United States General Accounting Office

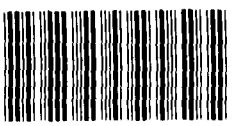
GAO

Report to the Honorable Edward J. Markey, House of Representatives

June 1987

NUCLEAR REGULATION

Public Knowledge of Radiological Emergency Procedures



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United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division
B-213114

June 2, 1987

The Honorable Edward J. Markey
House of Representatives

Dear Mr. Markey:

On September 3, 1986, you asked us to determine whether people living within the 10-mile radius emergency planning zones (EPZ) around commercial nuclear power plants know what actions to take if an accident occurs. We agreed, after thorough discussion with your office, to direct our efforts at whether any federal agency assessed public knowledge of radiological emergency procedures and, if not, the feasibility of our making such an assessment.

In summary, we found that no federal agency assesses public knowledge of radiological emergency procedures. The Federal Emergency Management Agency (FEMA) has responsibility for ensuring the adequacy of offsite emergency plans at nuclear power plants and has periodically conducted surveys to determine whether EPZ residents have received basic emergency planning information. However, FEMA has not assessed whether the public actually knows what to do in the event of an emergency. FEMA attempted to make such an assessment in 1981, but discontinued the effort after objections by the Office of Management and Budget (OMB) that the proposed questionnaire and survey sample were too large and burdensome. In 1984 we recommended that FEMA develop guidance to assess public knowledge of radiological emergency response procedures, but subsequent FEMA efforts did not address this recommendation.

Because FEMA has regulatory authority in the radiological emergency area and has already performed (under contract) more limited surveys of EPZ residents, we believe it is appropriate that FEMA survey public knowledge of radiological emergency procedures. This report provides information concerning the actions that utilities and FEMA take to notify EPZ residents of the procedures to be followed if a nuclear accident occurs and recommends that FEMA, building on its past survey experience, develop a survey to assess EPZ residents' knowledge of radiological emergency procedures.

We conducted our review at FEMA headquarters in Washington, D.C. Our objectives, scope, and methodology are discussed in more detail in appendix I.

Federal Responsibility for Radiological Emergency Preparedness

The March 28, 1979, accident at the Three Mile Island (TMI) nuclear power plant near Harrisburg, Pennsylvania, demonstrated that communities near nuclear plants need to be prepared for accident-related emergencies and pointed out major deficiencies in the general state of emergency planning and preparedness at all governmental levels. Before the accident, off-site emergency plans were not a prerequisite for licensing nuclear power plants. The Atomic Energy Act of 1954, as amended, sets out the Nuclear Regulatory Commission's (NRC) basic authority for regulating nuclear power and directs NRC to reject license applications that it finds could endanger public health and safety. Neither the act nor NRC's regulations required that state and local governments submit off-site emergency plans as part of the license application. NRC did, however, require utilities to prepare on-site emergency plans that included establishing communication links to off-site state and local authorities.

NRC also provided guidance and training to assist state and local governments to prepare and maintain off-site emergency plans. Nevertheless, until the TMI accident, NRC's philosophy was that state and local emergency plans were not required for it to determine whether a nuclear plant could be operated without undue risk to public health and safety.

In a report issued 2 days after the TMI accident, we pointed out that, although 41 states had some type of nuclear emergency plan, considerable doubt existed concerning the preparedness of state and local governments.[1] Therefore, we recommended that

- FEMA assume responsibility for making policy and coordinating emergency response planning around nuclear facilities,
- NRC allow nuclear plants to begin operating only where state and local emergency response plans adequately address NRC planning guidance for off-site emergency plans, and
- NRC establish an emergency planning zone of about 10 miles around all nuclear plants as recommended by an NRC/Environmental Protection Agency (EPA) task force.

Under the executive and administrative policies established since the TMI accident, each of these recommendations has largely been implemented.

[1] Areas Around Nuclear Facilities Should Be Better Prepared for Radiological Emergencies (EMD-78-110, Mar. 30, 1979).

