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NRC INCIDENT RESPONSE

1/14/77

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STUDY

DRAFT #2

7/23/76

THIS DOCUMENT CONTAINS POOR QUALITY PAGES

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NRC INCIDENT RESPONSE

I. Introduction

The purpose of this paper is to consider how the existing incident response capabilities of the NRC might be improved. Present NRC actions taken in response to a serious incident are directed and accomplished from an Incident Management Center (IMC). The scope and capabilities of the present IMC are described in Appendix D to this paper.

To implement an emergency response plan, it is necessary that the IMC be equipped with appropriate communications services, information handling and evaluation aids, pre-approved action guidelines, and technical and management personnel resources. The present IMC, which is manned during the course of an incident by a team of NRC management and technical staff, has all of these in some degree. This paper addresses whether practical and useful short term and long term improvements can be made. The approach in the following sections is to discuss the practicality and need for various IMC resources as a function of the goals of the NRC response capability and the time sequences of a spectrum of incident scenarios judged typical of those that are at least theoretically possible.

II. Major Considerations

A. Goals of Incident Response Capabilities

By an incident, in this paper, is meant those events which present an actual or imminent threat to the public health and safety or the common defense and security; specifically (1) an event which has had actual significant radiological consequences or involved a confirmed diversion of protected material or (2) an event which has the potential for immediate significant radiological consequences or the potential for immediate diversion of protected material. For example, an event such as the Browns Ferry fire would, at least for the first few hours, be classed as an incident requiring activation of the IMC, but an operational problem such as channel box wear or pipe cracks would be handled through normal organizational channels as they would not require an immediate response to protect the public health and safety. (Improvements in the efficiency of handling longer term problems are not addressed in this paper.)

Although a final judgment has not been made on the precise role that the NRC should seek to play in the event of a serious incident, the following overall goal has been assumed for the purpose of this discussion paper as reflecting current staff opinion and providing a broad framework for discussion of various alternatives:

> The goal of NRC incident response is to obtain and evaluate information in order to have the capability to make independent judgments with regard to the impact of licensee and other agency actions on the public health and safety and the common defense and security and to have the capability to assist the licensee and other agencies where possible and direct the licensee if required.

The practicality of achieving this goal is of course dependent on the time available to respond in a given incident and the level of resources committed to achieving this goal. These aspects are discussed later in Section II of this paper.

The overall objective of NRC incident response can be subdivided into several activities which would be pursued by the IMC incident response team. These are listed below in the order in which the activities would be initiated. Once initiated, these activities would continue in some form until the incident response team was disbanded.

1. Information Gathering

   a. Obtain early, factual information in as complete a form as practical to determine and initiate the physical and personnel resources likely to be required by NRC and to inform responsible authorities within and outside NRC in accordance with pre-planned action guidelines.

   b. Monitor and record the course of the incident and the response actions taken by licensees, NRC and other involved agencies.

2. Evaluation

   a. Evaluate the information obtained with respect to the likely future course of events within the facility and likely offsite consequences and determine whether the actions taken up to that point by the licensee and other agencies will assure that effects on the public health and safety and the common defense and security are minimized.

b. Determine the alternative courses of future action available to the licensee, NRC and other agencies and the consequences of these actions on the public health and safety and common defense and security to form a basis for interaction and discussion with the licensee and other agencies as determined to be desirable.

c. Determine the additional resources required to provide assistance or direction.

3. Assistance

On the basis of evaluation of information obtained, determine what assistance to the licensee and other agencies is feasible and useful and initiate that assistance. The assistance may be in the form of discussions in which opinions are exchanged or advice given or in the form of making technical (including security) expertise available remotely or at the site.

4. Direction

On the basis of evaluation of information obtained, determine whether the actions or lack of actions taken by the licensee warrant formal intervention by the NRC and initiate this action. This direction could take the form of oral and written directives by a responsible officer of the NRC or, in the extreme, could theoretically involve on-site direction of actions.

B. Timing of the Response

The timing of the NRC response to an incident is a significant consideration in determining the resources required for incident response and the practicality of accomplishing the above stated goals of the response activities. The physical resources which must be held in readiness for response increase dramatically as the desired response time is shortened. For example, the NRC can presently place an inspector on-site in from one to six hours. To significantly shorten this time would require additional resources such as arrangements for helicopter use or on-site inspectors. (This is not to say that alternative communication means with the site could not supply a substantial amount of the information that could be obtained by an on-site inspector.)

Another example of the relationship between timing and resources is the activation of the IMC. The present reaction time for IMC activation is about 1 hour following notification of an incident. The limiting consideration in this activation time is location of the appropriate technical and management personnel and their travel time to the IMC. To significantly shorten this activation time would require the continuous presence of qualified staff at the IMC or quicker notification and travel methods (e.g., pagers and helicopters).

The incident scenarios discussed in Section III of this paper illustrate the types of incidents and the timing of decision points. It is clear that for many important scenarios, a response time of an hour to a few hours is adequate if adequate factual information is available to the IMC in the same time frames. Some scenarios, on the other hand, have important decision points early in the event sequences. To be reasonably sure that a response is the correct response in a short time frame, however, carries the implication of the availability of a very large amount of plant specific information and the large concommitant physical resources associated with obtaining this information (for example, readout of plant process information in the IMC via computer hookup with the reactor).

C. Type of Incident

Whether an incident is internally or externally caused has a direct bearing on the role of the NRC in the incident. For example, for plant related accidents the NRC has lead agency responsibility, but for external threats, the FBI assumes this role. While this paper contains discussions of events related to plant security, the primary thrust of the paper is toward incidents caused by equipment failures, unusual natural phenomena or transportation accidents. Certain resources in addition to those identified as practical and useful in this paper will be forthcoming in the near future. An outline of the considerations that lead to the determination of the resources required to respond to safeguards incidents is given in Appendix H. On the basis of the NMSS review of this paper to date, nothing has been identified that would cause a major revision to the resources proposed in this paper that were selected on the basis of incidents resulting in radiological consequences.

III. Basis for Resource Requirements

A. Consideration of scenarios

To determine what resources would be practical and useful for the incident management center, a number of possible incident scenarios were postulated, developed and reviewed to determine whether common characteristics could be identified which would lend weight to pre-collecting a particular set of plant or site information for use in the IMC, obtaining certain standard incident status information from plant and site, establishing standard evaluation resources, or specifying that certain personnel be consulted. The scenarios were also examined to determine which of the response activities previously discussed (information gathering, evaluation, advice and direction) would be feasible on the time scale available for influencing the course of the event. Many of the scenarios were taken from the WASH-1400 study and involve core-melt sequences of very low probability. Other scenarios are more credible and one, the large fire, has actually occurred. In most cases faults in addition to the initiating event were postulated to produce a scenario in which the potential offsite consequences would be great enough to warrant NRC action if the utility did not perform adequately. The postulated incidents for which detailed scenarios (which are presented in Appendix A) were developed are as follows:

Radiological Consequences

1. Large Loss of Coolant Accidents (16 scenarios)
2. Small LOCA's (5 scenarios)
3. Reactor Plant Transients (4 scenarios)
4. Refueling Accidents
5. Gaseous and Liquid Waste Releases (2 scenarios)
6. Large Fire (Browns Ferry)
7. Abandoned Control Room at a Nuclear Power Plant (2 scenarios)
8. Crash of Spent Fuel Cask with Release of Radioactivity (2 scenarios)

9. Major Flooding or Other Natural Phenomena at a Nuclear Power [illegible] [illegible]narios)

10. East Coast Blackout

Radiological and Safeguards Consequences

11. Seizure of a Reactor with Threat of Sabotage

Safeguards Consequences with Potential Radiological Consequences

12. Penetration of Physical Barrier at a Fuel Facility with Theft of SNM

It should be emphasized that the scenarios presented in Appendix A were selected as situations beyond the expected to illustrate the times by which an NRC response, if any, would be required. A design basis accident which followed its expected course would involve only information gathering and evaluation by the NRC to confirm that adequate actions were being taken by the licensee and other responsible agencies.

It should also be noted that the need for active NRC involvement in an incident is predicated on the failure of preplanned utility and State actions either because an event different than planned for has occurred or because of a breakdown in the execution of the preplanned actions. Emergency plans and procedures developed by each utility are examined during the course of licensing reviews and are required to be based on the assumption of no NRC intervention.

Several observations with regard to the timing of operator action to prevent core melting can be made on the basis of these scenarios. For example, in 11 of the 16 large LOCA scenarios core melt was calculated to be initiated in 20 minutes or less and a major fission product release within about one hour was calculated for these cases. The proportion of the large LOCA sequences that would result in a relatively quick fission product release is not important, but the fact that a large number of scenarios would require essentially instantaneous response to affect the outcome of the incident and prevent core melting is important. After consideration of the type and timing of information and action plans that would have to be available to a continuously staffed IMC, we have concluded that NRC action to change the course of in-plant or off-site events in a time frame of less than an hour is neither feasible nor desirable. All action within such a short time frame must be taken by those with the best information, the best knowledge of the facility, and the best chance to influence the outcome of a sequence of events--the on-site plant operating staff. Even if it were possible to arrive at specific action plans for response to a large number of accident scenarios which would theoretically allow remote direction of an incident, the best use of these action plans would be to make them available to all operating plants for incorporation into their emergency procedures.

A number of the scenarios considered (including some large and small LOCA's, some plant transients, the large fire, and some hydrological events) require reaction times in the order of a few hours after event initiation. For this type of event, NRC interaction with the licensee would be feasible but may not be desirable because of the need for action by operational personnel with access to the best available plant and incident knowledge.

Despite the impracticality of obtaining and adequately evaluating plant and site information immediately after initiation of an incident, there are a nuimber of scenarios where actions taken many hours after initiation of an incident are of high significance. This is particularly true in plant transients initiated by mechanical or electrical eqiupment failure, fires, loss of offsite power, reactor seizure, abandoned control room, and major flood event. Even in these cases, however, an intimate knowledge of the facility by the operating staff would have to be combined with any additional evaluative resources that the IMC may be able to bring to bear to implement actions within the facility. The IMC plant-related activities are therefore expected to be at most advisory in nature. It would be an extremely unusual situation where directives would need to be issued with regard to specific plant actions in response to incidents. A somewhat better case can be made for IMC direction of off-site actions, mainly because of the additional time available during which the radioactivity is being transported to the population and the fewer number of physical parameters required for decisions regarding off-site actions. Even for off-site actions, however, the IMC role would be much more likely to be adisory than directive.

On the basis of the above discussion, we conclude that the main focus of the resource requirements for the IMC should be on those information gathering, evaluation, and communication capabilities which will allow the IMC to function effectively in an advisory capacity in the time period starting at least a few hours after an incident. We also conclude, however, that it is prudent to provide the legal and communication resources to assure the capability to direct a licensee should the need ever become evident during the course of an incident.

B. Recommended Resources for the IMC

1. Discussion

As discussed above, we recommend that the resources for the IMC be those that allow efficient collection and evaluation of information to assure that the IMC can function in an advisory capacity within a few hours after an incident is initiated. The administrative and communication resources should be such that should the unlikely situation arise where the NRC needed to direct a licensee, the capability to do so would exist.

The approach of this section is to set forth the recommended IMC resources in five categories:

a. Physical IMC facility and IMC organization--physical, communications and personnel requirements for the IMC;

b. Precollected information--information on the plant and site that would be available to the IMC staff at the start of an incident and with which it would be generally familiar;

c. Real time information--lists of plant and site parameters and interactions with other agencies likely to be required during the course of an incident;

d. Evaluation resources--personnel, computer and other tools needed to evaluate information obtained.

e. Action resources--communication and transportation capabilities and management tools needed to assure that any necessary advice or direction reaches the site in a timely manner.

These recommended resources are then discussed in section IV with respect to whether they should be implemented on a short- or long-term basis. In many cases, the content of a particular list of recommended information will need to be further developed by specialists in the particular area. Such cases have usually been designated for long-term development.

2. Resources

a. Physical IMC facility and Organization

The present arrangements depicting authorities and responsibilities and the existing layout and arrangement for NRC incident response are described in Appendices B, C and D. These existing arrangements have been reviewed jointly by NRR and IE. A proposal to meet NRC's needs to accomplish its mission for incident response is given below:

(1) Organization for Incident Response

On the basis of a review of the existing organization for incident response, we have concluded that some changes are necessary for the proper functioning of the IMC. One apparent deficiency is that a senior advisory group to the IRACT does not formally exist. Such a team would function in a manner similar to the EACT (Emergency Action & Coordination Team) created by ERDA as a management advisory team. It is clear that the IRACT should be the response arm of NRC but those dealing with an incident need immediate access to and guidance by senior level management. This would exist to some extent without a formal designated structure, but we recommend that the composition of the advisory group be clearly delineated at this time.

It is also clear that the IRACT itself needs the capability to obtain operational assistance immediately from the line offices in order to better function because at least some of the technical resources of NRR and NMSS will probably be needed for serious incidents. The concept of the existing charter described in NRC Manual Chapter 0502 for the IRACT need not be changed to accomplish this objective, only the team makeup.

We, therefore, recommend the following members be designated for membership to the Management Advisory Team (MAT) and the Incident Response Action Coordination Team (IRACT). (Because the Line Office Directors [NMSS, NRR, IE] are named to the Management Advisory Team, the leader for IRACT is designated as a senior IE operations member.)

