

REGULATORY GUIDE

OFFICE OF STANDARDS DEVELOPMENT



REGULATORY GUIDE 1.101 EMERGENCY PLANNING FOR NUCLEAR POWER PLANTS

A. INTRODUCTION

Section 50.34, "Contents of Applications; Technical Information," of 10 CFR Part 50, "Licensing of Production and Utilization Facilities," requires that each application for a license to operate a facility include in a Final Safety Analysis Report (FSAR), along with other information, the applicant's plans for coping with emergencies, including the items specified in Appendix E, "Emergency Plans for Production and Utilization Facilities," to 10 CFR Part 50. Section 100.3 of 10 CFR Part 100, "Reactor Site Criteria," in the definitions of exclusion area and low population zone, establishes additional criteria for plans to cope with emergencies and serious accidents.

Appendix E refers to a document entitled "Guide to the Preparation of Emergency Plans for Production and Utilization Facilities," which was developed to help applicants establish adequate plans for coping with emergencies. This regulatory guide provides more complete guidance in developing the emergency plans required in the FSAR for nuclear power plants. It describes a method acceptable to the NRC staff for complying with the Commission's regulations with regard to the content of emergency plans for nuclear power plants, primarily in the FSAR stage. Additional guidance in the overall area of emergency preparedness is under development and will be forthcoming. The Advisory Committee on Reactor Safeguards has been consulted concerning this guide and has concurred in the regulatory position.

* Lines indicate substantive changes from previous issue.
Copies may be obtained by request to the U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. Attention: Director, Office of Nuclear Reactor Regulation.

B. DISCUSSION

The Commission's interest in emergency planning is focused primarily on situations that may cause or may threaten to cause radiological hazards affecting the health and safety of workers or the public or resulting in damage to property. Emergency plans should be directed toward mitigating the consequences of emergencies and should provide reasonable assurance that appropriate measures can and will be taken to protect health and safety and prevent damage to property in the event of an emergency. Although it is not practicable to develop a completely detailed plan encompassing every conceivable type of emergency situation, advance planning, including the preparation of procedures to implement the planning objectives and periodic testing by drills and exercises, can create a high order of preparedness and ensure an orderly and timely decision-making process at times of stress, as well as the availability of necessary equipment, supplies, and services.

An important element of emergency planning for nuclear power plants is the recognition of a need for active participation in the planning process by those who have emergency response roles. Federal, State, and local agencies, as well as the licensee, have responsible roles to play in both the planning and the implementation of emergency preparedness procedures. Federal interagency responsibilities for radiological incident emergency response planning were originally set forth by the Federal Office of Emergency Preparedness (now Federal Preparedness Agency, General Services Administration) in a Federal Register Notice (38 FR 2356) published January 24, 1973. The Notice was revised as of December 24, 1975, and published in the Federal

USNRC REGULATORY GUIDES

Regulatory Guides are issued to describe and make available to the public methods acceptable to the NRC staff of implementing specific parts of the Commission's regulations, to delineate techniques used by the staff in evaluating specific problems or postulated accidents, or to provide guidance to applicants. Regulatory Guides are not substitutes for regulations, and compliance with them is not required. Methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission.

Comments and suggestions for improvements in these guides are encouraged at all times, and guides will be revised, as appropriate, to accommodate comments and to reflect new information or experience. This guide was revised as a result of substantive comments received from the public and additional staff review.

Comments should be sent to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch.

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Register (40 FR 248). The current Notice outlines Federal agencies' responsibilities with respect to radiological emergency response planning related to fixed nuclear facilities and to transportation accidents involving radioactive materials. To a large extent, these responsibilities are directed toward a coordination of Federal efforts to provide assistance to State and local governments in their planning. This policy is based on the recognition that State and local governments have the necessary authority to implement protective measures for the public in their jurisdictions. Although Federal agencies can and will respond to emergencies arising from nuclear power plant activities if necessary, such response should be regarded primarily as supportive of, and not as a substitute for, responsible action by licensees and State and local governments. The development of an effective interface between the licensee and the State and local governments in radiological response planning is therefore necessary.²

In the preparation of emergency plans for a specific nuclear power plant, the applicant should be guided by the following criteria to clarify the scope, content, and purpose of the document that describes the plans.

1. Although considered a part of the Final Safety Analysis Report, the plans should be prepared and maintained as a separate document.

2. This document should be an expression of the overall concept of operation, which describes the essential elements of advance planning that have been considered and the provisions that have been made to cope with emergency situations. It should incorporate information about the emergency response roles of supporting organizations and offsite agencies. That information should be sufficient to ensure coordination among the supporting groups and between them and the licensee.

3. Details that can reasonably be expected to change from time to time, e.g., names and telephone numbers, specific items of equipment and supplies, inventory lists, and step-by-step procedures or checklists that may be altered as a result of experience or test exercises, need not be incorporated into the plans submitted as part of the Final Safety Analysis Report. However, detailed procedures that will ensure timely and effective implementation of various aspects of the emergency plan should be prepared.

²NUREG-75/111. "Guide and Checklist for the Development and Evaluation of State and Local Government Radiological Emergency Response Plans in Support of Fixed Nuclear Facilities."

C. REGULATORY POSITION

1. Each applicant's emergency plan should include provisions for coping with emergencies, both within the boundary of the plant site and in the environs of the site. Responsibility for planning and implementing all emergency measures within the site boundaries rests with the licensee. Planning and implementation of measures to cope with plant-related emergencies outside the site boundary with particular emphasis on the low population zone should be a coordinated effort involving the licensee and local, State, and Federal agencies having emergency responsibilities. The emergency plan should describe the coordination of the arrangements and agreements between the licensee and these agencies.

