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GUIDE FOR THE EVALUATION OF ALERT AND NOTIFICATION SYSTEMS FOR NUCLEAR POWER PLANTS

Prepared for:

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TABLE OF CONTENTS

INTRODUCTION

The Federal Emergency Management Agency (FEMA), created in 1978, has overall federal responsibility for offsite radiological emergency planning and preparedness functions. This responsibility, which includes coordinating, evaluating, and approving state and local offsite radiological emergency planning and preparedness for commercial nuclear power plants, was officially assigned to FEMA by the President in December 1979. The Nuclear Regulatory Commission (NRC), which is responsible for onsite safety, assesses overall nuclear power plant safety, using FEMA's findings on offsite radiological emergency planning and preparedness. The NRC is responsible for determining whether new commercial nuclear power plants should be licensed and whether existing plants should continue operating. However, new plants can be licensed to begin operating, and existing plants can continue to operate without formal FEMA approval and certification to the NRC on the adequacy of offsite radiological emergency planning and preparedness in accordance with FEMA's rule, Title 44 of the Code of Federal Regulations, Part 350 (44 CFR 350).

FEMA and the NRC jointly developed federal criteria, published in November 1980, for assessing both onsite and offsite nuclear power plant radiological emergency planning and preparedness in a document titled 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.* These criteria include 16 planning standards -- 15 related to both onsite and offsite planning and preparedness issues and one related only to onsite safety issues. These 16

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*U.S. Nuclear Regulatory Commission and Federal Emergency Management Agency, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," November 1980.

standards are mandated in NRC and FEMA regulations for use in onsite and offsite nuclear power plant radiological emergency planning and preparedness.

FEMA's rule, 44 CFR 350, "Review and Approval of State and Local Radiological Emergency Plans and Preparedness" (September 28, 1983), is the regulation establishing policy and procedures for FEMA review and approval of state and local offsite radiological emergency plans and preparedness. This rule also references the 16 planning standards originally delineated in NUREG-0654/FEMA-REP-1, Revision 1. Of these 16 planning standards, three apply directly to the review and evaluation of alert and notification systems: E, Notification Methods and Procedures; F, Emergency Communications; and N, Exercises and Drills. In addition, NUREG-0654/FEMA-REP-1, Revision 1, Appendix 3, applies directly to alert and notification systems. This guide only elaborates on the three NUREG-0654/FEMA-REP-1, Revision 1, alert and notification system-related planning standards, seven of their 15 evaluation criteria, and requirements in NUREG-0654/FEMA-REP-1, Revision 1, Appendix 3.

In September 1983, FEMA implemented interim guidelines for assessing the adequacy of a nuclear power plant's alert and notification system in a document titled Standard Guide for the Evaluation of Alert and Notification Systems for Nuclear Power Plants, FEMA-43. Prior to the issuance of FEMA-43, FEMA approvals of offsite radiological emergency plans and preparedness included a caveat statement that the alert and notification systems would be evaluated at a later date. This document supersedes FEMA-43 and addresses the basis for a federal evaluation of the alert and notification aspects of a state and local offsite radiological emergency plan.

The following table indicates the chapters in this guide that address the NUREG-0654/FEMA-REP-1, Revision 1, and Appendix 3, planning standards, evaluation criteria, and requirements that apply to alert and notification systems.

FEMA-43	NUREG-0654/FEMA-REP-1, Revision 1	
	Planning Standard	Evaluation Criteria Included
Chapter 1	E	5, 6
Chapter 2	F	1
Chapter 3	N	1, 2, 3, 5

Each planning standard comprises a separate chapter. To further facilitate cross referencing of this guide, the page numbers of the chapters are prefixed by the NUREG-0654/FEMA-REP-1, Revision 1, planning standard letter (i.e., E, F, and N).

Each planning standard and its associated criteria are quoted within each chapter. Additional guidance and an explanation are provided as follows:

1. Areas of Review. This section briefly describes the scope of the review and defines aspects of the emergency response plan that should be addressed under the evaluation criterion. The applicability to licensee, state, and local plans is as specified in NUREG-0654/FEMA-REP-1, Revision 1, and only those portions of the evaluation criterion applicable to the state and local offsite radiological emergency plans will be reviewed under this guide.