MANAGEMENT ADVISORY TEAM

Director, IE (Team Leader)
Director, NRR
Director, NMSS

INCIDENT RESPONSE ACTION COORDINATION TEAM

Director, Division of Field Operations, IE	Director
Director, Division of Materials Inspection Programs, IE	Member
Director, Division of Reactor Inspection Programs, IE	Member
Director, Division of Operating Reactors, NRR	Member (Reactor Incidents)
Director, Division of Safeguards, NMSS	Member (Safeguards Incidents)
Director, Division of Fuel Cycle and Materials Safety	Member (Materials Incidents)

The newly assigned members; i.e., those not in IE, would serve only when incidents occur in their area of licensing jurisdiction unless otherwise requested by the IRACT Director. The proposed incident response organization is shown schematically in Figure 1.

The specific charter for each of the teams will need to be specified as well as the line responsibilities for issuance of orders or authorization of other actions by the NRC. As presently conceived, the IRACT would be charged with conducting all response activities up to and including advisory interaction with the licensees. Should the issuance of an order to a licensee be required, this would be done by the directors of ONRR or ONMSS or their designees who would be present as part of the MAT.

In addition to the changes proposed above, the NRC incident response program should utilize the capabilities of the newly created Information Assessment Team (IAT) for responding to incidents in which it has offered advice to the line Office Directors. This team consists of three members, one each from NMSS (team leader), NRR and IE. Their charter will include the routine collection of intelligence data, assessment of such data, and recommendations to the line Office Directors. This team should be physically present at the IMC during response to security or safeguards incidents to advise the IRACT team and assist it in obtaining information and contacting appropriate authorities.

- Once the IRACT has been activated, the Information Assessment Team should report to IRACT Director but also be available to interact with the MAT.

(2) IMC Physical Arrangement

The broadened scope of the incident response mission recommended in this paper and the physical facilities necessary to accommodate this mission require a dedicated facility to meet these needs. Accommodations are needed for the IRACT, support staff, and, when necessary, the IAT. This room should be unoccupied for other purposes and should contain commuinications equipment and briefing files. Existing rooms in the E/W Towers building could serve this purpose. (Relocation plans for the IMC are now under active development.) Adjacent to this group, a special facility is needed to accommodate the MAT. This room must be able to accommodate up to six management personnel and should include telephones, intercoms and speakers connected to the IMC operation room and television. There must also be a convenience room to accommodate the Commissioners and EDO and at least one assistant for each. This room too must have an intercom, arrangment with the MAT room, and a television set should be provided. Visual monitoring of the IMC status boards via closed circuit television to the MAT and Commission rooms should be evaluated. Some of the scenarios described in this paper indicate that the technical support staff needed might be rather large. Certainly the IRACT will need certain key technical personnel in its center; however others should be nearby and performing "what if" studies as the incident progresses. A room is needed for them to function.

In addition to these needs, a place must be available for protracted incidents where parts of the staff can rest and obtain food. This facility too should be nearby the IMC room.

The needs are, therefore, a specific dedicated space for permanent installation of communications and display equipment and a dedicated room (may be occupied during routine operations) for each of the following: MAT, Commissioners and EDO, Technical Support Staff, and for sleeping and eating.

We also recommend that the IMC Operations Room be equipped with emergency lighting to allow continued operation in blackouts. A system of communications which does not rely on the telephone network is also recommended. The feasibility of providing a power source for the backup communications equipment should be determined.

Teletype facilities, including a secure teletype for safeguards incidents should be provided.

b. Pre-collected information

(1) Plant information

(a) PWR, BWR and Gas Cooled briefing packages should be available including visual aid material to enable briefing of the IRACT, MAT, EDO and Commission as required on the basic physical context in which the incident is taking place. This briefing package should include single line drawings of the major equipment and plant layouts inside and outside the containment. This information should be available in the IMC for the use of the IRACT and its support staff. As complete a set of typical detailed system and component drawings as possible should be indexed and available for reference for each plant type and vendor. (Such drawings are now available in the IE training facilities but may require augmentation.)

(b) Up-to-date technical specifications, FSAR, Environmental Report, staff Safety Evaluations, Environmental Statements, and Emergency Plans should be accessible at all times by IRACT support staff members but need not be in the IMC itself. Consideration should be given to obtaining and updating a set of detailed plant Emergency Procedures for each facility.

(c) A detailed plant information package on each unit should be available. This package should define major departures from the detailed drawings available for each plant type and contain photographs of plant equipment, containment and control areas. This package should contain schematics of at least the systems essential for plant shutdown and plant layout drawings from the FSAR. (Essential systems are those listed in SRP 3.5.1.4) This information should be available in the IMC.

(d) For each facility, lists of manufacturers of major components and systems, architect-engineers and constructors and contact points in each of these organizations should be compiled to enable more detailed plant information to be obtained quickly. A list of key plant and utility personnel and plant and utility organization charts should be retained for each facility. This information should be in the IMC.

(2) <u>Site Information</u>

(a) A briefing package should be available on each site containing aerial photographs of the plant in relation to its surroundings, USGS maps or equivalent of the immediate site areas, population distribution to a distance of at least 20 miles, and selected figures from the FSAR and Environmental Report. Information on the location of institutions such as schools and hospitals near the site and water intakes near the site should be provided on maps or listings. This information should be available in the IMC.

(b) Up-to-date environmental technical specifications, Emergency Plans, FSAR, Environmental Reports, Safety Evaluations and Environmental Statements should be accessible at all times by the IRACT support staff members but need not be in the IMC itself. Consideration should be given to obtaining and updating detailed site emergency procedures for each facility.

(c) Summaries of important site "ology" information should be available, with emphasis on seasonal meteorological summaries of expected and worst case stability, wind speed and wind direction. A description of the plant meteorological instrumentation and alternate local sources of data should be included. Other brief summaries should be included on hydrology, geology and seismology. This information should be available in the IMC.

(d) For each facility lists of contact points for local and state authorities should be compiled in addition to the list of agency contacts which would be applicable to all facilities. This information should be available in the IMC.

(3) Interagency Contacts

The authorities and responsibilities of various agencies are addressed in Appendices E, F and G of this report. Lists of contacts are now available for use in the IMC.

c. Incident Status Information

(1) A detailed list of plant parameters to be obtained at the time of the incident will need to be developed as a function of the scenario type. As an example, an incident initiated by a plant transient or piping or component failure might require collection of the following information:

Primary indicators

Reactor coolant pressure

Reactor coolant temperature

Reactor vessel or pressurizer level

Power

Steam generator pressure (PWR)

Steam generator level (PWR)

Feedwater flow

Safety injection flow

Residual heat removal system flow

Control rod position indicators

Boron concentration

Makeup flow

Main steam line flow rate

Radiation level in main steamline (BWR)

Containment Indicators

Containment pressure

Containment temperature

Radiation level in containment

Containment sump or torus level

Hydrogen concentration in containment

Engineered Safety Feature Indicators

Containment spray flow

Containment fan cooling flow

Water level in emergency cooling water and chemical tanks

Emergency filter train operation

Emergency ventilation systems operation

Containment isolation valve positions

Status of power supplies

Temperature in vicinity of vital equipment

Pump speeds

System valve positions

Standby liquid poison control system operation (BWR)

<u>Radioactivity Release Indicators</u>

Activity release rate from principal plant vents (including filter trains)

Radiation level at air ejector

Area radiation levels in secondary containments and auxiliary buildings.

The above listing of information is typical of that being reviewed for usefulness by the Task Force on Instrumentation to Follow the Course of an Accident.

Any listings compiled for the IMC will need to be consistent with the findings of that task force. In addition the order in which the information must be obtained and the time scale on which it must be obtained will need to be decided for each scenario type. The listings developed should be available in the IMC.

(2) Site parameters which must be collected at the time of the incident will need to be listed as a function

of the scenario type. For example, these could include some of the following:

Site Indicators

Wind speed

Wind direction

Meteorological stability class

River flow

Water level

Radiation levels outside buildings

Offsite information

Offsite radiation surveys

Status of protective actions

Local, state and federal contacts by the utility

Media contacts.

The listings developed should be available in the IMC.

d. Evaluation resources

(1) Computer facility requirements for the IMC support staff should be developed. A portable terminal (suitcase type) should be readily available at all times for use by the IMC support staff in addition to the permanent terminal in the E/W Towers building.

A list of useful computer codes and experts in their use should be compiled and these codes put on computers (e.g., NIH) which can be accessed on a 24-hour basis.

Some of the parameters listed above for collection during an incident may be obtainable from plant process computers at the present time. Serious consideration should be given to requiring that this type of information be available at one location in the facility so that an on-site inspector, as well as the plant staff, can quickly determine the status of most of the key parameters. One possibility for transmittal of the information to the IMC would be through a direct hookup from an IMC computer to all plant computers. The feasibility of this type of hookup should be evaluated. However, an immediate problem of equipment compatability arises and this method of data collection may not be feasible for plant information. Site meteorological information may be more amenable to direct computer readout in the IMC. Several commercial systems are now being developed for sale to utilities for the purpose of optimizing releases and recording data within the constraints of Appendix I. These same computer systems are programmed to calculate off-site exposures. Interaction with the suppliers of this equipment at this time might result in adequate compatability with an IMC terminal to make direct collection of meteorological data feasible. Current regional weather data can also be obtained through a facsimile hookup.

Data such as current information on the status of materials accountability at licensed facilities (to enable evaluation of threat credibility) may be amenable to storage and updating in a format retrievable by computer. Alternatively, updated lists of materials' status should be immediately available to the IMC.

An industry-wide inventory of spare part equipment at nuclear power plants by geographical area should be considered as a possible joint effort with the nuclear industry. This would facilitate the location of components required for emergency repairs. Because it would be a major effort to compile and continually update such a list, this is probably only feasible if the inventory list could serve some other purpose useful to ther utilities involved. A possible approach would be for the NRC to encourage the AIF to institute a clearinghouse for such equipment to facilitate sales between utilities. Of course, if this approach worked efficiently, it would reduce the inventory of spare parts that would be available, although the location of parts available would be better known. An alternative approach would be to maintain a list of key contacts in various organizations, as suggested in an earlier section of this paper, who could quickly ascertain the availability of desired equipment at their facility.

(2) A list of analytical tools needed for data reduction should be compiled and those not already available should be developed. This is particularly important in the areas of radiological exposure and decay heat/boiloff calculations.

(3) A list of specific technical personnel resources available should be developed for immediate use and for standby notification. For example, at least one of the DOR Operational Technology (OT) branch chiefs should normally be requested to report to the IMC to serve as supervisor for the technical support staff

and the other OT branch chiefs and selected NRR reviewers put on standby. Any projects personnel with special knowledge of the particular plant should also be put on standby. Technical resources in other agencies and NRC consultants should also be listed by subject. The feasibility of prearrangements for emergency use of consultants not normally used for potential conflict of interest or other reasons should be explored with the administrative office.

(4) A list of key preplanned actions for each facility that can be used to assess whether these actions have been initiated in a timely manner by the licensee and whether the instituted actions are having the desired effect.

e. Action resources

(1) Communications (as discussed earlier) and transportation are the two key resources required to implement action determined appropriate on the basis of the IRACT incident evaluation. In addition to the ability to determine and communicate the status of a licensee's action, which will usually be done by Region inspectors, a capability to place technical personnel at

the disposal of the licensee, either remotely or by transport to the site is required. If it is judged important to place an expert at a site in a particular instance, another expert should maintain contact with the site during the "dead time" that will result during travel to the site. Prearrangements for efficient travel to all sites should be established. Minimum and normal travel times and proposed transport modes to all sites should be established and reviewed by headquarters to assure the shortest feasible transport time without incurring extraordinary costs.

Special communications equipment should be available for personnel dispatched to a site to assure timely reporting of significant information to headquarters and to maximize the availability of these personnel to the Region or headquarters staff. For example, two-way radios with a repeater station and a base station may be needed. All equipment must be amenable to light plane and car transport.

(2) Legal authority and the continuous availability of appropriate management levels to the IRACT are required to assure that should an order to a licensee

to take a particular action be necessary, it could be issued in a timely fashion.

IV. Implementation Recommendations

This section presents the recommended time schedule for implementation of the resource recommendations of section III of this paper. The implementation of the various recommendations is divided into short term and long term categories. By short term is mean implementation within three months and by long term is meant within six months to one year.

The following table is organized in the same order in which the recommendations are presented in section III.B.2. The timing recommended is determined mainly by the feasibility of obtaining the resource quickly.

IMPLEMENTATION RECOMMENDATIONS

Report Section	Short Term	Long Term
Section III.B.2.		
a Physical IMC and Organization		
a.(1)	Add a Management Advisory Team (MAT) to the incident response organization. Change the composition of the IRACT to include a member from the line offices. Delineate the specific charter of the IRACT and MAT including the line responsibilities for advisory response actions and orders. Make the Information Assessment Team part of the incident response organization reporting to IRACT when an incident involving safeguards is in progress.	
a.(2)	Arrange for specific dedicated space for permanent installation of IMC communications and display equipment and additional dedicated space (which may be normally occupied) for other incident response personnel.	Obtain emergency lighting for the incident response areas to allow functioning during power blackout Establish a system of communication which does not rely on telephone networks. Examine the feasibility of self-powered communication equipment. Teletype equipment, including a secure teletype should be obtained.

POOR ORIGINAL

IMPLEMENTATION RECOMMENDATIONS (Cont'd)

Report Section	Short Term	Long Term
Section III.B.2 Continued		
b. Precollected Information		
b.(1)(a)	Develop briefing package on PWR, BWR, Gas Cooled reactors	Index set of typical detailed system and component drawings
b.(1)(b)	Confirm that plant licensing materials such as FSAR's and Safety Evaluations are readily available to IRACT support staff	
b.(1)(c)		Prepare plant information package on each unit. (Requires site visits for photographs.)
b.(1)(d)	Confirm that lists of key plant and utility personnel and organizational charts are available in the IMC for each facility	Compile lists of manufacturers by component, A/E's and constructors and contact points for each unit.
b.(2)(a)	Prepare briefing package on each site from available materials	Commission aerial photographs if not available.
b.(2)(b)	Confirm that site licensing materials such as FSAR's and Environmental Reports are readily available to the IRACT support staff.	
b.(2)(c)		Prepare summaries of "ology" information with emphasis on meteorology.