2. The scope and content of a nuclear power plant emergency plan should be substantially equivalent to that recommended in Annex A, "Organization and Content of Emergency Plans for Nuclear Power Plants," to this guide. To ensure organizational proficiency in coping with emergencies, provisions should be made for an annual review of the emergency plan and for periodic testing, updating, and improving procedures based on training, drills, exercises, and changes on site or in the environs.

3. Features and candidate subjects that should be considered in the preparation of specific procedures for implementing the emergency plan are described in Annex B, "Implementing Procedures for Emergency Plans," to this guide. Implementing procedures need not be incorporated into the plan and are not required to be submitted as part of the Final Safety Analysis Report to the Commission. These procedures should, however, be available for review by the Office of Inspection and Enforcement during its precicensing and routine inspections.

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees regarding the NRC staff's plans for using this regulatory guide.

This guide reflects current Nuclear Regulatory Commission practice. Therefore, except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein is being and will continue to be used in the evaluation of Final Safety Analysis Reports.

ANNEX A

ORGANIZATION AND CONTENT OF EMERGENCY PLANS FOR NUCLEAR POWER PLANTS

1. DEFINITIONS

This section should provide definitions of any terms that are unique to the power plant under consideration or are given connotations that differ from normally accepted usage. Listed below are some terms used in this guide along with the definitions that should be applied to these terms when they are used in emergency plans.

1.1 Assessment actions—those actions taken during or after an accident to obtain and process information that is necessary to make decisions to implement specific emergency measures.

1.2 Corrective actions—those emergency measures taken to ameliorate or terminate an emergency situation at or near the source of the problem in order to prevent an uncontrolled release of radioactive material or to reduce the magnitude of a release, e.g., shutting down equipment, firefighting, repair and damage control.

1.3 Protective actions—those emergency measures taken after an uncontrolled release of radioactive material has occurred for the purpose of preventing or minimizing radiological exposures to persons that would be likely to occur if the actions were not taken.

1.4 Population at risk—those persons for whom protective actions are being or would be taken.

1.5 Recovery actions—those actions taken after the emergency to restore the plant as nearly as possible to its preemergency condition.

1.6 Protective action guides (PAG)—projected radiological dose or dose commitment values to individuals in the general population that warrant protective action following a release of radioactive material. Protective actions would be warranted provided the reduction in individual dose expected to be achieved by carrying out the protective action is not offset by excessive risks to individual safety in taking the protective action. The PAG does not include the dose that has unavoidably occurred prior to the assessment.

1.7 Emergency action levels—radiological dose rates; specific contamination levels of airborne, waterborne, or surface-deposited concentrations of radioactive materials; or specific instrument indications (including their rates of change) that may be used as thresholds for initiating such specific emergency measures as designating a particular class of emergency, initiating a notification procedure, or initiating a particular protective action.

2. SCOPE AND APPLICABILITY

This section of the plan should define the unit, plant, station, or area to which the plan is applicable and present a summary of the plan's interrelationships with (1) its implementing procedures; (2) plant operating, radiological control, and industrial security procedures; (3) other emergency plans of the company (e.g., an overall corporate plan); and (4) emergency plans of other participating agencies, particularly the responsible State agency or other governmental authority having radiological emergency planning responsibilities in the immediate offsite area.

3. SUMMARY OF EMERGENCY PLAN

This section should describe the key elements of overall emergency planning logic, incorporating graded emergency classifications of increasing severity and their relationship to the participating status of onsite and offsite personnel and agencies.

4. EMERGENCY CONDITIONS

4.1 Classification System

An emergency plan should characterize several classes of emergency situations. The system of classification employed should consist of mutually exclusive groupings (to avoid ambiguity) but should cover the entire spectrum of possible radiological emergency situations. Succinct verbal rather than numerical or alphabetical classification designations are recommended to give better immediate information to personnel as to the scope and character of the situation. The system of classification should be compatible with the system used by the State and local governments. Each class defined should be associated with a particular set of immediate actions to be taken to cope with the situation. (These actions should be described in Section 6.) This section should note that various classes of accidents require a graded scale of responses. For example, a fire may begin as a small problem but then increase in severity and therefore move up from one class of accident to another.

Specific implementing procedures should be prepared for each identified class of emergency (see Annex B).

An acceptable classification scheme is described in qualitative terms in Sections 4.1.1 through 4.1.5. This part of the emergency plan should describe the criteria for characterizing each class and the criteria for specific emergency action levels to be used to recognize and declare each class or subclass.

4.1.1 Personnel Emergency

This class involves accidents or occurrences onsite in which emergency treatment of one or more individuals is required. It includes those situations that have no potential for escalation to more severe emergency conditions. There may be no effect on the plant, and immediate operator action to alter plant status is not necessarily required. A Personnel Emergency does not activate the entire emergency organization but may activate such teams as the first aid team. It may also require special local services such as ambulance and medical. Emergencies in this class can reasonably be expected to occur during the life of the plant.

Implementing procedures for handling this class of emergency may also be incorporated in the plant's radiation protection procedures and general industrial safety procedures.

Included in this class are injuries that may be complicated by contamination problems or excessive radiation exposures to onsite personnel.

Recognition of this class of emergency is primarily a judgment matter for plant supervisory or management personnel. Its importance as part of the classification scheme rests to some extent on its "negative" information content, viz, that the incident giving rise to the emergency is restricted in its scope of involvement. This section of the plan should designate the classification criteria and should enumerate discrete accident situations that could give rise to the Personnel Emergency class.

