Staff Reports To
The President's Commission On

THE ACCIDENT AT THREE MILE ISLAND

Emergency Preparedness,
Emergency Response

THE PRESIDENT'S COMMISSION ON
THE ACCIDENT AT
THREE MILE ISLAND

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REPORT OF THE
OFFICE OF CHIEF COUNSEL

ON

EMERGENCY PREPAREDNESS

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I. INTRODUCTION

This report examines the principal influences that shaped the emergency planning in place at the time of the TMI accident. The report is divided into two parts. The first part reviews the Nuclear Regulatory Commission's (NRC) requirements on reactor siting and emergency planning, and traces the influence of that regulatory approach in the emergency plan developed by the utility. The second part examines federal, state, and local planning activities in this regulatory climate during the years before the TMI accident.

Reactor siting, discussed in the first part of the report, plays an obvious and critical role in emergency preparedness because the location of a reactor affects the nature and extent of the off-site response required in an emergency. NRC provisions that permit reactors to be built close to population centers or that require consideration of hypothetical accidents without taking into account substantial radiation releases beyond a small zone are examples of siting criteria outlined in the paper that have a direct impact on the context in which emergency planning must be performed. In addition, concepts related to reactor siting, principally that of the low population zone (LPZ), have been applied in administrative proceedings to define geographically the planning obligation of the licensee, an obligation that has been criticized for being too limited to provide an adequate measure of protection for the public.

The regulatory approach to reactor siting has had a direct impact on the NRC's view of the role of off-site emergency planning. There is evidence to suggest that emergency planning has been a low priority function in the NRC and its predecessor, the Atomic Energy Commission (AEC), largely as a result of the agencies' nearly complete confidence in designed reactor safeguards for public protection. Sworn testimony indicates that certain elements within the AEC and NRC have held the view that emphasis on radiological emergency planning would serve only to arouse public concern and to stifle the development of nuclear power. Even if these attitudes are changed, however, the NRC has no authority to require radiological emergency planning by off-site organizations. Moreover, its efforts to assist the states in planning have been completely advisory and, according to some observers, largely ineffective. The NRC could adopt a rule prohibiting the siting of reactors in states that do not have NRC-approved emergency plans, but it has not done so.

The emergency plan developed by Met Ed for TMI-2 is a case study of some aspects of the NRC approach. During the TMI-2 licensing proceedings, the intervenors challenged the sufficiency of emergency planning for the facility and raised issues that foreshadowed deficiencies that became apparent during the accident. For example, the intervenors were prevented from questioning a witness about the sufficiency of emergency planning beyond the state's prescribed 5-mile planning radius -- 3 miles larger than the TMI LPZ -- on the basis of a principle established in other proceedings to the effect that the licensee's planning obligation ends at the perimeter of the LPZ. The NRC's first recommendation to state officials during the accident, however, was that a 10-mile evacuation be undertaken.

The second part of this report examines the radiological emergency planning activities of off-site organizations at all levels of government. Prior to the TMI accident, the NRC regulators approach appears to have contributed to a belief that off-site emergency planning near nuclear power plants was practically unnecessary because of the depth of designed reactor safeguards. In this regulatory climate, a federal response plan developed by other federal agencies has spent years in bureaucratic limbo. The Commonwealth of Pennsylvania civil defense organization did not begin to develop a radiological emergency plan until 1975, even though the Peach Bottom plant and TMI-1 were operational, and the state had had nuclear power plants under construction within its borders for several years prior to that time. Apathetic local officials could not be motivated to participate in radiological emergency planning activities. When an accident finally occurred, the state plan was thought inadequate, county plans were limited, and local plans were nonexistent. All evacuation plans in effect now were either created or substantially expanded during the most critical phase of the accident.

The NRC regulatory approach and the lack of urgency with which various levels of government have conducted planning activities indicates a fundamental problem of attitude that is woven into the fabric of the radiological emergency planning in place at the time of the TMI accident.

II. REACTOR SITING

The reactor siting stage of the NRC licensing process plays a critical role in emergency planning and preparedness. Reactor siting is the process of determining feasible locations for power reactors, and is important both to safe reactor operation and emergency planning. Whether a reactor is built **in** an earthquake or flood-prone area, for example, directly affects its prospects for continued safe operation. Whether it is built near population centers directly affects the feasibility of off-site protective action in the event of an emergency, as well as the extent of the threat to public health an accident might create.

The NRC controls siting decisions for nuclear reactors by criteria set forth in the Code of Federal Regulations, Volume 10, "Part 100." 1/ With respect to locating reactors near populated areas, Part 100 establishes a two-step decision-making procedure. The first step involves mathematical computations of potential fission product releases from proposed reactors. The possible impact of those fission product releases on densely populated areas determines whether the reactor would be too close to those areas. The second step, if necessary, is the review of specific site characteristics.2/

In the first step of the procedure, the NRC assesses the maximum fission product release that would be caused by a major accident. This information, in turn, directly determines the size of the LPZ, which is defined as an area containing "residents, the total number and density of which are such that there is a reasonable probability that appropriate protective measures would be taken in their behalf in the event of a serious accident." 3/ The proximity of the LPZ to "population centers" finally dictates site suitability -- no reactor may be constructed in a location closer to the nearest boundary of any "population center" than a distance equaling 1-1/3 times the LPZ radius. For purposes of the NRC provision, a "population center" is an area with 25,000 or more inhabitants.

The foundation on which this decision-making process is built is the evaluation of the postulated major accident from which a fission product release would result. The NRC has established nine classes of postulated accidents, the review of which is instrumental in establishing performance standards for engineered safety features. 4/ The classes of the accidents are ranked in ascending order according to the seriousness of their potential environmental consequences and probable occurrence rates.5/ Class 1 accidents are based on small system perturbations that result in insignificant health and safety consequences. Class 9 accidents, the most serious group, are characterized by successive system failures more severe than those considered by protective systems designers or safety engineers. The most serious radiation release and adverse health consequences would be expected to result from the occurrence of a Class 9 accident.6/

Class 8 accidents include a spectrum of postulated "loss-of-coolant accidents" (LOCAs), those in which various pipe breaks would, without

replenishment of coolant, result in total or partial interruption of reactor coolant flow to the core. 7/ The NRC analyzes this postulated range of LOCAs as part of its standard review of facility design. 8/ If the analysis of these LOCAs, based on conservative assumptions, 9/ indicates that they would not produce radiological consequences at the proposed LPZ boundary in excess of the substantial Part 100 exposure limits, the proposed LPZ will be accepted.10/

In a Class 9 accident, designed safety systems are presumed to fail. However, the NRC does not use Class 9 accidents, which would result in more substantial radiation releases into the environment than Class 8 LOCAs, as the basis for siting determinations. Nor does it use them for establishing performance standards for reactors, having taken the view that, due to the NRC's "defense in depth" regulatory approach, the likelihood of the occurrence of a Class 9 accident is extremely remote. 11/ The TMI accident, however, has now been classified by the NRC as a Class 9 accident.12/

Because the calculation of the LPZ is based in large part on the designed reactor safeguards, it is possible for an applicant to reduce the size of the zone if its border is too close to a population center. The applicant can do so by supplementing the plant design by adding more reactor safeguards, thereby reducing the design-basis accident's (DBA) postulated fission product release and, in turn, the LPZ itself. 13/ This situation arose concerning the Seabrook, N.H., nuclear plant. The reactor was already under construction when it was objected to as being too near to the recreational shoreline, a "densely populated area" under NRC regulations. Reactor safeguards, however, permitted a reduction of the LPZ sufficient to exclude the shoreline.14/

A fundamental problem in the NRC regulatory approach that affects emergency preparedness is that the LPZ boundary is determined under postulated accident conditions with reference to a standard that permits a substantial dose of radiation to an individual. An applicant is required to determine:

> A low population zone of such size that an individual located at any point on its outer boundary who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage) would not receive a total radiation dose to the whole body in excess of 25 rem or a total radiation dose in excess of 300 rem to the thyroid from iodine exposure.15/

If the postulated fission product release were actually to occur at levels even approaching these doses, it is evident that persons outside the LPZ would be exposed to serious doses of radiation. The effects of a release beyond the LPZ and the preparedness of off-site organizations to cope with those effects should be a central concern of the regulator, but prior to the TMI accident, they clearly were not, as the TMI-2 licensing proceedings, discussed in section IV, demonstrated.

Even with the substantial doses of radiation postulated for determining the LPZ boundary, LPZs generally are relatively small areas. Prior to the accident at Three Mile Island, the NRC staff had adopted the position that "a distance of 3 miles to the outer boundary of the low population zone is usually adequate,"16/ and the NRC regulatory approach to siting reactors has resulted in some LPZs of approximately a mile in radius. 17/ In the case of TMI-2, the LPZ was established at 2 miles. 18/ Since a reactor with an LPZ of 2 miles can be constructed 2-2/3 miles from the "densely populated boundary"19/ of a major population area, TMI-2 is 2.2 miles from Middletown, which is not a major population area, and 10 miles from Harrisburg, which had at the time of siting a population of 68,000. 20/ The estimated population of the 50-mile area immediately surrounding TMI is nearly 2 million. The TMI-2 application predicted that that figure would increase to over 3 million during the 30-year life of the facility. The proximity of reactors to large population centers is not unusual -- 10 million people live within 20 miles of a nuclear reactor. 21/ This regulatory approach has drawn criticism from both within and outside the NRC,22/ and during the TMI accident -- with detected levels of radiation far below those postulated during siting proceedings -- the NRC staff and commissioners recommended that evacuation planning be conducted for areas 10 and 20 miles from the site, perhaps the best indication of the tenuous relationship of the LPZ to realistic emergency planning.

The NRC approach to reactor siting has complicated the problems of planning for and responding to radiological incidents at nuclear power plants. Under this approach, the NRC and the AEC before it have placed reactors in locations where emergency response might be extremely difficult. Commenting on this problem, Robert Ryan, director of the NRC's Office of State Programs, which has responsibilities for emergency planning, described his reaction to the siting of New York's Indian Point nuclear power complex, which has three reactors:

> I think it is insane to have a three-unit reactor on the Hudson River in Westchester County, 40 miles from Times Square, 20 miles from the Bronx. And if you describe that 50-mile circle, as I said before, you've got 21 million people. And that's crazy. I'm sorry. I just don't think that that's the right place to put a nuclear facility.
>
> And it was bad enough to put one in, but subsequently they put another in and then yet another.... [I]t's a nightmare from the point of view of emergency preparedness.23/

It should be noted that the siting regulations disregard post-licensing changes in land use. Even if an area qualifies at the time of licensing as a sparsely populated region in which an evacuation or other protective action could be carried out successfully, there is no guarantee that the area will maintain that character over time. In many cases, population concentrations can increase in areas near reactors to the point that original siting assumptions become invalid. Although the NRC has been aware of this problem, its regulations do not address it.24/

The NRC has recently begun to review its approach through task forces. The NRC Siting Policy Task Force, the first NRC group since 1962 formally to evaluate siting policy,25/ recommended in August 1979 that the LPZ be abandoned in favor of a "fixed emergency planning distance of 10 miles." The emergency planning zone would be one in which "evacuation of persons, including transients, would be feasible if needed to mitigate the consequences of an accident."26/ This proposal is consistent with that of a joint NRC/Environmental Protection Agency (EPA) Task Force on Emergency Planning Report issued in 1978. 27/ The NRC has now endorsed the recommendations of the NRC/EPA Task Force.28/

As a result of the present regulatory approach of the NRC, however, the location of the TMI plant, with its LPZ of 2 miles, was approved without considering the effects of an accident causing a considerable release of radiation beyond the LPZ. That policy has made the possibility of off-site consequences of reactor operation less prominent and has contributed to the development of an attitude visible at all levels of government that radiological emergency planning for off-site consequences was not at all a matter of urgent concern and was not even necessary for areas more than a few miles from the site.29/

III. NRC REQUIREMENTS FOR EMERGENCY PLANNING

Both the AEC and the NRC accorded emergency planning a low priority. One reason for this attitude was their confidence in designed reactor safeguards, reflected in their approach to reactor siting. Another reason, as NRC Commissioner Peter Bradford admitted, was "reluctance to confront the public with high visibility emergency planning in the context of nuclear power. It was uncomfortable." 30/ That this was a concern was also acknowledged by the NRC's assistant director for emergency preparedness in its Office of State Programs:

> There were people in the agency [AEC] who were afraid that if emergency preparedness and planning became too big an issue that it may stymie the development of nuclear power. I think that is a fair statement.31/