IMPLEMENTATION RECOMMENDATIONS (Cont'd)

Report Section	Short Term	Long Term
Section III.B.2 Continued		
b.(2)(d)	Confirm that lists of contact points for local and state authorities are available for each site in the IMC.	
b.(3)	Review the authorities and responsibilities and recommend changes in interagency agreements or write these if they do not exist.	Implement recommended changes in in interagency agreements.
c. Incident Status Information		
c.(1)	Compile a list of plant paramaters as a function of scenario type which should be collected during the incident and prepare instructions to IRACT operational staff for the order in which information is to be collected.	Assure that lists are compatible with work of task force on Instrumentation to Follow the Course of an Accident.
c.(2)	Compile a list of site paramaters to be collected during an incident.	
d. Evaluation Resources		
d.(1)	Establish procedures for making [illegible]rtable computer terminal i[illegible]diately available to IRACT support staff.	

IMPLEMENTATION RECOMMENDATIONS (Cont'd)

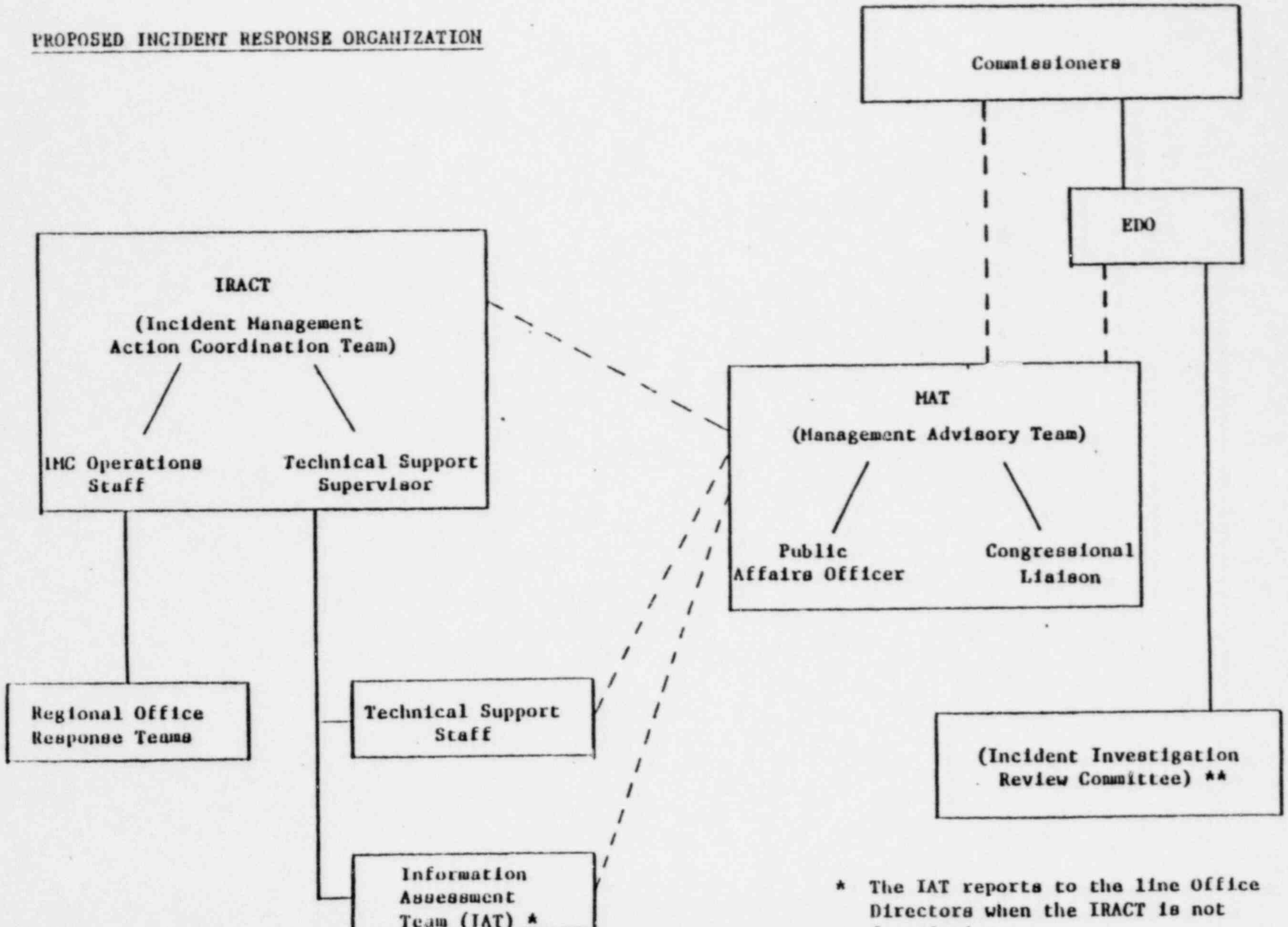
Report Section	Short Term	Long Term
Section III.B.2 Continued		
d.(1) - continued	Compile a list of useful computer codes and experts in their use.	
	Establish feasibility of direct hookup to a permanent IMC terminal to obtain plant and site peramaters.	Request all facilities to maintain updated knowledge of key plant parameters in one location; preferably through the plant process computer.
		Obtain updated lists or computer storage capability on the status of materials accountability at licensed facilities.
		Arrange for receipt of regional weather service information in the IMC
		Establish feasibility of maintaining an industry-wide spare parts inventory.
d.(2)	Establish need for specific additional analytical tools such as computer codes.	Write and document any needed computer codes.
d.(3)	Compile a list of technical personnel resources by subject (inside and outside NRC).	
e. Action Resources		
e.(1)	Establish prearrangements for travel to all sites.	
	Establish the communications equipment needed for personnel dispatched to a site.	Purchase communications equipment such as two-way radios, repeater stations, base stations.

IMPLEMENTATION RECOMMENDATIONS (Cont'd)

Report Section	Short Term	Long Term
Section III.B.2 Continued		
e.(2)	Confirm that the appropriate legal and management resources are available for issuance of orders.	Change regulations as necessary to assure that timely issuance of orders during an incident is possible.

FIGURE 1

PROPOSED INCIDENT RESPONSE ORGANIZATION

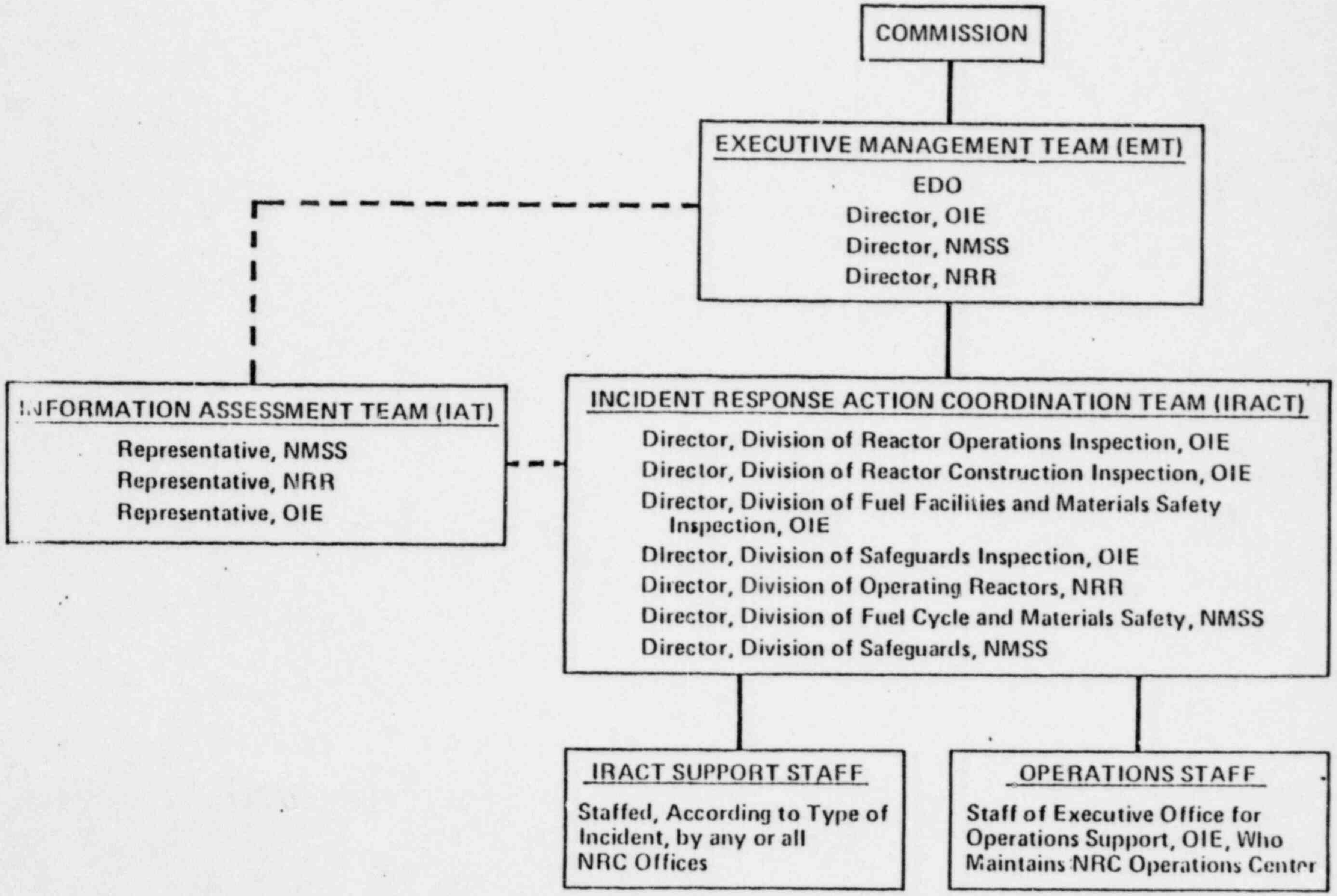


* The IAT reports to the line Office Directors when the IRACT is not functioning.

** The IIRC is a post-incident evaluative team.

FIGURE 1

NRC INCIDENT RESPONSE ORGANIZATION



APPENDICES

NRC INCIDENT RESPONSE

A. Incident Scenarios

B. Current NRC Office/Division Responsibilities

C. Current NRC Personnel Assigned to Incident Response Functions

D. Present Incident Management Center

E. Present Agency Authorities for Incident Planning and Preparedness

F. Current Information Exchange Agencies

G. Current Support Agencies Responsibilities

H. Draft NRC Headquarters Contingency Plan Outline

APPENDIX A

INCIDENT SCENARIOS

TABLE OF CONTENTS

Radiological Consequences

Radiological and Safeguards Consequences

Safeguards Consequences with Potential Radiological Consequences

LARGE LOCA - ALL ECCS FUNCTION (PWR - A8)

Time	Event
0	Large break in the reactor coolant system.
6 - 7 secs.	Accumulator discharge begins.
10 - 11 secs.	Primary system depressurization complete.
30 secs.	Accumulator discharge complete; safety injection pumps and containment spray injection system start.
1 min.	Gap inventory released to containment.
200 secs.	Start containment spray recirculation system.
30 mins.	End source leak from containment.
47 mins.	Containment spray injection ends (w/minimum pump capacity).
63 mins.	Core injection ends (w/minimum pump capacity). Manual switching to emergency coolant recirculation which continues as long as sump water is available.
	No evacuation of off-site people required.

PWR
LARGE LOCA
ECR + CSRS FAILURE
AHF6

Time	Event
0	Large Break.
6 - 7 secs.	Accumulator discharge beings; multiple alarms begin.
10 - 11 secs.	Primary system depress.
30 secs.	Accumulator discharge complete; safety injection pumps and CSIS start.
60 secs.	Gap inventory released to containment--radiation alarm.
47 mins.	Continment spray injection ends.
50 mins.	Core injection ends. Attempt to manually switch to recirculation and fail. (Decision point: Can recirculation be fixed within 30 mins.? Should evacuation be initiated?)
60 mins.	Start boiloff.
100 mins.	Start core melting.
150 mins.	End core melting (80% molten), melt source has been released to containment.
150 mins.	Steam explosion and core dispersed through failed containment.
175 mins.	Source plume from steam exp. crosses site boundary of 0.5 mi w/1.2 mph wind speed.
210 mins.	End reactor vessel melting.
230 mins.	Decomposition of containment concrete base mat mat begins.
250 mins.	Source plume from steam explosion crosses LPZ boundary of 2 mi, @ wind speed of 1.2 mph.
330 min.	Vaporization source has been released to containment.
1290 mins.	End containment melting.

PWR
LARGE LOCA
ECI + CSRS FAILURE
ADF

Time	Event
0	Large break.
6 - 7 secs.	Accumulator discharge begins; multiple signals received.
10 - 11 secs.	Primary system depress.
30 secs.	Acc. discharge complete; CSIS start.
60 secs.	Boiloff, gap inventory released to containment; core injection discovered inoperable. (Decision point: Should evacuation be initiated?)
16 mins.	Start core melting.
60 mins.	End core melting (80%) melt source has been released to containment.
94 mins.	CSI ends.
120 mins.	End reactor vessel melting.
140 mins.	Decomposition of cont. concrete base mat begins.
240 mins.	Vaporization source has been released to cont.
1200 mins.	End containment melting.

