al., 1979, p. 29). Although the organization originally operated at the federal and regional levels, the DCPA later channeled federal funds and personnel to state agencies. The DCPA was responsible for many of the shelter and fallout programs of the 1950s and '60s. Figure 3 is a diagram of its organization. The agency eventually merged with the Office of Emergency Preparedness (OEP), a division of the Federal Services Administration, in 1979, to become the Federal Emergency Management Agency (FEMA).

Also created following World War II, the Atomic Energy Commission (AEC), originally staffed by engineers from the Manhattan Project, also performed a regulatory function. However, it was a technical agency as well, promulgating the advantages of commercial nuclear power. Prior to 1974, the commission required on-site safeguards and preparedness plans, but did not require that any provisions be made for off-site areas (U.S. Federal Emergency Management Agency, 1980a, p. I: 4). Conflict of interest arising from the AEC's simultaneous promotion of the industry and its regulatory functions resulted in reorganization. In 1975, the agency was split into the Energy Research and Development Administration (now defunct), and the Nuclear Regulatory Commission (NRC).

> The stepchild relationship of the government and industry was somewhat altered by all of this. Although it inherited many AEC regulatory personnel, the NRC was dedicated to an increasingly strict system of regulation of the industry. The days of riding point for the industry were virtually over, except for an informal legacy of partnership which persisted at the staff level. (Rogovin, 1980, p. 183)

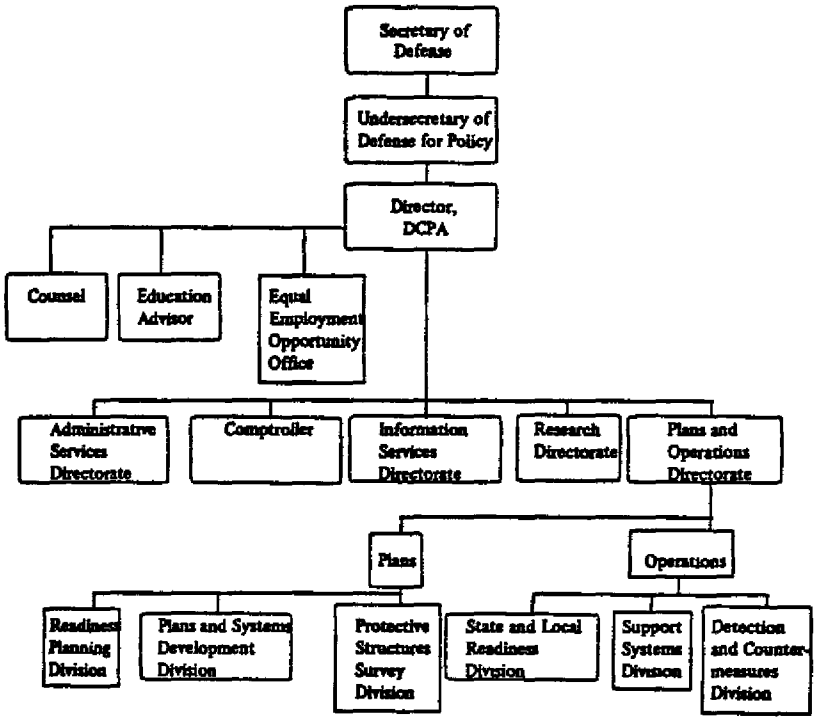

FIGURE 3

DEFENSE CIVIL PREPAREDNESS AGENCY
ORGANIZATIONAL CHART
PRIOR TO 1979

(Chanault et al., 1979, p. 32)

The first federal monies to assist local government in preparation of nuclear response plans were made available during this period of reorganization. In 1973, a Federal Register notice was issued by OEP designating the Atomic Energy Commission as the lead agency for assisting in the preparation of radioactivity response plans. Together with the DCPA, OEP and others, the AEC and later the NRC organized an infrastructure of interagency support (FEMA, 1980a, p. I: 4).

The new program of support was thoroughly voluntary, and in 1975 was broadened to include emergency preparedness assistance not only for nuclear

facilities but for transportation of radioactive materials as well. In 1975, the NRC issued a statement of its reponsibilities, which included:

1. Guidance to state and local agencies for emergency planning
2. Guidance to other federal agencies regarding their authority and responsibility in radiation incident planning
3. Review and concurrence of response plans
4. Guidance for radiation monitoring and detection systems
5. Review and analysis of potential hazards at fixed location nuclear power plants (FEMA, 1980a, p. I: 5-6).

In the assistance program's six year life span, the NRC aided in the development of 14 state plans, including California's, and continued to be the lead agency in guiding radiation emergency planning until the reorganization which took place after the accident at Three Mile Island.

A Near Miss: Three Mile Island and Its Effect

"To the American public, these towers have now become monuments to an epic industrial accident" (Rogovin, 1980, p. 1). The familiar towers referred to by Rogovin in his report to the Nuclear Regulatory Commission are those of the Three Mile Island (TMI) Nuclear Power Plant. The March 28, 1979 accident at Middletown, Pennsylvania brought the nation dangerously close to a major health disaster and increased the nation's awareness of the need for effective emergency planning. Immediately, a six month investigation was initiated. A commission headed by Dr. John G. Kemeny, President of Dartmouth College, was appointed by President Carter to review the performance of the utility, the contractor, the plant personnel, and the adequacy of the emergency response plan. The final report was highly critical. The major findings were:

1. The accident was initiated by a mechanical malfunction and was magnified by human error.

2. At all levels of government, planning for off-site consequences of nuclear accidents lacked coordination, urgency, and attention.

3. The utility company failed to acquire enough information on safety, failed to analyze it adequately, and failed to act upon the information it did have.

4. The incident revealed very serious flaws in the way government and the private sector manage and regulate nuclear power. Fundamental changes were found to be in order.

5. The NRC had not given adequate attention to safety issues. They had ignored them for years.

6. The training of power plant operators was inadequate.

7. The accident had "negligible effects on the physical health of individuals." The major health effect was mental stress associated with the accident (Kemeny, 1979).

President Carter made a series of decisions in response to recommendations of the Kemeny Commission. A Nuclear Oversight Committee was created which now reports annually to the president on the progress of the NRC, other federal agencies, the states, and utilities in improving the safety of nuclear power plants. The Federal Emergency Management Agency was instructed to review emergency response plans in states that had operating or planned facilities. The lead role in off-site emergency planning was transferred from the NRC to FEMA. In turn, the NRC was urged to assist FEMA in these operations (FEMA, 1980b).

In order to meet the new executive mandates, FEMA and the NRC entered into a Memorandum of Understanding (FEMA, 1980a, p. II: 7). The division of responsibility assigned to each agency presently complies with this agreement. The Federal Register lists these commitments:

1. To take the lead in off-site emergency planning. FEMA is held responsible for reviewing plans for adequacy. The NRC is obligated to consider FEMA's findings as part of the licensing process, although no legal requirement for a FEMA approved plan exists.

2. To review state and local emergency plans in states with operating or planned nuclear facilities. By January, 1980, all 31 states with operating plants had been assessed and those found deficient began amending their plans to meet new standards. The San Luis Obispo local plan was prepared in 1977, and California's emergency plan originally received voluntary NRC concurrence in 1978. In general, FEMA found both plans to have a good foundation in state legislation which mandated revisions and provided for reimbursement of up to two million dollars to local agencies by the licensed operators. FEMA commented that "the Diablo Canyon Plant is ready for licensing and may well become a focus for public and political concern over the public health and safety issues of nuclear power" (FEMA, 1980a, p. II: 5-7).

3. To assume the responsibility of training state and local officials.

4. To develop and issue interagency assignments to assess capabilities, define procedures, and assign responsibilities (an effort to coordinate emergency planning) (FEMA, 1980b, p. 42341).

The Nuclear Regulatory Commission's duties and responsibilities for preparedness were also entered into the Memorandum of Understanding. The NRC retains the primary responsibility for licensing commercial nuclear power plant operations. In support of FEMA activities the NRC has agreed:

1. To assess on-site emergency plans of the licensee for adequacy. They must verify the current feasibility of on-site plan implementation, taking into account equipment maintenance, training, personnel, resources, and procedures.

2. To review the findings and determinations of FEMA on the adequacy of state and local plans.

3. To report their findings with regard to the overall state of emergency preparedness (FEMA, 1980b, p. 42341).

As a final common measure for assessing plans, the two agencies have jointly developed criteria for emergency preparedness. Adopted in 1980 and known as NUREG 0654, they provide a planning checklist for state and local governments (FEMA and NRC, 1980).

NUREG 0654 endorsed the use of Emergency Planning Zones (EPZs) as the planning foundation (Figure 4). These zones define the area to be addressed in a nuclear emergency response plan. Two major divisions determine the

shape of the planning zone. The first is called the "Plume Exposure Pathway," and covers an area within approximately a ten-mile radius of the plant. Contamination in this area would consist of whole body exposure to gamma radiation or particle inhalation. The second division is the "Ingestion Exposure Pathway," an area within approximately fifty miles of the exposure point. Danger in this zone would be largely due to contamination of water and food-stuffs (FEMA and NRC, 1980, pp. 4-9). The new criteria also emphasized lessons learned from Three Mile Island. Notification methods, public education, and information procedures have been outlined, and the importance of clear, concise, and early notification was stressed. Dissemination of literature in utility bills, phone books, mailings, and posted signs was listed as a minimum requirement for informing the public (FEMA and NRC, 1980, pp. 43, 49). Moreover, it was required that these measures' effectiveness be tested statistically.

> Every year, or in conjunction with an exercise of the facility, FEMA, in cooperation with the utility operator, and/or the state and local governments will take a statistical sample of the residents of all areas within about ten miles to assess the public's ability to hear the alerting signal and their awareness of the meaning of the prompt notification message as well as the availability of information on what to do in an emergency (FEMA and NRC, 1980, Appendix 3, pp. 3-4).

In a report to the president, FEMA concluded that for the first time the new criteria combined "guidance to nuclear plant operators and state and local governments, thus showing the close relationship between the plan and preparedness of these entities" (FEMA, 1980a, p. VI: 6). NUREG 0654 advanced nuclear emergency planning from the civil defense sphere but still did not provide a link in planning between behavioral profiles of communities and the preparation and administration of emergency response plans. The Federal Emergency Management Agency itself has stated, "Since the

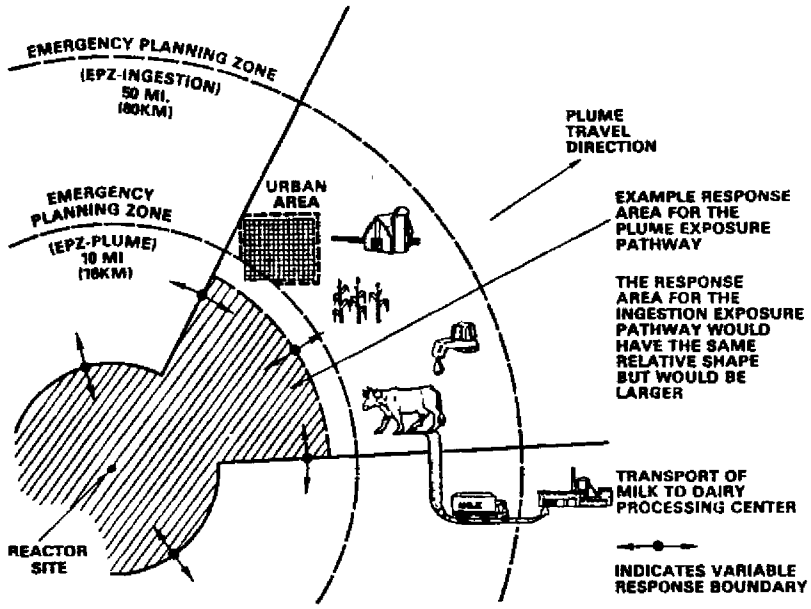

FIGURE 4

CONCEPT OF EMERGENCY PLANNING ZONES (EPZs)

(FEMA and NRC, 1980, p. 16)

accident at Three Mile Island, there has been a growing need for research in the area of human factors, such as the behavior of persons under stress during accidents at nuclear power plants" (FEMA, 1980a, p. VI: 14).

San Luis Obispo County Nuclear Power Plant Emergency Response Plan

The Diablo Canyon Nuclear Power Plant was one of the first facilities to fall under the new regulations, and its draft emergency plan was prepared following the criteria developed by FEMA and NRC. That plan is essentially a supplement to both the California State and San Luis Obispo County Basic Emergency Plans, and has been approved by the County Board of Supervisors.

The plan was developed by Stan M. Voorhees and Associates, Inc., Transportation, Environmental and Planning Consultants, with guidance and

assistance from the California State Office of Emergency Services and the regional offices of the appropriate federal agencies. Additional assistance was provided by Pacific Gas and Electric Company, particularly in covering funding not reimbursed by federal funds (Pursuant to SB-1183) (FEMA, 1980a, p. II:7). An organizational chart of the planning groups involved appears in Figure 5. It is interesting to note that in the chart, public participation is only slightly alluded to in the form of volunteers, and placed at a low priority.