In addition, the October 1979 report of the President's Commission on the Accident at Three Mile Island recommended that federal authority and responsibility for off-site nuclear emergency planning and preparedness be consolidated under FEMA. In response to that recommendation, on December 7, 1979, the President directed FEMA to lead all federal off-site emergency activities and, by June 1980, to thoroughly review off-site emergency plans in all states with operating nuclear plants and to complete a review of state plans for plants nearing completion as soon as possible. To implement the President's directive, NRC and FEMA entered into a memorandum of understanding establishing that

- FEMA would coordinate all federal planning for the off-site impact of radiological emergencies;
- FEMA would take the lead to assess off-site plans and preparedness, make findings and determinations concerning the implementation of the plans, and communicate its findings to NRC;
- NRC would review FEMA findings and determinations, in conjunction with its own findings on a utility's on-site emergency plan, and make determinations on the overall state of emergency preparedness; and
- NRC would use its overall findings and determinations on radiological health and safety questions in deciding whether to issue nuclear power plant licenses or to allow the continued operation of licensed plants.

In November 1980, FEMA and NRC published criteria to assess nuclear emergency planning and preparedness—Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, NUREG-0654/FEMA-REP-1, Revision 1—commonly referred to as NUREG-0654. The criteria include 16 planning standards—15 related both to on- and off-site safety and 1 related solely to on-site safety. These standards are further broken down into 196 elements or criteria that describe the intent of the standards. NUREG-0654 requires that utilities prepare emergency plans to mitigate the consequences of radiation exposure to people living in communities within a 10-mile radius of a commercial nuclear power plant. The emergency plans must also address measures necessary to deal with the potential for ingestion of radioactively contaminated food and water for a distance of 50 miles from the plants.

In March 1982 the President established a Federal Radiological Preparedness Coordinating Committee (FRPCC) to assist FEMA in its oversight of state and local government emergency planning and preparedness activities. The FRPCC is chaired by FEMA and includes officials from

EPA and NRC, and the Departments of Agriculture, Commerce, Defense, Energy, Health and Human Services, the Interior, and Transportation. The FRPCC is supported by regional assistance committees (RAC) in each of the 10 standard federal regions. The RACs are chaired by the FEMA regional representatives and include officials from the member agencies of the FRPCC. The RACs assist state and local government officials in developing and testing their radiological emergency response plans.

As part of NRC's licensing process, FEMA reviews and makes findings and determinations on the adequacy of off-site emergency preparedness under the provisions of its regulations for reviewing and approving state and local radiological plans and preparedness (44 CFR 350). FEMA begins this process when a governor or designee submits state and local plans for its review. The review process includes (1) a RAC evaluation of the plans for compliance with NUREG-0654 standards and criteria, (2) at least one RAC-observed exercise that tests the state and local governments' ability to implement major portions of their plans, and (3) a meeting with state and local government officials and the public to discuss, and receive comments on, the plan and the exercise.

Responsibility for Public Education

The regulations governing development of radiological emergency plans do not specify the mechanisms the utilities should use to educate the public on emergency procedures.[2] Rather, they specify only the type of information to be disseminated, such as methods and times of notification that would be used during an emergency, protective actions planned, local emergency broadcast stations, and the nature and effects of radiation.

To find out how effectively this information was being conveyed to the public, FEMA developed a lengthy questionnaire in 1980 to assess how much the EPZ residents knew about radiological emergency procedures. The questionnaire consisted of 20 multiple-choice questions, some of which had multiple parts, and could have required as many as 80 separate answers. FEMA proposed to mail this questionnaire annually to a sample of the approximately 3.4 million people living within the EPZs of the nuclear plants then in operation or under construction. FEMA expected an initial mailing of about 165,000 questionnaires in 1981 and about 300,000 each year thereafter.

[2]10 CFR 50, App. E, Emergency Planning and Preparedness for Production and Utilization Facilities.

