



UNITED STATES COMMISSION  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

PER  
ON  
CORRESPONDENCE

October 3, 1980

The Honorable Thomas P. O'Neill, Jr.  
Speaker of the United States  
House of Representatives  
Washington, D. C. 20515

Dear Mr. Speaker:

I am pleased to forward the following reports called for in Public Law 90-295:

NUREG-0728, "Report to Congress: NRC Incident Response Plan,"  
required by Section 106.

NUREG-0729, "Report to Congress on NRC Emergency Communications,"  
required by Section 306.

NUREG-0730, "Report to Congress on the Acquisition of Reactor Data  
for the NRC Operations Center," required by Section 305(b).

The reports summarize the status of many of the actions taken or being taken to improve the NRC response to emergencies and incidents at nuclear power plants. During and immediately after the accident at Three Mile Island-Unit 2, unforeseen difficulties in the response were overcome as quickly as possible. Later, additional improvements were made following major NRC, Congressional and Presidential reviews of the accident and response. The various individual changes are now being consolidated into more comprehensive and interrelated plans and programs such as those forwarded herewith.

The NRC Incident Response Plan assigns responsibilities for performing the functions and making the decisions that comprise the NRC response. It is based on early notification of an incident (as required by 10 CFR 50.72 and 10 CFR 20.403) and on deliberate escalation of the NRC response to whatever level is necessary to help limit risks to the public and the environment. The plan specifies that the Chairman direct the NRC response through a shortened chain of command, with provision for delegation of authority to a senior NRC official at the site of an incident as early as it is practical to do so. The plan will be exercised, modified as necessary, and expanded to cover incidents other than those at nuclear power reactors. Some procedures and decision criteria also remain to be formalized. The NRC plan and its implementing procedures will be made consistent with those now being prepared by the Federal Emergency Management Agency, but the NRC will continue to improve its own plan in the meantime.

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The Report on Emergency Communications summarizes the findings of communications problems cited by six major reviews of the accident and response at Three Mile Island. The report also notes the status of corrective actions for those problems, then presents a more comprehensive evaluation of current capabilities to provide the communications needed to support the functions described in the new Incident Response Plan. Several important communications problems persist, so the report concludes with a description of some of the options now being considered for further improvements. The report also points out that an ongoing investigation is looking into inadequacies in Three Mile Island site personnel communications with others on the day of the accident. The investigation was described in my March 21, 1980, letter to Congressman Udall. This ongoing investigation is also addressing the concerns raised in the September 10, 1980, letter to me from Senators Hart and Simpson. The investigation, which began last Spring, has been delayed by the legal process resulting from challenges to our administrative subpoenas. We expect that the report of this investigation will contain further recommendations to improve information flow, with emphasis on other than hardware issues.

The Report on the Acquisition of Reactor Data for the NRC Operations Center describes in detail current plans for one major facet of the communications problem--a link between the site and NRC Headquarters. The data link will play a key and early role in some NRC functions and decisions, and because of the additional perspective which it makes possible, the link will broadly support the entire NRC Incident Response Plan. In response to a letter from the Senate Committee on Public Works and Environment dated May 12, 1980, and another letter from the House Committee on Interior and Insular Affairs dated May 5, 1980, the report describes the relationship of the data link to decision-making and further describes other means of providing similar information to decision makers.

I believe that these three reports satisfy the requirements of Sections 106, 305, and 306 of Public Law 90-295 and include sufficient additional information to provide the appropriate context.

The Commission recognizes that it would be impractical and unwise to attempt to take over reactor operation from our Headquarters. However, we cannot completely rule out a need for some level of NRC advice or involvement in an emergency situation, and our data requirements, while based primarily on our responsibility to recommend actions to protect the public around the reactor, must be established with this remote possibility in mind.

Commissioner Gilinsky adds:

I am troubled by the vague description of NRC's role in future emergencies in the enclosed reports on NRC incident response planning, emergency communications and data transmission and what this may portend.

Immediately at issue is whether the NRC is to acquire, for an expanded emergency role, electronic equipment for transmitting reactor control board information to NRC Headquarters. And if the answer is yes, how elaborate should the system be? The role of NRC in accidents should dictate the choice of equipment; I am concerned that the process is working the other way around.

None of the three reports state clearly that the NRC's main safety role in a reactor accident is to help local and state governments decide whether there is a need to protect the surrounding population--in the extreme whether to order an evacuation. There is no hint in the enclosed reports of what such decisions would turn on or on what basis an evacuation might be recommended.

A secondary NRC role would be to help the reactor's operator, the utility, to cope with the situation, and data on the reactor's status would obviously be helpful. It should be understood, however, that in practice it is the reactor vendor, the designer and fabricator, who is most familiar with the details of the plant and is in the best position to offer assistance.

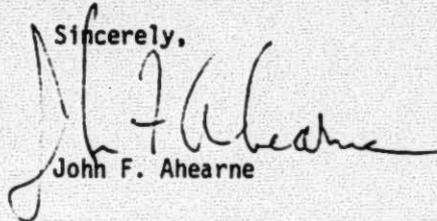
What is most worrisome about these reports is that despite some caveats they open the door to a very much more active NRC role in running a nuclear reactor during an accident. This is not a role the NRC is competent to carry out--it does not have a cadre of individuals licensed for, or experienced in, the operation of commercial power reactors--or a role that makes sense in any case.

It is one thing to say that the possibility cannot be ruled out that the NRC will have to exercise more control than was planned for. It is quite another thing to say that however unlikely, an NRC takeover, possibly even from Bethesda, is nevertheless something to be planned for. What concerns me is that the planning for an NRC takeover, accompanied by acquisition of all the accompanying electronic paraphernalia needed to carry out such a task, threatens to tangle lines of responsibility and obscure our ultimate dependence during accidents on the competence of reactor operators and management. If that competence is lacking in a utility it should not be operating power reactors; it will not help to try to operate distant power reactors from Bethesda.

The Honorable Thomas P. O'Neill, Jr. 4

I believe the above points have been made by all Commissioners at each Commission meeting on the Nuclear Data Link (including Commissioner Kennedy, when he was here). It nevertheless may be read as to imply the NRC should not receive accurate and timely information during the time an accident is developing. Like others who actively participated in the early stages of the TMI accident, I am perhaps overly sensitive to the frustration of trying to find out what is going on during what may be critical moments. However, I share Commissioner Gilinsky's concerns that the data system may become too large, and we all will attempt to limit it to those few parameters needed to carry out our responsibilities.

Sincerely,

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John F. Ahearne

Enclosures:

1. NUREG-0728
2. NUREG-0729
3. NUREG-0730



CHAIRMAN

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

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The Honorable Walter F. Mondale  
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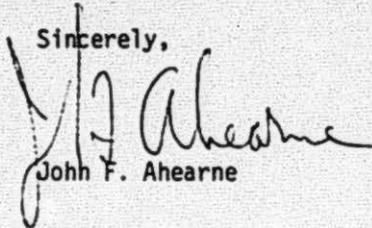
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Enclosures:

1. NUREG-0728
2. NUREG-0729
3. NUREG-0730

NUREG-0728

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# Report to Congress: NRC Incident Response Plan

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Manuscript Completed: September 1980  
Date Published: September 1980

Office of Inspection and Enforcement  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555



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## FOREWORD

Public Law 96-295 contains a request for NRC to provide three reports to Congress, all related to improvements in the NRC response to nuclear emergencies since the accident at Three Mile Island Unit 2 on March 28, 1979. The reports prepared to answer that request are:

NUREG-0728, "Report to Congress: NRC Incident Response Plan"  
NUREG-0729, "Report to Congress on NRC Emergency Communications"  
NUREG-0730, "Report to Congress on the Acquisition of Reactor Data  
for the NRC Operations Center"

These reports summarize the status of many of the actions taken to date and provide the basis for continued upgrading of the NRC Incident Response Program.

The NRC Incident Response Plan assigns responsibilities for performing the functions and making the decisions that comprise the NRC response. The NRC plan will be made consistent with plans being prepared by the Federal Emergency Management Agency.

The Report on Emergency Communications summarizes the findings of communications problems identified by the major reviews and investigations of the accident and response at Three Mile Island. The report also includes the status of corrective actions for the identified problems and presents an evaluation of current communication capabilities and future options needed to support the functions identified in the NRC Incident Response Plan.

The Report on Acquisition of Reactor Data for the NRC Operations Center describes alternatives for one major facet of the communications problem: acquiring data at a nuclear power plant and transmitting them to NRC headquarters. Such a data link can play a role in the NRC functions and decisions and provide broad support for the entire NRC Incident Response Plan.

Collectively, these reports to Congress provide a comprehensive outline of the actions and plans of the NRC for improving its response to any future accidents. It is anticipated that these documents will also provide the other possible participants in an accident (State and local agencies, licensees, vendors, etc.) with an understanding of the present manner in which NRC can be expected to respond and how the response will change in the near future.

### ACKNOWLEDGMENT

This report was prepared by the Operations Support Staff of the Office of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, from the work of many individuals in several headquarters and regional offices. Major contributions are hereby acknowledged from (listed alphabetically) William Axelson, Charles Gallina, Joe Himes, and Eric Weinstein. Other essential assistance was rendered by Greg Gibson, Joseph Hendrie, Phillip McKee, Richard Rosano, Richard Van Niel, and Bernard Weiss.

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## NRC INCIDENT RESPONSE PLAN

### 1. INTRODUCTION

#### 1.1 Statutory Responsibility

The U.S. Nuclear Regulatory Commission (NRC) regulates nuclear activities to protect the health and safety of the public and to preserve environmental quality. Toward that end, NRC must be prepared to respond quickly to any incident involving NRC licensed activities that has the potential to threaten the public or the environment in any way. This Incident Response Plan assigns responsibilities which collectively assure that NRC will fulfill its statutory responsibility.

#### 1.2 Parallel Responsibilities

While the NRC and its licensees together must be prepared to perform all essential technical activities to protect the public in the event of an incident at a licensed facility, they must also be prepared to cooperate with local, State, and other Federal agencies having related responsibilities.

The Federal Emergency Management Agency (FEMA) is preparing a National Contingency Plan which will include provisions for coordinating all Federal response activities outside the boundaries of a nuclear facility. Consistency between the NRC and FEMA plans will be assured through a formal Memorandum of Understanding between the two agencies. The NRC also has signed a Memorandum of Understanding with the Federal Bureau of Investigation for incidents involving possible safeguards violations and another with the Department of Transportation for transportation accidents. To assure consistency between this Incident Response Plan and the planned radiological activities of several other agencies, NRC is also helping to revise the former Interagency Radiological Assistance Plan into a new Federal Radiological Response Plan.

#### 1.3 Purposes and Scope of the Plan

This Incident Response Plan currently governs responses to incidents at nuclear power reactors licensed by the NRC under Sections 103 and 104 (b) of the Atomic Energy Act of 1954. It will be expanded to govern incidents at other types of facilities by March 1, 1981.

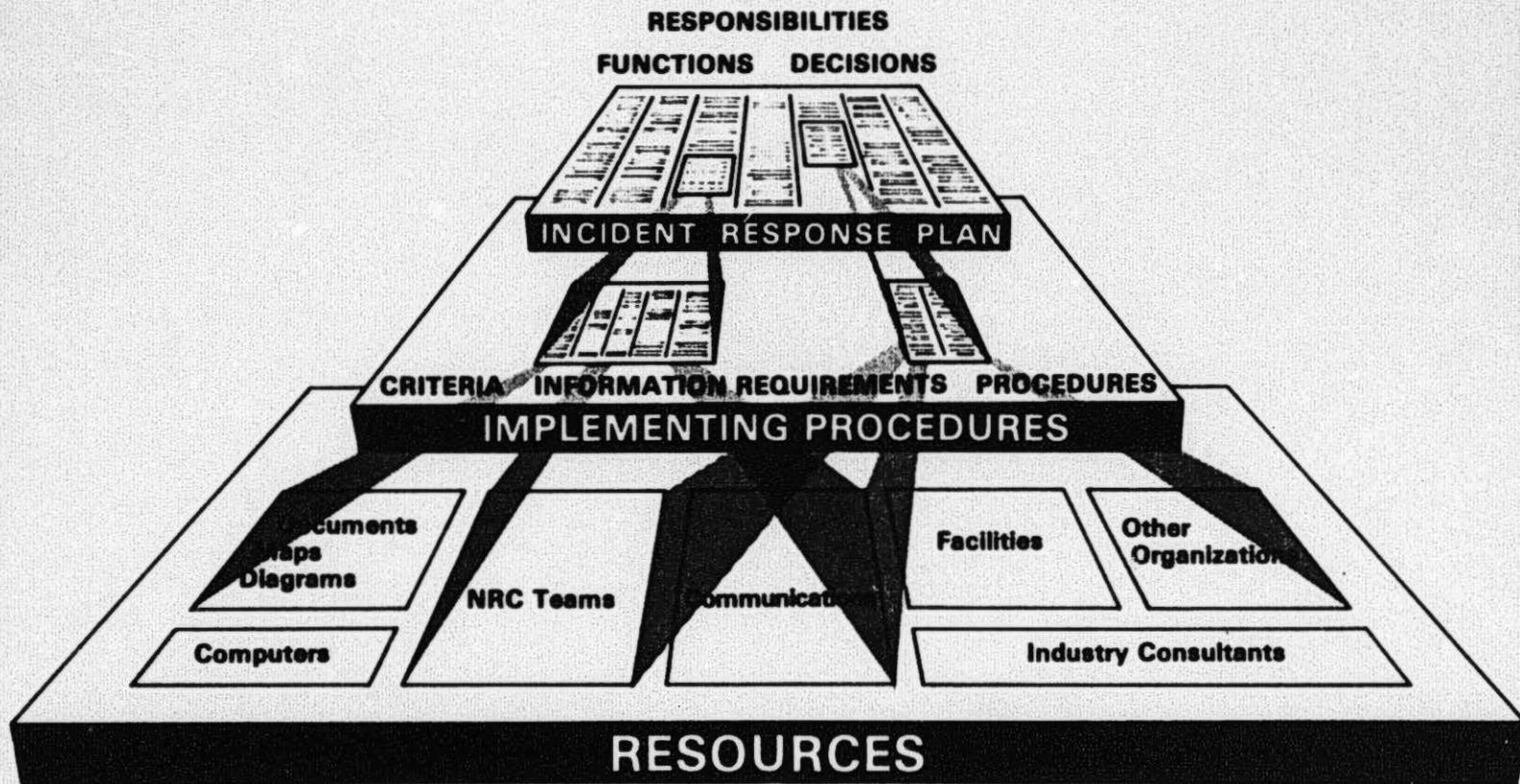
The plan is intended to serve the following major purposes:

- (1) Guide NRC managers who must assure that all appropriate tasks are under way at any stage of a response.
- (2) Remind each NRC participant of his or her responsibilities (either as an individual or as a team member) throughout a response.
- (3) Identify NRC interrelationships with other organizations.
- (4) Serve as a training aid to maintain personnel readiness.

The Incident Response Plan describes the functions and kinds of decisions that comprise an NRC response. It should require only infrequent change. Taken as a whole, the plan provides an overview of NRC functions before and during an

incident. The responsibilities assigned by the plan are exercised through a set of implementing procedures that delineate the manner in which each function will be performed, the criteria to be used in making each decision, and the information needed for both (Fig. 1). The implementing procedures (such as call lists) are not included in this plan; they are operational tools that will usually change much more frequently than the plan and so are contained in separate documents. Although procedures for nearly all of the functions have been developed through exercises and responses to real incidents, many have not yet been formalized. Procedures will now be formalized, each referenced to a particular assignment in the plan and indicating the specific resources that response personnel must have available to fulfill the assignment.

The need for resources is dictated by the implementing procedures. Therefore, this plan and its implementing procedures will be used as the basis for allocating existing resources among the functions and defining new requirements to better fulfill all responsibilities. (A supplementary plan may be prepared for maintaining and using each kind of resource, such as computers or communications, to assure compatibility in meeting the varied demands of several different functions.) Thus, there are three major steps in fully defining a new NRC incident response system. This plan is the first step.



**FIGURE 1**  
**RELATIONSHIP OF PLAN, PROCEDURES, AND RESOURCES**

## 2. EMERGENCY MANAGEMENT AND OPERATIONS

An effective emergency response demands not only a simplified management concept but also a clear organization of task responsibilities. This plan is intended to meet the following objectives:

- (1) Provide for definite decisions to escalate or deescalate the NRC response (commensurate with the potential severity of an incident) so that all participants will be aware of the correct response mode, and of their corresponding responsibilities, at all times.
- (2) Identify single-point responsibilities for advising the licensee, directing the licensee, and making other decisions. The plan also provides for direct delegation of authority between the person giving and the person receiving the authority.
- (3) Provide for informing NRC personnel and other organizations about NRC response actions and about any delegation of authority.

Within any response mode, overall authority and responsibility is clearly assigned by the plan. When the focus of the response is shifted to the site by the appointment of a Director of Site Operations, there is an orderly transfer of command to avoid duplication of authority.

### 2.1 Response Roles

The licensee has the immediate and primary continuing responsibility for limiting the consequences of an accident at a nuclear power reactor. When the licensee notifies NRC of an incident, the initial NRC response is to ascertain the status of the plant and monitor licensee activities. The purpose of this monitoring role is to assure that the public and the environment are fully protected. The NRC (and other organizations) will measure offsite radiological effects and will develop projections of onsite and offsite effects for the use of other Federal, State, and local agencies.

If and when the NRC determines that there is a potential threat to the public or the environment, it will begin to monitor more intensively to develop an NRC assessment of the problems. The NRC will offer specific advice to the licensee to help solve or limit the consequences of the problem but, while in this advisory role, the NRC must also be prepared to issue formal orders if the licensee should fail to take whatever actions the NRC deems necessary to protect the public. In the logical extreme, the NRC must be prepared to assume management control of a plant to whatever degree deficiencies in licensee management make it necessary. Management control is a very unlikely possibility, and good coordination of licensee and NRC activities during an emergency will lower the possibility still more.

### 2.2 Response Modes

NRC incident response operations are divided in this plan into five distinct modes:

- (1) **NORMAL**                      This mode includes all activities designed to maintain readiness; it continues through the initial discussion of any call. Headquarters and regional personnel,

Office of Inspection and Enforcement (IE), jointly assess the initial information and the senior headquarters official determines NRC actions in the normal response mode. If so instructed, the Headquarters Duty Officer establishes and maintains a telephone conference linking the person reporting a problem with the headquarters and regional personnel responding to it. Any number of specialists may be consulted, but the Operations Center is not formally manned.

Transition event  
to STANDBY:

The NRC response system is put on Standby by a decision of the senior IE official when the incident is judged to be sufficiently uncertain or complex that there is a need to use the facilities of the Operations Center. The NRC response will go on Standby, at least, whenever a licensee declares an Alert at a site (See NUREG-0610, Ref. 1).

(2) STANDBY

Standby mode activities depend on the incident:

(1) If there is a problem within the plant site, the IE Management-on-call or the appropriate IE Division Director will assume control and designate individuals to form a Standby Team at the Headquarters Operations Center. Preparations, including some notifications (to FEMA, for example), are made for rapid activation should it become necessary. (A decision to escalate or deescalate is expected to be made in a relatively short time.) Licensees designate someone to provide data requested by NRC. Regional personnel may be sent to the site at the option of the Regional Office Director.

(2) If there is a problem external to the plant site that may affect the plant, the NRC response may be in Standby mode for an extended period. (A hurricane exemplifies this problem.) The Regional Office Director or his designee will assume control during such incidents. Headquarters will assemble a Standby Team as necessary to assist.

The IE Director will monitor activities in all Standby situations and may assume control at any time.

Transition event  
to INITIAL  
ACTIVATION

The NRC response system is fully activated upon either of the following actions:

- Licensee declaration of a reactor Site Area or General Emergency. (See NUREG-0610.)
- Decision by an Executive Team member (see page 8) to activate the NRC response for any other reason. This may occur before declaration of a Site Area or General Emergency.

(3) INITIAL  
ACTIVATION

Response teams report to the Operations Center and other duty stations. The cognizant regional office response is fully activated and a designated Site Team is dispatched under the leadership of the Regional Office Director. Other regional offices go on Standby. The focus of NRC response operations is at headquarters.

Transition event  
to EXPANDED  
ACTIVATION

The NRC response system enters an expanded activation mode whenever, after receiving a report from the Regional Office Director or other senior NRC official previously dispatched to the site, the response Director (i.e., the NRC Chairman) decides to keep the response system activated, designate an NRC Director of Site Operations, and delegate specific authority to him.