The plan is divided into five parts: an administrative plan; implementing instructions; standard operating procedures (SOPs); support materials; and maintenance, training, and exercise programs. The administrative plan outlines definitions, concepts, and authorities. The implementation section specifies when an action should be taken, by whom, and what that action should be. The SOPs are more specific still and give operational level instruction on a smaller group scale. SOPs are satellite plans which may be developed for schools, hospitals, or large employers. The support material contains background information, and the final section summarizes the requirements for plan maintenance (San Luis Obispo County, 1981c, p. viii).

The emergency plan was submitted to both the California State Office of Emergency Services and the Federal Emergency Management Agency for review and comment. Legally, the relationship of county approval of the plan to the granting of an operating license by the Nuclear Regulatory Commission is ambiguous. Technically, there is no federal provision requiring an approved plan as a prerequisite for licensing. FEMA, however, must evaluate a legitimate plan and that evaluation must be taken into consideration in the licensing process by the NRC. Not being anxious to

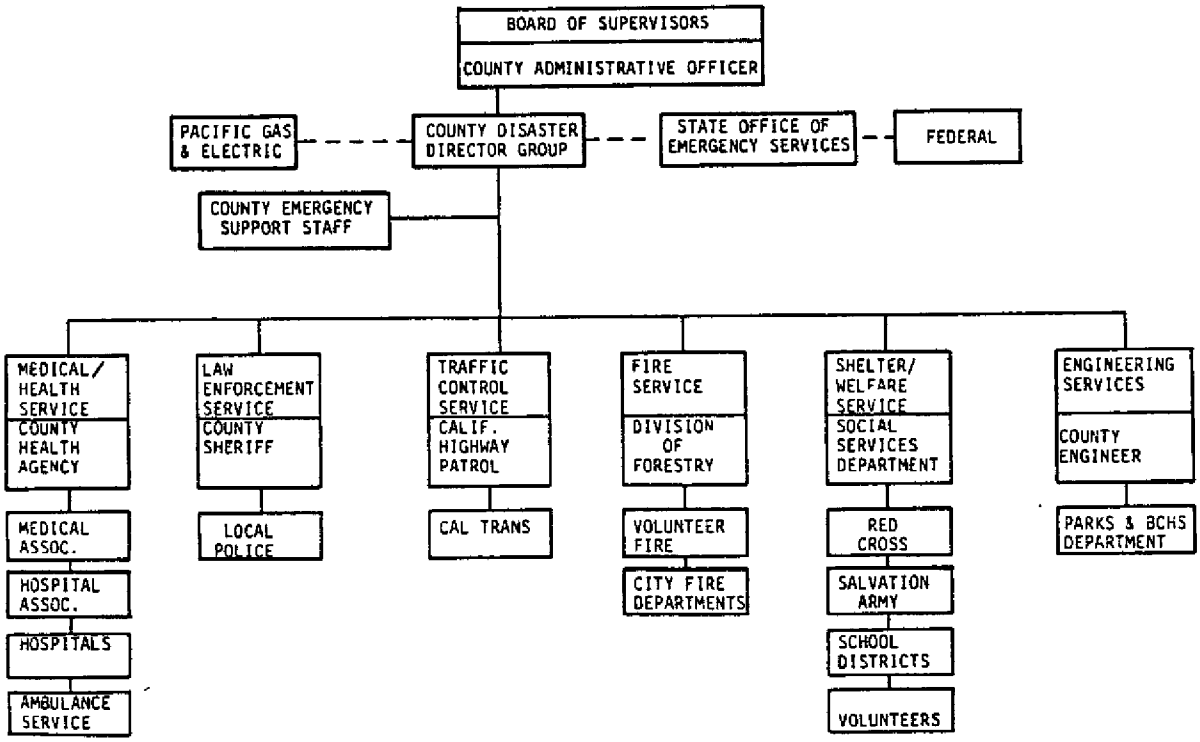

FIGURE 5

EMERGENCY PLAN ORGANIZATIONAL CHART

(San Luis Obispo County, 1981c)

test the case in court, interested parties felt pressured to obtain local approval (Woertz, 1982).

The San Luis Obispo County Nuclear Power Plant Emergency Response Plan is a document that took two years to draft, and is two inches thick. One hundred and fifty copies have been distributed to agencies, utilities, volunteer groups, and libraries, and authorities have met all requirements for public hearings. There has been newspaper and radio coverage of its development and ratification. An initial exercise has taken place; sirens have been installed. The County Office of Emergency Services has circulated samples of a prototype one-page instruction sheet for radiation

emergencies. Pacific Gas and Electric Company (PG&E) has included informational flyers with utility bills. Page A4 of the San Luis Obispo County Telephone Directory (October, 1981) gives information about the plan. All of these actions were required by regulations designed to educate citizens and aid in the preparedness of affected populations. However, although the authors of the document stated their goal as "the preparation of a response plan and the associated preparedness of government and citizens" (San Luis Obispo County, 1981c, p. I.1(1)), fulfillment of the legislative requirements is not necessarily synonymous with successful preparedness of the public. Unfortunately, the nuclear power emergency response plan for San Luis Obispo County focuses upon bureaucratic, administratively centered solutions emphasizing logistics and lines of authority. Human behavioral characteristics--attitudes, awareness, perceptions, confidence--are not well considered.

RESEARCH DESIGN

The degree of success or failure in incorporating community behavioral characteristics into the San Luis Obispo County Nuclear Power Plant Emergency Response Plan was tested by a questionnaire survey completed in the spring of 1982.[1] Utilizing stratified random digit dialing, the survey was administered by telephone to 200 households in communities near Diablo Canyon. The telephone survey technique was chosen after considering factors of cost, time, randomness, bias, and spontaneity. The sample size and target population were chosen to generate statistically valid inferences about the population, but at the same time to still constitute a manageable unit (French, 1982). A target population is that group about

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[1]The questionnaire appears in Appendix A.

which information is being sought. It may be the group of people constituting the general population, a group of professionals, organizations, agencies, or any other subgroup of individuals or combinations of individuals. The target population in this study consisted of households in proximity to the Diablo Canyon Nuclear Power Plant site--the "Basic Emergency Planning Zone" (Basic EPZ) being chosen as the outer boundary of the population. The household is an appropriate unit for study because of the nature of emergency response and the logistics of administration. This choice intentionally excludes transient populations such as tourists, sportspersons and hikers, shoppers, and commuters.

Figure 6 outlines the boundaries of the EPZs for San Luis Obispo County. An EPZ is defined in the Draft Emergency Response Plan as:

> The State of California Nuclear Power Plant Emergency Response Plan area is enclosed by a boundary with a minimum radius of ten miles but which is enlarged for each nuclear power plant to include areas where protective actions may be required (The range of protective actions includes total evacuation) (San Luis Obispo County, 1981c, p. I.3(1)).

The Basic EPZ is an easily definable geographic area, and worked well for this survey, providing a manageable, statistically representative sample.

To obtain results truly indicative of respondents' attitudes and awareness, spontaneity and lack of bias on the part of respondents were sought. Using the telephone to conduct the survey eliminated the possibility of researched answers or collaborative efforts. Bias and ambiguity were reduced through careful pretesting and ordering of questions and responses, and through the screening and training of interviewers.

The "Communities Speak" questionnaire was administered over a period of one month, at different times, alternating days and evenings, work days and weekends. Respondents were told the nature of the survey and asked if

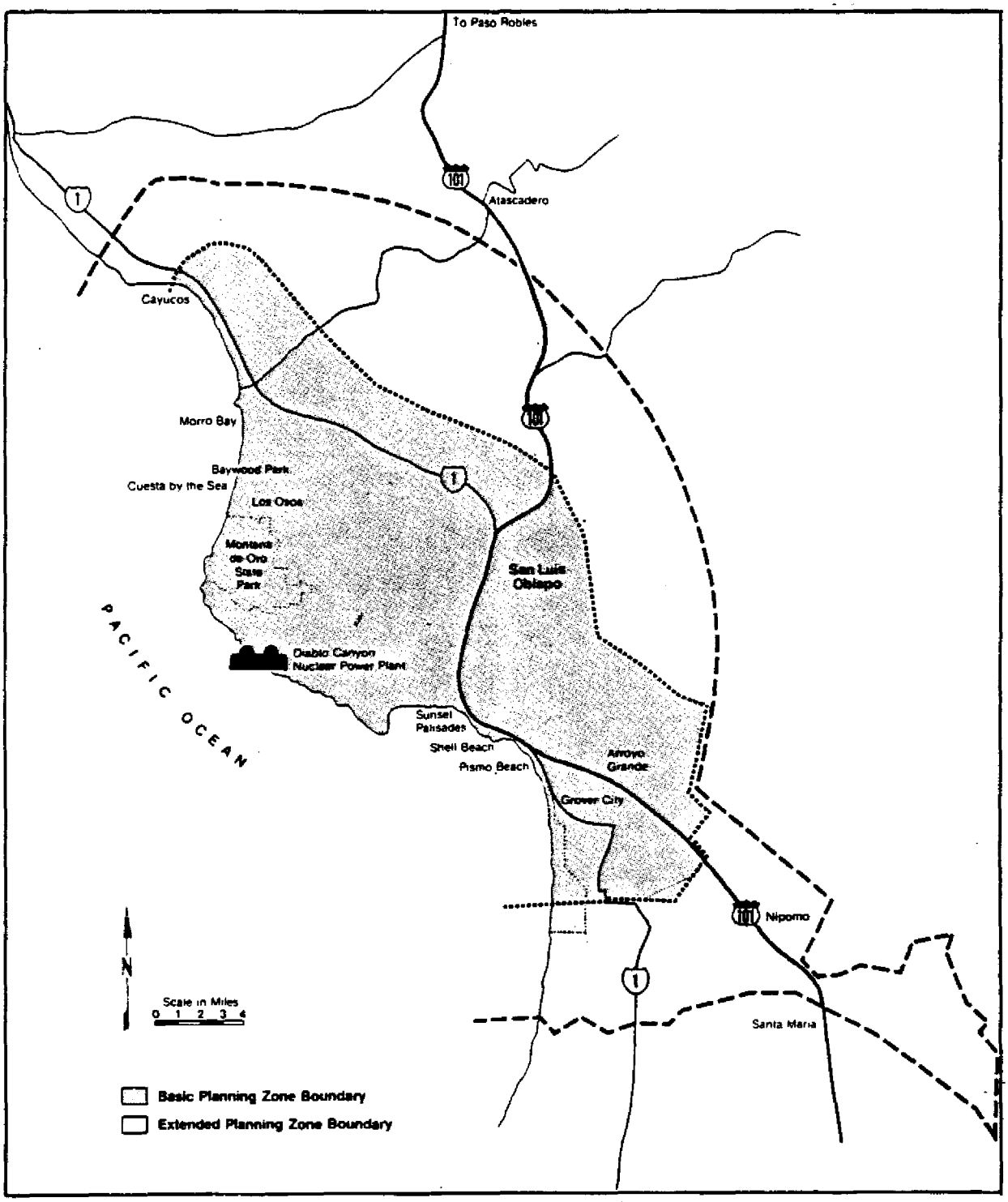

FIGURE 6

EMERGENCY PLANNING ZONES FOR
SAN LUIS OBISPO COUNTY

(Pacific Gas and Electric Company, 1982)

they would be willing to respond. Additional comments were encouraged and recorded.[1] Closed answer categories were immediately coded, while open-ended answers were categorized after the survey's completion. The length of time needed to conduct the "Communities Speak" interview ranged from 8 to 45 minutes.

At the completion of the survey, all responses were statistically analyzed by computer to produce information on frequencies of response, percentages, and comparisons of responses to demographic profiles. Cross tabulations were also generated to compare selected responses, and chi-square tests were used to determine correlation and dependence.

The interviews provided data on residents' attitudes and awareness concerning emergency planning for the Diablo Canyon Nuclear Power Plant. Not insignificantly, they also provided a channel of communication between decision makers and local residents, and acted as an educational tool. Analysis of the data provided insight into several questions pertinent to effective response planning:

1. How effective has the public notice and education program been?
2. How involved have communities been in the preparation of the Emergency Response Plan?
3. How knowledgeable are residents about the plan, and what is the level of emergency preparedness?
4. What is the perceived risk of residents towards the power plant's operation, and how does that affect response?
5. What is the contribution of local residents to plan development and maintenance, and what can it be?

[1]A complete record of comments is listed in Appendix B.

COMMUNITIES SPEAK: ANALYSIS OF RESIDENTS' AWARENESS AND ATTITUDES

As stated earlier, Diablo Canyon Nuclear Power Plant rests on an oceanside bluff surrounded by several hundred acres of rolling hills. It sits at the mouth of Diablo Creek, and is separated from U.S. Highway 101 by the Irish Hills, part of the San Luis Mountain Range. Nearby communities are small, but growing. The area economy relies largely upon agriculture, fishing, and tourism.

To the north of the plant lies Baywood-Los Osos, the city of Morro Bay, Cambria, and Cayucos. They are picturesque seaside communities with a combined population of under 25,000.[1] The residents of these areas are mostly white and middle class, with a high percentage of senior citizens. Often considered to be bedroom communities of the county's inland capital (San Luis Obispo), these towns are buffered from that city by agricultural lands and open space.

The city of San Luis Obispo is the largest in the county and is also the county seat. It has a population of slightly more than 34,000 according to 1980 census data. During most of the year, San Luis Obispo is a college town, being adjacent to California Polytechnic State University. The summer population dwindles to two-thirds of its school year size. Its climate is warm and temperate because of the protection provided by nearby hills.

