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Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants

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FOREWORD

The purpose of this guidance and upgraded acceptance criteria is to provide a basis for NRC licensees, State and local governments to develop radiological emergency plans and improve emergency preparedness. The guidance is the product of the joint FEMA/NRC Steering Committee established to coordinate the agencies' work in emergency preparedness associated with nuclear power plants. The interim version of this document was published in January 1980, and subjected to public comment under Federal Register Notice 44 FR 9768 of February 13, 1980. Based upon the comments received, meetings with the Interorganizational Advisory Committee (made up of State and local representatives) and later at a September 1980 Workshop sponsored by FEMA for State officials, the final version was prepared for publication. The principal changes in the document consist of clarification of intent and accommodation of many of the unique situations which arise in State/local/utility interfaces. Therefore, plans prepared using the interim guidance should not require substantial revision. This document is consistent with NRC and FEMA regulations and supersedes other previous guidance and criteria published by FEMA and NRC on this subject. It will be used by reviewers in determining the adequacy of State, local and nuclear power plant licensee emergency plans and preparedness.

October 1980

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ACKNOWLEDGEMENT

The Steering Committee acknowledges with thanks the contributions of the Interorganizational Advisory Committee on Radiological Emergency Planning and Preparedness (IOAC) of the Conference of (State) Radiation Control Program Directors. Members of this Committee also include representatives of the National Emergency Management Association and the U. S. Civil Defense Council. The Steering Committee also acknowledges with thanks the contributions made by other Federal agencies, State and local governmental organizations, members of the public, and the nuclear industry.

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U. S. Nuclear Regulatory Commission - Federal Emergency Management Agency

CRITERIA FOR PREPARATION AND EVALUATION OF RADIOLOGICAL EMERGENCY RESPONSE PLANS AND PREPAREDNESS IN SUPPORT OF NUCLEAR POWER PLANTS

I. INTRODUCTION

A. Purpose

The purpose of this document is to provide a common reference and guidance source for:

1. State and local governments and nuclear facility operators in the develoment of radiological emergency response plans and preparedness in support of nuclear power plants.

2. Federal Emergency Management Agency (FEMA), Nuclear Regulatory Commission (NRC), and other Federal agency personnel engaged in the review of State, local government and licensee plans and preparedness.

3. The Federal Emergency Management Agency, the Nuclear Regulatory Commission and other Federal agencies in the development of the National Radiological Emergency Preparedness Plan.

B. Background

The NRC and FEMA staff have prepared this document as part of their responsibilities under the Atomic Energy Act, as amended, and the President's Statement of December 7, 1979, with the accompanying

B. Background (continued)

Fact Sheet. These responsibilities include development and promulgation of guidance to nuclear facility operators, States and local governments, in cooperation with other Federal agencies, for the preparation of radiological emergency response plans and assessing the adequacy of such plans.[1/]

This guidance is classified as final guidance. The interim version of this guidance, published in January, 1980, was commented upon by interested parties during the formal public comment period solicited by the Federal Register Notice 44 FR 9768 of February 13, 1980. Additionally, comments received on "Draft Emergency Action Level Guidelines", (September 1979), NUREG-0610 solicited by Federal Register Notice 44 FR 55446 of September 26, 1979 were also considered in the revision to Appendix 1 of the criteria document. A separate document has been prepared by NRC and FEMA which lists the comments received and which indicates the NRC and FEMA response to these comments. FEMA, NRC, and other involved Federal agencies intend to use the guidance contained in this document in their individual and joint reviews of State and local government radiological emergency response plans and preparedness, and of the plans and preparedness of NRC facility licensees. The NRC Final Rule on Emergency Planning

1/ In light of the President's Statement of December 7, 1979, the agency responsibilities assigned on January 24, 1973 by the Office of Emergency Preparedness, (and later reassigned on December 24, 1975 by the Federal Preparedness Agency/GSA) are being revised and will be promulgated in the near future by FEMA.

B. Background (continued)

(45 FR 55402) of August 19, 1980 has an effective date of November 3, 1980. This document is supportive of the NRC Final Rule and is referenced therein. This document is also supportive of the proposed FEMA Rule concerning the review and approval of State and local radiological emergency plans and preparedness, which at this writing is in the process of revision as a result of comments received during the public comment period.

NRC has now established a schedule for the implementation of the "Minimum Staffing Requirements for NRC Licensees for Nuclear Power Plant Emergencies" set forth in Table B-1, (see II.B.5), and for Appendix 2, "Meteorological Criteria for Emergency Preparedness at Operating Nuclear Power Plants" (see Annex to Appendix 2).

C. Scope

This document is concerned with accidents at fixed commercial nuclear power reactors which might have impact on public health and safety.[2/]

2/ Many of the planning elements contained in this guide may be useful for planners in the vicinity of test and research reactors, fuel processing plants, or other facilities using or producing large quantities of radioactive material. None of the numerical values in this document need be used for planning at such facilities. Similarly, while some planning elements presented here may apply to transportation accidents involving radioactive material, such accidents have unique characteristics which warrant separate guidance. These accidents are not specifically covered in this document and will be the subject of future guidance.

C. Scope (continued)

The guidance intended for use by NRC licensees and operators of commercial nuclear power reactors is based upon several existing documents familiar to such operators: first, NRC Regulatory Guide 1.101 (March 1977); second, NRC's letters of October 10, 1979 and November 29, 1979 to its power reactor licensees; third, NRC's final rule including the revised Appendix E to 10 CFR Part 50 and fourth, NRC's NUREG-0610, "Draft Emergency Action Level Guidelines for Nuclear Power Plants," September 1979, the revised version of which is Appendix 1 to this document.

The guidance intended for use by State and local governments has been drawn in large part from existing documents already familiar to planners: first, the NRC Guide and Checklist for the Development and Evaluation of State and Local Government Radiological Emergency Response Plans in Support of Fixed Nuclear Facilities, NUREG 75/111 (1974) and its Supplement No. 1 (March 1977); and second, guidance on the planning basis contained in the Report of the NRC/EPA Task Force on Emergency Planning, NUREG-0396, EPA 520/1-78-016 (December 1978). The Guide and Checklist, its supplement and the NRC/EPA Task Force Report, were subjected to very broad State and local government reviews prior to publication, in both draft and final form. NRC specifically endorsed the guidance contained in each of these documents. NRC's formal policy statement on the Emergency

C. Scope (continued)

Planning Zone concept was published in the Federal Register of October 23, 1979, (44 FR 61123). EPA's endorsement of the Emergency Planning Zone concept was published in the Federal Register of January 15, 1980 (45 FR 2893). This document supersedes NUREG 75/111 and Regulatory Guide 1.101. As in the January, 1980 version of this document, FEMA formally endorses this guidance concerning Emergency Planning Zones and urges its immediate use by States and local governments and by NRC licensed nuclear power plant operators. Also included in this document are some obvious lessons learned during and after the accident at Three Mile Island. The criteria put added emphasis on the following elements: Notification Methods and Procedures, Emergency Communications, Public Education and Information, Emergency Facilities and Equipment, Accident Assessment, and Exercises and Drills. FEMA and NRC regard all of the planning standards identified and contained herein as essential for an adequate radiological emergency plan.

D. Planning Basis

1. Background

The NRC/EPA Task Force Report on Emergency Planning, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants, NUREG-0396, EPA 520/1-78-016" provides a planning basis

D. Planning Basis (continued)

for offsite emergency preparedness efforts considered necessary and prudent for large power reactor facilities. The NRC's policy statement of October 23, 1979 (44 FR 61123), directs the NRC staff to incorporate the guidance in the report into emergency preparedness documents. Additionally, the guidance in the NRC/EPA Task Force Report on Emergency Planning is now reflected in the NRC Final Rule on Emergency Planning. FEMA has also concluded that the guidance in NUREG-0396 should be used as the planning basis for emergency preparedness around nuclear power facilities.

The overall objective of emergency response plans is to provide dose savings (and in some cases immediate life saving) for a spectrum of accidents that could produce offsite doses in excess of Protective Action Guides (PAGs).[3/,4/] No single specific accident sequence should be isolated as the one for which to plan because each accident could have different consequences, both in nature and degree. Further, the range of possible selection for a planning basis is very large, starting with a zero point of requiring no planning at all because significant offsite radiological accident consequences are unlikely to occur,

3/ Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, EPA-520/1-75-001, September 1975, U. S. Environmental Protection Agency.

4/ Accidental Radioactive Contamination of Human Food and Animal Feeds, U. S. Department of Health, Education and Welfare (now U. S. Department of Health and Human Services), 43 FR 58790 of December 15, 1978.

D. Planning Basis (continued)

to planning for the worst possible accident, regardless of its extremely low likelihood. The NRC/EPA Task Force did not attempt to define a single accident sequence or even a limited number of sequences. Rather, it identified the bounds of the parameters for which planning is recommended, based upon knowledge of the potential consequences, timing, and release characteristics of a spectrum of accidents. Although the selected planning basis is independent of specific accident sequences, a number of accident descriptions were considered in the development of the guidance, including the core melt accident release categories of the Reactor Safety Study.

The most important guidance in the Report for planning officials is the definition of the area over which planning for predetermined actions should be carried out.

Information on the time frames of accidents is also important. The time between the initial recognition at the nuclear facility that a serious accident is in progress and the beginning of the radioactive release to the surrounding environment is critical in determining the type of protective actions which are feasible. Knowledge of the potential duration of release and the time

D. Planning Basis (continued)

available before exposures are expected several miles offsite is important in determining what specific instructions can be given to the public.

A knowledge of kinds of radioactive materials potentially released is necessary to decide the characteristics of monitoring instrumentation, to develop tools for estimating projected doses, and to identify the most important exposure pathways.

The need for specification of areas for the major exposure pathways is evident. The location of the population for whom protective measures may be needed, responsible authorities who would carry out protective actions and the means of communication to these authorities and to the population are all dependent on the characteristics of the planning areas. Emergency preparedness should be related to two predominant exposure pathways. They are:

a. Plume exposure pathway -- The principal exposure sources from this pathway are: (a) whole body external exposure to gamma radiation from the plume and from deposited material; and (b) inhalation exposure from the passing radioactive plume. The duration of the release leading to potential exposure could range from one-half hour to

D. Planning Basis (continued)

days. For the plume exposure pathway, shelter and/or evacuation would likely be the principal immediate protective actions to be recommended for the general public. When evacuation is chosen as the preferred protective measure, initial evacuation of a 360° area around the facility is desirable out to a distance of about two to five miles although initial efforts would, of course, be in the general downwind direction. This concept is indicated in Figure 1. The precise boundaries of such evacuations and sectors evacuated at extended downwind distances would be largely determined by political boundaries and would not fit the precise pattern of Figure 1. The possible administration of the thyroid blocking agent, potassium iodide, should also be considered.[5/] The U. S. Department of Health and Human Services (DHHS) is preparing guidance on the potassium iodide issue which will be considered by NRC and FEMA. The ability to best reduce potential exposure under the specific conditions during the course of an accident should determine the appropriate response.

b. Ingestion exposure pathway -- The principal exposure from this pathway would be from ingestion of contaminated water or foods such as milk, fresh vegetables or aquatic foodstuffs.

5/ Potassium Iodide as a Thyroid-Blocking Agent in a Radiation Emergency, U. S. Department of Health, Education and Welfare (now U. S. Department of Health and Human Services), 43 FR 58798 of December 15, 1978.

D. Planning Basis (continued)

The duration of potential exposure could range in length from hours to months. For the ingestion exposure pathway, the planning effort involves the identification of major exposure pathways from contaminated food and water and the associated control and interdiction points and methods. The ingestion pathway exposures in general would represent a longer term problem, although some early protective actions to minimize subsequent contamination of milk or other supplies should be initiated (e.g., remove cows from pasture and put them on stored feed).

Separate guidance is provided for these two exposure pathways, although emergency plans for a particular site will include elements common to assessing or taking protective actions for both pathways.

2. Emergency Planning Zones

With regard to the area over which planning efforts should be carried out, "Emergency Planning Zones" (EPZs) about each nuclear facility must be defined both for the short term "plume exposure pathway" and for the longer term "ingestion exposure pathways." The Emergency Planning Zone concept is illustrated in Figure 1. EPZs are defined as the areas for which planning is needed to assure that prompt and effective actions can be taken to protect the public in the event of an accident. The criteria in NUREG-0396 are to be applied by the response organizations in these

D. Planning Basis (continued)

zones as applicable. The NRC/EPA Task Force Report on Emergency Planning (NUREG-0396, EPA 520/1-78-016) anticipates that State, rather than local, response organizations will be principally responsible for the planning associated with the ingestion exposure pathway.

The choice of the size of the Emergency Planning Zones represents a judgment on the extent of detailed planning which must be performed to assure an adequate response base. In a particular emergency, protective actions might well be restricted to a small part of the planning zones. On the other hand, for the worst possible accidents, protective actions would need to be taken outside the planning zones.

The Task Force selected a radius of about 10 miles for the plume exposure pathway and a radius of about 50 miles for the ingestion exposure pathway, as shown in Figure 1 and in Table 1.[6/] Although the radius for the EPZ implies a circular area, the actual shape would depend upon the characteristics of a particular site.

6/ 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. This conclusion is based on the lower potential hazard from these facilities (lower radionuclide inventory and longer times to release significant amounts of activity for many accident scenarios). The radionuclides considered in planning should be the same as recommended in NUREG-0396/EPA-520/1-78-016.

D. Planning Basis (continued)

The size (about 10 miles radius) of the plume exposure EPZ was based primarily on the following considerations:

a. projected doses from the traditional design basis accidents would not exceed Protective Action Guide levels outside the zone;

b. projected doses from most core melt sequences would not exceed Protective Action Guide levels outside the zone;

c. for the worst core melt sequences, immediate life threatening doses would generally not occur outside the zone;

d. detailed planning within 10 miles would provide a substantial base for expansion of response efforts in the event that this proved necessary.

The NRC/EPA Task Force concluded that it would be unlikely that any protective actions for the plume exposure pathway would be required beyond the plume exposure EPZ. Also, the plume exposure EPZ is of sufficient size for actions within this zone to provide for substantial reduction in early severe health effects (injuries or deaths) in the event of a worst case core melt accident.

The size of the ingestion exposure EPZ (about 50 miles in radius, which also includes the 10-mile radius plume exposure EPZ) was selected because:

D. Planning Basis (continued)

a. the downwind range within which contamination will generally not exceed the Protective Action Guides is limited to about 50 miles from a power plant because of wind shifts during the release and travel periods;

b. there may be conversion of atmospheric iodine (i.e., iodine suspended in the atmosphere for long time periods) to chemical forms which do not readily enter the ingestion pathway;

c. much of any particulate material in a radioactive plume would have been deposited on the ground within about 50 miles from the facility; and

d. the likelihood of exceeding ingestion pathway protective action guide levels at 50 miles is comparable to the likelihood of exceeding plume exposure pathway protective action guide levels at 10 miles.

3. Time Factors Associated with Releases

The range of times between the onset of accident conditions and the start of a major release is of the order of one-half hour to several hours. The subsequent time period over which radioactive material may be expected to be released is of the order of one-half hour (short-term release) to a few days (continuous release). Table 2 summarizes the guidance on the time of the release, which

D. Planning Basis (continued)

has been used in developing the criteria for notification capabilities in Part II. (Other reasons for requiring prompt notification capabilities include faster moderate releases for which protective actions are desirable and the need for substantial lead times to carry out certain protective measures, such as evacuation, when this is indicated by plant conditions.)

4. Radiological Characteristics of Releases

Planners will need information on the characteristics of potential radioactivity releases in order to specify the characteristics of monitoring instrumentation,[7/] develop decisional aids to estimate projected doses, and identify critical exposure modes.

For atmospheric releases from nuclear power facilities, three dominant exposure modes have been identified: (a) whole body (bone marrow) exposure from external gamma radiation and from ingestion of radioactive material; (b) thyroid exposure from inhalation or ingestion of radioiodines; and (c) exposure of other organs (e.g., lung) from inhalation or ingestion of radioactive materials. Any of these exposure modes could dominate (i.e., result in the largest exposures) depending upon the relative quantities of various isotopes released.

7/ An interagency Task Force on Emergency Instrumentation (offsite) is now preparing guidance on offsite radiation measurement systems, accident assessment techniques, and the type and quantity of instruments needed for the various exposure pathways. Federal agencies represented on the Instrumentation Task Force include FEMA, NRC, EPA, HEW, and DOE.

D. Planning Basis (continued)

Radioactive materials produced in the operation of nuclear reactors include fission products, transuranics and activation products generated by neutron exposure of the structural and other materials within and immediately around the reactor core. The fission products consist of a very large number of different kinds of isotopes (nuclides), almost all of which are initially radioactive. The amounts of these fission products and their potential for escape from their normal places of confinement represent the dominant potential for consequences to the public. Radioactive fission products exist in a variety of physical and chemical forms of varied volatility. Virtually all activation products and transuranics exist as non-volatile solids. The characteristics of these materials show quite clearly that the potential for releases to the environment decreases dramatically in this order: (a) gaseous materials; (b) volatile solids, and (c) non-volatile solids. For this reason, guidance for source terms representing hypothetical fission product activity within a nuclear power plant containment structure emphasizes the development of plans relating to the release of noble gases and/or volatiles such as iodine. Consideration of particulate materials, however, should not be completely neglected. For example, capability to determine the presence or absence of key particulate radionuclides will be needed to identify requirements for additional resources. Table 3 provides a list of dominant radionuclides for each exposure pathway.

