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FEMA-REP-1

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

For Interim Use and Comment

U.S. Nuclear Regulatory Commission

Federal Emergency Management Agency

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FOREWORD

The purpose of this interim 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. This document supersedes previous guidance and criteria published by FEMA and NRC. It will be used by reviewers in determining the adequacy of State, local and nuclear power plant operator emergency plans and preparedness.

FEMA and the NRC staff approve this document as interim guidance containing minimum acceptance criteria for radiological emergency planning and preparedness. Both agencies invite comment from interested members of the public. Guidance will be promulgated in final form after these public comments are received and reviewed.

January 1980

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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

(For Interim Use and Comment)

I. INTRODUCTION

A. Purpose

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

1. State and local governments and nuclear facility operators in the development of radiological emergency response plans and preparedness in support of nuclear power plants.
2. Nuclear Regulatory Commission (NRC), Federal Emergency Management Agency (FEMA) and other Federal agency personnel engaged in the review of State, local government and licensee plans and preparedness.

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 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/]

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)

This guidance is classified as "Interim." NRC and FEMA will invite the public to comment on this document by means of a notice in the Federal Register. FEMA and the NRC staff 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 operators until such time as final agency guidance is promulgated. Final guidance may take the form of agency regulations.

After public comments are received, NRC will establish a schedule for the implementation of the requirements set forth in Table B-1, "Minimum Staffing Requirements for Nuclear Plant Emergencies" and for Appendix 2, "Meteorological Criteria for Emergency Preparedness at Operating Nuclear Power Plants" after public comments are received.

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 proposed rule, the revised Appendix E to 10 CFR Part 50 which was published for comment in the Federal Register of December 19, 1979; (44 F.R. 75167) and fourth, NRC's NUREG-0610, "Draft Emergency Action Level Guidelines for Nuclear Power Plants," September 1979. (See Appendix 1.)

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

C. Scope (continued)

on the Emergency Planning Zone concept was published in the Federal Register of October 23, 1979. EPA's endorsement of the Emergency Planning Zone concept was published in the Federal Register of January 15, 1980 (45 F.R. 2893). This document supersedes NUREG 75/111 and Regulatory Guide 1.101. By 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. FEMA and NRC regard all of the elements contained here as essential for an adequate radiological emergency plan. The criteria put added emphasis on the following elements: Notification, Communications, Public Information, Equipment, Accident Assessment, and Exercises and Drills.

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 for offsite emergency preparedness efforts considered necessary and prudent for large power reactor facilities. The NRC's policy statement of October 23, 1979 (44 F.R. 61123), directs the NRC staff to incorporate the guidance in the report

D. Planning Basis (continued)

into emergency preparedness documents. FEMA and EPA have 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). 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, 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.

D. Planning Basis (continued)

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 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 actions may be needed, responsible authorities who would carry

D. Planning Basis (continued)

out these actions and the means of communication to these authorities are all dependent on the size 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 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. The possible administration of the thyroid blocking agent, potassium iodide, should also be considered. The ability to best reduce 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 or fresh vegetables. 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

D. Planning Basis (continued)

control points and mechanisms. 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., put cows 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 zones as applicable. NUREG 0396 anticipates that State, rather than local, response organizations will be principally responsible for the planning associated with the ingestion exposure pathway.

D. Planning Basis (continued)

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. Although the radius for the EPZ implies a circular area, the actual shape would depend upon the characteristics of a particular site.

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.

D. Planning Basis (continued)

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 radius) was selected because:

a. the downwind range within which significant contamination could occur would generally be 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; and

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

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.

D. Planning Basis (continued)

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 has been used in developing the criteria for notification capabilities in Part II.

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,[4] 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.

4/ An interagency Task Force on Emergency Instrumentation (offsite) is now preparing guidance on 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.

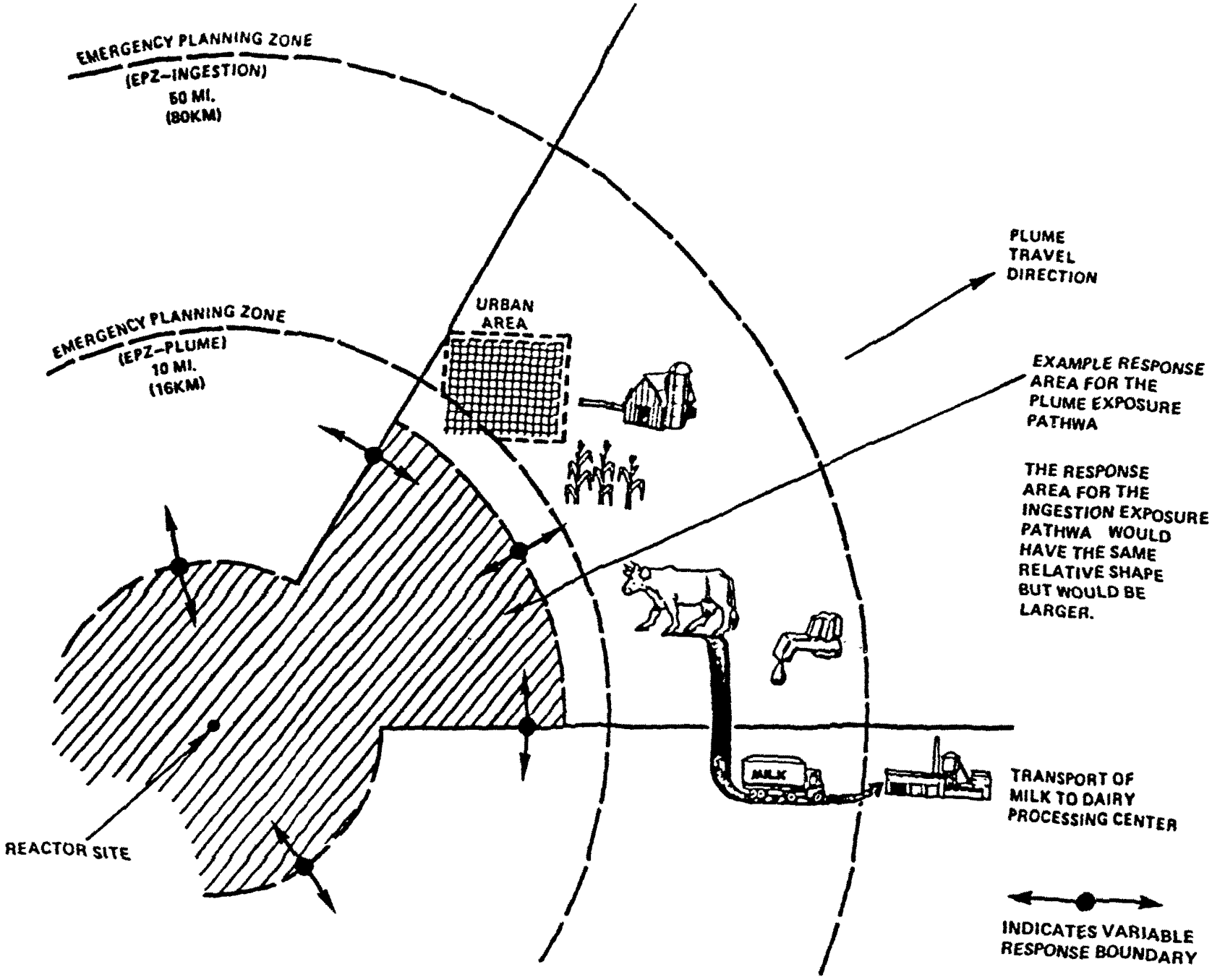

Figure Concept of Emergency Planning Zones

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		Radionuclides with Significant Contribution to Whole Body Exposure		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)	Radionuclide	Half Life (days)	Radionuclide	Half Life (days)
I-131	8.05	I-131	8.05	I-131	8.05
I-132	0.0958	Te-132	3.25	I-132	0.0958
I-133	0.875	Xe-133	5.28	I-133	0.875
I-134	0.0366	I-133	0.875	I-134	0.0366
I-135	0.280	Xe-135	0.384	I-135	0.280
Te-132	3.25	I-135	0.280	Cs-134	750
Kr-88	0.117	Cs-134	750	Kr-88	0.117
		Kr-88	0.117	Cs-137	11,000
		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 governments will have jurisdictional authority within the EPZ and these separate governmental entities will control their own emergency response organizations

E. Contiguous-Jurisdiction Governmental Emergency Planning (contd)

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 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.

E. Contiguous-Jurisdiction Governmental Emergency Planning (contd)

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 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

E. Contiguous-Jurisdiction Governmental Emergency Planning (contd)

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.