South of San Luis Obispo and towards the coast, the climate is cooler. The small towns and cities on the gateway side of the Diablo Canyon site range in population from under 1,000 to somewhat over 11,000. The beachfront areas rely on tourism, and the summers bring scores of

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[1]This and all other census/demographic data were obtained from the "1980 Census Summary Report (File 1)," California State Census Data Center.

sunbathers and vacationers in recreational vehicles. The economic base of the inland towns is agriculture.

All of these areas lie within the Basic EMZ. There are five incorporated cities, six unincorporated town sites, and surrounding rural lands included in the study area. Together, they include approximately 75% of the county's population. There are 42,277 dwelling units inside this planning zone (see Table 3). Residents of those units (over 100,000 people) were the target population of this study. Only three households fall within a two mile radius of the Diablo Canyon Nuclear Power Plant, and just 30 are located inside a six mile zone. Consequently, the vast majority of the study population is between six and 15 miles from the plant site. The outskirts of the largest city, San Luis Obispo, are 12 miles from the power plant.

The Communities

Survey results are only valid if the sample survey has similar characteristics to the study population. To test this, the survey respondents were asked a series of descriptive questions, and their demographic characteristics were compared to the communities' demographic profiles.

The respondents tended to be slightly younger than the county's population as a whole, but in the final analysis, the overall results were affected little. The margin of error was within 5% of county figures, a number small enough to infer validity. The percentages of males and females fell well within 5% of county statistics. Fifty-two percent of the respondents were female and 48% were male, compared to 49% female and 51% male in the county as a whole. The ratio of owners to renters was 1:1, compared to 1.3:1 for the county. The study's close correlation to

Protective Action Zone Number and Title		Residential Population	Dwelling Units
1	2-mile	5	3
2	6-mile	58	27
3	Avila/San Luis Bay	949	502
4	See Canyon/Prefumo Canyon/ Los Osos Valley	57	29
5	Baywood/Los Osos	11,554	4,691
6	City of Pismo Beach	5,286	3,315
7	Squire Canyon	210	79
8	San Luis Obispo Area	41,803	15,561
9	Morro Bay/Cayucos	11,830	6,172
10	Five Cities, Southern portion	25,459	10,555
11	Price Canyon, Orcutt Road Lopez Drive, Route 227	1,386	599
12	Nipomo north of Willow Rd.	2,000	744
	Sub-total, Basic EPZ	100,588	42,277
13	Nipomo	7,137	2,474
14	Cuesta Pass/Santa Margarita	1,151	455
15	Rte. 41/ Cypress Mtn. Drive	171	66
	Total, Basic and Extended EPZ	109,047	45,272

TABLE 3

PROTECTIVE ACTION ZONE ESTIMATED 1980
POPULATION AND DWELLING UNITS

(San Luis Obispo County, 1981c)

demographic measures for the general population strengthens the validity of the results for the study population.

Additional descriptive information was asked of respondents to provide clearer insight into the character of the communities. Analysis of education levels showed that over half (67.4%) of those questioned had at least some college background. One-quarter (24.6%) of the respondents had high school diplomas, and 8% had somewhat less than a high school education.

People in the survey population were relatively active in their communities. The majority (55.1%) had participated in or attended community meetings. Public meetings were most frequently mentioned, drawing involvement from over one-third (37%) of the respondents. Neighborhood social gatherings and school meetings were also attended by 14.5% and 16%, respectively. Generally speaking, levels of education and citizen participation indicated that residents were educated and informed.

The communities were aware of the Diablo Canyon Nuclear Power Plant and had some idea of its location. Over one-quarter (25.8%) had been living in the area since the time the site was originally approved for construction. (Approval was made in the late 1960s, and construction began in 1970.) Ninety percent of those surveyed had lived in their communities for the bulk of the licensing hearings and anti-nuclear protests.

Respondents were asked how far they lived from the plant site. The purpose was to give some indication of perceived notions of proximity. A strong relationship was found between real and perceived distances from the plant site (Figure 7). Overall, most thought themselves to be much closer to Diablo Canyon than they were. Over half (52%) believed that they were less than ten miles away. Actual figures show that only 12% of the households are within that distance. Twelve percent of all respondents estimated the plant to be over 15 miles away, but it is interesting to note that in the city of Morro Bay, 44.4% of those interviewed fell into this category. Morro Bay, however, is clearly within the boundaries of the Basic EPZ. One explanation of this perception may be that the entrance to the plant is on Avila Bay Drive--more distant from Morro Bay. For some, the entrance point may provide a gauge for estimating distance. No significant ties were found between these results and education level, length of

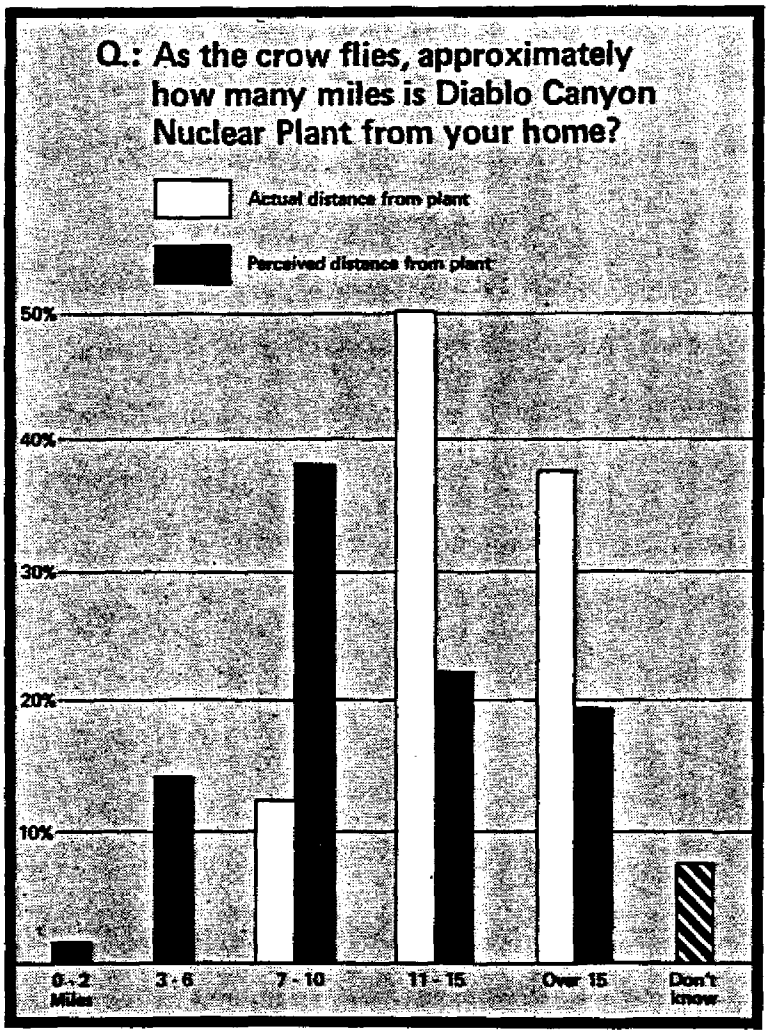


FIGURE 7

PERCEIVED AND ACTUAL DISTANCE FROM
DIABLO CANYON NUCLEAR POWER PLANT

residence, or knowledge of the emergency response plan. Perceptions of proximity to Diablo Canyon appear to be based upon some general knowledge of its location and its felt presence.

Public Exposure to the Emergency Response Plan

At the time of this study, the legal requirements for informing the public about the emergency response plan (as set forth by federal criteria) had all been met. Yet, only 35% of those questioned had any familiarity

with the San Luis Obispo County Nuclear Power Plant Emergency Response Plan draft. Those who did know about it tended to be citizens that were generally more active in the community. Although only three people reported having attended a public meeting specifically concerning the plan, almost three-quarters (72.1%) of those who knew something about the plan had also been active in the community in some way (Figure 8). The newspaper was the major source (65%) of information about the emergency response plan. To a lesser degree (43.1%), respondents mentioned hearing news through radio or television broadcasts. A few (17.2%) also received pamphlets from either the Pacific Gas and Electric Company or the County Office of Emergency Services. A variety of other sources were quoted as well, including friends, classes, and "inside" information from plant employees.

Emergency preparedness by individuals seems to bear some relationship to knowledge of the plan. Those who knew something about the plan tended to also have given some thought to how they would reunite their families if an evacuation were necessary. One-third of the respondents who had some familiarity with the plan also had thought about the problem of reuniting their families, while only 14.2% of all others had given it any thought. Results indicated only a small increase in knowledge about sirens on the part of those with some knowledge of the plan. (The newly installed sirens were designed to warn residents of impending danger and signal them to tune into the Emergency Broadcast System for further information.)

Because resourcefulness can be critical in an emergency, knowing where to find information about emergencies is important in itself and is a good indicator of public awareness. Respondents were asked if they had any information close at hand telling them what to do if there was a radiation emergency at Diablo Canyon. Only 5.5% answered "yes" and, more

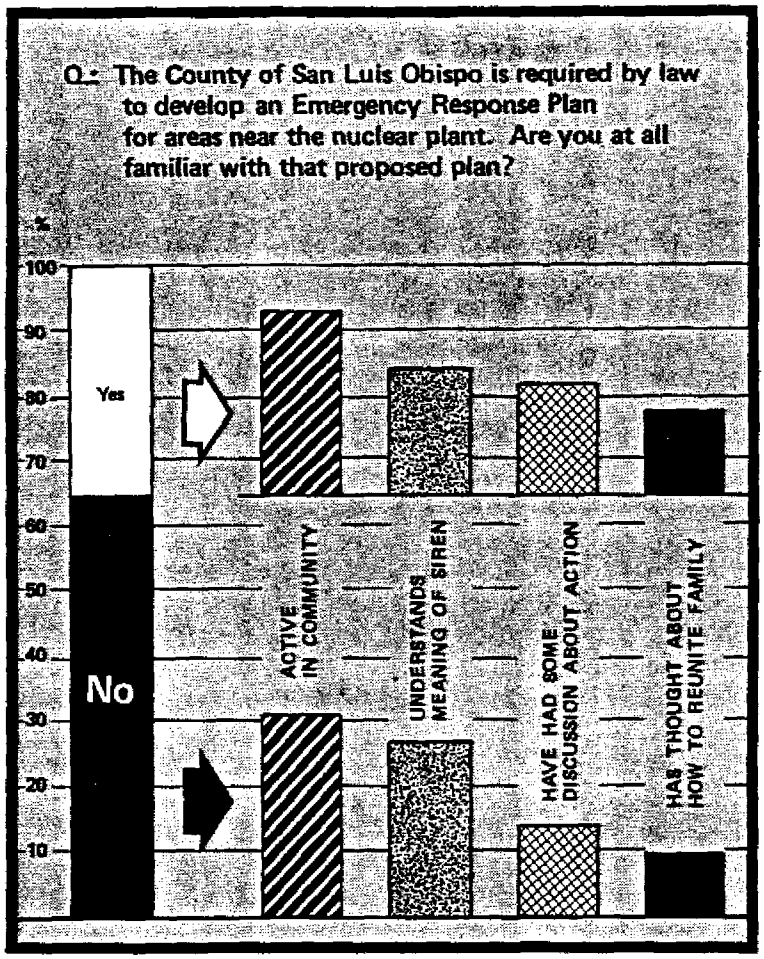


FIGURE 8

KNOWLEDGE OF THE
SAN LUIS OBISPO COUNTY NUCLEAR RESPONSE PLAN DRAFT

significantly, only two people out of the 200 who were interviewed referred to the information in the telephone directory. The San Luis Obispo directory contains a full page of information for nuclear emergencies (Figure 9).

The majority of the public was not familiar with the San Luis Obispo County Nuclear Power Plant Emergency Response Plan, and those who were

tended to have only a vague understanding of its content. Almost all information intended to reach household members had gone unnoticed.

Community Preparedness

The plans and actions residents individually decide upon are very important to community or area emergency planning. Generally, people react rationally based upon their knowledge and experience (Fogelman and Parenton, 1959, p. 130). Thus, whether or not to follow someone else's instructions is a conscious choice by most people. In the survey, questions were asked to determine possible decisions under current levels of understanding. Approximately one-half (48.5%) of those interviewed indicated that they would probably follow their own plans during an emergency, rather than those issued by someone else. Many expressed the hope that their plans would match those of authorities but gave their own decisions priority. Close to one-third (30%) of those interviewed would not take shelter in their homes, even if those were the instructions given. A strong correlation showed up in the answers to these two questions. The overwhelming majority (88.6%) of respondents who would make their own plans also would not take shelter even if instructed. Approximately two-thirds (67.3%) of those who would follow instructions also would take shelter if advised. It is interesting to note that over half (61.3%) of those who would not take shelter in their homes felt the chances of a major accident to be somewhat high. In contrast, the majority (63.6%) of those who would take shelter perceived the chances of a major accident to be either low or very low (Figure 10). There seems to be a connection between residents' perceptions of risk and actions they would be willing to take.