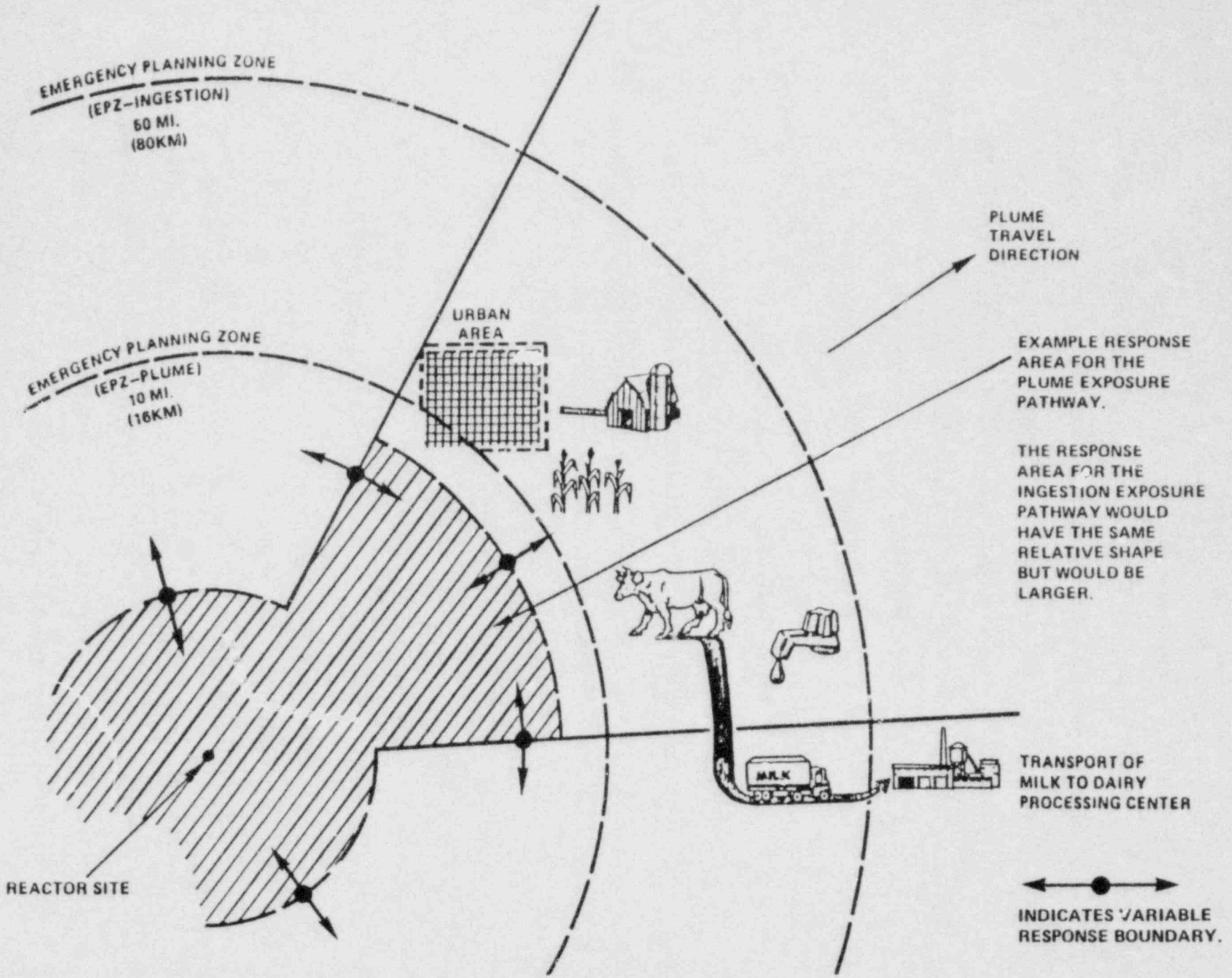

Figure 1 Concept of Emergency Planning Zones

TABLE 1

GUIDANCE ON SIZE OF THE EMERGENCY PLANNING ZONE

Accident Phase	Critical Organ and Exposure Pathway	EPZ Radius
Plume Exposure Pathway	Whole Body (external)	about 10 mile radius*
	Thyroid (inhalation)	
	Other organs (inhalation)	
Ingestion Pathway	Thyroid, whole body, bone marrow (ingestion)	about 50 mile radius**

* Judgment should be used in adopting this distance based upon considerations of local conditions such as demography, topography, land characteristics, access routes, and local jurisdictional boundaries.

**Processing plants for milk produced within the EPZ should be included in emergency response plans regardless of their location.

TABLE 2

GUIDANCE ON INITIATION AND DURATION OF RELEASE

Time from the initiating event to start of atmospheric release	0.5 hours to one day
Time period over which radioactive material may be continuously released	0.5 hours to several days
Time at which major portion of release may occur	0.5 hours to 1 day after start of release
Travel time for release to exposure point (time after release)	5 miles -- 0.5 to 2 hours 10 miles - 1 to 4 hours

Table 3

RADIONUCLIDES WITH SIGNIFICANT CONTRIBUTION TO DOMINANT EXPOSURE MODES

Radionuclides with Significant Contribution to Thyroid Exposure

Radionuclide	Half Life (days)
I-131	8.05
I-132	0.0958
I-133	0.875
I-134	0.0366
I-135	0.280
Te-132	3.25

Radionuclides with Significant Contribution to Whole Body Exposure

Radionuclide	Half Life (days)
I-131	8.05
Te-132	3.25
Xe-133	5.28
I-133	0.875
Xe-135	0.384
I-135	0.280
Cs-134	750
Kr-88	0.117
Cs-137	11,000

Radionuclides with Significant Contribution to Lung Exposure* (Lung only controlling when thyroid dose is reduced by iodine blocking or there is a long delay prior to releases).

Radionuclide	Half Life (days)
I-131	8.05
I-132	0.0958
I-133	0.875
I-134	0.0366
I-135	0.280
Cs-134	750
Kr-88	0.117
Cs-137	11,000
Ru-106	365
Te-132	3.25
Ce-144	284

*Derived from the more probable Reactor Safety Study core melt categories and from postulated design basis accident releases.

E. Contiguous-Jurisdiction Governmental Emergency Planning

The concept of Emergency Planning Zones (EPZs) necessarily implies mutually supportive emergency planning and preparedness arrangements by several levels of government: Federal, State and local governments, including counties, townships and even villages. For the purposes of this document, it is not necessary to outline the varied governmental and jurisdictional situations that can and do exist throughout the United States, nor is it necessary to describe in detail the varied emergency planning and preparedness mechanisms that can be developed among these governmental entities.

It would be useful to offer several generally representative governmental-jurisdictional situations relating to the Emergency Planning Zone concept. There are obvious permutations and combinations of these situations, but these are examples of what is desirable in terms of cross-jurisdictional emergency planning. The important point is that integrated emergency planning will benefit all of the communities within the Emergency Planning Zones.

Example No. 1 Local Government Jurisdictions Within the Plume Exposure Pathway (10 miles) Emergency Planning Zone

A variety of local government jurisdictions may be found within the 10-mile plume exposure pathway Emergency Planning Zone (EPZ). In some situations, several county-level governments and municipal or township

E. Contiguous-Jurisdiction Governmental Emergency Planning (continued)

governments will have jurisdictional authority within the EPZ and these separate governmental entities will control their own emergency response organizations and resources. In multi-jurisdictional situations like this, an integrated multi-county level emergency response plan is preferable. The response organizations and resources of municipal or township governments can be integrated -- by mutual agreement -- into the overall multi-county emergency response plan.

In other situations, a municipal or township government might have a larger emergency response organization than its parent county. Under these circumstances, the municipality or township government might be mutually designated the "lead" emergency planning and response organization, incorporating the resources available to the county in the overall emergency plan.

Local government plans and response mechanisms are particularly important for the 10-mile EPZ. This is because relatively shorter times may be available to implement immediate protective measures associated with the plume exposure pathway (sheltering, thyroid blocking, evacuation), as opposed to the generally

E. Contiguous-Jurisdiction Governmental Emergency Planning (continued)

longer times available for implementing protective measures for the ingestion exposure pathway. State government resources may be too far away from the involved local jurisdictions to be of much immediate help for a plume exposure problem in the early hours of an accident. Local government emergency plans should be made a part of the State emergency plan.

Example No. 2 Local Government Within the Plume Exposure Pathway (10-mile) Emergency Planning Zone Whose Boundaries Are Also a State Boundary

This situation will normally be found where the nuclear facility is situated on a river which forms a boundary between States and local governments. In this case, the fact that a State boundary is now involved within the EPZ makes it necessary to have contiguous State emergency planning within the EPZ, involving cooperative planning at a higher level of government. This should not preclude cooperative planning between adjacent counties, municipalities or townships located in different States.

Example No. 3 State vs. Local Government Emergency Planning Within the Ingestion Exposure Pathway (50-mile) Emergency Planning Zone

The 50-mile EPZ for the ingestion (agricultural products consumption) exposure pathway may encompass one or

E. Contiguous-Jurisdiction Governmental Emergency Planning (continued)

several States, as well as many local government, municipal or township jurisdictions. Planning for the implementing of protective measures associated with the ingestion exposure pathway is best handled by the State governments, with support from local governments, particularly at the county level, with backup from the Federal Government. This is because the involved areas could be quite large, crossing many jurisdictional boundaries and involving the use of relatively sophisticated radiological analysis equipment generally found only at State and Federal Government levels. Further, the time available to implement protective measures associated with the ingestion exposure pathway is generally greater than the time available to implement protective measures associated with the plume exposure pathway. The State, with support from the Federal Government, should be able to respond quickly enough to implement any desirable protective measures for the ingestion exposure pathway.

E. Contiguous-Jurisdiction Governmental Emergency Planning (continued)

Example No. 4 State and Local Government Jurisdictions Near An International Boundary

At present, the only U. S. situations involving emergency planning considerations across an international boundary involve Canada. Both the U. S. and Canada have nuclear facilities near their common borders. Mutual emergency planning with Canada is desirable and the NRC and FEMA are pursuing this matter through appropriate channels.

F. Integrated Guidance and Criteria

NRC and FEMA have deliberately consolidated in this document guidance intended for use by State and local governments and that intended to guide the emergency planning and preparedness activities of NRC licensees because of a shared belief that an integrated approach to the development of response plans to radiological hazards is most likely to provide the best protection of the health and safety of the public. NRC and FEMA recognize that plans of licensees, State and local governments should not be developed in a vacuum or in isolation from one another. Should an accident occur, the public can be best protected when the response by all parties is fully integrated. Each party involved must have a clear understanding of what the overall level of preparedness must be and what role it will play in the event of

F. Integrated Guidance and Criteria (continued)

a nuclear accident. This understanding can be achieved best if there is an integrated development and evaluation of plans. There must also be an acceptance by the parties and a clear recognition of the responsibility they share for safeguarding public health and safety.

Although the guidance indicates that the criteria are appliable to one or more specific organizations, the intention throughout has been to provide for an adequate state of emergency preparedness around the facility. If weaknesses in one organization are identified, but compensated for in another organization, the reviewers can still find that an adequate state of emergency preparedness exists.

This consolidated guidance should also allow the parties to recognize and understand each other's capabilities, responsibilities and obligations. The guidance makes clear which party has responsibility for which essential element. In many cases, the NRC licensee, the State and the local governments are all called upon to produce material for the same essential element. The consolidated guidance will allow reviewers to do a more thorough analysis and to probe the relationship of one plan with another. This document has been designed to assist reviewers in their work.

G. Funding and Technical Assistance

While funding and technical assistance are not addressed in this document, it is a subject which must be discussed between the individual nuclear utilities and the involved State and local governments who must prepare emergency plans to support the nuclear facilities. The nuclear utility may have an incentive based on its own self interest as well as its responsibility to provide electric power, to assist in providing manpower, items of equipment, or other resources that the State and local governments may need but are themselves unable to provide. The Federal Regional Assistance Committees, now under the chairmanship of FEMA, will play an increasing role in the development of these plans. Training programs for State and local officials formerly sponsored by NRC and now sponsored by FEMA will continue without interruption.

H. Nuclear Facility Licensee Response Organization

NRC and FEMA agree that the licensees of nuclear facilities have a primary responsibility for planning and implementing emergency measures within their site boundaries. These emergency measures include corrective actions at the site and protective measures and aid for persons onsite. Since facility licensees cannot do this alone, it is a necessary part of the facility emergency planning to make advance arrangements with State and local organizations for special emergency assistance such as ambulance, medical, hospital, fire and police services.

H. Nuclear Facility Licensee Response Organization (continued)

An additional emergency activity for which facility licensees have primary responsibility is accident assessment. This includes prompt action to evaluate any potential risk to the public health and safety, both onsite and offsite, and timely recommendations to State and local governments concerning protective measures. In some situations, there could be a need for protective measures within short time intervals -- a half-hour or perhaps even less -- after determination that a hazard exists. For this reason, licensee emergency planners must recognize the importance of prompt accident assessment at the source. The criteria in this document reflect the identification and classification of accidents and the notification of offsite agencies by the facility licensee consistent with NRC rules as set forth in Appendix 1.

Emphasis on inplant identification of potential hazards is a change from the previous emphasis in many licensee response plans on measurement of actual levels of radioactivity before notifications of offsite organizations are made and actions to protect the public recommended.

Because of the potential need to take immediate action offsite in the event of a significant radiological accident, notifications to appropriate offsite response organizations (State or States and local government organizations) must go directly from the facility licensee. The response organizations which receive these notifications should

H. Nuclear Facility Licensee Response Organization (continued)

have the authority and capability to take immediate predetermined actions based on recommendations from the facility licensee. These actions could include prompt notification of the public in the offsite area, followed by advisories to the public in certain areas to stay inside (take shelter) or, if appropriate, evacuate to predetermined relocation or host areas. State agencies, which are likely to have greater radioprotective resources than local agencies, would bring their resources to bear and make decisions with regard to whether the recommended protective measures are adequate.

In the longer time frame, substantial corporate and private sector organization resources should also supplement the initial response of the nuclear facility licensee. A facility licensee organization is therefore required to have a "recovery organization" similar to the one recommended by the Atomic Industrial Forum, which can use and absorb Federal and private support which in all likelihood will be available following any radiological accident.

I. Federal Response

The Department of Energy's current Radiological Assistance Program (RAP), the Federal Interagency Radiological Assistance Plan (IRAP), other radiological emergency assistance plans, and DOE's National Laboratories capabilities as well as those of the U. S. Environmental Protection

I. Federal Response (continued)

Agency and the Department of Health and Human Services and other Federal capability, are being incorporated in a Federal Radiological Monitoring and Assessment Plan. Response plans should contain provisions for integration of this important Federal assistance.

The facility licensee must make provisions for an NRC presence onsite following an accident and for supplying information to and receiving advisories from NRC regional or headquarters operations centers. In addition, the plan should provide for communication between State authorities, NRC and FEMA.

The interrelationships of the Federal agencies and their roles during a radiological emergency will be defined in a National Radiological Emergency Preparedness Plan now being developed by FEMA, and in an NRC agency plan. These plans will be compatible with State, local and licensee plans developed using the "Planning Standards" of this guidance and criteria document.

J. Form and Content of Plans

The criteria in this document are organized under the topic headings of NUREG-75/111 (the principal previous NRC guidance to State and local response organizations) wherever possible. That format may be followed by planners.

J. Form and Content of Plans (continued)

The guidance does not specify a single format for emergency response plans but it is important that the means by which all criteria are met be clearly set forth in the plans. All plans should contain a table of contents, and a cross-reference to the criteria contained in this document is also needed. Applicable supporting and reference documents and tables may be incorporated by reference, and appendices should be used whenever necessary. The plans should be kept as concise as possible. The average plan should consist of perhaps hundreds of pages, not thousands. The plans should make clear what is to be done in an emergency, how it is to be done and by whom.

In addition to addressing the substance of all criteria, the plans must, of course, define the facility or facilities and area to which the plans apply. The plans should include definitions of any terms that are unique to the facility under consideration or are given connotations that differ from normally accepted usage.

Findings by FEMA and NRC with regard to the adequacy of emergency preparedness will be related to the capability of the facility licensee, State and local response organizations, to respond in a coordinated manner to emergencies at or related to particular nuclear facilities.

J. Form and Content of Plans (continued)

A continued state of readiness must be maintained by all organizations. Periodic reviews by FEMA and NRC will verify the capability of response organizations to implement various aspects of the response plans. This will include observation of exercises and certain drills by NRC, FEMA and other Federal agencies participating in the Regional Assistance Committees.

II. Planning Standards and Evaluation Criteria

A. Assignment of Responsibility (Organization Control)

Planning Standard

Primary responsibilities for emergency response by the nuclear facility licensee, and by State and local organizations within the Emergency Planning Zones have been assigned, the emergency responsibilities of the various supporting organizations have been specifically established, and each principal response organization has staff to respond and to augment its initial response on a continuous basis.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
1.a. Each plan shall identify the State, local, Federal and private sector organizations (including utilities), that are intended to be part of the overall response organization for Emergency Planning Zones. (See Appendix 5).	X	X	X
b. Each organization and suborganization having an operational role shall specify its concept of operations, and its relationship to the total effort.	X	X	X
c. Each plan shall illustrate these interrelationships in a block diagram.	X	X	X
d. Each organization shall identify a specific individual by title who shall be in charge of the emergency response.	X	X	X
e. Each organization shall provide for 24-hour per day emergency response, including 24-hour per day manning of communications links.	X	X	X

A. Assignment of Responsibility (Organization Control) (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
2.a. Each organization shall specify the functions and responsibilities for major elements and key individuals by title, of emergency response, including the following: Command and Control, Alerting and Notification, Communications, Public Information, Accident Assessment, Public Health and Sanitation, Social Services, Fire and Rescue, Traffic Control, Emergency Medical Services, Law Enforcement, Transportation, Protective Response (including authority to request Federal assistance and to initiate other protective actions), and Radiological Exposure Control. The description of these functions shall include a clear and concise summary such as a table of primary and support responsibilities using the agency as one axis, and the function as the other. (See Section B for licensee).		X	X
b. Each plan shall contain (by reference to specific acts, codes or statutes) the legal basis for such authorities.		X	X
3. Each plan shall include written agreements referring to the concept of operations developed between Federal, State, and local agencies and other support organizations having an emergency response role within the Emergency Planning Zones. The agreements shall identify the emergency measures to be provided and the mutually acceptable criteria for their implementation, and specify the arrangements for exchange of information. These agreements may be provided in an appendix to the plan or the plan itself may contain descriptions of these matters and a signature page in the plan may serve to verify the agreements. The signature page format is appropriate for organizations where response functions are covered by laws, regulations or executive orders where separate written agreements are not necessary.	X	X	X

A. Assignment of Responsibility (Organization Control) (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
4. Each principal organization shall be capable of continuous (24-hour) operations for a protracted period. The individual in the principal organization who will be responsible for assuring continuity of resources (technical, administrative, and material) shall be specified by title.	X	X	X

B. Onsite Emergency Organization

Planning Standard

On-shift facility licensee responsibilities for emergency response are unambiguously defined, adequate staffing to provide initial facility accident response in key functional areas is maintained at all times, timely augmentation of response capabilities is available, and the interfaces among various onsite response activities and offsite support and response activities are specified.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
1. Each licensee shall specify the onsite emergency organization of plant staff personnel for all shifts and its relation to the responsibilities and duties of the normal staff complement.	X		
2. Each licensee shall designate an individual as emergency coordinator who shall be on shift at all times and who shall have the authority and responsibility to immediately and unilaterally initiate any emergency actions, including providing protective action recommendations to authorities responsible for implementing offsite emergency measures.	X		
3. Each licensee shall identify a line of succession for the emergency coordinator position and identify the specific conditions for higher level utility officials assuming this function.	X		

B. Onsite Emergency Organization (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
4. Each licensee shall establish the functional responsibilities assigned to the emergency coordinator and shall clearly specify which responsibilities may not be delegated to other elements of the emergency organization. Among the responsibilities which may not be delegated shall be the decision to notify and to recommend protective actions to authorities responsible for offsite emergency measures.	X		
5. Each licensee shall specify the positions or title and major tasks to be performed by the persons to be assigned to the functional areas of emergency activity. For emergency situations, specific assignments shall be made for all shifts and for plant staff members, both onsite and away from the site. These assignments shall cover the emergency functions in Table B-1 entitled, "Minimum Staffing Requirements for Nuclear Power Plant Emergencies." The minimum on-shift staffing levels shall be as indicated in Table B-1. The licensee must be able to augment on-shift capabilities within a short period after declaration of an emergency. This capability shall be as indicated in Table B-1. The implementation schedule for licensed operators, auxiliary operators and the shift technical advisor on shift shall be as specified in the July 31, 1980 letter to all power reactor licensees. Any deficiencies in the other staffing requirements of Table B-1 must be capable of augmentation within 30 minutes by September 1, 1981, and such deficiencies must be fully removed by July 1, 1982.	X		

B. Onsite Emergency Organization (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
6. Each licensee shall specify the interfaces between and among the onsite functional areas of emergency activity, licensee headquarters support, local services support, and State and local government response organization. This shall be illustrated in a block diagram and shall include the onsite technical support center and the operational support (assembly) center and the licensee's near-site Emergency Operations Facility (EOF).	X		
7. Each licensee shall specify the corporate management, administrative, and technical support personnel who will augment the plant staff as specified in the table entitled "Minimum Staffing Requirements for Nuclear Power Plant Emergencies," (Table B-1) and in the following areas:	X		
a. logistics support for emergency personnel, e.g., transportation, communications, temporary quarters, food and water, sanitary facilities in the field, and special equipment and supplies procurement;	X		
b. technical support for planning and reentry/recovery operations;	X		
c. management level interface with governmental authorities; and	X		
d. release of information to news media during an emergency (coordinated with governmental authorities).	X		
8. Each licensee shall specify the contractor and private organizations who may be requested to provide technical assistance to and augmentation of the emergency organization.	X		

Table B-1

MINIMUM STAFFING REQUIREMENTS FOR NRC LICENSEES FOR NUCLEAR POWER PLANT EMERGENCIES (See B.5.)