2. Acceptance Criteria. The objective of this section is to define as precisely as possible what will be accepted by the reviewer as adequate. Specific conditions and technical parameters to be satisfied are included, along with a rationale for their use. Whenever possible, acceptance criteria are specified in quantitative terms. Special attention is placed on identifying the information that should be provided to support the review.

The technical and administrative review using this guidance will result in the following acceptability determination:

- Acceptable - meets or exceeds standards; or
- Unacceptable or marginally acceptable - corrective actions recommended.

An element is deficient when FEMA determines that the function or activity is not addressed in a satisfactory manner. A function or activity is not satisfactory when the function or activity does not support a finding that the system is adequate to provide prompt alert and notification of the public in the event of a radiological emergency.

FEMA's ten regional offices prepare both interim and final findings on various aspects of offsite radiological emergency planning and preparedness. FEMA regional offices are assisted in this effort by Regional Assistance Committees comprised of representatives from other federal agencies with expertise in emergency planning and preparedness. These agencies are committed through federal regulations to assist FEMA in reviewing offsite plans. FEMA headquarters and the Federal Radiological Preparedness Coordinating Committee, which is the headquarters counterpart to the Regional Assistance Committees, review final evaluations of offsite radiological emergency planning and preparedness prepared by the FEMA regional offices. The Federal Radiological Preparedness Coordinating Committee includes the following member-agencies: the NRC; the Environmental Protection Agency; and the Departments of Agriculture, Health and Human Services, Commerce, Energy, Interior, Transportation, and Defense. FEMA chairs both the Federal Radiological Preparedness Coordinating Committee and the Regional Assistance Committees. These committees provide FEMA and state and local governments technical offsite radiological emergency planning and preparedness expertise.

This guide has been developed to elaborate upon FEMA's rule 44 CFR 350 and NRC's NUREG-0654/FEMA-REP-1, Revision 1, to provide guidance for meeting planning standards E, F, and N and for reviewing and approving alert and notification systems to the:

- Regional Assistance Committees as they assist state and local government officials in the development of radiological emergency response plans (44 CFR 350.6);
- States in the preparation of an emergency plan and subsequent application for formal review and FEMA approval (44 CFR 350.7);
- FEMA Regional Directors in the evaluation of a state plan (44 CFR 350.11);
- FEMA Associate Director in making a determination of adequacy regarding a state plan (44 CFR 350.12);
- NRC in the review of FEMA's findings and determination on the adequacy of state plans; and
- NRC licensees in their design and documentation of alert and notification systems.

Although efforts have been made to ensure completeness, this document may not cover certain alert and notification situations. Each of these cases will be handled on an individual basis.

This guide is supplemented by four appendices describing procedures for preparation and submission of an alert and notification system design report, design report map requirements, the alert and notification public survey methodology, and routine siren testing procedures and operability requirements. These appendices are:

- Appendix 1: "Procedures for Preparation and Submission of a Design Report Describing Alert and Notification Systems";
- Appendix 2: "A Summary of Design Report Map Requirements";

- Appendix 3: "A Summary of the Alert and Notification Survey Methodology"; and
- Appendix 4: "A Summary of Design Report Routine Siren Testing Procedures and Operability Requirements."

These appendices have been included in this guide to aid licensees and state and local governments in the preparation of an alert and notification system design report.

CHAPTER 1

NUREG-0654/FEMA-REP-1, Revision 1, PLANNING STANDARD E - NOTIFICATION METHODS AND PROCEDURES

Planning Standard E in NUREG-0654/FEMA-REP-1, Revision 1, requires that:

> "Procedures have been established for notification, by the licensee of State and local response organizations and for notification of emergency personnel by all response organizations; the content of initial and followup messages to response organizations and the public has been established; and means to provide early notification and clear instruction to the populace within the plume exposure pathway Emergency Planning Zone have been established."

Evaluation Criterion E.5 in Planning Standard E requires that:

> "State and local government organizations shall establish a system for disseminating to the public appropriate information contained in initial and followup messages received from the licensee including the appropriate notification to appropriate broadcast media, e.g., the Emergency Broadcast System (EBS)."

E.5.1 Areas of Review

Evaluation Criterion E.5 addresses the system(s) used to disseminate information to the public during a nuclear power plant emergency. The review under Evaluation Criterion E.5 ensures that responsible state and local government organizations have adequate administrative procedures to communicate appropriate information to the public and that the physical capabilities exist to disseminate this emergency information.

The public will generally be informed by some form of broadcast media. All appropriate media are encouraged to participate.