PWR
LARGE LOCA
CSIS ECR CSRS FAILURE
ACHF

Time	Event
0	Large break.
6 - 7 secs.	Accumulator discharge begins.
10 - 11 secs.	Primary system depress.
30 secs.	Accumulator discharge complete; safety injection pumps start.
60 secs.	Failure of CSIS discovered.
100 mins.	Core injection ends; operator attempts to switch recirculation; failure of recirculation system discovered.
120 mins.	Start boiloff.
170 mins.	Start core melting.
200 mins.	Containment overpressure failure; puff release.
220 mins.	End core melt (80%) melt source released to cont.
280 mins.	End reactor vessel melting.
300 mins.	Decomposition of cont. base mat begins.
1360 mins.	End containment melting.

PWR
LARGE LOCA
CSIS + ECI FAILURE
ACD

Time	Event
0	Large break.
6 - 7 secs.	Accumulator discharge begins.
10 - 11 secs.	Primary system depress.
30 secs.	Accumulator discharge complete.
60 secs.	Discover no CSID + ECI.
60 secs.	Boiloff, gap inventory released to containment.
3.3 mins.	Start CSRS, try to start ECR and fail.
16 mins.	Start core melting.
60 mins.	End core melting (80%) melt source has been released to containment.
120 mins.	End reactor vessel melting.
140 mins.	Decomposition of cont. concrete base mat begins CO_2 leakage.
240 mins.	Vaporization source has been released to cont.
1200 mins.	End containment melting.

PWR
LARGE LOCA
CSIS, ECI + CSRS FAILURE
ACDF

Time	Event
0	Large break.
6 - 7 secs.	Accumulator discharge begins.
10 - 11 secs.	Primary system depress.
30 secs.	Accumulator discharge complete.
60 secs.	Operator discovers CSIS, ECI inoperable.
60 secs.	Boiloff.
5 mins.	Attempt to start CSRS + ECR and fail.
16 mins.	Start core melting.
60 mins.	End core melting (80%) melt source released.
60 mins.	Containment over press. failure.
120 mins.	End vessel melting.
140 mins.	Decomposition of containment concrete base mat.
1200 mins.	End containment melting.

PWR
LARGE LOCA
NO ELECTRIC POWER (PWR - ABα)

Time	Event
0	Large break in the reactor coolant system; electric power fails.
6 - 7 secs.	Accumulator discharge initiated.
10 - 11 secs.	Primary system depressurization complete.
30 secs.	Accumulator discharge complete.
1 min.	Start boiloff - gap inventory released to containment. Release to atmosphere from nominal containment leakage.
16 mins.	Start core melting.
60 mins.	End core melting (~80%) molten). Melt source has been released to containment.
60 mins.	Steam explosion; significant release to atmosphere due to containment failure; reactor vessel melting begins.
85 mins.	Sourc e plume from steam explosion crosses site boundary of 0.5 mi. assuming wind speed of 1.2 mph.
120 mins.	End reactor vessl melting; decomposition of containment concrete base mat begins.
160 mins.	Source plume from steam explosion crosses LPZ boundary of 2 mi. @ wind speed of 1.2 mph.
240 mins.	Vaporization source has beedn released to containment.
Up to 1800 mins.	CO_2 and H_2O generated from concrete.

BWR
LARGE LOCA
CL>100%/day & HPSW FAILURE
AGJe

Time	Event
0	Large break.
0.5 secs.	MSIV closure.
1 sec.	SCRAM signal.
3 secs.	Primay containment isolated.
30 secs.	Primary system depress, core spray syst. start.
43 secs.	LPCI system start.
60 secs.	Gap inventory released to containment, ESW pumps at rated speed (high release outside cont.)
1.5 mins.	Core reflooded.
10 mins.	Manual actuation of RHRS.
30 mins.	Discover no HPSW (Decision point: Should evacuation be initiated?)
250 mins.	Pump cavitation due to saturated water.
270 mins.	Start core melting.
330 mins.	End core melting (80%) melt source has been released to containment.
390 mins.	End reactor vessel melting.
410 mins.	Start decomposition of cont. concrete base mat.
490 mins.	Vaporization source has been released to cont.
767 mins.	Max suppression pool Temp reached.
2500 mins.	End containment melting.

BWR
LARGE LOCA
CL>100%/day, CSRS & LCRS FAILURE AGHI

Time	Event
0	Large break.
0.5 secs.	MSIV closure.
1 sec.	SCRAM signal.
30 secs.	Primary system depress; core spray start.
60 secs.	ESW pumps at rated speed.
1.5 mins.	Core reflooded.
10 mins.	Manual actuation of RHRS.
15 mins.	Operator discovers no recirc. capability. (Decision point: Should evacuation be initiated.
20 mins.	Start core melting (release to atmosphere).
80 mins	End core melting (80%) melt source has been released to containment (radiation alarm).
140 mins.	End reactor vessel melting.
160 mins.	Start decomposition of cont. concrete.
250 mins.	Pump cavitation.
767 mins.	Max suppression pool Temp reached.
2000 mins.	End containment melting; molten core in ground water containment.

BWR
LARGE LOCA
ECF & CL>100%/day
AFG

Time	Event
0	Large break.
0.5 secs.	MSIV closure.
1 sec.	SCRAM signal.
30 secs.	Primary system depress.
3 mins.	Operator discovers no ECF.
5 mins.	Start core melting; significant release detected. (Decision point: Should evacuation be initiated?)
150 mins.	End core melting (80%) melt source has been released to containment.
210 mins.	End reactor vessel melting.
230 mins.	Start decomposition of containment.
330 mins.	Vaporization source has been released to containment.
2000 mins.	End containment melting; core in ground water containment.

BWR
LARGE LOCA
CL>100%/day & ECI FAILURE
AEG (dry)

Time	Event
0	Large break.
0.5 secs.	MSIV closure.
1 sec.	SCRAM signal.
30 secs.	Primary system depress.
60 secs.	Gap inventory released to containment.
3 mins.	Release to atmosphere, operator discovers ECI not working.
20 mins.	Start core melting.
150 mins.	End core melting (80%) melt source has been released to containment.
180 mins.	End reactor vessel melting.
200 mins.	Start decomposition of containment concrete.
300 mins.	Vaporization source has been released to containment.
2000 mins.	End containment melting; core in ground water containment.

BWR
LARGE LOCA
VS + HPSW FAILURE
ADJ

Time	Event
0	Large break.
0.5 secs.	MSIV closure.
1 sec.	SCRAM signal.
30 secs.	Primary system depress; core spray start.
30 secs.	Containment overpress. failure; puff release. High radiation alarm. (Decision point: Should evacuation be initiated?)
43 secs.	LPCI system start.
60 secs.	ESW pumps at rated speed.
1.5 mins.	Core reflooded.
2 mins.	Gap inventory released to containment.
10 mins.	Manual actuation of RHRS.
25 mins.	Source plume from overpress. crosses site w/wind speed of 1.2 mph.
100 mins.	Source plume crosses LPZ boundary of 2 mi. w/wind speed of 1.2 mph.
400 mins.	Pump cavitation; Operator discovers loss of RHR capability. (Decision point: Should evacuation be initiated?)
400 mins.	Max suppression pool Temp reached.
420 mins.	Start core melting; significant release to atmosphere.
510 mins.	End core melting (80%) melt source has been released to containment.
600 mins.	End reactor vessel melting.
620 mins.	Start decomposition of cont. concrete.
720 mins.	Vaporization source has been released to cont.
3000 mins.	End containment melting; core underground in cont.

BWR
LARGE LOCA
VS. CSRS + LPCRS FAILURE
ADHI

Time	Event
0	Large break.
0.5 secs.	MSIV closure.
1 sec.	SCRAM signal.
30 secs.	Primary system depress; core spray start.
30 secs.	Containment overpress failure; puff release. Radiation alarm. (Decision point: Should evacuation be initiated?)
60 secs.	ESW pumps at rated speed.
1.5 mins.	Core reflooded.
10 mins.	Manual actuation of RHRS.
13 mins.	Operator discovers no recirculation capability.
20 mins.	Start core melting.
25 mins.	Source plume from overpress. crosses site boundary of 0.5 mi. w/wind speed of 1.2 mph.
80 mins.	End core melting (80%) melt source has been released to containment.
100 mins.	Source plume crosses LPZ boundary of 2 mi. w/wind speed of 1.2 mph.
140 mins.	End reactor vessel melting.
160 mins.	Start decomposition of cont. concrete.
2000 mins.	End containment melting.

BWR
LARGE LOCA
VS & ECI FAILURE
ADE γ (dry)

Time	Event
0	Large break.
0.5 secs.	MSIV closure.
1 sec.	SCRAM signal.
30 secs.	Primary system depress.
30 secs.	Containment over pressure failure; puff release.
30 secs.	Operator knows containment fails. (Decision point: Should evacuation be initiated?)
2 mins.	Gap inventory released to containment and atmosphere.
20 mins.	Start core melting.
25 mins.	Source plume from overpress. crosses site boundary of 0.5 mi. w/wind speed of 1.2 mph.
100 mins.	Source plume crosses LPZ boundary of 2 mi. w/wind speed of 1.2 mph.
150 mins.	End core melting (80%) melt source has been released to containment.
180 mins.	End reactor vessel melting.
200 mins.	Start decompositin of containment concrete.
300 mins.	Vaporization source has been released to cont.
2000 mins.	End containment melting; core into ground.

BWR
LARGE LOCA
SCRAM & VS FAILURE
ACD

Time	Event
0	Large break.
0.5 secs.	MSIV closure.
30 secs.	Primary system depress; core spray start.
30 secs.	Containment overpress failure; puff release. Radiation alarm. (Decision point: Should evacuation be initiated?)
43 secs.	LPCI system start.
60 secs.	ESW pumps at rate speed.
60 secs.	Operator discovers SCRAM fails.
1.5 mins.	Core reflooded.
5 mins.	Start core melting.
10 mins.	Manual actuation of RHRS.
25 mins.	Source plume from overpress. crosses site boundary of 0.5 mi. w/wind speed of 1.2 mph.
100 mins.	Source plume crosses LPZ boundary of 2 mi. w/wind speed of 1.2 mph.
150 mins.	End core melting (80%) melt source has been released to containment.
210 mins.	End reactor vessel melting.
230 mins.	Start decomposition of cont. concrete.
250 mins.	Pump cavitation.
767 mins.	Max suppression pool Temp reached.
2000 mins.	End containment melting.

BWR
LARGE LOCA
EP & V S FAILURE
ABD

Time	Event
0	Large break and EP failure.
0.5 secs.	MSIV closure.
1 sec.	SCRAM signal.
30 secs.	Primary system depress.
30 secs.	Containment overpress. failure; puff release.
20 mins.	Start core melting.
25 mins.	Source plume from over press. crosses site boundary of 0.5 mi. w/wind speed of 1.2 mph.
100 mins.	Source plume crosses LPZ boundary of 2 mi. w/wind speed of 1.2 mph.
150 mins.	End core melting (80%) melt source has been release to containment.
180 mins.	End reactor vessel melting.
200 mins.	Start decomposition of cont. concrete.
2000 mins.	End containment melting.

PWR
SMALL BREAK
2 - 6 in
CASE I - ALL ESFs FAILURE

Time	Event	Indications
0	Pipe rupture occurs.	PCS Low pressure alarm; cont. Hi. press. alarm.
6 - 7 mins.	Reactor SCRAMS.	SCRAM signal; power decline.
30 secs.	Containment sprays on.	Flow indication
30 secs.	HPIS initiates.	Flow indication; P.S. pressure<1700.
100 - 200 secs.	Accumulator injection starts.	Flow indication; P.S. pressure<600 psi.
200 - 300 secs.	LPIS initiates.	Flow indication; P.S. pressure<200 psi.
30 - 40 mins.	Operator initiates CSRS, CHRS & ECR.	Flow indications pump status and valve positions.

PWR
SMALL BREAK
CASE 2 - LOSS OF LONG TERM COOLING (CSRS-CHRS, ECR)
STEPS 1 THROUGH 6 SAME AS CASE 1

Time	Event	Indications
30 - 40 mins.	Initiate CSRS, CHRS & ECS.	Flow indications* indicate no long term cooling.
100 - 110 mins.	Water boils off from core-clad fails and gap activity released.	Containment pressure rising radiation alarms.
200 mins.	Core melts ~80% molten.	No core instrumentation; containmen pressure increasing.
300 mins.	Containment fails due to overpressur; F.P. release.	Containment pressure exceeds ultimate strength.
2000 mins.	Core melts through containment; core in ground.	

*Start Evacuation of public

PWR
SMALL BREAK
CASE 3 - LOSS OF EP

Time	Event	Indication
0	Pipe rupture occurs.	Loss of all power on station & instrumentation readout.
0	Loss of all EP.	
6 - 7 secs.	Reactor SCRAMS (Gravity drop).	
100 - 200 secs.	Accumulator injection.	
60 mins.	Core melts.	
160 mins.	Containment fails due to overpressure; F.P. release.	
800 mins.	Core melts through containment.	

BWR SMALL BREAK
CASE 1 FAILURE OF LONG TERM COOLING
(CSRS, LPCRS and HPSW FAIL)

Time	Event	Action or Indication
0	Small rupture occurs.	
5 secs.	MSIV closure.	Alarm in control room.
10 secs.	SCRAM reactor.	
30 secs.	Diesel start.	
45 secs.	ADS valves open	
4 mins.	ECI working	
20 mins.	Core reflooded	
20 - 30 mins.	Manual switch to recirculation	No long term heat removal capability. (Decision point: Should evacuation be initiated?)
~12 hrs.	Containment fails; moderate release.	
~12 hrs.	Suppression pool water flashes pumps cavitate.	
12 1/2 hrs.	Core dry out.	
15 hrs.	Core 80% melts; large release.	
24 hrs.	Core melts through containment. Release into soil and groundwater.	