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. U.S. EPZ concepts have not been broached with Canada on a formal basis. Nevertheless, mutual emergency planning with Canada is desirable and the NRC and FEMA intend to more actively pursue this matter through appropriate diplomatic channels. It should be noted that Canadian power reactor facilities are of a different design from those found in the United States, and the potential for and consequences of accidents at the Canadian facilities may be quite different from those accidents analyzed for U.S. facilities.

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 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 applicable 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.

F. Integrated Guidance and Criteria (contd)

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 in any large effort to quickly improve planning and resources. The Federal Emergency Management Agency expects to make a significant contribution to assist in the development of State and local plans. The Federal Regional Advisory 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 now sponsored by NRC will continue without interruption, but lead responsibility for them has been transferred to FEMA.

G. Funding and Technical Assistance (contd)

Additionally, FEMA and NRC expect that the nuclear facility operator will have an interest in providing certain manpower and capital expenditures needed by the State and local governments to meet the criteria in this document.

H. Nuclear Facility Operator Response Organization

NRC and FEMA agree that the operators 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 operators 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.

An additional emergency activity for which facility operators 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, operator emergency planners must recognize the importance of prompt accident

H. Nuclear Facility Operator Response Organization (contd)

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 operator as set forth in NUREG-0610. That document is reprinted here as Appendix 1.

Emphasis on inplant identification of potential hazards is a change from the previous emphasis in many operator 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 operator. The response organizations which receive these notifications should have the authority and capability to take immediate predetermined actions based on recommendations from the facility operator. 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.

H. Nuclear Facility Operator Response Organization (contd)

In the longer time frame, substantial corporate and private sector organization resources should also supplement the initial response of the nuclear facility operator. A facility operator 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 Radiological Assistance Program (RAP), the Federal Interagency Radiological Assistance Plan (IRAP), other radiological emergency assistance plans, and DOE's National Laboratories as well as those of the U. S. Environmental Protection Agency and the Department of Health, Education and Welfare and other Federal capability, provide significant additional emergency resources in the event of a serious accident.

Response plans should contain provisions for integration of this important Federal assistance. The facility operator 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 precise roles during a radiological emergency will be defined in a national contingency plan now being developed by FEMA, and in an NRC agency plan.

J. Form and Content of Plans

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

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 an index, and the contents should be cross-referenced to the criteria contained in this document. 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. They should be understandable by a layman in a single reading. 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.

J. Form and Content of Plans (contd)

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

A continued state of readiness shall 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 Advisory Committees.

II. Planning Objectives and Evaluation Criteria

A. Assignment of Responsibility (Organization Control)

Planning Objective

To assure that primary responsibilities for emergency response in nuclear facility operator, State and local organizations within the Emergency Planning Zones have been assigned, that the emergency responsibilities of the various supporting organizations have been specifically established, and that each principal response organization is staffed to respond and to augment its initial response on a continuous basis.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	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.	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		
	Operator	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, Warning, 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.	X	X	X
b. Each plan shall describe the legal basis for such authorities.		X	X
3. Each plan shall include written agreements referring to appropriate legal instruments such as legislation, among 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.	X	X	X
4. Each emergency organization shall be capable of continuous (24-hour) operations for a protracted period. The individual in the emergency 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 Objective

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

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
1. Each operator 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 operator shall designate an individual as emergency coordinator who shall be onsite 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 operator shall provide a line of succession for the emergency coordinator position as well as the specific conditions for higher level utility officials assuming this function.	X		
4. Each operator 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 make recommendations to authorities responsible for offsite emergency measures.	X		

B. Onsite Emergency Organization (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
5. Each operator shall specify the positions or title and qualifications to be met 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 capabilities and staffing on-shift and available within one-half hour following the declaration of the emergency class shall be as indicated in Table B-1.	X		
6. Each operator 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 near-site emergency operations center.	X		
7. Each operator shall establish the framework for a long term augmented facility operator emergency organization. The Recovery Organization recommended by the Atomic Industrial Forum, which would come into play several hours after the initiation of an accident, ("Nuclear Power Plant Emergency Response Plan" dated October 11, 1979), is an acceptable framework.	X		
8. Each operator 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		

Table B-1

MINIMUM STAFFING REQUIREMENTS FOR NRC LICENSEES
FOR NUCLEAR POWER PLANT EMERGENCIES

Major Functional Area	Major Tasks	Position Title or Expertise	On Shift	Additions Within 30 minutes
Plant Operations and Assessment of Operational Aspects		Shift Supervisor (SRO)[1/]	1	--
		Shift Foreman (SRO)[1/]	1	--
		Control Room Operators	2	--
		Auxiliary Operators	2	
Emergency Direction and Control (Emergency Coordinator)		Shift Technical Advisor	1**	--
		Shift Supervisor or designated facility manager		
Notification/ Communication	Notify licensee, State local and Federal personnel & maintain communication		1	3
Radiological Accident Assessment and Support of Operational Accident Assessment	Emergency Operations Facility (EOF) Director	Senior Manager	--	1
	EOF Offsite Dose Assessment	Senior Health Physics (HP) Expertise		1
	Offsite Surveys		--	4
	Onsite (out-of-plant)		--	2
	In-plant surveys	HP Technicians	1	2
	Chemistry/Radio-chemistry	Rad/Chem Technicians	1	1
Plant System Engineering, Repair and Corrective Actions	Technical Support	Shift Technical Advisor[2/]	1	--
		Core	--	1
		Electrical	--	1
		Mechanical	--	1
	Repair and Corrective Actions	Mechanical Maintenance/	1**	1
		Rad Waste Operator		1
		Electrical Maintenance/	1**	2
		Instrument and Control (I&C) Technician		1

Table B-1 (contd)

Major Functional Area	Major Tasks	Position Title or Expertise	On Shift*	Additions Within 30 Minutes
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**	4
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	26

Notes:

* For each unaffected nuclear unit in operation, maintain at least one shift foreman, one control room operator and one auxiliary operator. This means that a single unit will require a minimum shift complement of 10, a two-unit complex 13, and a three-unit complex 16.

** 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.

1/ At least one of these must be a Senior Reactor Operator (SRO).

2/ For a multi-unit site this function may be filled by a Shift Supervisor or Foreman, provided all other qualification requirements are met.

B. Onsite Emergency Organization (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
8. (continued)			
a. logistics support for emergency personnel, e.g., transportation, 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		
9. Each operator shall specify the contractor and private organizations who may be requested to provide technical assistance to and augmentation of the emergency organization.	X		
10. Each operator shall specify the services to be provided by local agencies for handling emergencies, i.e., police, ambulance, medical, hospital, and firefighting organizations shall be specified. The operator 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 Objective

To assure that arrangements for requesting and effectively using assistance resources have been made, that arrangements for State and local staffing of the operators near-site Emergency Operations Facility have been made, and that other organizations capable of augmenting the planned response have been identified.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
1. Each State and operator shall make arrangements for support with the U.S. Department of Energy (DOE) Regional Coordinating Office responsible for implementing the DOE Radiological Assistance Plan (RAP) and the Interagency Radiological Assistance Plan (IRAP) as follows:			
a. specify persons authorized to request RAP/IRAP assistance;	X	X	
b. make arrangements for using RAP/IRAP resources (teams and equipment); and	X	X	
c. identify the available RAP/IRAP resources relied upon.	X	X	
2. Each principal organization shall plan to dispatch representatives to the operators near-site Emergency Operations Facility. The operator shall provide for the dispatch of a representative to principal offsite governmental emergency operations centers.	X	X	X

C. Emergency Response Support and Resources (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
3. Each organization shall identify radiological laboratories and their capabilities and expected response times 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.	X	X	X

D. Emergency Classification System

Planning Objective

To assure that a standard emergency classification and action level scheme is in use by the nuclear facility operator, including facility system and effluent parameters; and to assure that State and local response organizations, will rely on information provided by facility operators for determinations of initial off-site response measures.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
1. An emergency classification and emergency action level scheme as set forth in NUREG-0610 must be established by the facility operator. (See Appendix 1.) The specific instruments, parameters or equipment status shall be shown for establishing each emergency class, both in the in-plant emergency procedures and in the plan itself.	X		
2. The initiating conditions shall include the example conditions found in NUREG-0610 and all postulated accidents in the Final Safety Analysis Report (FSAR).	X		
3. Each State and local organization shall establish an emergency classification and emergency action level scheme consistent with that established by the facility operator.		X	X