(4) EXPANDED  
ACTIVATION

The focus of NRC response operations is at the site, although headquarters may retain certain specific authority. The Executive Team draws on all regional and headquarters personnel to provide support to the NRC Director of Site Operations. Relief teams are established to permit continuous, sustained operations.

Transition event  
to DEACTIVATION:

The NRC response is deactivated when the Director so decides. The decision will usually be based on a recommendation of the Executive Team (if in the Initial Activation mode) or the NRC Director of Site Operations (if in the Expanded Activation mode).

(5) DEACTIVATION

Response operations during the early part of this mode are similar to those during the Standby mode, except that a Site Operations Team may remain active. In addition, tapes, logs, and other records of the incident are assembled and catalogued for review. Responsibilities for reviews and investigations are assigned. Responsibilities for recovery operations will also be assigned, and some recovery operations will usually continue as the NRC response returns to normal.

Table 1 relates the NRC response modes to those defined in NUREG-0610 for licensees. As noted in the table, licensees report many events under the requirements of 10 CFR 50.72 (Ref. 2) which do not meet the thresholds defined in NUREG-0610 for "Notification of an unusual event." Those reports, which this plan denotes as "Early notification," may cause the NRC response to go on standby under some conditions. When the licensee reports an unusual event as defined in NUREG-0610, NRC may go on Standby or may activate. When NRC enters its Standby mode, preparations are made to activate quickly, if necessary. Activation of the NRC response is automatic upon notification of conditions which cause a Site Area or General Emergency.

Table 1. Relationship Between NRC and Licensee Response Modes

NRC MODE	LICENSEE MODE				
	*Early Notification	Notification of Unusual Event	Alert	Site Area Emergency	General Emergency
Normal	X	X			
Standby	X	X	X		
Initial or Expanded Activation		X	X	X	X

\*Licensee Event Required to be Reported to NRC by 10 CFR 50.72, but not Categorized in NUREG-0610.

### 2.3 Response Management

The NRC response need not escalate through all modes, but may be ordered into activation immediately. There will nearly always be two modes of activation, however: (1) initial (when activities are directed from headquarters), and (2) expanded (when most or all activities are directed from the site). The transition occurs when the Director (i.e., the Chairman of the Commission or designated alternate) appoints an NRC Director of Site Operations. Figures 2 and 3 show the management concept before and after the appointment. The concept permits the management focus to shift from headquarters to the site without disrupting response operations.

The Chairman of the Commission is the senior NRC authority for all aspects of a response and, in carrying out his responsibility for directing NRC activities, may choose to make, modify, or set aside any decision. During an emergency, the Chairman will become the "Director" of all NRC response activities and personnel, a title meant to imply that the Chairman has not only the authority but also the responsibility for taking direct charge of any particular activity should the need arise.

Normally, however, certain responsibilities will be predelegated by the Chairman to whomever he appoints to be the "Deputy Director" upon activation of the Operations Center. The Deputy Director, who may be the Executive Director for Operations (EDO) or another member of the Executive Team (ET), will carry out the delegated responsibilities unless the Chairman specifically directs otherwise. (Other members of the ET are the Director of the Office of Inspection and Enforcement and either the Director of the Office of Nuclear Reactor Regulation or the Director of the Office of Nuclear Material Safety and Safeguards, as appropriate). The Director (i.e., the Chairman) can call on the other Commissioners to advise him and to perform key missions; the Deputy Director can call on the other members of the Executive Team, who act as his assistants. Together, the Director and Deputy Director assure that preplanned actions are under way during initial activation; they also identify other necessary actions unique to the particular incident. Headquarters and region teams carry out those actions.

The Director may appoint an NRC "Director of Site Operations" as soon as a qualified official (usually the cognizant Regional Office Director) arrives at the site, assesses the situation, and reports back to the Director. Concurrent with the appointment, the Director may also delegate one or more of the following authorities to the Director of Site Operations:

- (1) Authority to recommend actions to the licensee
- (2) Authority to direct the licensee to take specified actions
- (3) Authority to recommend actions off site, including protective measures for the public.

Other officials and organizations will be immediately informed of the appointment and delegated authority. The Director of Site Operations will assume supervision of all NRC personnel at the site, will represent NRC in interactions with other agencies, and will decide what response actions must be taken, consistent with the delegated authority. He may obtain direct support

# INITIAL ACTIVATION ORGANIZATION

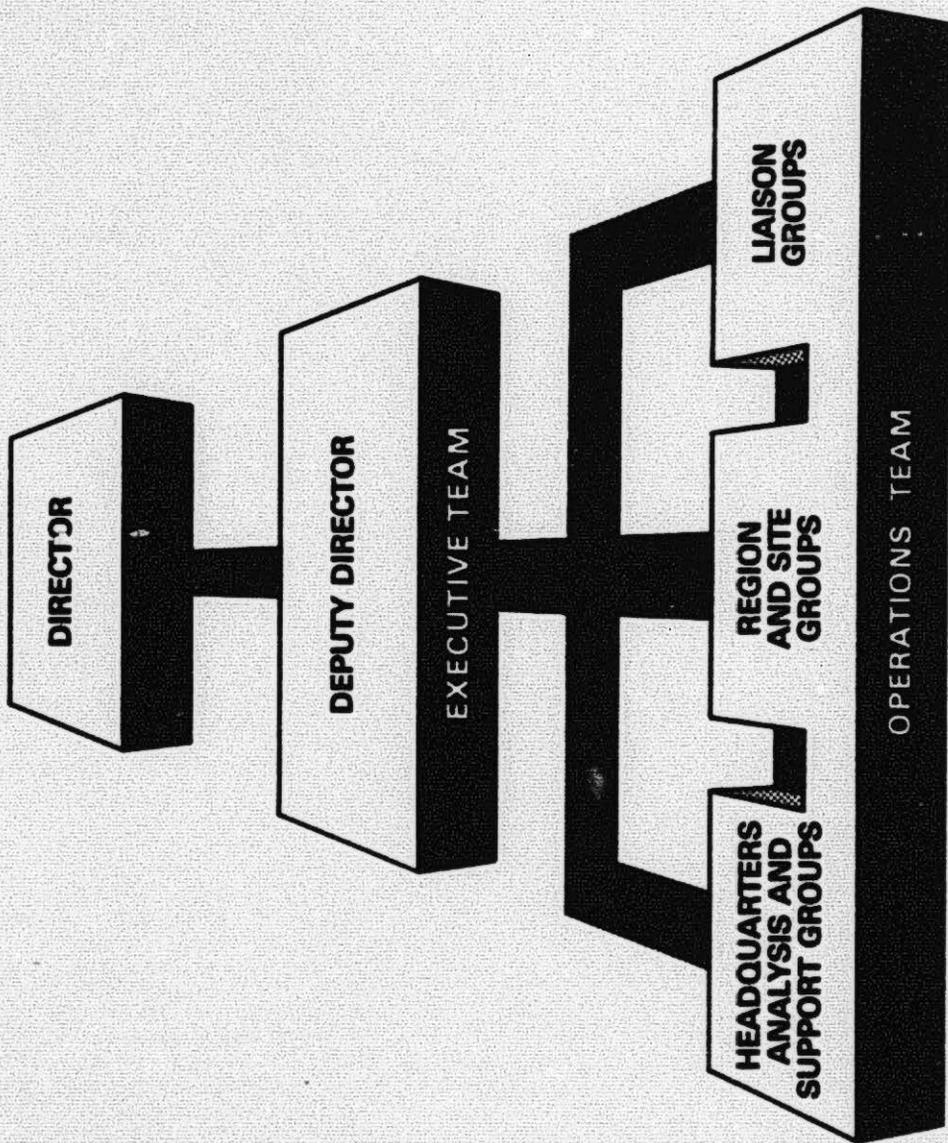


FIGURE 2

# EXPANDED ACTIVATION ORGANIZATION

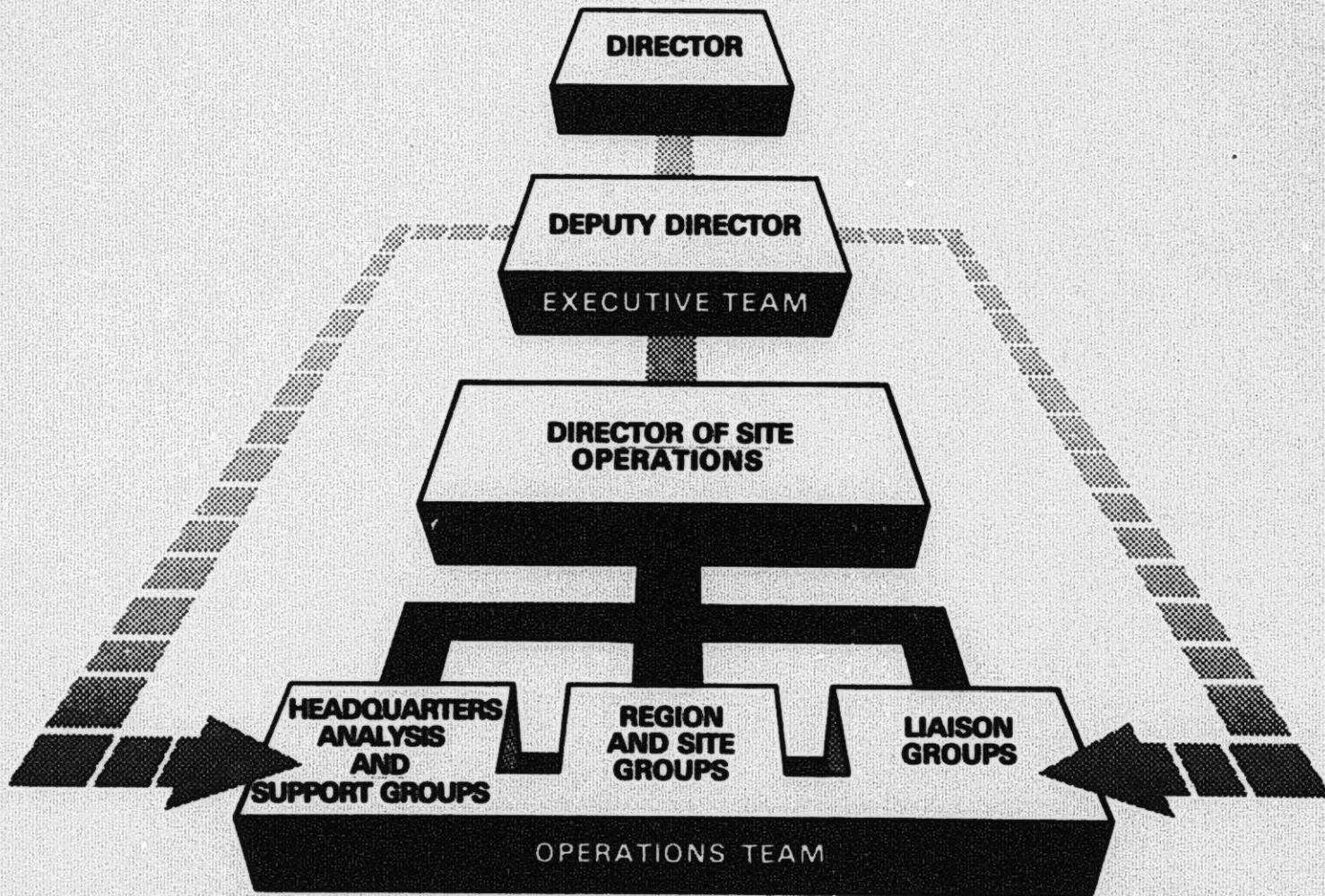


FIGURE 3

from any element of NRC. If the Director of Site Operations is uncertain how best to obtain support, the Deputy Director, with the help of the Executive Team, will assist and will assign personnel at headquarters and at any of the regional offices to such tasks as are needed, as indicated in Figure 3.

#### 2.4 Principal Participants

NRC response personnel are denoted as follows in this plan:

(1) Executive groups

Director (Chairman of the Commission)  
Commissioners  
Deputy Director (appointed by the Director on initial activation)  
Executive Team  
Regional Office Directors

(2) Site and regional groups

Director of Site Operations (appointed by the Director after onsite evaluation by senior official, usually a Regional Office Director)  
Site Team (except Resident Inspector)  
Resident Inspector  
Regional Offices (personnel not at the site)

(3) Headquarters analysis and support groups

Headquarters Duty Officer  
IE Management-on-call (after duty hours) or IE Division Director (during duty hours)  
Standby Team (designated at beginning of Standby mode)  
Deactivation Team (designated at beginning of Deactivation mode)  
Protective Measures Analysis Team  
Reactor Safety Analysis Team  
Safeguards Analysis Team  
Operations Support and Control

(4) Liaison groups

Federal Liaison (Headquarters and Region)\*  
Congressional Affairs  
State Liaison (Headquarters and Region)\*  
Public Affairs (Headquarters and Region)

\* Federal and State liaison activities are combined at present, both at headquarters and at the regional offices.

Other groups and organizations with which the NRC expects to interact frequently during an incident are:

Executive Office of the President ("White House")  
Federal Emergency Management Agency (FEMA)  
Department of Energy (DOE)  
Environmental Protection Agency (EPA)  
Department of Health and Human Services (HHS)  
Federal Bureau of Investigation (FBI)  
Congress  
State Executive  
State radiological and logistical personnel  
State emergency services  
Local emergency services (Civil Defense)  
Licensee management (at corporate headquarters, at the onsite Technical Support Center, and at the offsite Emergency Operations Facility)  
Licensee operating personnel  
Public and the media  
Plant architects and engineers, construction contractors, nuclear steam system suppliers, and other vendors  
Nuclear industry advisory groups  
Consultants  
Intervenor groups

The NRC will interact with other organizations through one of the listed groups.

## 2.5 Response Functions

The functions described below are those that must be performed to some degree in preparation for, and response to, any incident of sufficient severity. The charts in Section 3 identify the functions appropriate to each response mode. Using the definitions below, the charts also identify responsibilities for tasks and decisions, assuring that all aspects of each function are assigned to the most qualified persons.

### (1) Maintain response capability

This function includes those tasks required to maintain readiness, such as training personnel and maintaining communications systems.

### (2) Man emergency communications systems

This function includes those tasks that assure proper receipt and handling of all communications during any response mode.

### (3) Evaluate and categorize initial information

This function includes those tasks that culminate in decisions as to the severity of an event and the extent of the initial NRC response.

(4) Decide to escalate the NRC response

This function includes those tasks which address responsibilities both for recommending and for deciding on a need for greater NRC participation at any time after the initial response decision.

(5) through (8) Enter a different response mode

These functions include those tasks that must be completed as soon as possible upon transition to a different response mode. The tasks are different for each mode.

(9) Evaluate incident and plant status

This function includes those tasks needed to assure that response personnel have a complete and accurate overview of the evolution and status of the problem at any time.

(10) Evaluate licensee actions

This function includes those tasks that provide continual evaluation of the licensee's fidelity to his emergency plans and of the adequacy of those plans for the immediate situation.

(11) Project incident consequences and plant status

This function includes those tasks needed to develop timely action plans to protect the health and safety of response personnel and the public.

(12) Advise or direct licensee

This function includes those tasks needed to assure that advice and orders are defined clearly, developed from the best facts and projections, and transmitted accurately.

(13) Request other-agency support

This function includes those tasks that clarify responsibilities for identifying needs, requesting support, and resolving conflicts in priorities or actions.

(14) Maintain liaison with the Congress, White House, other Federal, State and local agencies

This function includes those tasks that identify primary liaison responsibilities for helping to assure that information exchange is adequate, accurate, timely, and consistent.

(15) Inform public and monitor public information

This function includes those tasks needed to assure first, that NRC information releases are complete, accurate, and consistent, available to

all response personnel, and accurately relayed to the public; and second, that public reactions are brought to the attention of NRC managers.

(16) Recommend protective actions for public

This function includes those tasks that culminate in NRC decisions to recommend offsite actions to protect the public health and safety, based on preplanned technical criteria and NRC projections of plant status.

(17) Provide administrative and logistical support

This function includes those tasks needed to assure the availability of adequate transportation, housing, information resources, and any other NRC support needs that may be identified during an incident.

(18) Decide to deescalate

This function includes those tasks that provide for orderly reduction of the NRC response.

(19) Review, investigate, and document response actions

This function includes those tasks that formalize the responsibilities for assuring complete and timely documentary followup to an incident.

(20) Recover

This function includes those tasks that formalize the responsibilities for assuring appropriate technical followup to an incident.

### 3. RESPONSIBILITIES

The Office of Inspection and Enforcement is responsible for developing and maintaining an effective NRC response capability. That office will maintain and revise this plan and its implementing procedures and will continue to assure readiness through a comprehensive training and exercise program.

Individual and team responsibilities for incident response tasks and decisions are presented on charts contained in a pocket inside the back cover of this plan. The charts are designed primarily to aid NRC managers in assuring that all appropriate response activities are under way during any of the five response modes. They can also be used by all response personnel as reminders of individual or team responsibilities. (Most response tasks are, or will be, amplified in detailed implementing procedures.) The format of the enclosed charts permits users to identify readily:

- . Functions that should be under way in a particular response mode;
- . Responsibilities and authorities for accomplishing those functions;
- . Responsibilities for key interfaces with other organizations.

#### Use of Charts

- Step 1: Select the appropriate chart for the current NRC response mode. Refer to Section 2 of this plan for a description of the response modes.
- Step 2: Locate your individual or team position in the list of participants, left column. Team assignments should be known at all times; if in doubt, ask the person who notified you of the incident.
- Step 3: Identify your individual or team task responsibilities in the row for your position. Each task assigned to you or your team contributes to the overall performance of one of the essential functions listed along the top row. Refer to Section 2 of this plan for descriptions of the functions as numbered on the charts. Refer to your implementing procedures for details of any task.
- Step 4: Review all task responsibilities for each of the functions in which you have a part to familiarize yourself with your role relative to the roles of others in performing the function.

The task assignments are intended to assure that each function is properly performed without unnecessary duplication of effort. Many of the tasks culminate in a decision, highlighted on the charts by a heavy solid border. Heavy broken borders indicate tasks that require an active interface with other organizations.

#### 3.2 Summary of Interfaces With Other Organizations

The most important interface for the NRC is with the licensee. The NRC depends on the licensee for initial notification of any incident in accordance with guidelines set forth in 10 CFR 50.72 and NUREG-0610. Direct, dedicated telephone lines (the Emergency Notification System or ENS "hot lines") have been

installed to facilitate the notification call. With the first decision by NRC headquarters or a regional office that a report cannot be handled routinely, a continuous communications link with the licensee is established over the direct lines and is maintained for the duration of the incident. Additional telephone conferences are established (including those using the Health Physics Network, or HPN--sometimes incorrectly referred to as a "hot line") if the situation grows more complex. Planning is under way to provide reactor data directly and automatically to the NRC. (See NUREG-0730, Ref. 3)

Other than electronic links, there are three major facets to the interface with the licensee:

- (1) Critical facility design data for each nuclear power reactor is maintained at the Headquarters Operations Center. This information is being updated by each licensee and converted by the NRC into readily accessible and usable form.
- (2) Resident Inspectors at each site provide independent assessments of the early stages of an incident prior to arrival of the NRC site team from one or more of the regional offices.
- (3) An onsite Technical Support Center and an offsite Emergency Operations Facility, when built, will provide for effective communication without crowding the reactor control room. Upon transfer of NRC authority to a Director of Site Operations, face-to-face communication at those facilities may become the dominant means of exchanging information and of interacting with the licensee.

NRC interface with other organizations is less extensive. In general, NRC personnel at headquarters will deal with the headquarters personnel of other agencies; NRC site personnel will deal with all others. NRC will also work with most other organizations through the Federal Emergency Management Agency (FEMA), whenever possible. (This working relationship will be detailed in the National Contingency Plan and in a Memorandum of Understanding between the NRC and FEMA.) NRC must also work directly with certain other organizations, however, to exchange radiological data and to assure that radiological effects of an incident are completely monitored for the protection of the public. These other organizations include the Department of Energy (DOE), the Environmental Protection Agency (EPA), the Department of Health and Human Services (HHS), and State agencies. These organizations will coordinate radiological monitoring operations and will correlate the data from such operations at or near the site under terms of the Federal Radiological Response Plan now being developed. All organizations will thus be able to draw from the same pool of correlated data.