4.1.2 Emergency Alert

This class involves specific situations that can be recognized as creating a hazard potential that was previously nonexistent or latent. The situation has not yet caused damage to the plant or harm to personnel and does not necessarily require an immediate change in plant operating status. Inherently, however, this is a situation in which time is available to take precautionary and constructive steps to prevent an accident and to mitigate the consequences should it occur. Emergency Alert situations may be brought on by either manmade or natural phenomena and can reasonably be expected to occur during the life of the plant.

Emergency Alert conditions imply a rapid transition to a state of readiness by plant personnel and possibly by offsite emergency support organizations, the possible cessation of certain routine functions or activities within the plant that are not immediately essential, and possible precautionary actions that a specific situation may require. Examples of situations that should be placed in this class are threats to or breaches of plant security measures such as bomb

threats or civil disturbance;³ severe natural phenomena in the plant environment such as a flood, earthquake, tsunami, hurricane, or tornado; emergency situations such as nearby industrial or forest fires; or release of a toxic or noxious gas in or near the plant. This section of the emergency plan should identify specific candidate situations for Emergency Alerts and the criteria that would be used to recognize and declare this class.

4.1.3 Plant (Unit) Emergency

This class includes physical occurrences within the plant requiring staff emergency organization response. The initial assessment leading to this class should indicate that it is unlikely that an offsite hazard will be created. However, substantial modification of plant operating status is a highly probable corrective action if it has not already taken place by the automatic protective systems. Although this class is associated with a judgment that the emergency situation can be corrected and controlled by the plant staff, notification of corporate headquarters and, in turn, notification of appropriate offsite agencies to alert them as to the nature and extent of the incident should be measures associated with this class. For example, incidents such as fires that may have a significant potential for triggering a release of radioactive materials to the offsite environs should require that the licensee notify the principal responsible State and local agency of the plant status. The licensee would then recommend that the pertinent offsite agencies required to respond to a particular emergency be contacted, apprised of the situation, and directed to assume an alert condition (short of mobilization) until further notice. The offsite agencies would be expected to remain in this condition until either the plant was verified to be in a safe condition or until one of the other emergency classification categories was indicated, possibly requiring further action by offsite emergency response personnel. Protective evacuations or isolations of certain plant areas may be necessary. This class of emergency can also reasonably be expected to occur during the life of a plant.

Examples of situations that might fall into this class are those accidents analyzed in the FSAR as events that are predicted to have insufficient radiological consequences offsite to warrant taking protective measures. Fires and explosions in the plant having no radiological consequences offsite will generally fall into this class, although they may also be treated as separate and distinct emergency classification categories.

³Details of measures to cope with security incidents should be described in the facility physical security plan required pursuant to 10 CFR 50.34(c) and should be withheld from public disclosure pursuant to 10 CFR 2.790(d).

Activation levels for declaring Plant Emergencies should be based on (1) the recognition of an immediate need to implement in-plant emergency measures to protect or provide aid to affected persons in the plant or to mitigate the consequences of damages to plant equipment; (2) a positive observation that effluent and other radiological monitors show no indication of a possible Site Emergency; and (3) a positive observation that there is no apparent breach of any fuel cladding, primary system boundary, or containment. This section should describe the alarm conditions or combinations of alarm conditions and the emergency action levels for initiating a Plant Emergency.

4.1.4 Site (Station) Emergency

Emergency situations more severe than plant emergencies are not expected to occur during the life of a plant because of design features and other measures taken to guard against their occurrence. Nevertheless, it is considered necessary and prudent to make provisions for a class that involves an uncontrolled release of radioactive materials into the air, water, or ground to an extent that the initial assessment indicates the advisability of considering protective action offsite. Mobilization and readiness of principal offsite emergency organizations is a recommended measure. Protective actions are likely to include evacuation of plant areas other than control rooms and emergency stations; they should include, for example, the evacuation of construction personnel when additional units are under construction on the same site. Associated assessment actions include provisions for monitoring the environment.

Situations falling into this class include those accidents analyzed in the FSAR that could result in releases of radioactive materials to the environment. The releases would be of sufficient magnitude to warrant consideration of protective measures offsite to minimize potential health hazards due to resulting abnormal levels of airborne or deposited radioactive materials.^{4, 5}

Emergency action levels for declaring a Site Emergency should be defined (1) in terms of instrument readings or alarms that annunciate in the control room, including indications of the functioning of safety systems and the readout from effluent monitors and (2) alternatively in terms of specific contamination levels in environmental media, e.g., water, soil, vegetation, milk. To avoid unnecessary response to false alarms, the activation criteria for control room monitors should be defined so as to re-

⁴"Background Material for the Development of Radiation Protection Standards," Federal Radiation Council, Report No. 5, July 1964, and Report No. 7, May 1965.

⁵"Manual of Protective Action Guides and Protective Actions for Nuclear Incidents" (Chapter 2), U.S. Environmental Protection Agency—EPA-52011-75-001, September 1975.

quire corroborating evidence from two independent sources that provide input to the control room. The bases and criteria used to specify these emergency action levels should be described and their relationship to protective action guides explained. Licensees should use, and should recommend to local and State authorities for use, protective action guides incorporated in Federal agency guidance.⁵

4.1.5 General Emergency

Hypothetical accidents have been postulated that have the potential for serious radiological consequences to public health and safety. Although the likelihood of occurrence of such an event is extremely low, emergency plans should include a General Emergency class which provides for early warning of the public and prompt initiation of protective actions within the low population zone. Provision should also be made for modification or expansion of protective actions, based on conditions prevailing at the time of an accident, to include areas in which projected doses to individuals would be likely to exceed the upper limits of protective action guides.