E. Notification Methods and Procedures

Planning Objective

To assure that procedures have been established for notification, by the facility, of State and local response organizations and for notification of emergency personnel by all response organizations; to assure that the content of initial and followup messages to response organizations and the public have been established; and to assure that means to provide early warning 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		
	Operator	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 NUREG-0610. These procedures shall include means for verification of messages.	X	X	X
2. Each organization shall establish procedures for notifying, alerting, and mobilizing emergency response personnel.	X	X	X

E. Notification Methods and Procedures (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
3. The operator in conjunction with State and local organizations shall establish the contents of the initial emergency messages to be sent from the plant. These messages 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		
4. Each operator 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 height of release;	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. prevailing weather (wind velocity, direction, temperature, atmospheric stability data; form of precipitation, if any);	X		
h. actual or projected dose rates at site boundary; projected integrated dose at site boundary;	X		

E. Notification Methods and Procedures (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
i. projected dose rates and integrated dose at about 2, 5 and 10 miles, including sector(s) affected;	X		
j. estimate of any surface radioactive contamination;	X		
k. emergency response actions underway;	X		
l. recommended emergency actions, including protective measures;	X		
m. request for any needed onsite support by offsite organizations;	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 the information contained in initial and followup messages received from the operators.		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 operator's responsibility to ensure 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
7. Each organization shall provide written messages intended for the public, consistent with the operator's classification scheme. In particular, 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, thyroid blocking or evacuation.	X	X	

F. Emergency Communications

Planning Objective

To assure that provisions exist for prompt communications among principal response organizations, to emergency personnel and to the public.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	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 operators, 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 including 24-hour per day manning of communication link;	X	X	X
b. provision for communications with contiguous State/local governments within the Emergency Planning Zones;	X	X	X
c. provision for communications with Federal emergency response orgnizations;	X	X	X
d. provision for communications between the nuclear facility and the operators near-site Emergency Operations Facility, State and local emergency operations centers, and field assessment teams;	X	X	X
e. provision for alerting or activating emergency personnel in each response organization; and	X	X	X
f. provision for communication by the operator with NRC headquarters and NRC Regional Office Emergency Operation Centers and the operators near-site Emergency Operations Facility and radiological monitoring team assembly area.	X		

F. Emergency Communications (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
2. Each organization shall conduct periodic testing of the communications system.	X	X	X

G. Public Information

Planning Objective

To assure that accurate and timely information is provided to the public on how they will be notified and what their initial actions should be; to assure that the principal points of contact with the news media for dissemination of information (including physical location or locations) are established in advance; and to establish procedures for coordinated dissemination of information to the public.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
1. Each organization shall provide for periodic 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. respiratory protection d. sheltering e. evacuation routes			
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.			
2. The public information program describing this system is acceptable if the permanent and transient adult population within about 10 miles of the site is provided an adequate opportunity to become aware of this information annually. The program should include provision for written material that is likely to be available in a residence during an emergency.	X	X	X

G. Public Information (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
3.a. Each organization shall designate the principal points of contact and physical locations for use by news media during an emergency.	X	X	X
b. Each operator shall provide space for 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
5. Each organization shall conduct 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 Objective

To assure that adequate emergency facilities and equipment to support the emergency response are provided.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
1. Each operator shall establish a technical support center and an onsite operational support center (assembly area) in accordance with NUREG-0578 and in the NRC letter to all power reactor licensees dated October 30, 1979.	X		
2. Each operator shall establish a principal and an alternate operators nearsite 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 radiolocal emergencies. In most cases, the principal operators nearsite Emergency Operations Facility should be within one mile of the reactor. This facility shall have sufficient space to accommodate representatives from Federal, State and local governments, as appropriate.	X		
3. Each organization shall establish an emergency operations center to carry out response functions.		X	X
4. Each organization shall provide for activating and staffing the facilities and centers in a timely manner.	X	X	X
5. Each operator shall identify and establish onsite monitoring systems that are to be used to initiate emergency measures in accordance with NUREG-0610, as well as those to be used for continuing assessment.	X		

H. Emergency Facilities and Equipment (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
The equipment shall include:			
a. geophysical phenomena monitors, (e.g., meteorological, hydrologic, seismic);	X		
b. radiological monitors, (e.g., process, area, emergency, effluent, 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);	X		
d. fire and combustion products detectors.	X		
6. Each operator shall make provisions for offsite monitoring equipment including:			
a. geophysical phenomena monitors;	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.	X		
c. laboratory facilities, fixed or mobile.	X		
7. Each organization shall provide for offsite radiological monitoring equipment and shall identify offsite meteorological capability in the vicinity of the nuclear facility.	X	X	X

H. Emergency Facilities and Equipment (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
8. Each operator shall provide meteorological instrumentation and procedures which satisfy the criteria in Appendix 2, and provisions to obtain representative real-time meteorological information from other sources.	X		
9. Each operator shall provide for an onsite Operations Support Center (assembly area) which shall have adequate capacity, shielding, ventilation, and inventory of supplies, including, for example, respiratory protection, protective clothing, portable lighting and communications equipment.	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, provide for an inventory of emergency kits by general category (protective equipment, communications equipment, radiological monitoring equipment and emergency supplies).	X	X	X
12. Each organization shall establish a central point (preferably associated with the operators near-site Emergency Operations Facility), for the receipt and analysis of all field monitoring data.	X	X	

I. Accident Assessment

Planning Objective

To assure the adequacy of methods, systems and equipment for assessing and monitoring actual or potential offsite consequences of a radiological emergency condition.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
1. Each operator 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 NUREG-0610. Such parameter values and the corresponding emergency class shall be included in the appropriate facility emergency procedures.	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 operator 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		
b. the magnitude of the release of radioactive materials based on plant system parameters and effluent monitors.	X		

I. Accident Assessment (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
4. Each operator shall establish the relationship between effluent monitor readings and onsite and offsite exposures and contamination for various meteorological conditions.	X		
5. Each operator shall have the capability of acquiring 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 Center, the Technical Support Center, the Control Room and an offsite NRC center.	X		
6. Each operator 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 have a capability to detect and measure radioiodine concentrations in air in the vicinity of the site as low as 5 x 10 E-08 uCi/cc (microcuries per cubic centimeter) under field conditions in any kind of weather. Interference from the presence of noble gas and background radiation shall not decrease the stated minimum detectable activity.	X	X	

I. Accident Assessment (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
8. Each organization shall describe the capability and resources for field monitoring within the plume exposure Emergency Planning Zone	X	X	X
9. Each organization 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	
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 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.	X	X	

J. Protective Response

Planning Objectives

To assure that a range of protective actions is available for the plume exposure pathway for emergency workers and the public, guidelines for the choice of protective actions during an emergency, consistent with Federal guidance, are developed and in use, and that protective actions for the ingestion exposure pathway appropriate to the locale have been developed.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
1. Each Operator 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;			
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 Operator 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		
3. Each Operator shall provide for radiological monitoring of people evacuated from the site.	X		

J. Protective Response (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
4. Each Operator 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 this offsite location.	X		
5. Each Operator 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 on-site individuals continuously thereafter.	X		
6. Each Operator shall, for individuals on-site, make provisions for:			
a. Individual respiratory protection;	X		
b. Use of protective clothing;	X		
c. Use of radioprotective drugs, (e.g., individual thyroid protection).	X		
7. Each Operator shall establish a mechanism for recommending protective actions to the appropriate State and local authorities. These shall be based on Emergency Action Levels corresponding to projected dose to the population-at-risk, in accordance with NUREG-0610 and with the recommendations set forth in Table 5.1 of the Manual of Protective Action Guides and Protective Actions for Nuclear Incidents (EPA-510/1-75-001). As specified in NUREG-0610, prompt notification shall be made directly to the offsite autorities responsible for implementing protective measures within the plume exposure Emergency Planning Zone.	X		

J. Protective Response (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
8. Each Operator's plan shall contain time estimates for evacuation within the plume exposure EPZ. These shall be in accordance with "Request for Evacuation Time Estimates for Areas Near Nuclear Power Plants", (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 HEW/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, sectors (see Table J-1), relocation centers in host areas, shelter areas, hospital and other medical facilities;	X	X	X
b. Population distribution around the nuclear facility. This shall be in a format described in Table J-1;	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 confinement;		X	X
e. Provisions for the use of radioprotective drugs, particularly for emergency workers, including quantities, storage, and means of distribution;		X	X

TABLE J-1

SECTOR AND ZONE DESIGNATORS FOR POPULATION DISTRIBUTION MAPS 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	0-1	1
22 1/2	B	1-2	2
45	C	2-3	3
67 1/2	D	3-4	4
90	E	4-5	5
112 1/2	F	5-6	6
135	G	6-7	7
157 1/2	H	7-8	8
180	J	8-9	9
202 1/2	K	9-10	10
225	L	10-15	15
247 1/2	M	15-20	20
270	N	20-25	25
292 1/2	P	25-30	30
315	Q	30-35	35
337 1/2	R	35-40	40
		40-45	45
		45-50	50

AREA SEGMENT - An area is identified by a Sector and Zone alphanumeric designator. Thus, area A1 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 G4 would be that area between 123 3/4 to 146 1/4 degrees and the 3- and 4-mile arcs from the facility.