Table 2 summarizes the extent of the NRC interface with organizations other than licensees. The purpose of the table is to alert other organizations to the need to identify appropriate contacts for each kind of interface. Different kinds of interface may require different contacts. Immediate notification is a one-time action, for example, but technical assistance, which means any kind of help other than a brief explanation of an

accident, may require nearly continuous information exchange. The table shows that NRC will be ready to offer technical assistance to DOE and State agencies, among others, as early as the NRC Standby mode. NRC will periodically verify or correct each contact as part of the implementing procedures for this plan.

Table 2. NRC Interfaces with Other Organizations  
(except licensee)

<u>Organization</u>	<u>NRC Outputs To Organization</u>			<u>Expected Inputs To NRC</u>	
	<u>Immediate Notification</u>	<u>Periodic Status Reports</u>	<u>Technical Assistance</u>	<u>Periodic Status Reports</u>	<u>Technical Assistance</u>
Dept. of Energy	S,I,E	S,I,E	S,I,E	S,I,E	S,I,E
Fed. Emergency Mgmt. Agency	S,I,E	S,I,E	I,E	S,I,E	I,E
Environmental Protection Agency	S,I,E	S,I,E	I,E	I,E	I,E
Dept. of Health & Human Svcs.	S,I,E	S,I,E	I,E	I,E	I,E
Fed. Bur. of Investigation (safeguards only)	S,I,E	S,I,E	S,I,E	S,I,E	S,I,E
Congress	I,E	I,E			
White House	S,I,E	I,E			
State	S,I,E	S,I,E	S,I,E	I,E	I,E
Consultants, industry advisors, plant vendors, and contractors			S,I,E		S,I,E
Public, media		I,E		S, I, E	

Legend: S - during Standby  
I - during Initial Activation  
E - during Expanded Activation

#### 4. REFERENCES

1. U.S. Nuclear Regulatory Commission, "Draft Emergency Action Level Guidelines for Nuclear Power Plants," USNRC Report NUREG-0610, September 1979.  
Available from GPO Sales Program, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555
2. Code of Federal Regulations, Title 10, Chapter 1, Part 50, Section 72, General Services Administration, revised January 1980. Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
3. U. S. Nuclear Regulatory Commission, "Acquisition of Reactor Data for the Nuclear Regulatory Commission Operations Center, " USNRC Report NUREG-0730, September 1980.

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# Report to Congress on NRC Emergency Communications

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Manuscript Completed: September 1980  
Date Published: September 1980

Office of Inspection and Enforcement  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555



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## FOREWORD

Public Law 96-295 contains a request for NRC to provide three reports to Congress, all related to improvements in the NRC response to nuclear emergencies since the accident at Three Mile Island Unit 2 on March 28, 1979. The reports prepared to answer that request are:

NUREG-0728, "Report to Congress: NRC Incident Response Plan"  
NUREG-0729, "Report to Congress on NRC Emergency Communications"  
NUREG-0730, "Report to Congress on the Acquisition of Reactor Data  
for the NRC Operations Center"

These reports summarize the status of many of the actions taken to date and provide the basis for continued upgrading of the NRC Incident Response Program.

The NRC Incident Response Plan assigns responsibilities for performing the functions and making the decisions that comprise the NRC response. The NRC plan will be made consistent with plans being prepared by the Federal Emergency Management Agency.

The Report on Emergency Communications summarizes the findings of communications problems identified by the major reviews and investigations of the accident and response at Three Mile Island. The report also includes the status of corrective actions for the identified problems and presents an evaluation of current communication capabilities and future options needed to support the functions identified in the NRC Incident Response Plan.

The Report on Acquisition of Reactor Data for the NRC Operations Center describes alternatives for one major facet of the communications problem: acquiring data at a nuclear power plant and transmitting them to NRC headquarters. Such a data link can play a role in the NRC functions and decisions and provide broad support for the entire NRC Incident Response Plan.

Collectively, these reports to Congress provide a comprehensive outline of the actions and plans of the NRC for improving its response to any future accidents. It is anticipated that these documents will also provide the other possible participants in an accident (State and local agencies, licensees, vendors, etc.) with an understanding of the present manner in which NRC can be expected to respond and how the response will change in the near future.

### ACKNOWLEDGMENT

This report was prepared by the Operations Support Staff of the Office of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, from the work of many individuals in several headquarters and regional offices. Major contributions are hereby acknowledged from (listed alphabetically) Joe Himes, John Jones, Vernon Kerr, Richard Rosano, and Bernard Weiss. Other essential assistance was rendered by Dennis Allison, William Axelson, Larry Bell, Thomas Elsasser, Charles Gallina, Greg Gibson, Gerald Klingler, Robert Paulus, Steve Ramos, Gerald Troup, Richard Van Niel, and Eric Weinstein.

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**1. INTRODUCTION AND SUMMARY**

## NRC EMERGENCY COMMUNICATIONS

### 1. INTRODUCTION AND SUMMARY

This report summarizes the needs, capabilities, and plans for communications to be used in support of emergency response activities of the U. S. Nuclear Regulatory Commission (NRC). Many needs became acutely apparent during the accident at Three Mile Island (TMI). Some of the TMI problems were satisfied -- for the duration of the response, at least -- with the help of other agencies, local telephone companies, the American Telephone and Telegraph Company (AT&T), and the White House Communications Agency. More permanent improvements were started immediately after the accident, again to solve the most urgent problems first (such as those which impeded prompt notification of the accident to the NRC). In the meantime, NRC, other Federal agencies, States, and licensees began to revise or develop plans to guide a coordinated response to any future accident at a nuclear power reactor. In a similar manner, communications must be comprehensively planned to support the coordinated response effectively. The NRC is now in the process of revising its communication programs to support its newly revised Incident Response Plan.

Substantial communication improvements have been made since the TMI accident, but they have predominately involved modifications in hardware and procedures; personnel problems received less attention. NRC is continuing an intensive investigation into certain deficiencies in the flow of pertinent information during the TMI accident to assure that no problems are ignored and that the comprehensive improvements now under way consider all aspects of a solution - facilities, procedures, and people.

NRC has completed other reviews and investigations of the TMI accident. Section 2 and the Appendix to this report cite and summarize the communication-related findings of two of those investigations as well as the findings of four major independent investigations. The summary briefly describes each problem, its effect on NRC functions, and the status of actions taken to resolve it. For example, significant improvements were made in the notification functions soon after TMI. A requirement was established for prompt notification to the NRC of an incident, guidelines were issued to help licensees decide when to make such notifications, special dedicated telephones were installed to carry the notification reliably, and personnel were assigned at NRC headquarters to receive the calls.

On the other hand, the flow of information in the first few hours after the initial notification is not yet greatly improved, even during normal duty hours. During this potentially critical period there are not yet (and perhaps never can be) enough people in a reactor control room to perform the licensee's emergency functions and provide sufficient information to the NRC at the same time, and an automated data system is about four years away (NUREG-0730, Ref. 7). Better procedures and training are being initiated to help in the meantime.

As part of the continuing investigation into the Three Mile Island accident, deficiencies in the early flow of information are being investigated.

These deficiencies impeded various groups in their efforts to evaluate and respond to the events of the accident. One of the products of the investigation is expected to be the identification of people-related communication deficiencies which, when corrected, will improve the timeliness, completeness, and accuracy of the flow of information in the event of another accident.

There are other examples of significant improvements and remaining problems from TMI:

- (1) Additional telephone lines have been, and will be, installed, but the small local telephone exchange serving a typical site would be saturated if another accident were to happen tomorrow. Means of bypassing the local exchange are being considered, but alternatives present other problems (such as high cost).
- (2) Onsite and near-site facilities have been planned to relieve congestion in the control room and provide for better face-to-face coordination of response activities, but the specific role and staffing of each facility is still being discussed.

The NRC staff recognized that "quick fixes" for the problems at TMI would not necessarily provide the best communications capability in the event of some future, perhaps very different, accident. Section 3 of this report identifies the communication capabilities needed--who must communicate with whom, and how--to carry out each of the functions described in the current NRC plan for response to any kind of accident at a nuclear power reactor. (The NRC Incident Response Plan, NUREG-0728, Ref.8, is being submitted to the Congress in satisfaction of a separate requirement of Public Law 96-295).

Section 4 describes the adequacy of communication systems now in use or under development for satisfying each needed capability. Systems are assessed in terms of NRC capability to communicate by voice, written narrative, graphics, data, and face-to-face. Not all of the needs were apparent during TMI. For example:

- (1) Hurricanes and other weather hazards can cause widespread outages in the telephone system. There is no reasonable backup available today, although adequate backup must be considered an essential part of any communication system for which high reliability is important.
- (2) Too much data can be a problem. Not only does it tax the communication system unnecessarily, but it may also overwhelm the data evaluators. Some people fear that too much data sent offsite can lead to too much management from offsite. Procedures have been developed to guard against this problem but training and exercises will still be needed.

Section 5 discusses, briefly, potential options for solving some of the remaining problems--satellite systems for primary, augmented and backup communications, rapidly deployable communications vans, and radio systems. Important policy issues are involved:

- (1) To what extent should NRC mandate communication system configurations for the licensees?

- (2) How should system costs be shared?
- (3) To what extent should NRC depend on FEMA and other Federal organizations for backup and augmentation?
- (4) To what extent is communications privacy required?

No clear need for legislation can be defined until these issues are better resolved.

This document is, in part, a status report of efforts under way to improve NRC emergency communications; supplementary reports of more progress will be issued as NUREG documents. Continued progress does not depend on the NRC alone, however. Other Federal, State, local, and private organizations are also upgrading their communications, but too little effort to date has been directed toward joint planning of these improvements. Issues of compatibility, cost-sharing, and system management must be resolved before a truly coordinated interagency emergency response capability can exist. This document is intended to be a step in that direction.

**2. COMMUNICATION PROBLEMS DURING THE  
ACCIDENT AT THREE MILE ISLAND**

## 2. COMMUNICATION PROBLEMS DURING THE ACCIDENT AT THREE MILE ISLAND

### 2.1 Introduction

Each of the major reviews and investigations of the accident at Three Mile Island found significant communication problems. These problems, which affected several response activities, involved limitations in personnel and procedures as well as facilities and equipment. Steps have been taken to overcome each kind of limitation but all of the problems have not yet been completely resolved.

### 2.2 Method of Review

NRC personnel involved in various facets of the TMI response reviewed the following documents:

- (1) Investigation into the March 28, 1979 Three Mile Island Accident by the NRC Office of Inspection and Enforcement (NUREG-0600; Ref. 1)
- (2) Report of Special Review Group, Office of Inspection and Enforcement, on Lessons Learned from Three Mile Island (NUREG-0616; Ref. 2)
- (3) Three Mile Island - A Report to the Commissioners and to the Public ("Rogovin Report"; Ref. 3)
- (4) Report of the President's Commission on the Accident at Three Mile Island ("Kemeny Report"; Ref. 4)
- (5) Report to the United States Senate: Nuclear Accident and Recovery at Three Mile Island ("Senate Report"; Ref. 5)
- (6) Report of the Governor's Commission on Three Mile Island ("Governor's Report"; Ref. 6)

The reviewers cited references to communications problems in the documents, then summarized the problems in terms of their effects on response activities (see Appendix).

The problems were categorized according to which of the following response activities was most seriously affected in each case:

- (1) Initial notifications from the licensee to NRC and to State and local agencies
- (2) Communications into and out of the facility
- (3) Communications among key NRC and licensee individuals and groups
- (4) Communications with and among key Federal, State, and local individuals and groups
- (5) Communications to the public.

Using their personal knowledge of the situation at Three Mile Island, the reviewers also assessed the corrective actions taken by the NRC and licensees since the accident to determine the degree to which the problems have been resolved. These actions are also included in the Appendix. The actions are summarized below.

### 2.3 Summary of Corrective Actions

Several major actions have been taken to date which, in whole or in part, are intended to overcome communication problems found at Three Mile Island. The actions are summarized in Sections 2.3.1, 2.3.2, and 2.3.3, below. They are discussed again in more detail and broader context as elements of the current and planned NRC capability, Section 4.

#### 2.3.1 Facilities and Equipment

- (1) Two dedicated telephone systems (sometimes called "hot lines" by users of the systems) have been installed between several locations at each reactor site, NRC regional offices, and NRC headquarters. One system, the Emergency Notification System (ENS), rings at NRC headquarters when taken off-hook at any onsite or offsite location at a licensee's facility; it is used for initial notifications and for subsequent voice transmission of reactor operations data. The second dedicated system, the Health Physics Network (HPN), is not truly a "hot line" and is intended for voice transmission of key radiological data after the notification is made.
- (2) A concept for automatic transmission of plant status data from each site to NRC Headquarters is being considered by the Commission. (See NUREG-0730, Ref. 7.) Implementation specifications are being developed and a detailed concept of operations will be prepared in consonance with the new NRC Incident Response Plan (NUREG-0728, Ref. 8).
- (3) An onsite Technical Support Center and an offsite Emergency Operations Facility are to be built at each reactor site. They will provide more face-to-face information exchange without overcrowding the reactor control rooms. They will also serve as centers for information flow to and from each site during an emergency. There is an unresolved issue regarding who will specify, pay for, and manage the communications equipment needed at these locations (see Section 5).
- (4) Upgraded Operations Centers are planned at NRC headquarters and regional offices to provide better coordination among all NRC executive, analysis, and liaison personnel. The Headquarters Operations Center will be the focus of the NRC response until an onsite authority is appointed; it will support the onsite authority thereafter.
- (5) A test of high-frequency radios is under way in one region. If the test is successful, these radios will be used by NRC site teams to supplement short-range radios available from other agencies. They will also provide vital communications between an incident site and a regional office in case of a widespread outage of the telephone system (as caused by a hurricane).

### 2.3.2 Personnel

- (1) Communicators with the necessary technical training have been designated in the NRC response teams at Headquarters and the regional offices. One communicator, a specialist in reactor operations, mans the ENS while another, a specialist in health physics, mans the HPN.
- (2) Licensees are being required to provide communicators to maintain continuous communications over the ENS to relay data to NRC after notification.
- (3) State emergency plans may provide for sending State and local representatives to the Emergency Operations Facility; adequate space will be made available in all such facilities. Plans are also being developed to exchange personnel among the headquarters of key Federal organizations.
- (4) Better training is being required of all licensee personnel. Periodic exercises are required to test the training.
- (5) The Resident Inspector Program has been significantly enlarged and accelerated by assigning additional Resident Inspectors to major operational reactor sites.

### 2.3.3 Procedures

- (1) A new rule for emergency planning (10 CFR 50, Appendix E) has been published in the Federal Register (45 FR 55402) to be effective November 3, 1980. The rule requires that licensees and State and local governments have adequate emergency response capabilities. It also requires that a capability exist by July 1, 1981, for notification of the public within about 15 minutes after declaration of an emergency, and further requires yearly exercises to maintain proficiency.
- (2) A new regulation (10 CFR 50.72) requires nuclear power reactor licensees to make prompt notification of significant events, giving more specific information to the NRC than was required at the time of the TMI accident.
- (3) A new Incident Response Plan (NUREG-0728) has been developed to clarify NRC responsibilities for performing essential functions and for making key decisions. It will be exercised periodically.
- (4) Interagency agreements and plans are being formulated to clarify responsibilities among the several Federal organizations which will respond to an incident at a power reactor. After formal agreements are reached, detailed implementing procedures must still be prepared.

The above actions are noted as appropriate in Table 1 in the Appendix. The table also includes page references to the specific findings in the documents from which the problem descriptions were paraphrased.

### **3. FUNCTIONAL REQUIREMENTS**

### 3. FUNCTIONAL REQUIREMENTS

An improved NRC emergency communications system must be based on a broader assessment of needs than the TMI reviews alone. A new NRC Incident Response Plan (Ref. 8) has been developed to govern the response to any kind of accident at a nuclear power reactor; it will later be expanded to include other kinds of incidents. The plan describes responsibilities for performing essential functions and for making key decisions to fulfill the NRC role. Detailed procedures for performing most of the functions have evolved from experience before, during, and after the TMI accident. Based on those procedures, it is possible to determine who must communicate with whom to carry out each function.

Figure 1 presents the results of such an analysis. The functions which head each column correspond to the functions that are defined in Section 2 of the NRC Incident Response Plan. The plan (but not Figure 1) also lists the separate tasks that comprise each function. Each task was analyzed to determine who must talk to whom, and by what means, to fully satisfy the requirements of the task. Those persons or locations are noted in Figure 1 by dots, connected by lines for visual clarity. (If the same connectivity between persons or locations could serve another task within the same function, the line was not repeated in the figure.)

Because voice link requirements are so numerous, the principal task for which each is intended is described briefly below; the numbers correspond to the numbered voice links in Figure 1:

- (1) Test of transmission of health physics and radiological data.
- (2) Test of transmission of operational and plant status data.
- (3) Test of notification of key personnel.
- (4) Conference capability for line used to report site emergency.
- (5) Conference capability for line used to transmit radiological data.
- (6) Assessment of initial information by key NRC and licensee personnel.
- (7) Communication between initial NRC members of response organization.
- (8) Coordination of NRC decision-making at headquarters.
- (9) Inputs to NRC decision and dissemination to regional office, site, and licensee.
- (10) Coordination of NRC decision-making at headquarters.
- (11) Notification of State and local authorities by licensee.
- (12) Establishment of communication between NRC and newly activated EOF.
- (13) Notification of other agencies by NRC.
- (14) Transmission of health physics data.
- (15) Establishment of communications between NRC/HQ and NRC Site Team.
- (16) Entry of NRC Site Team onto health physics link.
- (17) Notification of other agencies that NRC Site Team has assumed responsibility for NRC activities.
- (18) Notification of State and local authorities by licensee.
- (19) Coordination of continuing effort.
- (20) Notification of other agencies.
- (21) NRC decision and announcement to others.
- (22) Assessment of radiological information.
- (23) Evaluation of licensee actions by key NRC personnel.

- (24) Evaluation of licensee actions by State and local authorities.
- (25) Assessment of general consequences and communication of this information to other agencies.
- (26) Assessment of radiological consequences.
- (27) Communication of advice or direction to licensee and notification to others.
- (28) Coordination of NRC direction and licensee response.
- (29) Headquarters coordination and support.
- (30) Identification of needs, and requests for resources, from other agencies.
- (31) Headquarters and executive liaison.
- (32) Operations liaison and coordination.
- (33) NRC press releases and responses.
- (34) Licensee press releases and responses.
- (35) Site press conferences and releases.
- (36) FEMA press conferences and releases.
- (37) Communication of recommendations and coordination between concerned agencies.
- (38) Licensee coordination with State and local authorities.
- (39) Development of radiological recommendations.
- (40) Coordination and communication of administrative needs.
- (41) Development and communication of decision to deescalate.
- (42) Monitoring by NRC.
- (43) Coordination by licensee.

All communication linkages identified in Figure 1 are derived from the Incident Response Plan. Together, the linkages indicate the total communication capabilities required between major locations during response to an incident. Section 4 describes the degree to which these requirements are met by systems already in use or planned and under way.