The history of emergency preparedness within the AEC and NRC demonstrates the lack of commitment. In 1969, when approximately 20 nuclear power plants were already in operation,32/ only seven AEC employees out of 500 to 600 had any responsibility for emergency planning, 33/ and even those seven did not work exclusively on emergency planning matters. Between 1969 and 1972, they collectively worked "about one to two man years per year" on the subject.34/

Even after the promulgation of 10 CFR Appendix E, the regulation on emergency planning, "emergency planning was not a big piece of business in the AEC." 35/ The commitment increased somewhat after 1972, 36/ although it remained weak. 37/ Immediately prior to the TMI accident, only three full-time professionals and one secretary out of 2,500 NRC employees worked on emergency preparedness matters. 38/ "The emergency preparedness function in the NRC was a backwater and ... was not receiving the time, attention, and resources which were necessary to make it a successful program. 39/ The problem is not only one of resources, however. It is also one of attitude. For example, in response to a May 1978 report by the Citizens for a Better Environment, entitled "Nuclear Power Plant Evacuation Plans," which alleged that radiological emergency response planning was inadequate, Robert Ryan, director of the Office of State Programs for the NRC, while disputing the "sweeping denunciation of our program by CBE," raised a series of emergency preparedness issues for internal resolution by the commission. The memorandum was never answered. According to Ryan, "It disappeared into the sand like a glass of water in the Sahara. It just created not a ripple." 40/ Only since the TMI accident has the NRC proposed a comprehensive review of its regulatory approach to and resource allocations for emergency planning.41/

The lack of commitment evident in NRC's historical approach to emergency planning is manifested in its current regulations. Under Appendix E,42/ construction permit applicants need submit for NRC review only general information regarding emergency planning.43/ Operating license applicants must submit more extensive information,44/ and it is at the operating license review stage that a more detailed examination of emergency planning takes place. Under the regulation, licensee emergency plans must address several matters,45/ but the appendix states only that "plans should contain" those elements and does not specify the

ways in which those matters should be treated.46/ Regulatory Guide 1.101 (1.101), 47/ which was written to provide more detailed guidance on NRC's view of the extent of planning required by Appendix E, has no legal force. According to a recent congressional report, of the 48 sites with operating commercial power reactors, only four have plans that the NRC considers to be in compliance with 1.101. 48/ TMI is not one of the four. 49/ Prior to the accident, the NRC had no plans to require licensees-not in compliance to revise their emergency plans to meet 1.101 standards. One reason given for this decision was the NRC manpower commitment. 50/ Since the accident, however, the NRC's Office of Nuclear Reactor Regulation has determined to bring noncomplying plants into compliance with 1.101 on a "fairly short time fuse."51/

1.101 covers a range of planning by advising licensees to classify potential accidents,52/ "describe" emergency response organizations,53/ "identify" emergency plans and equipment,54/ and provide some "means to insure" maintenance of emergency preparedness. 55/ 1.101 categorizes "emergency measures" by whether the intended effect of the measures is to mitigate on-site or off-site consequences of accidents. For on-site consequences, plans cover several different responsive actions,56/ but for off-site consequences, only three are mentioned:

a. "[A]ctions planned to protect persons in the low population zone and criteria for their implementation";57/

b. "the means and the time required to warn or advise the persons involved, including (1) businesses, property owners, and tenants; (2) schools or recreational facilities; and (3) general public";58/ and

c. regarding control of contaminated foodstuffs, provisions "for preventing or minimizing direct or subsequent ingestion exposure to radioactive materials deposited on the ground or other surfaces . . . ."59/ For off-site areas, these provisions should take the form of "[P]rotective actions planned for the low population zone with provisions for extending such actions to areas further from the site boundary, if necessary . . . . "60/,61/

Although the extent of the off-site planning required of the licensee to satisfy these elements is unspecified, it has been held that the licensee's planning obligation is limited to the LPZ.62/ Limiting the obligation to a zone of only a few miles is an approach consistent with both the NRC's approach to siting and its stated position that the response to the off-site consequences of radiological incidents is primarily the responsibility of state and local governments. 63/ It is an approach, however, that has drawn extensive criticism.64/

The NRC has instituted a program, discussed in detail later in this report, by which it reviews state plans and issues a letter of "concurrence" if the plans contain certain elements. 65/ The program was intended to encourage states to upgrade their emergency plans in accordance with 154 criteria. 66/ From 1974 to 1977, no state plans qualified.67/ In 1977, the NRC reduced the number of planning elements

necessary for concurrence to 70.68/ Since that reduction, 13 states have received NRC concurrences, including two since the accident at TMI.69/ In the judgment of NRC's director of the Office of State Programs, 24 additional states need concurred-in plans.70/

Despite its view that off-site emergency response is the obligation of state and local governments, the NRC does not require as a condition of licensing that state emergency plans receive NRC concurrence or have specific elements. It has been stated that one reason for this policy has been the NRC's concern that, if the policy were adopted, state governors would have a veto, in effect, over nuclear power plant siting by purposely not obtaining NRC concurrence for state plans. 71/ The official reason for this policy -- reflecting the NRC regulatory approach -- was stated by Lee Gossick, the NRC's executive director for operations, in response to criticism from the General Accounting Office (GAO):

> NRC protects public health and safety by giving primary consideration to site characteristics and design features of nuclear facilities. Once we are satisfied that these meet an adequate measure of safety, we evaluate the emergency plans for the facility. From this point of view, State and local emergency plans provide an added margin of protection for the public in the vicinity of a nuclear facility in which we believe that an adequate measure of safety already* exists. The Commission's licensing decision process is structured to take into account a wide variety of standards and criteria in the evaluation of proposed or existing nuclear power plants to the end that substantial conservatisms exist in design and operating safety margins. To the extent that proposed or existing plants fail to meet these standards, NRC would not license them or permit them to continue to operate. In this context, State and local plans, while related to the facilities undergoing the licensing process, and to applicant's emergency plans, are not essential in determining whether the plant can be operated without undue risk to public health and safety. (Emphasis supplied.)72/ (*Emphasis in original.)

Since the accident, Chairman Hendrie has retreated from this statement, saying in hearings before a subcommittee of the House of Representatives that the "assortment of questions" raised by the accident "absolutely" revised that staff position. 73/ Hendrie would not, however, go so far as to recommend that licenses should not be issued in the absence of effective state and local plans, preferring to resolve that issue within the commission at a later time. 74/ Commissioner Richard Kennedy, however, still adheres to the view that state and local plans are not necessary for safe reactor operation. 75/ Nonetheless, in states which do not "move toward" having effective plans, he would consider shutting down plants in the future. 76/ Two other commissioners, Peter Bradford and Victor Gilinsky, feel that licensing should be contingent upon states and localities having "satisfactory emergency plans." 77/ The author of the statement quoted above, Lee Gossick, has testified that his views remain unchanged. Although Gossick acknowledges that off-site communications are necessary, he believes that "a plan for evacuation is perhaps of

marginal value." 78/ Regardless of NBC's resolution of this issue, its long-standing approach to emergency planning unmistakably influenced the emergency planning in place during the TMI accident, a planning process that was shaped at the licensing stage.

IV. THE TMI OPERATING LICENSE REVIEW -- CONTENTION 8

The radiological emergency planning performed by Met Ed and state and local governments for TMI was specifically challenged during the NRC's operating license review process. Met Ed's application proposed an exclusion zone of 2,000 feet,79/ a zone which would reach nei`her bank of the Susquehanna River. The proposed LPZ was 2 miles. 80/ Acceptance of that LPZ by the NRC would result in TMI-2 being located within 10 miles of Harrisburg, Pa. (1970 population 68,000),81/ within 1.5 miles of Goldsboro (1970 population 600), within 2 miles of York Haven (1970 population 700), within 2.5 miles of Royalton (1970 population 1,100) and within 2.2 miles of Middletown-Steelton (1970 population 22,450).82/ The total population within the LPZ was estimated at 4,000.83/

In accordance with established procedure, the NRC staff initially reviewed the TMI-2 emergency plan and, in its safety evaluation report (SER), concluded that the plan satisfied all of the legal requirements of Appendix E.84/ To support that conclusion, the staff cited the plan's compatibility with 1.101, noted that necessary agreements between the utility and off-site organizations had been reached, and further concluded, based on its calculations, that "the time to evacuate any 22-1/2 degree sector out to five miles would vary from three to six hours, with resulting radiation doses which are a small fraction of the siting doses of 10 CFR Part 100."85/ Supplements to the SER did not discuss the emergency plan, indicating that the NRC's Advisory Committee on Reactor Safeguards, which reviewed the SER, had no objections.86/

At the public hearing stage of the licensing procedure, however, when the NRC staff position on the emergency plan was already taken, assertions of plan inadequacy arose. Citizens for a Better Environment (CBE), an environmental group which was not represented by counsel and which did not present direct testimony, raised numerous objections to the proposed license, including Contention 8 on emergency planning:

> The warning and evacuation plans of the Applicants and the Commonwealth of Pennsylvania are inadequate and unworkable. The plans assume that all local and state officials involved are on 24-hour notice and can be contacted immediately. They further assume that all people notified will promptly react and know how to respond and are trained in what to do. They also assume that the public, which has been assured that accidents are "highly unlikely" or "highly improbable," will respond and allow themselves to be evacuated. No operating license should be granted for Unit 2 until emergency and evacuation plans are shown to be workable through live tests.87/

At the hearing before the Atomic Safety and Licensing Board (ASLB), the state and county civil defense agencies and the NRC staff supported the TMI-2 plan. Craig Williamson, deputy director of what is now the Pennsylvania Emergency Management Agency, testified for Met Ed. Williamson outlined Pennsylvania's emergency response structure, the state's Disaster Operations and Assistance Plan, and the state's

expected response in an emergency.88/ The NRC staff also supported the licensee by reiterating its earlier SER approval of the plan.89/ Kevin Molloy, the director of civil defense for Dauphin County, who was aided in the preparation of his testimony by Met Ed lawyers,90/ testified that his emergency organization could successfully contact all necessary persons "within minutes" of the onset of an accident. 91/ He testified further that his organization could evacuate the most populous areas around the plant out to 5 miles in a period of less than 7 hours.92/

During the proceedings, state and Met Ed lawyers had not objected to questions about planning beyond the LPZ so long as the area discussed was within the 5-mile emergency planning zone the state required of civil defense organizations. 93/ When Molloy was pressed by the intervenors about whether he could promise effective evacuation in. areas beyond 5 miles from the site, however, the lawyers for both Pennsylvania and Met Ed objected to the line of questioning on the basis that nowhere was it apparent that an evacuation beyond 5 miles might ever be necessary. Citing a decision of the Atomic Licensing and Appeal Board (ALAB) in a previous case, Met Ed lawyers further maintained that any such discussion went beyond the "confines" of the hearing. The board sustained the objections, thus precluding any inquiry into the state of emergency preparedness beyond the 5-mile radius.94/

At the conclusion of the proceedings, the ASLB dismissed the intervenor's objections:

> [W]e find that the record supports the conclusion that Contention 8, in its entirety, is without merit, and that the Staff has properly assessed the adequacy and workability of the emergency response. We also find the emergency and evacuation plans to be both adequate and workable.95/

Six months later, the ALAB affirmed. 96/ Relying heavily on the opinion evidence entered in the lower proceedings, the ALAB rejected all of the intervenors' arguments. It dismissed the intervenors' contention that "live tests and drills" should be held regularly (to ensure continued plan workability) on the basis of Molloy's testimony that such tests could be "counter-productive." 97/ Again relying on Molloy, it dismissed the notion that local officials might be unable to respond adequately to a nuclear emergency because of their lack of specialized knowledge about radiation, holding that the lack of detailed knowledge of why evacuation might be necessary presents no bar to executing an evacuation successfully. It dismissed as unfounded the intervenors' argument that sufficient numbers of emergency response personnel might be unavailable on occasion to assist the public.98/

On the question of considering feasibility of evacuation beyond the 5-mile emergency planning zone required by the state, the board said:

> It is true that, for reasons which need not be discussed here, the applicants and the staff nevertheless looked into the possible need for protective measures within a five mile radius of the reactor -- and the intervenors were permitted to cross-examine on the evidence

presented in this regard. It scarcely follows from this fact, however that the question of emergency planning at still greater distances from the LPZ boundary had to be explored at the intervenors' instance.99/

V. TMI PLAN AND PROCEDURES

Against this regulatory backdrop, the "Three Mile Island Emergency Plan" was written and approved. At first, the plan seems imposing, comprising two volumes and hundreds of pages. In fact, however, section 2 of the TMI plan, designated the "site emergency plan," which comprises only 26 pages of text, is the only document reviewed by the NRC for compliance with the requirements of Appendix E and 1.101. The remainder of the first volume of the plan sets forth introductory information (section 1), "letters of agreement" with government authorities (section 3), a copy of the TMI Annex to the Pennsylvania Plan (section 4), and the important site emergency plan implementing procedures (section 5). Volume 2 is primarily devoted to nonradiological emergencies.