Under the Paperwork Reduction Act, FEMA was required to obtain OMB's approval before using the questionnaire. In a July 1981 letter, OMB denied FEMA permission to use the questionnaire. OMB stated that FEMA's proposed sample was too large and would result in an excessively burdensome survey.

In 1984 we recommended that FEMA develop guidance to assess public knowledge of radiological emergency procedures in the 10-mile EPZs.[3] In October 1985, FEMA issued A Guide to Preparing Emergency Public Information Materials (FEMA-Rep.-11) to assist state and local officials to prepare and revise emergency public information materials. Although this guidance attempts to ensure that emergency information is clear and suitable for the general public, it does not provide procedures to assess whether the public knows how to respond to emergency alerts.

In discussions with us in April 1987, FEMA officials agreed that the 1981 questionnaire was too long and not well written. They also still believed that directly assessing public knowledge of radiological emergency procedures is the best way to evaluate the agency's effectiveness and that such assessments are within the agency's charter. In view of OMB's letter, however, FEMA concentrates on evaluating and improving the quality of information disseminated by the utilities that operate the plants.

In April 1987, we also discussed FEMA's interpretation of OMB's letter with that agency's examiner for FEMA operations. The examiner was not involved with FEMA activities in 1981 and could not specifically address the issues raised in OMB's letter. However, the examiner told us that federal agencies often revise and resubmit survey proposals and questionnaires to OMB and expressed surprise that FEMA had not done so.

FEMA Testing of Alert and Notification Systems

The NUREG-0654 criteria require that the utilities establish an alert and notification system (ANS) capable of providing both an alert signal and an informational or instructional message to the population throughout the 10-mile EPZ within 15 minutes of an emergency. FEMA reviews and tests the ANS according to its Guide for the Evaluation of Alert and Notification Systems for Nuclear Power Plants (FEMA-Rep.-10) to determine if the system is adequate. Following an engineering review to confirm

[3]Further Actions Needed to Improve Emergency Preparedness Around Nuclear Power Plants (GAO/RCED-84-43, Aug. 1, 1984).

that the ANS satisfies the coverage requirements, FEMA surveys a statistical sample of EPZ residents to determine the number who heard or were otherwise made aware of the test. As part of this telephone survey, the residents are asked whether they recall receiving emergency preparedness information.

The primary alert mechanisms that utilities use include fixed sirens, mobile sirens on civil defense or other emergency vehicles, and tone-alert radios. FEMA allows the utilities to select the method or combination of methods. According to FEMA officials, utilities use fixed sirens in more densely populated areas because they cover a larger geographic area. Each siren is expensive, costing about $30,000 to install, and about $3,000 a year to maintain. Some EPZs may require more than 100 of these sirens. FEMA requires that utilities test the fixed sirens periodically to ensure they operate properly.

In rural areas, the utilities have found that it is more cost-effective to give the residents tone-alert radios. These cost about $50 per unit plus batteries and minimal maintenance. These are regular radios with a built-in signal alarm that can be activated by the National Oceanic and Atmospheric Administration or under the Emergency Broadcast System Area Operational Plan. Utilities purchase the radios, which are generally distributed through the local civil defense organizations. At the Hatch Nuclear Power Station near Baxley, Georgia, for example, all EPZ residents have been given tone-alert radios, according to FEMA officials. FEMA requires that state and local officials and/or utilities periodically test the tone-alert radios.

About 15 minutes after an ANS test starts, Chilton Research Services, FEMA's contractor, begins the telephone surveys. Chilton takes a random sample of residents within the EPZ and uses a six-question FEMA survey that has been approved by OMB. According to FEMA officials, Chilton conducts interviews until the desired level of statistical precision is obtained (plus or minus 5 percent at the 95 percent confidence level). Depending on the responses, Chilton may have to conduct between 250 and 400 interviews to obtain this level of precision. The cost of conducting each survey is about $10,000. For this price, the contractor prepares the sample, conducts the survey, collates and analyzes the data, and writes a summary report.