POPULATION - The number of permanent and maximum (including transients) persons within each of area segments constructed as above.

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

J. Protective Response (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
10. (Continued) 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 predetermined 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 mi'es, and preferably 10 miles, beyond the boundaries of the plume exposure emergency planning zone;		X	X
i. Projected traffic capacities of evacuation routes under emergency conditions;		X	X
j. Control of access to evacuated areas and organizational responsibilities for such control;		X	X
k. Identification of and means for dealing with potential impediments 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.)		X	X

1/ See DHEW 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, DHEW.

J. Protective Response (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	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[1] in residential units 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. The plan shall include 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. The maps shall start at the facility and include the areas which process food products originating in the ingestion pathway Emergency Planning Zone (EPZ).		X	

[1/] 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).

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

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

K. Radiological Exposure Control

Planning Objectives

To assure that means for controlling radiological exposures, in an emergency, are established for emergency workers and the affected population.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
1. Each Operator shall establish onsite exposure guidelines consistent with EPA Emergency Worker and Lifesaving Activity Protective Actions Guides 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;	X		
g. providing medical treatment services.	X		
2. Each Operator 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 should be worked out in advance for permitting onsite volunteers to receive radiation exposures in the course of carrying out lifesaving 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		
	Operator	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 provide for maintaining dose records.	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 shall specify action levels for determining the need for decontamination.	X	X	X
b. Each organization shall establish the means for radiological decontamination of emergency personnel, supplies, instruments and equipment, and for waste disposal.	X	X	X
6. Each Operator 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.	X		

K. Radiological Exposure Control (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
7. Each Operator 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 contamination of the skin.	X		
8. Each organization shall describe the means for registering and monitoring of evacuees at relocation centers in host areas.		X	X

L. Medical and Public Health Support

Planning Objectives

To assure that arrangements are made for medical services for contaminated individuals.[1]

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
1. Each organization shall describe arrangements for local and backup hospital and medical services and 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 Operator shall provide for onsite first aid capability.	X		
3. Each State shall develop maps showing the physical location of all 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 victims of a radiological accident. These emergency medical services should be able to radiologically monitor contaminated personnel, and have facilities and trained personnel able to care for victims of radiological accidents.		X	
4. Each organization shall describe arrangements 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), 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 Objective

To assure that general plans for recovery and reentry are developed.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
1. Each organization shall develop general plans and procedures for recovery and describe the means by which decisions to relax protective measures are reached. This process should consider both actual and potential conditions.	X	X	X
2. Each operator 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 operator 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 Objective

To assure that periodic exercises are conducted to evaluate major portions of emergency response capabilities, that the results of exercises form the basis for corrective action for identified deficiencies and that periodic drills are conducted to develop and maintain key skills.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	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. Each organization shall conduct an emergency response exercise prior to adoption of the Plan (and prior to issuance of an Operating License (OL)) and at least once every 12 months (plus or minus 3 months) thereafter to demonstrate the effectiveness of the Plan. 1/,2/,3/	X	X	X

1/ Each State shall conduct at least one exercise within each 12-month period. The number of exercises needed to assure adequacy of State response capability for those States with more than one nuclear facility site is open and under review by NRC and FEMA. Both agencies solicit public comments on this point.

2/ NRC and FEMA urge the organizations to invite participation by volunteers and members of the public whenever possible.

3/ The organizations should invite participation in exercises by Federal response organizations periodically. The required frequency for joint exercises with Federal response organization is yet to be established; both NRC and FEMA solicit public comment on this question.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
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 shall 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.	X	X	X
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 evaluated by the 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 annually. Communications between the nuclear facility, State and local emergency operations centers, and field assessment teams shall be tested annually.	X	X	X

N. Exercises and Drills (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
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
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, grass, soil and air).	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.	X	X	
(2) Analysis of inplant liquid samples with actual elevated radiation levels shall be included in Health Physics drills by operators.	X		

N. Exercises and Drills (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
3. The scenarios[4/] 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.	X	X	X
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 desribing 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.	X	X	X
f. Arrangements for qualified observers.	X	X	X

4/ The NRC and FEMA are developing a series of scenarios which can be used in exercising the plans. The organizations will be able to select an exercise scenario from this list on a rotating basis.

N. Exercises and Drills (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
4. Qualified observers from Federal, State or local governments will observe 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. 5/	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

5/ NRC and FEMA will publish guidance for use by observers in evaluating exercises.

O. Radiological Emergency Response Training

Planning Objective

To assure that radiological emergency response training is provided to those who may be called upon to assist in an emergency.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
1. Each organization shall make provisions for the training of appropriate individuals	X	X	X
a. Each facility to which the plan 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 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.

O. Radiological Emergency Response Training (continued)

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	State	Local
3. Training for individuals assigned to operator 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;	X	X	*
d. Police and fire fighting personnel;	X	*	X
e. Repair and damage control 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. Operator's headquarters support personnel;	X		
5. Each organization shall provide for the initial and annual retraining of personnel with emergency response responsibilities.	X	X	X

2/ If State and local governments lack the capability and resources to accomplish this training, they may look to the Operator and the Federal government 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.

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

Planning Objective

To assure that responsibilities for plan development, review and distribution of emergency plans are established and that planners are properly trained.

Evaluation Criteria	Applicability and Cross Reference to Plans		
	Operator	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 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 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		
	Operator	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 and an index.	X	X	X
9. Each operator shall arrange for and conduct independent audits of the emergency preparedness program at least every two years. The audit shall include the emergency plan, its implementing procedures and practices, training, readiness testing, and equipment. Management controls shall be implemented for evaluation and correction of audit findings. The result of the audit shall be documented, reported to appropriate organizational management and retained for a period of five years.	X		

APPENDIX 1

U.S. NUCLEAR REGULATORY COMMISSION

DRAFT EMERGENCY ACTION LEVEL GUIDELINES FOR NUCLEAR POWER PLANTS

September 1979

OFFICE OF NUCLEAR REACTOR REGULATION
U.S. NUCLEAR REGULATORY COMMISSION

BASIS FOR EMERGENCY ACTION LEVELS FOR NUCLEAR POWER FACILITIES

This document is provided for interim use during the initial phases of the NRC effort to promptly improve emergency preparedness at operating nuclear power plants. Changes to the document can be expected as experience is gained in its use and public comments are received. Further, the Commission has initiated a rulemaking procedure, now scheduled for completion in January 1980 in the area of Emergency Planning and Preparedness. Additional requirements are to be expected when rulemaking is completed and some modifications to this document may be necessary.

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 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 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 which, if exceeded, will initiate the emergency class.

Some background information on release potential and expected frequencies for the various classes is provided in this material. Note that there is a wide band of uncertainty associated with the frequency estimates. The release potential given reflects the amount that could be released over a long time period or under favorable meteorological conditions without exceeding the exposure criteria of a more severe class. Release of these amounts in a short time period under unfavorable meteorological dispersion conditions might trigger the criteria of a more severe class.

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. 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) provide current information on unusual events, and (3) provide a periodic unscheduled test of the offsite communication link. Release Potential No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs. Expected Frequency Once or twice per year per unit.	1. Promptly inform State and/or local offsite authorities of nature of unusual condition as soon as discovered 2. Augment on-shift resources 3. Assess and respond 4. Close out with verbal summary to offsite authorities; followed by written summary within 24 hours or 5. Escalate to a more severe class	1. Provide fire or security assistance if requested 2. Standby until verbal closeout or 3. Escalate to a more severe class

EXAMPLE INITIATING CONDITIONS: NOTIFICATION OF UNUSUAL EVENT

1. ECCS initiated

2. Radiological effluent technical specification limits exceeded

3. Fuel damage indication. Examples:

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

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

6. Failure of a safety or relief valve to close

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 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, 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

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

    c. Any tornado near 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 failure

15. Other plant conditions exist that warrant increased awareness on the part of 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.

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.