An indication of the extent of deliberate preparations was also obtained by the survey. The survey population was asked if they had ever

Nuclear Emergency Information

A4

San Luis Obispo Area Nuclear Power Plant Emergency Response Plan

A radiological emergency can occur as the result of an accidental release of radioactive material from a nuclear power plant or as the result of an accident involving vehicles carrying radioactive material. Health hazards can result from prolonged exposure to radiation levels above normal background radiation, from short exposure to high levels from breathing in radioactive materials or from taking in radioactive materials through food and drink.

Local government agencies have instruments and trained personnel to detect the presence and level of radioactivity. If necessary, warning will be given so that protective measures can be taken.

Siren System

In the event of a threat to public safety because of an actual or potential unplanned release of radiation from Diablo Canyon Nuclear Power Plant, warning sirens will be sounded. The sirens are placed throughout the shaded area shown on the map at right and are designed to be heard clearly by everyone in the area.

In some cases, mobile sirens, telephone calls, Coast Guard vessels offshore or home visits may be used as an alternative or additional means of alert.

If You Hear Sirens

If you should hear sirens sounding a loud, steady tone (about three to five minutes in duration), you should turn on your radio or television and listen for instructions over the Emergency Broadcast System (EBS). You will be kept informed as long as the emergency or threat of an emergency exists. Please do not use your telephone except for personal emergencies.

The primary EBS stations in this area are:

KVEC	**920 AM**
KSLY	**1400 AM** (evening hours)
KSBY-TV	**(Channel 6)**

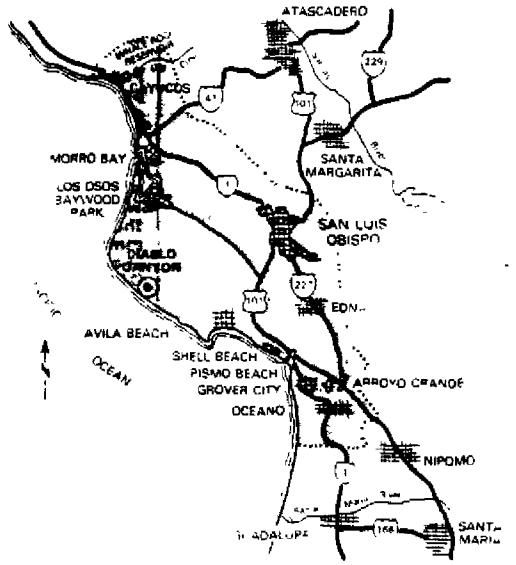
Other area AM and participating FM stations will repeat EBS broadcasts from these primary stations.

Emergency Actions

The sounding of sirens requires nothing more than your tuning into an EBS station for information. County officials will provide current information on the emergency and advise you to take any protective actions which may be necessary. Protective actions may involve staying indoors with doors and windows closed and ventilating or air conditioning systems turned off. Temporary evacuation of certain affected areas might be recommended. Such instructions would be given over the local radio or television stations through the Emergency Broadcast System.

Local Emergency Telephone Numbers

County Sheriff	**543-7911**
County Office of Emergency Services	**549-5011**



For More Information

If you would like more information on the emergency response plan or on the Diablo Canyon Nuclear Power Plant, write or call the San Luis Obispo County Office of Emergency Services or Pacific Gas and Electric Company.

San Luis Obispo County Office of Emergency Services Courthouse Annex, Room A205 San Luis Obispo, CA 93408 Telephone **549-5011**	Pacific Gas and Electric Company **894 Monterey Street** San Luis Obispo, CA 93401 Telephone **544-3334**

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Effective date for telephone listings and addresses on this page is July 24, 1981.

SAN LUIS OBISPO

FIGURE 9

NUCLEAR RADIATION EMERGENCY INFORMATION
AVAILABLE IN THE LOCAL TELEPHONE DIRECTORY

(Pacific Telephone and Telegraph Company, 1981, p. A4)

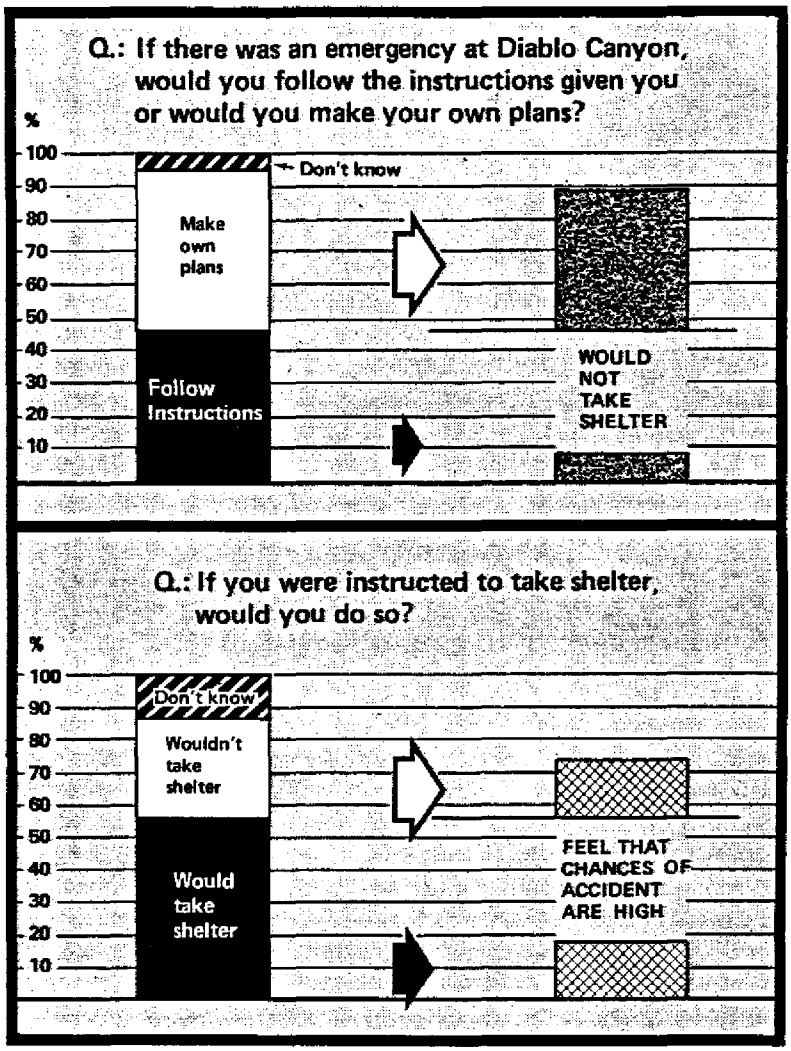

FIGURE 10

DECISIONS AND ACTIONS

discussed with either family or friends possible actions to take in case of an emergency at Diablo Canyon. A moderate number (34.5%) had had at least some conversation generally concerning the problem, and those who had some knowledge of the emergency response plan had pursued the subject more often than those who knew nothing of the plan.

Most of those questioned (76.1%) had no idea how they would reunite with their families if an evacuation was necessary. Those who preferred to

make their own plans tended to have more of an idea than those who would follow instructions. A small proportion (15.4%) of those who had thought about the problem had no family in the area. The others provided a wide range of responses. Those who had local family ties most often favored meeting their families before evacuation and "sticking together" (31%). This contrasted with the 16% who would meet their families outside the area. A characteristic sampling of ideas elicited includes:

> "There are only two of us. We'd stick together."
>
> "I have a route picked out - go north and circle back south to L.A."
>
> "I would go get the kids at school and meet my husband."
>
> "We would meet at a pre-arranged place."
>
> "Won't evacuate."
>
> "We have a trailer stocked with food. We would go to the mountains."
>
> "Meet in Bakersfield."
>
> "Hopeless."
>
> "I would get more information."[1]

Early warning siren systems have been installed in the area by PG&E, and respondents were asked what they would do if the sirens went off. Some respondents (16.1%) had absolutely no idea what they would do in that event. A surprisingly large number (47.8%) reported that they would seek further information or instructions about what to do. Another 21.6% mentioned that they would either evacuate or prepare to evacuate. There does not appear to be any significant difference in response between those who had heard about the emergency response plan and those who had not, possibly

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[1]Appendix B contains a complete list of the comments.

suggesting that the anticipated reaction is a matter of personal judgment. A wide variety of possible actions were given. A notable feature was that almost two-thirds (62.5%) of those who mentioned gathering their families were also those who had previously discussed what actions they would take.

The things people would take with them if an evacuation was necessary could expedite or hinder emergency procedures. Respondents were therefore questioned about what items they thought were important. Most of those surveyed mentioned at least some general categories. Two-thirds (65.5%) cited either people, animals, or stores of food--animals being a major concern of 15.5% of the total sample. Water and/or clothing was reported by almost half (47.5%) of the respondents. There was a strong correlation between those who had received some information about the emergency response plan and those who mentioned bringing water and clothing.

Interestingly, despite the dry climate, money was chosen more often than water. Personal effects (9%), bedding (8%), important papers (8%), valuables (6.5%), keepsakes (6%), and transportation (6%) were also mentioned. Some poeple thought to add medicine or first-aid kits (4.5%), weapons (3%), flashlights and radios (2.5% each), but only two people (1%) suggested they might bring fuel, camping gear, or survival kits. Beer, a clock, a stereo, and a guitar also made their way onto the list. Results suggest that there is a general knowledge about what kinds of items would be a priority, but there is a lack of knowledge and/or consensus about which specific items should be taken.

Attitudes and Confidence

The next portion of the questionnaire examined the communities' overall feelings of confidence and security. Opinions on the likelihood of a

major accident at Diablo Canyon were divided. Approximately 40% of the respondents thought the risk of a major accident was high or very high. Slightly over 50% rated the chances as low or very low (see Figure 11). There did not seem to be much of a difference among communities in this perception of risk. Neither community geographic location nor estimated distance from Diablo Canyon correlated with this response. Analysis did

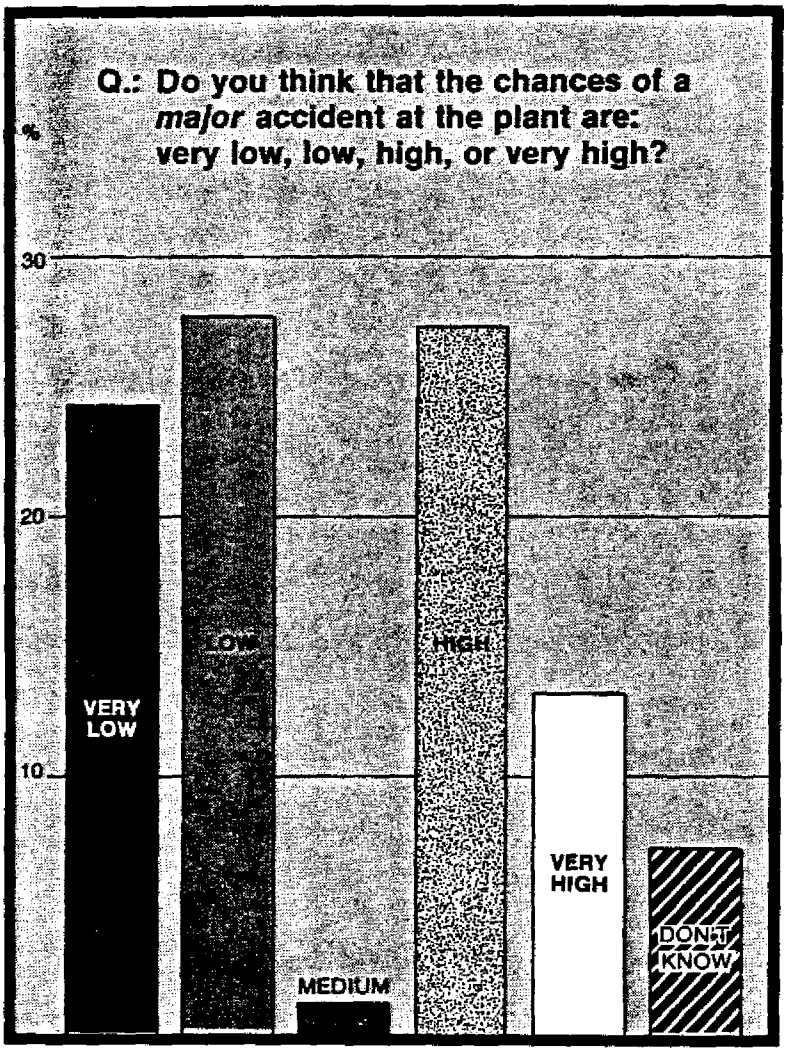

FIGURE 11

PERCEPTIONS OF RISK: MAJOR ACCIDENT POTENTIAL

show, however, a strong connection between this and other feelings of safety, security, and confidence.

As a means of assessing the perceived risks of living near a nuclear power plant, respondents were asked what kind of secondary effects its operation would have on their community. Diablo Canyon was generally felt (48.2%) not to have any effect on the growth of the area. However, a significant number (37.2%) tended to believe that population would actually decrease if the plant were put into operation. A very small number (9%) saw the power plant as an incentive to growth. About half (50.3%) of those questioned believed that property values would decrease if Diablo came "on line." Only 4% thought the effect would be to increase assessed value. Figure 12 graphically demonstrates these results. No positive connection could be made between these figures and any one salient community characteristic; the findings remained consistent across demographic and geographic categories.