Major Functional Area	Location	Major Tasks	Position Title or Expertise	On Shift*	Capability for Additions 30 min	Capability for Additions 60 min
Plant Operations and Assessment of Operational Aspects			Shift Supervisor (SRO)	1	--	--
			Shift Foreman (SRO)	1	--	--
			Control Room Operators	2	--	--
			Auxiliary Operators	2	--	--
Emergency Direction and Control (Emergency Coordinator)***			Shift Technical Advisor, Shift Supervisor or designated facility manager	1**	--	--
Notification/ Communication****		Notify licensee, State local and Federal personnel & maintain communication		1	1	2
Radiological Accident Assessment and Support of Operational Accident Assessment		Emergency Operations Facility (EOF) Director	Senior Manager	--	--	1
		Offsite Dose Assessment	Senior Health Physics (HP) Expertise		1	--
		Offsite Surveys		--	2	2
		Onsite (out-of-plant)		--	1	1
		In-plant surveys	HP Technicians	1	1	1
		Chemistry/Radio-chemistry	Rad/Chem Technicians	1	--	1
Plant System Engineering, Repair and Corrective Actions		Technical Support	Shift Technical Advisor	1	--	--
			Core/Thermal Hydraulics	--	1	
			Electrical	--	--	1
			Mechanical	--	--	1
		Repair and Corrective Actions	Mechanical Maintenance/ Rad Waste Operator	1**	--	1 1
			Electrical Maintenance/ Instrument and Control (I&C) Technician	1** --	1 1	1 --

Table B-1 (contd)

Major Functional Area	Major Tasks	Position Title or Expertise	On Shift*	Capability for Additions 30 min	60 min
Protective Actions (In-Plant)	Radiation Protection: a. Access Control b. HP Coverage for repair, corrective actions, search and rescue first-aid & firefighting c. Personnel monitoring d. Dosimetry	HP Technicians	2**	2	2
Firefighting	--	--	Fire Brigade per Technical Specifications	Local Support	
Rescue Operations and First-Aid	--	--	2**	Local Support	
Site Access Control and Personnel Accountability	Security, firefighting communications, personnel accountability	Security Personnel	All per Security plan		
		Total	10	11	15

Notes:

* For each unaffected nuclear unit in operation, maintain at least one shift foreman, one control room operator and one auxiliary operator except that units sharing a control room may share a shift foreman if all functions are covered.

** May be provided by shift personnel assigned other functions.

*** Overall direction of facility response to be assumed by EOF director when all centers are fully manned. Director of minute-to-minute facility operations remains with senior manager in technical support center or control room.

**** May be performed by engineering aide to shift supervisor.

B. Onsite Emergency Organization (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
9. Each licensee shall identify the services to be provided by local agencies for handling emergencies, e.g., police, ambulance, medical, hospital, and fire-fighting organizations shall be specified. The licensee shall provide for transportation and treatment of injured personnel who may also be contaminated. Copies of the arrangements and agreements reached with contractor, private, and local support agencies shall be appended to the plan. The agreements shall delineate the authorities, responsibilities, and limits on the actions of the contractor, private organization, and local services support groups.	X		

C. Emergency Response Support and Resources

Planning Standard

Arrangements for requesting and effectively using assistance resources have been made, arrangements to accommodate State and local staff at the licensee's near-site Emergency Operations Facility have been made, and other organizations capable of augmenting the planned response have been identified.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
1. The Federal government maintains in-depth capability to assist licensees, States and local governments through the Federal Radiological Monitoring and Assessment Plan (formerly Radiological Assistance Plan (RAP) and Interagency Radiological Assistance Plan (IRAP). Each State and licensee shall make provisions for incorporating the Federal response capability into its operation plan, including the following:			
a. specific persons by title authorized to request Federal assistance; see A.1.d., A.2.a.	X	X	
b. specific Federal resources expected, including expected times of arrival at specific nuclear facility sites; and	X	X	
c. specific licensee, State and local resources available to support the Federal response, e.g., air fields, command posts, telephone lines, radio frequencies and telecommunications centers.	X	X	X

C. Emergency Response Support and Resources (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
2.a. Each principal offsite organization may dispatch representatives to the licensee's near-site Emergency Operations Facility. (State technical analysis representatives at the nearsite EOF are preferred.)		X	X
b. The licensee shall prepare for the dispatch of a representative to principal offsite governmental emergency operations centers.	X		
3. Each organization shall identify radiological laboratories and their general capabilities and expected availability to provide radiological monitoring and analyses services which can be used in an emergency.	X	X	
4. Each organization shall identify nuclear and other facilities, organizations or individuals which can be relied upon in an emergency to provide assistance. Such assistance shall be identified and supported by appropriate letters of agreement.	X	X	X

D. Emergency Classification System

Planning Standard

A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee, and State and local response plans call for reliance on information provided by facility licensees for determinations of minimum initial offsite response measures.

Evaluation Criteria	Applicability and Cross Reference to Plan		
	Licensee	State	Local
1. An emergency classification and emergency action level scheme as set forth in Appendix 1 must be established by the licensee. The specific instruments, parameters or equipment status shall be shown for establishing each emergency class, in the in-plant emergency procedures. The plan shall identify the parameter values and equipment status for each emergency class.	X		
2. The initiating conditions shall include the example conditions found in Appendix 1 and all postulated accidents in the Final Safety Analysis Report (FSAR) for the nuclear facility.	X		
3. Each State and local organization shall establish an emergency classification and emergency action level scheme consistent with that established by the facility licensee.		X	X
4. Each State and local organization should have procedures in place that provide for emergency actions to be taken which are consistent with the emergency actions recommended by the nuclear facility licensee, taking into account local offsite conditions that exist at the time of the emergency.		X	X

E. Notification Methods and Procedures

Planning Standard

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 Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
1. Each organization shall establish procedures which describe mutually agreeable bases for notification of response organizations consistent with the emergency classification and action level scheme set forth in Appendix 1. These procedures shall include means for verification of messages. The specific details of verification need not be included in the plan.	X	X	X
2. Each organization shall establish procedures for alerting, notifying, and mobilizing emergency response personnel.	X	X	X
3. The licensee in conjunction with State and local organizations shall establish the contents of the initial emergency messages to be sent from the plant. These measures shall contain information about the class of emergency, whether a release is taking place, potentially affected population and areas, and whether protective measures may be necessary.	X		

E. Notification Methods and Procedures (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
4. Each licensee shall make provisions for followup messages from the facility to offsite authorities which shall contain the following information if it is known and appropriate:	X		
a. location of incident and name and telephone number (or communications channel identification) of caller;	X		
b. date/time of incident;	X		
c. class of emergency;	X		
d. type of actual or projected release (airborne, waterborne, surface spill), and estimated duration/impact times;	X		
e. estimate of quantity of radioactive material released or being released and the points and height of releases;	X		
f. chemical and physical form of released material, including estimates of the relative quantities and concentration of noble gases, iodines and particulates;	X		
g. meteorological conditions at appropriate levels (wind speed, direction (to and from), indicator of stability, precipitation, if any);	X		
h. actual or projected dose rates at site boundary; projected integrated dose at site boundary;	X		
i. projected dose rates and integrated dose at the projected peak and at 2, 5 and 10 miles, including sector(s) affected;	X		

E. Notification Methods and Procedures (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
j. estimate of any surface radioactive contamination inplant, onsite or offsite;	X		
k. licensee emergency response actions underway;	X		
l. recommended emergency actions, including protective measures;	X		
m. request for any needed onsite support by offsite organizations; and	X		
n. prognosis for worsening or termination of event based on plant information.	X		
5. 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).		X	X
6. 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.	X	X	X

E. Notification Methods and Procedures (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
7. Each organization shall provide written messages intended for the public, consistent with the licensee's classification scheme. In particular, draft messages to the public giving instructions with regard to specific protective actions to be taken by occupants of affected areas shall be prepared and included as part of the State and local plans. Such messages should include the appropriate aspects of sheltering, ad hoc respiratory protection, e.g., handkerchief over mouth, thyroid blocking or evacuation. The role of the licensee is to provide supporting information for the messages. For ad hoc respiratory protection see "Respiratory Protective Devices Manual" American Industrial Hygiene Association, 1963 pp. 123-126.	X	X	X

F. Emergency Communications

Planning Standard

Provisions exist for prompt communications among principal response organizations to emergency personnel and to the public.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
1. The communication plans for emergencies shall include organizational titles and alternates for both ends of the communication links. Each organization shall establish reliable primary and backup means of communication for licensees, local, and State response organizations. Such systems should be selected to be compatible with one another. Each plan shall include:			
a. provision for 24-hour per day notification to and activation of the State/local emergency response network; and at a minimum, a telephone link and alternate, including 24-hour per day manning of communications links that initiate emergency response actions.	X	X	X
b. provision for communications with continguous State/local governments within the Emergency Planning Zones;	X	X	X
c. provision for communications as needed with Federal emergency response organizations;	X	X	X
d. provision for communications between the nuclear facility and the licensee's near-site Emergency Operations Facility, State and local emergency operations centers, and radiological monitoring teams;	X	X	X
e. provision for alerting or activating emergency personnel in each response organization; and	X	X	X

F. Emergency Communications (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
f. provision for communication by the licensee with NRC headquarters and NRC Regional Office Emergency Operations Centers and the licensee's near-site Emergency Operations Facility and radiological monitoring team assembly area.	X		
2. Each organization shall ensure that a coordinated communication link for fixed and mobile medical support facilities exists.	X	X	X
3. Each organization shall conduct periodic testing of the entire emergency communications system (see evaluation criteria H.10, N.2.a and Appendix 3).	X	X	X

G. Public Education and Information

Planning Standard

Information is made available to the public on a periodic basis on how they will be notified and what their initial actions should be in an emergency (e.g., listening to a local broadcast station and remaining indoors), the principal points of contact with the news media for dissemination of information during an emergency (including the physical location or locations) are established in advance, and procedures for coordinated dissemination of information to the public are established.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
1. Each organization shall provide a coordinated periodic (at least annually) dissemination of information to the public regarding how they will be notified and what their actions should be in an emergency. This information shall include, but not necessarily be limited to:	X	X	X
a. educational information on radiation; b. contact for additional information; c. protective measures, e.g., evacuation routes and relocation centers, sheltering, respiratory protection, radioprotective drugs; and d. special needs of the handicapped.			
Means for accomplishing this dissemination may include, but are not necessarily limited to: information in the telephone book; periodic information in utility bills; posting in public areas; and publications distributed on an annual basis.			

G. Public Education and Information (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
2. The public information program shall provide the permanent and transient adult population within the plume exposure EPZ an adequate opportunity to become aware of the information annually. The programs should include provision for written material that is likely to be available in a residence during an emergency. Updated information shall be disseminated at least annually. Signs or other measures (e.g., decals, posted notices or other means, placed in hotels, motels, gasoline stations and phone booths) shall also be used to disseminate to any transient population within the plume exposure pathway EPZ appropriate information that would be helpful if an emergency or accident occurs. Such notices should refer the transient to the telephone directory or other source of local emergency information and guide the visitor to appropriate radio and television frequencies.	X	X	X
3.a. Each principal organization shall designate the points of contact and physical locations for use by news media during an emergency.	X	X	X
b. Each licensee shall provide space which may be used for a limited number of the news media at the nearsite Emergency Operations Facility.	X		
4.a. Each principal organization shall designate a spokesperson who should have access to all necessary information.	X	X	X
b. Each organization shall establish arrangements for timely exchange of information among designated spokespersons.	X	X	X
c. Each organization shall establish coordinated arrangements for dealing with rumors.	X	X	X

G. Public Education and Information (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
5. Each organization shall conduct coordinated programs at least annually to acquaint news media with the emergency plans, information concerning radiation, and points of contact for release of public information in an emergency.	X	X	X

H. Emergency Facilities and Equipment

Planning Standard

Adequate emergency facilities and equipment to support the emergency response are provided and maintained.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
1. Each licensee shall establish a Technical Support Center and an onsite operations support center (assembly area) in accordance with NUREG-0696, Revision 1.	X		
2. Each licensee shall establish an Emergency Operations Facility from which evaluation and coordination of all licensee activities related to an emergency is to be carried out and from which the licensee shall provide information to Federal, State and local authorities responding to radiological emergencies in accordance with NUREG-0696, Revision 1.	X		
3. Each organization shall establish an emergency operations center for use in directing and controlling response functions.		X	X
4. Each organization shall provide for timely activation and staffing of the facilities and centers described in the plan.	X	X	X

H. Emergency Facilities and Equipment (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
5. Each licensee shall identify and establish onsite monitoring systems that are to be used to initiate emergency measures in accordance with Appendix 1, as well as those to be used for conducting assessment.	X		
The equipment shall include:			
a. geophysical phenomena monitors, (e.g., meteorological, hydrologic, seismic);	X		
b. radiological monitors, (e.g., process, area, emergency, effluent, wound and portable monitors and sampling equipment);	X		
c. process monitors, (e.g., reactor coolant system pressure and temperature, containment pressure and temperature, liquid levels, flow rates, status or lineup of equipment components); and	X		
d. fire and combustion products detectors.	X		
6. Each licensee shall make provision to acquire data from or for emergency access to offsite monitoring and analysis equipment including:			
a. geophysical phenomena monitors, (e.g., meteorological, hydrologic, seismic);	X		
b. radiological monitors including ratemeters and sampling devices. Dosimetry shall be provided and shall meet, as a minimum, the NRC Radiological Assessment Branch Technical Position for the Environmental Radiological Monitoring Program; and	X		
c. laboratory facilities, fixed or mobile.	X		

H. Emergency Facilities and Equipment (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
7. Each organization, where appropriate, shall provide for offsite radiological monitoring equipment in the vicinity of the nuclear facility.	X	X	X
8. Each licensee shall provide meteorological instrumentation and procedures which satisfy the criteria in Appendix 2, and provisions to obtain representative current meteorological information from other sources.	X		
9. Each licensee shall provide for an onsite operations support center (assembly area) which shall have adequate capacity, and supplies, including, for example, respiratory protection, protective clothing, portable lighting, portable radiation monitoring equipment, cameras and communications equipment for personnel present in the assembly area.	X		
10. Each organization shall make provisions to inspect, inventory and operationally check emergency equipment/instruments at least once each calendar quarter and after each use. There shall be sufficient reserves of instruments/equipment to replace those which are removed from emergency kits for calibration or repair. Calibration of equipment shall be at intervals recommended by the supplier of the equipment.	X	X	X
11. Each plan shall, in an appendix, include identification of emergency kits by general category (protective equipment, communications equipment, radiological monitoring equipment and emergency supplies).	X	X	X

H. Emergency Facilities and Equipment (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
12. Each organization shall establish a central point (preferably associated with the licensee's near-site Emergency Operations Facility), for the receipt and analysis of all field monitoring data and coordination of sample media.	X	X	X

I. Accident Assessment

Planning Standard

Adequate methods, systems and equipment for assessing and monitoring actual or potential offsite consequences of a radiolcgical emergency condition are in use.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
1. Each licensee shall identify plant system and effluent parameter values characteristic of a spectrum of off-normal conditions and accidents, and shall identify the plant parameter values or other information which correspond to the example initiating conditions of Appendix 1. Such parameter values and the corresponding emergency class shall be included in the appropriate facility emergency procedures. Facility emergency procedures shall specify the kinds of instruments being used and their capabilities.	X		
2. Onsite capability and resources to provide initial values and continuing assessment throughout the course of an accident shall include post-accident sampling capability, radiation and effluent monitors, in-plant iodine instrumentation, and containment radiation monitoring in accordance with NUREG-0578, as elaborated in the NRC letter to all power reactor licensees dated October 30, 1979.	X		
3. Each licensee shall establish methods and techniques to be used for determining:			
a. the source term of releases of radioactive material within plant systems. An example is the relationship between the containment radiation monitor(s) reading(s) and radioactive material available for release from containment.	X		

I. Accident Assessment (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
b. the magnitude of the release of radioactive materials based on plant system parameters and effluent monitors.	X		
4. Each licensee shall establish the relationship between effluent monitor readings and onsite and offsite exposures and contamination for various meteorological conditions.	X		
5. Each licensee shall have the capability of acquiring and evaluating meteorological information sufficient to meet the criteria of Appendix 2. There shall be provisions for access to meteorological information by at least the nearsite Emergency Operations Facility, the Technical Support Center, the Control Room and an offsite NRC center. The licensee shall make available to the State suitable meteorological data processing interconnections which will permit independent analysis by the State, of facility generated data in those States with the resources to effectively use this information.	X		
6. Each licensee shall establish the methodology for determining the release rate/projected doses if the instrumentation used for assessment are offscale or inoperable.	X		
7. Each organization shall describe the capability and resources for field monitoring within the plume exposure Emergency Planning Zone which are an intrinsic part of the concept of operations for the facility.	X	X	X

I. Accident Assessment (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
8. Each organization, where appropriate, shall provide methods, equipment and expertise to make rapid assessments of the actual or potential magnitude and locations of any radiological hazards through liquid or gaseous release pathways. This shall include activation, notification means, field team composition, transportation, communication, monitoring equipment and estimated deployment times.	X	X	X
9. Each organization shall have a capability to detect and measure radioiodine concentrations in air in the plume exposure EPZ as low as 10^{-7} uCi/cc (microcuries per cubic centimeter) under field conditions. Interference from the presence of noble gas and background radiation shall not decrease the stated minimum detectable activity.	X	X	
10. Each organization shall establish means for relating the various measured parameters (e.g., contamination levels, water and air activity levels) to dose rates for key isotopes (i.e., those given in Table 3, page 18) and gross radioactivity measurements. Provisions shall be made for estimating integrated dose from the projected and actual dose rates and for comparing these estimates with the protective action guides. The detailed provisions shall be described in separate procedures.	X	X	
11. Arrangements to locate and track the airborne radioactive plume shall be made, using either or both Federal and State resources.		X	

J. Protective Response

Planning Standard

A range of protective actions have been developed for the plume exposure pathway EPZ for emergency workers and the public. Guidelines for the choice of protective actions during an emergency, consistent with Federal guidance, are developed and in place, and protective actions for the ingestion exposure pathway EPZ appropriate to the locale have been developed.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
1. Each licensee shall establish the means and time required to warn or advise onsite individuals and individuals who may be in areas controlled by the operator, including:			
a. Employees not having emergency assignments;	X		
b. Visitors;	X		
c. Contractor and construction personnel; and	X		
d. Other persons who may be in the public access areas on or passing through the site or within the owner controlled area.	X		
2. Each licensee shall make provisions for evacuation routes and transportation for onsite individuals to some suitable offsite location, including alternatives for inclement weather, high traffic density and specific radiological conditions.	X	X	X
3. Each licensee shall provide for radiological monitoring of people evacuated from the site.	X		