Emergency action levels and other criteria for declaring a General Emergency should be specified in terms of information readily available in the control room. Such information should include the status of engineered safeguards. The selection of the levels should be guided solely by postulated conditions within the plant⁶ that would be likely to lead to serious releases of radioactive products into the atmosphere. An acceptable planning basis is the most serious design basis accident analyzed for siting purposes.

Coordination with local authorities is an essential element of the planning for this class to ensure the availability of mechanisms for early warning of the public.

4.2 Spectrum of Postulated Accidents

Accident analysis sections of Safety Analysis Reports are primarily concerned with the design responses of a plant to postulated malfunctions or equipment failure and include estimates of the radiological consequences of discrete accidents. By contrast, emergency planning is concerned with individual and organizational responses to the continuum of potential accident situations, including those discrete accidents that have been hypothesized. This section of the emergency plan should describe how the postulated accidents are encompassed within the emergency characterization classes and should provide a summary analysis of their implications for emergency planning. Implications to be considered should include (1) instrumentation capability for prompt detection and continued assessment and (2)

⁶See 10 CFR Part 100, footnote 1 to §100.11.

manpower needs in relation to the anticipated sequence and timing of events.

5. ORGANIZATIONAL CONTROL OF EMERGENCIES

Starting with the normal operating organization as a base, this section of the plan should describe the emergency organization that would be activated on the site and its augmentation and extension offsite. Authorities and responsibilities of key individuals and groups should be delineated. The communication links established for notifying, alerting, and mobilizing emergency personnel should be identified.

5.1 Normal Plant Organization

Both day and night shift staffs (crews) should be described, indicating clearly who is in the immediate onsite position of responsibility for the plant or station and his authority and responsibility for declaring an emergency.

5.2 Onsite Emergency Organization

This section should describe the onsite emergency organization of plant staff personnel for both day and night shift situations.

5.2.1 Direction and Coordination

The position title of that person onsite who is designated to take charge of emergency control measures should be clearly identified. A specific line of succession for this authority should also be given. A policy statement describing the scope of authority and responsibility vested in that role by the company (applicant) should be included. Functional responsibilities assigned to this individual should be described.

5.2.2 Plant Staff Emergency Assignments

The plan should specify the organizational groups to which the following additional functional areas of emergency activity are assigned, including an indication of how the assignments are made for both day and night shifts and for plant staff members both onsite and away from the site. Functional areas should include:

1. Plant systems operations,
2. Radiological survey and monitoring,
3. Firefighting,
4. Rescue operations,
5. First aid,
6. Decontamination,
7. Security of plant and access control,
8. Repair and damage control,
9. Personnel accountability,
10. Recordkeeping, and
11. Communications.

5.3 Augmentation of Onsite Emergency Organization

This section should describe two categories of off-site support assistance to the plant staff emergency organization.

5.3.1 Licensee Headquarters Support

Headquarters management, administrative, and technical personnel should be prepared to augment the plant staff in the performance of certain functions required to cope with an emergency. The following special functions are considered appropriate for headquarters support and should be incorporated in the overall plan, although company policy and organizational features may dictate variations in modes of assigning responsibilities for these functions among headquarters personnel, plant staff personnel, and outside support organizations:

1. Environs monitoring,
2. Logistics support for emergency personnel, e.g., transportation, temporary quarters, food and water, sanitary facilities in the field, and special equipment and supplies procurement,
3. Technical support for planning and reentry/recovery operations,
4. Notification of governmental authorities, and
5. Release of information to news media during an emergency coordinated with governmental authorities.

The emergency organization status of supporting headquarters personnel should be specified, relative particularly to the person directing the plant emergency organization.

In some instances, companies may provide for certain emergency supporting services to their plants by contracts with private organizations. Where this is the case, the nature and scope of the support services should be characterized here. (When such contractors are used, evidence of their qualifications may be requested.) Specific services by contractors should be identified at the appropriate places in the emergency plan.

5.3.2 Local Services Support

This section should identify the extension of the organizational capability for handling emergencies to be provided by ambulance, medical, hospital, and firefighting organizations. Evidence of the arrangements and agreements reached with such organizations should be included in an appendix. This section should contain references to that appendix and to the parts of the plan in which the functions of these organizations are described.

5.4 Coordination with Participating Government Agencies

This section should identify the principal State agency (designated State authority) and other governmental agencies (local, county, State, and Federal) having action responsibilities for radiological emergencies in the area in which the plant is located. If the boundary line between two political entities, e.g., counties or States, passes within the low-population zone or within approximately four miles of the site, agencies from both governmental entities should be included. Subsections for each such agency should include:⁷

1. The identity of the agency.
2. A description of the authority and responsibility of the agency for emergency preparedness planning and for emergency response, particularly in relation to those of the licensee and to those of other agencies.
3. A description for each agency of specific response capabilities in terms of the expertise of personnel and other organizational resources available. Copies of written agreements with such agencies should be included in an appendix. The information should provide a clear concept of radiological response operations.
4. Activation of the agency function, including titles and alternates for both ends of the communication links, and primary and alternative means of communication. Administrative control methods that will ensure the effective coordination and control of the emergency activities of support organizations should be established.
5. The designation and location of the Emergency Operations Center of each State/local government agency.

Typical agencies to be included here are law enforcement agencies, departments of health or environmental protection, civil defense or emergency/disaster control agencies, and the regional coordinating offices of USERDA's Radiological Assistance Program.

6. EMERGENCY MEASURES

Specific emergency measures should be identified in this section for *each emergency class* and related to action levels or criteria that specify when the measures are to be implemented.