A. THE SITE EMERGENCY PLAN

The site emergency plan is divided into seven major parts. The first, "Emergency Conditions," outlines criteria for determining which types of accidents constitute "emergencies." It classifies emergencies into three categories: local or personnel emergencies (on-site accidents involving one or more persons and protective evacuation of one or more buildings, but causing no off-site consequences), site emergencies (incidents which could result in uncontrolled radiation releases off-site), and general emergencies (incidents with a potential for serious radiological consequences to the health and safety of the general public). The plan supplements each classification with "conditions," descriptions of events and on-site and off-site "action" which those events might necessitate.100/

With respect to "emergency measures," 101/ the plan clearly reflects the NRC planning standards for which it was drawn. In accordance with 1.101, "emergency measures" focus predominantly on on-site crisis management, including means for declaring emergencies,102/ designation of channels of notification, 103/ minimal acci1ent assessment actions, 104/ and aid to affected personnel. 105/ In line with 1.101, requirements for off-site emergency response by the licensee are limited to notification of off-site organizations. Section 4.1.4 requires Met Ed to notify either the Pennsylvania Emergency Management Agency (PEMA) or the state Bureau of Radiation Protection (BRP) if a site or general emergency occurs. 106/ Section 4.3.2, governing notification, states:

> Metropolitan Edison is responsible for prompt notification of appropriate Pennsylvania state authorities if a TMI accident is causing or threatening to cause significant off-site exposure as defined in Reference 6. The State of Pennsylvania, Bureau of Radiological Health [now BRP], is responsible for the management of all off-site aspects of a radiation emergency and the Pennsylvania State Council of Civil Defense [now PEMA] is responsible for carrying out the required protective actions.

The plan permits the licensee to exercise discretion in choosing the agency to be notified. Section 4.1.4 permits emergency notification of either PEMA or BRP. This lack of precision may have contributed to confusion on Friday morning, the third day of the accident, when the

Met Ed shift supervisor called PEMA to inform it of a planned radiation release. That conversation and another following shortly thereafter generated a great deal of confusion concerning the need for evacuation. Had the supervisor called BRP, it is possible that the misunderstandings would not have occurred. Both PEMA and BRP officials agreed that BRP, not PEMA, should have been called.107/

The plan also identifies emergency facilities. 108/ For TMI-2, the plan designated an emergency control center (the TMI-2 control room), an on-site emergency control station (located in the 306-foot elevation of the TMI-1 control building), 109/ and an off-site emergency control station (the TMI observation center). 110/ All of these facilities were used extensively during the accident. 111/ The plan requires Met Ed to have available communications 112/ and accident assessment equipment.113/ During the accident, however, equipment available for communication with off-site organizations was inadequate.

At section 6, the plan also covers training of employees for emergency response. The section calls for a one-day, annual "General Training Program" for the TMI staff to review the plan's provisions.114/ "Off-site agencies with emergency responsibilities" may attend115/ and include PEMA, the Dauphin, York, and Lancaster counties civil defense offices, the BRP, state police, local fire companies, and local hospital radiation emergency personnel.116/

The plan also requires periodic drills. 117/ At TMI, health physics and training groups normally develop drill schedules, scenarios, and participant lists, with the objective of including every shift in at least one annual 2-to-4 hour drill.118/ Drills by design have no impact on normal plant operations. 119/ Off-site agencies, including PEMA, BRP, and county civil defense organizations, are asked to participate in drills and to observe them from the control room.120/ Whether this observation is meaningful is open to question. Kevin Molloy of Dauphin County recalled attending some drills:

> And when they conducted their yearly drills, [we] would be invited down, to come observe which procedures they followed, things of that nature, which was impressive. Although, we didn't quite know what they were doing, to be quite honest.121/

Two or three NRC inspectors normally observe licensee drills. Their major interests are the functioning of the control room and emergency control center, the flow of information, and the adequacy of accident assessment, and the general coordination of emergency response. 122/ Although they participate in post-drill critiques, NRC inspectors need not and sometimes do not put their observations into writing for a permanent record. 123/ An NRC inspector assigned to TMI was asked how he could recall emergency response deficiencies from one year to the next without some written record, and he responded, "I guess I have a good memory."124/

The part of the plan that announces Met Ed's "agreements" for coordinating emergency response125/ is of particular interest. Section 8 provides:

> Written agreements have been reached with local, state, and federal agencies and private medical facilities with regard to the type of support to be provided to the TMI Nuclear Station in the event of an emergency. The written agreements ensure that there is a clear understanding of assigned responsibilities and that there will be proper coordination of activities in the event of an emergency. (Emphasis supplied.)

In fact, however, these "written agreements" are often only form letters addressed to the licensee. In the letters, off-site organizations merely acknowledge their statutory roles in emergency response. Typical is the "letter of agreement" of the United States Coast Guard, which provides in part:

> This is to advise you that, upon notification by the Station Superintendent or his designee of an emergency situation involving a disaster which has occurred or is impending at Three Mile Island Generating Station, the Coast Guard will provide its traditional response.126/

The letter from Dauphin County's Office of Civil Defense, which is identical to letters from other county emergency organizations, provides in full as follows:

> This is to advise you that, upon notification by the Station Superintendent or his designee of an emergency situation existing at the Three Mile Island Nuclear Station, our Civil Defense Unit will provide assistance as available.127/

Similarly, the "written agreement" from PEMA simply cites the Pennsylvania Disaster Operations Plan and informs Met Ed that it can expect support from the county level.128/ The same kind of letter is obtained from the regional DOE Radiological Assistance Office. As an NRC staff member made clear, there is little substance behind these NRC-required arrangements:

> QUESTION: I'm just interested in what the precise off-site response capability has to be in order for you to decide that a utility plant [sic: plan] is adequate.
>
> ANSWER: They must be able to show that there is a law enforcement agency in existence. That there is a state agency in existence which has the prime contact and the prime responsibility and authority, or at least accepts the responsibility for doing certain things. Okay?
>
> They also must make an agreement with the federal inter-agency radiological assistance plan by DOE.
>
> QUESTION: Make an agreement with the plan?
>
> ANSWER: With the local, regional Department of Energy office for federal aid in emergency.

QUESTION: What does that agreement say?

ANSWER: It must -- simply at the federal one, it's a pro forma letter that they get from DOE, and that's all it is.

[I]t goes back, as I said, to findings that were made a long time ago, from a legal standpoint, which none of the staff here has ever really questioned, we have never questioned, which has to do with what is reasonable to impose on an applicant for a licensee as far as the worst accident, there is a scoping accident that has to be encompassed in his plan to give him a license, as compared to what the rest of the world may do anyway. And the scoping accident has been the Part 100 accidents. And the Part 100 accident, you aren't going to have bodies because as long as that containment is there, you have all the time in the world to do things.129/

B. THE IMPLEMENTING PROCEDURES

The site emergency plan implementing procedures, found at section 5 of the TMI Emergency Plan, are unlike the plan they implement in several respects. First, they are detailed. They specify with some care the precise responsibilities of various licensee employees during radiological emergencies. Thus, they, and not the site emergency plan, are the key to a licensee's emergency preparedness. 130/ Second, the procedures are kept up to date. There is no similar requirement that the TMI site emergency plan be modified to reflect current facility operation. Third, because implementation of procedures is required by the operating license itself, compliance with the procedures is enforceable. The site emergency plan imposes only requirements to plan.131/ The NRC has no regulations specifying the content of the procedures.

In the past, Region I of NRC has reviewed the TMI procedures as part of its facility inspection program. The Region I emergency planning officer inspects emergency preparedness on an average of once each year. The number of inspections varies depending on staff availability and past licensee performance.132/ An average inspection takes approximately 20 to 22 hours.133/

The TMI procedures, divided into 13 parts,134/ begin by outlining responses for local, site, and general emergencies. Local emergencies, relatively minor occurrences without off-site complications, do not require notification of off-site organizations.135/ Site and general emergency procedures, however, require notification of civil defense authorities "... (within five minutes if practical) after determination of the emergency," 136/ as well as employment of on-site and off-site radiation monitoring teams,137/ and evacuation, if necessary, of all nonessential personnel.138/

With respect to Met Ed's responsibilities to evacuate the general public, the procedures reflect the approach of the plan by describing the responsibilities of off-site agencies to evacuate people from the low population zone:

4.0 Evacuation of General Population from the Low Population Zone

4.1 If data reported by the Emergency Off-site Monitoring team exceeds Radiation Protection Guides recommended by the Commonwealth of Pennsylvania, evacuation of the general population will be initiated. These guides are listed in Section 4 of the Three Mile Island Plan.

4.2 The Commonwealth of Pennsylvania has the ultimate responsibility for evacuation, provided the appropriate department within the Commonwealth (Bureau of Radiological Health) can be contacted at the time and the situation permits. If the situation requires immediate protective action for the local population, Met Ed will recommend to the County Civil Defense, to initiate the evacuation of the affected area.

4.3 If the decision is made to evacuate the section of the LPZ in the downwind direction, each resident of the affected area will be notified and instructed to report to specified Civil Defense shelters. It may be necessary for the State Police to erect certain road blocks at roadways.

4.4 The U. S. Coast Guard will be responsible for notifying swimmers and small craft in areas adjacent to the site to evacuate. The Coast Guard will be notified by the Civil Defense.

The evacuation of people from an area larger than the 2-mile TMI LPZ is not contemplated by either the plan or the procedures-139/ Protective action for the off-site consequences of a radiological incident is the responsibility of state and federal organizations.

VI. RADIOLOGICAL EMERGENCY PLANNING ACTIVITIES OF FEDERAL GOVERNMENT AGENCIES PRIOR TO THE TMI ACCIDENT

The responsibility to plan for and respond to the off-site consequences of radiological accidents at NRC-licensed facilities rests with various federal, state, and local organizations. The evidence suggests, however, that these organizations have not conducted planning activities with a sense of urgency.

At the time of the TMI accident, federal efforts in radiological emergency preparedness had focused on planning the response of federal agencies to peacetime radiological incidents and assisting state and local governments in their own planning. This section examines the federal efforts in the light of the accident.

A. FEDERAL RESPONSE PLANS AS OF MARCH 28, 1979

On March 28, 1979, two formal federal interagency programs had been created to develop radiological emergency plans for federal agencies. The older of the two resulted in the Interagency Radiological Assistance Plan (IRAP) to provide technical federal assistance, principally radiological monitoring and communication capabilities, during a peacetime nuclear incident. 140/ The more recent effort was the Federal Response Plan for Peacetime Nuclear Emergencies (FRPPNE) which concentrates on the development of operational emergency response plans to protect the public health and safety.141/ Although IRAP signatory agencies provided indispensable technical monitoring assistance, much of this support was rendered on an ad hoc basis outside the formal structure of the plan. At the time of the accident, FRPPNE was still being developed.

1. Interagency Radiological Assistance Plan (IRAP): Department of Energy

IRAP was developed in 1961. At that time no federal agency had responsibility to plan or coordinate the federal response to a peacetime radiological incident. The preamble to the revised 1978 version of IRAP states the purpose of the plan:

> The Interagency Radiological Assistance Plan (TRAP) was developed in 1961 by an interagency committee of Federal agency representatives as a means for providing rapid and effective radiological assistance in the event of a peacetime radiological incident. The TRAP provides a means whereby the participating Federal agencies may coordinate their radiological emergency related activities with those of state and local health, police, fire, and civil defense agencies.

The preamble emphasizes that the plan is designed to coordinate and provide for the effective performance of the functions of the various federal, state, and local agencies, and not to supersede those functions.

In short, IRAP coordinates agency functions; it does not create new ones. TRAP should not be confused with RAP, the DOE Radiological Assistance Program. RAP is a long-standing program which originated in the AEC and, after the reorganizations in the executive branch of 1975 and 1978, is now administered by DOE. RAP is primarily a program through the national laboratories to offer states and nuclear facilities assistance during radiological emergencies. When operating under RAP, DOE team members offer advice, monitor radiation levels, and otherwise assist as necessary.