E.5.2 Acceptance Criteria

An acceptable emergency plan under Evaluation Criterion E.5 should describe a system of disseminating information to the public that meets the following criteria:

1. Lists the broadcast stations and broadcasting systems that are to be selected so as to ensure that:

   - Transmission signal(s) are of adequate strength within the coverage area under review; and

   - Capability exists to broadcast official information 24 hours a day, 7 days a week. If a selected station does not have a backup power supply, then an alternate station should be identified and included in the emergency plan.

2. Depicts procedures and individual responsibilities for each organization and commitments between agreeing parties to honor these responsibilities in case of an offsite radiological emergency. These procedures should address activation authorization and designate individuals, by title, responsible for notification system activation. Actual authentication codes should not be identified.

3. References or includes some form of documentation, available for review, that states the station's or broadcast system's ability to participate in the public notification process. The emergency plan should identify, by title, points of contact accessible 24 hours a day, 7 days a week. Participation in a "Local Emergency Broadcast System Operational Area Plan" is considered satisfactory.

4. Clearly defines intervals for broadcasting official information statements for each class of nuclear power plant emergency action level. It is recommended that the maximum broadcast interval be no more than 15 minutes (for official information during actual general emergencies) until the emergency is declared officially to be over.

5. Includes a commitment that the Emergency Operations Center (EOC) or the media center will have the capability to monitor the broadcast of official information messages (radio and television). Incorrectly transmitted information should be immediately identified to the station(s) by the EOC's authorized point of contact.

Evaluation Criterion E.6 in Planning Standard E requires that:

> "Each organization shall establish administrative and physical means, and the time required for notifying and providing prompt instructions to the public within the plume exposure pathway Emergency Planning Zone. (See Appendix 3.) It shall be the licensee's responsibility to demonstrate that such means exist, regardless of who implements this requirement. It shall be the responsibility of the State and local governments to activate such a system."

E.6.1 Areas of Review

Evaluation Criterion E.6 addresses the required means to alert and notify the public within a nuclear power plant's EPZ in a situation involving real or potential radiological hazards. Evaluation Criterion E.6 requires the establishment of both the administrative procedures and the physical means for notifying the public within an EPZ.

The administrative procedures must describe the interaction of the various organizations, as well as the responsibility of each organization in this linkage. Activation of the alert and notification system includes all actions from the process by which a decision to alert the public is made, through the communications chain, to the actual capability to provide an alert signal and instructional message within a nuclear power plant's EPZ. The implementation of an alert and notification process commences with a telephone call from onsite personnel to offsite personnel responsible for activation of the alert and notification system.

The physical means must address the methods and equipment incorporated for alerting the public. A fully effective alerting system may employ a number of means which could include, but not be limited to, a combination of the following physical methods: fixed sirens; mobile siren vehicles; tone alert

radios; aircraft; automatic telephone dialers and switching equipment; modulated power lines; and police, fire, and rescue vehicles or personnel. Accordingly, a coordinated program of alert and notification system development, implementation, and routine testing and maintenance is encouraged. Regardless of the physical means (or any combination thereof) selected and implemented, Evaluation Criterion E.6 requires that the licensee provide a design report describing the alert and notification system. During FEMA's review of the alert and notification system, the design report will be reviewed and must be determined to be acceptable prior to activating the system for the purposes of conducting a public telephone survey to satisfy the alert and notification aspects of 44 CFR 350.9(a).

E.6.2 Acceptance Criteria

An acceptable design report under Evaluation Criterion E.6 should describe how the administrative procedures and the physical means are utilized to ensure initial alert and notification of the public within a nuclear power plant's EPZ and how these administrative procedures and physical means can and will be consistent with 44 CFR 350.12(b)(1). The development and use of innovative, cost-effective approaches is encouraged when notifying and providing prompt instruction to the public within a nuclear power plant's EPZ.

Administrative Procedures

A description of acceptable administrative procedures should include, at a minimum:

- Specification of those organizations or individuals, by title, responsible for activating the alert and notification system, including any alternates necessary

to ensure that such organizations or individuals will be notified and mobilized in time to perform their responsibilities.

- Discussion of the alert and notification activation procedures and an analysis of the amount of time required to implement these procedures, demonstrating that once the appropriate official has decided to activate the alert and notification system, the 15-minute design objective of NUREG-0654/FEMA-REP-1, Revision 1, p. 3-3 (discussed below), will be met.