**FIGURE 1**  
**Emergency**  
**Communications**  
**Linkages**  
 (Sheet 1 of 5)

		Maintain Response Capability	Man Emergency Communications Systems	Evaluate and Categorize Initial Information	Decide to Escalate the NRC Response
		(1) (2) (3)	(4) (5)	(6)	(7)
NRC Headquarters Operations Center	Executive Team				
	Operations Team	● ● ● ●	● ● ● ●	● ● ●	●
NRC Regional Office	Operations Center	● ● ● ●	● ● ● ●	● ● ●	●
	Duty Officer	● ● ● ●	● ● ● ●	● ● ●	
Licensee Corporate Headquarters					
Onsite	NRC Resident Inspector	● ● ● ●	● ● ● ●	● ● ●	
	Control Room	● ● ● ●	● ● ● ●	● ● ●	
	Technical Support Center	● ● ● ●	● ● ● ●	● ● ●	
	Health Physics Office	● ● ● ●	● ● ● ●	● ● ●	
NRC Site Team					
Near Site	Emergency Operations Facility	● ● ● ●	● ● ● ●	● ● ●	
	NRC Mobile Lab				
	Local Authorities				
State	Governor's Office				
	Emergency Operations Center		●		
	Radiological Health				
Other Federal Agencies	Federal Emergency Management Agency		●		
	Department of Energy		●		
	Federal Bureau of Investigation		●		
	Environmental Protection Agency		●		
	Dept. of Health and Human Services		●		
	White House		●		
	Congress		●		
Press					

**LEGEND**

— VOICE

● ● ● ● WRITTEN NARRATIVE

/// GRAPHIC/PICTORIAL

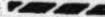
..... DATA

**FIGURE 1**

**Emergency  
Communications  
Linkages  
(Sheet 2 of 5)**

		Enter Standby Mode	Enter Initial Activation Mode	Enter Expanded Activation Mode	Enter Deactivation Mode
		(8) (9)	(10)(12)(13)(14)	(15)(16)(17)(18)	(19) (20)
NRC Headquarters Operations Center	Executive Team	●	●	●	●
	Operations Team	●	●	●	●
NRC Regional Office	Operations Center	●	●	●	●
	Duty Officer	●	●	●	●
Licensee Corporate Headquarters			(11) ●	●	●
Onsite	NRC Resident Inspector	●	●	●	●
	Control Room		●	●	●
	Technical Support Center	●	●	●	●
	Health Physics Office		●	●	●
NRC Site Team			●	●	●
Near Site	Emergency Operations Facility		●	●	●
	NRC Mobile Lab			●	●
	Local Authorities		●	●	●
State	Governor's Office		●	●	●
	Emergency Operations Center		●	●	●
	Radiological Health		●	●	●
Other Federal Agencies	Federal Emergency Management Agency		●	●	●
	Department of Energy		●	●	●
	Federal Bureau of Investigation		●	●	●
	Environmental Protection Agency		●	●	●
	Dept. of Health and Human Services		●	●	●
	White House		●	●	●
Congress		●	●	●	
Press			●	●	●

**LEGEND**

 VOICE  
 WRITTEN NARRATIVE  
 GRAPHIC/PICTORIAL  
 DATA

**FIGURE 1**  
**Emergency**  
**Communications**  
**Linkages**  
 (Sheet 3 of 5)

		Evaluate Incident and Plant Status	Evaluate Licensee Actions	Project Incident Consequences and Plant Status	Advise or Direct Licensee
		(21) (22)	(23) (24)	(25) (26)	(27) (28)
NRC Headquarters Operations Center	Executive Team	●	●	●	●
	Operations Team	●	●	●	●
NRC Regional Office	Operations Center	●	●	●	●
	Duty Officer	●	●	●	●
Licensee Corporate Headquarters		●	●	●	●
Onsite	NRC Resident Inspector	●	●	●	●
	Control Room	●	●	●	●
	Technical Support Center	●	●	●	●
	Health Physics Office	●	●	●	●
NRC Site Team		●	●	●	●
Near Site	Emergency Operations Facility	●	●	●	●
	NRC Mobile Lab	●		●	●
	Local Authorities		●		
State	Governor's Office	●		●	
	Emergency Operations Center		●		
	Radiological Health	●		●	●
Other Federal Agencies	Federal Emergency Management Agency	●		●	
	Department of Energy	●		●	
	Federal Bureau of Investigation	●			
	Environmental Protection Agency	●		●	
	Dept. of Health and Human Services	●		●	
	White House	●		●	
	Congress	●		●	
Press					

**LEGEND**

— VOICE

● ● ● ● ● ● ● ● WRITTEN NARRATIVE

▨ ▨ ▨ ▨ ▨ ▨ ▨ ▨ GRAPHIC/PICTORIAL

..... DATA

**FIGURE 1**  
**Emergency**  
**Communications**  
**Linkages**  
 (Sheet 4 of 5)

		Request Other-Agency Support	Maintain Liaison	Inform Public and Monitor Public Information	Recommend Protective Actions for Public
		(29) (30)	(31) (32)	(33) (34) (35) (36)	(37) (38) (39)
NRC Headquarters Operations Center	Executive Team	●	●	●	●
	Operations Team	●	●	●	●
NRC Regional Office	Operations Center	●	●	●	●
	Duty Officer				
Licensee Corporate Headquarters			●	●	●
Onsite	NRC Resident Inspector		●	●	●
	Control Room			●	●
	Technical Support Center		●		
	Health Physics Office			●	●
NRC Site Team		●	●	●	●
Near Site	Emergency Operations Facility	●	●	●	●
	NRC Mobile Lab	●	●	●	●
	Local Authorities	●	●	●	●
State	Governor's Office		●	●	●
	Emergency Operations Center	●	●	●	●
	Radiological Health		●		●
Other Federal Agencies	Federal Emergency Management Agency	●	●	●	●
	Department of Energy	●	●	●	
	Federal Bureau of Investigation	●	●		
	Environmental Protection Agency	●	●		
	Dept. of Health and Human Services	●	●		
	White House	●	●		
Congress	●	●			
Press				●	●

**LEGEND**

— VOICE

--- WRITTEN NARRATIVE

//// GRAPHIC/PICTORIAL

..... DATA

**FIGURE 1**  
**Emergency**  
**Communications**  
**Linkages**  
 (Sheet 5 of 5)

		Provide Administra- tive and Logistical Support	Decide to Deescalate	Review, Investigate, and Document Response Actions	Recover
NRC Headquarters Operations Center	Executive Team	(40)	(41)	Due to the time availa- ble for this function, rapid emer- gency commu- nications are not necessary	(42) (43)
	Operations Team	● ●	●		● ●
NRC Regional Office	Operations Center	● ●	●		● ●
	Duty Officer				● ●
Licenses Corporate Headquarters					● ●
Onsite	NRC Resident Inspector				● ●
	Control Room				
	Technical Support Center				● ●
	Health Physics Office				
NRC Site Team		● ●	●		● ●
Near Site	Emergency Operations Facility	● ●	●		● ●
	NRC Mobile Lab				●
	Local Authorities				●
State	Governor's Office				
	Emergency Operations Center				●
	Radiological Health				
Other Federal Agencies	Federal Emergency Management Agency	● ●	●		
	Department of Energy				
	Federal Bureau of Investigation				
	Environmental Protection Agency				
	Dept. of Health and Human Services				
	White House		●		
	Congress		●		
Press					

**LEGEND**

— VOICE

— — — — — WRITTEN NARRATIVE

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..... DATA

**4. CURRENT AND PLANNED CAPABILITIES**

## 4. CURRENT AND PLANNED CAPABILITIES

### 4.1 Introduction

This section contains a discussion of the communication capabilities which are presently available or are being implemented. There is also an assessment of the adequacy of each system discussed. This assessment is based on the communication needs detailed in Section 3, the Three Mile Island (TMI) and other incident response experience, the knowledge that was obtained in developing the NRC Incident Response Plan (Ref. 8), the NRC Action Plan (Ref. 9), and discussions with the other organization that are potential participants in future incidents.

The various communication capabilities have been divided into five categories in order to permit a more efficient analysis and discussion of alternative modes for transmitting data, ideas, and documents. Capabilities have been significantly upgraded since the TMI accident, but developing requirements and emerging technology will drive further improvements. Major improvements and continuing concerns are noted below with more detailed discussion in Sections 4.2 through 4.6.

- (1) Voice - Initial notification methods have greatly improved; direct and dedicated lines which are continuously monitored have been installed between nuclear power plants and the NRC; and licensee reporting requirements have been strengthened. However, augmentation of basic telephone lines and backup systems has not improved, and communication capability among NRC site team members during the early hours of an incident is very limited or not available.
- (2) Written Narrative - Some increase in telephone facsimile and word processing capability is available to some participants but little coordination is evident to date.
- (3) Graphic/Pictorial - Little change is evident.
- (4) Data - Considerable interest has been evident in acquiring and transmitting reactor data offsite; NRC is developing a concept for transmitting such data to its Operations Center; National Weather Service Data is available to NRC continuously; and pilot studies using a computer system capable of sophisticated meteorological predictions is available to NRC, States, and licensees.
- (5) Face-to-Face - Controlled face to face communications will be greatly enhanced by licensee onsite Technical Support Center and nearsite Emergency Operations Facility.

### 4.2 Voice

There are three major voice systems currently utilized by NRC in attempting to meet its basic voice requirements. They are the nationwide direct-dial system (Figure 2), the NRC dedicated Emergency Notification System (Figure 3) and the NRC dedicated Health Physics Network (Figure 4). Supplementary voice systems which have more limited use and capabilities are also discussed because of their significance in providing features which can be of vital importance.

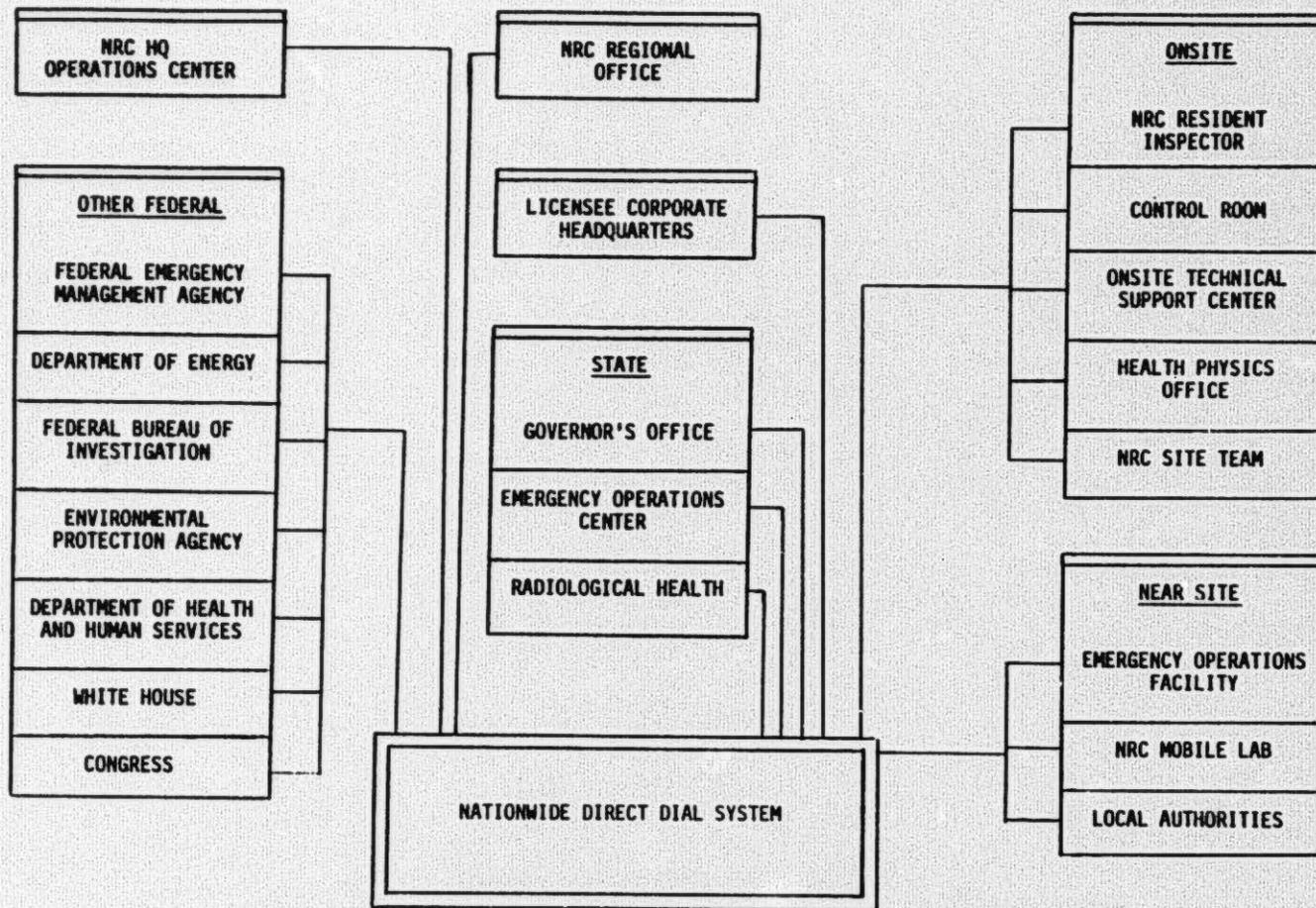


Figure 2. Emergency Communications Capabilities --  
Nationwide Direct-Dial System

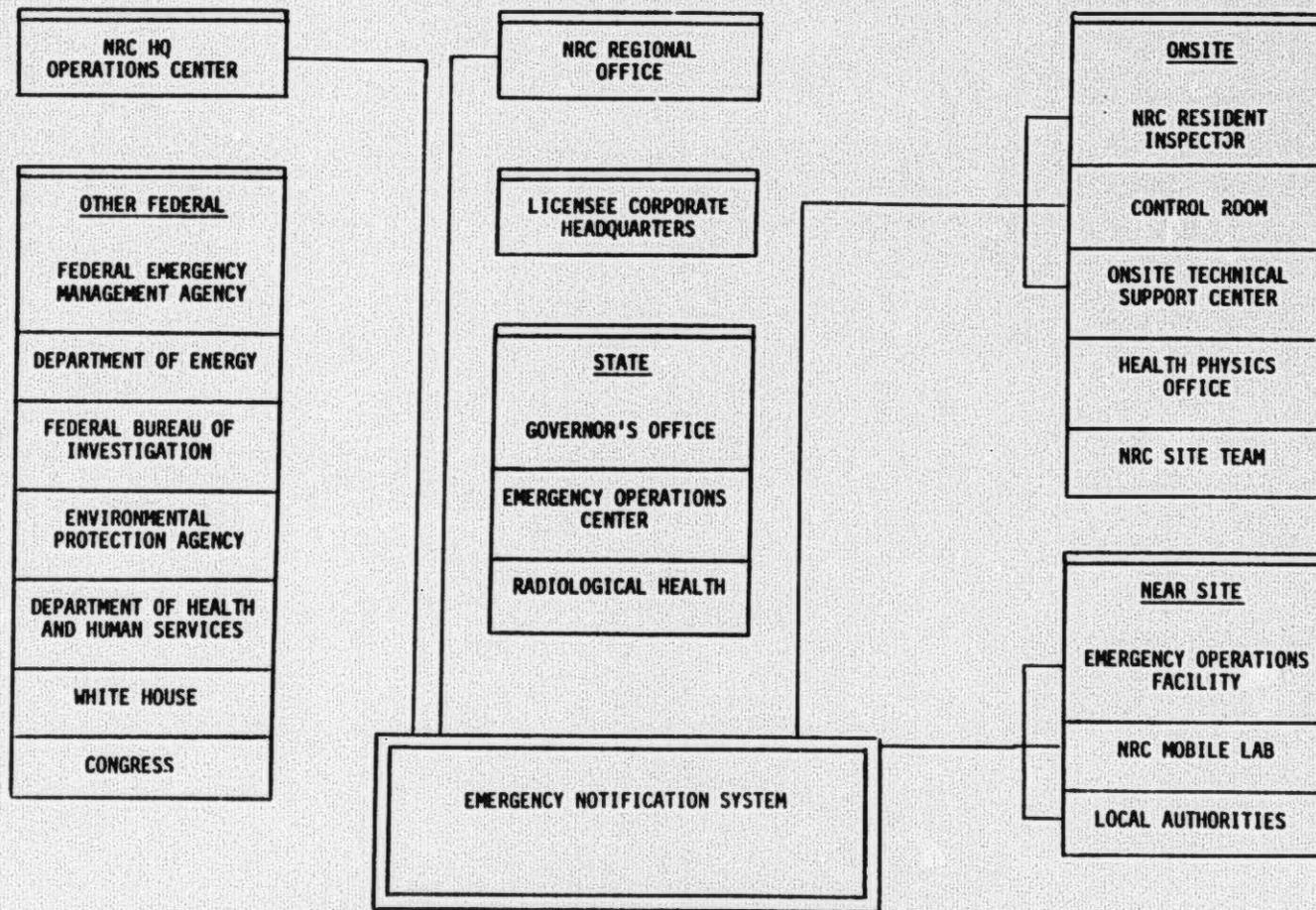


Figure 3. Emergency Communications Capabilities --  
Emergency Notification System

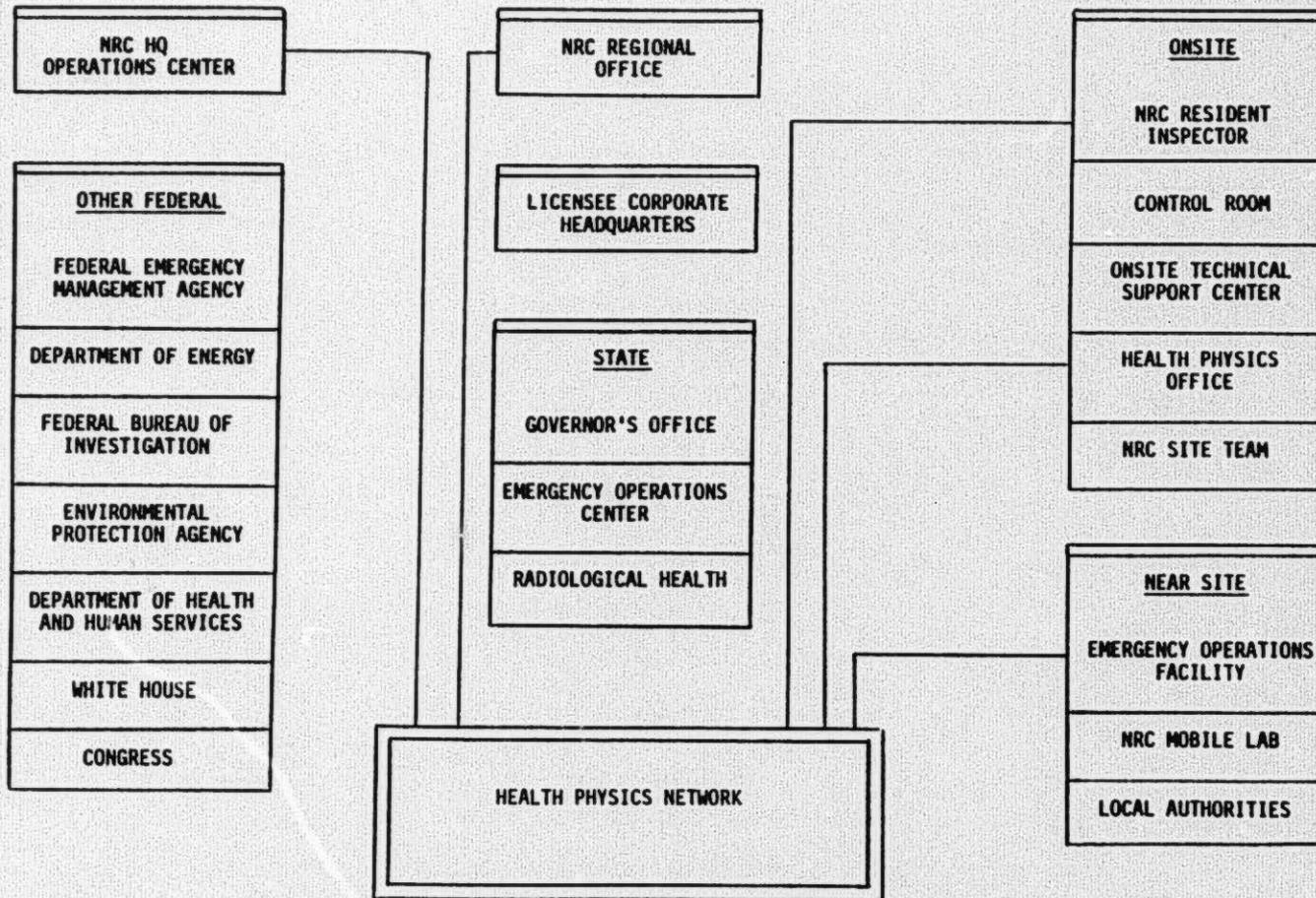


Figure 4. Emergency Communications Capabilities -- Health Physics Network

#### 4.2.1 Nationwide Telephone Network

As can be readily seen in Figure 2, the nationwide direct-dial system is the most pervasive system available. It has the capability of joining together all response participants and has the bonus of being backed up by the administrative and technical capabilities of AT&T and local telephone companies. Consequently, in an emergency, telephone lines can be added in a few hours.

This network will always serve as the communications backbone of any emergency response. However, two significant problems place a severe limitation on this network. Although the telephone companies can respond rapidly (within hours) to expand telephone service in an emergency, this may not be quick enough in a fast-moving event. Direct and dedicated systems provide some relief from this problem. Other long range solutions, such as satellite communications, will be considered as NRC further defines its communication needs and reassesses its current capabilities. Internal studies are currently being conducted and others will be initiated as the communication requirements of licensees, other Federal agencies, and State and local officials are better defined.

The second concern relates to the large number of users. When a crisis is imminent, the users can overload the local telephone system which can overwhelm the network to the point that it is almost useless. Solutions are being considered. AT&T has developed an innovative concept to alleviate this problem, but the cost for a quickly deployable emergency system is relatively high and the administrative problems of funding such communication systems have not been solved (see Section 5).