IRAP designates the Department of Energy, successor to both the Atomic Energy Commission and the Energy Research and Development Administration (ERDA), as the lead agency under the plan. As lead agency, it has sole responsibility for implementing the plan and coordinating the personnel and resources of the 13 federal agencies that may assist the state government in the response to a peacetime radiological incident. 142/ In 1975, when the AEC was reorganized into the NRC and ERDA, it became unclear which responsibilities fell to ERDA and which to NRC.143/ The agencies discussed the problem and finally spelled out their responsibilities in the 1977 "Agreement between the U.S. Energy Research and Development Administration and the U.S. Nuclear Regulatory Commission for Planning, Preparedness and Response to Emergencies." This agreement accepts IRAP as the vehicle by which the NRC may obtain the support of ERDA's (DOE's) resources in an event involving an NRC licensee, but it does not specify whether NRC or ERDA (DOE) has responsibility for implementing TRAP in the event of an incident.144/

The TMI accident was the first test of IRAP in a response to a significant incident at an NRC-licensed nuclear power plant.145/ NRC Chairman Hendrie stated in testimony before a Congressional subcommittee that TRAP "worked fairly well" during the accident,146/ but after the notification phase, the extent to which IRAP actually influenced the actions of some of the signatory agencies is unclear. For example, IRAP explictly assigns the lead agency role to DOE, but the DOE on-site coordinator has stated that he was uncertain whether the NRC, as the federal agency with exclusive regulatory responsibility for the licensee, would assume DOE's assigned responsibility. 147/ Despite this uncertainty, DOE officials determined on Wednesday that it would be unnecessary to request assistance from other federal agencies with assigned responsibilities under IRAP.148/ When the accident became more serious on Friday, however, high-level officials in EPA and HEW, both TRAP signatories, set into action an ad hoc response. 149/ These officials generally were unaware of IRAP's existence,150/ as were White House officials who coordinated an interagency task force.151/ After the crisis period of the accident had passed, HEW and EPA officials, still unaware of IRAP, learned that DOE had become the lead agency for the collation and dissemination of environmental monitoring data. Believing that a conflict of interest existed in DOE's dual role as an agency responsible for the development of nuclear technology and as lead agency at the site in the collation of data, these officials requested the White House to shift lead agency responsibility to the EPA for long-term environmental monitoring.152/

2. **Federal Response Plan For Peacetime Nuclear Emergencies (FRPPNE): Federal Preparedness Agency**

The other federal response plan existing at the time of the TMI accident was the "Federal Response Plan for Peacetime Nuclear Emergencies" (FRPPNE). Developed by the Federal Preparedness Agency (FPA),153/ FRPPNE sets out four categories of nuclear incidents 154/ and assigns to specific federal agencies responsibilities for developing response plans for each category. Therefore, FRPPNE is not a plan outlining specific responses to nuclear incidents; it is a process by which responsibility for planning is assigned to particular federal agencies and by which coordination and publication of completed plans are accomplished.155/ This process had not been completed by the time of the TMI accident.

Development of FRPPNE began in 1974, as a result of FPA's belief that existing radiological response plans did not adequately cover the full range of possible peacetime nuclear incidents. Although TRAP was in effect in 1974, FPA determined that TRAP did not address the full spectrum of problems that could occur in the event of a peacetime nuclear incident. 156/ FPA officials believed that the response detailed under TRAP was only adequate for FRPPNE Category 1 incidents. 157/ Moreover, while the Disaster Relief Act of 1974 required the Federal Disaster Assistance Administration (FDAA), the agency responsible for administering that act, to provide assistance to state and local governments in responding to disasters, that assistance could be provided only upon request by a state governor and upon subsequent declaration by the President that a major disaster existed. 158/ FPA believed that a broad range of catastrophic radiological incidents could occur under circumstances in which a response by other federal agencies would be needed, in addition to that provided by the Disaster Relief Act. In that event, the President would want to utilize the full capabilities of all appropriate departments and agencies. 159/ Thus, FPA officials believed that neither TRAP nor FDAA's authority under a Presidential declaration was adequate to deal with the broad spectrum of possible emergencies resulting from nuclear accidents.

In 1974, FPA began distributing drafts of FRPPNE to 32 federal departments and agencies for review and concurrence. Under FRPPNE, it was proposed that FDAA be assigned responsibility for developing a coordinated federal plan in response to a Category 3 event. By December 1976, all agencies had concurred on the proposal except FDAA. Beginning in 1974, FDAA objected to FRPPNE on two grounds. First, FDAA maintained that FPA was acting beyond its authority because certain executive orders were interpreted by FDAA as limiting FPA planning authority to emergencies affecting national defense or national security. Second, FDAA believed that the Disaster Relief Act of 1974 had already assigned to FDAA the authority to plan for all kinds of disasters. 160/ FPA, in response to FDAA's objections, recognized FDAA's authority for disaster assistance but only in the event that the Disaster Relief Act was implemented by a Presidential declaration. FPA pointed out that FRPPNE was intended to cover nuclear incidents where a federal response in addition to that provided by the Disaster Relief Act might be appropriate.161/

Moreover, FPA maintained that it was not limited to planning only for nuclear incidents affecting national security or defense. 162/ This disagreement precipitated a series of delays in the development of plans under FRPPNE that continued for the next 5 years. No plans under FRPPNE were available for the TMI accident.163/

In December 1976, FPA issued an interim report that incorporated language changes believed to resolve FDAA's objections,164/ but the report was not acceptable to FDAA.165/ FDAA's responsibilities under the plan were limited to Category 3 incidents, and since FDAA's non-concurrence was the only remaining obstacle to finalizing the FRPPNE program, FPA issued "FRPPNE Interim Guidance" in April 1977, so that the other FRPPNE agencies could begin planning for Category 1, 2, and 4 incidents. 166/ The TMI accident, according to an FPA official, would have been a Category 3 incident if it had worsened.167/

In summer 1977, FPA and FDAA staff finally reached agreement.168/ On September 26, 1977, Donald Carbone, the FDAA staff representative, forwarded the agreed language changes along with his recommendation for concurrence to the Department of Housing and Urban Development (HUD), FDAA's parent agency, for final approval. HUD responded approximately one year later in early fall 1978. It requested that Carbone resubmit the September 1977, memorandum. The reason given for the request was that HUD had lost the memorandum.169/ The memorandum was resubmitted and on October 31, 1978, HUD sent a letter to FPA stating that HUD would concur in FRPPNE, provided the agreed language changes were incorporated into the plan.170/

Between September 1977 and spring 1979 -- even after HUD sent its letter -- FPA continually called FDAA and HUD to determine the status of HUD's position on FRPPNE, but received no definitive statement on the progress of the review. 171/ During spring 1979, James Thomas of FPA called Carbone inquiring about the status. He was informed that HUD's concurrence had been forwarded to FPA in October 1978.172/ It appears that HUD's letter had been misdirected within FPA to a person who had moved to another position. 173/ The two agencies, having finally achieved the concurrence sought in 1974, were in a position to begin planning under FRPPNE for Category 3 incidents.

At the time of the TMI accident, FRPPNE had yet to be published, 174/ and the lack of coordination between the two agencies continued during the accident itself. Thomas of FPA planned to convene a meeting of federal agencies during the accident in part because FDAA had never prepared a Category 3 incident plan.175/ Carbone of FDAA, on the other hand, has testified that even had FRPPNE been finalized, FDAA did not intend to develop any Category 3 plans since the procedures "would be the ones that we would normally be carrying out in implementation of the Disaster Relief Act, any kind of a disaster, nuclear or otherwise." 176/ Ironically, the two agencies have now been combined with the Defense Civil Preparedness Agency into one agency, the Federal Emergency Management Agency.

B. FEDERAL PROGRAMS PROVIDING ASSISTANCE TO THE STATES FOR RADIOLOGICAL EMERGENCY RESPONSE PLANNING

Federal emergency management agencies acknowledge that primary responsibility for planning for and responding to an incident at a fixed nuclear facility rested with the state and local governments. Recognizing this basic principle of emergency preparedness, FPA published, in 1975, a Federal Register notice that outlined a federal interagency effort established in 1973 to assist state and local governments in radiological emergency response planning. 177/ No federal agency had authority to require state and local planning, and the FPA program was designed to "encourage" states to develop plans.178/ The prefatory language in the 1975 Federal Register notice stressed the "exceedingly low probability of incidents involving radioactive materials in fixed nuclear facilities." State participation in the program is completely voluntary.179/

The program assigns NRC the responsibility as lead federal agency to coordinate the efforts of this interagency group, to develop guidance for the state and local governments for the preparation of radiological emergency plans, and to review and "concur" in state plans.180/ Prior to taking on responsibility as lead agency of this federal interagency group in 1973, NRC had no formal program to guide state and local governments in the development of radiological response plans.181/

As lead agency, the NRC has established the following three committees:

- The Federal Interagency Central Coordinating Committee (FICCC), comprised of senior level personnel of all participating agencies, is responsible for establishing policy for the interagency group.182/

- The Headquarters Advisory Committee (HAC), an FICCC subcommittee, is responsible for expediting each member agency's assistance to the states at the regional level.

- The Regional Advisory Committee (RAC), comprised of regional office personnel of the member agencies, is responsible for assisting states in developing radiological response plans and for reviewing state plans submitted to FICCC for approval.183/

Under this program, the NRC established and published guidelines to both federal agencies and state governments for the preparation of radiological emlergency response plans.184/ These guidelines are also used by the RACs in determining the adequacy of state plans submitted for review. Upon finding that a plan meets the standards established in the NRC guidelines, the RAC recommends approval to the headquarters advisory committee. NRC then makes a final review of the plan and "concurs" in it if the plan meets the specifications set out in the NRC guidelines.185/

In 1975, Pennsylvania submitted draft emergency planning documents to the NRC for review under this program. Approximately one month later, NRC responded that the materials fell short of the standards

established in the NRC guidelines, and "encouraged" the state to develop its plan further. 186/ Over a year and a half later, the RAC members held an informal meeting with the state to discuss emergency planning, but Pennsylvania officials were more interested in talking about other things. Collins of the NRC stated, "I think they had questions on the Price-Anderson Act and a lot of things which were of interest to them.... I don't think a heck of a lot came out of that meeting." 187/ Pennsylvania submitted no other emergency planning documents to the RAC or NRC.188/

As Collins testified, the NRC had dedicated a very small staff to assisting the states in off-site emergency planning, and therefore, chose to concentrate its efforts elsewhere. 189/ Once the NRC concluded that Pennsylvania officials had little interest in developing a plan under this program, "we took our business elsewhere because we couldn't afford to sit around and work with people who at that time didn't seem to be showing a great deal of interest. We had to go where the action was."190/ At the time of the TMI accident, Pennsylvania had not formally submitted its radiological response plan to the RAC for review, and, therefore, had not received NRC concurrence. 191/ Pennsylvania is not the only state that has declined to participate in this cooperative program. Prior to the TMI accident, 25 states had operating commercial nuclear power plants. Of these 25 states, 11 had radiological emergency plans in which the NRC had concurred.192/

Federal and state officials recognize that the operational history of the interagency planning assistance program indicates the program has been ineffective. 193/ A major contributing factor has been the reluctance of both the federal and state governments to incur the costs and to commit the staff and resources necessary to develop radiological response plans under the program. 194/ The FICCC program provides only technical assistance to the states for developing plans -- no financial assistance is available:195/

> ... some of the states and local governments feel that they don't have the resources to do this kind of planning. And they are looking for financial assistance and they don't have the proper staffs and this kind of thing. That has been one excuse that has been trotted out for not following the guidelines.196/

In addition, it has been charged that some states have intentionally delayed development of radiological plans for the purpose of pressuring state legislatures to allocate funds for emergency planning. Harold Collins, the NRC's Office of State Programs assistant director for emergency programs, stated:

> I have had state officials that confessed that to me, told me outright that the reason they were doing nothing or proceeding along at such a pace that would barely keep them doing in emergency planning in this area was precisely that, that they were hoping against hope that something would happen and they would get money or funds or stimulate their legislators to give them the wherewithal to do this kind of planning.197/

John McConnell, assistant director of DCPA,198/ a signatory agency to the FICCC program, testified, however, that the member federal agencies must share responsibility for the disappointing performance of the program. McConnell explained that the participating agencies have not allocated enough time or resources to the states for active assistance in the preparation of radiological response plans. "I'm afraid that we depended too much upon advice and not enough on actually helping states to do their planning job."199/ Throughout FICCC's operational history, DCPA has recommended to the chairman of FICCC that the other agencies make a greater effort and that more specific guidance be given to the states. The situation has not significantly improved and the lack of momentum is attributable in part to the AEC-NRC regulatory approach. 200/ DCPA's McConnell has stated that federal agencies were hesitant to become involved in this effort because they believed that a radiological incident was unlikely:

> ... there is a reticence in most federal agencies to dedicate people, staff, and funds to emergency preparedness for things they do not believe are very likely to happen.
>
> Also, the states are just as responsible and just as reticent to spend time and staff on emergency preparedness and they need situations to occur like Three Mile Island to bring this to their attention.201/

In 1977, the NRC established an interorganizational committee, comprised of members of three major national organizations concerned with state radiological emergency preparedness, to advise the NRC on the efficacy of federal programs providing assistance to the states in radiological emergency response planning and preparedness. 202/ In March 1978 the committee reported to the NRC that it had reviewed the FICCC program and found it to be ineffective.203/ The committee also stated:

> The issue of the need for dynamic, viable emergency plans for peacetime nuclear emergencies is of such significance that the best efforts of the total available resources from all appropriate and responsible local, state, and federal governments must be fully utilized in the development of such plans.204/

The committee made several recommendations to the NRC that it believed essential to the improvement of the FICCC program. 205/ The NRC, in turn, met with members of the committee and indicated its unhappiness with the committee's criticism of the concurrence program:

> The NRC had -- I think they had hoped, perhaps that we wouldn't be quite so outspoken on their policies and procedures as we have been. It has caused them some problems -- some conflict of what we're saying and what they want to do. I think they've been a little disturbed at times that we were maybe a little more aggressive than they had thought we would be.