Respondents in areas near the nuclear power plant definitely felt a decline in safety and security. Almost two-thirds (63.6%) of the sample population felt that their community's safety and security would decrease if Diablo Canyon began to produce power. In contrast, 20.2% thought there would be no effect, 8.6% thought safety and security would increase, and 7.6% could not predict. Analysis showed a positive correlation between feelings of safety and security and the respondents' estimated number of miles from the plant.[1] Surprisingly, the proportion of respondents feeling a decrease in safety and security also grew larger as estimated distances from the plant lengthened.

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[1]Chi-square tests for independence showed significance at the .001 level.

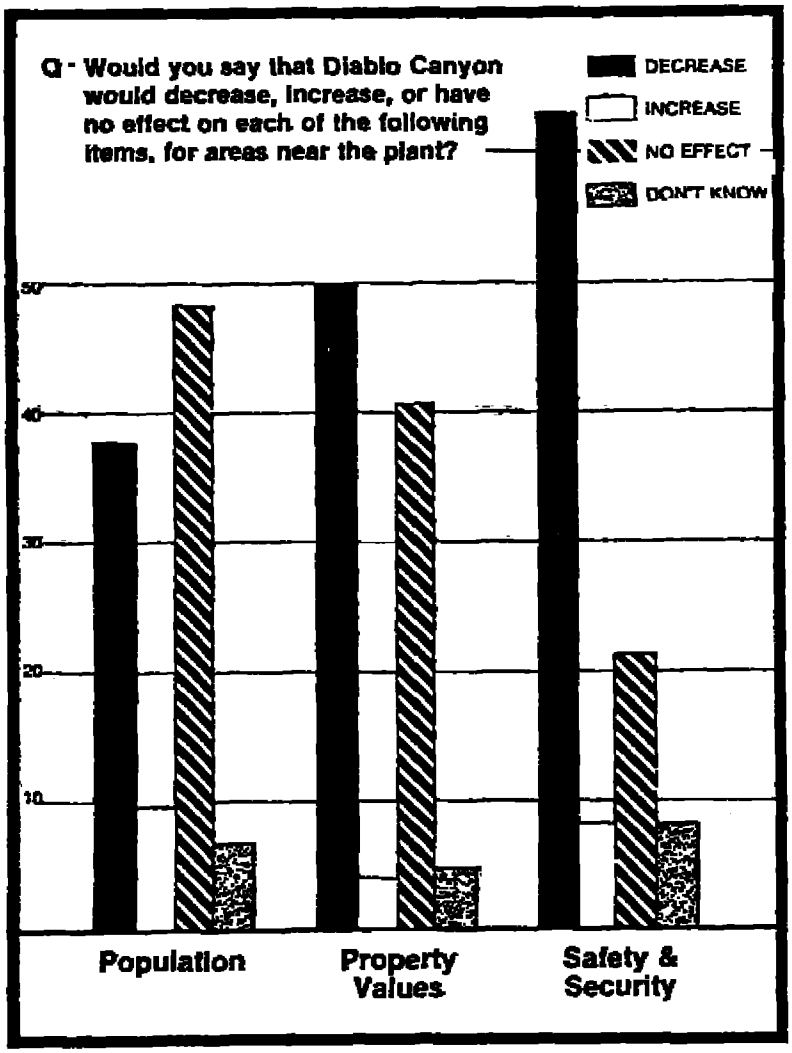

FIGURE 12

PERCEPTIONS OF RISK:
POPULATION, PROPERTY VALUES, SAFETY AND SECURITY

There were other links between attitudes and awareness. In comparing perceptions of risk and perceptions of safety and security, it was found that among respondents who felt the chances of an accident were serious, there was a greater likelihood of perceived loss of safety and security. However, the perceived risk tended to decline slightly for those who had received some information about emergencies.

Confidence in the source of information can be extremely important in a crisis situation. As a partial measure of respondents' confidence in various sources, the survey population was asked to rate their feelings about local government and the Pacific Gas and Electric Company. The communities in the sample tended to rate both relatively low (see Figure 13). Approximately three-quarters (73.9%) felt the local government's ability to respond to a major emergency at Diablo Nuclear Power Plant was low or very low. Less than 15% thought the ability was at least high, and only three individuals rated it as very high. Many potential correlations were analyzed for significance, but opinions were independent of most factors with only a few exceptions. The percentages of those who rated the government's ability to be low tended to rise with an increased perception of risk. However, even a majority (71.6%) of respondents who felt that the risk of a major accident was low held a low estimate of government's ability to manage a crisis. Information about emergencies also tended to affect respondents' ratings of the government's ability to respond to a major emergency. Those who had some information gave higher ratings than those who did not, reflecting some increase in their confidence in government.

Similarly, 59% of those questioned rated as low or very low their confidence that PG&E would promptly inform the correct agencies of any hazard at Diablo Canyon Power Plant. Over one-third (37%) expressed a high or very high degree of confidence in the utility. In this case, less than half (42.8%) of those who felt a low risk of a major accident had low confidence in PG&E as well. These figures suggest that residents hold PG&E responsible for pre-emergency risk management and the government for post-emergency management, and that those residents have little confidence in

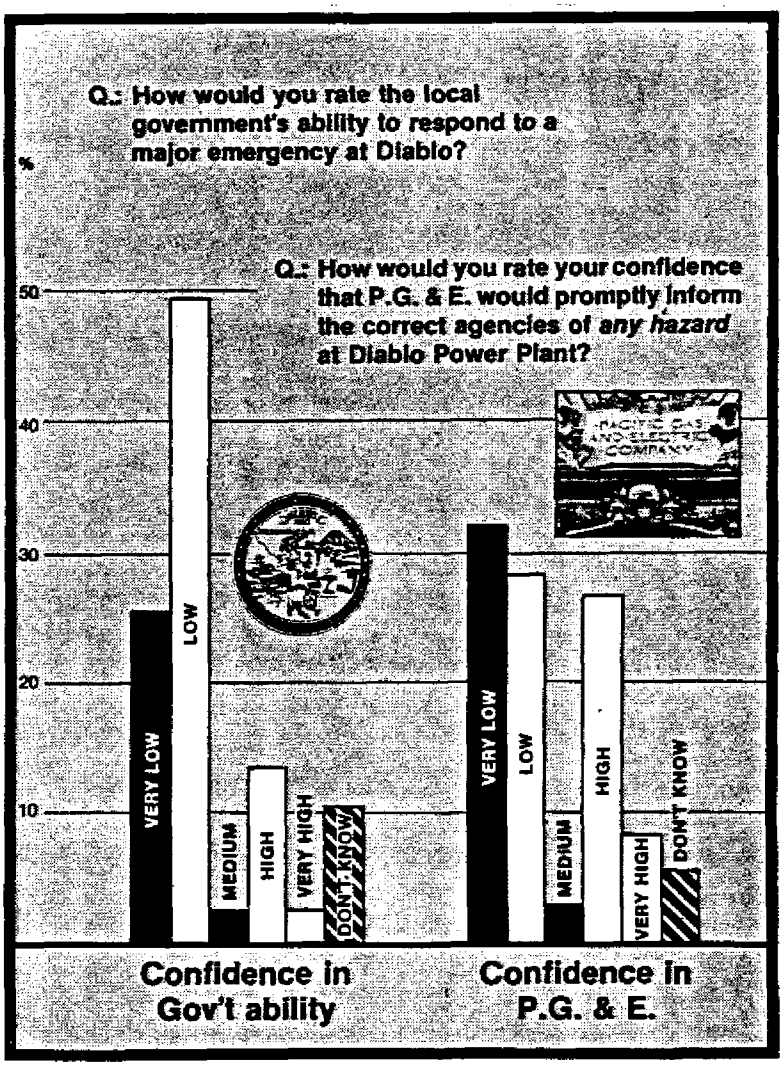

FIGURE 13

FEELINGS OF CONFIDENCE IN THE UTILITY
AND IN LOCAL GOVERNMENT

either organization's ability. Of course, both organizations must contribute to produce an effective response.

Needs and Resources

The survey was designed both to gain and to give information. Respondents were asked about their past experience with emergencies and their expectations of government in a possible future emergency. It was found

that 30.8% of the study population had witnessed some type of public emergency in the past. The events mentioned were diverse. As might be expected, the most common emergency mentioned (41.3%) was an earthquake. Flooding was also frequently reported (22.2%), and tornadoes (12.1%), fires (9.6%), war, and hurricane (both 8%) were also mentioned. A few respondents listed typhoons, tidal waves, avalanches, dam breaks, and one respondent reported having been in a nuclear radiation accident. Many persons offered descriptions of their emergencies and their responses. Some had had to evacuate, and others had barely escaped harm.[1]

When these answers were compared to others, it was found that those who had been in emergencies before were slightly more likely to plan to take shelter in their homes if an emergency occurred at Diablo Canyon. Persons who had experienced an emergency were twice as likely as those who had not to have thought about how they would reunite with their families. Similarly, 46.7% of those with experience had discussed what action to take in a radiological emergency compared to only 28.7% of those without this background. There appeared to be no difference between these groups in their attitudes toward issues or confidence in groups related to emergency operations at the power plant. Perhaps importantly, 10% of the population studied had been in a situation serious enough to call for evacuation. Their experience and knowledge of emergency response may be a valuable community resource.

Strong concern was expressed for the needs of special groups of people, and respondents felt that these groups should be monitored by local government. Approximately 85% agreed that government should have a special

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[1]Individual comments are included in Appendix B.

means of helping the mentally and physically handicapped, and those in institutions such as prisons and hospitals.

Other dependent groups were given similar support. Approximately three-quarters of the respondents felt that government should have information on elderly and school age populations and should keep track of these groups. Transportation-dependent populations were also identified by 70.4% as requiring special attention, and 63.8% reported that all those living within ten miles of the plant should be kept track of by local government. Some respondents commented that the feasibility of collecting and maintaining such information was questionable, but the overwhelming majority felt that something should be done.

Perceived risk tended to influence the perceived needs of these special groups. Respondents who thought the chances of a major accident were nigh were much more likely to support the idea of special help for these groups. Similarly, as confidence in PG&E and the government's ability to respond decreased, the perceived need to provide special help for people living within ten miles of the plant increased.

Twenty-seven percent of the respondents reported that someone in their household fell into one of these special categories. By far, most were school children (31.5%) or elderly (38.9%). Thirteen percent of the respondents reported that someone in their household was without private transportation. Homes with school children and transportation dependent members were more likely to have low confidence in PG&E and in the government's ability to protect them.

The major sources of information for most of the special groups, particularly the elderly, were television and the newspaper, but not the radio.

Many who were questioned (44%) mentioned that they knew of someone in their neighborhood who might need help in an emergency. They often offered suggestions, proposing ways that government might help dependent groups, most often citing transportation, evacuation, communication, and information needs.

The study population seemed to welcome the opportunity to express their ideas and concerns, and offered many comments. Because they were assured that what they thought mattered, their comments are included in Appendix B.

Summary of Major Findings

The "Communities Speak" questionnaire was administered to households within the Emergency Planning Zone for Diablo Canyon Nuclear Power Plant--encompassing 75% of the county's population. The results showed:

The communities

1. The age structure and sex ratio of those studied came within 5% of county statistics.
2. The ratio of owners to renters was one to one.
3. The majority of the sample population had some college background.
4. The majority of the sample population had engaged in some kind of citizen participation.
5. The respondents tended to feel that the plant was closer to where they lived than it actually was.

Public exposure to the emergency response plan

1. Only one-third of the households had any familiarity with the plan.
2. Only 5.5% of the households claimed they had any information telling them what to do if there was an emergency at Diablo Canyon Nuclear Power Plant.

Community preparedness

1. About one-half of the households felt that they would follow the instructions of authorities in a radiation emergency.

2. About one-third of the households said they would not take shelter in their homes if so instructed.

3. About one-third of the households had had at least some conversation among themselves that generally concerned the problem.

4. Most of those questioned had no idea how they would reunite their families if an evacuation were necessary.

5. Respondents with local family ties most often favored "sticking together" if there were a radiation emergency.

6. About one-half of the households said they would interpret a siren as a signal to seek further information; slightly over one-fifth would interpret it as a signal to evacuate; and over 15% said they would have no idea what to do.

7. The kinds of things people would bring along if evacuating varied widely and ranged from the very general to the very specific.

Attitudes and confidence

1. Approximately 40% of the households perceived the risk of a major accident at Diablo Canyon to be high or very high.

2. Overall, respondents felt that the operation of the plant would not affect the population growth of the area.

3. One-half of the households thought that the operation of the power plant would cause property values to decrease.

4. Two-thirds of the households thought that the safety and security of the area would decrease if the plant began to produce electricity.

5. The feelings of risk tended to decline and the feelings of confidence in the government's ability to respond tended to increase with those who had received some information about emergencies.

6. About three-quarters of the households felt that the local government's ability to respond to a major emergency at Diablo Canyon was low.

7. Over one-half of the households rated their confidence that PG&E would promptly inform the correct agencies of any hazard at the plant as low or very low.

Needs and resources

1. About one-third of the study population had witnessed some type of public emergency in the past.

2. Overall, 10% of the study population had been in a situation serious enough to call for evacuation.

3. A very strong concern was expressed for the special needs of the mentally and physically handicapped, the elderly, school children, the transportation-dependent, and residents living within ten miles of the plant.