- Specification of procedures and safeguards employed to ensure that a legitimate and clearly understood command to activate the alert and notification system is conveyed from the appropriate officials to the persons responsible for physically activating the system, and that these persons recognize, understand, and take appropriate actions in response to such a command.

Physical Means

As specified in Appendix 3 of NUREG-0654/FEMA-REP-1, Revision 1, the physical means must effectively alert the public:

"The minimum acceptable design objectives for coverage by the system are:

a) Capability for providing both an alert signal and an informational or instructional message to the population on an area wide basis throughout the 10 mile EPZ, within 15 minutes.*

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*NUREG-0654/FEMA-REP-1, Revision 1, (page 11) also contains the following footnote regarding EPZ size determinations:

"These radii are applicable to light water nuclear power plants, rated at 250 MWt or greater. The FEMA/NRC Steering Committee has concluded that small water cooled power reactors (less than 250 MWt) and the Fort St. Vrain gas cooled reactor may use a plume exposure emergency planning zone of about 5 miles in radius and an ingestion pathway emergency planning zone of about 30 miles in radius. In addition, the requirements for the alerting and notification system (Appendix 3) will be scaled on a case-by-case basis."

b) The initial notification system will assure direct coverage of essentially 100% of the population within 5 miles of the site.

c) Special arrangements will be made to assure 100% coverage within 45 minutes of the population who may not have received the initial notification within the entire plume exposure EPZ."

An effective alert and notification system may include more than one physical alerting method. Each physical means should be addressed in the design report. The design report must show that the integrated physical alerting system meets the above criteria. The design report should also address each major system component as specified in the following sections in this guide. The alert and notification method for institutions (such as recreational areas, schools, factories, hospitals, shopping centers, jails, and large office buildings) should be analyzed on a case-by-case basis and documented in the design report (see section E.6.2.4.2 of this guide, "Use of Institutional Alerting Systems"). The basis for any special requirements or exceptions should also be included in the design report. The design report, where appropriate, must include maps of a nuclear power plant's EPZ (see Appendix 2: A Summary of Design Report Map Requirements). The intent of the design report should be to demonstrate that the guidelines of NUREG-0654/FEMA-REP-1, Revision 1, and Appendix 3, are satisfied.

The following sections address the acceptance criteria for components comprising a totally integrated alerting system.

E.6.2.1 Fixed Sirens

Wherever proposed as part of an alert system, the siren system design and its routine testing procedures and maintenance program should be documented in the design report (see Appendix 4: A Summary of Design Report Routine Siren Testing Procedures

and Operability Requirements). The design report should also include maps depicting siren sound contours for C-weighted sound pressure levels (see Appendix 2: A Summary of Design Report Map Requirements), a description of how the sound pressure level contours were calculated, and any assumptions used including those from NUREG-0654/FEMA-REP-1, Revision 1. The sound contours may be based on Appendix 3 of NUREG-0654/FEMA-REP-1, Revision 1, including the use, in the absence of intervening topographical features, of the 10 dB loss per distance doubled sound attenuation factor used in FEMA CPG 1-17.* However, topographical features that act as sound barriers must be considered in such contour calculations. If the FEMA CPG 1-17 attenuation factor is not used, the design calculation should, at a minimum, account for the effects of topographical features, temperature, relative humidity, wind direction, wind speed, measured siren sound output, and siren location and height. Average summer daytime weather conditions may be used. Average daytime should be that period of time, during the day, that meteorologists define as representing neutral or unstable weather conditions.

To facilitate FEMA's evaluation of the computation, the design report should contain plant meteorological tower data representing 3 months of summer daytime conditions. The following parameters, taken from the lowest and intermediate tower positions, should be included: wind speed, wind direction, temperature, relative humidity or dew point, and barometric pressure. The data may be averaged or presented in an hourly format.

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*Federal Emergency Management Agency, "Outdoor Warning Systems Guide," CPG 1-17, March 1, 1980.

The reasonableness of the method for determining the siren sound output and the resulting siren sound pressure level contours should be documented in the design report. The validity of the sound pressure level contour calculation depends upon the validity of the determination of siren sound output at 100 feet from the siren. There are at least two ways to determine siren sound output:

- Onsite field measurements around at least one of each type of siren used within the EPZ; or
- Anechoic, semi-anechoic, or reverberation chamber tests in a qualified laboratory on sirens that are representative of each type of siren used within the EPZ.