The planning represented by this section should lead to more detailed emergency procedures and assignments for executing tasks by appropriate members of the emergency organization. Emergency measures begin with the activation of an emergency

⁷As an alternative method of providing the information requested in these subsections, the applicant may choose to submit copies of such agencies' radiological emergency response plans as evidence of acceptable coordination.

class and its associated emergency organization. The additional measures may be organized into assessment actions, corrective actions, protective actions, and aid to affected persons, where applicable to each class.

6.1 Activation of Emergency Organization

The emergency conditions classified in Section 4.1 involve the alerting or activation of progressively larger segments of the total emergency organization. This section should describe the communication steps taken to alert or activate emergency personnel under each class of emergency. In particular, action levels (based on readings from a number of sensors including the pressure in containment, the response of the ECCS, etc.) for notification of offsite agencies should be described. The existence, but not the details, of a message authentication scheme should be noted for such agencies.

6.2 Assessment Actions

Effective coordination and direction of all elements of the emergency organization require continuing assessment throughout an emergency situation. The details of assessment functions should be incorporated in explicit implementing procedures for each emergency classification. This section should include, however, a description of the methodologies and techniques to be used by the licensee. That description should give reasonable assurance that the magnitude of releases of radioactive materials can be determined, that the magnitude of any resulting radioactive contamination can be determined, that projected exposure to persons onsite or offsite can be estimated, and that emergency action levels specified can be determined, all in a timely manner.

6.3 Corrective Actions

In some emergency situations, actions can be taken to correct or mitigate the situation at or near the source of the problem (for example, to prevent an uncontrolled release of radioactive materials or to reduce the magnitude of a release). Such actions should be considered as a supplement to design features and as both a backup and an extension of automatically initiated actions. Proficiency in corrective actions should constitute a major objective of the training effort and onsite drill program. This section should identify those actions, e.g., fire control,⁸ repair, and damage control, that can and would be implemented when necessary.

6.4 Protective Actions

This section should describe the nature of protective actions for which the plan provides, the criteria

⁸If applicable, reference should be made to the description called for in Regulatory Guide 1.70, Section 9.5.1, "Fire Protection System."

for implementing these protective actions, the area involved, and the means of notifying or warning the persons or population at risk. Describe also steps taken (1) to provide to visitors to the plant or site and (2) to make available on request to occupants in the low population zone information concerning how the emergency plans provide for notification to them and how they can expect to be advised what to do.

6.4.1 Protective Cover, Evacuation, Personnel Accountability

The emergency plan should provide for timely relocation of persons in order to prevent or minimize exposure to radiation and radioactive materials. The following items should be included:

1. Plant Site
 - a. Action criteria.
 - b. The means and the time required to warn or advise persons involved, i.e.,
 - (1) Employees not having emergency assignments,
 - (2) Working and nonworking visitors,
 - (3) Contractor and construction personnel, and
 - (4) Other persons who may be in the public access areas on or passing through the site or within the exclusion area.
 - c. Evacuation routes, transportation of personnel, and reassembly areas, including alternatives for inclement weather and high traffic density.
 - d. Missing persons check.
 - e. Radiological monitoring of evacuees.

2. Offsite Areas⁹

- a. Actions planned to protect persons in the low population zone and criteria for their implementation.
- b. The means and the time required to warn or advise the persons involved, including:
 - (1) Businesses, property owners, and tenants;
 - (2) Schools or recreational facilities; and
 - (3) General public.

6.4.2 Use of Onsite Protective Equipment and Supplies

Additional protective actions that should be considered in emergency planning include measures for minimizing the effects of radiological exposures or contamination problems by the onsite distribution of

special equipment or supplies. Measures that should be considered for persons within the exclusion area include:

1. Individual respiratory protection,
2. Use of protective clothing, and
3. Use of radioprotective drugs, e.g., individual thyroid protection.¹⁰

For each measure that might be used, a description should be given of:

1. Criteria for issuance,
2. Locations of items, and
3. Means of distribution.

6.4.3 Contamination Control Measures

Provisions should be made for preventing or minimizing direct or subsequent ingestion exposure to radioactive materials deposited on the ground or other surfaces. Control of in-plant contamination should be described in specific radiological protection procedures and need not be repeated here.

6.4.3.1 Plant Site

Protective actions within the exclusion area but outside of fenced security areas should be described and should include, where applicable:

- a. Isolation or quarantine and area access control,
- b. Control of the distribution of affected agricultural products, including milk,
- c. Control of water supplies, and
- d. Criteria for permitting return to normal use.

Action criteria (Protective Action Guides) and responsibility for implementation of the measures planned should be described.

6.4.3.2 Offsite Areas¹¹

Protective actions planned for the low population zone with provisions for extending such actions to areas farther from the site boundary, if necessary, should be described and should include the same elements as in 6.4.3.1 above.

6.5 Aid to Affected Personnel

This section of the emergency plan should describe measures that will be used by the licensee to provide necessary assistance to persons injured or exposed to radiation and radioactive material. The following matters should be included:

⁹If the information requested here is included in copies of radiological emergency response plans of applicable government agencies (see footnote to Section 5.4), it need not be repeated.

¹⁰The U.S. Food and Drug Administration is presently developing guidance for the use of radioprotective drugs.

¹¹Refer to footnote to Section 6.4.1-2.