BWR
SMALL LOCA
CASE 2 - FAIL TO SCRAM

Time	Event
0	Small LOCA occurs.
5 secs.	MSIV closure.
60 secs.	Pressure increase in vessel and power increase.
5 mins.	Operator discovers failure to SCRAM.
20 mins.	Reactor vesssel failure; release to containment.
30 mins.	Core starts to melt.
4 hrs.	Core melts through vessel.
5 hrs.	Containment ruptures O.P. Large release.
13 hrs.	Core melts through containment; in ground.

PWR (Transient)
LOSS OF OFFSITE POWER
WITH TOTAL LOSS OF FEEDWATER

Time	Event
0	Loss of offsite power.
6 - 7 secs.	Reactor SCRAM.
10 secs.	Auxilliary Feedwater fails.
20 secs.	Secondary reliefs open.
3 mins.	Operator reacts; discovers feedwater failure.
60 mins.	Steam geneator dry.
60 mins.	Pressurizer safety and reliefs open.
2 hrs.	Top of core uncovers.
3 hrs.	Start core melt.
8 hrs.	Core melts through vessel.
16 hrs.	Core melts through containment. Base mat (large release).

PWR ATWS
(Loss of Feedwater, Westinghouse)

Time	Event
0	Loss of FW.
30 secs.	Turbine trips.
31.5 secs.	Pressurizer relief valves open.
43 secs.	S. G. safety valves open.
43.5 secs.	Pressurizer pressure peaks at 2412 psia.
53 secs.	Pressurizer relief valves close.
60 secs.	Auxiliary FW pumps start.
73 secs.	Pressurizer relief valves open.
85 secs.	Pressurizer fills with water.
87 secs.	Pressurizer safety valves open to relieve water.
113 secs.	Peak reactor coolant system pressure.
10 mins.	Operator initiates safety injection.
20 mins.	Operator puts plant in hot shutdown.
2 - 3 hrs.	RWST depleted, operator switches to recirculation mode.

BWR ATWS
(MSIV Closure - BWR 4,5,6)

Time	Event
0	MSIV Closure - SCRAM fails.
3 secs.	Reliefs valve lift.
4 secs.	Some fuel experiences transition boiling.
6 secs.	FW flow stops.
10 secs.	Vessel pressure peaks (1300 psig for BWR 6).
30 secs.	HPCI or HPCS and RCIC flow starts.
40 secs.	Liquid control flow reaches core.
3 mins.	Water level reaches minimum and begins to rise.
7 1/2 mins.	Hot shutdown is achieved.
10 mins.	Operator initiates pool cooling mode of RHR.
11 mins.	RHR flow begins (pool cooling).
2 1/2 hrs.	Containment temperature and pressure peak.

BWR (Transient)
CASE 1 FAILURE OF DECAY HEAT REMOVAL

Time	Event
0	Transient event occurs.
6 - 7 secs.	Reactor SCRAMs.
5 mins.	Safety/relief valves open and dump to suppression pool.
20 mins.	No decay heat removal. (Decision point: Should evacuation be initiated?)
27 hrs.	Containment pressure increases to ~175 psia; containment bursts.
27 hrs.	Feedwater flow to reactor vessel terminated by continament burst.
27 hrs.	Water flashes in suppression pool and water cannot be pumped to vessel because of pump cavitation.
28 hrs.	Core uncovers.
29 hrs.	Core starts to melt.
33 hrs.	Core melts through vessel.
40 hours.	Core melts through containment.

4. REFUELING ACCIDENT SCENARIO

Time	Event
-100 hrs.	Reactor Shutdown.
0.0	One fuel assembly dropped while being moved in Spent Fuel Pool; all fuel rods in that assembly rupture on impact, releasing gap noble gas and iodine activity.
+0	Activity passes thru the Fuel Building iodine filter and passes out to environment; ventilation vent radiation detector alarms in control room.
+8.4 minutes	Plume crosses site boundary at 503 meters, 1 meter/second wind speed.
+80 minutes	Plume crosses outer boundary of LPZ at 3 miles, 1 meter/second wind speed.

5.a. LIQUID WASTE RELEASE SCENARIOS

Time	Event
0	1. High Level Waste Drain Tank ruptures, spilling contents onto floor of Auxiliary Building, thru cracks in floor to ground below. OR 2. Liquid waste accidentally discharged thru storm sewer.
Less than 1 day	Activity discharged in Scenario (2) above enters local body of water and travels to nearest point of consumption.
0.3 to 3000 years	Activity discharged in Scenario (1) above travels thru ground, enters local body of water, and travels to nearest point of consumption. (Variability in travel times due to difference in soil porosity from site to site.)

5.b. GASEOUS WASTE RELEASE SCENARIO

Time	Event
0	One 434 ft^3 Waste Gas Decay Tank, buried in the plant yard, ruptures, releasing noble gas activity equivalent to 95.400 curies Xe-133, and iodine activity equivalent to 0.26 curies I-131, directly to environment.
+8.4 minutes	Plume crosses site boundary at 503 meters, 1 meter/second wind speed.
+80 minutes	Plume crosses LPZ outer boundary at 3 miles, 1 meter/second wind speed.

6. LARGE FIRE (BROWNS FERRY)

Plant Conditions at Time of Fire

Units 1 and 2 were operating at power, cable penetration between Unit 1 reactor building and cable speading room, common to Units 1 and 2, was being leak tested by observation of a lighted candle. Polyurethane insulation in penetration was ignited by the candle flame.

Time	Event
0	Fire ignited cables in penetration, propogated through the penetration and involved large numbers of cables in the building.
	Unit 1
5 - 6 mins.	ECCS alarm panel alarmed. Subsequent alarm received indicating erratic control equipment behavior. RCS recirculation pumps began running back.
13 mins.	RCS Recirculation pumps tripped.
16 mins.	Reactor manually tripped, shutdown confirmed, turbine and two feedwater pumps tripped.
16 - 20 mins.	Low water level after trip started HPCI and RCIC, water level rose to +47 inches and HPCI & RCIC were tripped.
20 mins.	E Plan implemented.
25 mins.	Unit 2 tripped.
28 mins.	MSIV's closed. Power lost to several boards, RCIC inopeable RV's opened automatically to control pressure.
	Cooling established by one CRD pump.
	Nuclear Instrumentation became inoperable, only 4 RV's effective in "remote manual."
	CO dumped in spreading room.
65 mins.	Blowdown to 350 psig begun.
	Minimum water height +48 inches above top of fuel. Condensate flow to reactor for cooling established and relief valves were kept open.

6. Large Fire (Browns Ferry) cont'd

Time	Event
5 1/2 hrs.	Power to 4 remaining relief valves lost.
7 hrs.	Fire pronounced out. (Fire burned intermittently throughout above sequence)
8 hrs.	Relief valve power restored.
9 hrs.	Reactor pressure rose to peak of 600 psig. Cooling above 350 psig by one CRD pump.
	Unit 2
15 mins.	Erroneous alarms received.
25 mins.	Numerous alarms received. Unit 2 tripped.
26 mins.	Shutdown confimed, turbine tripped.
28 mins.	HPCI and RCIC initiated and tripped by high water level, MSIV's closed.
35 mins.	HPCI and RCIC startd manually one CRD pump operating.
45 mins.	Relief valve manual activation capability lost; automatic OK.
95 mins.	Reactor began to depressurize.
100 mins.	Air for manual operation of relief valve restored. Depressuriztion allowed to continue.
115 mins.	RHR pump "D" placed in torus cooling mode.
	RHR drain pump initiated to control torus water level. Reactor pressure 200 psig.
3 1/2 hrs.	Cooling via condensate booster pump establised; main steam line drain line opened to condenser.
6 hrs.	Conditions stabilized.

7.a. ABANDONED CONTROL ROOM (SITE EVACUATION AT A WESTINGHOUSE PWR)

Initial Conditions:

The station is operating at 100% power with all control systems in automatic. All ESF systems are operable and the auxiliary feedwater system is aligned normally with the feed supply valves to all steam generators closed. Containment is being purged in preparation for the weekly containment entry. Chlorine is being supplied to the site by a truck containing liquid chlorine.

Assumptions:

1. The truck operator is involved in an accident and a fitting ruptures releasing the chlorine gas. The plant ventilation system spreads the gas through the station forcing site evacuation.

2. The plant operators trip the plant as they exit the control room. All protective functions occur as designed (i.e., reactor trip, turbine trip, auxiliary power transfer to offsite, etc.).

3. The containment purge system will fail to isolate on high radiation due to a failure of the radiation monitor so containment purge continues for the duration of the accident.

Time	Event
0	Rupture of tank fitting, chlorine released.
5 mins.	Chlorine is spread throughout the facility. The station emergency plan is initiated and site evacuation commences.
6 mins.	The operator trips the reactor as he exits control room. The turbine trips due to the reactor trip and steam dump to the condenser begins.
21 mins.	The police and fire departments arrive on site.
45 mins.	The steam generators boil dry due to no feedwater (auxiliary or main) being supplied and RCS temperature and pressure begin to increase. Pressure will be limited by the action of the pressurizer spray and relief valves. NOTE: If re-entry has not occurred before the steam generators have boiled dry, it is unlikely that the following sequence of events can be avoided.

7.a. Abandoned Control Room cont'd

Time	Event
90 mins.	RCS temperature increases to the point where NPSH is lost to the reactor coolant pumps and extreme cavitation begins causing bearing and seal damage. The seal damage allows a continuously increasing leak rate to the containment atmosphere with all contained activity released to the envirorment through the still operating containment purge system.
105 mins.	Safety injection is actuated on low pressurizer pressure and level due to the loss of primary inventory through the RCP seals.
160 mins.	Safety injection terminates due to the emptying of the refueling water storage tank.
163 mins.	The accumulators discharge into the RCS.
170 mins.	The reactor vessel is drained to the nozzle level due to leakage through the pumps seals.
190 mins	Reactor temperature increases due to decay heat and boiling begins.
240 mins.	Vessel inventory is reduced to the point where the fuel begins to be uncovered.
245 mins.	Clad perforation occurs and the gap inventory is released to containment and through the purge system to the environment. Localized core melting begins and the melt source begins to be released to containment.
260 mins	Gap activity reaches the site boundary of 0.5 miles. (Assuming a wind speed of 1.2 mph.)
360 mins.	The core is completely uncovered; melting continues with the melt source completely released to containment.

7.b. ABANDONED CONTROL ROOM - OPERATOR WALKOUT

Time	Event
0	Operators give noitice that in two hours all non-supervisory personnel will walk out because of a dispute over contract terms.
1 hr.	Plant management, after consultation with utility headquarters, decides to keep the plant on line and run with supervisor personnel rather than shut down. NRC notified.
2 hrs.	Operators leave plant. Plant continues to run under supervisory staff (augmented by off-duty supervisors).
8 hrs.	Talks with operators not productive. NRC requested to grant emergency relief to allow operation with less than normal station complement and with relaxed surveillance and maintenance schedules.
10 hrs.	System transient forces plant to hot shutdown condition. On-site staff prepares to increase power.

8.a. CRASH OF SPENT FUEL CASK WITH RELEASE OF RADIOACTIVITY AT A PWR FACILITY

Statement of Conditions

Two unit site with one unit in refueling and one unit at 100% power. Preparation for spent fuel shipment in progress in the fuel services building. With two fuel assemblies loaded in the cask, difficulty was encountered securing the cask lid underwater due to a malfunctioning tool. It was decided to transfer the cask to the decontamination area, with the lid in place but loose, where it could be secured under dry conditions. Severity of this accident will be strictly dependent on the decay time associated with the fuel involved. An initial loading error would also be required as fuel is not normally transported for at least 90 days after irradiation.

Assumptions:

1. Fuel decay time = 100 hours.
2. Initial release exceeds 10 CFR Part 100 limits at the site boundary by a factor of 30.
3. Fuel storage locations were misinterpreted and the assemblies loaded into the cask were just recently removed from the reactor.
4. 1200 psig fuel-clad gap pressure.

Time	Event
0	Shipping cask removed from pool, lid in place but not secured.
15 secs.	Fuel service building radiation alarm sounds, emergency gas treatment system activated.
20 secs.	Crane reversed to place cask back in pool.
21 secs.	Crane cable breaks, cask drops 60 feet to decontamination area floor. Cask lid comes off spilling both assemblies out onto the floor with ~50% of the fuel pins ruptured. Two personnel injured and disabled on the operating floor due to whipping cable.

8.a. Crash of Spent Fuel Cask with Release of Radioactivity at a PWR Facility (cont'd)

Time	Event
22 secs.	Airborne fission products starting to spread in fuel services building.
30 secs.	Fuel service building evacuation started.
2 mins.	Fuel service building evacuation complete with exception of injured men. Fission product release from plant vent starts.
5 mins.	Site emergency plan initiated. Radiation reaches site boundary.
10 mins.	Control area radiation levels increasing, operating unit shutdown initiated.
15. mins.	Rescue team enters fuel service building.
20 mins.	Police and fire department arrive.
21 mins.	Site boundary radiation levels measured to be in excess of part 100 by a factor of 30. Wind direction southeast at 2 MPH toward a population center of 400 located 3 miles away.
22 mins.	Rescue team returns; effort unsuccessful, high radiation.
25 mins.	Decision made to evacuate all site personnel to the northwest perimeter.
30 mins.	Operating unit in hot standby; control room evacuated.
35 mins.	Site evacuation complete.
37 mins.	Roving environmental monitoring team reports radiation levels a factor of seven above part 100 limits one mile to the southeast from the site perimeter.
38 mins.	Decision made to evacuate all population areas to the east and south within a radius of 10 miles.