Since consensus standards are not available for field and chamber siren measurements, the rationale for the employed measurement procedures must be detailed in the design report.

The design report should provide a list of all sirens and should contain the following information for each siren: unique identifier, siren type, sound output in dBC at 100 feet, and mounting height.

The design report demonstrates compliance with NUREG-0654/ FEMA-REP-1, Revision 1, criteria for those geographical areas covered by fixed sirens by showing that either:

- The expected siren sound pressure level generally exceeds 70 dBC where the population exceeds 2,000 persons per square mile and 60 dBC in other inhabited areas; or
- The expected siren sound pressure level generally exceeds the average measured summer daytime ambient sound pressure levels by 10 dB (geographical areas with less than 2,000 persons per square mile).

If the design report documents that the siren sound pressure levels exceed a measured ambient by 10 dB, then the following information should be provided:

- A description of how the average summer daytime ambient sound pressure levels were determined, including survey locations and the rationale for their selection;
- Identification of actual measurements including frequency range, time span, and location;
- Any assumptions used to determine the measured ambient along with rationale for those assumptions;
- Relationships of population density to measured ambient levels;
- Effects of major transportation routes; and
- Effects of any commercial activities in the area.

If the estimated siren sound pressure level does not generally meet the specified level based on either population density or a 10 dB differential between the measured average summer daytime ambient sound pressure level and the estimated siren sound pressure level, the siren system should be enhanced by the addition of sirens or by other alerting methods. These methods must be described in the design report.

Once the siren system is installed and operational, the licensee should develop and implement a routine siren testing and operability program (see Appendix 4: A Summary of Design Report Routine Siren Testing Procedures and Operability Requirements). This routine siren testing and operability program should include regularly scheduled testing of the siren system including but not limited to: silent, growl, and full-scale tests. NUREG-0654/FEMA-REP-1, Revision 1, suggests the following frequency:

- Silent tests should be conducted at least every two weeks;
- Growl tests should be conducted at least quarterly and whenever preventive maintenance is performed;
- Full-scale testing should be conducted at least annually and as required for formal exercises; and

- Other siren testing programs will be reviewed on a case-by-case basis.

The maintenance of the siren system should include prompt repair of any components not performing as expected during a test. This maintenance program should also include records of tests and repairs performed. The operability of a siren system is considered acceptable when an average of 90% of the sirens (as determined by a simple average of all regularly conducted tests) can be demonstrated as being functional over the 12-month period immediately preceding the submittal of the design report. Special conditions (e.g., siren systems that have not been operational for 12 months) will be considered on a case-by-case basis. A description of the routine siren testing procedures and a summary of the operability records should be included in the design report. This summary should contain a description of the computations used to determine the average operability of the siren system.

E.6.2.2 Mobile Siren Vehicles

Whenever mobile siren vehicles* are employed as part of the primary alerting system, the rationale for their use should be documented in the design report. A comprehensive description of the individual mobile siren configuration(s) and routine siren testing procedures and operability program (see Appendix 4: A Summary of Design Report Routine Siren Testing Procedures and Operability Requirements) should also be included in the design report. This description should specify those aspects of the

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*Mobile siren vehicles, as discussed in this section of the guide, are dedicated warning vehicles and do not include police, fire, or rescue vehicles. For acceptance criteria related to the use of police, fire, or rescue vehicles, see section E.6.2.4 of this guide, "Special Alerting."

siren design ensuring that the mobile siren vehicle is recognized by the public as part of a nuclear power plant's alert and notification system rather than mistaken for an emergency vehicle requiring clearance of the roadway. Furthermore, sound attenuation computations should be included in the design report. These sound attenuation computations should be made in order to predict distances, perpendicular to the vehicle's direction of travel, where 60 dBC and 70 dBC sound pressure levels occur. The attenuation calculations for mobile siren vehicles, a description of how the sound pressure level distances are calculated, and a discussion of how a vehicle's planned speed provides an effective signal duration to alert the intended population should be included in the design report.

Furthermore, the design report should include a description, including any assumptions made, of any analyses or calculations necessary to verify that individuals within the mobile alert areas can be provided an alert signal and informational message within 15 minutes of the initial decision to activate (or within 45 minutes of such decision when the design objective is to ensure coverage of a population who may not have received the initial notification). Such calculations should include conservative estimates of the time required to execute any necessary procedures, to obtain or position any necessary equipment, and to conservatively estimate equipment capabilities. When the individual responsible for activating the alert system does not directly control the necessary equipment or personnel responsible for activating the alert system, the design report should contain or reference suitable written agreements. These written agreements should ensure that the individual responsible for activation can place such equipment or personnel under his or her control within the times estimated in the design report.