> ....the information that came back to us was that they [NRC] were talking about how and why we felt the way we did about concurrence, and NRC made numerous comments that they were not too happy with what we were saying. They didn't agree with us, and then that has gone on for some time.206/

Despite this and other criticisms,207/ the NRC staff in December 1978 responded to a GAO report criticizing the NRC approach to emergency planning by adhering to the traditional AEC-NRC position that off-site planning merely adds a margin of safety to a system that is already safe enough. 208/ That position represents an attitude toward off-site emergency planning that appears to have affected the planning activities of state, county, and local organizations in Pennsylvania prior to the TMI accident.

VII. RADIOLOGICAL EMERGENCY PLANNING ACTIVITIES IN PENNSYLVANIA

A. ANNEX E TO THE PENNSYLVANIA DISASTER OPERATIONS PLAN

At the time of the TMI accident, Pennsylvania had a radiological response plan entitled "Annex E, Nuclear Incidents (Fixed Facilities)," which was part of the general emergency plan for the state.209/ This plan was initially published in 1977 by the State Council of Civil Defense, now the Pennsylvania Emergency Management Agency (PEMA),210/ the state's emergency management agency,211/ and was updated later in 1977, and again in 1978. Although there were operating nuclear power plants in the state prior to 1977,212/ no radiological emergency response plan had been developed prior to that time.

The original version and both updates of Annex E were funded through Pennsylvania's participation in a federal grant program. The Disaster Relief Act of 1974 authorized appropriations of $250,000 to each state for the development of plans, programs, and capabilities for disaster preparedness and prevention. 213/ In addition, annual grants of up to $25,000 could be awarded to each state to cover 50 percent of the cost of improving, maintaining, and updating state disaster plans.214/ This program, administered by the FDAA, focused primarily on general emergency planning, although a state could allocate a portion of this funding to develop "special contingency planning," including radiological emergency response plans for fixed nuclear facilities.215/ Development of radiological plans was considered collateral to the main thrust of this program; the FDAA review process did not include evaluation of the substantive quality of the radiological emergency plans developed under the program. This approach appears to have affected the development of Pennsylvania's Annex E.

According to Donald Carbone, the FDAA official responsible for overseeing the grant program, Pennsylvania submitted an application on January 22, 1975. This application provided that, in addition to improving and updating its general emergency operations plan,216/ Pennsylvania proposed to develop a plan:

> To meet potential problems arising from possible accidents at nuclear power facilities (three major plants are currently in operation within the State, with others under construction), a new section, setting forth the over-all policies, practices and procedures to be followed in the conduct of emergency operations associated with such accidents will be added to the plan. In addition, three separate supplements to the plan will be prepared. The latter will prescribe the details of emergency actions and operations within the immediate vicinity of each particular facility currently in operation. . . 217/

When the Pennsylvania grant application was accepted by FDAA, the State Council of Civil Defense (now PEMA) contracted with an independent research firm for development of the emergency operations plan.218/ In its first quarterly Performance Report on the development of its plan,

submitted to FDAA for the period covering February 20 through March 31, 1975, the Pennsylvania director of Civil Defense reported that he, with the chief of the Bureau of Radiological Health, now the Bureau of Radiation Protection of the Department of Environmental Resources, and the contractors retained by the state for the development of the plan, had agreed that active participation on the part of technical representatives of the operators of the three nuclear plants within the state "would be not only proper, but also essential to the development of sound, fully coordinated and effective plans. . .." An initial joint meeting of the state's and utilities' representatives was scheduled for April 16, 1975.219/ In its second Performance Report, Pennsylvania indicated that the April 16, 1975, meeting led to assurances of cooperation in future planning activities by representatives of the three nuclear plants. The state agencies also agreed to incorporate into their plan an accident classification system developed by the State Council of Civil Defense. 220/ Information provided to the President's Commission by FDAA indicates that no quarterly report filed by Pennsylvania between January 1975 and February 1977 mentioned the state's progress in developing a radiological response plan-221/

When Oran Henderson was appointed director of the State Civil Defense Council in August 1976 he reviewed the emergency operations plan prepared by the independent contractors and found it unacceptable. 222/ He directed his staff to prepare a "family of plans," a basic plan and a series of annexes, to cover the various types of disasters to which Pennsylvania is susceptible.223/

Pennsylvania submitted its final disaster operations plan for review to FDAA, Region III, on July 12, 1977, and it was reviewed by both the regional and national office of FDAA. The plan was accepted on February 7, 1977.224/ Although both the FDAA national and regional office made general comments about the plan, they said nothing specific about Annex E, the radiological emergency component.225/

Carbone testified during his deposition that the formal review process of emergency plans prepared under this grant program is limited to a "contractual review" -- whether there has been compliance with the terms of the grant work plan. The content and quality of the plans are not a concern in the formal review process: "It's not a judgmental or an evaluative review."226/ As an informal matter, and at the discretion of the regional office involved, the regional office may offer the state advice as to the adequacy, quality or efficacy of a plan, but this advice is not a function of the grant management program. 227/ Carbone testified that FDAA Region III's approach when Pennsylvania submitted Annex E was to conduct only a contractual review:

> I think their viewpoint was pretty much as I just suggested, that their review of it was in terms of what was supposed to be in the work plan. During the life of that particular program in the state, there were changes in our region, in the leadership of our region, . . . and also, more significantly I think, changes in the management of the program but at a state level.

> That probably had a greater bearing on what happened in the development of the state plan in Pennsylvania. . .228/

Pennsylvania also participated in the annual grant program, presently called the Improvement Grant Program, which is sponsored by FDAA, and provides $25,000 to each state for emergency planning. According to the deputy regional director of FDAA, Region III, Pennsylvania's "first task which was accomplished under this grant was to update Annex E, 'Nuclear Incidents,' to the Commonwealth Disaster Operations Plan."229/ In its first Quarterly Performance Report under the Improvement Grant Program, for the period ending March 31, 1978, Pennsylvania reported:

> Annex E, 'Nuclear Incidents' to the Commonwealth Disaster Operations Plan has been rewritten. It has been expanded to the degree necessary to fill the need for a state fixed facility nuclear plan. It is now ready for editing and coordination.230/

Carbone testified that the changes made to the October 1977 version of Annex E were only "a minor revision, just to make a technical change, I believe, as I recall to add one additional reference agency." 231/ In August 1978 Pennsylvania made other changes to Annex E, which was then printed and distributed. 232/ The August 1978 version of Annex E was in place at the time of the TMI accident. A detailed description of Annex E is attached as Appendix 4.

The process for developing a radiological emergency plan satisfactory to state authorities had continued for nearly 3 years, despite the operation of nuclear power plants in the state before and during that period. John McConnell, a DCPA official assigned by the White House to assist in planning activities during the accident, reviewed Pennsylvania's Annex E at the time of the accident and found it to be "very inadequate, very brief and without substance."233/

B. BRP PLANS

Annex E provides that the technical aspects of planning for and responding to nuclear incidents in Pennsylvania are the responsibility of the BRP of the Pennsylvania Department of Environmental Resources. 234/ BRP has developed two radiological emergency response plans designed solely for the use of BRP staff. Neither technical nor financial assistance was provided by federal agencies for development of these plans.235/ Other state agencies are given task assignments in these plans, but these assignments merely reflect those made in Annex E.236/ The first plan, entitled the "Department of Environmental Resources, Bureau of Radiological Health Plan for a Nuclear Power Generation Station Incident," sets out general procedures and guidelines for responding to nuclear incidents and provides methods for applying EPA Protective Action Guides.237/ The second plan, "Three Mile Island Nuclear Station Annex to the Pennsylvania Plan for the Implementation of Protective Action Guides," applies the provisions of the general BRP plan to TMI specifically, and lays out procedures for evaluating the possible off-site consequences of different incidents at TMI. Both plans were developed by Margaret Reilly, chief of the Division of

Environmental Radiation, 238/ who stated that neither of these plans had been submitted to the NRC for concurrence. Reilly does not believe that the NRC review and concurrence process would have been useful:239/

> a lot of people in Bethesda [NRC] ought to know by now that we've been pretty active in emergency planning up here, although we haven't chosen to go the route of concurrence because personally I don't see where it would -- I don't think it would have brought us beans in this accident.240/

Although the two BRP plans were developed by the same agency, they provide different classifications of radiological incidents and different notification procedures among the facility, PEMA, BRP, and county emergency organizations. The PEMA Annex E classifies incidents in the same manner as the general BRP plan, but prescribes notification procedures different from either BRP plan. Met Ed's own emergency plan for TMI uses a different system of classifying incidents. Little effort was made to coordinate the four plans in their classification of incidents and notification procedures.

VIII. COUNTY AND LOCAL EMERGENCY PLANNING

Following the basic principle of the emergency preparedness structure, Pennsylvania's Annex E provides that primary responsibility for planning for and initially responding to a nuclear incident rests with county and local governments.241/ County and local officials did not perceive the operation of TMI to be dangerous, however, and, therefore, had little interest or incentive to plan for a radiological incident.

The lack of interest may be attributable in part to the NRC's regulatory approach. 242/ James Montgomery, chairman of the Interorganizational Advisory Committee, a committee comprising state and local disaster preparedness directors, explained the impact of the NRC approach on state and local governments:

> QUESTION: Do you have any feeling as to whether the lack of motivation at the state, local and county levels is due to the fact of the approach that the NRC has traditionally taken of de-emphasizing the possibility of an accident happening?
>
> MONTGOMERY: I think that's part of it, yes. I don't think there are any questions about that. They certainly did not come on strong with the opposites. There's no question about that.
>
> I think there's a feeling of frustration that here there was pressure, but no requirement and all of this complex guides and everything on developing a plan, but no one in NRC saying that these things could be dangerous folks. You better get a plan going. That was frustrating. People -- I think states felt they were caught between a rock and a hard place because of the money involved, and the lack of leadership and emphasis by -- particularly, I think, the higher management of NRC.243/

The impact of the AEC-NRC regulatory approach is evident at the level of utility-community relations. For instance, in 1974, the Borough of Middletown, located less than 3 miles from TMI, was assured by Met Ed that the evacuation of Middletown would never be necessary. Town officials were told in a letter that, even in the event of a catastrophic nuclear accident, they would have several days to execute an evacuation:

> Even the worst possible accident postulated by the AEC would not require evacuation of the Borough of Middletown. In the event of a catastrophic accident at Three Mile Island where it may be necessary to evacuate people who were close to the plants, i.e., within 2 miles [the TMI LPZ], a period of several days would be available to accomplish the evacuation without subjecting the people to unsafe levels of radiation exposure.244/

At the county level, emergency preparedness directors complained that it was extremely difficult to spark interest in radiological emergency planning. Although many county directors are full-time paid

employees, most local directors work on a volunteer basis.245/ Kevin Molloy, director of the Dauphin County Emergency Preparedness/ Communications Department, testified that in fall 1978 he called a meeting to urge authorities from Dauphin County municipalities to develop their own emergency response plans for incidents at TMI. Few people attended the meeting.246/ As Molloy explained:

> Unfortunately, in most cases the local directors are volunteers that are -- the state law says every municipality will have one. The local elected heads of government appoint one. They don't support him. They don't care whether he attends training sessions or anything. There is just a very negative attitude. Back then too, when we were called Civil Defense and so forth, Civil Defense carries a very negative image.... But there was just a -- just a general I-don't-care attitude. And everybody assumed that the county has a [radiological emergency] plan. And I explained to them that my plan did not cover the specifics needed during this type of emergency situation.247/

Another indication of apathy at the local level is that county emergency management directors have, in the past, successfully conducted drills involving emergencies other than radiological incidents. They believed however, that drills involving a radiological emergency would be unsuccessful because of public apathy.248/ Paul Leese, director of the Lancaster County Emergency Management Agency, stated:

> Because of the apathy at that time, I think that just because of the fact that nothing had ever happened up there, that the people just were not too enthused about it. I think that is the whole thing. Now it is a different situation. 249/

Before the accident, PEMA had requested that counties within a 5-mile radius of nuclear power plants develop 5-mile evacuation plans.250/ Pursuant to this directive, 5-mile evacuation plans were developed by Lancaster and York Counties. 251/ Dauphin County, the only other county located within a 5-mile radius of TMI, had already developed such a plan in 1974. Kevin Molloy testified that, upon his appointment in 1974, he discovered that no emergency plan existed at the county level for response to an emergency at TMI. Believing that a plan was necessary, Molloy arranged a meeting, attended by state police representatives, BRP, Met Ed, and local civil defense people, to discuss the development of an emergency plan. As a result of this meeting, the 5-mile evacuation plan was developed. 252/ Even though PEMA had requested the preparation of these plans, it provided little guidance during their development,253/ and when the county evacuation plans were submitted to PEMA upon completion, there was very little comment by PEMA on the plans.254/ Although both the NRC Regulatory Guide 1.101 and PEMA's Annex E provide for the coordination of emergency plans between the utility and off-site agencies, Met Ed was not involved in the preparation or review of county plans.255/

At the local level, on March 28, 1979, there were no written plans in existence for responding to an accident at TM1256/, despite the

state's basic philosophy that the lowest level of government at which an emergency occurs has primary responsibility for responding. County and state officials explain that because most local emergency directors are volunteers, it is very difficult to convince them to invest time to develop adequate written emergency plans.257/ Henderson stated:

> . . . [E)xperience has shown that municipalities do a much more credible job during times of an emergency than their plan would indicate that they would or could. It is very difficult sometimes. You see all of your local municipal directors are strictly volunteers. There are no paid local municipal directors. About two-thirds of our county directors are paid, but the mass of these 2,200 are strictly volunteers. And to attempt to get polished plans from these municipalities is an extremely difficult job. They can express to your [sic] their mechanism, and what they would do in time of an emergency. But actually putting it down in writing, it leaves a lot to be desired from a professional planning viewpoint.258/

During the accident, however, the municipalities had no choice but to develop written evacuation plans. Indeed, when the decision was made to expand evacuation planning to 10 and 20 miles, the three counties were required to expand their own plans substantially. With the expansion of the radius for evacuation planning, other counties became involved. Prior to the accident, the emergency management directors of two of these counties had expressed an interest in developing plans to respond to a radiological incident at TMI. They were informed that the off-site consequences of any incident would not extend beyond 5 miles.259/ Plans were unnecessary.

IX. CONCLUSION

This report does not propose specific alternatives to the nation's approach to planning for radiological emergencies at nuclear power plants. Various organizations with more time and resources have undertaken detailed studies in this area, as in the case of the joint EPA-NRC Task Force Report. The report documents, however, a fundamental problem of attitude that is woven into the fabric of radiological emergency planning. The NRC and the AEC, its predecessor, have traditionally assigned a low priority to off-site radiological emergency planning in part because of their confidence in designed reactor safeguards reflected in their regulatory approach, and their reluctance to stimulate public concern about the safety of nuclear power. The lack of importance attached to off-site emergency planning is reflected in the present NRC regulatory approach and practices.

The attitude of the regulator of the industry has contributed to a lack of urgency and sense of purpose in the planning activities of other governmental organizations. Without specific authority or a request to do so, the FPA thought it necessary to initiate planning activities among other federal agencies, but a significant part of the effort atrophied in a bureaucratic limbo for years. Despite the construction of nuclear power plants within its borders for several years and three operational plants by 1974, the Pennsylvania Civil Defense Agency did not begin to develop a radiological emergency plan until 1975. The state did not participate actively in the NRC concurrence program, a program which itself had been criticized as "ineffective" by an NRC-sponsored committee. At the time of the accident, the state plan was reviewed by a federal emergency planning expert who found it "very inadequate, very brief, and without substance." The three counties within a 5-mile radius of TMI had the required 5-mile evacuation plans, but no written plans had been prepared at the local level. Attempts to spark interest in radiological emergency planning prior to the TMI accident were largely ignored by apathetic local officials.

The TMI accident demonstrated in harsh terms that conscientious, coordinated off-site radiological emergency preparedness is absolutely indispensable: when evacuation plans were hurriedly being prepared during the most critical hours of the accident, the NRC in Washington was writing criteria for recommending the evacuation of wedge-shaped areas of various distances downwind of the plant; state and federal emergency planning officials, however, were preparing plans for the evacuation of circular areas of 5, 10, and 20 miles from the plant.260/ Perhaps the experience of TMI will instill, at all levels of government, a sense of urgency and responsibility for radiological emergency preparedness. Indeed, in the heat of post-TMI scrutiny, the NRC has increased its commitment to emergency planning and initiated a rule-making proceeding to reexamine its emergency planning regulations. But a sustained commitment to emergency preparedness is needed, and the history of the past few years indicates that the performance at all levels of government has fallen short of the mark.

1/ 10 CFR Part 100 (1979).

2/ Regulatory Guide 4.7, which is advisory in effect, indicates the influence which specific site characteristics should exert on decision-making. With respect to population considerations, the guide states that:

> (i]f the population density, including weighted transient population, projected at the time of initial operation of a nuclear power station exceeds 500 persons per square mile averaged over any radial distance out to 30 miles (cumulative population at a distance divided by the area at the distance), or the projected population density over the lifetime of the facility exceeds 1,000 persons per square mile averaged over any radial distance out to 30 miles, special attention should be given to the considerations of alternative sites with lower population density.

Regulatory Guide 4.7.C.3.

3/ 10 CFR Section 100.3(b). The fission product release also determines the size of the facility's "exclusion zone." The exclusion zone is the area immediately surrounding the reactor over which the utility must have complete authority, including the power to exclude or remove people or property. 10 CFR Section 100.3(a). Applicants calculate the size of the exclusion zone by determining the distance from the plant at which a person, if located there during the two hours immediately following the onset of an accident, would receive a worker's once-in-a-lifetime dose. 10 CFR Section 100.11(a)(1). Applicants calculate the LPZ in the same manner as the exclusion zone, but assume that the projected whole-body exposure would occur over a 30-day period. 10 CFR Section 100.11(a)(2). The dose limits used in Section 100.11 are 25 rems to the whole body or 300 rems to the thyroid from iodine exposure. This is a substantial dose, many times more dangerous than the radiation exposure of any individual during the entire TMI accident.

4/ 10 CFR Part 50, Annex to Appendix D (hereinafter, Annex). Appendix D of Part 50 was revoked in 1974 (39 FR 26279) but its annex remains in effect as a proposed NRC regulation and serves as an informal regulatory guide. 36 FR 22851; 10 CFR Section 100.11, footnote 1; Regulatory Guide 1.4.

5/ Report of the Office of the Chief Counsel on the Nuclear Regulatory Commission (hereinafter, NRC Report).

6/ For a fuller discussion of these postulated accidents and NRC's review of them, see the NRC Report.

7/ U.S. Nuclear Regulatory Commission, Standard Review Plan, Section 15.6.5.

8/ Id.

9/ Id., Section II; Regulatory Guide 1.4.

10/ Id., Appendices A-D; Regulatory Guide 1.4; Martin deposition at 20-40.

11/ Annex; see also testimony of Joseph Hendrie, chairman of the NRC, before the Environment, Energy and Natural Resources Subcommittee of the Government Operations Committee of the U. S. House of Representatives, Hearing Emergency Planning Around U. S. Nuclear Power Plants; Nuclear Regulatory Commission Oversight, May 7, 10, and 15, 1979 (hereinafter "Congressional Hearings") **at** 551; whether risks presented by class 9 accidents are sufficiently great to warrant siting reactors only in unpopulated areas has been ruled a matter for congressional, rather than judicial, review. Porter County Chapter of the Izaak Walton League of America v. Atomic Energy Commission, 553 F.2d 1011 (7th Cir. 1976), cert. denied 429 U. S. 945 (1976).

12/ "NRC Staff Response to Board Question No. 4 Regarding the Occurence of a Class 9 Accident at Three Mile Island," filed in In the Matter of Public Service Electric and Gas Co., ASLB, Docket No. 50-272, Aug. 24, 1979. The NRC position was based on the multiple systems failures which occurred during the accident rather than on the amount of radiation released off-site. Id.

13/ In the Matter of New England Power Company, ALAB-390, 5 NRC 733, 737 (1977) (hereinafter, "New England"). See also In re Southern California Edison Co., ALA 1 NRC383, 404-405 (1975).

14/ In re Public Service Co. of New Hampshire, Nos. 50-443, 50-444, ALAB-421, 6 NRC 25 (1977).

15/ 10 CFR 11(a) (2) (1979).

16/ Regulatory Guide 4.7.C.3.

17/ LPZs vary from less than a mile up to 10 miles in radius. Collins deposition at 36.

18/ Safety Evaluation Report, Section 2.1.3. (operating license stage).

19/ The "population center distance", which is 1-1/3 times the LPZ radius, is measured from the boundary of population density rather than from the boundary of the political subdivision. Northern Indiana Public Service Co. v. Porter County Chapter of the Izaak Walton League of America, 423 U.S. 12 (1975).

20/ Safety Evaluation Report, Section 2.1.3 (operating license stage).

21/ Report of the Environment, Energy and Natural Resources Subcommittee on the Government Operations Committee of the House of Representatives, "Emergency Planning Around U.S." Nuclear Regulatory Commission Oversight, Aug. 8, 1979 (hereinafter "Congressional Report"), citing U.S. NRC, "Demographic Statistics Pertaining to Nuclear Power Reactor Sites," NUREG-0348, Table 1 (December 1977, draft).

22/ See Ryan deposition at 71. The Environment, Energy and Natural Resources Subcommittee of the House of Representatives was also critical:

> As previously noted, class 9 is the most serious category of accidents. But it is not the greater severity which makes the exclusion of class 9 accidents from the analysis so grave an error. Class 9 accidents are not simply quantitatively different from the other eight classes of accidents, they are qualitatively different. In analyzing the first eight classes of accidents, the Commission assumes that during an accident some or all of the plant's safety systems (e.g., containment, spray, filters, emergency core cooling) will work. An accident in which these systems work is called a "design basis" accident because the plant is assumed to respond to the accident as it was designed to respond. In a class 9 accident, the engineered safety systems fail. A class 9 accident, therefore, is the only class of accident where the plant is assumed not to work as designed.
>
> In assuming that any system as complex as a nuclear reactor, releasing such vast amounts of energy, will always work as designed, the Commission reveals an unwarranted faith in man's technological capabilities. The Commission's rationale for ignoring the possibility of class 9 accidents, of course, is that they are so improbable. But doubt has recently been cast on the precision of theoretically calculated probabilities of class 9 accidents. Moreover, the real life example of the Three Mile Island accident suggests that proud claims of infinitesimally small probability are unsoundly based: many experts consider that accident was of the class 9 type.
>
> Moreover, to assume that the possibility of class 9 accidents need not be taken account of in emergency planning is sheer regulatory sophistry. The central purpose of emergency planning is to prepare for accidents. Yet in assuming that class 9 accidents can be ignored, the Commission is assuming that the plant will always work as designed, since only in a class 9 accident does the plant fail to perform according to design. But if the plant always works as designed there is never really an accident. The Commission, in short, plans for nuclear accidents by assuming they will not happen.

Congressional Report at 40-41.

23/ Ryan deposition at 71. Ryan believes that if the TMI accident had occurred at Indian Point, loss of life might have resulted:

> Everybody says what a terrible situation we had at Three Mile Island, and I agree, but can you imagine what it would have been if it had been at Indian Point? It would have been calamitous. You would have had dozens, hundreds of people killed perhaps trying to get out of the place, because the roads are, you know, they're North-South roads basically and the narrow old turkey bridge -- I'm from New York so I know the area fairly well -- there are narrow,

old bridges, one of the oldest bridges across the Hudson, the Bear Mountain Bridge, is a two-lane bridge going, you know, West-East across the Hudson. It's just a ridiculous place .... Id. at 71-72.