8.b. TRANSPORTATION INCIDENT INVOLVING SPENT FUEL SHIPMENT

Conditions

A spent fuel shipment is being transported by truck from a nuclear power plant via a main highway. On the outskirts of a major population center, still within a fairly heavily populated area, the driver loses control (brake failure, speeding) and the truck/trailer strikes an abutment with force sufficient to dislodge the cask. The cask also hits the abutment and tumbles onto the highway. The driver is killed/unconscious. Several persons in a car are also involved in the accident and are injured. There is considerable liquid on the pavement, some encompassing the area of the cask.

Time	Event
0	Accident occurs. Road is impassable in one direction and traffic which is heavy begins to back up.
2 - 3 hrs.	Other nearby drivers/passengers go to scene and attempt to aid victims.
3 - 10 hrs.	Possibility of fire and/or radioactive contamination is mentioned and would-be rescuers retreat, not reaching truck driver. Police are called.
10 - 20 hrs.	Traffic tie-up builds. Police respond. Fire Department and ambulance are called.
15 - 25 hrs.	Police observe radioactivity markings and liquid on pavement. Police stop all traffic, rope off area, and call State Health Department. Truck driver is not available for questioning and shipping papers cannot be located.
30 - 60 hrs.	State Radiological Health personnel initiate response to scene of accident. Federal agencies are notified by telephone (ERDA/RAP, NRC, DOT or EPA).
	NRC receives report of a transportation accident probably involving a spent fuel shipment which may be leaking radioactive material to the environs. State people are believed to be on way to scene.

9.a LOCAL INTENSE PRECIPITATION

The Plant

The plant is located at one of the Great Lakes and adjacent to a small stream that has been modified at the mc ~h to serve as a discharge structure. The access road to the plant crosses e small stream by a bridge on the bluffs near the lake.

The Event

Heavy thunderstorms have occurred the previous evening and are forecast to continue all day with the possibility of tornadoes. At 2 p.m., after raining off and on all day a thunderstorm approaches from the SW. Rain is very heavy and continues uninterrupted until near 4 p.m. when a call from the relief operator alerts the plant that trees and other debris have lodged in the bridge and water is going over the bridge impeding passage.

Upon investigation by plant personnel, they notice that the stream has left its bank and water is reaching the lake through the yard. Cars in the parking lot are in water above their hub caps. Rain continues to fall. At 4:30 the parking lot has 2 feet of water and the stream continues to rise cutting other channels through the yard and depositng trees, etc. throughout the plant site. At 6 p.m. the rain stops and the stream slowly recedes.

Time	Event
0	Heavy rain.
2 hrs.	First alarm - bridge closed.
2-1/2 hrs.	Water in plant yard.
4 hrs.	Flood crests.

9.b. DAM FAILURE

The Plant

The plant is located along a river with numerous dams upstream. Plant grade is set to protect the plant from all but the most severe floods on the basin or from possible dam failures. The nearest dam is located about 10 miles upstream of the plant.

The Event

After a mild earthquake that caused no apparent damage, excessive seepage is noted at the toe of the upstream dam. One hour later, a small stream has developed and erosion is noticeable. Within 3 hours the dam is breached. The crest of the wave reaches the plant 1-1/2 hours later.

Time	Event
0	Seepage noted at toe of dam.
1 hr.	1st alarm - probable dam failure.
3 hrs.	Dam breached.
4-1/2 hrs.	Flood crest reaches plant.

9.c. MAJOR FLOOD EVENT

The Plant

The plant sits on the flood plain of a major river at elevation 200 MSL. Normal river level is approximately 40 feet below plant grade. The plant is protected to the PMF level of 230 MSL but must shut down at elevation 197.

The Event

After a rather wet and cold period a major storm is forecast for the area. The following is a sequence of dates and hydrologic events.

January 8 - 10	Heavy rain is falling throughout the basin.
January 10 - 12	A flood is forecast for the river - rain continues.
January 14	The river has started to rise - still raining.
January 15	River forecasts call for a major flood.
January 17	River projected to rise to plant grade at river to top of bank.
January 20	River near plant grade forecast to rise 20 additional feet.
January 21	River at plant grade
January 26	River crests at 225 ft MSL.
February 7	River at plant grade and falling.

9.d. TSUNAMI

The Plant

A coastal site with once-through cooling with the intake and discharge on a bay sitting about 10 to 15 feet above sea level.

The Event

An earthquake occurs somewhere offshore--at the plant the shock is felt as a major shock but it does no damage to the plant. Five minutes after the shock the intake is left essentially dry. Ten minutes after the shock water reaches plant grade and continues to rise for 3 additional feet. The cycle is repeated with the same period but with less severe fluctuations in water level.

Time	Event
0	Earthquake.
5 mins.	Water recedes.
10 mins.	Water 3 feet above plant grade.

10. EAST COAST BLACKOUT

Time	Event
0	Electrical grid system disturbance initiated in a large power plant switchyard.
1 min.	Faults in interconnecting transmission systems cause successive blackouts in New England, Pennsylvania, Maryland and Virginia. Region I and headquarters power out. Telephone lines are operable but swamped with high volume of calls so that telephone communication is not practical.
1 hour	Ten power plant sites are without outside power. Some have presumably been able to restart facilities after system transient to carry hotel load; others are probably relying on on-site emergency power supplies. Telephone communication to the sites has not yet been established.
3 hours	Electrical service has been restored in some areas. Phone situation begins to alleviate but telephone communication with some sites not yet established.
4 hours	Plugging of fuel lines to emergency diesel generator causes loss of all AC power at one blacked-out site--no telephone contact available from site to Region I or headquarters.
8 hours	Power restored at headquarters but not at Region I or at 4 sites, one of which has had the AC power loss.
10 hours	Power restored to all areas.

11. SEIZURE OF A REACTOR WITH THREAT OF SABOTAGE

Problem

A terrorist group seizes a single unit PWR power reactor and threatens to sabotage the facility to release radioactivity over the countryside if their demand for release of fellow members from jail is not met.

Time	Event
0	Plant seized. 10 armed terrorists gain entry and are demanding release of friends from county jail. They threaten to blow up the facility if demands are not met in 6 hours.
30 mins.	Utility Corporate Headquarters reports seizure of plant to NRC.
?	LLEA reports receipt of information that there are 10 terrorists armed with hand guns and several automatic weapons. They claim to be part of the xxx group. Reports indicate they have about 20 boxes of dynamite.
?	FBI reports the xxx group had been identified in the area and the group has claimed responsibility for bombings of several buildings in the past 2 years.
?	Reports from the facility indicate the terrorists intend to dynamite major penetrations into the containment building, dynamite waste hold-up tanks in the radwaste building, and destroy the control room panels. 25 hostages are being held.

12. PENETRATION OF PHYSICAL BARRIER AT A FUEL FACILITY WITH THEFT OF SNM

Time	Event
0	A mixed-oxide fuel fabrication facility is penetrated and a quantity of SNM is stolen.
2 hrs.	NRC Regional Office receives a report from xy fuel fabrication facility that the facility was penetrated after hours and a quantity of SNM is missing. Two security guards were killed. The facility is within 50 miles of the Mexican border. The facility possessed a significant inventory of both Pu and U oxides.
	The faclity reports the material access area was breached by use of explosives and the terrorist group consisted of about 8 persons. The attack occurred just after midnight. The group carried hand guns and automatic weapons and apparently used plastic explosives for penetrating the material access area. Approxmately 40 to 60 containers of PuO_2 are missing. Each container had about 2.5 kg of material. Escape was made in a panel truck.
	A material inventory confirms the loss of 50 containers of PuO_2. Each of the shipping containers had 2.5 kg of material. Radiological surveys indicate no spread of contamination. The FBI and Regional Office personnel are at the scene. Interviews with the guards present during the attack and theft have failed to produce any leads concerning the identity of the individuals or the group.

APPENDIX B

Current NRC Office/Division Responsibilities

Under the direction of the Director, Office of Inspection and Enforcement, the Incident Response Action Coordination Team (IRACT), the Regional Office staff, and the Incident Management Center (IMC) provide the resources and capabilities to initiate and coordinate NRC's response to incidents. Other Offices and Divisions of the NRC support the IRACT and operation of the IMC.

IRACT and IMC procedures and response actions for dealing with threats, thefts, and sabotage relating to special nuclear material, high-level radioactive wastes and licensed nuclear facilities are prepared under the direction of the Director, Office of Nuclear Material Safety and Safeguards.

Specific responsibilities and authorities of the NRC Offices and Divisions are as follows:

The Executive Director for Operations

determines, with respect to incidents reported to him or otherwise brought to his attention, whether the incident should be reviewed by the Incident Investigation Review Committee (IIRC).

Director, Office of Inspection and Enforcement:

a. provides direction for the Incident Response Action Coordination Team (IRACT) and the IE Headquarters and

NRC Regional Office response to incidents; operates the Incident Management Center (IMC) to support the response to incidents which require extensive coordination between NRC and other agencies.

b. develops procedures for use within NRC for receipt and dissemination of information relating to notifications and reports of incidents; informs the Commissioners, the Executive Director for Operations; other senior NRC management; and other appropriate agencies of incidents and NRC response actions.

c. develops contingency plans for dealing with radiological and safety-related incidents, other than threats to sabotage, in consultation and coordination with other Offices of the NRC.

d. receives and evaluates reports of incidents and determines and initiates the initial required response actions including, where appropriate, requesting radiological assistance from the Energy Research and Development Administration (ERDA) or the Interagency Radiological Assistance Plan (IRAP).

e. disseminates pertinent information about incidents to licensees.

f. advises the Commission, the Executive Director for Operations, and senior NRC management on questions connected with an incident relating to the operational aspects of shutting down or placing licensed facilities in a safe condition.

g. coordinates NRC response actions with other agencies on the Federal and State level.

The Technical Advisor to the Executive Director for Operatior

as Chairman, directs the activities of the Incident Investigation Review Committee in its investigation of incidents.

Director, Office of Standards Development:

a. reviews reports of investigation of incidents to determine whether changes and improvements are needed in regulations, guides, codes, and standards relating to the use of materials and facilities.

b. issues regulations, standards, and guides for NRC licensees on the subjects of plans and preparedness to cope with incidents which may occur in licensed operations.

c. provides technical staff to be members of the IRACT Support Staff and the IIRC when needed.

Director, Office of Nuclear Reactor Regulation:

a. reviews reports of investigation of incidents to:

(1) identify safety and safeguards related problems associated with the construction and operation of nuclear reactors and the materials and activities associated therewith; (2) determine if additional safety and safeguards evaluation may be needed; and (3) determine if changes and improvements are needed in regulatory requirements.

b. establishes requirements in licenses and technical specifications for reactor licensees regarding the reporting of incidents to the NRC.

c. evaluates corrective actions proposed by reactor licensees as a result of incidents; performs safety evaluations of reactor facilities subsequent to an incident, during repair, test, and startup.

d. provides technical staff to be members of the IIACT Support Staff and the IIRC when needed.

Director, Office of Nuclear Material Safety and Safeguards:

a. reviews reports of investigation of incidents to: (1) identify problems associated with the processing, transport, and handling of nuclear materials, including provision and maintenance of safeguards against threats, thefts, and sabotage of licensed materials and facilities; (2) determine if additional safety and safeguards evaluation may be needed; and (3) determine if changes or improvements are needed in regulatory requirements.

b. establishes requirements in licenses and technical specifications for materials and fuel cycle facility licensees regarding the reporting of incidents to the NRC.

c. develops contingency plans for dealing with threats, thefts, and sabotage relating to special nuclear material, high-level radioactive wastes, and licensed nuclear facilities, maintains awareness of threat posture through analyses and interagency coordination; and establishes and maintains pertinent interagency liaisons and procedures to ensure that NRC receives timely notifications of perceived threats.

d. provides technical staff to be members of the IRACT Support Staff and the IIRC when needed.

e. evaluates corrective actions proposed by materials and fuel cycle facility licensees as a result of incidents; performs safety and safeguards evaluations subsequent to an incident, during any repair, test, or startup of facilities or licensed operations.

f. establishes appropriate interfaces with other Federal agencies concerning contingency planning for threats, theft, and sabotage.

Director, Office of Management Information and Program Control:

a. maintains the computer-based Licensee Event Report File based on reports submitted by licensees and prepares periodic listings and special searches of the file.

b. identifies "abnormal occurrences," defined in the Energy Reorganization Act of 1974, Section 208, and prepares the required Quarterly Reports to the Congress and reports to the public on these events. Reports, notifications of incidents and safety evaluations made pursuant to this Chapter are reviewed to assess whether or not an "abnormal occurrence" has occurred.

Director, Office of State Programs:

a. carries out the lead agency responsibilities assigned to the NRC by the Federal Preparedness Agency, GSA, relating to radiological incident emergency response planning activities among Federal agencies, including the coordination of Federal radiological emergency response planning guidance for fixed facilities and transportation, and planning assistance and training programs for Federal, State, and local governments.

b. establishes liaison with other nations, in cooperation with the Department of State, for the exchange of information relating to incidents having international implications.

c. assists the Office of Public Affairs in public relations matters relating to incidents having international implications.