The geographical areas covered by mobile siren vehicles should be clearly delineated on the map(s) submitted with the design

report (see Appendix 2: A Summary of Design Report Map Requirements). The proposed route and elapsed time (measured from the initial time of alert) of each vehicle along its route should be shown in the design report. The geographical areas along the routes should be covered by sound pressure levels as indicated below:

- Areas with population densities below 2,000 persons per square mile, equal to or above 60 dBC; and
- Areas with population densities above 2,000 persons per square mile, equal to or above 70 dBC.

In accordance with this guide's discussion of fixed sirens (see section E.6.2.1, "Fixed Sirens"), the design report should state when the ambient background noise level has been determined to be less than 50 dBC. The mobile siren coverage should be computed and depicted to show coverage at least 10 dB above the average measured outdoor daytime ambient.

If the design report depicts mobile siren sound pressure levels exceeding the average measured outdoor daytime ambient by 10 dB, the following information should be provided:

- A description of how the average summer daytime ambient sound pressure levels were determined, including survey locations and the rationale for their selection;
- Identification of actual measurements including frequency range, time span, and location;
- Any assumptions used to determine the measured ambient along with the rationale for these assumptions;
- Relationships of population density to measured ambient levels;
- Effects of major transportation routes; and
- Effects of any commercial activities in the area.

In summary, mobile siren vehicles satisfy NUREG-0654/FEMA-REP-1, Revision 1, criteria when:

- The expected siren sound pressure level generally exceeds 70 dBC where the population density exceeds 2,000 persons per square mile and 60 dBC in other inhabited areas;
- The expected siren sound pressure level generally exceeds the average measured summer daytime ambient sound pressure levels by 10 dB (geographical areas with less than 2,000 persons per square mile); or
- The sound produced by a mobile siren vehicle is of such nature and duration along its route that it can be clearly recognized by the public as a part of a nuclear power plant's alert and notification system.

Total elapsed time for mobile siren alerting (including vehicle transit time to initiation of the route) should not exceed 45 minutes when the design objective of the mobile siren usage is to ensure coverage of the population who may not have received the initial notification.

E.6.2.3 Tone Alert Radios

A tone alert radio is defined in this guide as a radio receiver containing circuitry that allows the radio to receive a signal that can activate an audible tone and provide a voice message. If tone alert radios are proposed as part (or all) of a nuclear power plant's alert and notification system, the rationale for their use should be included in the design report. The design report should also contain a description of the tone alert radio(s) utilized, including: the manufacturer, the model number, any operating instructions, and photographs. The geographical area covered by tone alert radios must be indicated on the map(s) submitted with the design report (see Appendix 2: A Summary of Design Report Map Requirements).

Although absolute control of tone alert radios is forfeited once they are given to the public for use in residences, the following steps can be taken to ensure that the public (in geographical areas where the radios are used as a primary alerting method) is offered the opportunity to benefit from the

availability of tone alert radios. At a minimum, an effective and continual tone alert radio distribution and maintenance program should be established that includes the following:

- Tone alert radios should be offered to the public in geographical areas (where needed) and a "best-effort" attempt must be made to place the radios. A record system (register) containing an accurate list of addresses (names are optional) must be maintained for those geographical areas using the tone alert radios. The addresses of residents refusing tone alert radios should also be noted.

- A maintenance program offering operating checks should be available at least annually to the public in geographical areas using the tone alert radios. This maintenance program and the register program (mentioned above) may be integrated.

- Tests offering the public a means to self-test its receivers are desired at least monthly. However, a final determination of testing frequency rests with appropriate state and local government officials. These test results need not be monitored.

- Written guidance should accompany the tone alert radio. These instructions should address, where applicable, a tone alert radio's:

  - General usage;
  - Self-testing frequency and method;
  - Suggested location (to facilitate efficient monitoring);
  - Maintenance program; and
  - Telephone numbers for repair or replacements.

  As a reminder, this written guidance should be provided annually to each tone alert radio recipient. This portion of the tone alert program may also be integrated with the register and maintenance programs (mentioned above).