#### 4.2.2 Emergency Notification System

The NRC has had AT&T and the local telephone companies install a direct and dedicated telephone in the control room of each operating reactor with extensions at other key locations in and around that site, as shown in Figure 3. A licensee can contact the NRC Operations Center by merely lifting the receiver from its cradle. This action causes a ring at the Operations Center which is manned continuously by NRC technical staff "Duty Officers." NRC regulations (10 CFR 50.72) require licensees to report a broad spectrum of events and to stay on the line for the more significant events until relieved of that responsibility by NRC.

This system has been shown to be a reliable and necessary tool for responding to incidents in an expeditious manner. However, there have been occasions where lines were incapacitated due to general failures in the commercial system which resulted in NRC losing contact, on this system, with one or more sites simultaneously. In addition, because of the sensitivity of the automatic ringing feature, periodic false rings are common. This is normally merely annoying to the Duty Officer but it has the potential to interfere with the response to notification calls.

By design, only a limited number of response participants can be interconnected in this system. During an emergency these lines will be used almost exclusively for transmitting unevaluated data for which the audience is intentionally small.

#### 4.2.3 Health Physics Network

This is a direct and dedicated telephone system, somewhat akin to a long distance intercom system. Extensions of this system appear at the plant health physics office, emergency operations facility, resident inspector's office and other locations at all sites where there is an Emergency Notification System telephone (Figure 4). In contrast to the latter system, the Health Physics Network telephones are not used for immediate notification. The system is activated by NRC in the beginning of an incident and will remain open throughout the incident, for the collection of radiological and environmental information.

This system has recently been completed. The NRC has had limited experience with the system and cannot at this time comment on any inadequacies. It is a system, however, which is limited to predesignated locations. It does not have the flexibility to add parties outside of its predetermined universe. Since this system is not used for immediate notifications, and since nonemergency conversations on any of the network circuits can be cleared by the NRC Operations Center by use of an "override" feature, the Health Physics Network will be used for routine business, particularly between the Regional Offices and the resident inspectors. This routine use is intended to improve familiarity with the system and facilitate identification of any inadequacies.

#### 4.2.4 Supplementary Systems

The NRC operates a radiotelephone system in the Washington, D.C. area which permits continuous contact with key management officials in designated NRC vehicles. Telephone calls can then be interconnected into this system by the NRC Operator. While no such system is operated by NRC Regional Offices, each Region has been provided with commercial portable/mobile radio-telephone units. The quality of service is variable because of the high usage in urban locations and lack of coverage in some rural areas. For incident response, radiotelephones may sometimes be useful in providing a communication link to individuals enroute to an incident, but experience indicates that communication in some rural areas may be spotty. Radiotelephones may be able to provide some backup communications at the site, if the available lines are incapacitated or being utilized.

Radiotelephones are not sufficiently reliable for making the initial notifications necessary to assemble NRC response participants at Headquarters or the Regions. This task must be accomplished by effective use of telephone procedures and papers.

When an emergency occurs, an NRC Headquarters Duty Officer (who is available 24 hours per day) receives the first call from the licensee and initiates a notification scheme to call in NRC staff and alert other Federal officials and participating agencies. Each contact is represented by several individuals so that the probability of reaching a contact is reasonably high. This system has worked well at Headquarters and is being tested periodically to maintain effectiveness and sensitize participants.

Pager systems are used extensively to aid in contacting key headquarters and regional office staff members. At the headquarters Operations Center, NRC operates its own paging system which covers the entire Washington Metropolitan

area. At the Regional Offices, commercial paging services are utilized. No such service is now provided for resident inspectors, but consideration is being given to the possible use of pagers if such services are available and can be utilized in particular situations.

Although the NRC operates two dedicated telephone systems, experience has shown that hardwired systems are vulnerable. On several occasions, a site has lost all telephone service for short periods of time (up to several hours). Evidently, there is a need to provide additional alternate communications to the operating facilities. Provision of this alternate capability is currently under study and could incorporate a high-frequency radio capability (either independent or for joint use with another Federal agency such as FEMA) or a satellite communications capability. A pilot study of high-frequency radio capability is in progress in Region II using FEMA frequencies. In addition, an agreement for NRC entry into FEMA high-frequency networks during emergencies has recently been approved. Should the high-frequency pilot program demonstrate the value of this type of radio communications for emergency use, consideration will be given to developing a larger network, including licensees, as a primary backup system.

Short-range VHF radio systems for regional office use have been under consideration for some time. These small lightweight radios would allow NRC inspectors to carry out tasks in or around the plant site while maintaining continuous two-way voice communication with the NRC Director of Site Operations. A prototype system was procured prior to the TMI accident and has demonstrated considerable usefulness. At TMI the system functioned satisfactorily but was severely limited by the small number of portable radios available for the site teams. A Field Incident Radio System has been defined and NRC frequencies have been assigned. Detailed specifications have been developed based on the extensive testing of the prototype system. This system will be procured by NRC when funding is available. Similar VHF radio capability can be made available to NRC in an emergency through the Department of Agriculture's National Fire Radio Cache and the Department of Energy's Nuclear Emergency Search Team. Both of these groups were present at the TMI accident and provided extremely effective local communications assistance. In any future accident, NRC will request their assistance. However, the need for at least a few short-range radios is acute as soon as NRC response teams arrive at the site 2 to 6 hours after notification and substantially before augmentation can be available. These other groups are highly mobile but will still require from 8 to 24 hours to arrive and be functional.

Secure voice terminals are available for the use of the NRC Commissioners, safeguards staff and security personnel. Additional voice terminals will be available for installation adjacent to the NRC Operations Center. The current secure voice terminals will be replaced with smaller, more versatile terminals when the new equipment becomes available.

At present, all telephones in the Headquarters Operations Center are recorded by a centralized multi-channel system. However, because of limited space in the Operations Center, most of the technical assessment team functions are conducted in rooms on the periphery of the Operations Center and are not recorded. Additional recording capability is being considered as the Operations Center is moved and/or expanded. Regional Office Operations Centers do

not record telephone communications currently, but plans are underway to provide these offices with the necessary equipment.

A continuing study effort is underway to determine what voice communications facilities and equipment are required for a prompt and sustained NRC response to emergencies. This effort will be integrated with other ongoing planning efforts, particularly those of licensees, FEMA, and State agencies.

#### 4.3 Written Narrative

During any emergency, written narratives must be exchanged among the participants in order to lessen misunderstandings and provide accurate coordination. This subsection describes several major networks. No specific discussion of the U.S. Postal Service is included. The Postal Service serves as the primary system for transmitting routine written information. However, even with Express Mail Service, this system will not generally provide the speed necessary in a crisis situation.

##### 4.3.1 Telephone Facsimile Service

Telephone facsimile transmission has become the major means by which NRC provides written documents to recipients during a crisis. The NRC Operations Center maintains a variety of facsimile machines in order to interface with almost all the facsimile machines available. However, consideration is being given to the concept of NRC specifying the type of high-speed facsimile machine (less than one minute per page) it will use to communicate with other participants. Any participant desiring NRC hard copy would obtain a compatible machine. This would allow transmission of general documents to multiple recipients at the same time and limit the transmission delays which were common during the TMI accident. Of all the written narrative systems discussed, facsimile service may be the only written narrative system which could be reasonably expected to be at, or quickly installed at, an incident site.

##### 4.3.2 Word Processing

Modern word-processing systems are located within various NRC offices and have the capability to interconnect with other compatible word-processing terminals to transmit written material. This is currently being used extensively between the NRC Headquarters and their Regional Offices. As other Federal agencies, industry, and State groups obtain compatible equipment this system will be expanded.

##### 4.3.3 Teletype

Dial-up teletype facilities are available and may be used extensively between Federal agencies. The availability for use with State, local and industry contacts is less sure. This system will be generally considered as a backup to other systems but may be utilized where some delay can be tolerated.

##### 4.3.4 SACNET

This is a secure teletype system operated by the Department of Energy and serving that agency's operating locations, the National Laboratories, and selected contractors. The network also interfaces with the Department of

Defense Automatic Digital Network (AUTODIN) and thus has access to practically all U.S. military installations. The SACNET and AUTODIN handle both classified and unclassified message traffic. The full requirement for secure communication during a nuclear reactor emergency has not been defined, although certain safeguards information of a potentially classified nature would be exchanged in the event of hostile activity or threats which could result in an emergency. The capability to exchange classified messages is available at the NRC and will be expanded when and if necessary to satisfy the requirement for secure communications.

#### 4.3.5 DEFCORD

The Defense Coordination Teletype Network (DEFCORD) is established to provide the Federal Emergency Management Agency with the capability for rapid dissemination of information relating to an emergency and guidance on the nature and scope of actions to be taken by the Federal departments and agencies during an emergency.

It is apparent that a number of unrelated systems capable of transmitting narrative information is available and functioning. These range from commercial message systems to dedicated governmental systems. The availability of terminals compatible with NRC systems at onsite and nearsite locations is currently being determined. Designers of onsite Technical Support Centers and nearsite Emergency Operations Facilities, as well as State and local officials, should take into consideration the capabilities available to the NRC when defining the specific communications support for these emergency management facilities.

#### 4.4 Graphic/Pictorial

Transmission of graphic/pictorial information during an incident is primarily accomplished by telephone facsimile service, as described in Section 4.3.1 above. This method of communication is particularly useful for graphics but has limited utility for high resolution pictorial representations. Where time is not an urgent factor, express mail service or courier service can be utilized.

NRC Headquarters has the ability to receive and transmit slow scan TV pictures (i.e., single-frame TV pictures) via telephone at the rate of one frame every 50 seconds. A hard-copy machine is available to produce a permanent image. Currently, the only use of this system is for communication with the DOE Nuclear Emergency Search Team communication pod which would be dispatched to the site for communication support for DOE and NRC. This system was available during the TMI accident and was not utilized. Expansion of this capability is not being considered.

#### 4.5 Data

The transmission of plant data from reactor facilities to the NRC and other response participants is undergoing considerable development. Licensees will provide certain plant variables to the onsite technical support center and the nearsite emergency operations facility. These data systems will be phased in over the next few years. In addition, it is anticipated that various nuclear industry groups that may possess specialized expertise will receive plant

information and some States may request plant data for their emergency operations centers.

The NRC is developing a nuclear data link, which is a data transmission system designed to send a set of specific plant variables to the NRC Operations Center. This system would receive a subset of the data required to be available at the licensee technical support centers and emergency operations facilities. A detailed discussion of acquisition of reactor data for the NRC Operations Center is the subject of a Report to Congress (NUREG-0730) which is being submitted concurrently with this report. Implementation of such a system is not expected until 1984.

Meteorological data is available at the NRC Operations Center from the National Weather Service in the form of teletype weather reports and facsimile weather maps. (NRC Region II in Atlanta also receives National Weather Service reports of severe weather conditions because of the high incidence of hurricanes in that region.) These data provide NRC meteorological staff with a limited capability to do dispersion calculations and perform predictive dose projections to aid in recommending protective actions for the public. More sophisticated capability is available through the Atmospheric Release Advisory Capability (ARAC) operated by Lawrence Livermore Laboratories for the Department of Energy. In conjunction with DOE, and FEMA, the States of New York, and California, and two nuclear reactor utility companies, the NRC is conducting a pilot study to determine the usefulness of this sophisticated computer system in emergency situations. By early 1981, interactive terminals will be installed at the NRC Operations Center, the Indian Point site, New York State, the Rancho Seco site, and California. A lengthy evaluation will assess the capabilities, value and cost-effectiveness of this capability.

At the present time, data transmission from a plant site to offsite authorities is almost non-existent. One or two States receive a very small amount of data which is of some limited value. Federal, State and nuclear industry interest in receiving remote data has increased markedly in 1980 and numerous systems are being designed for installation in the next few years. NRC is taking steps to provide industry with performance specifications so that an adequate minimum capability is assured and, further so that there is uniformity of data and units to assure that technical discussions among the various evaluation teams will not be hindered by incompatible or misinterpreted data.

Consideration may have to be given to assuring that there is not an overproliferation of plant data offsite. Although it would be useful in a crisis situation to receive as much expert advice as possible, there may also be problems with too many "cooks in the kitchen."

#### 4.6 Face-to-Face

There is a specific aspect of human nature which provides an individual with better reassurance and understanding in face-to-face conversations than in more distant telephone or printed word communications. This aspect, along with the related desire to be close to the scene, was evident at TMI. Many of the significant emergency response changes since TMI take this into consideration.

The nearsite emergency operations facility which licensees are required to build will provide one location where the major response participants -- licensee management, NRC, FEMA, other Federal agencies, State and local officials, and the media -- can get together. This facility will be the hub of the overall management of offsite response activities.

At the national level, arrangements have been made among several Federal agencies to have representatives of one agency present in the Operations Center of the other. During TMI, representatives of FEMA, EPA, DOE, HEW and FAA were present at the NRC Operations Center (some continuously) to assist in the necessary liaison. This concept will be continued and expanded.

**5. REMAINING REQUIREMENTS AND FUTURE OPTIONS**

## 5. REMAINING REQUIREMENTS AND FUTURE OPTIONS

In addition to the communications improvements already made and those under way, others will be needed to resolve the remaining problems. Options are now in various stages of study, but the analyses are complicated by the uncertainties of future technologies and, to a large extent, by uncertainties in the requirements themselves.

NRC emergency communications must be fully adequate in three respects:

- (1) Primary, full-time systems must be adequate; they provide the communications that must be available at all times for immediate use if an emergency should occur.
- (2) Backup systems must be adequate to restore critical services quickly in case of failure of the primary systems for any reason.
- (3) Augmentation systems must be adequate to support the full complement of response personnel by the time they arrive at the site.

NRC does not now have, in use or in plans, fully adequate primary, backup, and augmentation capabilities. The NRC shall develop, implement and maintain adequate communication systems. The problems are summarized in the following sections.

### 5.1 Primary Systems

At headquarters, the need for direct lines to other Federal agency headquarters is under review. Additional telephone service will also be added to support a new Headquarters Operations Center and improvements at the regional offices, but no significant difficulties are foreseen. Telephone recording capability must be expanded at headquarters and regional offices also to assure that a complete sequential record of NRC response activities is retained.

In the vicinity of most sites local telephone service will again be overloaded if a serious incident occurs. No clear solution exists, but satellite systems or other means of bypassing the local exchange are being considered.

At the site the greatest need is to identify the most effective information flow among response participants. Once that is done, there may be some difficulty in assuring adequate manning of the communications terminals. Current analyses of information flow necessarily include that consideration. Of course, the best onsite communications system will be of little value if local exchanges are overloaded, as mentioned above.

Between headquarters, regional offices, and the site, current and planned systems leave room for improvement. Probably the most critical need is for adequate communications during the early stages of a response, prior to arrival at the site of an NRC Site Team. An automatic data acquisition system could reduce the need for telephone requests for plant status information, but the effect is still uncertain. No capability to transmit graphics (such as might be used in discussing a piping and instrumentation diagram) is now planned. The utility of a standard closed-circuit television link is less clear, but sufficient communications capacity is not now available from the site even if television proves to be useful.

Satellite systems are being considered as a way of providing more primary capacity, because satellites may also provide an important backup and augmentation capability which will bypass overloaded local exchanges. The best estimates of an adequate primary capability foresee a mix of satellite, microwave, and landline communications. The diversity of such a mix should also offer more survivable communications under adverse weather conditions, for example. A major drawback is the cost of a satellite system. Costs and use could be shared with another agency to improve the feasibility.

The requirement for secure communications between headquarters and the regional offices has been stated on numerous occasions. The nature of these communications has not been decided, but the prime candidates discussed are secure voice and secure facsimile communications. The installation of any form of secure communications in the regional offices will require extensive physical security arrangements costing considerably more than the secure devices themselves. Plans to satisfy this stated requirement are under way, but these are still in the early stages.

### 5.2 Backup Systems

Backup systems become the primary systems in case of widespread problems with the latter. They cannot usually carry the full capacity of the primary systems. NRC will evaluate the effectiveness of the high-frequency radios now being used on a trial basis in Region II and at headquarters. If this system offers the optimum method of providing backup communications, it will be implemented nationwide. Other possibilities for backup communications are very limited. Existing microwave links between each site and the licensee's load dispatch center (and, frequently, other offices) could be used for critical messages, but they are also needed by the licensee during an incident. The existing microwave capacities are also too small to offer significant backup. Should the need arise in the near future, NRC would request backup communications through FEMA from military, civil defense, and other organizations.

NRC is also reviewing preliminary proposals for a rapidly deployable communications center that would provide not only restoration but also augmentation communications out of the power plant site. Satellite communications transportable terminals play a major role in all such preliminary proposals investigated to date.

Within NRC Headquarters, only two telephone lines and the health physics network (HPN) in the Operations Center are routed around the main exchange serving headquarters. More protection against accidents and deliberately caused failures is being considered as part of plans for moving the center to another location.

### 5.3 Augmentation Systems

Information flow among a full complement of response personnel is still being analyzed. The FEMA National Contingency Plan, the NRC Incident Response Plan, and the licensee emergency plan all must be made to mesh, partly through the planned flow of information to, from, and among personnel at the site. Detailed requirements for augmenting the primary communications will be derived from a review of those plans.

In the meantime, NRC relies on AT&T to add telephone capacity as soon as possible; on the Forest Service to provide hand-held radios for communication among members of the NRC Site Team and among response personnel from other agencies; and on the Department of Energy to link key officials at the site by radio and into the public telephone system. These arrangements are expected to continue. Two telephone-related problems are current issues:

- (1) New communications systems (such as the Emergency Notification System and the Health Physics Network) cannot be acquired by the NRC without GSA approval under Federal Property Management Regulations. While this prior approval presents no particular problems in routine or preplanned implementation of emergency communications, it could hinder the rapid implementation of emergency communications to satisfy requirements developed during the response to an emergency. NRC will attempt to reach agreement with GSA on methods which will overcome this potential delay during periods of emergency response.
- (2) Authorization is needed from the Federal Communications Commission (FCC) to record incident-related telephone conversations without superimposing an audible signal, the so-called "beep" tone. NRC telephones now carry the tone when conversations are recorded, so several parties joined in a telephone conference hear separate tones for each party. (The tones are not synchronized because of technical limitations.) The multiple tones are a definite hindrance to good communications and should be unnecessary under the circumstances. The FCC is willing to consider an NRC request for exemption from the requirement to impose tones on the recorded lines.

#### 5.4 Implementation Issues

In the process of rulemaking to improve the overall capability to respond to emergencies, NRC must decide several issues that will strongly affect the future of emergency communications:

- (1) To what extent should NRC manage the details of the configuration of emergency communications systems to be provided by the licensees? Too little configuration control will lead to the licensees spending vast amounts on emergency communications with no assurance that the resulting systems would be compatible with one another or with NRC's systems. Too much configuration control exercised unilaterally by NRC would tend to be over-regulation and could stifle innovative approaches to solving emergency communication problems.
- (2) To what extent should NRC fund emergency communications between NRC and the licensees, between States and NRC, and between other Federal agencies and NRC? NRC currently funds the Emergency Notification System, the Health Physics Network, and a pilot high frequency radio system working through the Federal Emergency Management Agency's Civilian Defense National Radio System networks. NRC must still determine what share of the costs of the nuclear data link must be borne by the licensees.

- (3) To what extent should NRC depend upon the Federal Emergency Management Agency to provide restoral and augmentation communications capabilities during nuclear incidents? FEMA certainly has a role in planning for and responding to emergencies of all types. Proposals are being made by the communications industry to provide deployable emergency communications facilities and crews to restore severed communications or to augment existing communications at the site of a nuclear incident. NRC at this time has insufficient funds to proceed with any such proposals and additionally has an insufficiently clear picture of what, if any, similar capabilities FEMA will be providing for the use of all agencies in all types of emergencies.
- (4) To what extent should NRC provide privacy protection equipment for its emergency communications? The monitoring of response communications by the press or public could lead to premature judgments which could be very harmful. Much of the coordination of response activities and the status of events at the site of an emergency is done by radio. The content of the conversations includes unanalyzed data, speculation, and technical information which could easily be misunderstood by persons not trained in the implications of such information. The reaction to the publication or widespread discussion of such information could cause unnecessary apprehension by persons in the vicinity or, at worst, could create a panic situation. On the other hand, unless all parties directly involved in the response had compatible privacy systems, necessary coordination and information exchange could be hampered.

Legislation may be required to implement a fully adequate emergency communication system, but the need is not yet clear. If the above problems cannot be resolved through other means, appropriate legislation will be requested by NRC.