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, (2) provide offsite authorities current status information, and (3) provide possible unscheduled tests of response center activation.

Release Potential

Limited releases of up to 10 curies of I-131 equivalent or up to 10^4 curies of Xe-133 equivalent.

Expected Frequency

Once in 10 to 100 years per unit.

Licensee Actions

1. Promptly inform State and/or local authorities of alert status and reason for alert as soon as discovered
2. Augment resources by activating on-site technical support center, on-site operations center and near-site emergency operations center (EOC)
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. Close out by verbal summary to offsite authorities followed by written summary within 8 hours

or

8. Escalate to a more severe class

State and/or Local Offsite Authority Actions

1. Provide fire or security assistance if requested
2. Augment resources by activating near-site EOC and any other primary response centers
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. Maintain alert status until verbal closeout

or

6. Escalate to a more severe 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 µci/cc equivalent of I-131)

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

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

3. Rapid failure of more than 10 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 or MSIV malfunction

5. Primary coolant leak rate greater than 50 gpm

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

7. Loss of offsite power and loss of all onsite AC power

8. Loss of all onsite DC power

9. Coolant pump seizure leading to fuel failure

10. Loss of functions 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. 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 toxic or flammable gases

    e. Turbine failure causing casing penetration

19. Other plant conditions exist that warrant precautionary activation of technical support center and near-site emergency operations center

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

Class	Licensee Actions	State and/or Local Offsite Authority Actions
Site 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. Purpose Purpose of the site emergency warning 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 current information for and consultation with offsite authorities and public, and (5) provide possible unscheduled test of response capabilities in U. S. Release Potential Releases of up to 1000 ci of I-131 equivalent or up to 10^6 ci of Xe-133 equivalent. Expected Frequency Once in one hundred to once in 5000 years per unit.	1. Promptly inform State and/or local offsite authorities of site emergency status and reason for emergency as soon as discovered. 2. Augment resources by activating on-site technical support center, on-site emergency operations center and near-site emergency operations center (EOC) 3. Assess and respond 4. Dispatch on-site and offsite monitoring teams and associated communications 5. Provide a dedicated 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 in emergency class by briefing of offsite authorities at EOC and by phone followed by written summary within 8 hours or 10. Escalate to general emergency class	1. Provide any assistance requested 2. Activate immediate public notification of emergency status and provide public periodic updates 3. Augment resources by activating near-site EOC and any other primary response centers 4. Dispatch key emergency personnel including monitoring teams and associated communications 5. Alert to standby status other emergency personnel (e.g., those needed for evacuation) and dispatch personnel to near-site duty stations 6. Provide offsite monitoring results to licensee and others and jointly assess them 7. Continuously assess information from licensee and offsite monitoring with regard to changes to protective actions already initiated for public and mobilizing evacuation resources 8. Recommend placing milk animals within 2 miles on stored feed and assess need to extend distance 9. Provide press briefings, perhaps with licensee 10. Maintain site emergency status until closeout or reduction of emergency class or 11. Escalate to general emergency class

EXAMPLE INITIATING CONDITIONS: SITE 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 more than 10 steam generator tubes 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. Loss of functions needed for plant hot shutdown

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

10. Fire affecting safety systems

11. All alarms (annunciators) lost for more than 15 minutes and plant is not in cold shutdown or plant transient initiated while all alarms lost

12. 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

13. Imminent loss of physical control of the plant

14. 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. Winds in excess of design levels

15. 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 toxic or flammable gases into vital areas

16. Other plant conditions exist that warrant activation of emergency centers and monitoring teams and a precautionary public notification

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

Class

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.

Purpose

Purpose of the general emergency warning is to (1) initiate predetermined protective actions for public, (2) provide continuous assessment of information from licensee and offsite measurements, (3) initiate additional measures as indicated by event releases or potential releases, and (4) provide current information for and consultation with offsite authorities and public.

Release Potential

Releases of more than 1000 ci of I-131 equivalent or more than 10^6 ci of Xe-133 equivalent.

Expected Frequency

Less than once in about 5000 years per unit. Life threatening doses offsite (within 10 miles) once in about 100,000 years per unit.

Licensee Actions

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 emergency operations center and near-site emergency operations center (EOC)
3. Assess and respond
4. Dispatch on-site and offsite monitoring teams and associated communications
5. Provide a dedicated 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 EOC and by phone followed by written summary within 8 hours

State and/or Local Offsite Authority Actions

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
4. Augment resources by activating near-site EOC and any other 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 and others and jointly assess these
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. Consider relocation to alternate EOC if actual dose accumulation in near-site EOC exceeds lower bound of EPA PAGs
12. 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 masured in the environs.

   Note: Consider evacuation only within about 2 miles of the site boundary unless these levels are exceeded by a factor of 10 or projected to continue for 10 hours

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

   Note: Consider 2 mile precautionary evacuation. If more than gap activity released, extend this to 5 miles downwind.

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.

   Notes: a. For sequences where significant releases 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 are in the containment atmosphere. Recommend sheltering in other parts of the plume exposure Emergency Planning Zone under this circumstance.

   b. For sequences where significant releases 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 containmer* atmosphere, consider precautionary evacuation to 5 miles and 10 mile downwind evacuation (45° to 90° sector).

   c. For 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.

EXAMPLE PWR SEQUENCES

1. Small and large LOCA's with failure of ECCS to perform leading to severe core degradation or melt. Ultimate failure of containment likely for melt sequences. (Several hours available for response)

2. 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.

3. Transient requiring operation of shutdown systems with failure to scram. Core damage for some designs. Additional failure of core cooling and makeup systems would lead to core melt.

4. 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.

5. 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 meltthrough with release of gases only for dry containment; quicker and larger releases likely for ice condenser containments for melt sequences or for failure of containment isolation system for any PWR.

EXAMPLE BWR SEQUENCES

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

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

3. 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.

4. 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.

5. Any major internal or external events (e.g., fires, earthquakes, etc.) 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

1. Primary Meteorological Measurements Program

   a. Position: All sites with operating nuclear power plants shall have an adequate operational meteorological measurements program to produce real-time and record historical local meteorological data.

   b. Purpose: To allow a determination of the dispersion of radioactive material due to accidental and routine radioactive releases to the atmosphere by the plant.

   c. Acceptance Criteria:

      (1) The meteorological measurements program shall include measurements and calculations of the following parameters:

         (a) Wind direction and speed at a minimum of two levels (see Regulatory Guide 1.23) one of which is representative of the 10-meter level;

         (b) Standard deviation of wind direction fluctuations (sigma theta) at all measured levels;

         (c) Vertical temperature difference for at least one layer;

         (d) Ambient temperature (10 meters);

         (e) Dew point temperature (10 meters);

         (f) Precipitation near ground level; and

         (g) Pasquill stability class used for diffusion estimates.

(2) The remaining acceptance criteria stated in Revision 1, Section 2.3.3 of NUREG-75/087, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, apply.

(3) A quality assurance program shall be established consistent with the applicable provisions of Appendix B to 10 CFR Part 50. The acceptance criteria stated in Revision 1, Section 17.2 of NUREG-75/087 apply.

(4) The meteorological measurements system and associated controlled environment housing for the equipment shall be connected to a power system which is supplied from redundant power sources.

2. Backup Meteorological Measurements Program

a. Position: All sites with operating nuclear power plants shall have a viable backup system and/or procedures to obtain real-time local meteorological data.

b. Purpose: To provide meteorological information when the primary system is out of service, thus providing assurance that basic meteorological information is available during and immediately following an accidental airborne radioactivity release.

c. Acceptance Criteria:

(1) An independent system and/or procedures shall be established for obtaining measurements of wind direction and speed representative of the 10-meter level and a seven category (A-G) estimator of atmospheric stability (ΔT, wind fluctuations, etc.).

NOTE: An independent system is defined as a system installed and maintained by the licensee specifically for the purpose of providing redundant site-specific meteorological information. An independent procedure is defined as a procedure whereby meteorological information can be obtained from an existing well-maintained meteorological installation capable of providing information representative of the site environs.

(2) The systems and/or procedures shall provide information representative of the site environs, and should include data from multiple locations when necessary.

(3) The system and/or procedure shall provide information in a real-time mode in the event necessary parameters from the primary system are not available. Changeover from the primary system to the backup system shall occur within five minutes. This information should be presented in place of the lost record as outlined in Enclosure 1.

(4) The remaining acceptance criteria stated in Revision 1, Section 2.3.3, of NUREG-75/087, apply.

(5) A quality assurance program shall be established consistent with the applicable provisions of Appendix B to 10 CFR Part 50. The acceptance criteria stated in Revision 1, Section 17.2 of NUREG-75/087, apply.