Director, Office of Administration:

a. provides advice and assistance on the Incident Management Center security program, including its physical and technical security measures.

b. provides central control and coordination through the Division of Security for receipt and dissemination of reports of investigations which are made by the Federal Bureau of Investigation relating to NRC licensed activities.

c. reviews reports of investigation of incidents dealing with classified information or material to determine: (1) if there was any compromise of national security information or (2) action taken to prevent a recurrence.

d. serves, through the Division of Security, as the central point of contact with other investigative agencies on matters relating to the NRC security and security classification program.

e. provides the IMC with computer services, telephone and other communications services, access to emergency communications systems, information and data processing, and other capabilities that may be needed.

Director, Office of Public Affairs:

a. follows established NRC public information policies for release of information relating to incidents.

b. assists the Office of Inspection and Enforcement in information activities relating to incidents.

c. reviews public statements and press releases regarding incidents at NRC-licensed facilities and clears those having international implications with the State Department.

d. promotes the NRC policy of encouraging licensees to take the lead in information activities related to incidents occurring at their facilities.

Directors, Offices and Divisions,

notify the IRACT through IE Division of Field Operations (or the IE Hq Duty Officer during non-working hours) of reports of incidents received from sources other than the NRC staff.

APPENDIX C

Current NRC Personnel assigned to Incident Response function

Incident Investigation Review Committee (IIRC)

Technical Advisor to the Executive Director for Operations - Chairman

Representative, Office of Standards Development - member

Representative, Office of Nuclear Reactor Regulation - member

Representative, Office of Nuclear Material Safety and Safeguards - member

Incident Response Action Coordination Team (IRACT)

Director, Office of Inspection and Enforcement - Director

Deputy Director, Office of Inspection and Enforcement - member

Director, Division of Field Operations - member

Director, Division of Materials Inspection Programs - member

Director, Division of Reactor Inspection Programs - member

IRACT Support Staff

Staff members, as necessary, from:

- Office of Nuclear Reactor Regulation
- Office of Nuclear Material Safety and Safeguards
- Office of Public Affairs
- Office of Standards Development
- Office of Administration
- Office of Nuclear Regulatory Research

Incident Management Center (IMC) Operating Cadre

Technical and clerical staff of Office of Inspection and Enforcement:

Operations Officer

Administrative Officer

Communications Officer

Regional Staffs

5 Regional Office Response Teams

Information Assessment Team (IAT)

Chief, Contingency Planning Branch, NMSS - Chairman

Representative, Program Support Branch, NRR - member

Representative, Field Operations Support Branch, IE - member

APPENDIX D

Present Incident Management Center

The present IMC is located in the East-West Towers and consists of the rooms and equipment shown in Attachment 1.

In addition to the equipment shown in Attachment 1, the IMC uses the IE File room and other communicating equipment for incident response. Two communicating mag-card typewriters, two facsimile machines, and a computer terminal coded for input and simultaneous access by all five Regions is available. The file room contains a complete docket file for Part 50 licensees. Each Part 50 power reactor licensee and Part 70 major fuel facility licensees have site descriptions, emergency plans, and environmental statements (some Part 70 licensees are not complete - material is not yet available), in individual packets on separte shelves in the file room.

The functions of the IMC are shown in Attachment 2.

In order to perform the functions outlined, the IMC has cadre that proceeds to the IMC when the IRACT directs the activation of the center. The cadre consists of an Opertions, a Communications, and an Administrative Officer. The procedures for activation and operation of the center have been written and tested.

In addition to the IMC procedures, response procedures have been written by each region, teams have been predesignated, arrangements for chartered air service have been made, portable radiation detection instruments are available for the team, and two Regions have vans that can be moved to the incident scene. Prearrangements have been made with Local and federal agencies for assistance. Call lists are included in the plans. Portable radio equipment is being purchased.

The IMC is operational and may be activated within approximately one hour from the time of notification. If Headquarters response to the scene is required to supplement a Region, emergency funds are stored and immediately available, and emergency transportation has been arranged.

ATTACHMENT 1

INCIDENT MANAGEMENT CENTER

LOCATION

The following rooms, located on the 5th floor of East-West Towers, have been designated as the Incident Management Center:

Room 503 - Initial IMC (See Fig. 1)

Room 504 - Expanded IMC

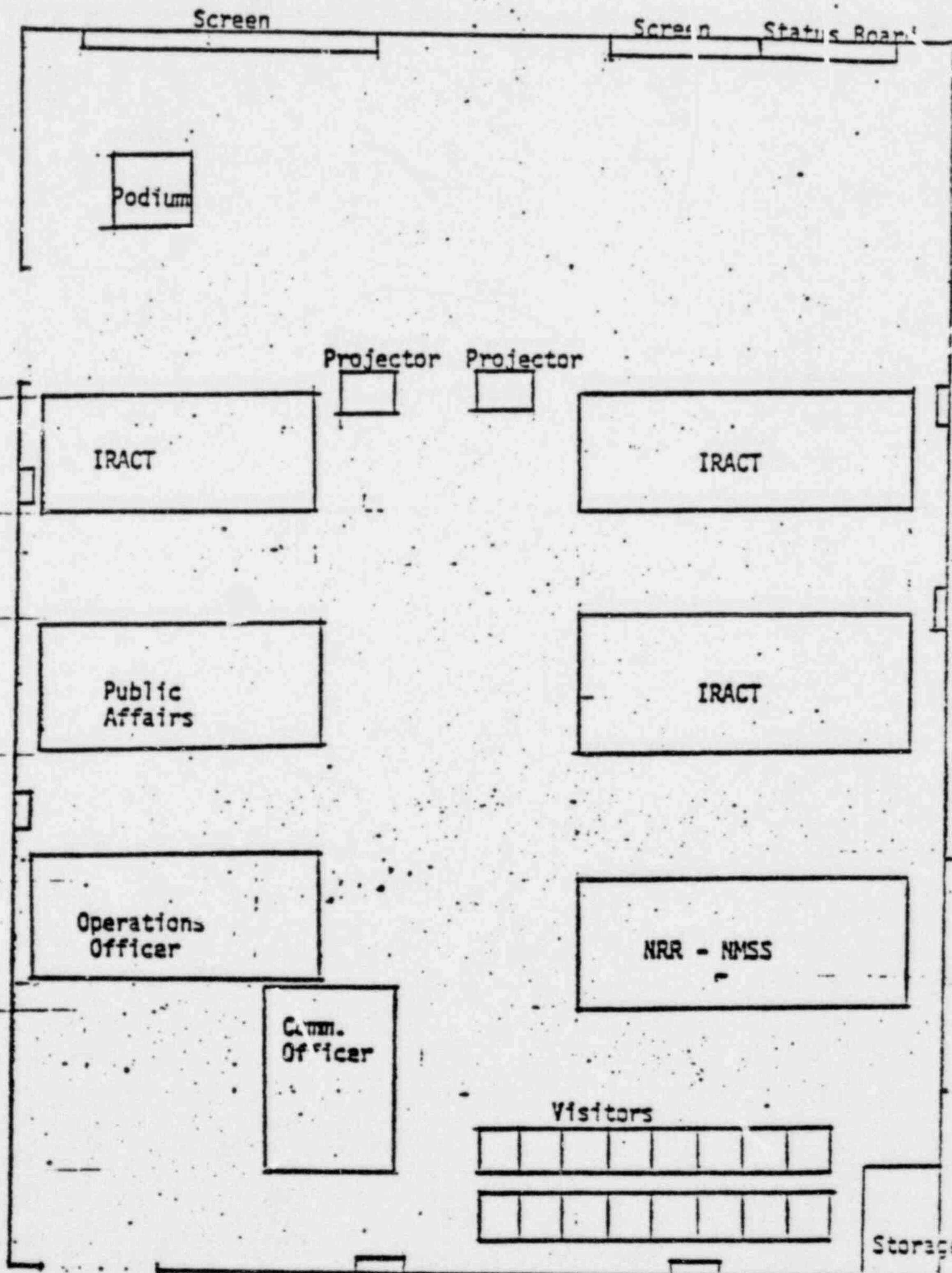
Room 506 - EDO/Comm. Office

Room 513 - Rest/Sleeping Area

INDIGENOUS EQUIPMENT

Rooms 503 and 504 have tables and chairs for approximately 20 people each. Each room also has a Vu-Graph projector, illustration boards (which also serve as screens), slide projector, podium, telephone hookups, and equipment locker. Room 503 contains the IMC equipment cabinet.

Fig. 1 Room 503



<u>DESCRIPTION:</u> IMC Equipment Cabinet (key-locked)

<u>LOCATION:</u> Rm. 503, E/W.

<u>RESPONSIBILITY:</u> The Admin. Officer, IMC, is responsible for the contents and general maintenance of the cabinet except where noted below.

<u>CONTENTS:</u>

1. Telephones (8) - Communications Officer, IMC
2. Conference phone - Communications Officer, IMC
3. Regional Emergency Response Plans - Operations Officer, IMC
4. Directory of Key Personnel - to be developed - Operations Officer, IMC
5. IE Manual Chapter (5) - Operations Officer
6. Writing tablets (2 dozen)
7. Pencils (2 dozen)
8. Pens (2 dozen)
9. Staplers (2)
10. Paper 8x10 1/2, Xerox (500)
11. Paper, 8x10 1/2, letterhead (100)
12. 3M Type 588 transparencies for thermo fax machine (1 box)
13. NRC telephone directory (8)
14. Dictionary (1)
15. Paper clips, scotch tape, clips, folders, etc.

<u>DESCRIPTION:</u> Beds, blankets, sheets, pillows for use in the Rest/Sleeping area.

<u>PRESENT LOCATION:</u> Warehouse.

<u>TRANSITION RESPONSIBILITY:</u> Admin. Officer, IMC works with Admin., NRC.

<u>IMC LOCATION:</u> Rm. 513 E/W.

<u>OPERATIONAL RESPONSIBILITY:</u>

<u>PROCUREMENT:</u>

Three beds are stored over at the warehouse. Telephone the Security Force (P-100, x27227) at <u>any</u> Time. Inform them to notify either Grover Estep or Art Correira (WHSE) that the beds are required. They will arrange to have the beds and accessories transported and set-up in Rm. 513.

ATTACHMENT 2

TABLE I - FUNCTIONS OF THE IMC

COLLECT INFORMATION: LICENSEES, FIELD OFFICES, INSPECTORS ON THE SCENE FEDERAL/STATE/LOCAL ORGANIZATIONS

EVALUATE INFORMATION: SYNTHESIZE, CHECK FOR ACCURACY, ASSESS MAGNITUDE OF INCIDENT, DETERMINE ASSISTANCE REQUIRED AND POSSIBLE CORRECTIVE ACTION, ETC.

DISSEMINATE INFORMATION: COMMISSIONERS & OTHER PARTS OF NRC; CONGRESS; NEWS MEDIA; WHITE HOUSE; ERDA, FBI & OTHER FEDERAL AGENCIES

RENDER ASSISTANCE: DISPATCH ADDITIONAL ASSISTANCE, PROVIDE ADVICE

OVERRIDE: IF REQUIRED

APPENDIX E

AUTHORITIES AND RESPONSIBILITIES FOR EMERGENCY (INCIDENT) PLANNING AND PREPAREDNESS-(NMSS, NRR, IE, SD, SP)

TYPES OF INCIDENTS (EMERGENCIES)	REQUIREMENTS ON NRC AS A REGULATORY AGENCY	OFFICE/DIVISION RESPONSIBLE FOR IMPLEMENTING AGENCY REQUIREMENTS	OFFICE/DIVISION RESPONSIBLE FOR INTERNAL NRC PLANS AND PREPAREDNESS	NRC EMERGENCY PLANS AND PROCEDURES	OTHER PRINCIPAL AGENCIES INVOLVED	INTERAGENCY AGREEMENT
	Atomic Energy Act of 1954, Energy Reorg Act of 1974, Exec Order 11490, applicable to all emergencies & incidents			NRCM 0502, Response Actions for Incidents, generally applies to all except national emerg	State and local agencies as appropriate	
1. OPERATIONAL						
a. Fires	a.	a.	a.	a.	a. DOL:OSHA	a. —
b. Explosions	b.	b.	b.	b.	b. DOL:OSHA	b. —
c. Industrial accdt	c.	c.	c.	c.	c. DOL:OSHA	c. —
d. Radioactive rels	d. "	d. NRR, NMSS, IE	d. IE, NRR, NMSS	d. IEMC 1300 NRCM-0502	d. EPA, USCG	d. MOU* MOU
e. Toxic release	e.	e.	e.	e.	e. EPA	e. MOU
f. Injury, fatality	f.	f.	f.	f.	f. DOL:OSHA	f. —
g. Radiation exposre	g. "	g. NRR, NMSS, IE	g. IE	g. NRCM-0502 IEMC-1300	g.	g.
h. Transp accident	h. "	h.	h.	h.	h. DOT ERDA	h. MOU Pending
i. Rad assistance	i. IRC	i. IE	i. IE	i. NRCM-0502 IEMC-1300	i. ERDA	i. Pending

* MOU = Memorandum of Understanding

AUTHORITIES AND RESPONSIBILITIES FOR EMERGENCY (INCIDENT) PLANNING AND PREPAREDNESS- (NMSS.NRR.IE.SD.SP)