**6. REFERENCES**

## 6. REFERENCES

1. U. S. Nuclear Regulatory Commission, "Investigation into the March 28, 1979 Three Mile Island Accident by Office of Inspection and Enforcement," USNRC Report NUREG-0600, August 1979.\*
2. U. S. Nuclear Regulatory Commission, "Report of Special Review Group, Office of Inspection and Enforcement, on Lessons Learned from Three Mile Island," USNRC Report NUREG-0616, December 1979.\*
3. Special Inquiry Group, M. Rogovin, Director, "Three Mile Island A Report to the Commissioners and to the Public," USNRC Report NUREG/CR-1250, Vols. I and II, January 1980 (Vol. I) and May 1980 (Vol. II).\*
4. J. G. Kemeny, Chairman, "Report of the President's Commission on the Accident at Three Mile Island," October 1979.\*\*
5. Subcommittee on Nuclear Regulation, "Report to the United States Senate: Nuclear Accident and Recovery at Three Mile Island," June 1980.\*\*\*
6. Commonwealth of Pennsylvania, "Report of the Governor's Commission on Three Mile Island," Office of the Governor, Harrisburg, PA, February 26, 1980.\*\*\*
7. U. S. Nuclear Regulatory Commission, "The Acquisition of Reactor Data for the NRC Operations Center," USNRC Report NUREG-0730, to be published (available in preprinted form from the Office of Inspection and Enforcement).
8. U. S. Nuclear Regulatory Commission, "NRC Incident Response Plan," USNRC Report NUREG-0728, to be published (available in preprinted form from Office of Inspection and Enforcement).
9. U. S. Nuclear Regulatory Commission, "NRC Action Plan Developed as a Result of the TMI-2 Accident," USNRC Report NUREG-0660, Vols 1 and 2, May 1980.\*

\* Available for purchase from NRC/GPO Sales Program, U. S. Nuclear Regulatory Commission, Washington, DC 20555 and National Technical Information Service, Springfield, Virginia 22161.

\*\* Available from the U. S. Government Printing Office, Washington, DC 20402, Attention: Superintendent of Documents, GPO Stock Number: 052-003-00718-51.

\*\*\* Available in NRC Public Document Room for inspection and copying for a fee.

APPENDIX  
COMMUNICATIONS PROBLEMS  
DURING THE ACCIDENT  
AT  
THREE MILE ISLAND

Table 1  
TMI COMMUNICATION PROBLEMS

AFFECTED TMI RESPONSE ACTIVITY	INVESTIGATION DOCUMENTATION		RESOLUTIONS	STATUS
	FINDING	CITATIONS		
1. Initial notifications from Licensee to NRC and to State and local agencies	a. Licensee slow in reporting event to State and Local agencies.	Kemeny Report: General comment Rogovin: 29	(1) Revisions to Federal regulations (10 CFR 50.72 and 10 CFR 50, Appendix E) require licensee to promptly inform NRC, State and local agencies of any emergency.	(1) In effect now for notification to NRC; in effect November 3, 1980 for 15-minute notification to State and local.
			(2) NUREG-0654 gives additional guidelines for reporting.	(2) In use as interim draft.
			(3) Direct telephone line installed to NRC HQ from each facility.	(3) In use.
	b. Initial notification to NRC Regional Office was received by answering service.	NUREG-0600: 1-3-39 Rogovin: 27 Senate: 118	(1) NRC Incident Response Plan requires all-hours staffing to receive emergency notification.	(1) Implemented through temporary assignments; permanent assignments being considered.
	c. Backup to telephones needed in case of failure.	Rogovin: 1043 NUREG-0616:119	(1) Two direct-line networks reduce chances of total failure.  (2) No backup installed, but high-frequency radios and satellite communications under study.	(1) In use. Backup not yet adequate.  (2) Pilot study of radios underway in Region II.

AFFECTED TMI RESPONSE ACTIVITY	INVESTIGATION DOCUMENTATION		RESOLUTIONS	STATUS
	FINDING	CITATIONS		
	d. Initial notification to the State did not portray the accident as serious.	Senate: 16, 121, 123 Rogovin: 47	(1) New emergency planning rule (10 CFR 50, Appendix E) requires licensee to categorize events.	(1) Published as final regulation (see 45 FR 55402); effective November 3, 1980.
2. Communications into and out of facility	a. Communications between NRC HQ and the site were totally inadequate.	Kemeny: 21, 39 Senate: 13, 120, 127, 131, 137 Rogovin: 35, 48, 107, 108, 853	(1) Two dedicated emergency telephone systems from each facility to NRC HQ, regions, and resident inspectors.  (2) New Emergency Operations Facilities will offer more communications.  (3) Direct data acquisition system will send critical data to NRC HQ and regions from each	(1) In use. Overall reliability and capacity still inadequate.  (2) In various stages of construction by licensees.  (3) Concept and implementation specifications in development.
	b. Facility was uncertain about the type of information to be reported to State and local agencies.	Senate: 13, 17, 79, 86, 136	(1) State emergency plans required to clarify needs.	(1) In view by FEMA.
	c. Senior NRC management unable to obtain up-to-date information.	Kemeny: 39 Senate: 13, 15, 82, 119, 131 Rogovin: 134	(1) Resident Inspector Program established to provide backup communications and assessment from the facility to senior NRC management.	(1) In use.

**AFFECTED TMI  
RESPONSE ACTIVITY**

**INVESTIGATION DOCUMENTATION  
FINDING CITATIONS**

**RESOLUTIONS**

**STATUS**

d. Communications did not improve until a senior NRC representative arrived at the site and took charge. Kemeny: 39 Senate: 130

- (2) Direct data acquisition system will provide continuous and timely plant status information. (2) Concept and implementation specifications in development.
- (3) Incident Response Plan provides for improved flow of communications to senior management. (3) Plan and procedures completed. Need exercises with regions.
- (1) New Incident Response Plan provides:
  - o Regional Office Director leaves for site when response is activated.
  - o Chairman may delegate authority to site when official arrives.
  - o Chain-of-command is shortened.
- (2) 10 CFR 50, Appendix E requires a near-site Emergency Operations Facility (EOF) for senior NRC and facility management to coordinate the emergency response of all participants. (2) In various stages of construction by licensees.

**AFFECTED TMI  
RESPONSE ACTIVITY**

**INVESTIGATION DOCUMENTATION**

**FINDING**

**CITATIONS**

**RESOLUTIONS**

**STATUS**

- |   |   |   |  |
|---|---|---|--|
| <p>e. Many problems with the large number of incoming calls to the plant; too few incoming lines; no switchboard operator available.</p>              | <p>Rogovin: 1043<br/>NUREG-0600: II-A-18,<br/>II-2-24</p>                     | <p>(1) Predetermined emergency operations procedures for the facility and for State and local governments should limit the number of calls to each site and transfer them to the EOF.</p> | <p>(1) Uncertain effect; needs testing. No clear solution yet for avoiding overloads at local telephone exchanges.</p> |
| <p>f. Too many uncoordinated demands for information from the plant's control room. No follow-up on these to ensure that questions were answered.</p> | <p>Rogovin: 36, 911<br/>0600: I-A-66<br/>Senate: 17</p>                       | <p>(1) Automatic Data System will reduce the demand for other plant status information during an emergency.</p>   | <p>(1) Concept and implementation specifications in development.</p>   |
| <p>g. Information reported out of the plant was not timely, accurate or descriptive</p>   | <p>Rogovin: 62, 853,<br/>911, 1043<br/>NUREG-0600: Several<br/>references</p> | <p>(1) Trained communicators are needed at both ends of the communications links between facility and the NRC.</p>  | <p>(1) NRC technical communicators are assigned; not all licensee communicators assigned.</p>                          |
|   | <p>Senate: 13, 15, 16,<br/>120, 135, 137</p>                                  | <p>(2) Exercises and drills needed to demonstrate an effective training program required by 10 CFR 50, Appendix E.</p>  | <p>(2) Exercises to be scheduled.</p>  |

AFFECTED TMI RESPONSE ACTIVITY	INVESTIGATION DOCUMENTATION		RESOLUTIONS	STATUS
	FINDING	CITATIONS		
			(3) Automatic data acquisition system.	(3) In development.
3. Communications among key NRC and licensee individuals and groups	a. Many key recommendations were made by individuals who did not have accurate information.	Kemeny: General comment Rogovin: 62, 63 Senate: 124, 130	(1) New NRC Incident Response Plan defines functions of all personnel.	(1) NUREG-0728
	b. Role of Commission & entire decision-making process during the accident were ill-defined. No procedures for staff recommendations were explored & resolved prior to recommendation to the governor.	Kemeny: 40 Senate: 13, 134, 158	(2) Drills, exercises and a training program to ensure effective plan implementation.	(2) NRC continuing exercises. Exercises involving licensees and others being planned.
	c. Geographical spread between the various NRC offices in Washington caused communications problems.	Kemeny: 21 Rogovin: 35	(1) Same as (1) and (2) for Finding (a), above.	(1) Same as above.
			(1) Commission consolidating offices.	(1) Site selected; effects of move uncertain.

AFFECTED TMI RESPONSE ACTIVITY	INVESTIGATION DOCUMENTATION		RESOLUTIONS	STATUS
	FINDING	CITATIONS		
4. Communications with and among key Federal, State, and local individuals and groups	a. There existed a lack of proper communications channels between the Federal government (NRC) and the Commonwealth of Pennsylvania.	Governor: 82 Kemeny: 40 Rogovin: 1041 - 1043 Senate: 13	(1) Responsibilities for liaison are established in the NRC Incident Response Plan.	(1) NUREG-0728
	b. The Federal government should designate a single spokesperson to advise the Governor on coordinated Federal response and on-site technical matters.	Governor: 82, 122	(1) National Contingency Plan to provide for coordination.	(1) In preparation by FEMA.
	c. Communications between the Pennsylvania Emergency Management Agency (PEMA) and the Bureau of Radiation Protection (BRP) were incomplete and, therefore, ineffective.	Rogovin: 1043 Senate: 122 Governor: 77, 78	(1) State Radiological Emergency Response Plan requires liaison among all state organizations. NUREG-0654 requires better-defined roles.  (2) Dedicated communication established between PEMA and BRP.  (3) Exercises and drills required.	(1) Revised plan in review. Other State plans also in review by FEMA. NUREG-0654 in use as interim guide.  (2) In use.  (3) To be scheduled.

AFFECTED TMI RESPONSE ACTIVITY	INVESTIGATION DOCUMENTATION		RESOLUTIONS	STATUS
	FINDING	CITATIONS		
d. The flow of official information from the State (PEMA) to the counties regarding plant status and and radiological matters was virtually nonexistent. For the most part updated information did not exist at PEMA.	Rogovin: 1041 - 1043 Senate: 122, 123 Governor: 83, 84, 123	(1) Same resolutions as for finding (c).	(1) Same as above.	
			(2) Dedicated phone lines established between PEMA and risk counties.	(2) Installed around TMI; not generally installed around other facilities.
			(3) State Plan requires PEMA representative to report to licensee's near-site Emergency Operations Facility.	(3) In effect.
e. No mechanism existed for establishing reliable communications among the onsite and several offsite organizations responsible for various aspects of the emergency response.	Kemeny: 40 Rogovin: 65	(1) New rule for emergency planning (10 CFR 50) requires primary and backup communication systems from the facility to NRC HQ and Regional Offices, State and local governments, near site Emergency Operations Facility, Technical Support Center, and field assessment teams.	(1) Effective November 3, 1980.	
			(2) Emergency Operations Center with liaison between the State, local government, and facility.	(2) In various stages of construction by licensees.

AFFECTED TMI RESPONSE ACTIVITY	INVESTIGATION DOCUMENTATION		RESOLUTIONS	STATUS
	FINDING	CITATIONS		
f. Key Federal agencies did not know what other Federal agencies were doing.		Kemeny: 17, 36 Senate: 16, 120	(1) The Federal Emergency Management Agency (FEMA) will provide stronger Federal coordination through the National Contingency Plan.	(1) Plan in preparation.
			(2) NRC Incident Response Plan provides for liaison with FEMA, DOE, HHS, FBI, EPA, FDA, Congress, And the White House.	(2) NUREG-0728.
			(3) NRC Incident Response Plan provides for liaison with State and local agencies.	(3) State liaison officers now located in each region.
g. Status of the plant must be provided to all response personnel.		Kemeny: General comment Senate: 13-16	(1) NRC Incident Response Plan provides for status reports.	(1) NUREG-0728
			(2) Acquisition of reactor data for NRC Operations Center will improve the status reports.	(2) Concept in development.
			(3) Frequent exercises, drills and training will refine the contents of the reports to suit user needs.	(3) To be scheduled.

AFFECTED TMI RESPONSE ACTIVITY	INVESTIGATION DOCUMENTATION		RESOLUTIONS	STATUS
	FINDING	CITATIONS		
			(4) The Emergency Operations Facilities will provide a forum for face-to-face discussions.	(4) In various stages of construction by licensees.
5. Communications to the public	a. NRC did not have adequate procedures for providing accurate and timely accident information to the public and the news media.	Kemeny: 57 Rogovin: 156 Senate: 148	(1) NRC Incident Response Plan requires coordination in preparing and disseminating press releases.	(1) NUREG-0728
	b. Public unaware of information about radiation and its effects.	Kemeny: 57 - 58, 77	(1) Public education program required by the new emergency planning rule (10 CFR 50, Appendix E).	(1) Effective November 3, 1980.
	c. NRC needs a systematic public information program and training for media.	Kemeny: 57 - 58, 78-79	(1) 10 CFR 50, Appendix E requires licensees to offer orientation program for media. FEMA is developing a program with NRC assistance.	(1) Rule effective November 3, 1980.
	d. NRC individuals who brief the press lacked technical expertise to explain the event. Reactor "jargon" is difficult for the press to understand.	Kemeny: 78	(1) Public affairs personnel will be assisted by technical experts.	(1) Incorporated in the Incident Response Plan, NUREG-0728.

AFFECTED TMI RESPONSE ACTIVITY	INVESTIGATION DOCUMENTATION		RESOLUTIONS	STATUS
	FINDING	CITATIONS		
	e. A press center for major press briefing should be close to the site.	Kemeny: 78-79	(1) Emergency Operations Facilities will contain provisions for briefings	(1) In various stages of construction by licensees. May not be large enough. Some sites have identified other locations.
	f. A local broadcast method should be developed that will disseminate timely and accurate information.	Kemeny: 78-79	(1) 10 CFR 50, Appendix E, requires 15-minute warning to the public with provision for sending instructions to the public about protective measures.	(1) Rule Effective November 3, 1980. Difficulties may continue beyond implementation date (July 1, 1981).
	g. NRC was slow in confirming good news the status of the accident.	Kemeny: 18	(1) All status information to be routed to press officers for coordinating press releases.	(1) Required by NRC Incident Response Plan, NUREG-0728.
	h. PEMA was not allowed to make public statements without first clearing them through the Governor's office, and the State rumor control center was established after the greatest need was over.	Rogovin: 1042-1044 Senate: 123	(1) Revisions to State plans clearly define how flow of information to the public is to be handled.	(1) In effect in Pennsylvania; plans for other states in preparation or review.

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# Report to Congress on the Acquisition of Reactor Data for the NRC Operations Center

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Manuscript Completed: September 1980  
Date Published: September 1980

Office of Inspection and Enforcement  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555



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## FOREWORD

Public Law 96-295 contains a request for NRC to provide three reports to Congress, all related to improvements in the NRC response to nuclear emergencies since the accident at Three Mile Island Unit 2 on March 28, 1979. The reports prepared to answer that request are:

- NUREG-0728, "Report to Congress: NRC Incident Response Plan"
- NUREG-0729, "Report to Congress on NRC Emergency Communications"
- NUREG-0730, "Report to Congress on the Acquisition of Reactor Data for the NRC Operations Center"

These reports summarize the status of many of the actions taken to date and provide the basis for continued upgrading of the NRC Incident Response Program.

The NRC Incident Response Plan assigns responsibilities for performing the functions and making the decisions that comprise the NRC response. The NRC plan will be made consistent with plans being prepared by the Federal Emergency Management Agency.

The Report on Emergency Communications summarizes the findings of communications problems identified by the major reviews and investigations of the accident and response at Three Mile Island. The report also includes the status of corrective actions for the identified problems and presents an evaluation of current communication capabilities and future options needed to support the functions identified in the NRC Incident Response Plan.

The Report on Acquisition of Reactor Data for the NRC Operations Center describes alternatives for one major facet of the communications problem: acquiring data at a nuclear power plant and transmitting them to NRC headquarters. Such a data link can play a role in the NRC functions and decisions and provide broad support for the entire NRC Incident Response Plan.

Collectively, these reports to Congress provide a comprehensive outline of the actions and plans of the NRC for improving its response to any future accidents. It is anticipated that these documents will also provide the other possible participants in an accident (State and local agencies, licensees, vendors, etc.) with an understanding of the present manner in which NRC can be expected to respond and how the response will change in the near future.

### ACKNOWLEDGMENT

This report was prepared by the Operations Support Staff of the Office of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, from the work of several individuals at NRC headquarters and at Sandia National Laboratories, a contractor. Major contributions are hereby acknowledged from (listed alphabetically) John Long (Sandia) and Bernard Weiss. Other essential assistance was rendered by Ormon E. Bassett, Ronald Feit, Joe Himes, Bernard Stiefeld (Sandia), and Eric Weinstein.

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ACQUISITION OF REACTOR DATA  
FOR THE NUCLEAR REGULATORY COMMISSION OPERATIONS CENTER

1. INTRODUCTION

During and after the accident at Three Mile Island Unit 2 (TMI-2), participants, observers and investigators of the accident recognized a substantial need to provide more accurate and reliable plant data to assist NRC in carrying out its responsibilities. Initial efforts to acquire an enhanced data acquisition system were limited because the role and responsibilities of NRC during emergencies required better definition.

Prior to the accident at TMI-2, the general perception within NRC was that its primary role was to monitor the response of the licensee to an incident to assure that the licensee was taking appropriate actions to mitigate the consequences of such an accident. However, the details of that approach were not thoroughly developed.

During the accident at TMI-2, it was evident that NRC participation was broader than anticipated. In the aftermath of the accident, it was clear that NRC emergency response planning would have to change, but the degree of modification was not settled. One group advocated that NRC should take over a facility in an emergency, whereas others insisted that the NRC had overstepped its authority at TMI-2 and should strictly limit its actions to that of a conventional regulatory agency; that is, monitor and investigate. As a result of this debate, both within and outside the agency, the role of NRC in an emergency became better defined. More attention was devoted to the means of acquiring reactor data to support the functions and decision-making necessary to fulfill NRC's role.

Although little formal agency action was taken toward data acquisition during the summer and early fall of 1979, the staff informally consulted with various companies, exploring the feasibility of a data acquisition system and the technology available to acquire, transmit and display site data to the NRC Operations Center. In October 1979, senior NRC officials discussed the need for an enhanced data acquisition system. A major concern was for an early operational capability that would provide sufficient information to allow NRC to perform its identified roles. Sandia National Laboratories was tasked as the overall system integrator and charged with the major task to develop a detailed conceptual approach to the data requirements of NRC. To provide Sandia with guidance as to the type and quantity of data required, the NRC staff developed a detailed set of variables for which values will be transmitted to the NRC Operations Center from each operating reactor facility (Ref. 1).

The Commission was informed of the actions being undertaken by the staff, mainly through a series of briefings. These sessions also provided the staff with valuable guidance in working on the data system concept. The initial briefing on February 5, 1980, was concerned with the overall upgrading of the Operations Center including the data system design considerations, features, and attributes (Ref. 2). At that briefing, the Commission directed the staff to continue work on the data system concept and report when the Sandia study was complete.

Sandia published the initial concept study in April 1980 (Ref. 1) and the staff briefed the Commission on that report in a May 15, 1980, meeting (Ref. 3). This briefing also included a discussion of other possible data link alternatives. The Commission requested further review of the alternatives and comparison of the relationship of the nuclear data link (NDL) data system to those similar systems being required of licensees in developing new emergency facilities.

On July 14, 1980, the staff again briefed the Commission on the progress in the development of a nuclear data system concept, as requested in the previous meeting (Ref. 4). During that session, the Commission approved the nuclear data link (NDL) concept and agreed that the staff should move forward to develop specifications for open bidding and selection of contractors. The Commission requested that they review the specifications prior to the announcement of the bid solicitations. The necessary implementation tasks, schedule, and specifications for open bidding will be completed early in FY81. An operational system is anticipated in FY84.