24/ Memorandum, "Staff Practice on LPZ Boundaries at Sites with Operating and New Units," from Brian Grimes, chief, EEB, Division of Operating Reactors, to. L. Crocker, DPM, April 4, 1978. See also Congressional Report, p. 41.

25/ Ryan deposition at 69-70.

26/ Report of the Siting Policy Task Force, NUREG-0625, August 1979.

27/ NRC/EPA Task Force on Emergency Planning, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants," NUREG-0396, December 1978 (hereinafter, "NRC/EPA Task Force Report"). The task force recommends an emergency planning zone of "about 10 miles" for the plume exposure pathway and "about 50" for the ingestion exposure pathway. Id., p. 16.

28/ NRC Policy Statement, "Planning Basis for Emergency Responses to Nuclear Power Reactor Accidents" (undated, although issued on Oct. 5, 1979). The endorsement recommends using the NRC/EPA Task Force Report as NRC guidance only and does not specify that the recommendations be retroactively applied to existing sites. Id.

29/ One effect of the AEC-NRC approach is demonstrated in a 1974 letter from Met Ed to the nearby Borough of Middletown. See footnote 243, infra, and accompanying text.

30/ Bradford deposition at 151.

31/ Collins deposition at 18.

32/ Id. at 8.

33/ Id. at 7.

34/ Id.

35/ Id. at 12.

36/ NRC began some guidance programs to involve federal agencies in planning efforts. Id. at 13-16.

37/ The FY 1978 NRC budget for the emergency preparedness program involving state and local governments was $250,000, representing 0.15% of the total NRC FY 1978 budget. Memorandum, Robert Ryan to Lee Gossick, April 10, 1979.

38/ Ryan deposition at 33-34.

39/ Id. at 6-7.

40/ Id. at 33. See memorandum from Robert Ryan to Lee Gossick, executive director for operations, Aug. 16, 1978.

41/ 44 Fed. Reg. 41483 (July 17, 1979). The NRC staff working on emergency preparedness was increased to 13 after the accident. Ryan deposition at 6. The budget of the Office of State Programs for emergency preparedness program functions, moreover, may be increased by as much as 50 percent. Id. at 15.

42/ 10 CFR Part 50, Appendix E. The statutory authority supporting Appendix E is Section 161 of the Atomic Energy Act of 1954, as amended, which authorizes the commission to:

> b. establish by rule, regulation, or order, such standards and instructions to govern the possession and use of special nuclear material, source material, and byproduct material as the Commission may deem necessary or desirable to promote the common defense and security or to protect health or to minimize danger to life or property. (Emphasis supplied.)

43/ 10 CFR Section 50.34(a)(10). The level of detail required is that degree "sufficient ... to assure the compatibility of proposed emergency plans with facility design features, site layout, and site location with respect to such considerations as access routes, surrounding population distributions, and land use." Appendix E, Part II.

44/ 10 CFR Section 50.34(b)(5)(v); 10 CFR Part 50, Appendix E, Part III.

45/ Those matters are:

- organizations for coping with radiation emergencies (Section IV(A)):
- identification of employees or others with special qualifications for coping with emergencies (Section IV(B));
- means for assessing magnitudes of radiation releases (Section IV(C));
- criteria for notifying off-site agencies (Section IV(C));
- criteria for involving off-site agencies (Section IV(C));
- criteria for determining use of protection measures (Section IV(C));
- agreements reached with officials and agencies concerning warning and implementing protection measures (Section IV(D));
- provisions for keeping plans up to date (Section IV(E));
- emergency first aid and personnel decontamination facilities (Sectopm IV(F));
- arrangements for treating individuals outside site boundaries (Section IV(G));
- training of employees (Section IV(H));
- provision for periodic emergency drills (Secton IV(I)); and
- criteria for reentry into a facility following an accident (Section IV(J)).

46/ Appendix E, Section IV.

47/ Regulatory Guide 1.101, "Emergency Planning for Nuclear Power Plant," Revision 1, March 1977.

48/ Congressional Report at 19.

49/ The four plants are D.C. Cook, Hatch, North Anna, and Salem. Congressional Hearings at 573.

50/ Testimony of Harold Denton before the President's Commission, Aug. 23, 1979, at 19.

51/ Ryan deposition at 18.

52/ 1.101, Section C. Accidents fall into five graduated levels of severity:

> Personnel emergency - "accidents or occurrences onsite in which emergency treatment of one or more individuals is required... (including) ... those situations that have no potential for escalation to more severe emergency conditions."
>
> Emergency alert - situations that "can be recognized as creating a hazard potential that was previously non-existent or latent. The situation has not yet caused damage to the plant or harm to personnel and does not necessarily require an immediate change in plant operating status."
>
> Plant (Unit) emergency - "physical occurrences within the plant requiring staff emergency organization response ... [where it would be]...unlikely that an off-site hazard will be created."
>
> Site (Station) emergency - an accident involving "an uncontrolled release of radioactive materials into the air, water, or ground to an extent that the initial assessment indicates the advisability of considering protective action off-site."
>
> General emergency - although the regulation is not specific on the precise description of accidents that rise to the "general emergency" level, general emergencies encompass accidents that "have a potential for serious radiological consequences to public health and safety."
>
> Applicants are permitted to classify accidents by an alternate approach, assuming that the alternate approach is "substantially equivalent." Id.

53/ 1.101, Annex A, Section 5.

54/ Id., Section 7.

55/ Id., Section 8.

56/ They are:

- protective actions for relocating on-site persons during emergencies, including
  - "action" criteria (Section 6.4.1.1(a));
  - warning of on-site persons (Section 6.4.1.1(b));
  - evacuation routes, transportation of personnel, and reassembly (Section 6.4.1.1(c));
  - missing persons checks (Section 6.4.1.1(d));
  - radiological monitoring of evacuees (Section 6.4.1.1(e));
- protective actions regarding distribution of protective equipment and supplies in the exclusion zone, including
  - individual respiratory protection (Section 6.4.2.1);
  - use of protective clothing (Section 6.4.2.2);
  - use of radioprotective drugs, e.g., individual thyroid protection (Section 6.4.2.3);
- protective actions regarding in-plant contamination control measures (Section 6.4.3);
- protective actions outside of security area, but within the exclusion area, including
  - isolation or quarantine and area access control (Section 6.4.3.1(a));
  - control of distribution of affected agricultural products, including milk (Section 6.4.3.1(b));
  - control of water supplies (Section 6.4.3.1(c)); and
  - criteria for permitting return to normal use (Section 6.4.3.1(d)); and
- protective action to aid affected personnel, including
  - exposure guidelines for entry and reentry to areas in order to remove injured persons and undertake corrective actions (Section 6.5.1);
  - decontamination and first aid (Section 6.5.2);
  - medical transportation (Section 6.5.3);
  - medical treatment (Section 6.5.4).

57/ 1.101, Section 6.4.1.2(a).

58/ 1.101, Section 6.4.1.2(b).

59/ 1.101, Section 6.4.3.

60/ 1.101, Section 6.4.3.2. Off-site contamination control provisions should include the same "elements" as are required for on-site contamination control:

a. Isolation or quarantine and area access control;
b. Control of the distribution of affected agriculture products, including milk;
c. Control of water supplies; and
d. Criteria for permitting return to normal use. Id. Section 6.4.3.1.

61/ Section 6.4 indicates that plans should also describe steps "taken ... (2) to make available on request to occupants in the low population zone information concerning how the emergency plans provide for notification to them and how they can expect to be advised what to do

62/ The NRC's Atomic Licensing and Appeal Board (ALAB) has held that, during licensing proceedings, the feasibility of developing an emergency plan applicable to the area beyond the LPZ is not relevant to the determination of whether the regulations have been met. New England, p. 747

63/ See, e.g., prepared testimony of Joseph Hendrie, supra note 7, at 380.

64/ See Congressional Report at 40 (using the LPZ as the basis for emergency planning is "devoid of any rational basis"); "Report to the Congress, Areas around Nuclear Facilities Should be Better Prepared for Radiological Emergencies," EMD-78-110, (March 30, 1979), ("GAO Report") at 21 (" ... these zones do not cover the entire area that could be affected by [releases from the most severe types of nuclear accidents]");

NRC/EPA Task Force Report, Appendix III B ("If the engineered safety features are lost during an accident, then the LPZ has no meaning with regard to the size of the areas around the plant in which emergency response would be appropriate").

65/ See "Guide and Checklist for Development and Evaluation of State and Local Government Radiological Emergency Response Plans in Support of Fixed Nuclear Facilities," NUREG 75/111, Dec. 1, 1974; (NUREG 75/111); the General Accounting Office (GAO) has recommended that all states with reactors meet these NRC standards. GAO Report, p. 35.

66/ NUREG 75/111. Ryan deposition at 27.

67/ Ryan deposition at 27.

68/ Id. "Supplement No. 1" to NUREG 75/111, March 15, 1977.

69/ The 13 states are Alabama, Arkansas, California, Connecticut, Delaware, Florida, Iowa, Kansas, Nebraska, New Jersey, New York, South Carolina, and Washington. Attachment to memorandum from Robert Ryan to Lee Gossick, April 10, 1979. The two states added since the accident at TMI are Arkansas and Nebraska. Ryan deposition at 28; Collins deposition at 25. Other sources have stated that prior to the accident only nine states had concurred-in plans. Congressional Report; GAO Report.

70/ Ryan deposition at 28.

71/ Bradford deposition at 151.

72/ Letter to J. Dexter Peach, director, Energy and Mineral Division, U.S. General Accounting Office, from Lee Gossick, executive director for operation, Nuclear Regulatory Commission, dated Dec. 18, 1978, at 1-2. Anticipating the GAO' criticism, the NRC's Office of State Programs agreed in October 1978, that plants in states without NRC concurrences should not be licensed. Ryan deposition at 41-43. The Office of Nuclear Reactor Regulation, however, opposed the suggestion and that ended the discussion until the accident. Memorandum from Harold Denton to Robert Ryan, Nov. 3, 1978; Ryan deposition at 43-44.

73/' Congressional Hearings at 574.

74/ Letter to Honorable Paul McCloskey from Joseph Hendrie, June 26, 1979; cited in Congressional Hearings at 578-582.

75/ Kennedy deposition at 174-182.

76/ Id.

77/ Letter from Joseph Hendrie to Honorable Toby Moffett, June 26, 1979, cited in Congressional Hearings at 603.

78/ Gossick deposition at 37.

79/ Technical specifications, Design Features, Figure 5.1-1; Safety Evaluation Report, Sept. 5, 1969, Section 2.1 (construction permit stage).

80/ Technical specifications, Design Features, Figure 5.1-2.

81/ Safety Evaluation Report, Section 2.1.3 (operating license stage).

82/ Three Mile Island Nuclear Station Annex to the Pennsylvania Plan for the Implementation of Protective Action Guides, ("Pa. Plan Annex") Part I; Safety Evaluation Report, Section 2.1 (construction permit stage).

83/ Pa. Plan Annex, Part I.

84/ Safety Evaluation Report, Section 13.3 (operating license stage).

85/ Id. This calculation disagreed with Met Ed's own computations, which concluded that evacuations out to 4 miles could be effected in less than 2 hours. Testimony of NRC staff on Emergency Plans for Evacuation filed before the ASLB, Docket No. 50-320, (hereinafter, "NRC staff testimony") at 4.

86/ Safety Evaluation Report (operating license stage), Supplements 1 (undated) and 2 (February 1978).

87/ NRC staff testimony at 1.

88/ Prepared testimony of Craig Williamson, Docket No. 50-320.

89/ NRC staff testimony. The staff also cited an "extensive study" conducted by the Environmental Protection Agency. That study, according to the staff, found "no statistical difference in the effectiveness of evacuation with or without an emergency plan." The staff was unwilling to sponsor that result, however, commenting that "preplanning is desirable and prudent." Id. at 3.

90/ Transcript of ASLB proceedings, May 18, 1977, p. 1,374.

91/ Prepared testimony of Kevin Molloy, Docket 50-320, p. 10.

92/ Id. at 6, 10.

93/ Transcript of ASLB proceedings, May 20, 1977, at 1,736-1,739.

94/ Id.

95/ In the Matter of Metropolitan Edison, et al., ASLB, Docket 50-320, 6 NRC 1185, 1206 (Dec. 19, 1977).