As of November 1986, FEMA had tested the ANS for 57 nuclear power plant sites containing 87 reactors. On the basis of the test results, FEMA projects that, on average,

- 95.6 percent of the sirens work properly at all times (FEMA regulations require that at least 90 percent of the sirens must work at all times),
- 83.1 percent of the residents were alerted by the ANS (FEMA requires that at least 70 percent of the residents must acknowledge the alert signal during the test), and
- 71.1 percent of the residents remember receiving emergency preparedness information prior to the test (FEMA has no specific minimum requirement).

With one exception, all tests indicated that the sirens would work at least 90 percent of the time. With two exceptions, all tests projected that over 70 percent of the EPZ residents could be alerted by the ANS. According to FEMA officials, these exceptions have been studied and corrective actions taken. FEMA officials believe their top priority is to ensure that the ANS hardware is adequate and works properly, and they spend about 80 percent of their operating budget reviewing and testing it. FEMA uses its remaining budget for other purposes, including the Chilton contract to conduct the telephone surveys.

According to FEMA officials, it is not practical to have an ANS that absolutely ensures that everyone within an EPZ will be alerted within the first 15 minutes after an emergency is announced. These officials believe that if 70 to 80 percent of the residents hear the alert, they will then alert others through phone calls to friends and relatives, word-of-mouth communications in offices or shopping centers, or emergency vehicles with loudspeakers.

FEMA's tests have shown that utilities' ANS hardware generally works properly and that most EPZ residents receive required information dealing with radiological emergency procedures. However, as we discuss later, these results do not necessarily mean that people understand this information or know what to do in such an emergency. FEMA efforts in this area have been geared toward improving utilities' public education programs.

FEMA Efforts to Improve Utilities' Public Education Programs

Although FEMA's survey results project that an average of 71.1 percent of the EPZ residents recall receiving emergency preparedness information, actual responses range from 31.5 to 84.5 percent, with many responses in the 50 to 60 percent range. FEMA officials stated that they know utilities and/or state and local officials send out the required information, but the materials simply are not getting the recipients' attention. As a result, FEMA has conducted extensive reviews of the

public education programs of 35 utilities through November 1986. These utilities have voluntarily cooperated with FEMA to improve their emergency preparedness information programs.

FEMA officials stated that, although they do not formally assess the level of public education on emergency procedures, they do continually work with utilities to improve the quality and effectiveness of their public education programs. They believe their efforts have been successful. Among the steps utilities have taken are (1) changing the format and style of information brochures, (2) changing the reading level of the brochures to coincide more closely with that of the particular geographic area, and (3) using different materials. For example, FEMA said that in one case a utility replaced its information brochure with free calendars that contained basic emergency information. When the utility retested the EPZ residents, it found a dramatic increase in the number of households that were aware of the information. In another instance, FEMA found that the reading level required to understand the brochure was much higher than the average reading level of the EPZ residents. According to FEMA officials, the utility rewrote the brochure and found that many more people were aware of having received the information.

Conclusions and Recommendation

Neither FEMA nor NRC determines whether—or to what extent—the public pays attention to the radiological emergency preparedness materials provided by the utilities that operate nuclear power plants. Although FEMA officials believe that making such a determination is within the agency's purview and the best way to evaluate the material's effectiveness, they also believe that OMB's 1981 letter precludes them from doing so. However, we do not believe that OMB's letter precludes FEMA from revising its approach in such a way that it could obtain both OMB's approval and statistically valid results.

We believe that the best way to determine the extent to which EPZ residents are prepared to deal with radiological emergencies is to directly assess their knowledge of emergency procedures. In 1984 we recommended that FEMA develop guidance to make these assessments. FEMA's October 1985 guidance does not do this; rather, it is intended to improve the quality and effectiveness of emergency preparedness materials sent by the utilities to EPZ residents.