- A determination should be made that the broadcast medium for initiating the tone alert signal has adequate availability (24 hours a day, 7 days a week), signal strength, and signal quality.

When a tone alert program (as defined above) has been implemented, NUREG-0654/FEMA-REP-1, Revision 1, criteria are satisfied for the tone alert portion of an alert and notification system.

E.6.2.4 Special Alerting

As indicated in NUREG-0654/FEMA-REP-1, Revision 1, Appendix 3, certain alerting methods may be more cost effective than sirens, mobile siren vehicles, or tone alert radios. Since special alerting methods encompass a broad variety of innovative alerting techniques, it is not possible to cover all situations within this guide. The following examples provide only general guidance regarding special alerting methods:

- Use of institutional alerting mechanisms (e.g., in schools, factories, hospitals, shopping centers, jails, hotels, motels, centralized offices, recreational areas, and government and military installations);
- Use of aircraft for alerting (equipped with either loudspeakers or leaflets);
- Use of automatic telephone dialers/switching equipment;
- Use of modulated power lines; or
- Use of police, fire, and rescue (emergency) vehicles or personnel (e.g., in an extremely sparsely populated area, it may be more cost effective to have law enforcement, fire protection, rescue, or other personnel alert households by a vehicle's public address or siren system, or by personal contact).

E.6.2.4.1 General Acceptance Criteria For Special Alerting Methods

The design report should include a detailed description of each special alerting method and the rationale for employing this method as a proposed part (or all) of an alert and notification system. In addition, the map(s) submitted with the design

report (see Appendix 2: A Summary of Design Report Map Requirements) must indicate the areas alerted by the special method(s). The design report should also contain a description, including any assumptions made, of any analyses or calculations necessary to verify that individuals within a special alerting area can be provided an alert signal and informational message within 15 minutes of the initial decision to activate (or within 45 minutes of such decision when the design objective is to ensure coverage of a population who may not have received the initial alert and notification). Such calculations should include conservative estimates of the time required to execute any necessary procedures and to obtain or position any necessary equipment and should conservatively estimate equipment capabilities. When the individual responsible for activating the alert and notification system does not directly control the necessary equipment or personnel responsible for activation, the design report should contain or reference applicable written agreements. These written agreements should ensure that the individual responsible for activation can place such equipment or personnel under his or her control within the times estimated in the design report.

The design report should also discuss the testing and maintenance of any equipment necessary to employ a special alerting method. In general, full-scale equipment testing should be conducted at least annually. Routine use of this equipment or these procedures (independent of their utilization as a part of an alert an notification system) demonstrating alert and notification system capabilities may be considered to be an acceptable test.

For those special alerting methods involving the distribution of equipment (other than tone alert radios as covered in this guide's section E.6.2.3, "Tone Alert Radios") to the public, a special alerting program should make a "best-effort" attempt to place this equipment or information. This effort should include:

- A record system (register) containing an accurate list of addresses (names are optional) in the geographical area(s) where the equipment or information is needed;
- A record of addresses where such equipment or information is offered to and refused by the residents; and
- An ongoing maintenance program, available to all residences within the affected areas, offering equipment operating checks.

Necessary written guidance should accompany the equipment. This guidance should address, if applicable:

- General usage;
- Suggested placement to facilitate efficient use;
- Details of the maintenance program, including self tests, if appropriate; and
- Telephone numbers for equipment repair or replacement.

This information should be provided annually as a reminder to each equipment holder. Any other necessary special information should also be redistributed annually. Register update and maintenance and public information programs can be integrated with this written guidance.

E.6.2.4.2 Use of Institutional Alerting Systems

In addition to meeting the general acceptance criteria for special alerting systems, institutional alerting methods used as a part of an alert and notification system should have an effective and continual program that, at a minimum, encompasses the following:

- Specification of those organizations and the individuals within those organizations, by title, responsible for the institutional alerting system;

- Description of the procedures employed to notify those individuals that the alert and notification system is to be activated; and

- Distribution of special information to notify those individuals of their responsibility to activate the existing institutional alerting system, including, where appropriate (e.g., for hotels, motels, and shopping centers), guidance on the most effective method of alerting system activation or other supporting information (e.g., public information stickers or posters).

E.6.2.4.3 Use of Aircraft for Alerting

In some geographical areas (e.g., hiking trails and hunting and fishing areas), prompt alert and notification may not be feasible except by employing aircraft equipped with powerful sound systems or by dropping prepared leaflets.