6.5.1 Emergency Personnel Exposure

This should specify exposure guidelines for entry or reentry to areas in order to (1) remove injured persons and (2) undertake corrective actions. Exposure guidelines should also be specified for emergency personnel who will be providing first aid, decontamination, ambulance, or medical treatment services to injured persons and a description of how these guidelines will be implemented. Methods for permitting volunteers to receive radiation exposures in the course of carrying out lifesaving activities should ensure expeditious decisionmaking and a reasonable balance of relative risks.¹²

6.5.2 Decontamination and First Aid

Capabilities for decontaminating personnel should be included, along with a brief description of first aid training and capabilities of appropriate members of the emergency organization.

6.5.3 Medical Transportation

Arrangements for transporting injured personnel, who may also be radiologically contaminated, to medical treatment facilities should be specified.

6.5.4 Medical Treatment

Arrangements made for local and backup hospital and medical services and the capability for the evaluation of radiation exposure and uptake should be described.

For both hospital and medical service, the plan should incorporate assurance not only that the required services are available, but also that persons providing them are prepared and qualified to handle radiological emergencies. Written agreements with respect to arrangements made by the applicant should be included in the appendix.

7. EMERGENCY FACILITIES AND EQUIPMENT

This section of the emergency plan should identify, describe briefly, and give the locations of items to be used or maintained by the licensee. Where appropriate, references may be made to applicable sections of the Final Safety Analysis Report for additional detail.

7.1 Emergency Control Centers

This should include the principal and, if provided for, alternative onsite locations from which effective emergency control direction is given. One alternative offsite location under the jurisdiction of the applicant

should also be described. Their locations should be related to the reactors, prevailing wind direction, and evacuation routes.

7.2 Communications Systems

This should give brief descriptions of both onsite and offsite communications systems, including redundant power sources that would be required to perform vital functions in transmitting and receiving information throughout the course of an emergency.

7.3 Assessment Facilities

Many of the emergency measures described in Section 6 will depend on the availability of monitoring instruments and laboratory facilities. This section should list monitoring systems that are to be used to initiate emergency measures, as well as those to be used for continuing assessment. The listing should be organized as follows:

7.3.1 Onsite Systems and Equipment

1. Geophysical phenomena monitors, e.g., meteorological, hydrologic, seismic.
2. Radiological monitors, e.g., process, area, emergency, effluent, and portable monitors and sampling equipment.
3. Process monitors, e.g., reactor coolant system pressure and temperature, containment pressure and temperature, liquid levels, flow rates, status or lineup of equipment components.
4. Fire detection devices.

7.3.2 Facilities and Equipment for Offsite Monitoring

1. Geophysical phenomena monitors.
2. Radiological monitors.
3. Laboratory facilities, fixed or mobile.

7.4 Protective Facilities and Equipment

Specific facilities and equipment that are intended to serve a protective function should be described. The description of shelter or assembly areas should emphasize those features that ensure their adequacy with respect to their capacity for accommodating the number of persons expected and with respect to shielding, ventilation, and inventory of supplies, including, for example, respiratory protection, protective clothing, portable lighting, and communications equipment. If design and other details are provided elsewhere in the Final Safety Analysis Report, only a brief summary need be given.

7.5 First Aid and Medical Facilities

A summary description of onsite facilities should be provided. (Offsite medical facilities should be

¹²National Council on Radiation Protection and Measurements, NCRD Report No. 39, "Basic Radiation Protection Criteria," issued January 15, 1971, pages 99-102.

identified in the appendix (Section 10 of Annex A to this regulatory guide) along with the agreements providing for their use.)

7.6 Damage Control Equipment and Supplies

A summary description of onsite damage control equipment and supplies should be provided.

8. MAINTAINING EMERGENCY PREPAREDNESS

This section of the plan should describe the means to be employed to ensure that the plan will continue to be effective throughout the lifetime of the facility.

8.1 Organizational Preparedness

8.1.1 Training¹³

This should include a description of specialized initial training and periodic retraining programs to be provided to each of the following categories of emergency personnel:

1. Directors or coordinators of the plant emergency organization.
2. Personnel responsible for accident assessment, including control room shift personnel.
3. Radiological monitoring teams.
4. Fire control teams (fire brigades).
5. Repair and damage control teams.
6. First aid and rescue teams.
7. Local services personnel.
8. Medical support personnel.
9. Licensee's headquarters support personnel.

8.1.2 Drills and Exercises¹³

This section should describe provisions for the conduct of periodic drills and exercises to test the adequacy of timing and content of implementing procedures and methods, to test emergency equipment, and to ensure that emergency organization personnel are familiar with their duties. Preplanned descriptions or simulations of accidents or similar events should be used to prepare scenarios appropriate to the objectives of each drill or exercise.

The plan should provide for an initial exercise prior to loading of the first unit at any site and for annual exercises thereafter using scenarios appropriate to the Site Emergency or General Emergency classifications of Section 4.1. Each of these exercises should contain provisions for coordination with and participation of offsite emergency personnel, including those of State and local government agencies. Each exercise should test, as a minimum, the communications links and notification procedures with those offsite agencies to demonstrate that capability for early warning of the public is maintained.

¹³See also Regulatory Guide 1.120, "Fire Protection Guidelines for Nuclear Power Plants."

This plan should also provide for quarterly drills for fire team (fire brigade) members, annual fire emergency drills containing provisions for a participation by an offsite fire department, and annual drills of repair and damage control teams. These should be conducted as realistically as is reasonably possible. Provisions should be made for critiques of all drills and exercises. Training should include delineation of methods to evaluate its effectiveness and to correct weak areas through feedback with emphasis on schedules, lesson plans, practical training, and periodic examinations.

8.1.3 Emergency Planning Coordinator

It is suggested that licensees establish and maintain on the normal plant operating staff an Emergency Planning Coordinator whose responsibility should include the coordination of offsite emergency planning efforts. Principal duties of this position may be described in this section.