(6) The meteorological measurements and associated controlled environmental housing system for the equipment shall be connected to a power system which is supplied from redundant power sources.

3. Real-time Predictions of Atmospheric Effluent Transport and Diffusion

a. Position: All licensees with operating nuclear power plants shall have a demonstrated system for making real-time, 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.

b. Purpose: To provide an input to the assessment of the consequences of accidental radioactive releases to the atmosphere. To aid in the implementation of emergency preparedness decisions.

c. Acceptance Criteria:

(1) Real-time, site specific atmospheric transport and diffusion models shall be developed and used when accidental airborne radioactive releases occur. Two classes of models should be developed; Class A - a model and calculational capability which can produce initial transport and diffusion estimates within fifteen minutes following classification of an incident, and Class B - a model and calculational capability which can produce refined estimates for the duration of the release. The models shall incorporate the following features:

(a) Site area topography, local meteorological anomalies (as at coastal locations) and available local meteorological measurements;

(b) Variations in time and space of the parameters affecting transport and diffusion, including forecasts of changing meteorological conditions, for model Class B only;

(c) Information from all local meteorological measuring systems used in making the transport and diffusion estimates shall be identified. The licensee shall make arrangements to transmit data from these systems at 30-minute intervals duing an incident.

(2) The transport and diffusion estimates shall include current and forecast plume position, dimensions and radioactivity concentrations at 30-minute intervals as a minimum. Forecast capability up to 24 hours in the future is required in three-hour increments. Such estimates shall be included as a portion of the information accessible for remote interrogation.

(3) A determination shall be made of the accuracy and conservatism of the models in estimating atmospheric transport and diffusion to distances out to 80 km (50 miles).

4. Remote Interrogation of the Atmospheric Measurement and Prediction Systems

a. Position: 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.

b. Purpose: To provide simultaneous real-time meteorological data and transport and diffusion estimates in the site vicinity to the licensee, emergency response organizations and the NRC staff, on demand, during emergency situations.

c. Acceptance Criteria:

(1) The meteorological system shall have the capability of being remotely interrogated simultaneously by the licensee, emergency reponse organization and the NRC.

(2) The meteorological data and effluent transport and diffusion estimates shall be in the format indicated in Enclosure 1.

(3) The systems shall have a dial-up connection for a 300 BAUD ASCII terminal of 80 columns via telephone lines (e.g., output format of RS232C in FSK) and a functional back-up communications link (e.g., radio or satellite).

(4) The system shall have the capability of recalling 15-minute averages of meteorological parameters from at least the previous 12-hour period.

(5) The resolution of the data shall meet the system specifications of accuracy given in Section C.4 of Regulatory Guide 1.23.

ENCLOSURE 1

FORMAT FOR INTERROGABLE DATA FROM METEOROLOGICAL SYSTEMS

To facilitate the remote interrogation requirments and the ability of the NRC to correctly access and utilize meteorological data, the procedures outlined below shall be followed. A series of data bases shall be coupled to executable codes to yield a file containing pertinent site information, selected meteorological data, and information regarding transport and diffusion for emergency planning and during emergency situations. The access codes and execution instructions unique to the operational system shall be documented and provided to the NRC and other appropriate organizations prior to implementation.

The information to be accessed shall be available by executing an online program. Upon execution of the code, a query should be initiated requesting a meteorological data base starting and stopping time, and an option to include preliminary estimates of relative concentration. The user response will be in the form of three free field entries comprised of 2 time entries and the number of previous hours for which diffusion estimates are to be provided; i.e., YYJJJHHMM (starting time), YYJJJHHMM (stopping time), I (0 to 12), e.g., 801830015 801831200 12. An all nine field for stopping time (999999999) should conclude the data set with the most recent set of observations. The system response shall include the following: site descriptor; meteorological data field descriptor; meteorological data; diffusion estimate descriptor; and estimated relative concentration coincident with the meteorological data present from the previous I number of hours.

The information presented in the output file shall identify site information contained within a 10-record block (mandatory filling of 10 lines with blanks, if necessary). These records shall include the following items as a minimum: utility; plant names; plant location; elevation at the base of the meteorological tower; measurement heights above grade for meteorological parameters to be presented; and any additional information pertinent to identification of the site, tower, and/or parameters; e.g., last calibration date. The information shall state whether the primary system was fully operational; if not, an indication shall be given for those parameters which represent values recorded by the backup system. Suspect or lost data should be identified by the appropriate error code. The format for the site descriptor is given in Table A-1.

The meteorological information should be preceded by a 3-record block that provides a descriptor for each field of data. This 3-record block should be repeated for every 6-hour block of meteorological data; i.e., every 24 records. The format for the meteorological data field descriptor is given in Table A-2.

The meteorological data considered critical in emergency situations for initial estimation purposes shall be provided by transmission. The information requested in the following list could be altered as procedures for evaluating the consequences of radioactive release change. The list of parameters to be transmitted shall include: 15-minute averaged wind speed and direction at all measured levels; standard deviation of wind direction fluctuations (sigma theta) at all measured levels; vertical temperature difference for all measured layers; ambient and dew point temperature at the 10-meter level; and the precipitation total for the 15-minute period.

All nines in any field indicated a lost record or a parameter not monitored. All eights in any field indicated the sensor is in place and recording; however, the information was deemed suspect. All sevens in the wind direction field indicated calm. If only two levels of data are monitored, use the upper level. The format for presentation of the meteorological data record is given in Table A-3.

The relative radioactivity concentration (unit source term) and the average dose rate calculations from each major release point shall be presented at 30-minute intervals. These data may have to be repeated giving priority to those release points providing the highest concentrations. The following information shall be presented to a distance of 16km (10 miles): the direction of effluent transport (reported as direction affected); the distance to and estimate of the maximum concentration in the plume exposure pathway and the plume width (the crosswind distance to which the off centerline relative concentration decreases to 1/10 that of the maximum concentration). Estimates should also be made for locations at 3.2km (2 miles), 8km (5 miles), and 16km (10 miles) along the direction of effluent transport. This information, on an hourly basis, shall be preceded with 4 records to identify the model characteristics, release characteristics, and the 7 parameters in question. The format for the descriptor and dilution estimates is given in Table A-4.

TABLE A-1

SITE DESCRIPTOR DATA FORMAT
(8 Mandatory Records)

Record	Format	Content
1	80A1	Organization/Utility Name
2	80A1	Plant Name/Tower Identification
3	80A1	See Coding Form (Figure A-1)
4	F10.5	Latitude of Containment (degrees North)
	F10.5	Longitude of Containment (degrees West)
	F10.0	Elevation of Base of Met Tower (feet above MSL)
5	80A1	See Coding Form (Figure A-1)
6	F5.1	Height of Wind Sensor Upper Level (meters)
	F5.1	Height of Wind Sensor Intermediate Level (meters)
	F5.1	Height of Wind Sensor Lower Level (meters)
	5X	Blank
	F5.1	Heights of Temperature Difference (Upper to Lower) Upper Level (meters)
	F5.1	Heights of Temperature Difference (Upper to Lower) Lower Level (meters)
	5X	Blank
	F5.1	Heights of Temperature Difference (Upper to Intermediate) Upper Level (meters)
	F5.1	Heights of Temperature Difference (Upper to Intermediate Intermediate Level (meters)
	5X	Blank
	F5.1	Heights of Temperature Difference (Intermediate to Lower) Intermediate Level (meters)
	F5.1	Heights of Temperature Difference (Intermediate to Lower) Lower Level (meters)
	5X	Blank

TABLE A-1 (continued)

SITE DESCRIPTOR DATA FORMAT
(8 Mandatory Records)

Record	Format	Content
	F5.1	Height of Ambient Temperature Lower Level (meters)
	F5.1	Height of Dew Point Temperature Lower Level (meters)
	F5.1	Precipitation Gauge Height (meters)
7-10	80A1	Comment Section

TABLE A-2

METEOROLOGICAL DATA FIELD DESCRIPTOR
(3 RECORDS FOR EVERY 6 HOURS OF DATA)

RECORD		
1	80X	Blank
2	80A1	See Coding Form (Figure A2)
3	80X	Blank

TABLE A-3

METEOROLOGICAL DATA FORMAT
(1 RECORD PER 15 MINUTE AVERAGED DATA SET)