In addition to meeting special alerting system general acceptance criteria, the design report should describe the use of aircraft for alerting as follows:

- The sound system, if any, to be employed in alerting the public via aircraft should be described. The design report should include an analysis demonstrating that the sound system can provide an intelligible alerting signal at ground level throughout the geographical area requiring coverage.

- The system and procedures established for dropping leaflets should be discussed. The design report should indicate the manner and location in which the leaflets are stored, the individual responsible for ensuring that they are loaded onto the aircraft, and the time required to load the leaflets onto the aircraft. The design report should also include an analysis or calculation demonstrating that the employed procedures are likely to provide adequate coverage of the geographical area to be alerted by aircraft.

- The airfield and storage location for the aircraft and its distance from the area to be covered should be specified. Specifically, the design report analysis of the time required to alert individuals should include, among other pertinent factors, the amount of time required:

- To notify the pilot or alternate, who is available 24 hours a day, 7 days a week;
- For the pilot to reach the aircraft;
- To prepare the aircraft for flight;
- For the aircraft to take off; and
- For the aircraft to reach the area to be alerted.

E.6.2.4.4 Use of Automatic Telephone Dialers/Switching Equipment

Another available alert and notification method is a system that automatically dials pre-selected telephone numbers and plays a recorded emergency announcement when the telephone is answered. After a fixed number of rings, the next number is dialed automatically, with the unanswered numbers redialed at the end of the queue. Other telephone systems available connect directly to telephone exchange equipment, can call 100, 1,000, or more stations simultaneously, and may employ a special ring condition (e.g., a half-second ring followed by a two-second pause), a recorded voice, or a live voice message.

In addition to meeting special alerting system general acceptance criteria, the design report should describe automatic telephone dialers/switching equipment as follows:

- The type, manufacturer, and general operating concepts of the automatic telephone dialers or switching equipment employed should be specified. If a sequential automatic dialer is used, the design report should include a calculation of total time required to cycle once through the queue under both "worst-case" conditions (e.g., all respondents answer on the last ring before re-dial) and "expected" conditions. The design report should also present the rationale for sequencing the numbers in the queue. Measures to ensure that the telephone system does not fail due to traffic (subscriber) overloading prior to at least one complete cycle through the queue should also be discussed. If simultaneous alert calling is used, the design report should discuss provisions to ensure that "busy lines" at

the time the system is activated are alerted. Measures to ensure that the telephone system does not fail due to traffic (subscriber) overloading during this alert call should also be discussed in the design report.

E.6.2.4.5 Use of Modulated Power Lines

Electrical power lines can be used as another alert and notification method to transmit information by adding a modulated carrier frequency into the standard 60-cycle-per-second frequency used for power transmission. Transmitted information can perform a variety of functions (e.g., turn on a water heater, activate a device that reads the electric meter and transmits the reading back to the utility, ring a bell). Such a system can be modified to activate a variety of alerting devices, including an electrically driven horn, a warning light, or a buzzer. If used as a part of an alert and notification system, a modulated power line system should meet special alerting system general acceptance criteria.

E.6.2.4.6 Use of Police, Fire, or Rescue Vehicles and Personnel

In very isolated areas, the most cost-effective means of alert and notification may employ police, fire, or rescue vehicles and personnel to alert individual households, either via a vehicle's public address or siren system or by individually contacting members of a household. This use of police, fire, or rescue vehicles and personnel may also be a cost-effective method of alerting individuals in small populated areas, such as parks, where seasonal and diurnal variations in a population make a fixed siren system less cost effective.

In addition to meeting special alerting system acceptance criteria, the design report should describe the use of police, fire, or rescue vehicles and personnel as follows:

- The alerting procedures to be followed;
- The geographical areas to be covered; and
- The routes to be used.

These routes should be clearly delineated on the map(s) submitted with the design report (see Appendix 2: A Summary of Design Report Map Requirements). A proposed route and elapsed time (measured from the initial time of alert) should be shown for each vehicle on each route. The design report should also account for the transit time of each vehicle to the initiation of its route and the time required for a vehicle to slow or pause to alert an individual household. Total elapsed time for alert and notification using police, fire, or rescue vehicles and personnel should not exceed 15 minutes (or 45 minutes, when the design objective of route alerting is to ensure coverage of a population who may not have received the initial alert and notification).