4. About one-quarter of the respondents reported that someone in their household fell into one of the special needs categories.

5. The major sources of information for the special groups were television and newspapers.

6. About one-half of the households knew of someone in their neighborhood who might need help in an emergency.

7. In offering advice on how the government might help special groups, respondents most often cited the need to work on transportation, evacuation routes, communications, and information.

CONCLUSION AND RECOMMENDATIONS

Analysis of the survey showed that public notice and education programs for the emergency plan had not been very successful. Local residents were not very aware of the plan, and did not know where to get information concerning radiation emergencies.

The public had not been significantly involved in emergency response planning, and the plan, therefore, did not reflect the collective perceptions and concerns of citizens.

Residents did not have much confidence in the government's ability to handle a radiological hazard, nor did they have high confidence in the utility's commitment to the safety of surrounding areas. They felt that the operation of Diablo Canyon Nuclear Power Plant would impose a risk to the area's safety and security.

that could be used. Crime prevention groups (for example, Crime Watch) might disseminate information on preparedness. Retired citizens groups such as R.S.V.P. or relief organizations like the American Red Cross might also provide support. Civic clubs might provide a forum for speakers and presentations. Schools and professional training programs could also be used as planning and education resources. And, of course, the media could be used to distribute information. To be succesful, preparedness for any emergency must be a component of daily life, part of normal daily activities.

Thus, in several ways, effective emergency preparedness has to be a continuous process. Surveying techniques such as the one used here, advisory groups, and public forums should be employed periodically to examine and express changing community attitudes and needs. Objectives and their implementation have to be modified as technology and society change, and evaluation of the resulting plan should again include participation by residents of the affected area. The resulting plan must then be effectively communicated to the public on a continuing basis, and modified as the hazard or the public perception of it changes. The process is necessarily circular; to be maximally effective it must not end.

REFERENCES

A. A. Safe Energy Groups
1981 Action Handbook: Supplement to the Diablo Handbook. Santa Cruz, California.

Atha, Amanda, Charlie Jenne and Caroline Waldegrave
1980 "Will You Survive the Bomb?" Harper's and Greene (August), pp. 202-207.

Babbie, Earl R.
1975 The Practice of Social Research. Belmont, California: Wadsworth.

Bristow, Allen P.
1972 Police Disaster Operations. Springfield, Illinois: Charles Thomas.

Burke, Edmund M.
1979 A Participatory Approach to Urban Planning. Chestnut Hill, Massachusetts: Human Sciences Press.

Burton, Ian, Robert W. Kates and Gilbert F. White
1978 The Environment as Hazard. New York: Oxford University Press.

Cahn, Edgar S. and Barry A. Passett
1971 Citizen Participation: Effecting Community Change. New York: Praeger.

California State Office of Emergency Services
1974 Revised Guidance for Development of the City Portion of a Composite County/City Emergency Plan. Sacramento, California.

1975 Nuclear Power Emergency Response Plan. (Revised, 1978). Sacramento, California.

1980 Newsletter. Sacramento, California.

California State Office of Planning and Research
1980 State of California General Plan Guidelines. Sacramento, California.

California State Seismic Safety Commission, Disaster Preparedness Committee
1979 Public Official Attitudes Towards Disaster Preparedness in California, SSC 79-05. Sacramento, California.

California State Census Data Center
1980 1980 Census Summary Report (File 1). Sacramento, California.

Chanault, William W., Gary D. Nilbert and Seth D. Reichlin
1979 Evacuation Planning in the TMI Accident. Washington, DC: U.S. Federal Emergency Management Agency.

Christiansen, John R. and Ralph L. Garrett
1976 "Why People Volunteer." Foresight (Summer), pp. 14-16.

Coleman, Ronny J.
1982 "Evacuation Planning Around a Nuclear Power Plant." Fire Chief Magazine (February), pp. 24-27.

Dynes, Russell R., E. L. Quarantelli and Gary A. Kreps
1972 A Perspective on Disaster Planning. Disaster Research Center Report Series #11. Washington, DC: Defense Civil Preparedness Agency.

Edge, Billy L., ed.
1980 Coastal Zone '80: Proceedings of the Second Symposium on Coastal and Ocean Management, Volume II. New York: American Society of Civil Engineers.

Fogleman, Charels W. and Vernon J. Parenton
1959 "Disaster and Aftermath: Selected Aspects of Individual and Group Behavior in Critical Situations." Social Forces 3812 (December), pp. 130-131.

Freedman, Jonathan L., J. Merrill Carlsmith, and David O. Sears
1974 Social Psychology. New Jersey: Prentice Hall.

French, Steven P.
1981-82 Personal interviews. California Polytechnic State University, San Luis Obispo, California.

Friesema, H. Paul, James Caporaso, Gerald Goldstein, Robert Lineberry and Richard McCleary
1979 Aftermath: Communities After Natural Disasters. Beverly Hills, California: Saye.

Grosser, George H., ed.
1964 The Threat of Impending Disaster. Cambridge, Massachusetts: MIT Press.

Harvey, S. Alison.
1981 "Survival Store." (San Luis Obispo, California) Telegram-Tribune. August 24.

Healy, Richard J.
1969 Emergency and Disaster Planning. New York: John Wiley and Sons.

Johnson, Cheryle
1982 "Private Schools, Pre-Schools Evacuation Plans Told." (Arroyo Grande, California) Five Cities Times-Press-Recorder. May 7.

Katz, Alfred H. and Eugene I. Bender
1976 The Strength In Us: Self-Help Groups in the Modern World. New York: New Viewpoints.

Kemeny, John G.
1979 Report of the President's Commission on the Accident at Three Mile Island, the Need for Change, the Legacy of TMI. Washington, DC: U.S. Government Printing Office.

Lachman, Ray, Maurice Tatsuoka and William J. Bonk
1961 "Human Behavior During the Tsunami of May 1960." Science, 133 (May), pp. 1405-1409.

Maxwell, Christopher
1982 "Hospital Organizational Response to the Nuclear Accident at Three Mile Island: Implications for Future-Oriented Disaster Planning." American Journal of Public Health 72 (March), pp. 275-279.

Mileti, Dennis
1975 Natural Hazard Warning Systems in the United States: A Research Assessment. Natural Hazards Research Monograph #13. Boulder: University of Colorado, Institute of Behavioral Science.

National Academy of Sciences, National Research Council, Committee on Disaster Studies
1956a Tornado in Worcester: An Exploratory Study of Individual and Community Behavior in an Extreme Situation. Disaster Study No. 3. Washington, DC.

1956b "Human Behavior in Extreme Situations." Report No. 1. Washington, DC.

1958 "Behavior in an Emergency Shelter." Washington, DC.

Neiburger, Carl
1982a "Diablo License: Crowd at What May Be Final Hearing." (San Luis Obispo, California) Telegram-Tribune. January 19.

1982b "Emergency Plan Concern: It May Slow Diablo." (San Luis Obispo, California) Telegram-Tribune. January 23.

Ness, Tim
1981 Personal interview. San Luis Obispo County Office of Emergency Services, San Luis Obispo, California. October.

New Hampshire, State of, New England Municipal Center
1980 You Are Never Completely Safe . . . Emergency Management: A Handbook For Local Government Officials. Durham, New Hampshire.

Pacific Gas and Electric Company
1976 P.G.& E. Diablo Canyon Nuclear Information Center. San Luis Obispo, California.

1977 "Nuclear Power from Diablo Canyon." San Luis Obispo, California.

1981 Diablo Canyon Newsletter. San Luis Obispo, California. August.

1982 Diablo Canyon Newsletter. San Luis Obispo, California. January.

Pacific Telephone and Telegraph Company
1981 San Luis Obispo County Telephone Directory. San Luis Obispo, California.

Quarantelli, Enrico L.
1960 "Images of Withdrawal Behavior in Disasters: Some Basic Misconceptions." Social Problems 8: 1 (Summer), pp. 68-79.

Rogovin, Mitchell
1980 Three Mile Island: A Report to the Commissioners and to the Public, U.S. Nuclear Regulatory Commission, special Inquiry Group, Volume I. Washington, DC.

San Luis Obispo County
1970 Civil Defense and Disaster Plan. San Luis Obispo, California.

_____, Office of Emergency Services
1981a "Emergency Survival." San Luis Obispo, California.

1981b Meeting with Parents on Evacuation Plans, Bellevue-Santa Fe School, San Luis Obispo, California. October 26.

1981c San Luis Obispo County Nuclear Power Plant Emergency Response Plan. Draft. San Luis Obispo, California. October.

_____, California Office of Emergency Services, and U.S. Federal Emergency Management Agency
1981d Public Hearing on Draft Plan of the Nuclear Power Plant Emergency Response Plan for San Luis Obispo County. Cuesta College, San Luis Obispo, California. November 24.

Schumacher, E. F.
1960 Small is Beautiful: Economics as if People Mattered. London: Harper and Row.

Scott, Stanley
1979 What Decision-Makers Need to Know: Policy and Social Science Research on Seismic Safety. Berkeley: Institute of Governmental Studies, University of California.

Sears, Sharyn and Maura Thurman
1982 "Attitude Survey May Forecast Disaster Actions." (California Polytechnic State University, San Luis Obispo, California) Mustang Daily. January 25.

Shader, Richard I. and Alice J. Schwartz
1966 "Management of Reactions to Disaster." Social Work (April), pp. 100-102.

So, Frank S. and others, eds.
1979 The Practice of Local Government Planning. Washington, DC: International City Management Association.

Spokane Daily Chronicle, Spokane, Washington
1980 May 18.

Stinchcombe, Arthur L.
1968 Constructing Social Theories. New York: Harcourt, Brace and World.

Telegram-Tribune, San Luis Obispo, California
1982a "Diablo Plan Gets 2 Jolts," January 12.

1982b "Disaster Plans Draw Fire," January 13.

1982c January 20.

U.S. Department of Defense, Defense Civil Preparedness Agency
1972a Standards for Civil Preparedness: Summary for Public Officials. CPG 1-4. Washington, DC.

1972b Standards for Local Civil Preparedness. CPG 1-6. Washington, DC.

1974 A Perspective on Disaster Planning. Washington, DC.

U.S. Federal Emergency Management Agency (FEMA).
1980a Report to the President: State Radiological Emergency Planning and Preparedness in Support of Commercial Nuclear Power Plants. Washington, DC.

1980b "Review and Approval of State and Local Radiological Emergency Plans and Preparedness." Federal Register, 45 (June), pp. 42341-42347.

FEMA, and Nuclear Regulatory Commission (NRC)
1980c Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants. Washington, DC.

1981a Disaster Operations: A Handbook for Local Governments. CPG 1-6. Washington, DC.

1981b Evaluation Findings Diablo Canyon Nuclear Power Plant Offsite Emergency Response Plans Exercise. Washington, DC.

1981c "Radiological Emergency Planning and Preparedness; Final Regulations." Federal Register, 47 (March), pp. 10758-10762.

_____, Region IX
1981d Emergency Management Newsletter, December.

_____, and others
1981e Public Hearing. Cuesta College, San Luis Obispo, California. December.

Voorhees, Alan M. and Associates, Inc.
1980 Evacuation Times Assessment Study for the Diablo Canyon Nuclear Power Plant. Berkeley, California.

Walthers von Alten, Judith.
1982 "Critics Batter Diablo Plan." (San Luis Obispo, California) Telegram-Tribune. January 14.

Weaver, Toni
1982 Personal interview. Santa Barbara, California. January.

Woertz, Byron
1982 Personal interview. Pacific Gas and Electric Company. July.

APPENDICES

APPENDIX A

"COMMUNITIES SPEAK" SAMPLE QUESTIONNAIRE*

COMMUNITIES SPEAK:
DIABLO CANYON EMERGENCY PLAN
QUESTIONNAIRE
SPRING 1982

CASE NUMBER..... / / CODE 1-3
PREFIX..... 4-6

DATE	TIME	INTERVIEWER	RESULT	CODE FOR RECALLS

ABBREVIATIONS:

NA = No Answer

REF = Refused (when, why, at what point, M or F)

IC = Interview Completed

PIC = Partially Completed

F = Foreign language (specify).

C: Have talked to respondent (give any instructions that are helpful.

DIS = Disconnect.

Hello, is this _____ (NUMBER)?

This is _____. I am part of a research team at Cal Poly. We are conducting an independent survey, and have drawn your phone number in a random sample. This is an impartial and neutral survey about emergency planning for the areas near Diablo Canyon. We would like to know your ideas, and we would like to bring your ideas to policy-makers. The survey has 18 questions and should take about 10 minutes. Will that be okay?

Q1. First of all, approximately (as the crow flies) how many miles is the Diablo Canyon Nuclear Plant from your home? 7

0-2 MILES..... 0
3-6 MILES..... 1
7-10 MILES..... 2
11-15 MILES..... 3
Over 15 MILES..... 4
(DON'T KNOW)..... 8
(REFUSAL)..... 9

(YOU MAY PROBE WITH RANGES)

* Questionnaire appears as administered. Enumeration reflects editing of final draft.