I2	YEAR
I3	JULIAN DATE
I2	HOUR (on 24 hour clock)
I2	MINUTE (ending observation)
F4.0	WIND DIRECTION (degrees)* UPPER LEVEL
F4.0	WIND DIRECTION (degrees)* INTERMEDIATE LEVEL
F4.0	WIND DIRECTION (degrees)* LOWER LEVEL
1X	BLANK COLUMN
F4.1	WIND SPEED (meters/sec) UPPER LEVEL
F4.1	WIND SPEED (meters/sec) INTERMEDIATE LEVEL
F4.1	WIND SPEED (meters/sec) LOWER LEVEL
1X	BLANK COLUMN
F3.0	SIGMA THETA (degrees) UPPER LEVEL
F3.0	SIGMA THETA (degrees) INTERMEDIATE LEVEL
F3.0	SIGMA THETA (degrees) LOWER LEVEL
1X	BLANK COLUMN
F5.1	TEMPERATURE DIFFERENCE (^{o}C/100m) UPPER-LOWER
F5.1	TEMPERATURE DIFFERENCE (^{o}C/100m) UPPER-INTERMEDIATE
F5.1	TEMPERATURE DIFFERENCE (^{o}C/100m) INTERMEDIATE-LOWER
1X	BLANK COLUMN
F5.1	AMBIENT TEMPERATURE (^{o}C) LOWER LEVEL
1X	BLANK COLUMN
F5.1	DEW POINT TEMPERATURE (^{o}C) LOWER LEVEL
1X	BLANK COLUMN
F5.1	PRECIPITATION TOTAL (mm) GROUND LEVEL
1X	BLANK COLUMN
I1	PASQUILL STABILITY CLASS OR EQUIVALENT TO BE ASSUMED FOR DIFFUSION ESTIMATES (1=A, 2=B, 3=C, . . . , 7=G)

*Wind direction indicates the direction <u>from</u> which the wind is coming.

TABLE A-4

DILUTION FACTOR FORMAT FOR MODEL CLASS A

RECORD		
1	80A1	MODEL CHARACTERISTICS/ASSUMPTIONS
2	80A1	RELEASE POINT/SOURCE CHARACTERISTICS
3	80A1	SEE CODING FORM ATTACHED (FIGURE A-3)
4	80A1	SEE CODING FORM ATTACHED (FIGURE A-3)
5	I2	YEAR
	I3	JULIAN
	I2	HOUR (on 24 hour clock)
	I2	MINUTE(ending observation)
	4X	BLANK
	F4.0	AFFECTED DIRECTION (degrees)*
	4X	BLANK
	F6.0	DISTANCE TO PEAK X/Q (meters)
	2X	BLANK
	1PE10.3	PEAK X/Q (sec/m^3)
	1X	BLANK
	F5.0	PLUME WIDTH TO 1/10 OF PEAK (meters)
	1X	BLANK
	1PE10.3	X/Q (sec/m^3) at 3218 meters (2 miles)
	1X	BLANK
	1PE10.3	X/Q (sec/m^3) at 8047 meters (5 miles)
	1X	BLANK
	1PE10.3	X/Q (sec/m^3) at 16093 meters (10 miles)

*Affected direction indicates the direction to which the wind is going.

NOTE: Dilution factor formate for model class B to be developed.

NRC Form 93A
(12-76)

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OFFICE _____

PAGE _____ OF _____

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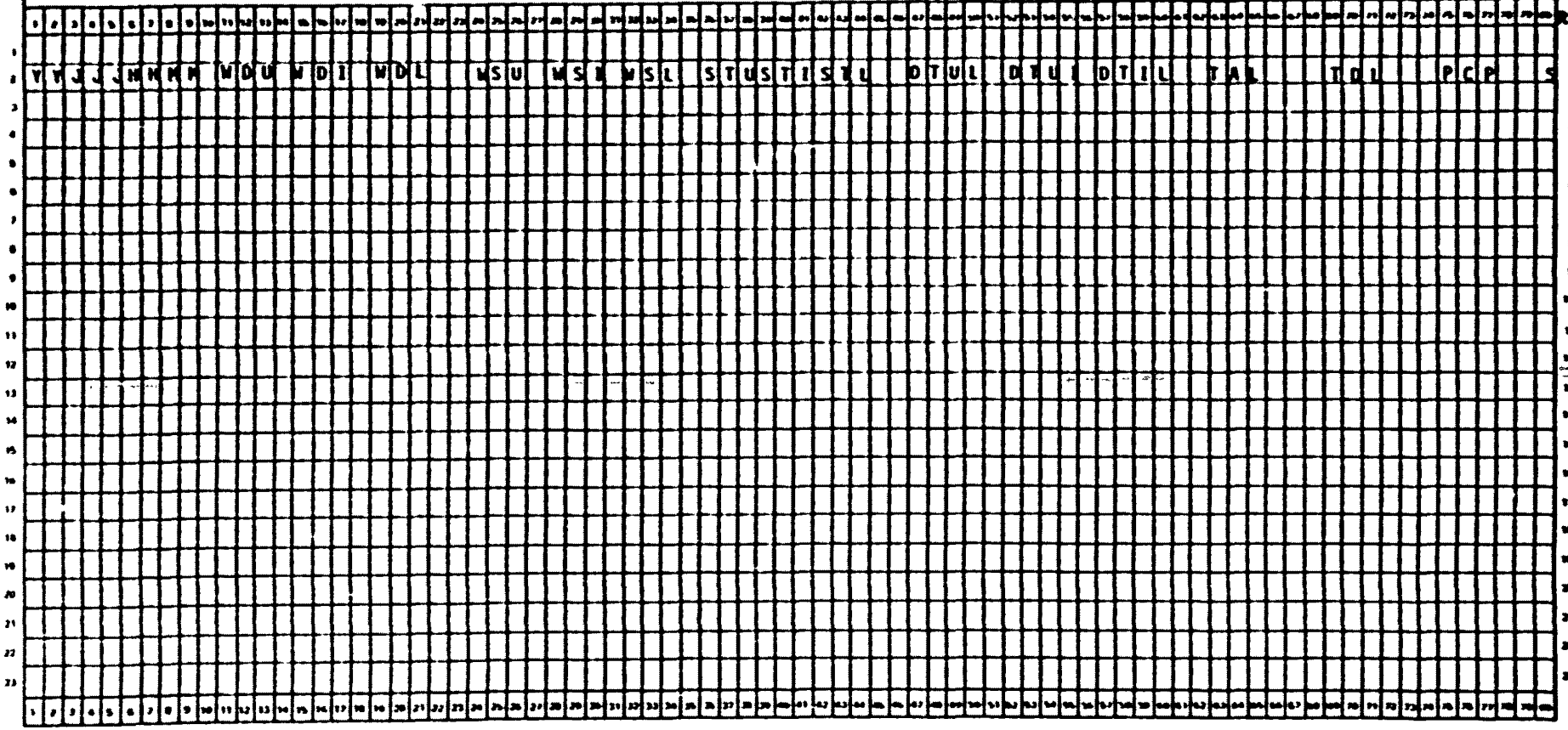
FIGURE A-1



NRC FORM 53A
(12-76)

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FIGURE A-2

REC

TIME BLOCK DIRECTION DISTANCE PEAK PLUME CHI/Q'S AT DOWNWIND DISTANCES

AFFECTED TO PEAK CHI/Q WIDTH 3218 8047 16093

APPENDIX 3

MEANS FOR PROVIDING A PROMPT NOTIFICATION TO 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 assuring that the means exist for putting such a system into place rests with Facility Operators.

The design objective for this element shall be to complete the initial notification of the affected population wihtin the plume exposure pathway Emergency Planning Zone within 15 minutes of the notification of the State and local government by the facility operator.

The plans shall include:

- o The specific organizations or individuals who will be responsible for notifying the affected population;
- o A capability for 24-hour per day notification;
- o Provision for the use of public communications media or other methods for issuing emergency instructions to members of the public; and
- o 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.

Detailed considerations are:

a. Implementation Means (Prompt Public Notification)

Means for providing a prompt notification signal to the public within a 10-mile radius of a site may include a combination of notification systems. Several examples of notification systems are discussed in the exhibit entitled, "Physical Systems Prompt Notification Signal." A system which requires the recipient to turn on a radio before a signal is received is not acceptable.

b. Effectiveness of Notification

The minimum acceptable design objectives for coverage (e.g., 60 db signal from sirens) by the notification system are:

Distance	% Notified in 15 Minutes
5 miles	100%
5 to 10 miles	90%

The design objective for the remaining 10% of the public within 10-mile zone is notification within 45 minutes after notification of local officials.