8.2 Review and Updating of the Plan and Procedures

Provision should be made for an annual review of the emergency plan and for updating and improving procedures to incorporate results of training and drills and to account for changes onsite or in the environs. Means for maintaining all coordinate elements of the total emergency organization informed of the plan and revisions to the plan or relevant procedures should be described. Provisions for reviewing and updating all written agreements at least every two years should be included.

8.3 Maintenance and Inventory of Emergency Equipment and Supplies

The operational readiness of all items of emergency equipment and supplies should be ensured. The provisions for performing maintenance, surveillance testing, and inventory on emergency equipment and supplies should be described.

9. RECOVERY

This section should describe general plans, including applicable criteria, for restoring the plant as nearly as may be possible to a safe status.

10. APPENDIX

The appendix should include the following items:

1. Copies of agreement letters with offsite emergency response supporting organizations and copies or summaries of referenced interfacing emergency plans.

2. Plots of calculated time-distance-dose for the most serious design basis accident as called for in the

latest revision of Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants," Section 13.3-1.a, -1.b, and -1.c.

3. A map or maps, drawn to suitable scale and clearly legible, that reflect the information called for in Regulatory Guide 1.70, Section 13.3-6.a. and -6.b., and display the exclusion area and low population zone boundaries.

4. Listings, by title, of written procedures that implement the plan.

5. Listings by general category of emergency kits, protective equipment, and supplies that are stored and maintained for emergency purposes. A detailed catalog of individual items should not be included in the plan.

The written procedures themselves and a detailed catalog of protective equipment and supplies should be available at the plant site for inspection at any time by a representative of the Commission's Office of Inspection and Enforcement.

ANNEX B

IMPLEMENTING PROCEDURES FOR EMERGENCY PLANS

This annex provides guidance regarding the preparation and content of procedures that implement the emergency plan.

1. CONTENT AND FORMAT OF PROCEDURES

This section describes desirable features that should be incorporated, where appropriate, into individual implementing procedures.

1.1 Organization and Responsibilities

Each procedure should specify the individual or organizational element having the authority and responsibility for performing specific critical tasks covered by the procedure.

1.2 Action Levels

Emergency action levels and protective action guides should be specified in procedures, along with the emergency actions or protective actions required and the individuals or organizational units responsible for their implementation.

1.3 Actions by Support Agencies

The specific actions to be performed by support groups should be identified in the procedures dealing with their activities. If the emergency actions performed by these groups require coordination with other elements of the emergency organization, the particulars and requirements of this coordination should be specified in the controlling procedure.

1.4 Procedure Format

A rigid format for implementing procedures is not suggested in this guide. An acceptable format should display the action steps so the user of the procedure can clearly understand his duties. The format of procedures that specify immediate actions to be taken has special significance because the user needs brief and explicit instructions that can be followed easily and quickly.

1.4.1 Conditions and Prerequisites

Each procedure should explain the prerequisites and conditions that should exist before the specified actions or operations are performed. These should be in the form of action levels or protective action guides.

1.4.2 Actions and Limitations

Procedures should present the required actions in a succinct and concise manner and in step-by-step

order and logical sequence. The instructions should be sufficiently detailed for a qualified individual to perform the required actions without supervision but need not provide a completely detailed description of the actions, methods, or processes.

If the user is given the latitude to exercise judgment in implementing specific actions or parts of the procedure, guidelines should be provided in the procedure to aid the user in making decisions.

1.4.3 Cautions and Precautions

Important steps or precautions should be noted or highlighted within the procedure.

1.4.4 References

When procedural steps require other functions or jobs to be performed, the controlling procedure should contain the reference to other applicable procedures.

1.4.5 Signoff Sheets and Checklists

Complex or lengthy controlling procedures should have provisions for signoff sheets or checklists to document the fact that required actions have been taken or have been completed. Examples include notification call lists and personnel accountability checks.

2. SCOPE AND IMPLEMENTING PROCEDURES

2.1 Immediate Action Procedures

There should be a separate procedure for each identified class of emergency to specify and implement the preplanned response actions required for that emergency condition. Each procedure should (1) clearly identify the action level, the protective action guide, or the conditions for declaring the emergency condition; (2) list by priority the individuals and elements of the emergency organization that are to be notified and mobilized; and (3) specify the emergency actions that are to be taken by designated individuals and elements of the emergency organization. Communications procedures should require formality, acknowledgements of orders and reports, designation of relative priority of communications with the scene of the emergency, site emergency control center, control room, outside activities, etc. Effective methods for rapid internal and external transmission of information may include prepositioned messages (fill in the blanks in specified sequence); instructions for use of voice (telephone and radio transmission) and

telewire facsimile (TWX); use of manual status boards for details of the emergency; and use of maps, charts, and plant configuration drawings for site and local areas required by Annex A.10.3.

2.2 Emergency Action Procedures

The following sections list subjects that should be covered by written procedures. The titles of specific procedures, as well as their contents, may vary among licensees, but the actions or subjects described below should be covered within the group of procedures that implement the emergency plan.

2.2.1 Notifications

Call lists to alert and mobilize the emergency organization and supporting agencies should be specified for each identified class of emergency. If call lists are not too lengthy or complex, they should be incorporated into the immediate action procedure.

2.2.2 Radiological Surveys

Procedures should specify the methods, and preplanned locations if feasible, for emergency radiological surveys in the plant and in the environs of the plant. The procedures should include or refer to requirements for providing collected data and information to the individual or organizational element responsible for emergency assessment functions.