This report provides a summary of the results and conclusions of activities that have taken place over the past 18 months. This report is intended to serve as a definitive statement of the alternative data acquisition systems considered in the development of the NDL concept, a description of the fully automatic alternative which would give the NRC Operations Center a comprehensive analytical capability and the projected costs and schedule for implementation of that alternative. Although this alternative is considered in greatest detail, the Commission has made no decision to implement this, or any of the other alternatives described in this report. The Commission is continuing to consider\* the field of alternatives in the context of the role of the agency, headquarters and regions in the event of a radiological emergency.

\*NOTE: The NRC published for review and comment a draft report, "Functional Criteria for Emergency Response Facilities," NUREG-0696, July 1980. That draft described and sought comments on a fully automatic data transmission alternative. The comment period for the draft report closed September 29, 1980.

## 2. ROLE OF THE NUCLEAR REGULATORY COMMISSION

### 2.1 Spectrum of Roles

The proper response role for NRC during the course of a radiological emergency at a licensed nuclear facility has not been clear. Historically, the NRC and its predecessor agency have concentrated on the purely regulatory aspect of their mission. Major concern was limited to assuring, through monitoring, that the licensee was taking those actions required by his license and NRC regulations.

After the incident at the Browns Ferry Nuclear Power Plant near Decatur, Alabama, on March 22, 1975, the role of NRC was modified but still was largely confined to remote monitoring and advisory functions. The accident at TMI-2 caused NRC to reassess its role requirements and improve its response procedures. As a result of that reassessment and the several inquiries into NRC actions during the accident at Three Mile Island Unit 2 (TMI-2), it became clear that there was a range of potential roles that NRC might assume when responding to an emergency. The different roles that NRC must be prepared to fulfill vary according to the degree of control exercised and range from passive monitoring to active intervention.

In any incident, NRC may exercise more than one role, sometimes concurrently, as the incident progresses. However, it is important that all participants in an incident (NRC and others) be fully aware of changes in the NRC role. A plan has been developed by NRC to assure that appropriate notifications are carried out. This plan is the subject of a separate Report to Congress (NUREG-0728) which is being submitted concurrently with this report.

These major roles are presented in ascending order of responsibility. Role alternatives are not discrete or mutually exclusive, but instead are successive increments in which one is added to another.

#### 2.1.1 Monitoring-Only Role

In this role, NRC response is essentially passive and confined to information acquisition and assessment. The licensee, in conjunction with State and local authorities, has primary responsibility for dealing with the incident. NRC keeps itself apprised of both the situation and the status of response actions, based on dependent data supplied by the licensee as well as any data obtained independent of the licensee via a data system, reported by NRC personnel on site or provided by offsite authorities. NRC also maintains cognizance of offsite conditions and activities related to the incident. Additional ad hoc information may be requested by NRC, as deemed necessary. Data from all sources is collated, verified, analyzed, and evaluated by NRC to arrive at its own estimate of the situation and of the adequacy of the operational protective measures being taken. NRC serves as the focal point at the Federal level for providing authoritative technical information on the incident related to the onsite situation and licensee offsite activities.

### 2.1.2 Advisory Role

The NRC role in this case is expanded to include exerting influence on the response process, using information gathered by continued monitoring. Primary responsibility for coping with the incident, however, still resides with the licensee. NRC gives advisory support, either requested or volunteered, to assist in diagnosing the situation, isolating critical problems, and determining what remedial courses of action and additional precautionary measures are indicated. Advice is made available to the licensee, State and local authorities, and to other Federal agencies concerned. Acceptance of NRC opinions, judgment, and suggestions is discretionary rather than binding upon the licensee; it is channeled to licensee management.

In addition, in selected cases the NRC may integrate response measures taken on site and external support relating directly to onsite response needs. In this capacity, NRC may also orchestrate the site-oriented response process and serve as a common focal point or intermediary for the licensee and various other participants involved.

### 2.1.3 Limited Direction Role

In addition to monitoring and advisory activities, in this role the NRC intervenes in a limited fashion to direct and control the licensee's onsite response. It assumes responsibility and initiative in making certain critical operational decisions with regard to response measures to be taken, by issuing formal orders to the licensee accordingly, and monitoring implementation of the actions ordered. In some cases, NRC could reserve for itself only a few major or key operational decisions, leaving the remainder of the decision-making to the licensee. However, in this role, the licensee continues to operate and manage the facility with licensee personnel who may be augmented by personnel from other industry groups. NRC advice and direction is channeled to licensee management.

### 2.1.4 Assume Management Control

NRC could find it necessary to exercise detailed management control, making many decisions on operational matters that are perceived to be significant, sensitive, or critical. The licensee, in effect, becomes the executive agent of the NRC. All aspects of onsite response would be concurred in or approved by NRC, whether expressly directed or not.

An extraordinary contingency could be postulated in which some or all of the technical functions required to deal with the situation are actually performed by NRC-provided personnel deployed on site. However remote, this is a hypothetical possibility. Such a role of last resort could fall on NRC by default. The takeover role is highly scenario-dependent, and the potential role demands on NRC are correspondingly open-ended. There are, however, serious questions about the desirability, as well as the capability of NRC, or another Federal agency, supplanting the licensee. In addition, for this role to be considered viable, the legal issue of NRC liability must be examined in depth.

Based on experience, NRC believes that, nearly all of the time, NRC will participate in an emergency in the monitoring and advisory roles. For planning

purposes, the Commission has developed guidance estimating that 98% of the time NRC will exercise the monitoring and advisory roles. However, even though the probability of directing licensees or assuming management control is extremely small and would in all likelihood be done by the senior NRC official at the site, NRC must be prepared to function in the "limited direction" role, and will consider further whether it can or should be prepared to "assume management control."

The focus of a particular NRC role will depend to a great degree on the stage of the NRC response, the availability of staff, and the particular decisions required. In general, there will be an emphasis to manage the NRC functions and activities at the site. However, regardless of the location, analysis teams at NRC headquarters will support the NRC site personnel by continuing to monitor events, to project consequences of the situation, and to develop recommended actions throughout an emergency. NRC headquarters technical staff can provide a perspective that is free from the immediate pressures of crises at the site.

## 2.2 Key Decisions and Functions Requiring Site Data

In an emergency, NRC must be prepared to make quick and critical decisions and perform tasks that could have a crucial effect on public health and safety. In most situations in which decisions are necessary (e.g., recommending protective measures to State officials), declining to make a decision or delaying a decision can be as important as taking a specific action. The NRC, by virtue of its position as regulator of the affected plant, will find itself directly involved in any emergency that has the potential of affecting the public health and safety. In this position, decisions must be made and functions carried out that require an independent NRC evaluation of the plant operations and the real or potential effect on the public and the environment.

Based on statutory responsibilities, the NRC Incident Response Plan (NUREG-0728), which is concurrently being transmitted to the Congress with this report, highlights decisions that must be made by the NRC to fulfill its basic responsibilities in an emergency. These include the following:

- . Evaluate and categorize initial information to estimate severity
- . Decide to escalate the NRC response
- . Recommend protective actions for the public
- . Recommend (and possibly direct) licensee actions
- . Deescalate the NRC response

These critical decisions depend on effective performance of certain key functions that are highly dependent on site data:

- . Evaluate incident and plant status
- . Evaluate licensee actions
- . Project incident consequences and plant status
- . Advise or discuss problems with licensees
- . Review, investigate, and document response actions
- . Maintain response capability

Current methods of data transmission (voice telephone communication between two individuals) have demonstrated severe limitations. The flow of site data to the NRC Operations Center on a single-voice line can be severely hampered at a critical time. Although there is a requirement for the licensee to assign an individual to that single-voice line, staff experience has shown that:

- (1) The information obtained is limited because the site contact has to ferret out much of the data.
- (2) The NRC staff requests may be off target initially because of a lack of general understanding of the situation. This wastes valuable communication time.
- (3) The site contact on the telephone is not always someone known by NRC staff; as a result, communications may not be smooth in the emergency atmosphere.
- (4) Data communicated orally can be very easily misunderstood or misinterpreted.

Consequently, there is a distinct need to develop methods for improving the transmission of data from reactor sites to the NRC Operations Center. It is essential that the data transmission be accomplished without significantly interfering with other licensee activities, particularly during periods of stress.

Some concern has been raised as to the extent of data which should be available to NRC for evaluating the situation at a reactor site. The basis for this concern appears to be the belief that increased data at NRC headquarters would lead some individuals to direct a licensee to take particular actions. However, if NRC is to perform the functions listed above and make the critical decisions required to carry out its responsibilities, particularly during the early hours before the NRC staff can reach the site, it must have the reliable data. To protect against "informal direction," procedures have been developed whereby any NRC advice or direction is provided to the licensee at a management level so that it can be evaluated before the licensee directs the operator to take a certain action. In addition, the chain of command of the NRC emergency response organization has been strengthened so that advice or direction would come from a specific senior management position rather than several NRC employees. That position will be announced to the licensee so that he is aware of who has the authority to advise on or direct licensee actions.

It should also be noted that the final determinations of the type and number of plant variables to be included in an upgraded data system have not been made. The final selection will be based on a period of discussion within NRC and among licensees, vendors, architect-engineers, and other interested groups.

### 3. ALTERNATE METHODS FOR TRANSMISSION OF DATA TO THE NUCLEAR REGULATORY COMMISSION OPERATIONS CENTER

#### 3.1 Criteria for Choice of Transmission Method

Any method chosen for the transmission of data between the plant site and NRC Operations Center must support the functions performed at the Operations Center. Table 1 lists the major functions of the Operations Center and the resulting criteria imposed on the transmission and information system used to support the Center.

Items 4 and 6 under column "Transmission and Information System Requirements" (Table 1) relate to timeliness and quantity of data. To ensure that the Operations Center can make an accurate, overall assessment of an incident in progress and the licensee's response to that incident, data must be received at a rate comparable to changes in the status of the plant's critical systems. In particular, such assessments require the evaluation of the current parameter values, sequence of changes in a value, and sequence of significant changes of all parameters (considered together). The insight necessary to make accurate assessments is gained only by seeing the sequence of changes as they occur and by having access to historical data and parameter comparisons, as opposed to being dependent on after-the-fact descriptions of events. A review of the data from the Three Mile Island Unit 2 (TMI-2) accident and data from other incidents indicates that critical safety parameters may change from an acceptable to critical status in time scales measured in seconds or minutes.

Diverse opinions exist on the number of data parameters that should be available to the NRC for monitoring power plant incident status. Typically, a plant control room has the capability to acquire approximately 1000 analog and 1500 digital signals for the operators to use in controlling the plant. In contrast, NRC draft Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident" (Ref. 5), lists approximately 150 reactor operations, radiological and meteorological parameters each for PWR and BWR systems. Similarly, the nuclear data link specification prepared by the NRC staff (dated Feb. 21, 1980) lists approximately 120 parameters (Ref. 1), essentially all of which are also listed in Regulatory Guide 1.97. These parameters would provide a basis for the NRC staff to perform incident monitoring functions, including the evaluation of the effectiveness of a licensee's response strategy. With the nuclear data link, sufficient technical detail would be available for NRC staff (generally the Director of Site Operations) to consider general courses of action to be taken, make recommendations, or perhaps issue orders if the situation warrants. Without considerably more detailed data regarding plant equipment status, valve lineup, health physics, etc., NRC staff would be limited in its ability to provide detailed operational recommendations or orders to plant personnel.

#### 3.2 Alternative Methods

Alternative systems exist that could be used to acquire significant power plant data, transmit these data to the Operations Center, and finally provide methods to distribute these data as needed to the concerned Operations Center groups. These alternative methods for site data acquisition and transmission to the Operations Center can be classified into three general categories:

**Table 1. Transmission and Information System Requirements to Support Major Operations Center Functions**

<b>Operations Center Functions (NRC Incident Response Plan)</b>	<b>Transmission and Information System Requirements</b>
Evaluate and categorize initial information	<ol style="list-style-type: none"> <li>1. Provide data early in incident when emergency personnel may not yet be available</li> <li>2. Provide automatic alarms and warnings on status of important parameters</li> <li>3. Minimize demands on control room personnel</li> </ol>
Evaluate incident and plant status	<ol style="list-style-type: none"> <li>4. Collect data on a timely basis at a rate comparable to changes in the status of the plant's critical systems</li> <li>5. Ensure accuracy of data</li> <li>6. Provide data in sufficient detail and quantity for analysis and identification of critical trends</li> <li>7. Facilitate data access, storage and recall by Operations Center technical personnel</li> </ol>
Decide to escalate NRC response; decide to deescalate NRC response	Items 1, 2, 4-7 above
Evaluate licensee actions	Items 1, 4-7 above
Direct licensees	Items 1, 4-7 above
Advise licensees	Items 1, 4-7 above
Project incident consequences	Items 1, 4-7 above
Recommend protective actions for public	Items 4-7 above
Review, investigate and document response actions	<ol style="list-style-type: none"> <li>8. Provide permanent data storage</li> <li>9. Provide for data recall procedures</li> </ol>
Provide for personnel training activities	<ol style="list-style-type: none"> <li>10. Provide capability for accident simulation</li> <li>11. Maximize uniformity of data formatting and recall methods at each site</li> </ol>
Maintain response capability	<ol style="list-style-type: none"> <li>12. Verify communications link availability</li> <li>13. Verify site data acquisition integrity</li> <li>14. Provide for notification in event of loss of site communications or data on an on-going basis</li> </ol>

- (1) Manual methods - This category includes methods using person-to-person voice communications (telephone), manually loaded telefax machines, and other methods that require much manual intervention to acquire, transmit, and retrieve data for use by the Operations Center.
- (2) Semi-automatic methods - These methods use automatic data acquisition, but require manual intervention prior to transmission of the data, or manual intervention at the Operations Center to distribute the data. Examples of semi-automatic techniques are the use of data loggers and magnetic tape recorders at the plant site. With this equipment, data is automatically recorded but manual intervention is required to mount the tape on a playback or transmission unit. The use of printers at the Operations Center is another example in which data listing may be automatic, but distribution, copying, and data reduction involve considerable manual intervention.
- (3) Automatic methods supplemented by manual methods - These methods use computer-based data acquisition at the reactor site and essentially continuous data transmission from the site to the Operations Center. At the Operations Center, data handling is based on automatic acceptance of received data, computer-based file management, and multiple access terminals for data retrieval by concerned task groups.

Under this alternative, supplementary voice or telefax methods are employed for site-to-center consultations for the transfer of information not suited for automatic acquisition. Examples of this type of information include data readings taken with portable instruments, requests for special equipment, and discussions on unanticipated technical situations. The design of an automatic method would have to allow for a manual or semi-automatic backup.

### 3.3 Discussion of Alternatives

Six of the system requirements listed in Table 1 have special significance in limiting the selection of alternatives. These are:

- . Collect data on a timely basis compatible with changes in plant status;
- . Provide data in sufficient detail and quantity;
- . Ensure accuracy of data;
- . Provide data early in the incident;
- . Provide automatic alarms and warnings; and
- . Minimize demands on the control room personnel during emergencies.

#### 3.3.1 Manual Methods

Although the Regulatory Guide 1.97 data parameter list of approximately 150 items is small when compared with the number of data items available in the control room, 150 parameters or even 30 or 40 parameters sampled at a rate comparable to changes in the status of the plant's critical systems presents a formidable problem when dealt with manually. A voice-based manual system would require several full-time personnel and several telephone lines to acquire the necessary data from control room personnel and pass on that data

to the Operations Center even if the requirements for sampling rate were relaxed. A manual system using facsimile transmission would collect data in a similar manner. Data would have to be acquired manually and transcribed to a form for mounting on the facsimile unit, or listings from the control room would have to be obtained for transmission.

In any of the manual systems, the manpower necessary to collect the required data could impose a burden on the plant. The collection activities could be disruptive in the control room or onsite technical support center (TSC). Transmission of data during the early stages of the accident would be precluded until personnel arrived at the site and the Operations Center. In addition, given the psychological stress and urgency which exists under crisis conditions, the acquired data might be subject to human error and misinterpretation. These conclusions can be justified by a quick look at the mechanics of a manual system.

In the manual method even under the best conditions, the data must go through three cycles of transcription. That is, the instrument is read at the plant, and the value of the reading is noted in writing. Later, the value is read and spoken over the telephone to the NRC communicator at the Operations Center (or telefaxed). Then, the communicator must hear the value correctly and note it in writing (or receive the facsimile). Finally, the communicator must provide these data to the technical analysis teams. Each of these transcriptions contributes a reasonable chance for error. Furthermore, the values are not sent to NRC immediately, but several values are accumulated before they are sent, thus incurring a significant delay. Once the data is in the Operations Center, additional manual effort is needed to manipulate the data so that different parameter readings from the same point in time are side-by-side, or to produce trend graphs of parameters for comparison. Thus, another delay is incurred before serious analysis can begin.

The cost of the equipment for manual methods of data acquisition is fairly small. However, the total annual cost for a system using single dedicated leased lines to the present 45 plant sites incurs an annual fee of about \$500,000. Several lines to each plant would be required to transmit the unevaluated data in addition to the existing direct and dedicated lines which will be used to exchange status information. The number of additional lines would be dependent on the number of parameters required and the number of individuals that could be made available at the site for this task.

### 3.3.2 Semi-Automatic Methods

A semi-automatic system for acquiring and transmitting data is characterized by automatic data acquisition at the licensed plant and transmission of data using digital techniques. This approach minimizes the data acquisition problem and reduces communications difficulties. Manual intervention might be required at the plant or at the Operations Center, or both, before data from the plant could be available to the NRC for analysis.

One idea for a semi-automatic system involves recording data on a removable storage unit at the plant process computer. The removable storage unit (a tape, floppy disk, cartridge, etc.) could then be transferred manually from the plant process computer to the NRC terminal. There, the data would be

transmitted to the Operations Center while incoming data was recorded on a fresh storage unit by the data acquisition system.

It may be substantially cheaper to provide data to the nuclear data link (NDL) by manually transferring removable storage devices in this manner, rather than using digital communications to make the transfer, as by transferring data manually, the installation of a separate data acquisition system with a digital communications interface could be avoided. However, if a separate system with a digital interface were installed by licensees for the onsite technical support center (TSC) and nearsite emergency operation facility (EOF), in most cases existing process computers cannot be used for this task. If this is the situation the semi-automatic NDL can share this required data acquisition system, and the use of manually transferred removable storage devices would not represent a cost savings in this regard. Furthermore, the cost of the NRC transmission terminals at the site would be increased by the use of this technique and a time lag before data is transmitted would be introduced.

At the Operations Center, the data could be processed by the proposed Operations Center computer. Alternatively, using a second technique for a semi-automatic system, the data might simply be printed by a conventional impact printer at the Operations Center. Analysis and distribution of the data then becomes a manual task. This scheme could be used at the Operations Center whether the data was acquired by automatic or semi-automatic means. However, the amount of paper that could be quickly generated by an impact printer could hinder effective analysis.

The advantage of simply printing the data at the Operations Center is the apparent low cost and simplicity of the printer, as compared with automated distribution equipment. However, the equipment is not as simple as it might first appear. Connecting a printer to the dedicated telephone link (through a modem) is possible, but it allows no opportunity for correcting errors occurring during normal transmission, or for truly standardized data formatting. These shortcomings could be remedied only by the addition of additional communications control equipment at the Operations Center, and by increasing the complexity of the NRC terminal at the site.

Without data link error-correction capability, several errors in the incoming data introduced typically by electrical noise in transit from the plant to headquarters can be expected every day. (The actual error rate will vary from line to line and from time to time on any line.) Some of these errors will produce printed characters that are obviously out of context; other errors will simply look like valid readings and may never be discovered. The Operations Center staff will be far too busy during an incident to question every important, abnormal value. Error correction is thus necessary.

Error correction is achieved by a relatively simple computer processor at the Operations Center with the capability of checking the messages for errors, and for formulating and transmitting a message back to the site over the same wires achieving correction. Note that this error correction is achieved by two-way communications; the messages flowing both ways on the same line are controlled by a communications protocol that ensures that messages are not lost and do not interfere with each other.

Semi-automatically transmitted data must be transmitted in a standardized format from every reactor to avoid having to deal with all of the 80 plus unique plant formats at the Operations Center. This requires installing a formatting capability (both software and processing power) in the terminals at the various sites prior to transmission to NRC. The formatting task is not assigned to the data acquisition system at the plant, because the NDL format for data transmission is not suitable for the other systems acquiring data from that source. The data acquisition system would also perform time-critical tasks and should not be expected to handle multiple formats.

There are other disadvantages of having data printed upon arrival at the Operations Center that are not remedied by additional hardware and software. During an incident, the Operations Center is the scene of considerable activity. In this environment, data distribution is a major problem. Strict procedures do not always assure that people can get information promptly, especially when those people are moving about and meeting with others on an emergency basis.