TYPES OF INCIDENTS (EMERGENCIES)	REQUIREMENTS ON NRC AS A REGULATORY AGENCY	OFFICE/DIVISION RESPONSIBLE FOR IMPLEMENTING AGENCY REQUIREMENTS	OFFICE/DIVISION RESPONSIBLE FOR INTERNAL NRC PLANS AND PREPAREDNESS	NRC EMERGENCY PLANS AND PROCEDURES	OTHER PRINCIPAL AGENCIES INVOLVED	INTERAGENCY AGREEMENT
	Atomic Energy Act of 1954, Energy Reorg Act of 1974, Exec Order 11490, applicable to all emergencies & incidents			NRCM 0502, Response Actions for Incidents, generally applies to all except national emerg	State and local agencies as appropriate	
2. SAFEGUARDS						
a. Threat to steal	a. "	a. NMSS, NRR IE	a. NMSS, NRR	a. "	a. FBI	a. NRC/FBI Pending
b. Threat to use	b. "	b. "	b. "	b. "	b. "	b. "
c. Indication of penetration facil	c. "	c. "	c. "	c. "	c. "	c. "
d. Indication of theft/sabotage	d. "	d. "	d. "	d. "	d. "	d. "
e. Facility penetration in progress	e. "	e. "	e. "	e. "	e. "	e. "
f. Assault--penetration & escape	f. "	f. "	f. "	f. "	f. "	f. "
g. Assault and seizure	g. "	g. "	g. "	g. "	g. "	g. "
h. Possible theft	h. "	h. "	h. "	h. "	h. "	h. "
i. Industrial sabotage	i. "	i. "	i. "	i. "	i. "	i. "
j. Confirmed theft	j. "	j. "	j. "	j. "	j. "	j. "

AUTHORITIES AND RESPONSIBILITIES FOR EMERGENCY (INCIDENT) PLANNING AND PREPAREDNESS- (NMSS, NRR, IE, SD, SP)

TYPES OF INCIDENTS (EMERGENCIES)	REQUIREMENTS ON NRC AS A REGULATORY AGENCY	OFFICE/DIVISION RESPONSIBLE FOR IMPLEMENTING AGENCY REQUIREMENTS	OFFICE/DIVISION RESPONSIBLE FOR INTERNAL NRC PLANS AND PREPAREDNESS	NRC EMERGENCY PLANS AND PROCEDURES	OTHER PRINCIPAL AGENCIES INVOLVED	INTERAGENCY AGREEMENT
	Atomic Energy Act of 1954, Energy Reorg Act of 1974, Exec Order 11490, applicable to all emergencies & incidents			NRCM 0502, Response Actions for Incidents, generally applies to all except national emerg	State and local agencies as appropriate	
3. NATURAL PHENOMENA						
a. Earthquake	a.	a. NRR, NMSS	a. NRR, NMSS, IE	a. "	a.	a. None
b. Hurricane, Tornado	b.	b. "	b. "	b. "	b.	b. "
c. Flood	c.	c. "	c. "	c. "	c.	c. "
d. Wind, snow, ice, etc	d.	d. "	d. "	d. "	d.	d. "
4. NATIONAL						
a. Domestic	a. EO 11051, 11490 + 11725	a. OSP	a. OSP (Coordinator)	a. None	a. FPA	a.
b. Enemy attack	b.	b.	b.	b. "	b.	b.

APPENDIX F

Current Information Exchange Agencies

Federal Bureau of Investigation (FBI)

The FBI has a limited intelligence gathering role, but serves as a supplier of needed intelligence concerning a range of threats against the nuclear industry. In addition the FBI prepares and disseminates security alerts, bulletins and summaries to FBI field offices and other appropriate federal agencies regarding terrorist groups or activities.

Defense Intelligence Agency (DIA)

The DIA is responsible for producing and disseminating defense intelligence to satisfy the intelligence requirements of the Secretary of Defense, the Joint Chiefs of Staff, and major components of the DOD. It accomplishes this either by use of internal resources (Army, Navy, Air Force); through the management control, and coordination of the intelligence functions of the DOD activities; or through cooperation with other intelligence organizations.

Information collected by DIA on terrorist and other threatening groups provide input for NRC's threat assessment and alert dissemination activities.

Department of Army Military Operations (DAMO).
DAMO is the central point of contact for the utilization of DOD resources (equipment and technical personnel). In the event of a civil disturbance or when the FBI requests assistance to combat terrorism, the DAMO will provide the necessary resources.

Foreign Science and Technology Center
The mission of this center is to provide all source world wide scientific and technical intelligence to meet the requirements of the U.S. Army and the Defense Intelligence Agency. This center provides NRC with studies, testing data and capabilities of foreign weapons.

Naval Investigative Service (NIS)
The Naval Investigative Service is the primary activity within the U.S. Navy responsible for investigative and counterintelligence support within assigned geographic areas, and upon request conducts investigations and operations in criminal, counterintelligence and security matters. Information gathered through NIS is used by NRC in threat analysis and assessment. An example of the information provided includes

investigation of adversary activities near ports and harbours, (applicable to overseas shipment) and threat information relative to naval reactors, naval fuel facilities and associated transportation system all of which are pertinent to NRC efforts in this area.

Central Intelligence Agency (CIA)

The CIA correlates and evaluates intelligence relating to the national security and provides for the appropriate dissemination of such intelligence within our government, using where appropriate, existing agencies and facilities.

Information from the CIA serves to increase the probability and reliability of early adversary detection as a means of reducing our safeguards problem.

DOS - Bureau of Intelligence and Research

The Bureau of Intelligence and Research coordinates programs of intelligence, research, and analysis for the Department of State and for other Federal agencies, and produces intelligence studies and current intelligence anlayses essential to foreign policy determination and execution. Information on adversary actions or plans against nuclear facilities in foreign countries assists the NRC in accomplishing threat assessment.

DOS - Office of Security

Within the Office of Security is the Command Intelligence Center which is responsible for the collection, evaluation and dissemination of domestic and international information on terrorism for the Department of State. An automated data base and support system is being developed for use by the Center. The Office of Security has agreed to provide NRC with any intelligence information affecting the nuclear industry.

FAA - Operations/Liaison Staff

The Operations Liaison Staff is the principal element of the Civil Aviation Security Service responsible for the collection, evaluation and dissemination of Civil Aviation Security information to deter and prevent criminal acts. Based upon our experience in countering terrorists in sky-jackings and bombings, the FAA has developed and implemented procedures for the collection and assessment of threat information and for the dissemination of security alerts, bulletins, and summaries to the appropriate recipients.

ERDA - Safeguards and Security

A working arrangement has been agreed upon between the NRC and ERDA providing for mutual support and assistance in the response to incidents occurring in or affecting facilities or activities under the jurisdiction of either agency. Information exchange occurs between the Office of Nuclear Material Safety and Safeguards and ERDA's Division of Safeguards and Security on matters involving sabotage, terrorism and theft of SNM.

Treasury - Customs Service

Of particular interest to NRC is the Terrorist Data Base (TDB) presently being developed and their Indicative Intelligence Center to carry out their assigned mission. The TDB includes information describing terrorist organizations, their capabilities, size, operating characteristics, and membership. These systems can provide NRC information in a timely manner to support our threat assessment and alert dissemination.

U.S. Secret Service - Protective Intelligence Operation

The Protective Intelligence Operation which conducts investigations relating to the protection of the President and others, maintains liaison with law enforcement and intelligence agencies. Pertinent information is provided to NRC on individuals or groups who pose a threat to the commercial nuclear industry.

Department of State - Operations Center

This operations center is responsible for coordinating the Federal Government's response to major non-military emergencies which have international implications. It is staffed with operational personnel 24 hours a day, seven days a week. Information received from this Operations Center on threats or acts of terrorism against nuclear facilities in other countries is included in our threat assessment and alert dissemination program. In addition close coordination would occur between NRC and the State Department's Operation Center in an incident originating in the U. S. whose effects cross over into adjacent countries and thus have international implications.

National Security Council - Situation Room

The situation room is used for advising the President and senior government officials of all information available on pending crisis situations. Through this contact NRC could advise our executive branch of government of a theft or possible act of sabotage of significant quantities of SNM which could pose a threat to our national security.

Department of Health, Education and Welfare (DHEW)

DHEW is responsible for providing guidance for evaluation, control and use of radiologically contaminated foods and animal feed.

APPENDIX G

Current Support Agencies Responsibilities

1. Support/Action Agencies

Federal Bureau of Investigation (FBI)

The FBI is responsible for investigating all incidents, including nuclear threats, which involve suspected or actual violations of Federal laws. Thus, the FBI will have the primary jurisdiction and overall responsibility for direction of operations whenever terrorist actions are directed against nuclear material and/or facilities. Special Weapons and Tactics (SWAT) teams are available to provide a response force and for adversary apprehension.

Energy Research and Development Agency (ERDA)

ERDA will provide technical advice on the bomb design and assist in the disarming or disabling of the dispersal or improvised nuclear device. This service is available to the civilian sector when requested through JNACC or ERDA channels.

Joint Nuclear Accident Coordination Center (JNACC)

JNACC is a joint organization (ERDA/DOD) that acts as an information and coordination center for advice on radiological mishaps and can provide data on the location and availability of nuclear accident response teams, equipment, and special capabilities. It also receives requests for assistance, and in turn, requests the required assistance from the appropriate agency. The DOD element of JNACC is located at Field Command, DNA, Kirtland AFB, New Mexico.

Nuclear Emergency Search Team (NEST)

The Nuclear Emergency Search Team is made up of representatives from the ERDA Laboratories (Los Alamos Scientific Laboratory (LASL), Lawrence Livermore Laboratory (LLL), and Sandia Laboratories (SL) and an ERDA contractor, EG&G. NEST is responsible for searching, locating, and identifying ionizing radiation-producing materials; and for providing the logistics and communications support required for the ERDA team assisting in the disarming or disabling of dispersal or improvised nuclear devices.

ERDA Emergency Operations Center (EOC)

The direction and coordination of ERDA's EACT emergency response operations are accomplished from the Emergency Operations Center which is located at Germantown, Maryland. NRC requests for ERDA response forces assistance would be made through the EOC.

Radiation Assistance Plan (RAP) Team

RAP teams will respond, upon request, to provide radiological advice and assistance at the scene of an incident.

Interagency Radiological Assistance Plan (IRAP)

IRAP is a plan designed to marshall Federal resources for radiological incidents. ERDA is the Secretariat.

Department of Defense (DOD)

Explosive Ordinance Disposal Teams (EOD)

The various military Explosive Ordinance Disposal teams are responsible for locating, identifying, rendering safe, removing or destroying explosive ordinances, to include nuclear devices.

Department of Transportation (DOT)

U. S. Coast Guard (USCG)

The Coast Guard is a law enforcement agency with a significant military capability in terms of aircraft, helicopters, patrol boats, cutters, weapons, and highly trained personnel which can act as a response force for incidents occurring on waterways, at offshore nuclear plants and on the high seas. They also have a Command Center which serves as the command center for the Department of Transportation. As such, they have responsibility not only for shipments by sea and inland waterways, but also for accidents and incidents involving the shipment of hazardous materials on land (rail and truck).

Department of Treasury - Customs Service

The Customs Service is responsible for the collection and protection of the revenue; the prevention of fraud and smuggling through the tactical interdiction program, and the processing and regulation of people, carriers, cargo and mail into and out of the United States. In support of this program the Customs Operations Office utilizes the Treasury Enforcement Communications System (TECS). The TECS capability for message switching point-to-point and broadcast from headquarters to the field levels might prove useful for alert messages to border posts, airfields, and ports in the case of a theft contingency in which adversaries are attemping to leave the country. We would coordinate with their Operations Center for assistance on adversaries attempting to leave this country.

Environmental Protection Agency (EPA)

EPA can provide radiological monitoring assistance through its Regional Offices.

Defense Civil Preparedness Agency (DCPA)

DCPA can provide radiological monitoring assistance through the civil defense resources.

Local Law Enforcement Authorities (LLEA)

All NRC licensees are required to make arrangements with local law enforcement authorities — municipal, county, and State — to provide assistance when requested. State and local law enforcement agencies currently have a limited capacity to respond in a timely fashion to security emergencies at nuclear facilities and transport.

APPENDIX H

OUTLINE

"DRAFT NRC HEADQUARTERS SAFEGUARDS CONTINGENCY PLAN"

to be prepared by Contingency Planning Branch, SG

I. Introduction

a. Background
b. Purpose
c. Scope
d. Content

Sets the stage for the material to follow.

II. Possible Safeguards Contingencies

a. Threats
b. Thefts
c. Sabotage

The objective of this section is to define what is meant by a safeguards contingency and to present examples of the three types.

III. NRC Response to Incidents

a. General Discussion
b. Events/Objectives
c. Decision - Action Sequences
d. Decision Criteria
e. Data Requirments for Decision Making

This section consists of a delineation of (1) the criteria for the initiation and termination of extraordinary safeguards concern, and (2) the general requirements for adequate response to the cause of that concern. It groups all indications or confirmations of threats, thefts, or sabotage for both the fixed site and transportation fuel cycle segments into several dozen categories of events according to how they are first perceived by any member of the safeguards system. Each event has an associated objective, a necessary level of awareness or desired final state of operations towards which all efforts are directed.

Each event/objective pair will be followed by a delineation of the preconceived sequence of decisions and actions to be taken to guide the NRC responses from the stimulus to the objective. Each discussion will also include criteria and data requirements necessary for decision making.

esponsibilities in Reacting to Incidents

a. NRC Responsibilities
b. Federal Agencies Responsibilities
c. Local Government Responsibilities
d. Licensees Responsibilities
e. Responsibility Matrices--who does what and when

The fourth section will delineate the responsibilities of the various federal and local agencies (with emphasis on NRC Headquarters). The Responsibility Matrix depicts the NRC organizational responsibilities for making decisions or taking actions. The matrix is an expedient for presenting the actions and/or decisions required as a function of a particular event and responsible agency.

V. Procedures Summary

The Procedures Summary is a convenient rearrangement of the Responsibility Matrix. For each member of the organization, it condenses the set of events into groups that initiate identical task sequences, or series of decisions and actions. It then lists for each task sequence the procedures to be followed, the criteria for considering the task sequence accomplished, and all the data necessary to perform the tasks.