J. Protective Response (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
4. Each licensee shall provide for the evacuation of onsite non-essential personnel in the event of a Site or General Emergency and shall provide a decontamination capability at or near the monitoring point specified in J.3.	X		
5. Each licensee shall provide for a capability to account for all individuals onsite at the time of the emergency and ascertain the names of missing individuals within 30 minutes of the start of an emergency and account for all onsite individuals continuously thereafter.	X		
6. Each licensee shall, for individuals remaining or arriving onsite during the emergency, make provisions for:			
a. Individual respiratory protection;	X		
b. Use of protective clothing; and	X		
c. Use of radioprotective drugs, (e.g., individual thyroid protection).	X		
7. Each licensee shall establish a mechanism for recommending protective actions to the appropriate State and local authorities. These shall include Emergency Action Levels corresponding to projected dose to the population-at-risk, in accordance with Appendix 1 and with the recommendations set forth in Tables 2.1 and 2.2 of the Manual of Protective Action Guides and Protective Actions for Nuclear Incidents (EPA-520/1-75-001). As specified in Appendix 1, prompt notification shall be made directly to the offsite authorities responsible for implementing protective measures within the plume exposure pathway Emergency Planning Zone.	X		

J. Protective Response (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
8. Each licensee's plan shall contain time estimates for evacuation within the plume exposure EPZ. These shall be in accordance with Appendix 4.	X		
9. Each State and local organization shall establish a capability for implementing protective measures based upon protective action guides and other criteria. This shall be consistent with the recommendations of EPA regarding exposure resulting from passage of radioactive airborne plumes, (EPA-520/1-75-001) and with those of DHEW (DHHS)/FDA regarding radioactive contamination of human food and animal feeds as published in the Federal Register of December 15, 1978 (43 FR 58790).		X	X
10. The organization's plans to implement protective measures for the plume exposure pathway shall include:			
a. Maps showing evacuation routes, evacuation areas, preselected radiological sampling and monitoring points, relocation centers in host areas, and shelter areas; (identification of radiological sampling and monitoring points shall include the designators in Table J-1 or an equivalent uniform system described in the plan);	X	X	X
b. Maps showing population distribution around the nuclear facility. This shall be by evacuation areas (licensees shall also present the information in a sector format);	X	X	X
c. Means for notifying all segments of the transient and resident population;	X	X	X
d. Means for protecting those persons whose mobility may be impaired due to such factors as institutional or other confinement;		X	X

TABLE J-1

SECTOR AND ZONE DESIGNATORS FOR RADIOLOGICAL SAMPLING AND MONITORING POINTS WITHIN EMERGENCY PLANNING ZONES

SECTOR NOMENCLATURE				ZONE NOMENCLATURE	
CENTERLINE OF SECTOR IN DEGREES TRUE NORTH FROM FACILITY	22 1/2° SECTOR			MILES FROM FACILITY	ZONE
0 & 360	*A		N	0-1	1
22 1/2	B		NNE	1-2	2
45	C		NE	2-3	3
67 1/2	D		ENE	3-4	4
90	E		E	4-5	5
112	F		ESE	5-6	6
135	G		SE	6-7	7
157	H	or	SSE	7-8	8
180	J		S	8-9	9
202 1/2	K		SSW	9-10	10
225	L		SW	10-15	15
247 1/2	M		WSW	15-20	20
270	N		W	20-25	25
292 1/2	P		WNW	25-30	30
315	Q		NW	30-35	35
337 1/2	R		NNW	35-40	40
				40-45	45
				45-50	50

AREA SEGMENT - An area is identified by a Sector and Zone designator. Thus, area NL is that area which lies between 348 3/4 and 11 1/4 degrees true north from the facility out to a radius of 1 mile. Area SE4 would be that area between 123 3/4 to 146 1/4 degrees and the 3- and 4-mile arcs from the facility.

*The letters I and O have been omitted from these sector designators so as to eliminate possible confusion between letters and numbers.

J. Protective Response (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
e. Provisions for the use of radioprotective drugs, particularly for emergency workers and institutionalized persons within the plume exposure EPZ whose immediate evacuation may be infeasible or very difficult, including quantities, storage, and means of distribution.		X	X
f. State and local organizations' plans should include the method by which decisions by the State Health Department for administering radioprotective drugs to the general population are made during an emergency and the pre-determined conditions under which such drugs may be used by offsite emergency workers;[1]		X	X
g. Means of relocation;		X	X
h. Relocation centers in host areas which are at least 5 miles, and preferably 10 miles, beyond the boundaries of the plume exposure emergency planning zone; (See K.8)		X	X
i. Projected traffic capacities of evacuation routes under emergency conditions;		X	X
j. Control of access to evacuated areas and organization responsibilities for such control;		X	X
k. Identification of and means for dealing with potential impediments (e.g., seasonal impassability of roads) to use of evacuation routes, and contingency measures;		X	X
l. Time estimates for evacuation of various sectors and distances based on a dynamic analysis (time-motion study under various conditions) for the plume exposure pathway emergency planning zone (See Appendix 4); and		X	X

1/ See DHEW (new DHHS) Federal Register notice of December 15, 1978 (43 FR 58798) entitled "Potassium Iodide as a Thyroid-Blocking Agent in a Radiation Emergency." Other guidance concerning the storage, stockpiling, and conditions for use of this drug by the general public, is now under development by the Bureau of Drugs, DHHS.

J. Protective Response (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
m. The bases for the choice of recommended protective actions from the plume exposure pathway during emergency conditions. This shall include expected local protection afforded[2] in residential units or other shelter for direct and inhalation exposure, as well as evacuation time estimates.	X	X	
11. Each State shall specify the protective measures to be used for the ingestion pathway, including the methods for protecting the public from consumption of contaminated foodstuffs. This shall include criteria for deciding whether dairy animals should be put on stored feed. The plan shall identify procedures for detecting contamination, for estimating the dose commitment consequences of uncontrolled ingestion, and for imposing protection procedures such as impoundment, decontamination, processing, decay, product diversion, and preservation. Maps for recording survey and monitoring data, key land use data (e.g., farming), dairies, food processing plants, water sheds, water supply intake and treatment plants and reservoirs shall be maintained. Provisions for maps showing detailed crop information may be by including reference to their availability and location and a plan for their use. The maps shall start at the facility and include all of the 50-mile ingestion pathway EPZ. Up-to-date lists of the name and location of all facilities which regularly process milk products and other large amounts of food or agricultural products originating in the ingestion pathway Emergency Planning Zone, but located elsewhere, shall be maintained.			X

2/ The following reports may be considered in determining protection afforded.

(1) "Public Protection Strategies for Potential Nuclear Reactor Accidents" Sheltering Concepts with Existing Public and Private Structures" (SAND 77-1725), Sandia Laboratory.

(2) "Examination of Offsite Radiological Emergency Measures for Nuclear Reactor Accidents Involving Core Melt" (SAND 78-0454), Sandia Laboratory.

(3) "Protective Action Evaluation Part II, Evacuation and Sheltering as Protective Actions Against Nuclear Accidents Involving Gaseous Releases" (EPA 520/1-78-001B). U. S. Environmental Protection Agency.

J. Protective Response (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
12. Each organization shall describe the means for registering and monitoring of evacuees at relocation centers in host areas. The personnel and equipment available should be capable of monitoring within about a 12 hour period all residents and transients in the plume exposure EPZ arriving at relocation centers.		X	X

K. Radiological Exposure Control

Planning Standard

Means for controlling radiological exposures, in an emergency, are established for emergency workers. The means for controlling radiological exposures shall include exposure guidelines consistent with EPA Emergency Worker and Lifesaving Activity Protective Action Guides.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
1. Each licensee shall establish onsite exposure guidelines consistent with EPA Emergency Worker and Lifesaving Activity Protective Actions Guides (EPA 520/1-75/001) for:			
a. removal of injured persons;	X		
b. undertaking corrective actions;	X		
c. performing assessment actions;	X		
d. providing first aid;	X		
e. performing personnel decontamination;	X		
f. providing ambulance service; and	X		
g. providing medical treatment services.	X		
2. Each licensee shall provide an onsite radiation protection program to be implemented during emergencies, including methods to implement exposure guidelines. The plan shall identify individual(s), by position or title, who can authorize emergency workers to receive doses in excess of 10 CFR Part 20 limits. Procedures shall be worked out in advance for permitting onsite volunteers to receive radiation exposures in the course of carrying out lifesaving and other emergency activities. These procedures shall include expeditious decision making and a reasonable consideration of relative risks.	X		

K. Radiological Exposure Control (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
3.a. Each organization shall make provision for 24-hour-per-day capability to determine the doses received by emergency personnel involved in any nuclear accident, including volunteers. Each organization shall make provisions for distribution of dosimeters, both self-reading and permanent record devices.	X	X	X
b. Each organization shall ensure that dosimeters are read at appropriate frequencies and provide for maintaining dose records for emergency workers involved in any nuclear accident.	X	X	X
4. Each State and local organization shall establish the decision chain for authorizing emergency workers to incur exposures in excess of the EPA General Public Protective Action Guides (i.e., EPA PAGs for emergency workers and lifesaving activities).		X	X
5.a. Each organization as appropriate, shall specify action levels for determining the need for decontamination.	X	X	X
b. Each organization, as appropriate, shall establish the means for radiological decontamination of emergency personnel wounds, supplies, instruments and equipment, and for waste disposal.	X	X	X
6. Each licensee shall provide onsite contamination control measures including:			
a. area access control;	X		
b. drinking water and food supplies;	X		
c. criteria for permitting return of areas and items to normal use, see Draft ANSI 13.12.	X		

K. Radiological Exposure Control (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
7. Each licensee shall provide the capability for decontaminating relocated onsite personnel, including provisions for extra clothing and decontaminants suitable for the type of contamination expected, with particular attention given to radioiodine contaminatio of the skin.	X		

L. Medical and Public Health Support

Planning Standard

Arrangements are made for medical services for contaminated injured individuals.[1]

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
1. Each organization shall arrange for local and backup hospital and medical services having the capability for evaluation of radiation exposure and uptake, including assurance that persons providing these services are adequately prepared to handle contaminated individuals.	X	X	X
2. Each licensee shall provide for onsite first aid capability.	X		
3. Each State shall develop lists indicating the location of public, private and military hospitals and other emergency medical services facilities within the State or contiguous States considered capable of providing medical support for any contaminated injured individual. The listing shall include the name, location, type of facility and capacity and any special radiological capabilities. These emergency medical services should be able to radiologically monitor contamination personnel, and have facilities and trained personnel able to care for contaminated injured persons.		X	
4. Each organization shall arrange for transporting victims of radiological accidents to medical support facilities.	X	X	X

1/ The availability of an integrated emergency medical services system and a public health emergency plan serving the area in which the facility is located and, as a minimum, equivalent to the Public Health Service Guide for Developing Health Disaster Plans, 1974, and to the requirements of an emergency medical services system as outlined in the Emergency Medical Services System Act of 1973 (P.L. 93-154 and amendments in 1979 P.L. 96-142), should be a part of and consistent with overall State or local disaster control plans and should be compatible with the specific overall emergency response plan for the facility.

M. Recovery and Reentry Planning and Postaccident Operations

Planning Standard

General plans for recovery and reentry are developed.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
1. Each organization, as appropriate, shall develop general plans and procedures for reentry and recovery and describe the means by which decisions to relax protective measures (e.g., allow reentry into an evacuated area) are reached. This process should consider both existing and potential conditions.	X	X	X
2. Each licensee plan shall contain the position/title, authority and responsibilities of individuals who will fill key positions in the facility recovery organization. This organization shall include technical personnel with responsibilities to develop, evaluate and direct recovery and reentry operations. The recovery organization recommended by the Atomic Industrial Forum's "Nuclear Power Plant Emergency Response Plan" dated October 11, 1979, is an acceptable framework.	X		
3. Each licensee and State plan shall specify means for informing members of the response organizations that a recovery operation is to be initiated, and of any changes in the organizational structure that may occur.	X	X	
4. Each plan shall establish a method for periodically estimating total population exposure.	X	X	

N. Exercises and Drills

Planning Standard

Periodic exercises are (will be) conducted to evaluate major portions of emergency response capabilities, periodic drills are (will be) conducted to develop and maintain key skills, and deficiencies identified as a result of exercises or drills are (will be) corrected.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
1.a. An exercise is an event that tests the integrated capability and a major portion of the basic elements existing within emergency preparedness plans and organizations. The emergency preparedness exercise shall simulate an emergency that results in offsite radiological releases which would require response by offsite authorities. Exercises shall be conducted as set forth in NRC and FEMA rules.	X	X	X
b. An exercise shall include mobilization of State and local personnel and resources adequate to verify the capability to respond to an accident scenario requiring response. The organization shall provide for a critique of the annual exercise by Federal and State observers/evaluators. The scenario should be varied from year to year such that all major elements of the plans and preparedness organizations are tested within a five-year period. Each organization should make provisions to start an exercise between 6:00 p.m. and midnight, and another between midnight and 6:00 a.m. once every six years. Exercises should be conducted under various weather conditions. Some exercises should be unannounced.	X	X	X

N. Exercises and Drills (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
2. A drill is a supervised instruction period aimed at testing, developing and maintaining skills in a particular operation. A drill is often a component of an exercise. A drill shall be supervised and evaluated by a qualified drill instructor. Each organization shall conduct drills, in addition to the annual exercise at the frequencies indicated below:			
a. Communication Drills			
Communications with State and local governments within the plume exposure pathway Emergency Planning Zone shall be tested monthly. Communications with Federal emergency response organizations and States within the ingestion pathway shall be tested quarterly. Communications between the nuclear facility, State and local emergency operations centers, and field assessment teams shall be tested annually. Communication drills shall also include the aspect of understanding the content of messages.	X	X	X
b. Fire Drills			
Fire drills shall be conducted in accordance with the plant (nuclear facility) technical specifications.	X		
c. Medical Emergency Drills			
A medical emergency drill involving a simulated contaminated individual which contains provisions for participation by the local support services agencies (i.e., ambulance and offsite medical treatment facility) shall be conducted annually. The offsite portions of the medical drill may be performed as part of the required annual exercise.	X		X

N. Exercises and Drills (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
d. Radiological Monitoring Drills			
Plant environs and radiological monitoring drills (onsite and offsite) shall be conducted annually. These drills shall include collection and analysis of all sample media (e.g., water, vegetation, soil and air), and provisions for communications and record keeping. The State drills need not be at each site. Where appropriate, local organizations shall participate.	X	X	X
e. Health Physics Drills			
(1) Health Physics drills shall be conducted semi-annually which involve response to, and analysis of, simulated elevated airborne and liquid samples and direct radiation measurements in the environment. The State drills need not be at each site.	X	X	
(2) Analysis of inplant liquid samples with actual elevated radiation levels including use of the post-accident sampling system shall be included in Health Physics drills by licensees annually.	X		
3. Each organization shall describe how exercises and drills are to be carried out to allow free play for decisionmaking and to meet the following objectives. Pending the development of exercise scenarios and exercise evaluation guidance by NRC and FEMA the scenarios for use in exercises and drills shall include but not be limited to, the following:			
a. The basic objective(s) of each drill and exercise and appropriate evaluation criteria;	X	X	X

N. Exercises and Drills (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
b. The date(s), time period, place(s) and participating organizations;	X	X	X
c. The simulated events;	X	X	X
d. A time schedule of real and simulated initiating events;	X	X	X
e. A narrative summary describing the conduct of the exercises or drills to include such things as simulated casualties, offsite fire department assistance, rescue of personnel, use of protective clothing, deployment of radiological monitoring teams, and public information activities; and	X	X	X
f. A description of the arrangements for and advance materials to be provided to official observers.	X	X	X
4. Official observers from Federal, State or local governments will observe, evaluate, and critique the required exercises. A critique shall be scheduled at the conclusion of the exercise to evaluate the ability of organizations to respond as called for in the plan. The critique shall be conducted as soon as practicable after the exercise, and a formal evaluation should result from the critique.	X	X	X
5. Each organization shall establish means for evaluating observer and participant comments on areas needing improvement, including emergency plan procedural changes, and for assigning responsibility for implementing corrective actions. Each organization shall establish management control used to ensure that corrective actions are implemented.	X	X	X

O. Radiological Emergency Response Training

Planning Standard

Radiological emergency response training is provided to those who may be called on to assist in an emergency.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
1. Each organization shall assure the training of appropriate individuals.	X	X	X
a. Each facility to which the plant applies shall provide site specific emergency response training for those offsite emergency organizations who may be called upon to provide assistance in the event of an emergency.1/	X		
b. Each offsite response organization shall participate in and receive training. Where mutual aid agreements exist between local agencies such as fire, police and ambulance/ rescue, the training shall also be offered to the other departments who are members of the mutual aid district.		X	X
2. The training program for members of the onsite emergency organization shall, besides classroom training, include practical drills in which each individual demonstrates ability to perform his assigned emergency function. During the practical drills, on-the-spot correction of erroneous performance shall be made and a demonstration of the proper performance offered by the instructor.	X		

1/ Training for hospital personnel, ambulance/rescue, police and fire departments shall include the procedures for notification, basic radiation protection, and their expected roles. For those local services support organizations who will enter the site, training shall also include site access procedures and the identity (by position and title) of the individual in the onsite emergency organization who will control the organizations' support activities. Offsite emergency response support personnel should be provided with appropriate identification cards where required.

O. Radiological Emergency Response Training (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
3. Training for individuals assigned to licensee first aid teams shall include courses equivalent to Red Cross Multi-Media.	X		
4. Each organization shall establish a training program for instructing and qualifying personnel who will implement radiological emergency response plans.2/ The specialized initial training and periodic retraining programs (including the scope, nature and frequency) shall be provided in the following categories:			
a. Directors or coordinators of the response organizations;	X	X	X
b. Personnel responsible for accident assessment;	X	X	*
c. Radiological monitoring teams and radiological analysis personnel;	X	X	*
d. Police, security and fire fighting personnel;	X	*	X
e. Repair and damage control/correctional action teams (onsite);	X		
f. First aid and rescue personnel;	X	*	X
g. Local support services personnel including Civil Defense/Emergency Service personnel;	X		X
h. Medical support personnel;	X	X	X
i. Licensee's headquarters support personnel;	X		
j. Personnel responsible for transmission of emergency information and instructions.	X	X	X

2/ If State and local governments lack the capability and resources to accomplish this training, they may look to the licensee and the Federal government (FEMA) for assistance in this training.

* NRC and FEMA encourage State and local governments which have these capabilities to continue to include them in their training programs.