2.2.3 Personnel Monitoring and Decontamination

The procedures should require monitoring of individuals leaving restricted areas or other areas known or suspected to be contaminated. The procedures should specify contamination levels that require decontamination actions. They should also include or refer to decontamination procedures for various types and levels of radioactive contamination.

2.2.4 Evacuation of Onsite Areas

Procedures for evacuation should include the action levels that require evacuation of specified areas, buildings, and the site. Primary and secondary evacuation routes and assembly areas should be designated. These procedures should refer to or be related to those procedures for personnel accountability and personnel monitoring.

2.2.5 Personnel Accountability

A method of personnel accountability should be specified in procedures to ensure that, at all times, all individuals within the site confines and areas and buildings within the site are warned of imminent threats or hazardous conditions and evacuated from affected areas if required.

The procedures should designate individuals having the responsibility of accounting for persons within areas and buildings within the site. The procedures should contain appropriate checksheets and signoffs and should provide for reporting of information to the central authority in charge of the emergency response actions.

2.2.6 Assessment Actions

Procedures should describe the system for gathering information and data on which to base decisions to escalate or deescalate emergency response actions. They should identify the types and sources of information available such as control room radiological and meteorological instruments and radiation and contamination level as defined by in-plant, site boundary, and onsite and offsite surveys. The procedures should specify action levels (based on readings from a number of sensors, including the pressure in containment, the response of the ECCS, etc.), protective action guides, and other guidelines as a basis for decisions to initiate emergency measures and actions or to terminate or otherwise modify emergency actions in progress. The procedures should assign responsibilities for gathering and using assessment data and information.

2.2.7 First Aid and Medical Care

The procedures that specify the methods and instructions for receiving, transporting, and handling injured persons and providing for their medical treatment should specifically include the precautions and special handling required for contaminated patients. The procedures should cover separately the provisions for and use of medical treatment facilities in both onsite and offsite areas.

2.2.8 Firefighting

In addition to the normal hazards of firefighting such as flame, heat, smoke, toxic gas, structural failure, electric shock, etc., the procedures should also cover precautions for fighting fires involving radioactive materials and for situations where firefighters may otherwise be exposed to radiation. They should cover the responsibilities and capabilities of both in-house and offsite firefighting teams and equipment. They should include specific instructions for monitoring the exposure to radiation of offsite personnel involved in firefighting.

2.2.9 Reentry

Procedures and guidelines should be developed for reentry to previously evacuated areas for the purposes of saving lives, search and rescue of missing and injured persons, or manipulation, repair, or recovery of critical equipment or systems. Specific guidelines should be included in these procedures for

maximum emergency radiation exposures for reentry and rescue personnel. Procedures should be developed for permitting voluntary acceptance of emergency exposure for lifesaving actions.

2.2.10 Plant Security

The normal plant security procedures should provide for security and access control during emergency conditions and should include provisions for unencumbered access by emergency vehicles and personnel.

2.2.11 Recovery

Action levels and guidelines should be developed for restoring operations and property as nearly as possible to a safe status. The less complex operations such as personnel emergencies and emergency alerts should require only brief recovery action procedures. The more complex emergency operations, however, (site and general emergencies, for example) will generally require correspondingly complex recovery actions. It is not practicable to plan detailed recovery actions for all conceivable situations, but procedures that include at least the initial planning considerations for recovering, repairing, decontaminating, etc., potentially affected portions of the facility should be developed.

During onsite recovery operations, personnel exposures to radiation should be maintained within 10 CFR Part 20 limits.

2.3 Supplemental Procedures

This section lists subjects for procedures that supplement those covering emergency response actions. The specific titles and contents may vary, but the described subjects should be covered in the licensee's procedural system.

2.3.1 Communications

Procedures should be available for activating, operating, testing, and maintaining the emergency communications systems.

2.3.2 Documentation and Records

Procedures should include requirements for recording the implementation and completion or termination of emergency response actions, logging assessment data, reports of personnel accountability, and maintenance of required records and logs.

2.3.3 Equipment and Instrumentation

Operating instructions for equipment and in-

strumentation should be prepared and stored with the equipment. Procedures should include inventory lists of kits, equipment, and instruments and provisions for periodic inventory, inspection, calibration, and maintenance.

2.3.4 Training

The training program for the emergency organization should be documented in the form of schedules and lesson plans or lesson outlines. The program should include training for licensee employees and for offsite organizations and personnel who are to provide support in the emergency response. The training for offsite personnel who may be required to enter the site should typically include familiarization with the site and instructions on site procedures necessary for their safety and for their effective interface with onsite personnel. Offsite personnel training may include emergency dosimeter issue procedures, fire main connection locations, vehicle access routes, and plant alarms.

Training should include delineation of methods to evaluate its effectiveness and to correct weak areas through feedback with emphasis on schedules, lesson plans, practical training, and periodic examinations.

2.3.5 Tests and Drills

Procedures should provide for practice drills that use detailed scenarios to test both specific procedures and implementation of the major aspects of the emergency plan. The scenarios should be planned simulations of emergency situations, and they should be approved by plant management after they have been reviewed for scope and adequacy.

The procedures should consider the utility of testing on both an announced and unannounced basis. They should require the use of an observer staff during the conduct of test drills and should contain provisions for appropriate checklists or critique sheets to be used by the observer staff.

3. REVIEW AND APPROVAL OF PROCEDURES

The procedural system used by licensees should contain written rules and instructions governing the writing, revising, and updating of implementing procedures. The instructions should specify the methods to be used to ensure that procedures, revisions, and changes are reviewed for adequacy, approved for use, and distributed to user organizations and individuals having the responsibility for implementing the procedures.

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