The basis for any exceptions (e.g., for extended water areas with transient boats or remote hiking trails) must be documented. Assurance of continued notification capability may be done on a statistical basis. Every year, the operator shall take a statistical sample of the residents of all areas within about ten miles to assess the public's awareness of the prompt notification system and the availability of information on what to do in an emergency. The plan must include a provision for corrective measures to provide reasonable assurance that coverage approaching the design objectives is maintained. The first survey by the operator shall be done by June 1981.

c. Public Information

Initial notifications of the public might include instructions to stay inside, close windows and doors, and listen to radio and TV for further information. A prompt notification scheme shall include the capability of local and State agencies to provide such information promptly over radio and TV. 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.

EXHIBIT

PHYSICAL SYSTEMS FOR PROVIDING A PROMPT NOTIFICATION SIGNAL

Use of Sirens as Alerting Devices

Sirens are one of several acceptable means to satisfy the provisions for the prompt notification of the public. The design of such a system 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.

In an EPA statistical sample,[1/] the background noise in residential areas across the United States is illustrated in the following table:

Population Density (persons/mi^2)	Ten Percentile Sound Level
30,000	70db (decibel)
10,000	62db
4,000	55db
2,000	48db

The ten percentile sound level will usually not be exceeded more than ten percent of the time. The average ambient sound level would be somewhat lower.

1/ United States Environmental Protection Agency Publication 550/9-74-009, Population Distribution of the United States as a Function of Outdoor Noise level (June 1974).

The basic criterion needed for the design of a siren system is the acceptable dissonant sound level.[2/]

As an acceptable criteria at most locations, the NRC staff believes that 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 may be needed to provide an audible 10db dissonant differential.

Siren systems should be designated considering the demography and topography of an area, and taking into account other warning systems in place or planned. The maximum sound levels received by any member of the public should be lower than 120db, the level which may cause discomfort to individuals.[3/]

National Oceanic and Atmospheric Administration (NOAA) Weather or 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 Administration (NOAA) or the Federal Communications Commission (FCC). Receivers and servicing thereof could be offered as a service.

2/ Federal Emergency Management Agency Publication CPG 1-17, "Outdoor Warnings Systems Guide," March, 1980 (in printing) (Based on Bolt Beranek and Newman, Inc. Report 4100, June 1979).

3/ Defense Civil Preparedness Agency (now Federal Emergency Management Agency) contract report "Outdoor Warning Systems Guide." Contract No. DCPA-01-78-C-329 (June 1979).

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 ten rings, the next number is dialed automatically; the unanswered numbers are redialed at the end of the queue. This system could be most cost-effective and secure for warnings to principal response officials, school systems, selected industrial complexes, downstream water works or isolated farms.

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

REQUEST FOR EVACUATION TIME ESTIMATES (AFTER NOTIFICATION) FOR AREAS NEAR NUCLEAR POWER PLANTS

Background

Prior to recent NRC requests that means for prompt notification to the public be installed around each nuclear power plant site, a significant component of evacuation time estimates was the time required to notify the public of a need for evacuation. Studies of actual evacuations that have taken place generally do not distinguish between the time required for notification, the time required to implement the evacuation, and the time required to confirm that an evacuation has taken place.[1/] The requested estimates for time required for evacuations relate primarily to the time to implement an evacuation as opposed to the time required for notification. These estimates may be based on previous local experiences (e.g., chemical spills or floods) or may be based on studies related to population density, local geography and road capacities. No standard method for making such estimates is identified for use at this time, but the basis for the method chosen should be described in the response. As an independent check on the evacuation time estimates, the organization doing the evaluation should obtain agreement with comments from the principal local officials responsible for carrying out such evacuations. Such agreement should be documented or the areas of disagreement indicated in the submittal.

1/ Hans, J. M., Jr., and T. C. Sell, 1974 Evacuation Risks - An Evaluation, U. S. Environmental Protection Agency, National Environmental Research Center, Las Vegas, EPA-520/6-74-002.

The format given below is appropriate for reporting to the NRC estimates of the time required to evacuate areas near nuclear power plants. These estimates should be made in order to give officials who would make evacuation decisions, knowledge of the time required to complete evacuation for all or a segment of the population. A second purpose of these estimates is to identify to all concerned those instances in which unusual evacuation constraints exist and where special planning measures should be considered. In some cases of extreme difficulty, where a large population is at risk, special facility modifications may also be considered.

Given a decision to evacuate rather than shelter in an actual event, more or less sectors or distances different than given in the reporting format might be evacuated should this be the chosen protective action. For example, three 22-1/2^{o} sectors might be initially evacuated in a downwind direction (the sector containing the plume and an adjacent sector on each side) followed by the evacuation of other sectors as a precautionary measure.

Format for Reporting Information

The areas for which evacuation estimates are required must encompass the entire area within a circle of about 10 miles radius, and have outer boundaries corresponding to the plume exposure EPZ. These areas are as follows:

Distance	Area
2 miles	two 180° sectors
5 miles	four 90° sectors
about 10 miles	four 90° sectors

In making estimates for the outer sectors, the plan should assume that the inner adjacent sectors are being evacuated simultaneously. To the extent practical, the sector boundaries should not divide densely populated areas. Where a direction corresponding to the edges of areas for which estimates have been made is thought not to be adequately represented by the time estimates for adjacent areas, an additional area should be defined and a separate estimate made for this case. The format for submittal shall include both a table and figure (overlayed on a map), both of which shall provide the information requested in items 1 and 2, below. Additional material may be provided in associated text.

Required Information

1. Two time estimates are requested in each of the areas defined in item 1 for a general evacuation of the population (not including special facilities). A best estimate is required and an adverse weather estimate is required for movement of the population.

2. The total time required to evacuate special facilities (e.g., hospitals) within each area must be specified (best estimate and and adverse weather).

3. The time required for confirmation of evacuation should be indicated. Confirmation times may consider special instructions to the public (e.g., tying a handkerchief to a door or gate to indicate the occupant has left the premises).

4. Where plans and prompt notification systems have not been put in place for areas out to about 10 miles, estimates of the times required to evacuate until such measures are in place for the plume exposure emergency planning zone (EPZ) should also be given. Notification times greater than 15 minutes should be included in the evacuation times and footnoted to indicate the notification time.

5. Where special evacuation problems are identified (e.g., in high population density areas), the report shall specify alternative protective actions, such as sheltering, which would reduce exposures and the effectiveness of these measures.

6. A short background document should be submitted giving the methods used to make the estimates and the asumptions made, including the routes and methods of transportation used. This document should also note the agreement or areas of disagreement with principal local officials regarding these estimates.

APPENDIX 5

GLOSSARY

Onsite Technical Support Center

An onsite technical support center (TSC) shall be maintained by each operating nuclear power plant. The TSC shall be separate from, but in very close proximity to, the control room. The TSC shall have the capability to display and transmit plant status to those individuals who are knowledgeable of and responsible for engineering and management support of reactor operations in the event of an accident, and those persons who are responsible for the management of the accident. Upon activation, this facility will provide the main communication link between the plant, the Operational Support Center, the Nuclear Regulatory Commission, and the operators near-site Emergency Operations Facility. The TSC will be staffed by plant management and technical personnel.

Onsite Operational Support Center (Assembly Area)

An onsite operational support center shall be established and be separate from the control room. The Operational Support Center shall be the place to which the operations support personnel report in an emergency situation. Communications will be provided with the plant control room, technical support center, and the operators near-site Emergency Operations Facility.

Emergency Operations Facility (Near-Site)

This facility will be operated by the licensee for continued evaluation and coordination of all licensee activities related to an emergency having or

potentially having environmental consequences. The facility will have sufficient space to accommodate representatives from Federal, State and local governments as appropriate. In addition, the major State and local response agencies may provide for data analysis jointly with the operator at this location. The Emergency Operations Facility (EOF) will provide information needed by Federal, State and local authorities for implementation of off-site emergency plans in addition to a centralized meeting location for key representatives from the agencies. Recovery operations shall be managed from this facility. Press facilities shall be available at the Emergency Operations Facility.

NRC FORM 335 (7 77)

U.S NUCLEAR REGULATORY COMMISSION

BIBLIOGRAPHIC DATA SHEET

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3 RECIPIENT S ACCESSION NO

7 AUTHOR(S)
NRC/FEMA Steering Committee

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16 ABSTRACT (200 words or less)

The purpose of this interim 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 supersedes previous guidance and criteria published by FEMA and NRC. It will be used by reviewers in determining the adequacy of State, local and nuclear power plant operator emergency plans and preparedness.

17. KEY WORDS AND DOCUMENT ANALYSIS

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