O. Radiological Emergency Response Training (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
5. Each organization shall provide for the initial and annual retraining of personnel with emergency response responsibilities.	X	X	X

P. Responsibility for the Planning Effort: Development, Periodic Review and Distribution of Emergency Plans

Planning Standard

Responsibilities for plan development and review and for distribution of emergency plans are established, and planners are properly trained.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
1. Each organization shall provide for the training of individuals responsible for the planning effort.	X	X	X
2. Each organization shall identify by title the individual with the overall authority and responsibility for radiological emergency response planning.	X	X	X
3. Each organization shall designate an Emergency Planning Coordinator with responsibility for the development and updating of emergency plans and coordination of these plans with other response organizations.	X	X	X
4. Each organization shall update its plan and agreements as needed, review and certify it to be current on an annual basis. The update shall take into account changes identified by drills and exercises.	X	X	X
5. The emergency response plans and approved changes to the plans shall be forwarded to all organizations and appropriate individuals with responsibility for implementation of the plans. Revised pages shall be dated and marked to show where changes have been made.	X	X	X
6. Each plan shall contain a detailed listing of supporting plans and their source.	X	X	X

P. Responsibility for the Planning Effort: Development, Periodic Review and Distribution of Emergency Plans (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Licensee	State	Local
7. Each plan shall contain as an appendix listing, by title, procedures required to implement the plan. The listing shall include the section(s) of the plan to be implemented by each procedure.	X	X	X
8. Each plan shall contain a specific table of contents. Plans submitted for review should be cross-referenced to these criteria.	X	X	X
9. Each licensee shall arrange for and conduct independent reviews of the emergency preparedness program at least every 12 months. (An independent review is one conducted by any competent organization either internal or external to the licensee's organization, but who are not immediately responsible for the emergency preparedness program). The review shall include the emergency plan, its implementing procedures and practices, training, readiness testing, equipment, and interfaces with State and local governments. Management controls shall be implemented for evaluation and correction of review findings. The result of the review, along with recommendations for improvements, shall be documented, reported to appropriate licensee corporate and plant management, and involved Federal, State and local organizations, and retained for a period of five years.	X		
10. Each organization shall provide for updating telephone numbers in emergency procedures at least quarterly.	X	X	X

APPENDIX 1

U. S. NUCLEAR REGULATORY COMMISSION

EMERGENCY ACTION LEVEL GUIDELINES

FOR NUCLEAR POWER PLANTS

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BASIS FOR EMERGENCY ACTION LEVELS FOR NUCLEAR POWER FACILITIES

Four classes of Emergency Action Levels are established which replace the classes in Regulatory Guide 1.101, each with associated examples of initiating conditions. The classes are:

Notification of Unusual Event

Alert

Site Area Emergency

General Emergency

The rationale for the notification and alert classes is to provide early and prompt notification of minor events which could lead to more serious consequences given operator error or equipment failure or which might be indicative of more serious conditions which are not yet fully realized. A gradation is provided to assure fuller response preparations for more serious indicators. The site area emergency class reflects conditions where some significant releases are likely or are occurring but where a core melt situation is not indicated based on current information. In this situation full mobilization of emergency personnel in the near site environs is indicated as well as dispatch of monitoring teams and associated communications. The general emergency class involves actual or imminent substantial core degradation or melting with the potential for loss of containment. The immediate action for this class is sheltering (staying inside) rather than evacuation until an assessment can be made that (1) an evacuation is indicated and (2) an evacuation, if indicated, can be completed prior to significant release and transport of radioactive material to the affected areas.

The example initiating conditions listed after the immediate actions for each class are to form the basis for establishment by each licensee of the specific plant instrumentation readings (as applicable) which, if exceeded, will initiate the emergency class.

Potential NRC actions during various emergency classes are given in NUREG-0728, Report to Congress: NRC Incident Response Plan. The NRC response to any notification from a licensee will be related to, but not limited by, the licensee estimate of severity; NRC will consider such other factors as the degree of uncertainty and the lead times required to position NRC response personnel should something more serious develop.

Prompt notification of offsite authorities is intended to indicate within about 15 minutes for the unusual event class and sooner (consistent with the need for other emergency actions) for other classes. The time is measured from the time at which operators recognize that events have occurred which make declaration of an emergency class appropriate.

Class	Licensee Actions	State and/or Local Offsite Authority Actions
NOTIFICATION OF UNUSUAL EVENT Class Description Unusual events are in process or have occurred which indicate a potential degradation of the level of safety of the plant. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs. Purpose Purpose of offsite notification is to (1) assure that the first step in any response later found to be necessary has been carried out, (2) bring the operating staff to a state of readiness, and (3) provide systematic handling of unusual events information and decisionmaking.	1. Promptly inform State and/or local offsite authorities of nature of unusual condition as soon as discovered 2. Augment on-shift resources as needed 3. Assess and respond 4. Escalate to a more severe class, if appropriate or 5. Close out with verbal summary to offsite authorities; followed by written summary within 24 hours	1. Provide fire or security assistance if requested 2. Escalate to a more severe class, if appropriate 3. Stand by until verbal closeout

EXAMPLE INITIATING CONDITIONS: NOTIFICATION OF UNUSUAL EVENT

1. Emergency Core Cooling System (ECCS) initiated and discharge to vessel

2. Radiological effluent technical specification limits exceeded

3. Fuel damage indication. Examples:

   a. High offgas at BWR air ejector monitor (greater than 500,000 uci/sec; corresponding to 16 isotopes decayed to 30 minutes; or an increase of 100,000 uci/sec within a 30 minute time period)

   b. High coolant activity sample (e.g., exceeding coolant technical specifications for iodine spike)

   c. Failed fuel monitor (PWR) indicates increase greater than 0.1% equivalent fuel failures within 30 minutes

4. Abnormal coolant temperature and/or pressure or abnormal fuel temperatures outside of technical specification limits

5. Exceeding either primary/secondary leak rate technical specification or primary system leak rate technical specification

6. Failure of a safety or relief valve in a safety related system to close following reduction of applicable pressure

7. Loss of offsite power or loss of onsite AC power capability

8. Loss of containment integrity requiring shutdown by technical specifications

9. Loss of engineered safety feature or fire protection system function requiring shutdown by technical specifications (e.g., because of malfunction, personnel error or procedural inadequacy)

10. Fire within the plant lasting more than 10 minutes

11. Indications or alarms on process or effluent parameters not functional in control room to an extent requiring plant shutdown or other significant loss of assessment or communication capability (e.g., plant computer, Safety Parameter Display System, all meteorological instrumentation)

12. Security threat or attempted entry or attempted sabotage

13. Natural phenomenon being experienced or projected beyond usual levels

   a. Any earthquake felt in-plant or detected on station seismic instrumentation

   b. 50 year floor or low water, tsunami, hurricane surge, seiche

   c. Any tornado on site

   d. Any hurricane

14. Other hazards being experienced or projected

    a. Aircraft crash on-site or unusual aircraft activity over facility

    b. Train derailment on-site

    c. Near or onsite explosion

    d. Near or onsite toxic or flammable gas release

    e. Turbine rotating component failure causing rapid plant shutdown

15. Other plant conditions exist that warrant increased awareness on the part of a plant operating staff or State and/or local offsite authorities or require plant shutdown under technical specification requirements or involve other than normal controlled shutdown (e.g., cooldown rate exceeding technical specification limits, pipe cracking found during operation)

16. Transportation of contaminated injured individual from site to offsite hospital

17. Rapid depressurization of PWR secondary side.

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Class

ALERT

Class Description

Events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant. Any releases expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.

Purpose

Purpose of offsite alert is to (1) assure that emergency personnel are readily available to respond if situation becomes more serious or to perform confirmatory radiation monitoring if required, and (2) provide offsite authorities current status information.

Licensee Actions

1. Promptly inform State and/or local authorities of alert status and reason for alert as soon as discovered
2. Augment resources and activate on-site Technical Support Center and on-site operational support center. Bring Emergency Operations Facility (EOF) and other key emergency personnel to standby status
3. Assess and respond
4. Dispatch on-site monitoring teams and associated communications
5. Provide periodic plant status updates to offsite authorities (at least every 15 minutes)
6. Provide periodic meteorological assessments to offsite authorities and, if any releases are occurring, dose estimates for actual releases
7. Escalate to a more severe class, if appropriate
8. Close out or recommend reduction in emergency class by verbal summary to offsite authorities followed by written summary within 8 hours of closeout or class reduction

State and/or Local Offsite Authority Actions

1. Provide fire or security assistance if requested
2. Augment resources and bring primary response centers and EBS to standby status
3. Alert to standby status key emergency personnel including monitoring teams and associated communications
4. Provide confirmatory offsite radiation monitoring and ingestion pathway dose projections if actual releases substantially exceed technical specification limits
5. Escalate to a more severe class, if appropriate
6. Maintain alert status until verbal closeout or reduction of emergency class

EXAMPLE INITIATING CONDITIONS: ALERT

1. Severe loss of fuel cladding

   a. High offgas at BWR air ejector monitor (greater than 5 ci/sec; corresponding to 16 isotopes decayed 30 minutes)

   b. Very high coolant activity sample (e.g., 300 uci/cc equivalent of I-131)

   c. Failed fuel monitor (PWR) indicates increase greater than 1% fuel failures within 30 minutes o 5% total fuel failures.

2. Rapid gross failure of one steam generator tube with loss of offsite power

3. Rapid failure of steam generator tubes (e.g., several hundred gpm primary to secondary leak rate)

4. Steam line break with significant (e.g., greater than 10 gpm) primary to secondary leak rate (PWR) or MSIV malfunction causing leakage (BWR)

5. Primary coolant leak rate greater than 50 gpm

6. Radiation levels or airborne contamination which indicate a severe degradation in the control of radioactive materials (e.g., increase of factor of 1000 in direct radiation readings within facility)

7. Loss of offsite power and loss of all onsite AC power (see Site Area Emergency for extended loss)

8. Loss of all onsite DC power (See Site Area Emergency for extended loss)

9. Coolant pump seizure leading to fuel failure

10. Complete loss of any function needed for plant cold shutdown

11. Failure of the reactor protection system to initiate and complete a scram which brings the reactor subcritical

12. Fuel damage accident with release of radioactivity to containment or fuel handling building

13. Fire potentially affecting safety systems

14. Most or all alarms (annunciators) lost

15. Radiological effluents greater than 10 times technical specification instantaneous limits (an instantaneous rate which, if continued over 2 hours, would result in about 1 mr at the site boundary under average meteorological conditions)

16. Ongoing security compromise

17. Severe natural phenomena being experienced or projected

    a. Earthquake greater than OBE levels

    b. Flood, low water, tsunami, hurricane surge, seiche near design levels

    c. Any tornado striking facility

    d. Hurricane winds near design basis level

18. Other hazards being experienced or projected

    a. Aircraft crash on facility

    b. Missile impacts from whatever source on facility

    c. Known explosion damage to facility affecting plant operation

    d. Entry into facility environs of uncontrolled toxic or flammable gases

    e. Turbine failure causing casing penetration

19. Other plant conditions exist that warrant precautionary activation of technical support center and placing near-site Emergency Operations Facility and other key emergency personnel on standby

20. Evacuation of control room anticipated or required with control of shutdown systems established from local stations

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Class

SITE AREA EMERGENCY

Class Description

Events are in process or have occurred which involve actual or likely major failures of plant functions needed for protection of the public. Any releases not expected to exceed EPA Protective Action Guideline exposure levels e[illegible]t near site boundary.

Purpose

Purpose of the site area emergency declaration is to (1) assure that response centers are manned, (2) assure that monitoring teams are dispatched, (3) assure that personnel required for evacuation of near-site areas are at duty stations if situation becomes more serious, (4) provide consultation with offsite authorities, and (5) provide updates for the public through offsite authorities.

Licensee Actions

1. Promptly inform State and/or local offsite authorities of site area emergency status and reason for emergency as soon as discovered
2. Augment resources by activating on-site Technical Support Center, on-site operational support center and near-site Emergency Operations Facility (EOF)
3. Assess and respond
4. Dispatch on-site and offsite monitoring teams and associated communications
5. Dedicate an individual for plant status updates to offsite authorities and periodic pressure briefings (perhaps joint with offsite authorities)
6. Make senior technical and management staff onsite available for consultation with NRC and State on a periodic basis
7. Provide meteorological and dose estimates to offsite authorities for actual releases via a dedicated individual or automated data transmission
8. Provide release and dose projections based on available plant condition information and foreseeable contingencies
9. Escalate to general emergency class, if appropriate

   or

10. Close out or recommend reduction in emergency class by briefing of offsite authorities at EOF and by phone followed by written summary within 8 hours of closeout or class reduction

State and/or Local Offsite Authority Actions

1. Provide any assistance requested
2. If sheltering near the site is desirable, activate public notification system within at least two miles of the plant
3. Provide public within at least about 10 miles periodic updates on emergency status
4. Augment resources by activating primary response centers
5. Dispatch key emergency personnel including monitoring teams and associated communications
6. Alert to standby status other emergency personnel (e.g., those needed for evacuation) and dispatch personnel to near-site duty stations
7. Provide offsite monitoring results to licensee, DOE and others and jointly assess them
8. Continuously assess information from licensee and offsite monitoring with regard to changes to protective actions already initiated for public and mobilizing evacuation resources
9. Recommend placing milk animals within 2 miles on stored feed and assess need to extend distance
10. Provide press briefings, perhaps with licensee
11. Escalate to general emergency class, if appropriate
12. Maintain site area emergency status until closeout or reduction of emergency class

EXAMPLE INITIATING CONDITIONS: SITE AREA EMERGENCY

1. Known loss of coolant accident greater than makeup pump capacity

2. Degraded core with possible loss of coolable geometry (indicators should include instrumentation to detect inadequate core cooling, coolant activity and/or containment radioactivity levels)

3. Rapid failure of steam generator tubes (several hundred gpm leakage) with loss of offsite power

4. BWR steam line break outside containment without isolation

5. PWR steam line break with greater than 50 gpm primary to secondary leakage and indication of fuel damage

6. Loss of offsite power and loss of onsite AC power for more than 15 minutes

7. Loss of all vital onsite DC power for more than 15 minutes

8. Complete loss of any function needed for plant hot shutdown

9. Transient requiring operation of shutdown systems with failure to scram (continued power generation but no core damage immediately evident)

10. Major damage to spent fuel in containment or fuel handling building (e.g., large object damages fuel or water loss below fuel level)

11. Fire compromising the functions of safety systems

12. Most or all alarms (annunciators) lost and plant transient initiated or in progress

13. a. Effluent monitors detect levels corresponding to greater than 50 mr/hr for 1/2 hour or greater than 500 mr/hr W.B. for two minutes (or five times these levels to the thyroid) at the site boundary for adverse meteorology

    b. These dose rates are projected based on other plant parameters (e.g., radiation level in containment with leak rate appropriate for existing containment pressure) or are measured in the environs

    c. EPA Protective Action Guidelines are projected to be exceeded outside the site boundary

14. Imminent loss of physical control of the plant

15. Severe natural phenomena being experienced or projected with plant not in cold shutdown

    a. Earthquake greater than SSE levels

b. Flood, low water, tsunami, hurricane surge, seiche greater than design levels or failure of protection of vital equipment at lower levels

c. Sustained winds or tornadoes in excess of design levels

16. Other hazards being experienced or projected with plant not in cold shutdown

a. Aircraft crash affecting vital structures by impact or fire

b. Severe damage to safe shutdown equipment from missiles or explosion

c. Entry of uncontrolled flammable gases into vital areas. Entry of uncontrolled toxic gases into vital areas where lack of access to the area constitutes a safety problem

17. Other plant conditions exist that warrant activation of emergency centers and monitoring teams or a precautionary notification to the public near the site

18. Evacuation of control room and control of shutdown systems not established from local stations in 15 minutes

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Class	Licensee Actions	State and/or Local Offsite Authority Actions
GENERAL EMERGENCY Class Description Events are in process or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area. Purpose Purpose of the general emergency declaration is to (1) initiate predetermined protective actions for the public, (2) provide continuous assessment of information from licensee and offsite organization measurements, (3) initiate additional measures as indicated by actual or potential releases, (4) provide consultation with offsite authorities and (5) provide updates for the public through offsite authorities.	1. Promptly inform State and local offsite authorities of general emergency status and reason for emergency as soon as discovered (Parallel notification of State/local) 2. Augment resources by activating on-site Technical Support Center, on-site operational support center and near-site Emergency Operations Facility (EOF) 3. Assess and respond 4. Dispatch on-site and offsite monitoring teams and associated communications 5. Dedicate an individual for plant status updates to offsite authorities and periodic press briefings (perhaps joint with offsite authorities) 6. Make senior technical and management staff onsite available for consultation with NRC and State on a periodic basis 7. Provide meteorological and dose estimates to offsite authorities for actual releases via a dedicated individual or automated data transmission 8. Provide release and dose projections based on available plant condition information and foreseeable contingencies 9. Close out or recommend reduction of emergency class by briefing of offsite authorities at EOF and by phone followed by written summary within 8 hours of closeout or class reduction	1. Provide any assistance requested 2. Activate immediate public notification of emergency status and provide public periodic updates 3. Recommend sheltering for 2 mile radius and 5 miles downwind and assess need to extend distances. Consider advisability of evacuation (projected time available vs. estimated evacuation times) 4. Augment resources by activating primary response centers 5. Dispatch key emergency personnel including monitoring teams and associated communications 6. Dispatch other emergency personnel to duty stations within 5 mile radius and alert all others to standby status 7. Provide offsite monitoring results to licensee, DOE and others and jointly assess them 8. Continuously assess information from licensee and offsite monitoring with regard to changes to protective actions already initiated for public and mobilizing evacuation resources 9. Recommend placing milk animals within 10 miles on stored feed and assess need to extend distance 10. Provide press briefings, perhaps with licensee 11. Maintain general emergency status until closeout or reduction of emergency class

EXAMPLE INITIATING CONDITIONS: GENERAL EMERGENCY

1. a. Effluent monitors detect levels corresponding to 1 rem/hr W.B. or 5 rem/hr thyroid at the site boundary under actual meteorological conditions

   b. These dose rates are projected based on other plant parameters (e.g., radiation levels in containment with leak rate appropriate for existing containment pressure with some confirmation from effluent monitors) or are measured in the environs

   Note: Consider evacuation only within about 2 miles of the site boundary unless these site boundary levels are exceeded by a factor of 10 or projected to continue for 10 hours or EPA Protective Action Guideline exposure levels are predicted to be exceeded at longer distances

2. Loss of 2 of 3 fission product barriers with a potential loss of 3rd barrier, (e.g., loss of primary coolant boundary, clad failure, and high potential for loss of containment)

3. Loss of physical control of the facility

   Note: Consider 2 mile precautionary evacuation

4. Other plant conditions exist, from whatever source, that make release of large amounts of radioactivity in a short time period possible, e.g., any core melt situation. See the specific PWR and BWR sequences below.

   Notes: a. For core melt sequences where significant releases from containment are not yet taking place and large amounts of fission products are not yet in the containment atmosphere, consider 2 mile precautionary evacuation. Consider 5 mile downwind evacuation (45° to 90° sector) if large amounts of fission products (greater than gap activity) are in the containment atmosphere. Recommend sheltering in other parts of the plume exposure Emergency Planning Zone under this circumstance.

   b. For core melt sequences where significant releases from containment are not yet taking place and containment failure leading to a direct atmospheric release is likely in the sequence but not imminent and large amounts of fission products in addition to noble gases are in the containment atmosphere, consider precautionary evacuation to 5 miles and 10 mile downwind evacuation (45° to 90° sector).

   c. For core melt sequences where large amounts of fission products other than noble gases are in the containment atmosphere and containment failure is judged imminent, recommend shelter for those areas where evacuation cannot be completed before transport of activity to that location.

d. As release information becomes available adjust these actions in accordance with dose projections, time available to evacuate and estimated evacuation times given current conditions.

5. Example PWR Sequences

a. Small and large LOCA's with failure of ECCS to perform leading to severe core degradation or melt in from minutes to hours. Ultimate failure of containment likely for melt sequences. (Several hours likely to be available to complete protective actions unless containment is not isolated)

b. Transient initiated by loss of feedwater and condensate systems (principal heat removal system) followed by failure of emergency feedwater system for extended period. Core melting possible in several hours. Ultimate failure of containment likely if core melts.

c. Transient requiring operation of shutdown systems with failure to scram which results in core damage or additional failure of core cooling and makeup systems (which could lead to core melt)

d. Failure of offsite and onsite power along with total loss of emergency feedwater makeup capability for several hours. Would lead to eventual core melt and likely failure of containment.

e. Small LOCA and initially successful ECCS. Subsequent failure of containment heat removal systems over several hours could lead to core melt and likely failure of containment.