Q2. The County of San Luis Obispo is required by law to develop an Emergency Response Plan for areas near the nuclear plant. Are you at <u>all</u> familiar with that proposed plan? 8

NO (GO TO Q3)..... 0
YES..... 1
(REFUSAL)..... 9

2.1 Have you attended any public meetings concerning the plan? 9

NO..... 0
YES..... 1
(REFUSAL)..... 9

2.11 What kind of meetings were they? 10-11

_____.....__
_____
_____
(REFUSAL)..... 9

2.2 What has been your main source of information about the plan? 12

TELEVISION..... 0
RADIO..... 1
GOVERNMENT PUBLICATIONS..... 2
PG&E PUBLICATIONS..... 3
FRIENDS..... 4
SCHOOL..... 5
OTHER (SPECIFY)_____..... 7
(DON'T KNOW)..... 8
(REFUSAL)..... 9

2.3 Is there anything you would like to see changed about the Emergency Response Plan? 13-14

_____.....__
_____
_____
_____
(NOTHING)..... 5
(EVERYTHING)..... 6
(DON'T KNOW)..... 8
(REFUSAL)..... 9

Q3. If there were an emergency at Diablo Canyon, would you follow the instructions given to you by officials, or would you make your own plans? 15

MAKE MY OWN PLANS..... 0
FOLLOW INSTRUCTIONS IF THEY MATCHED MY OWN PLANS..... 1
FOLLOW INSTRUCTIONS..... 2
OTHER (SPECIFY)_____..... 7
(DON'T KNOW)..... 8
(REFUSAL)..... 9

Q4. If you were instructed to take shelter in your house, would do so? 16

NO..... 0
YES..... 1
OTHER (SPECIFY)_____..... 7
(DON'T KNOW)..... 8
(REFUSAL)..... 9

Q5. Do you think that the chances of a major accident at the plant are: very low, low, high, or very high? 17

VERY LOW..... 0
LOW..... 1
HIGH..... 2
VERY HIGH..... 3
(DON'T KNOW)..... 8
(REFUSAL)..... 9

(POLICY MAKERS, CONCERNED WITH PLANNING THE SAFETY OF COMMUNITIES COULD BE HELPED BY UNDERSTANDING HOW WELL PREPARED EACH PERSON FEELS FOR A A PUBLIC EMERGENCY)

Q7. Have you ever discussed possible actions to take in an emergency at Diablo with family or friends? 19

(ENCOURAGE ELABORATION: EG. WHAT DO YOU MEAN?)

NO..... 0
YES..... 1
PARTIALLY..... 2
(REFUSAL)..... 0

Q8. Have you ever thought about how you would re-unite your family if evacuation was necessary? 20

NO..... 0
YES..... 1
(DON'T KNOW)..... 8
(REFUSAL)..... 9

Q11. What would be some important things you would take with you if an evacuation was necessary? Please list the most important item first, the next most important second, etc? 25-29

1. _____
2. _____
3. _____
4. _____
5. _____
(REFUSAL)..... 9

Q12. Have you ever been in any type of public emergency in the past? 30

NO..... 0
YES..... 1
REFUSAL..... 9

12.1 What kind of emergency was it? (YOU MAY MARK MORE THAN ONE.) 31-32

FLOOD..... 0
HURRICANE..... 1
TIDAL WAVE..... 2
TORNADO..... 3
NUCLEAR ACCIDENT..... 4
EARTHQUAKE..... 5
FIRE..... 6
CHEMICAL ACCIDENT..... 8
OTHER (SPECIFY)_____..... 7
(REFUSAL)..... 9

12.2 Please describe your experience. 33

_____
_____
_____
_____
_____
_____
_____
_____

(PICK MOST SEVERE, IF MORE THAN ONE.) (PROBE ABOUT SEVERITY, GOVERNMENT ACTION, CITIZEN REACTION, CALMNESS, EFFICIENCY, LENGTH OF TIME TO EVACUATE, PSYCHOLOGICAL RESPONSE)

Q13. Next, I am going to read a list of groups which may need special help during a public emergency. Please indicate whether or not you think local government should keep track of them (eg. special information: name, address, type of problem).

13.1 Should local government keep track of all people living within 10 miles of the plant? 34

NO..... 0
YES..... 1
(DON'T KNOW)..... 8
(REFUSAL)..... 9

13.2 Institutionalized people? (prisons, hospitals, mental institutions). 35

NO..... 0
YES..... 1
(DON'T KNOW)..... 8
(REFUSAL)..... 9

13.3 The mentally handicapped? 36

NO..... 0
YES..... 1
(DON'T KNOW)..... 8
(REFUSAL)..... 9

13.4 The physically handicapped? 37

NO..... 0
YES..... 1
(DON'T KNOW)..... 8
(REFUSAL)..... 9

13.5 School Children? 38

NO..... 0
YES..... 1
(DON'T KNOW)..... 8
(REFUSAL)..... 9

13.6 The elderly (over 65)? 39

NO..... 0
YES..... 1
(DON'T KNOW)..... 8
(REFUSAL)..... 9

13.7 Those without private transportation? 40

NO..... 0
YES..... 1
(DON'T KNOW)..... 8
(REFUSAL)..... 9

Q14. Does anyone in your household fit one of those last categories? 41

NO..... 0
YES..... 1
(REFUSAL)..... 9

14.1 Which group would that be? 42

_____.....__
(REFUSAL)..... 9

14.2 If there was an emergency at Diablo, how do you think the government (local) could help? _____ 43
(FILL IN ANSWER 14.1 HERE)

_____.....__
_____
_____
_____
_____
_____
_____
_____
_____
_____
(DON'T KNOW)..... 8
(REFUSAL)..... 9

Q15. Thinking for a minute, do you know of anyone in your neighborhood, outside your household, with a special situation, who would need your help in an emergency? 44

NO..... 0
YES..... 1
(DON'T KNOW)..... 8
(REFUSAL)..... 9

Q16. Many times, a new business or industry, like a power plant, can have secondary effects upon an area. Would you say that Diablo Canyon would decrease, increase, or have no effect on each of the following items? (For areas near the plant.)

16.1 Do you think that population would decrease, increase, or be unaffected? 45

DECREASE..... 0
INCREASE..... 1
NO EFFECT..... 2
(DON'T KNOW)..... 8
(REFUSAL)..... 9

16.2 Would property values decrease, increase, or be unaffected? 46

DECREASE..... 0
INCREASE..... 1
NO EFFECT..... 2
(DON'T KNOW)..... 8
(REFUSAL)..... 9

16.3 Safety and Security? (feelings of) 47

DECREASE..... 0
INCREASE..... 1
NO EFFECT..... 2
(DON'T KNOW)..... 8
(REFUSAL)..... 9

Confidence in the source of information is extremely important in a crisis situation. It can make a difference in the way people act, and in what they believe. Now we would like to ask a few questions about some of those sources.

Q17. First of all, would you rate the local governments' ability to respond to a major emergency at Diablo Power Plant as very low, low, high, or very high? 48

VERY LOW..... 0
LOW..... 1
HIGH..... 2
VERY HIGH..... 3
(DON'T KNOW)..... 8
(REFUSAL)..... 9

Q18. How would you rate your confidence that PG&E would promptly inform the correct agencies of any hazard at Diablo Power Plant? 49

VERY LOW..... 0
LOW..... 1
HIGH..... 2
VERY HIGH..... 3
(DON'T KNOW)..... 8
(REFUSAL)..... 9

This concludes the survey (portion of the interview), but we need to ask just a few more questions about yourself to help us interpret the results.

Q19. To what of the following age groups do you belong? 50

18-34..... 0
35-49..... 1
50-64..... 2
OVER 65..... 3
(REFUSAL)..... 9

Q20. What is the highest grade you have completed in school? 51

1 2 3 4 5 6 7..... 0
8..... 1
9 10 11..... 2
12..... 3
13 14 15..... 4
16..... 5
17 +..... 6
(REFUSAL)..... 9

Q21. Have you ever attended community meetings of any kind? 52

NO..... 0
YES..... 1
(REFUSAL)..... 2

21.1 What kind? (YOU MAY PROMPT WITH ANSWER CATEGORIES.) 53

NEIGHBORHOOD-SOCIAL..... 0
CRIME WATCH PROGRAMS..... 1
PUBLIC HEARINGS..... 2
BLOCK PARENTS..... 3
SCHOOL MEETINGS (E.G. PTA)..... 4
OTHER (SPECIFY)_____..... 7
(REFUSAL)..... 9

Q22. How long have you lived in this neighborhood? 54

LESS THAN A YEAR..... 0
1-2..... 1
3..... 2
4-7..... 3
8-11..... 4
12..... 5
13-20..... 6
OVER 20 YEARS..... 7
(REFUSAL)..... 9

Q23. Do you own or rent your home? 55

RENT..... 0
OWN..... 1
(REFUSAL)..... 9

Q26 Are there any other comments you would like to make about these subjects? 58-59

_____
_____
_____
_____
_____

(Q30. INTERVIEWER: PLEASE MARK WHETHER RESPONDENT IS MALE OR FEMALE.) 60

MALE..... 0
FEMALE..... 1

We hope to have the results of this survey ready in about 2 months. We will present the results to policy-makers around that time.

Thanks for taking the time to help.

C1N

APPENDIX B

COMMENTS AND ELABORATIONS

Have you ever thought about how you would re-unite your family if evacuation was necessary?

8.1 (ENCOURAGE ELABORATION AND IDEAS HERE)

- There are only two of us, we stick together.
- I have a route picked out-go north and circle back south to L.A.
- I wouldn't know what to do.
- I'd try to get my family together first.
- I would <u>not</u> evacuate, stay home.
- Ignores the whole idea of planning.
- No family here.
- I would go get kids at school and meet husband.
- I would go north to Bay Area to parents and meet wife.
- There are only two of us.
- No family in area.
- No family in area, I don't know.
- I would relocate in Santa Barbara with relatives.
- We would meet at a pre-arranged place.
- We would meet parents in the mountains.
- We would unite before leaving, at home. One hour waiting time.
- We would know the routes, meeting points.
- No family.

- Do what the school tells us.
- I wouldn't let us get separated.
- No family.
- I would reach family by phone and we would leave together.
- Won't evacuate.
- We would meet at home, then go outside area.
- Stick together.
- No family.
- We have a trailer stocked with food. We would go to the mountains.
- Stick together.
- We would leave and go to the valley.
- We would meet in Atascadero.
- I have no family here, I'm not worried.
- We would leave together.
- I would go north. We are together most of the time.
- We would meet at a certain area and head north.
- We would be together.
- We are together all the time. Do what authorities say.
- Stick together.
- We would meet outside area.
- Meet family first, then to to Los Angeles.
- Meet in Bakersfield.
- We would meet first, then leave.
- Hopeless.
- No family.
- I would get family at school, stick together.

- I would try to go to an emergency shelter by home.
- I would get more information.

Q10. Early warning, siren, systems have been installed by PG&E, what would you do if the sirens went off?

- Find out what to do from authorities.
- Evacuate, check with authorities.
- Evacuate immediately.
- Evacuate area.
- Evacuate, if valid emergency.
- Follow instructions given by local authorities.
- Seek advice for proper action to take.
- Get out of area if advised.
- Evacuate.
- Turn on radio for information.
- I don't know.
- Leave if the emergency was legitimate.
- Leave after obtaining information.
- Seek information for instructions.
- Wait to see if it is valid.
- Seek verification.
- Wait for instructions.
- Panic, tune in on radio.
- Verify.
- Leave the area.
- Turn on radio for information.
- I can't follow instructions, because there aren't any.
- Grab the blankets and kids and head south.

- Turn on the T.V. or radio and listen for information regarding the emergency.
- Sirens make people aware of the impending problems. Listen to the radio. The siren is a last effort.
- Listen to radio. T.V.
- I would get in the car, or wait for an announcement.
- I would panic and go home from where I was.
- I would evacuate in the car.
- I would ask the Sheriff's Disaster Department what was going on.
- Nothing.
- I would save water, close the house, and stay where I was.
- I would call my husband at work, or go to his work.
- I would turn on the radio to find out what's going on.
- I would find out what happened.
- I would go along with emergency instructions, and turn on the media.
- I would panic and turn on the T.V.
- I would turn on the radio.
- I would call the police or Diablo (husband works there).
- I would get in the car and get away to the south.
- I wouldn't know it was an emergency.
- I would wait for whatever.
- I would listen to the news and call friends.
- I would find out what's happening.
- I would wait for the emergency broadcast.
- I would check the emergency band radio and get my daughter from school.
- I would turn on the radio.
- I can't hear it in Cambria.

- I would get out fast.
- I would turn on the radio.
- I would get in the car and go.
- Get information from authorities for action to take.
- Leave the area as soon as possible.
- Check for information on what to do.
- Evacuate if instructed by authorities.
- Seek information from media.
- Evacuation.
- Seek information from authorities.
- Evacuate.
- Turn on media (T.V. or radio) to get information, then decide.
- Get out first, then listen to P.B.S.
- Ignore them. They have gone off so many times before.
- Call PG&E for information.
- Panic. Find husband and get out.
- Turn on radio.
- Turn on radio and get out as soon as possible.
- Listen to radio and find out what authorities want us to do.
- Panic.
- Contact the people close to me, turn on the radio and let them know where I am.
- Get out and go towards Los Angeles (works at plant).
- Flight.
- Call police.
- Get under a table, close doors and windows.
- Leave on T.V. or radio.