Therefore, we recommend that the Director, FEMA, develop a survey to assess EPZ residents' knowledge of radiological emergency procedures. In

doing this, we believe that FEMA should first explore the possibility of expanding its current EPZ survey to include questions on this issue.

We discussed the facts presented in this report with FEMA officials. As requested, we did not ask FEMA to review and comment officially on the report. Our work was performed between September 1986 and February 1987 and in accordance with generally accepted government auditing standards.

Unless you publicly announce its contents earlier, we plan no further distribution of this report for 30 days from the date of this letter. At that time we will send copies to the Director, FEMA, the Chairman, NRC, and other interested parties, and make copies available to others upon request. This work was performed under the direction of Keith O. Fultz, Associate Director. Other major contributors are listed in appendix II.

Sincerely yours,

J. Dexter Peach

J. Dexter Peach
Assistant Comptroller General

Contents

Abbreviations

ANS	alert and notification systems
EMD	Energy and Minerals Division
EPA	Environmental Protection Agency
EPZ	emergency planning zone
FEMA	Federal Emergency Management Agency
FRPCC	Federal Radiological Preparedness Coordinating Committee
GAO	General Accounting Office
NRC	Nuclear Regulatory Commission
OMB	Office of Management and Budget
RAC	regional assistance committee
RCED	Resources, Community, and Economic Development Division
TMI	Three Mile Island Nuclear Power Station

Objectives, Scope, and Methodology

On September 3, 1986, the Chairman, Subcommittee on Energy Conservation and Power, House Committee on Energy and Commerce, asked us to determine whether people living within the 10-mile EPZs around 10 commercial nuclear power plants know what to do if an accident occurs. On the basis of subsequent discussions with the Chairman's office, we agreed to determine whether any federal agency assessed public knowledge of radiological emergency procedures and, if not, the feasibility of our doing so.

To obtain the information needed, we reviewed pertinent federal statutes, regulations, and criteria for preparing, evaluating, and testing radiological emergency response plans, and the memorandum of understanding between NRC and FEMA dealing with off-site emergency planning issues. As requested, we limited our contacts on radiological emergency planning issues to officials at FEMA headquarters in Washington, D.C. We discussed with these officials their efforts to monitor and improve the methods electric utilities use to educate the public about nuclear emergency procedures.

We also discussed with FEMA officials the surveys conducted for them by Chilton Research Services concerning public awareness of ANS tests. According to FEMA officials, Chilton identifies the target population, selects the sample, conducts telephone interviews using six questions, summarizes the results, and prepares a report. Chilton has conducted about 60 surveys for FEMA and, therefore, has the necessary telephone equipment and trained callers, and it can make evening and weekend calls, if necessary. These surveys cost about $10,000 per plant, but FEMA officials estimated that a survey to assess public knowledge of radiological emergency procedures could cost at least twice as much.

In addition, we met with officials of the Census Bureau, which conducts public surveys, to determine the practicality and cost of conducting a survey of public knowledge of radiological emergency procedures. Census officials told us that they too have the equipment and personnel to conduct such surveys but would need the data base (EPZ resident addresses or telephone numbers) from which to select the sample and would need to develop and pretest the survey questionnaire. Census officials estimated that (1) it could cost about $20,000 per plant to make the telephone calls and tabulate and summarize the results, and (2) the costs could be higher, depending on the time needed to develop the data base and prepare and pretest the questionnaire.

Since no federal agency has assessed public knowledge of radiological emergency procedures and since FEMA has regulatory responsibility in this area and an existing contract with Chilton to perform similar surveys, we determined that it was appropriate for FEMA to survey public knowledge of radiological emergency procedures. As a result, the Chairman's office agreed to our providing information concerning the actions that the utilities and FEMA take to notify EPZ residents of the procedures to be followed if a radiological accident occurs.

We discussed the facts presented in this report with FEMA officials and incorporated their views where appropriate. However, as requested, we did not ask FEMA to review and comment officially on the report. Our review was conducted between September 1986 and February 1987 and in accordance with generally accepted government auditing standards.

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