Furthermore, the discovery of trends in variables observed during incidents and the understanding of obscure relationships between plant parameters requires that data be presented in a format more easily absorbed than an array of columns of numbers on a printout. In the absence of Operations Center data handling capability, the plotting and formatting of vast quantities of data would have to be done manually--a time-consuming, errorprone operation. Even the simplest plots of a rapidly changing parameter sampled once per minute require an hour of manual effort, if one is interested in a trend visible over a day's accumulation of data. The discovery of interrelationships between parameters is more difficult if time is important; simple aids such as side-by-side tabular lists (faster to prepare, but clearly inferior to superimposed plots) would have to be prepared manually.

Thus the shortcomings of the semi-automatic approach are excessive delays and errors in the data and cumbersome formatting. The specified data can be acquired and delivered to the NRC, but delays ranging from tens of minutes to hours will be incurred in formatting the data, and data of importance to a particular scenario, but not acquired automatically, cannot be handled by the system. In addition, the accuracy of any particular data value cannot be reasonably assured. These factors therefore preclude the use of semi-automatic methods with the NDL.

### 3.3.3 Automatic Methods

An automated data system is able to acquire data automatically and continuously at the plant, transmit it to the Operations Center, and then distribute and display the data immediately to the NRC staff without human intervention. The data is also stored at the Operations Center for use in generating time histories of the parameters. Time histories and other special displays can be generated upon command.

Disadvantages of an automated system include substantially higher initial cost, and higher cost of maintaining a system that is more complex to manage. Because of equipment acquisition and programming, the lead time for implementing

the system is greater. There is also a transition period, while the NRC staff becomes accustomed to working with the automated equipment, during which the system will not operate at full effectiveness.

Although some personnel are required to operate the system, the number is considerably smaller than for manual or semi-automatic systems of lesser reliability and data capability which is an advantage for an automated system. Furthermore, the accuracy of the data does not depend so strongly on human factors.

Various types of automated systems may provide some or all of the following important features:

- . Data is acquired from a known source; that is, the data acquisition system is connected to a specific sensor, and a description of the particular sensor supplying the data can be available at the Operations Center. (If data is acquired manually, one is not sure which sensor is being read.)
- . Parameters are sampled essentially simultaneously assuring that NRC and licensee are reviewing identical values for the same parameters.
- . Data is converted to engineering units in a consistent, documented fashion.
- . Data is transmitted promptly to the Operations Center; the delay between the reading of a value and its appearance on a screen at the Operations Center is in the order of one minute.
- . Errors introduced in transit are corrected.
- . Data is formatted automatically to enable the recognition of trends and interrelationships. The delay for reformatting data by special request will generally be less than one or two minutes.
- . Selected parameters can be designated to automatically initiate alarms at the Operations Center on detection of abnormal values.
- . At any given time, the data from the previous thirty minutes for each plant is available. If an event occurs, all data from that plant is retained; otherwise, data more than thirty minutes old is discarded. This assures that conditions leading to an event are documented.
- . Retention of data received by the NRC Operations Center begins on receipt of an automatic alarm or when instituted by the Operations Center (in case a subtle situation should fail to trigger an alarm). This data is stored automatically for recall as needed after the Operations Center is fully activated.
- . These processes all take place without the attention of licensee control room personnel. This is not to say that licensee personnel will not have essential input to the system. In fact, it is important that the present voice link to the licensee plants be retained. In a major incident, there is need for information other than raw data from the plant. Facsimile capability should also be available.
- . Data required specifically for one incident can be entered into the system and made a part of the data base. The recall and display of this data is a routine matter.

#### 4. DESCRIPTION OF THE FULLY AUTOMATIC NUCLEAR DATA LINK ALTERNATIVE

An automatic system for upgrading the NRC's emergency response capabilities is described in NUREG/CR-1451, "Conceptual and Programmatic Framework for the Proposed Nuclear Data Link." The proposed system provides for the transmission and automatic display at the NRC Operations Center of approximately 120 critical data parameters from each operating reactor. Supplementary voice/telefax communications are provided for as may be required.

The functions to be performed by the nuclear data link (NDL), along with the design considerations, dictate that the automatic system be composed of subsystems for data acquisition, communications, and for Operations Center data processing and display. Each of the subsystems performs an essential function for the NDL; each one is logically distinct from the others.

The function of the data acquisition subsystem [to be implemented by the licensee and shared with the onsite technical support center (.SC), nearsite emergency operations center (EOF), and safety parameter display system (SPDS)] is to bring data from the plant into a computer, where the values can be converted into engineering units (if necessary), and then sent to the Operations Center by the communications subsystem. The data acquisition system has the ability to verify the form of the data it receives.

The communications subsystem takes the data from the data acquisition subsystem and transmits it to the Operations Center over dedicated telephone lines. (Test data can be generated without aid from the plant and transmitted to the NRC Operations Center for system verification.) The arriving data at the Operations Center is checked for errors; errors introduced into the data as it travels over the line from the licensee site to the Operations Center are detected and corrected. The data is then passed to the Operations Center subsystem for distribution and display to the NRC staff.

Inside the Operations Center subsystem, the data is sent to two display areas and to storage devices for later retrieval. The data to be viewed immediately is converted to a readable form, formatted for easy understanding, and sent to the display screens. All data is processed by special software to make it easily retrievable, and is then sent to storage.

Another portion of the Operations Center subsystem receives commands from persons requesting that certain data be displayed in particular ways. Special software retrieves the requested data from storage and sends it to the screens. If a time trend has been requested, software also reprocesses the data and produces the requested plots promptly.

## 5. RELATIONSHIP OF NUCLEAR DATA LINK TO ELEMENTS NECESSARY FOR EMERGENCY PREPAREDNESS

The accident at Three Mile Island Unit 2 led to studies performed within the NRC and industry that identified the need for extensive improvements in emergency preparedness at nuclear power plants. The following improvements are called for:

- (1) Management and coordination of all support personnel and organizations having a response role;
- (2) Availability of information needed to assess and manage an accident at a nuclear reactor facility;
- (3) Continuous assessment of actual and potential radiological consequences;
- (4) Provisions (through State and local agencies) for early warning and frequent clear instructions to the local affected population; and
- (5) Provision for continuous accurate information to the general public.

Licensees will or have been required to provide new emergency response facilities or systems to assist in fostering these needed improvements. These facilities or systems are the safety parameter display system (SPDS), technical support center (TSC), and emergency operations facility (EOF). These along with the NDL, will operate as an integrated system to enhance management of the total emergency response (Figure 1). These facilities must each provide for their own performance requirements, and the MDL, while serving NRC needs, must be consistent with these other emergency response facilities.

### 5.1 Safety Parameter Display System (SPDS)

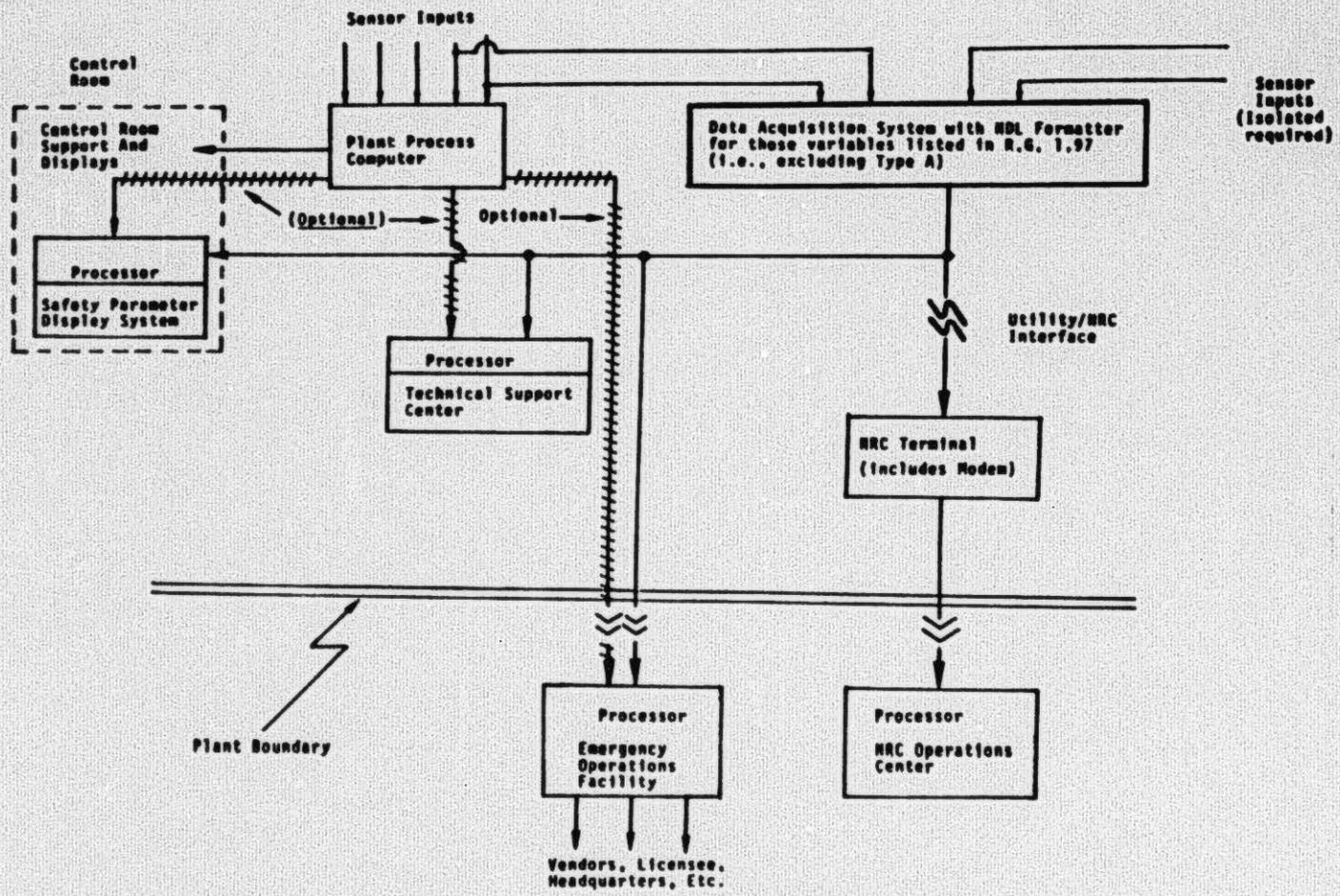
The safety parameter display system (SPDS) is a required operating aid for control room personnel that displays those variables defining the safety status of important plant systems. The SPDS is only a monitoring system and is not intended to replace any existing control room displays. Its purpose is to consolidate information that describes plant safety status and to present this information in a useful display format. The system will operate during both normal and abnormal operating conditions.

The design of the SPDS will provide the control room with a real-time display of a minimum set of plant parameters (a subset of the NDL parameters) from which the safety status of the plant may be quickly evaluated. It will be capable of displaying this information during both steady-state and transient conditions. Magnitudes and trends of appropriate parameters will be accessible to allow quick assessment of important plant processes. The SPDS will be located in the plant control room and requires no additional staffing beyond current levels.

### 5.2 Technical Support Center (TSC)

The onsite technical support center (TSC) is a required emergency response facility that alleviates control room overcrowding during an accident. It will provide plant management and technical support to reactor operations personnel during emergency conditions and during emergency recovery operations. Comprehensive data necessary to monitor the reactor systems status and evaluate

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Figure 1. Functional Block Diagram of Data Flow

plant systems abnormalities will be provided in the TSC. These data will be a fraction of the variables available in the control room.\* The data presentations will include current value, time rate of change, and time history displays of critical operational parameters. Sufficient data to determine the plant dynamic behavior prior to and throughout the course of an accident will be available for analysis in the TSC. Such data will include up-to-date plant records and procedures to support technical analysis and evaluation of plant conditions during the emergency and recovery operations.

The TSC will be the emergency operations work area for designated senior plant management personnel, licensee engineering and technical personnel, a small staff of NRC personnel, and any other licensee-designated personnel needed to provide the required technical support. TSC will be located near the control room to allow "face-to-face" interaction between control room personnel and plant management working in the TSC.

### 5.3 Emergency Operations Facility (EOF)

The required nearsite emergency operations facility (EOF) will be located near the reactor plant and will provide continuous coordination and evaluation of all licensee activities during an emergency having potential or actual environmental consequences. The overall management of licensee resources in response to an emergency will be based in the EOF. The EOF will function as the post-accident recovery management center for both onsite and offsite activities. To accomplish these functions, capability will be provided in the EOF for the collection and evaluation of all pertinent radiological, meteorological, and geophysical data.

Representatives from appropriate offsite agencies will be present at the EOF and will coordinate emergency response activities. Besides NRC and the Federal Emergency Management Agency, these agencies include local, State, and Federal emergency response organizations and will provide current information on conditions that may potentially affect the public welfare.

### 5.4 Data Availability

The safety parameter display system (SPDS), a required control room display, will use some variables listed in Regulatory Guide 1.97, plus other site-specific variables of significance. The data described in Regulatory Guide 1.97 (types B, C, D, and E), including a SPDS display, defines the minimum data availability at the technical support center (TSC) and emergency operations facility (EOF). The Regulatory Guide 1.97 data also includes all data required for the NDL. As shown in Figure 1, a data acquisition system separate from the plant process computer will be provided at each plant for Regulatory Guide 1.97 data. If Regulatory Guide 1.97 data were to be supplied by the process control computer, the possibility exists of competition for resources between the control room and the emergency response facilities. Separation of the data acquisition facility eliminates this possibility for required data. The licensee may supply additional data from the process control computer to

\* The NDL will have a subset of the TSC variables.

the TSC and EOF if the licensee chooses to do so. It should be noted again that the NDL does not determine the data acquisition system requirements, which are basically determined by SPDS, TSC and EOF needs. Thus the NDL system, which will be phased in shortly after the site requirements are satisfied, is not expected to impose a large incremental expense on licensees.

The large number of commonly required variables between the NDL, TSC, EOF and SPDS makes consideration of an integrated system appear more attractive from a standpoint of cost. The major disadvantage of a single data acquisition system is that if the acquisition system fails, the data source is lost for all emergency response facilities. Although it would be preferable to have completely separate data acquisition systems, appropriate and inexpensive measures can be provided to ensure reliability of the integrated NDL data stream. Thus the interrelationship of the four systems in the single data acquisition system will not present an insurmountable technical problem.

Integration of the systems will encourage better communications during an emergency, particularly between the various licensee and NRC participants. Because the data received by all parties will be compatible (generated by the same sensor using identical engineering units), technical discussion will be enhanced and the independently generated displays will be similar. Experience at TMI-2, other incidents, and drills have demonstrated the need to greatly improve the timely transfer of technical data with minimal misinterpretation by the participants and the public.

## 6. IMPLEMENTATION PLAN

The Commission has made no decision to implement any of the alternative data acquisition systems considered in this report. The Commission is continuing to consider the field of alternatives in the context of the respective roles of the agency, headquarters and regions in responding to a radiological emergency. However, to provide a sense of the possible implementation requirements and schedule, an implementation plan has been developed for the most complex of the alternatives, the automatic data acquisition system. The implementation plans for the other alternatives can be expected to be less complex than the one described below.

Implementation of the nuclear data link (NDL) would require a major coordinated effort from NRC, the licensees, a System Integrator and selected contractor(s). In summary, the implementation plan could employ the technical and managerial capabilities of a selected nonprofit institution or another Government agency as the NDL System Integrator who in turn would select, by competitive bidding, contractor(s) to design, supply, and install the NDL hardware and software.

The following specific responsibilities have been identified for each of the participating organizations.

### 6.1 NRC Responsibilities

- (1) NRC would assume the role of overall program manager which consists of establishing the system functional requirements and the overall program funding and schedule plan. Draft functional requirements have been written and will be augmented and modified as needed based on the intended use of the NDL in aiding NRC to discharge their responsibilities during a radiological incident.
- (2) The NRC would concur on the final NDL systems concept as developed and refined by the Systems Integrator.
- (3) Prototype nuclear data link installations would be made at no more than three selected reactor plants to verify interface requirements and gain experience to facilitate installation at all the other plants. The NRC would be responsible for making the overall arrangements with the lead plant utility organizations.
- (4) The NRC would issue necessary regulations and guides that would enable the utilities to meet their commitments to provide the various support facilities such as the technical support center and the data acquisition system. This also would include the interface specifications between such facilities.
- (5) When the NDL installation becomes operational, the NRC would assume responsibility for its overall operation.

### 6.2 System Integrator Responsibilities

- (1) The System Integrator would provide overall technical direction for the program within the framework re-established by the NRC funding and schedule plan and functional requirements.
- (2) The System Integrator would complete the NDL system design in sufficient detail to allow for a competitive procurement of as much of the hardware and software as time allows. NRC would expect to select the System Integrator early in FY81.

- (3) Project plans and schedules would be developed and maintained by the System Integrator.
- (4) Requests for proposals would be prepared by the System Integrator and contractor(s) would be selected using the procurement services of the System Integrator organization.
- (5) Contractor design and software work would be monitored by the System Integrator to ensure compliance to the systems specifications and schedules agreed to in the purchase contract.
- (6) The System Integrator would provide liaison between the contractor(s), the NRC and licensees as needed to ensure the timely integration of the overall NDL system.
- (7) The System Integrator would specify and supervise the overall system operational verification tests which would demonstrate the combined operation of the plant data acquisition subsystem (including the NRC site transmission unit), the communication subsystem, and the NRC headquarters Operations Center subsystem under simulated nuclear accident conditions.
- (8) The System Integrator would make provisions for a program to train NRC personnel to operate the NDL.

### 6.3 Systems Contractor(s)

The systems contractor(s) would be selected by competitive bidding to supply the hardware and software as prescribed in the contractual agreements with the System Integrator. This would include documentation, training and arrangements for future maintenance and software updating.

### 6.4 Licensees

- (1) Licensees would be responsible to provide the controlled NDL data set as a part of their response to the NRC general requirement for provision of emergency facilities. A preliminary specification, Functional Criteria for Emergency Response Facilities (Ref. 6), has been issued for interim use and comment.
- (2) The licensees would be required to program and maintain the required data acquisition system so that data transmission would not be interrupted.
- (3) The licensee would be required to provide space, power and environmental control for the NRC terminal.
- (4) Not more than three licensee organizations would be asked to participate in a lead plant (prototype) program with the System Integrator to verify interface requirements and gain installation information.

### 6.5 Projected Cost and Schedule

On July 10, 1980, the NRC staff presented to the Commission their recommendations for the NDL system including anticipated costs and schedule (Ref. 4). Preliminary cost estimates for one version indicated a total installed system cost would be of the order of 20 million dollars with initial operating capability projected to be achieved in about four years. The four-year schedule would permit integration of the NDL with the other required utility emergency response systems (the onsite technical support center and the nearsite emergency operations facility). This would result in NDL capability being achieved without excessive impact on the operating utilities.

The current plans contemplate completion of the NDL system concept study by the end of FY80. If an early decision is made to proceed with this alternative, lead plant prototype installation could begin in FY82 to verify interface requirements and obtain installation experience. Based on the lead plant evaluations, detailed interface and equipment specifications could be completed in FY82. Contractor(s) would be selected by the competitive process. The hardware and software would be procured and installed by mid-FY84. The NDL system could achieve initial operational capability by the end of FY84.

## 7. REFERENCES

1. U. S. Nuclear Regulatory Commission, "Conceptual and Programmatic Framework for the Proposed Nuclear Data Link," USNRC Report NUREG/CR-1451, April 1980.\*
2. NRC Commission Information Report, SECY-80-35, NRC Operations Center, January 21, 1980.\*\*
3. NRC Commission Information Report, SECY-80-35A, Update on Staff Actions Regarding a Nuclear Data Link, May 13, 1980.\*\*
4. NRC Commission Information Report, SECY-80-326, Nuclear Data Link (NDL), July 10, 1980.\*\*
5. U. S. Nuclear Regulatory Commission, Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled-Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident (Proposed Revision 2, December 1979)." Copies are available from NRC/GPO Sales Program, Washington, D. C. 20555, Attention: Regulatory Guide Account.
6. U. S. Nuclear Regulatory Commission, "Functional Criteria for Emergency Response Facilities", USNRC Report NUREG-0696, July 1980.\*

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\*Available for purchase from GPO Sales Program, U. S. Nuclear Regulatory Commission, Washington, D. C. 20444 and/or National Technical Information Service, Springfield, Virginia 22161.

\*\*Available in NRC Public Document Room for inspection and copying for a fee.