- Take shelter.
- They haven't told us yet.
- They often go off. I might think its a wiring problem. I would not leave.
- I would get my family and head for the nearest shelter.
- Run and tune in to find out what happened.
- Run.
- I can't hear.
- Tune in for information and instructions.
- Meet family at home and head north.
- Call to see what's going on.
- Turn on the radio.
- Get family together. Find out extent.
- Get in the car and drive.
- Get a radio or T.V. and listen to P.B.S.
- Stay home and don't panic.
- Turn on radio or T.V. Listen to see if emergency broadcast was an error.
- I would know they were PG&E. Nothing.
- Gather people and leave with the radio on.
- Listen to radio. Call PG&E for information.
- I don't know what it would sound like.
- Turn on the T.V.
- Find a radio.
- Turn on radio or T.V.
- Check radio for instructions.
- Pick up children and leave.

. Turn on the radio.

. Panic. Turn on the radio for instructions.

. Go home from work.

. Gather family.

. Laugh.

. Get everything ready to go.

. Get ready to move.

. Panic. Get to children. Turn on radio.

. Turn on radio. Listen to instructions.

. Call the plant for instructions.

. Evacuate if advised.

. Turn on E.B.S.

. Get family together. Find out further information. How will I know? I never heard it.

. Leave right away.

. Turn on the radio.

. Run to the neighbors - you can do more in a group.

. Get in contact with my family.

. Call family on the phone.

. Get to my husband.

. Turn to E.B.S.

. Panic.

. Pray.

. Turn on the radio. Find out information.

. Get the phone and find out information about my children.

. Panic. Try to find the mailing.

. Turn on the radio and see what they say to do.

- Get more information. Turn on T.V. or radio. Call Sheriff.
- Stay inside. Wait for instructions on radio.
- Get child from school and leave area.
- I don't know. Get information.
- Turn to local news. Get out of area to the valley.
- Stay inside and turn on radio. I wouldn't run down the road.
- Turn on radio.
- Get instructions.
- Check routes with responsible sources.
- Seek instructions from authorities.
- Prepare to evacuate.
- Seek additional information.
- Prepare to evacuate.
- Tune in for information.
- Call local agency for verification.
- Stay put. Tune in for information.
- Gather together at home. Listen for instructions and information about what emergency is.
- Listen for instructions.
- Seek information from media.
- Evacuate from area.
- Obtain information and instructions about emergency.
- Turn on radio for information.
- Seek verification, then leave.
- Tune in for information to radio or T.V.
- Evacuate area.
- Seek further information.

- Evacuate from area, if it were a real emergency.
- Evacuate, if advised.
- Get children and let their Dad decide what to do.
- Seek information from media.
- Seek information on radio
- Leave area and listen for instructions
- Seek information.
- Get information from media on what course of action to take.
- Tune into radio or T.V. for more information.
- Call for additional information.
- Get information on what to do.
- Seek information on what to do.

Q12. Have you ever been in any type of public emergency in the past?

12.2 Please describe your experience.

- Move quickly with notice. What happens, happens.
- React on individual basis.
- Secure house, stayed inside.
- Evacuated.
- No evacuation.
- Left home.
- Civil patrol rescue work in flood, feeding stock, convoy work.
- Evacuated.
- Evacuation of large number of people.
- Droughts in California for 2 months and mudslides in Santa Barbara. Radiation escaped from where it was supposed to be, but didn't get into environment, emergency procedures worked.
- Only took what could be held in hands. Only usable money was that in wallet. Banks were frozen.

- Severe and a great deal of panic in hurricane. Little help by government was given. Overall lack of preparation.
- San Fernando Valley flooded and left us homeless. We used the high schools as public shelters. No one was prepared. It took us a long time to evacuate - 10 days.
- Slight scare, minor accident, little damage.
- No evacuation.
- Panic everywhere.
- I panicked and followed others. Police didn't do anything. In the car wreck, I panicked and called ambulance.
- We had sand bag dikes for two days.
- We went down to the cellar and waited.
- No evacuation, no one hurt.
- A helicopter flew overhead and told everyone to evacuate. We stayed in the house, had no where to go.
- Our house knocked down and we had to relocate.
- Sought shelter in home.
- We got under the doorway and waited it out.
- No evacuation.
- In Costa Rica, stood and waited.
- Everyone walked, left in a hurry.
- Worried about my child.
- Evacuation was necessary, but the tidal wave never materialized.
- Frightening.
- Everybody got out of the way.
- Stayed put, it was a safe area.
- I worked with the flood help team.
- There was temporary panic for a few minutes, I stayed inside and turned on radio. It was more dangerous outside.

- The whole family went to high ground. We brought blankets and flashlight.

- Minimal damage and good response by local agencies. The reaction by people involved was calm.

- Severe emergency and complete evacuation was necessary. The reaction was calm. There was little government involvement because of the time element.

- Medium severity and calm reaction. The evacuation was very efficient.

- Moderate emergency and calm reaction by people. There was good response by officials.

- Severe property damage but non-threatening to life, calm reactions.

- Worked at the Veteran's Hospital.

- Everyone went to the basement. We used all the candles we could find.

- Drinking water was contaminated and food was distributed.

14.2 If there was an emergency at Diablo, how do you think the government (local) could help?

- You can't keep track of people moving in and out of institutions. A mother needs to know exactly where her children are going to be. It is not completely feasible to keep track of all groups.

- Help with transportation.

- We can only use two major roads. Get everyone evacuated. Fly and ship some out and work on the roads. Also, help clean up the mess.

- Give provisions: blankets, food, and water.

- Tell the groups where to go and what to do. It wouldn't matter to us.

- Prevention is the only way. We need communication, information, and advice on where to go.

- Get the warnings arranged and find a spot to get away as a shelter. Get buses for non-drivers.

- Have evacuation signs, route guides. Keep roads free and clear radiating from point. Incapacitated people are not of major importance.
- Find out, if anyone needs help.
- Give correct information.
- Provide shelter for evacuation. PG&E or the city should be responsible.
- Have a good evacuation plan.
- Get buses to the area and a map for evacuation routes.
- Reserve vehicles. Communication is important.
- I can't read. Have a public means of transportation.
- As taxpayers, we should have help to let us know what to do.
- Deaf, won't hear warning.
- County should be more informed about radiation. Problem should be understood.
- PG&E is too powerful.
- Send in aid to help, but I don't think they could help much.
- Find the whereabouts of people and provide transportation.
- Provide transportation.
- See that the plan is followed.
- Keep the road open and provide transportation for the disabled.
- Better be prepared. It's their responsibility.
- Don't think "they" could help.
- Control traffic, give aid to injured, broadcast information.
- Keep track of people in "that" situation and have a plan to help them.
- Keep a computer record of people.
- Provide a special plan for elderly who may need assistance during a crisis situation.

- Put an S.O.S. on radio or T.V. Give rapid instructions including road routes.
- Provide shelters.
- Provide information through media. Set up shelters, inform public.
- Supposed to coordinate evacuation-food sources.
- Provide local information, news, and assistance.
- Have direct involvement of bringing people to safety.
- Don't know how they could.
- Have good communication systems and suits to enter contaminated areas.

Q26. Are there any other comments you would like to make about these subjects?

- I'm not exactly pro-nuclear, but I'm not full of confidence in the technology as it stands. I choose not to align myself with anti-nuclear groups.
- PG&E would do they best they could, but they are not very knowledgeable.
- Diablo is stupidity heaped on top of incompetence. It should never have been put here 10 years ago. The relative danger is microscopic compared to smoking and driving.
- The Trodgen plant is pretty good. Their response plan is good. I lived in Washington, near the Trodgen plant, working as an engineer. The state runs its power companies as a co-op, so it is possible to have public input and veto. PG&E is the worst I've ever seen.
- If they were going to stop it, they should have done so long ago.
- Don't open Diablo.
- Diablo is a good thing, it saves us money.
- "They" should check the Diablo plant carefully.
- PG&E likes to cover up a lot.
- The evacuation plan doesn't seem to be complete.
- The younger groups (in their 30's) are more frightened than the elderly. I am against the plant.

- Get the damm thing closed.
- The early warning system causes panic and traffic jams to warn of a major risk.
- I don't think nuclear is where it's at for the future.
- I don't believe people are informed enough, if there were an emergency.
- Stop nuclear power until dangers are better controlled.
- Get rid of Diablo.
- I would like more information on it.
- Put our efforts into safer forms of power to replace nuclear power. There are too many risks.
- We need people self-help. The plant seems safe, but disposal is the problem.
- I don't trust public officials or the government.
- I'm in the middle. "They" did a good job in the blockade. The media has gone crazy on PG&E, distorting the facts.
- I would like to see it closed.
- We don't pay much attention to safety and security. We need it (the plant).
- Let them open Diablo and quit killing miners.
- Information is lacking. Something should be sent out to the community.
- We should be informed about evacuation procedures.
- Government is interested. I have my doubts about PG&E.
- The public needs more information. When its time to die its time to die. If you are worried about the plant, you should move.
- There are always weak points that are fixed every day. What is a hazard? In a "big one" they would inform. PG&E will deal with the issue and not leave anything half done. There will be difficulties with the plant and the evacuation plan, but things will work out.
- It is a sin, how government spends our money. They are always short of money. Send a pamphlet to everyone and tell them what to do.

- PG&E and government should communicate with people more. People would then be more sure of them. I went on the tour and it gave me more confidence. PG&E is a little sneaky.

- When it comes time for you to die, you die.

- After the tour, I saw how efficient they were.

- I think it stinks. I don't trust them.

- Nuclear is dangerous, but we need it until better sources (solar) are developed.

- "They" know, but they don't say anything until someone "blows the whistle." They don't tell us. The seaside wall is already eroded. They should filter the workers. They get "stoned" and make the nuclear power plant more dangerous. I don't think a plan would make a difference.

- People don't run away. Problems don't keep them out. There could be an unexpected terrorist action. All it takes is one "goof ball."

- "They" (government) are too "long-nosed" as it is. They are in too many people's lives. Ignorance is bliss. You are better off not knowing what's going on. I wish all the fanatics would get lost. The protesters are all looking for publicity. Most protesters are out-siders anyway.

- I hope the plant never opens.

- I am not against nuclear power. We lived near a nuclear plant before and we were not very uneasy. We are uneasy about Diablo because of faults and all. If Diablo does open, it may hurt the community.

- I hope the survey is effective to stop Diablo from opening.

- My trust is in Jesus. God is central to my life.

- There is not enough information publicly available.

- Emergency plans should be considered for any type of emergency.

- I worked long and hard to convince people that this plant will provide us with safe and cheap energy.

- I am a radiation technician in the summer. My home is next to the nuclear plant.

- Government has low manpower. I hope it doesn't get licensed. Tell them to get the hell out of here.

- I don't think the chances of a nuclear accident are very high. My husband works at Diablo. Get the plant on line and stop worrying about everything else.

- I am sick of hearing about it. I am disappointed in the responsibility of PG&E.

- If there is an accident, our worries will be over.

- I hope Diablo doesn't get licensed.

- Government shouldn't meddle except in an emergency. I only would follow trusted sources and PG&E is not trustworthy. Most people are not aware of the hazards. My friends felt secure, then changed their minds due to "China Syndrome" [movie], Sacramento problems, San Onofre, and Three-Mile Island. I don't want Diablo to run, but I see the unfairness to PG&E.

- I am anti-nuclear. The plant is too risky. Large companies are pumping money into it and not to alternative energy forms.

- Nuclear power is inevitable. Hazards are the payoff for power.

- I didn't like the demonstrations. I am all for nuclear if it can be perfected.

- I went on the tour, and felt better about it afterwards.

- We need the power. Start the plant.

- It is ludicrous. I have no faith in PG&E engineering.

- The emergency plan won't do any good. The population decreased at Three-Mile Island. Stop nuclear.

- There have been accidents in other countries, so why not here. The interest of PG&E is selfish.

- It is a good idea to think about emergency planning. I am reluctant to your Diablo. The inconsistencies in the construction are apparent.

- At my age, we don't get excited I have gone through two wars. Whatever happens, happens.

- The Telephone Company building in Los Osos is blast-proof. Local officials are not very concerned. Half of the safety features are only on paper.

- If you felt safe about nuclear power, you will continue to feel safe. Everyone should have emergency plans. The big necessity is exposure to the plan. For example, maps listed in the telephone book. We should have prior knowledge of the routes. It should be made clear through the media. You must account for different levels of emergencies. Everyone should know their roles and have maps, and lists of necessary things.

- We need more exercises and more drills. We need a pamphlet on what to do. With PG&E, the almighty dollar is involved. Get out information through mail. So far, it is all talk with no action. We need written information and maps.

- I am against nuclear power at the present time.

- If the plant opens, I am likely to leave the area.

- The tendency to minimize problems, by agencies, in regard to nuclear accidents should be discouraged.

- PG&E should be more careful regarding the workings of the plant.

- Everyone would go off in their own way in an emergency. It is a matter of individual survival.

- Safety agencies are lacking. They don't follow through on investigations. The public doesn't feel that the county and city governments have the credibility to give orders.

- I am worried about if people "over there" know as much as they should and if they are responsible enough.

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