NOTE: Most likely containment failure mode is melt-through with release of gases only for dry containment; quicker and larger releases likely for ice condenser containment for melt sequences. Quicker releases expected for failure of containment isolation system for any PWR.

6. Example BWR Sequences

a. Transient (e.g., loss of offsite power) plus failure of requisite core shut down systems (e.g., scram). Could lead to core melt in several hours with containment failure likely. More severe consequences if pumps trip does not function.

b. Small or large LOCA's with failure of ECCS to perform leading to core melt degradation or melt in minutes to hours. Loss of containment integrity may be imminent.

c. Small or large LOCA occurs and containment performance is unsuccessful affecting longer term success of the ECCS. Could lead to core degradation or melt in several hours without containment boundary.

d. Shutdown occurs but requisite decay heat removal systems (e.g., RHR) or non-safety systems heat removal means are rendered unavailable. Core degradation or melt could occur in about ten hours with subsequent containment failure.

7. Any major internal or external events (e.g., fires, earthquakes, substantially beyond design basis) which could cause massive common damage to plant systems resulting in any of the above.

APPENDIX 2

METEOROLOGICAL CRITERIA FOR EMERGENCY PREPAREDNESS AT OPERATING NUCLEAR POWER PLANTS

Introduction

10 CFR Part 50.47 requires that the Emergency Plan shall provide "(A)dequate methods, systems, and equipment for assessing and monitoring actual or potential offsite consequences of a radiological emergency condition ..."

The basic functions needed to comply with the meteorological aspects of these requirements are:

1. A capability for making meteorological measurements.

2. A capability for making near real-time predictions of the atmospheric effluent transport and diffusion.

3. A capability for remote interrogation of the atmospheric measurements and predictions by appropriate organizations.

A staged schedule is provided in Annex 1 to this appendix for implementation of the meteorological elements addressing emergency preparedness requirements.

Meteorological Measurements

The emergency facilities and equipment as stated in Appendix E to 10 CFR Part 50 shall include "(E)quipment for determining the magnitude of and for continuously assessing the impact of the release of radioactive materials to the environment." To address this requirement, in part, the nuclear power plant operator shall have meteorological measurements from primary and backup systems.

Each site with an operating nuclear power plant shall have a primary meteorological measurements system. The primary system shall produce current and record historical local meteorological data. These data will provide a means to estimate the dispersion of radioactive material due to accidental radioactive releases to the atmosphere by the plant. The acceptance criteria for meteorological measurements are described in the proposed Revision 1 to U. S. NRC Regulatory Guide 1.23.

Each site with an operating nuclear power plant shall have a viable backup meteorological measurements system. The backup system shall provide meteorological information when the primary system is out of service and, thus, assurance that basic meteorological information is available during and immediately following an accidental airborne radioactivity release. The acceptance criteria for the backup meteorological measurements system are described in the proposed Revision 1 to U. S. NRC Regulatory Guide 1.23.

Atmospheric Transport and Diffusion Assessment

Appendix E to 10 CFR Part 50 states that "(T)he means to be used for determining the magnitude of and for continually assessing the impact of the release of radioactive materials shall be described ..." To address this requirement, in part, all licensees with operating nuclear power plants shall provide the description of their system for making current, site-specific estimates and predictions of atmospheric effluent transport and diffusion during and immediately following an accidental airborne radioactivity release from the nuclear power plant. The purpose of these predictions is to provide an input to the assessment of the consequences of accidental radioactive releases to the atmosphere and to aid in the implementation of emergency response decisions.

Near real-time, site-specific atmospheric transport and diffusion models shall be used when accidental airborne radioactive releases occur. Two classes of models are appropriate. The first, Class A, is a model and calculational capability which can produce initial transport and diffusion estimates for the plume exposure EPZ within 15 minutes following the classification of an incident. The second, Class B, is a numerical model which represents the actual spatial and temporal variations of plume distribution and can provide estimates of deposition and relative concentration of radioactivity within the plume exposure and ingestion EPZs for the duration of the release.

The Class A model shall use actual 15 minute average meteorological data from the meteorological measurements systems maintained by the licensee. The selected data shall be indicative of the conditions within the plume exposure EPZ. The Class A model shall provide calculations or relative concentrations (X/Q) and transit times within the plume exposure EPZ. Atmospheric diffusion rates shall be based on atmospheric stability as a function of site-specific terrain conditions. Site-specific local climatological effects on the trajectories, such as seasonal, diurnal, and terrain-induced flows shall be included. Source characteristics (release mode, and building complex influence) shall be factored into the model. The output from the Class A model shall include the plume dimensions and position, and the location, magnitude, and arrival time of (1) the peak relative concentration and (2) the relative concentrations at appropriate locations. The bases and justification for these model(s) and input data shall be documented. The performance and limitations of the model(s) shall also be included in the documentation.

The essential elements of the input, of model components, and of output to be incorporated in the Class A model are given to provide guidance for meteorological system implementation. Additional guidance will be prepared to outline the staff position on dose assessment capabilities to be used for emergency response.

Remote Interrogation

Appendix E to 10 CFR Part 50 states that there shall be "(P)rovisions for communications among the nuclear power reactor control room, the onsite technical support center and the near-site emergency operations facility ...." There shall also be "(P)rovisions for communications by the licensee with the NRC Headquarters and the appropriate NRC Regional Office Operations Center from the nuclear power reactor control room, the onsite technical support center, and the near-site emergency operations facility" and "... among the nuclear facility, the principal State and local emergency operations centers ...."

To address this requirement with respect to the meteorological information, all systems producing meteorological data and effluent transport and diffusion estimates at sites with operating nuclear power plants shall have the capability of being remotely interrogated. This will provide current meteorological data and transport and diffusion estimates to the licensee, emergency response organizations, and the NRC staff, on-demand, during emergency situations.

Proposed Revision 1 to Regulatory Guide 1.23 identifies the meteorological data that shall be available. The information that shall be available from the transport and diffusion assessment include the model outputs, input variables, model identification and data source information, plant identification, and data from other sources, as available.

The capability to make transport and diffusion calculations with specific inputs shall be provided. The primary and backup communications systems shall have a data transmission rate of 1200 BAUD and the rate(s) and other specifications indicated in proposed Revision 1 to Regulatory Guide 1.23.

Documentation for procedures to access and use the system shall be provided to the emergency response organizations and the NRC, and shall be available in the control room, the Technical Support Center (TSC) and the Emergency Operations Facility (EOF).

ANNEX 1 TO APPENDIX 2

SCHEDULES TO IMPLEMENT THE METEOROLOGICAL ELEMENTS ADDRESSING EMERGENCY PLANNING RULES

Schedule for Operating Reactors -- For operating reactors the following implementation milestones shall be met to address the functional requirements.

Milestones are numbered and tagged with the following code; a-date, b-activity, c-minimum acceptance criteria. They are as follows:

(1) a. January 2, 1981

b. Submittal of radiological emergency response plans

c. A description of the emergency plan which addresses the meteorological functions shall be provided

(2) a. March 1, 1981

b. Submittal of implementing procedures

c. Methods, systems, and equipment to assess and monitor actual or potential offsite consequences of a radiological emergency condition shall be provided

(3) a. April 1, 1981

b. Implementation of radiological emergency response plans

c. Three functions of Appendix 2 with the exception of the Class B model of the assessment capability

Alternative to milestone (3) requiring compensating actions:

A meteorological measurements system which is consistent with the existing technical specifications as the baseline or a primary system and/or a backup system of Appendix 2, or two independent backup systems shall provide the basic meteorological parameters (wind direction and speed and an indicator of atmospheric stability) on display in the control room. An operable dose calculational methodology (DCM) shall be in use in the control room and at appropriate emergency response facilities. The following compensating actions shall be taken by the licensee for this alternative:

(i) if only a primary or a backup system is in use:

- The licensee (a person who will be responsible for making offsite dose projections) shall check communications with the cognizant National Weather Service (NWS) first order station and NWS forecasting station on a monthly basis to ensure that routine meteorological observations and forecasts can be accessed.

- The licensee shall calibrate the meteorological measurements at a frequency no less than quarterly and identify a readily available source of meteorological data (characteristic of site conditions) to which they can gain access during calibration periods.

- During conditions of measurements system unavailability, an alternate source of meteorological data which is characteristic of site conditions shall be identified to which the licensee can gain access.

- The licensee shall maintain a site inspection schedule for evaluation of the meteorological measurements system at a frequency no less than weekly.

- It shall be a reportable occurrence if the meteorological data unavailability exceeds the goals outlined in Proposed Revision 1 to Regulatory Guide 1.23 on a quarterly basis.

(ii) The portion of the DCM relating to the transport and diffusion of gaseous effluents shall be consistent with the characteristics of the Class A model outlined in the assessment capability of Appendix 2.

(iii) Direct telephone access to the individual responsible for making offsite dose projections (Appendix E to 10 CFR Part 50(IV)(A)(4)) shall be available to the NRC in the event of a radiological emergency. Procedures for establishing contact and identification of contact individuals shall be provided as part of the implementing procedures.

This alternative shall not be exercised after July 1, 1982. Further, by July 1, 1981, a functional description of the upgraded capabilities and schedule for installation and operation shall be provided (see milestones 4 and 5).

(4) a. April 1, 1982

b. Installation of Emergency Response Facility meteorological hardware and software

c. Three functions of Appendix 2, with exception of the Class B model of the assessment capability

(5) a. July 1, 1982

b. Full operation of milestone 4

c. The Class A model (designed to be used out to the plume exposure EPZ) may be used in lieu of a Class B model out to the ingestion EPZ. Compensating actions to be taken for extending the application of the Class A model out to the ingestion EPZ include access to supplemental information (meso and synoptic scale) to apply judgment regarding intermediate and long-range transport estimates. The distribution of meteorological information by the licensee should be as follows by July 1, 1982:

Meteorological Information	CR	TSC	EOF	NRC and Emergency Response Organizations
Basic Met. Data (e.g., 1.97 Parameters)	X	X	X	X (NRC)
Full Met. Data (1.23 Parameters)		X	X	X
DCM (for Dose Projections)	X	X	X	X
Class A Model (to Plume Exposure EPZ)	X	X	X	X
Class B Model or Class A Model (to Ingestion EPZ)		X	X	X

(6) a. July 1, 1982 or at the time of the completion of milestone 5, whichever is sooner

b. Mandatory review of the DCM by the licensee

c. Any DCM in use should be reviewed to ensure consistency with the operational Class A model. Thus, actions recommended during the initial phases of a radiological emergency would be consistent with those after the TSC and EOF are activated

(7) a. September 1, 1982

b. Description of the Class B model provided to the NRC

c. Documentation of the technical bases and justification for selection of the type Class B model by the licensee with a discussion of the site-specific attributes

(8) a. June 1, 1983

b. Full operation of the Class B model

c. Class B model of the assessment capability of Appendix 2

o Schedule for Near-Term OLs

For applicants for an operating license at least milestones 1, 2, and 3 shall be met prior to the issuance of an operating license. Subsequent milestones shall be met by the same dates indicated for operating reactors. For the alternative to milestone 3, the meteorological measurements system shall be consistent with the NUREG-75/087, "Standard Review Plan For the Review of Safety Analysis Reports for Nuclear Power Plants," Section 2.3.3 program as the baseline or primary system and/or backup system.

APPENDIX 3

MEANS FOR PROVIDING PROMPT ALERTING AND NOTIFICATION OF RESPONSE ORGANIZATIONS AND THE POPULATION

NRC and FEMA recognize that the responsibility for activating the prompt notification system called for in this section is properly the responsibility of State and local governments. NRC and FEMA also recognize that the responsibility for demonstrating that such a system is in place rests with the facility licensee.

The initial notification when appropriate, of the affected population within the plume exposure pathway Emergency Planning Zone (EPZ) must be completed in a manner consistent with assuring the public health and safety. The design objective for the system shall be to meet the acceptance criteria of section B of this Appendix. This design objective does not, however, constitute a guarantee that early notification can be provided for everyone with 100% assurance or that the system when tested under actual field conditions will meet the design objective in all cases.

The plan shall include:

- The specific organizations or individuals, by title, who will be responsible for notifying response organizations and the affected population and the specific decision chains for rapid implementation of alerting and notification decisions;

- A capability for 24-hour per day alerting and notification;

- Provision for the use of public communications media or other methods for issuing emergency instructions to members of the public, and

- A description of the information that would be communicated to the public under given circumstances, for continuing instructions on emergency actions to follow, and updating of information.

A. Concept of Operations

Commercial broadcast messages are the primary means for advising the general public of the conditions of any nuclear accident. The primary means for alerting the public to an impending notification by public authorities may be any combination of fixed, mobile or electronic tone generators which will convey the alerting signal with sufficient timeliness and intensity to permit completion of notification by broadcast media in a timely manner. Since the timeliness of notification is a function of the accident severity, to be effective, appropriate systems, such as EBS and NOAA weather radio, should be placed on alert prior to the physical need for a public broadcast. The second or "Alert" category of events in Appendix 1 would ordinarily trigger the placing of broadcast media on alert, pending further instructions from State and local officials.

It is desirable for the public notification system to have a phasing capability. The arrangements for phasing are a function of the case-by-case population distribution or topography around each nuclear power station, and the details of each site-specific preparedness plan of State and local government.

B. Criteria for Acceptance

1. Within the plume exposure EPZ the system shall provide an alerting signal and notification by commercial broadcast (e.g., EBS) plus special systems such as NOAA radio. A system which expects the recipient to turn on a radio receiver without being alerted by an acoustic alerting signal or some other manner is not acceptable.

2. 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.

   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.

The basis for any special requirements exceptions (e.g., for extended water areas with transient boats or remote hiking trails) must be documented. Assurance of continued notification capability may be verified on a statistical basis. Every year, or in conjunction with an exercise of the facility, FEMA, in cooperation with the utility operator, and/or the State and local governments will take a statistical sample of the residents of all areas within about ten miles to assess the public's ability to hear

the alerting signal and their awareness of the meaning of the prompt notification message as well as the availability of information on what to do in an emergency. The system plan must include a provision for corrective measures to provide reasonable assurance that coverage approaching the design objectives is maintained. The systems shall be operable no later than July 1, 1981. The lack of a specific design objective for a specified percent of the population between 5 and 10 miles which must receive the prompt signal within 15 minutes is to allow flexibility in system design. Designers should do scoping studies at different percent coverages to allow determination of whether an effective increase in capability per unit of cost can be achieved while still meeting the objective of item 2.a. above.

3. Public Notifications

A prompt notification scheme shall include the capability of local and State agencies to provide information promptly over radio and TV at the time of activation of the alerting signal. The Emergency Plans shall include evidence of such capability via agreements, arrangements or citation of applicable laws which provide for designated agencies to air messages on TV and radio in emergencies. Initial notifications of the public might include instructions to stay inside, close windows and doors, and listen to radio and TV for further instructions.

C. Physical Implementation

1. Communications Supporting Alerting and Notification Systems

Policy Objective

Federal, State and local government and utility authorities must develop and maintain plans, systems, procedures and relationships that

are effective in mobilizing responsible authorities and operating elements in alerting and notifying the general public and in assuring appropriate and effective responses by the public.

Incident Alert Notification

The triggering of processes to mobilize forces and warn the public is dependent upon the communication between the nuclear power facility and government authorities (Federal, State and Local). The communications net must feature the following capacity:

a. Coverage: 24 hour coverage at the facility and at the primary points to receive and act upon notification.

b. Points to be Linked: Appendix 1 describes the conditions for assured dissemination of alert and warning information by the nuclear power plant to appropriate local and State warning points at all times and under all conditions. The system should include identical communications capabilities at primary and alternate operating locations.

c. Net Control: To assure effective utilization, net discipline and availability, one location should be assigned responsibility for net control and an alternate designated. The primary and alternate location should be a State or local civil government activity. It should issue and update procedures on testing, net access, and discipline and maintenance and repair.

d. System Availability and Reliability: All stations/points on the network and the communications linkage must provide a capability for immediate dissemination, receipt and acknowledgment of

alert and warning messages on a 24-hour basis. The system should be able to function notwithstanding adverse environmental conditions, such as floods and power outages. It should not be subject to pre-emption for lower priority purposes nor to failure due to traffic (subscriber) overloading. To the extent a single system does not meet these performance standards, alternate means must be in place which have dissimilar vulnerability characteristics.

e. Information Sensitivity: The system design should take into consideration that alert and warning information is highly sensitive and if monitored or intercepted by unauthorized personnel, is subject to misinterpretation and can lead to undesirable and counterproductive reactions. Therefore it is desirable not to cite specific radio frequencies in public planning documents.

f. System Features: Dissemination should be rapid and reliable and provide acknowledgment and verification of message content. It is desirable for voice traffic to be supported by hard copy verification.

g. Multipurpose Use: Whatever system is designed and installed to meet all of the above capabilities for accident alerting may be used for communication in support of other response functions. However, systems designed for other purposes should not be adapted to incident alert notification unless (a) all of the criteria are met and (b) such adaptation does not compromise their primary purpose. Exception may be justified when a system designed for other purposes is adapted to incident alert notification to serve as a back-up to the primary system.

2. Notification of Response Organizations

a. Assigned Responsibility: Plans should clearly designate the responsibility and means of notifying response organizations by either the nuclear power plant or by the State or local warning points designated to receive initial alert notification.

b. Dissemination Time: Warning points cannot be encumbered by sequential call down processes nor can response organizations accept the time lost by such processes. This second level notification by warning points should be a one call process to all assigned organizations to be notified. Acknowledgement and message verification is essential. Message content must be clear, and brief. A preferred procedure is to communicate a posture code which calls for various predetermined responses for each organization based on its mission.

c. Capability of Organizations to be Notified: Organizations with immediate response functions must also have a 24-hour capability of receiving and acting upon a notification.

d. Internal Alerting: Each organization with response functions must develop reliable procedures for internal alerting and mobilization of forces. The system should account for the non-emergency nature of some organizations and the routine posture of key staff elements.

3. Sirens

Wherever proposed as part of a system, subject to later testing by statistical sampling, the design concept and expected performance

must be documented as part of plans submitted by licensees, States and local governments. The designs of such systems must take into account the demography and topography of the areas being considered.

Some institutional alerting mechanisms are already in place (e.g., in schools, factories, hospitals, shopping centers, jails, and centralized offices). Siren systems should complement rather than substitute for these already in place.

The basic criterion needed for the design of a siren system is the acceptable dissonant sound level as described in "Outdoor Warning Systems Guide," Report No. 4100, by Bolt, Beranek and Newman, Inc., June 1979 (FEMA publication number CPG-1-17).

As an acceptable criteria at most locations 10db above average daytime ambient background should be a target level for the design of an adequate siren system. In cases involving industrial operations, a special survey to determine design sound level targets or an inside system may be needed to provide an audible 10db dissonant differential. Sirens on vehicles may be used to supplement fixed alert systems outside the inner five mile radius of the plume exposure EPZ.

Siren systems should be designed considering the demography and topography of an area, and taking into account other alert or notification systems in place or planned. The maxium sound levels received by any member of the public should be lower than 123db, the level which may cause discomfort to individuals.

a. The 10db dissonant differential is a conservative use of the 9db differential which is discussed in FEMA document CPG-1-17. Research has shown that a person is capable of being alerted by such a differential above or below the background ambient in the case of a predominately narrow band 300 to 800 Hz emitted by large sirens. The achievement of a positive differential of 10db has been a basic objective (although not always attained) of a wide range civil defense system.

b. In considering siren applications for nuclear power stations, the actual population density must be considered. The average population density around such stations is well below 2000 persons/ per square mile. Therefore, any use of population based criteria such as Figure 1 of CPG-1-17 is improper because the actual population density is predominately low.

c. The 10db differential above daytime ambient is meant to provide a distinguishable signal inside of average residential construction under average conditions. Where special individual cases require a higher alerting signal, it should be provided by other means than a generally distributed acoustic signal.

d. In keeping with the policy that sirens may only be a portion of a complete public notification system, NRC and FEMA believe that organizations proposing their use retain the responsibility for cost/benefit decisions which might involve the use alternative methods in thinly populated areas where such methods are cost effective while meeting the notification criteria for the Plume Exposure EPZ. Where sirens are proposed, the design may be based either on handbook values for background, or alternatively on field surveys.

e. For Organizations Proposing Systems Without Field Surveys

It may be very difficult, expensive, and time consuming to determine the average-day-time ambient for an EPZ. Sound level change with season, location, weather, traffic, ground cover, etc. If in combination with the uncertainties in siren performance, it is doubtful whether the predictability of detection would be increased above what could be obtained using existing date to develop standards. 50db(a) is a conservative estimate of the average day time ambient in areas with population below 2000 person/per square mile. For organizations proposing systems without field surveys, the following requirements apply:

That Figure 1 of CPG-1-17, "Outdoor Warning Systems Guide" published by FEMA, be used as the design criterion for siren systems in areas with population densities above 2000 persons/mi^2.

For areas with population densities below 2000 persons/mi^2 the siren system must be designed to produce a minimum of 60db(c). An attenuation factor of 10db loss per distance doubled should be used to determine siren range in the absence of special geographical features. Those organizations applying the criteria should document the basis for their selection of appropriate values to include:

* population densities, location of major transportaiton routes and heavy industry

* attenuation factors with distance

* siren output db(c) at 100 feet vs. assumed range and acoustic frequency spect a.

* maps showing siren location, size of coverage and any features that could affect siren performance (e.g., hills)

* mounting heights of sirens

* special weather conditions such as expected heavy snow which might modify the design assumptions

f. For Organizations Proposing Systems With Field Surveys

Instead of a 50db(a) estimate of average daytime background for areas with relatively low population (less than 2000 persons/per square mile), the average daytime (7 am to 10 pm) background may be measured.

The 10 db above average daytime ambient background may then be applied against these measurements.

Background db should be determined in a band about the siren signal frequency. Inclusion of background noise energy from outside this band could be misleading.

Figure 1 of CPG-1-17, "Outdoor Warning System Guide," should be used as the design criterion for siren systems in areas with population densities above 2000 persons/mi^2.

Organizations choosing to measure background ambients should document the basis for their selection to include:

* The basic requirements described in paragraph e concerning population densities, attenuation factors, siren output and spectra, and maps with terrain features

* Values of measured average daytime ambient background used as a basis for siren selection, to include survey location, how locations were selected, frequency range measured and measurement time span

* How seasonal changes were taken into account

g. General Considerations

NRC's licensees are urged to cooperate with State and local governments in the use of cost effective combinations of systems, including those already in place, as a means of satisfying this objective.

The siren signal shall be a 3 to 5 minute steady signal as described in Paragraph IV E of CPG-1-17 and capable of repetition.

h. Siren Testing Guidance

(1) Types of tests and suggested frequency are:

* Silent Test	every two weeks - log entry
* Growl Test (or equipment)	quarterly and when preventive maintenance is performed
* Complete Cycle Test	at least annually, and as required for formal exercises

(2) Oversight

* FEMA will receive an annual statement from the cognizant State or local authority that silent and growl tests have been performed. This may in turn be based on utility certification if the utility has directed responsibility for maintenance.

* FEMA will observe or receive a statement of the annual statistical sample of population in the EPZ hearing a test based on a field test or in conjunction with an exercise. FEMA will approve corrective measures necessary to provide assurance that siren systems are meeting the objectives for alerting the population (where they are the specific means for such alerting) approved jointly by NRC and FEMA.

4. Other Systems

a. The Emergency Broadcast System (EBS)

The Emergency Broadcast System (EBS) exists to furnish an expedited means of furnishing real time communications to the public in the event of war, threat of war, or grave national, or regional or local crisis.

To activate the EBS at the State level, a request may be directed to an Originating Primary Relay Station (usually an FM station located near the State capital) by the Governor, his desingated representative, the National Weather Service, the State Civil Preparedness or Emergency Services Office, or other designated State authority.

At the local level, a request for activation may be directed to the Common Program Control Station (CPCS-1), by designated officials of local government or the National Weather Service.

In either case, communications facilities developed for use in contacting and providing emergency program material may include any of the following: telephone, remote pickup units, NOAA Weather Wire Service or NOAA Weather Radio, police and fire communications, amateur and citizens band radio. Station management at the Originating Primary Relay Station and/or the Common Program Control Station authenticates the validity of all requests to activate the system. Other broadcast stations may activate the EBS on an individual basis as needed. This is important since station management is responsible for all program material broadcast to the public.

The Originating Primary Relay Station at the State level, or the Common Program Control Station at the local level, will take the following steps to activate the EBS:

1. Take action to broadcast emergency programming which may include recording the emergency message for use later.

2. Broadcast an initial statement.

3. Transmit the two-tone Attention Signal.

4. Broadcast the emergency announcement.

All other participating stations, alerted via their off-the-air monitoring of the two-tone signal, repeat the above procedures.

The State and local EBS is available for public officials who have specifically been designated "activating officials." These designees are responsible to the community for determining the appropriateness of activating the EBS for disseminating emergency public information. In this regard, the activating official could determine that an early alert to the broadcasters was advisable, because of certain actual or contemplated adverse conditions at a nuclear power plant. Such a decision could be implemented by the activating official notifying the broadcasters by available communications. The bottom line of the early alert would be to notify stations that are off the air, that there may be a need for activation, which in turn would cause the stations to notify appropriate personnel to stand by.

Alerting and notification systems around nuclear facilities must be integrated with the State and local EBS Operational Area Plan. Operational Area EBS plans involve agreements with the Common Program Control Stations (CPCS-1) and local emergency preparedness organizations while the State EBS plan is coordinated with the State emergency communications chairman. It may be necessary for utility organizations to sign agreements with CPCS-1 stations in order to cover a fast breaking general emergency described in Appendix 1. However, actual public notices would only take place upon authorization of governmental authorities.

b. National Oceanic and Atmospheric Administration (NOAA) Weather of Emergency Alert

Receivers compatible with Weather or Emergency Alert transmitters can be obtained commercially. Where transmitters or repeaters are not available, such could be provided independently, or perhaps by negotiation with the National Oceanic and Atmospheric (NOAA) or the Federal Communications Commission (FCC). Receivers and servicing thereof could be offered as a service.

c. Telephone Automatic Dialers

Systems are available whereby pre-selected telephone numbers could be dialed automatically, and a recorded announcement played when a telephone is answered. After a fixed number of rings, the next number is dialed automatically, the unanswered numbers are redialed at the end of the quene. This system could be most cost-effective and secure for warning to principal response officials, school systems, selected industrial complexes, downstream water works or isolated farms.

d. Aircraft with Loudspeakers

Hiking trails and hunting areas are illustrative of areas where it may not be feasible to provide a prompt notification by any other means except by aircraft equipped with powerful sound systems or by dropping prepared leaflets. Such would not work in bad weather, of course, but such areas are less likely to be used in bad weather. These areas should be reached on a best effort basis.

APPENDIX 4

EVACUATION TIME ESTIMATES WITHIN THE PLUME EXPOSURE PATHWAY EMERGENCY PLANNING ZONE

The following is an example of what shall be included in an evacuation times assessment study and how it might be presented. The example includes a complete outline of material to be covered, but only a few typical tables and explanations are provided. The requirements are intended to be illustrative of necessary considerations and provide for consistency in reporting. Because the evacuation time estimates will be used by those emergency response personnel charged with recommending and deciding on protective actions during an emergency the evacuation time estimates should be updated as local conditions change (e.g., change in type or effectiveness of public notification system).

I. INTRODUCTION

This section of the report should make the reader aware of the general location of the nuclear power plant and plume exposure pathway emergency planning zone, and generally discuss how the analysis was done.

A. Site Location and Emergency Planning Zone

A vicinity map showing the plant location shall be provided along with a detailed map of the plume exposure pathway emergency planning zone (EPZ). The map shall be legible and identify transportation networks, topographical features and political boundaries. (See planning element J.10.a.)

B. General Assumptions

All assumptions used in the analysis shall be provided. The assumptions shall include such things as automobile occupancy factors, method of determining roadway capacities, and method of estimating populations.

C. Methodology

A description of the method of analyzing the evacuation times shall be provided. If computer models are used, a general description of the algorithm shall be provided along with a source for obtaining further information or documentation.

II. DEMAND ESTIMATION

The objective of this section is to provide an estimate of the number of people to be evacuated. Three potential population segments shall be considered: permanent residents, transients, and persons in special facilities. Permanent residents includes all people having a residence in the area, but not in institutions. Transients shall include tourists, employees not residing in the area, or other groups that may visit the area. Special facility residents include those confined to institutions such as hospitals and nursing homes. The school population shall be evaluated in the special facility segment. Care should be taken to avoid double counting.

A. Permanent Residents

The number of permanent residents shall be estimated using the U. S. Census data or other reliable data, adjusted as necessary, for growth. (See planning element J.10.b.). This population data shall then be translated into two subgroups: 1) those using autos and those

without autos. The number of vehicles used by permanent residents is estimated using an appropriate auto occupancy factor. A range of two to three persons per vehicle would probably be reasonable in most cases.

An alternative approach is to calculate the number of vehicles based on the number of households that own vehicles assuming one vehicle per household is used in evacuation. Regardless of the approach used, special attention must be given to those households not having automobiles. The public transport-dependent population must, therefore, be considered as a special case.

B. Transient Populations

Estimates of transient populations shall be developed using local data such as peak tourist volumes and employment data for large factories. Automobile occupancy factors would vary for different transient groups. Tourists might have automobile occupancy factors in the range of three to four while a factory would probably have a factor of less than 1.5 persons per vehicle. This population segment along with the permanent population subgroup using automobiles constitute the general population group for which an evacuation time estimate shall be made.

C. Special Facility Population

An estimate for this special population group shall usually be done on an institution-by-institution basis. The means of transportation are also highly individualized and shall be described. Schools shall be included in this segment.

D. Emergency Planning Zone and Sub-areas

The sub-areas for which evacuation time estimates are required must encompass the entire area within the plume exposure EPZ. Additionally, evacuation time estimates are also required for simultaneous evacuation of the entire plume exposure pathway. The areas to be considered are as follows:

Radius	Area
about 2 miles	four 90° sectors
about 5 miles	four 90° sectors
about 10 miles (EPZ)	four 90° sectors
about 10 miles (EPZ)	entire EPZ

When making estimates for the outer sectors, assume that the inner adjacent sectors are being evacuated simultaneously. The boundaries of the sub-areas shall be based upon the same factors as the EPZ, namely demography, topography, land characteristics, access routes, and local jurisdictions. To the extent practical, the sector boundaries shall not divide densely populated areas. Where meteorological conditions such as dominant wind directions, warrant special consideration, an additional sub-area may need to be defined and a separate estimate made for this case. The EPZ and its sub-areas shall be identified by mapping on United States Geological Survey (USGS) 7-1/2-minute series quadrant maps when available. Special facilities shall also be noted on these maps, to the extent that their locations can be geographically specified.

Populations shall be provided by evacuation areas as specified in planning element J.10.b. For the purpose of determining evacuation times it may also be useful to summarize population data by sector and distance from the plant. Figure 1 is an example of such a summary. Separate totals shall be provided for the three population segments. Figure 2 shows the population totals translated into the number of vehicles estimated to be used in evacuation.

III. TRAFFIC CAPACITY

This section of the report shall show the facilities to be used in evacuation. It shall include their location, types, and capacities. A complete review shall be made of the road network. Analyses shall be made of travel times and potential locations for serious congestion in potential corridors. (The analyses may be simplified in extreme rural areas.) The entire road network shall be used but local routes shall be carefully selected and analyzed to minimize their impact on the major routes should queuing or cross traffic conflicts occur. Care shall be taken to avoid depending only on high-capacity interstate and similar type routes because of limitations of on-ramp capacities. Alternatively, special traffic management plans may be developed to effectively utilize available capacity. Evacuation shall be based on general radial dispersion.

A. Evacuation Roadway Network

A map showing only those roads used as primary evacuation routes shall be provided. Figure 3 is an example. The map need not show local access streets necessary to get to the evacuation routes. Each segment of the network shall be numbered in some manner for reference.

The sector and quadrant boundaries shall also be indicated. (See planning elements J.10.a and b.).

B. Roadway Segment Characteristics

A table such as example Table 1 shall be provided indicating all the evacuation route segments and their characteristics, including capacity. The characteristics of a segment shall be given for the narrowest section or bottleneck if the roadway is not uniform in the number of lanes throughout the segment.

IV. ANALYSIS OF EVACUATION TIMES

As indicated previously, evacuation time is composed of several components. Each of these components shall be estimated in order to determine the total evacuation time.

A. Reporting Format

Table 2 shows the desired format for presenting the data and results for each type of evacuation. Each of the evacuation time components is presented along with the total evacuation time. Two conditions -- normal and adverse -- are considered in the analyses. Adverse conditions would depend on the characteristics of a specific site and could include flooding, snow, ice, fog or rain. The adverse weather frequency used in this analysis shall be identified and shall be severe enough to define the sensitivity of the analysis to the selected events. These conditions will affect both travel times and capacity. More than one adverse condition may need to be considered. That is, a northern site with a high summer tourist

population should consider rain, flooding, or fog as the adverse condition as well as snow with winter population estimates.

The text accompanying the table shall clearly indicate the critical assumptions which underlie the time estimates; e.g., day versus night, workday versus weekend, peak transient versus off-peak transient, and evacuation on adjacent sectors versus nonevacuation. The relative significance of alternative assumptions shall be addressed, especially with regard to time dependent traffic loading of the segments of the evacuation roadway network.

Some modification of the reporting format may be appropriate, depending on local circumstances.

B. Methodology

The method for computing total evacuation time shall be specified. Two approaches are acceptable. The simplest approach is to assume that events are sequential. That is to say, for example, that no one begins to move until all persons are warned and prepared to leave before anyone starts moving. The time is estimated by simply adding the maximum time for each component. This approach tends to over-estimate the evacuation time.

The second approach, which is more complex and will be discussed further, is to combine the distribution functions for the various evacuation time components. This second approach may result in reduced time estimates due to more realistic assumptions. The added complexity of analysis, therefore, may be warranted at sites

with long evacuation times. When distribution functions are used, estimates are made of the likelihood that each stage in an evacuation sequence will be accomplished within a given period of time. These conditional probabilities depend upon completion of the preceding stage. For example, formulation of family units or other evacuation groups does not commence until notification is received. Some of these distribution functions must be based on the judgment of the estimators. Computation of the joint distribution functions of evacuation times are made. Typically, the joint distribution assumes the form of an S-shape curve as shown in Figure 4. The evacuation time function is fairly smooth for large homogeneous population segments such as the general public. Special facilities, such as hospitals and industrial centers, produce less smooth functions, or discontinuous ones. The assessment of evacuation time may be easily updated should further analyses be conducted, assumptions changed, or new plans developed.

When distributions are used, distribution functions for notification of the various categories of the evacuee population shall be developed. The distribution functions for the action stages after notification predict what fraction of the population will complete a particular action within a given span of time. There are separate distributions for auto-owning households, school population, and transit dependent populations. These distribution functions can be constructed in a variety of ways, depending greatly on the kinds of data available for the actual site being studied. The previously developed conditional

distributions are combined to develop the time distributions for the various population segments departing their home or other facility from which they are being evacuated. For example, for the auto-owning population segment, these vehicles are then loaded onto the roadway network in order to compute travel times and delays.

Regardless of the means by which the time and amount of traffic to be loaded on the network is determined (i.e., sequentially or using distribution functions), it is necessary to calculate the on-road travel and delay times. In this step, traffic from each sector is assigned to available evacuation routes, and, if assigned volumes exceed capacity, delay times must be calculated using a queuing analyses. Traffic queue (backup) locations and estimated delay times should be indicated on the area map.

An estimate of the time required to evacuate that segment of the non-car-owning population dependent upon public transport shall be made, in a similar manner to that used for the auto-owning population. This estimate shall include consideration of any special services which might be initiated to serve this population subgroup. Such services might include fixed-route departures from designated assembly points.

Estimates for special facilities shall be made with consideration for the means of mobilization of equipment and manpower to aid in evacuation, and the needs for designated employees or staff to delay

their evacuation in order to shut down industrial facilities. Each special facility shall be treated on an individual basis. Weather conditions and time of day conditions shall be considered. Consideration shall be given to the impact of peak populations including behavioral aspects.

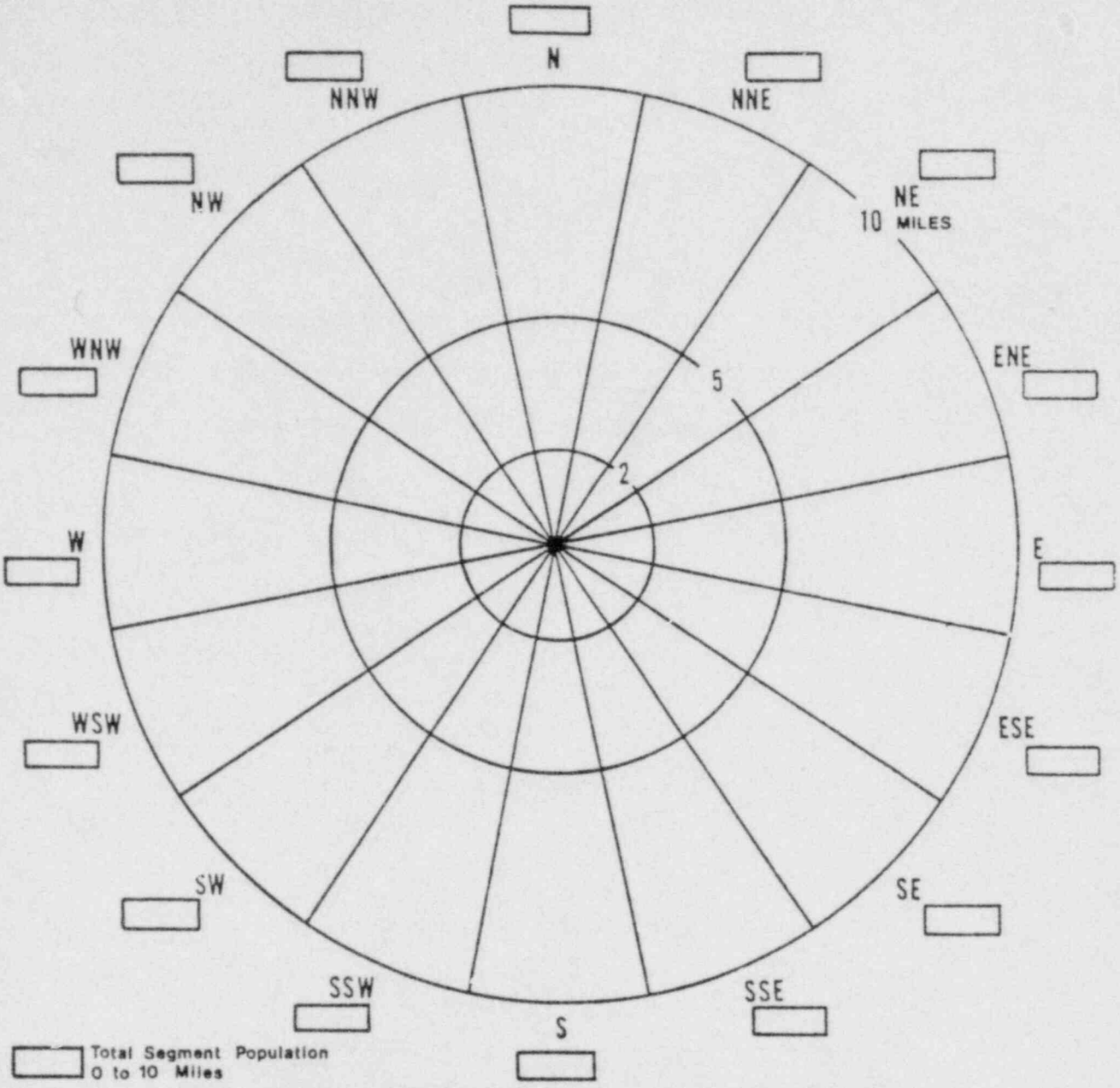
All of the results shall be reported in the format previously indicated. This format summarizes the maximum time for each component and for each sector. The components may or may not be directly additive based on the methodology used and stated in the report. Where distribution functions are used the percentage of the population as a function of time should be reported (See Figure 4 for an example format).

V. OTHER REQUIREMENTS

The time required for confirmation of evacuation shall be estimated. Candidate methods include visual confirmation by aircraft or ground vehicles and telephone confirmation.

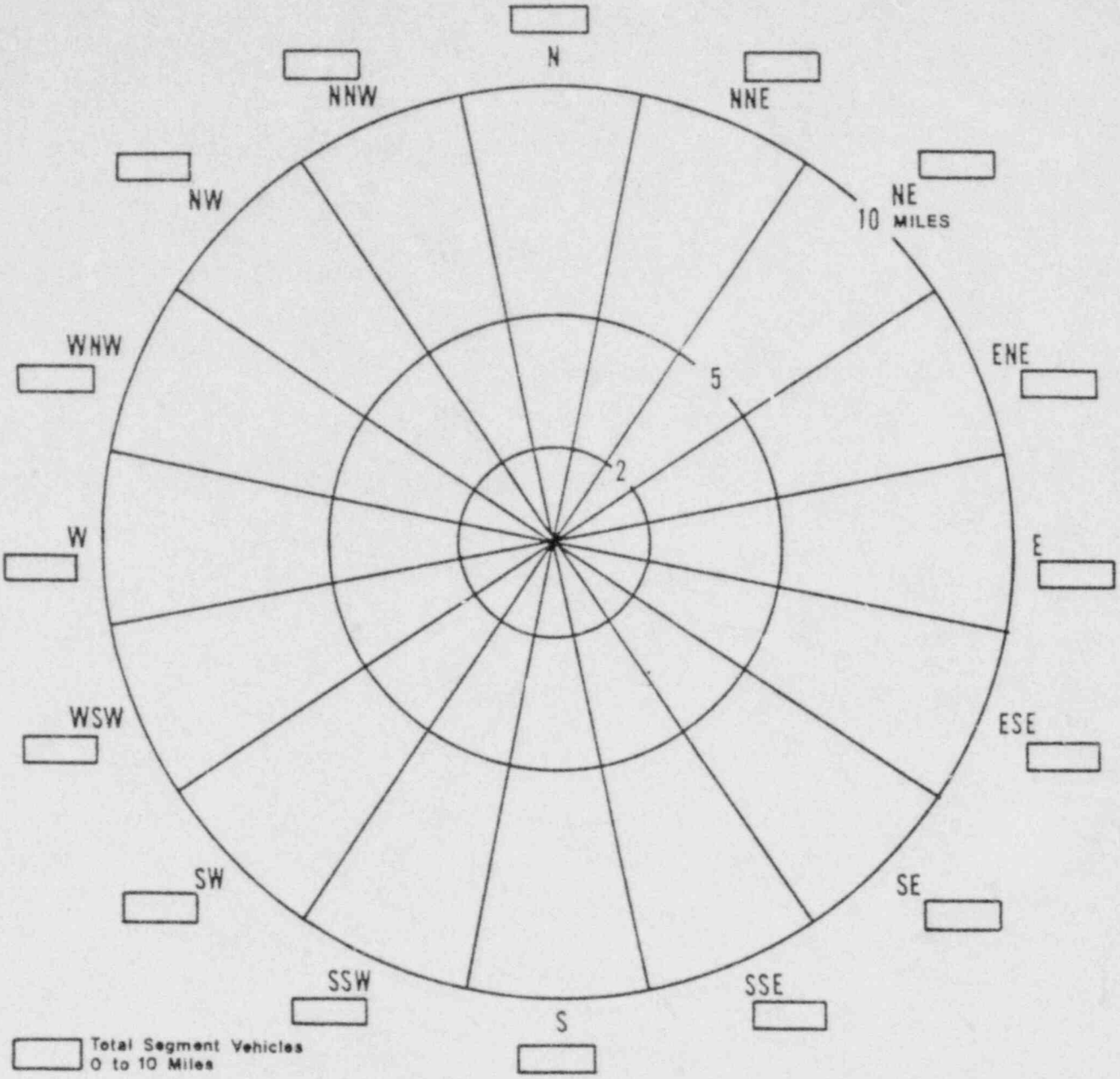
Specific recommendations for actions that could be taken to significantly improve evacuation time shall be given. Where significant costs may be involved, preliminary estimates of the cost of implementing these recommendations shall be given.

A review of the draft submittal by the principal organizations (State and local) involved in emergency response for the site shall be solicited and comments resulting from such review included with the submittal.



POPULATION TOTALS			
RING, MILES	RING POPULATION	TOTAL MILES	CUMULATIVE POPULATION
0 - 2		0 - 2	
2 - 5		0 - 5	
5 - 10		0 - 10	

Figure 1: Example of Format for Presentating Population Data By Sector



VEHICLES TOTALS			
RING MILES	RING VEHICLES	TOTAL MILES	CUMULATIVE VEHICLES
0 - 2		0 - 2	
2 - 5		0 - 5	
5 - 10		0 - 10	

Figure 2: Example of Format for Presenting Vehicle Data By Sector

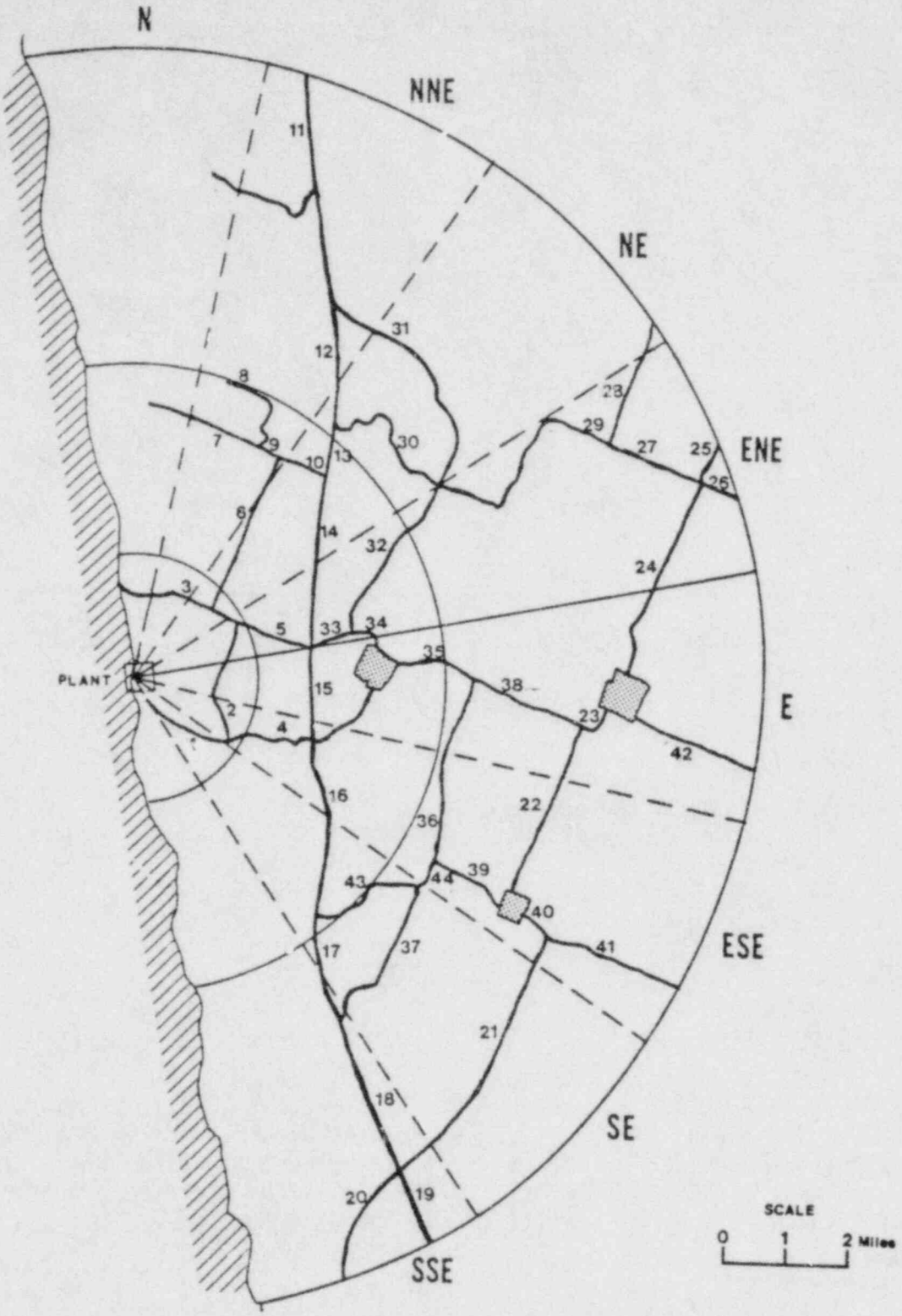


Figure 3: Example of Evacuation Roadway Network

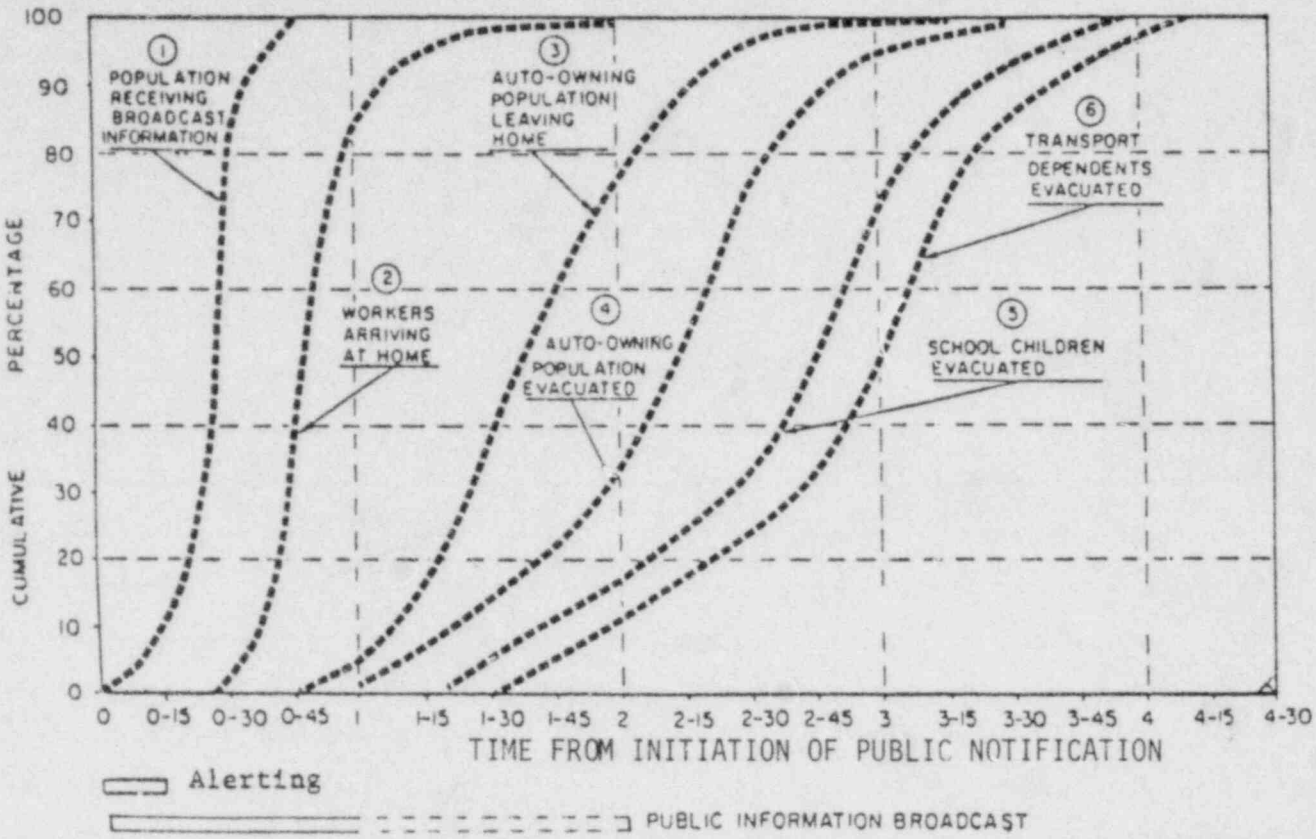


Figure 4: Example of Additional Reporting Format for Time Estimates of Population Evacuation When Probability Distributions Are Used

Note: These curves are suggestive of a hypothetical 10-mile radius EPZ. Similar curves can be developed for sub-areas of the entire EPZ. The horizontal displacement of these curves along the time axis as well as the slope of the curves will vary depending upon the characteristics of the EPZ or sub-areas of the EPZ.

Table 1: Example of Roadway Characteristics

Segment	Number[1] of Lanes	Type[2]	Capacity[3]	Comments[4]

NOTES:

[1]Total number of through lanes in both directions. If roadway cross section is not uniform, use section with least number of lanes

[2]F = Freeways and Expressways
U = Urban Streets
R = Rural Highways

[3]If known

[4]Indicate any special conditions that may affect roadway capacity.

Table 2: Example of Summary of Results of Evacuation Times Analysis

AREAS	WITHIN TWO MILES	WITHIN FIVE MILES	WITHIN TEN MILES
Permanent Population			
Permanent Pop. Vehicles			
Transient Population			
Transient Pop. Vehicles			
Evacuation Capacity Per Hour			
Notification Time			
Preparation Time			
Permanent Pop. Response Normal Conditions			
Permanent Pop. Response Adverse Contitions			
Transient Pop. Response Normal Conditions			
Transient Pop. Response Adverse Conditions			
General Pop. Evac. Time Normal Conditions			
General Pop. Evac. Time Adverse Conditions			
Confirmation Time			
Special Pop. Evac. Time Normal Conditions			
Special Pop. Evac. Time Adverse Conditions			

APPENDIX 5

GLOSSARY

Three major "organizations" are identified by the three columns headed "Licensee", "State", and "Local" in Part II of this document. "Organizations" are also indicated in the document generally with a modifying word preceeding the term "organization", e.g.: -

Principal (organizations):

Federal, State, Local agencies or departments or executive offices and nuclear utilities (licensees) having major or lead roles in emergency planning and preparedness.

Sub - (organizations):

Any organization such as agencies, departments, offices or local jurisdictions having a supportive role to the principal or lead organization(s) in emergency planning and preparedness.

Federal (organizations):

Agencies, departments or their components, of the U. S. Federal government, having a role in emergency planning and preparedness.

State (organization):

The State government agency or office having the principal or lead role in emergency planning and preparedness. There may be more than one State involved, resulting in application of the evaluation criteria separately to more than one State. To the extent possible, however, one State should be designated lead.

Local (organization):

The local government agency or office having the principal or lead role in emergency planning and preparedness. Generally this will be the County government. Other local government entities (e.g., towns, cities, municipalities, etc.), are considered to be sub-organizations with supportive roles to the principal or lead local government organization responsible for emergency planning and preparedness. In some cases there will be more than one lead organization at the local level, but designation of one lead local organization is preferable.

Private Sector (organizations):

Industry, volunteer, quasi-governmental etc. having a role in emergency planning and preparedness.

It is not possible to totally specify each class or type of organization that may be involved in the total emergency planning and preparedness scheme. Nor is it possible to define the particular roles, function and responsibilities of "principal organizations" and "sub-organizations". This is a matter that is best defined by the various parties involved in developing plans and preparedness for each nuclear site. Where the guidance in this document indicates a function that must be performed, emergency planners at all levels, must decide and agree among themselves, which organization is to perform such function. As a minimum, one lead agency at the State level and one lead local government agency having 24 hour manning is required.

Onsite Technical Support Center (TSC) and Licensees Near-Site Emergency Operations Facility (EOF)

For description and functional criteria for the TSC and EOF, see "Functional Criteria for Emergency Response Facilities" (NUREG-0696), U. S. Nuclear Regulatory Commission.

Consequences — The results or effects (especially projected doses or dose rates) of a release of radioactive material to the environment.

Core Melt Accident — A postulated reactor accident in which the fuel melts because of overheating.

Emergency Planning Zone (EPZ) — A generic area defined about a nuclear facility to facilitate offsite emergency planning and develop a significant response base. It is defined for the plume and ingestion exposure pathways. During an emergency response best efforts are made making use of plan action criteria without regard to whether particular areas are inside or outside EPZs.

Ingestion Exposure Pathway — The principal exposure from this pathway would be from ingestion of contaminated water or foods such as milk or fresh vegetables. The duration of principal exposures could range in length from hours to months.

Planning Basis	Guidance in terms of (1) Size of Planning Area (Distance); (2) Time Dependence of Release; and (3) Radiological Characteristics of Releases.
Planning Standard	The standard that must be met for onsite and offsite emergency plans and preparedness. (Ref: 10 CFR 50 section 50.47 Emergency Plans, 45 FR No. 162 pp 55409; and proposed 44 CFR 350 section 350.5 Criteria for Review and Approval of State and Local Radiological Emergency Plans and Preparedness, 45 FR No. 123 pp 42344).
Plume Exposure Pathway	The principal exposure sources from this pathway are: (a) whole body external exposure to gamma radiation from the plume and from deposited materials and (b) inhalation exposure from the passing radioactive plume. The duration of principal potential exposures could range in length from hours to days.
Projected Dose	An estimate of the radiation dose which affected individuals could potentially receive if protective actions are not taken.

Protective Action	An action taken to avoid or reduce a projected dose. (Sometimes referred to as protective measure).
Protective Action Guide	Projected absorbed dose to individuals in the general population which warrants protective action.

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The purpose of this guidance and upgraded acceptance criteria document is to provide a basis for NRC licensees, State and local governments to develop radiological emergency plans and improve emergency preparedness. The guidance is the product of the joint FEMA/NRC Steering Committee established to coordinate the agencies' work in emergency preparedness associated with nuclear power plants. This document is consistent with NRC and FEMA regulations and supersedes other previous guidance and criteria published by FEMA and NRC on this subject. It will be used by reviewers in determining the adequacy of State, local and nuclear power plant licensee emergency plans and preparedness.

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