96/ In the Matter of the Metropolitan Edison Co. et al., Docket 50-320, ALAB-486. CCH Reports, at 28,674, (July 19, 1978 (hereinafter, Met Ed).

97/ Met Ed at 28,677. Molloy had contended that live tests would not conform to real emergencies and that emergency responses learned during live tests might be inappropriate in real emergencies. Met Ed at 28,677-678.

98/ Met Ed at 28,679-81.

99/ Met Ed at 28,681.

100/ Site Emergency Plan, Section 2.1. Tied to this emergency classification is a postulation of five possible accidents for TMI. These accidents are:

> Case I LOCA: A loss-of-coolant accident assuming severe core damage and fuel melting with 100 percent of the noble gases and 25 percent of the iodines released to containment (Section 2.2.3);
>
> Case II LOCA: Primary coolant leak sufficient to damage fuel rods, releasing gases between the fuel and fuel rods into containment (Section 2.2.4);
>
> Case III Gas Decay Tank Rupture: Rupture of a gas decay tank, causing premature release of its radioactive contents to the auxiliary building and to the atmosphere (Section 2.2.5);
>
> Case IV Fuel Handling Accident: Gross mechanical damage of the entire outer row of fuel rods in the assembly with no retention of noble gases (Section 2.2.6); and

Case V Steam Generator Tube Rupture: A double-ended rupture of the steam generator tube with unrestricted discharge from each end to the secondary side of the steam generator (Section 2.2.7).

These postulated accidents, inserted in accordance with 1.101 requirements (1.101, Annex A, Section 4.1), play no apparent role in influencing licensee response in time of emergency.

101/ Id., Section 4.

102/ Id., Section 4.1.1.

103/ Id., Section 4.1.2 - 4.1.3.

104/ Id., Section 4.2.

105/ Id., Section 4.4.

106/ The plan identifies these organizations as the State Council of Civil Defense and the Bureau of Radiological Health. Id., Section 4.1.4.

107/ See Report of the Office of Chief Counsel on Emergency Response.

108/ Site Emergency Plan, Section 5.0.

109/ Id., Sections 5.2.1 - 5.2.2.

110/ Id., Section 5.3.

111/ See Report of the Office of Chief Counsel on Emergency Response

112/ Id., Section 5.4.

113/ Id., Section 5.5.

114/ Id., Section 6.1.1.6.

115/ Id., Section 6.1.1.1.

116/ Id., Section 6.1.1.4.

117/ Drills are of five types: site or general emergency drills, medical emergency drills, fire emergency drills (with off-site fire departments invited to attend), repair party team drills, and fire brigade drills. All of these must be held annually, except for fire brigade drills, which must be held quarterly. Id., Section 6.1.2.

118/ Dubiel deposition at 56-58.

119/ Id. For a description of the various drills held at TMI during calendar year 1978, see "Investigation into the March 28, 1979, Three Mile Island Accident by Office of Inspection and Enforcement," U.S. NRC Investigative Report No. 50-320/79-10, NUREG-0600 (August 1979), at 11-1-17, 18.

120/ Dubiel deposition at 63-64, 78-81. NRC Region I inspectors were present at the last drill, held at TMI-1 on Nov. 11, 1978. Representatives of the state agencies were also present. Dubiel recalls that some of those who were invited did not come, but he cannot remember which (Id.). Dubiel cannot remember whether any suggestions were made after the Nov. 11, 1978, drill, but he does recall post-drill discussions with off-site agency observers on other occasions. Dubiel deposition at 81-82a.

121/ Molloy deposition at 15.

122/ Donaldson deposition at 53.

123/ Id. at 45.

124/ Id. at 47.

125/ Vol. 1, Section 3.

126/ Letter from R. Jacobs, captain, U.S. Coast Guard, to J. Herbein, vice president, Metropolitan Edison Company (copy undated). The letter goes on to advise Met Ed that partially "due to involvement in primary mission areas such as search and rescue, maritime pollution, and fisheries law enforcement," Coast Guard response to a TMI emergency might be somewhat delayed. TMI Emergency Plan, Section 3.

127/ Letter from Kevin Molloy, Civil Defense of Dauphin County, to J. Herbein, vice president -- generation, Metropolitan Edison Company, dated Aug. 25, 1977* (*date unclear on copy). TMI Emergency Plan, Section 3.

128/ Letter from Oran Henderson, director of civil defense, to J. Herbein, vice president, Metropolitan Edison Company, dated Aug. 18, 1977. TMI Emergency Plan, Section 3.

129/ Martin deposition at 110-12. During the accident, however, NRC senior management repeatedly told state and federal officials that the "lead time" for evacuation might range from zero to several hours. See report of the legal staff on emergency response.

130/ Donaldson deposition at 64.

131/ The TMI-2 operating license technical specifications require Met Ed to "establish, implement, and maintain written procedures covering implementation of the Emergency Plan." Technical specifications, Administrative Controls, Section 6.8(e). If there is no license condition requiring emergency plan implementation, enforcement can be difficult. Donaldson deposition at 62-63. See 10 CFR 50.36; 50.40; 50.42; 50.43.

132/ Donaldson deposition at 11.

133/ Inspectors inventory emergency kits and emergency equipment to ensure that all items required by the plan are in place, and some of the equipment is actually tested to ensure that it is in working order.

Inspectors visit the licensee's emergency control center, examine the communications equipment, and inspect radiation monitors and other equipment. Off-site agencies with emergency responsibility are visited, as well as the area hospital with capability to treat irradiated workers. Inspectors also review documents. When an inspector is relying on a document to ascertain that the licensee has satisfied a particular responsibility, the inspector will normally not "look behind" the document to ensure that its contents are truthful. The inspector would do so, however, if, for some reason he suspected the document's validity: "[0]ne learns to know who to trust and who not to trust." Additionally, a random sampling of approximately 25 percent of licensee personnel with designated emergency response duties are interviewed to determine the extent of their training and their assessments of their own emergency response capabilities. Donaldson deposition at 13-38.

134/ The thirteen parts are:

-Local Emergency Procedures (Section 1670.1);
-Site Emergency Procedures (Section 1670.2);
-General Emergency Procedures (Section 1670.3);
-Radiological Dose Calculations (Section 1670.4);
-On-site Radiological Monitoring (Section 1670.5);
-Off-site Radiological Monitoring (Section 1670.6);
-Emergency Assembly, Accountability and Evacuation (Section 1670.7);
-Emergency Re-Entry for Repair or Rescue (Section 1670.8);
-Emergency Training and Emergency Exercises (Section 1670.9);
-Hershey Medical Center Medical Emergency Procedure (Section 1670.10);
-On-site Medical Emergency Procedure (Injured and Contaminated) (Section 1670.11);
-Emergency Contact List (Section 1670.14); and
-Post-Accident Re-Entry and Recovery Plan (Section 1670.16).

135/ Procedure 1670.1, Sections 4.1.3, 4.2.1, 4.4.1. The procedures require simple on-site notification of appropriate personnel, the taking and evaluation of a radiation survey, and the implementation of "appropriate steps to return condition to normal."

136/ Procedure 1670.2, Section 4.1.4. Figure 4 of the procedure contains a schematic drawing of a "communications tree." The drawing gives rise to the possibility that TMI would notify others in addition to PEMA, if appropriate.

137/ Id., Section 4.1.9.

138/ Id., Section 4.1.13.

139/ Other procedures establish methodologies for radiological dose calculations (Procedure 1670.4) and radiological monitoring (Procedures 1670.5, 1670.6), means for detection of radiation on the decontamination of exposed workers (Procedures 1670.10, 1670.11), and accounting for and assembling plant workers during emergencies (Procedure 1670.7). For radiation emergencies, initial medical treatment will be on-site, possibly in the "First Aid Room" (Procedure 1670.11, Section 1.2). Patients in

need of prolonged treatment would be sent to the Milton S. Hershey Medical Center, (Id., Section 1.4), where a single room has been made available for this purpose (Procedure 1670.10, Section IV (c) (2)). Occupation-specific training programs, consisting of review of planning provisions and refamiliarization of workers with emergency equipment, are also required (Procedure 1670.9, Section 4.0). Off-site agencies are invited for training (Id., Section 3.5.1). (For a listing of off-site agencies which have participated, see NUREG-0600, p. 11-1-7.) Regarding drills, procedures call for written evaluations by off-site agency observers (Procedure 1670.9, Section 4.1.4.1). Drill scenarios must be based on "plausible simulated accident[s]" sufficient to trigger site or general emergency response (Id., Section 4.1.5). The last procedure governs post-accident re-entry, and recovery (Procedure 1670.15). Only one page in length, it concedes the impossibility of anticipating post-accident conditions and, therefore, establishes no mandatory response actions. It does, however, recommend that officials holds off on commencing recovery until the emergency is over (Id., Section 1.3).

140/ IRAP, Preamble.

141/ FRPPNE, Interim Guidance, April 1977 at 2.

142/ IRAP at 2, 8. A listing of signatories to IRAP and their responsibilities under it may be found at Appendix 1.

143/ See Memorandum, L. Joe Deal (DOE) to File, re: Critique for Response to Three Mile Island Accident, at 6.

144/ Id.

145/ Deal deposition at 8; Villforth deposition at 44.

146/ Statement of Joseph Hendrie, chairman, NRC, before the Subcommittee on Environment, Energy, and Natural Resources, Committee on Government Operations, 96th Congress, 1st Session, at 389-390.

147/ Deal interview at 36-38.

148/ Deal deposition at 76; Deal interview at 36-38.

149/ Gage deposition at 34; Cotton deposition at 123-124.

150/ Id.; Villforth deposition at 42-44.

151/ Watson deposition at 107; Eidenburg deposition at 158.

152/ Cotton deposition at 100-110; Gage deposition at 89-91.

153/ FPA, within the General Services Administration, is charged with, among other things, responsibility for developing federal policies and programs with respect to emergency preparedness and working with federal agencies to ensure that appropriate planning is coordinated and completed. Executive Orders 11051 and 11490, as amended.

154/ The four FRPPNE categories are: Category 1 - A nuclear incident with minor and located effects; Category 2 - An incident with the potential for nuclear detonation and/or widespread dispersal of radioactive contamination; Category 3 - An occurrence in which, despite all preventive and controlling efforts, there is nuclear detonation and/or widespread dispersal of radioactive contamination; Category 4 - The post-Category 3 environment during which long-range recovery and rehabilitation are effected. FRPPNE Interim Guidance, April 1977 at 11-12.

155/ It is interesting to note that FRPPNE adopts the view that built-in reactor safeguards reduce the need for off-site emergency planning to protect the public health and safety:

> Federal, state, and local goverments, private industry, and other governmental users have taken measures to prevent foreseeable accidents associated with the manufacture, transportation, storage, and use of radioactive materials and devices intended for civil and military use. Safety features are incorporated in each nuclear reactor to reduce the probability of accident and the risk of radiological contamination. Security safeguards in addition to safety features are built into every nuclear weapon to assure an extremely low probability of an accidental or unauthorized detonation. [Id. at 1]

156/ Thomas deposition at 11.

157/ Id. at 10-11.

158/ Public Law 93-288. FDAA, although not required to do so, is authorized by the Act to develop disaster preparedness plans (Id. at Section 201(a)). No disaster declaration was made during the TMI accident. Indeed, federal and state officials purposely avoided making an explicit declaration. See Report of the Office of Chief Counsel on Emergency Response.

159/ Thomas deposition exhibit 2; Carbone deposition at 34-36.

160/ Carbone deposition at 32-33; Thomas deposition at 6-9; Thomas deposition exhibits 2, 3.

161/ Thomas deposition exhibit 2.

162/ Id.

163/ Carbone deposition at 52.

164/ Thomas deposition at 23.

165/ Id. at exhibit 3.

166/ Id. at 18, 19. As a result, the FBI furnished upgraded U.S. plans for peacetime nuclear emergencies involving terrorism, a Category 2 incident under FRPPNE. The Department of Defense (DOD) developed an extensive exercise involving a nuclear weapons accident, also a Category

2 incident under FRPPNE. Id. at 20-21; FRPPNE Interim Guidance, April 1977.

167/ Thomas deposition at 54.

168/ Id. at 25-26, exhibit 5.

169/ Carbone deposition at 49-53.

170/ Id. at 55; Thomas deposition, exhibit 6.

171/ Thomas deposition at 28-29.

172/ Carbone deposition at 51. Carbone believes that Thomas' inquiry may have been made after the TMI accident. Id. at 53.

173/ Id. at 51.

174/ Id. at 52.

175/ Thomas deposition at 57-58.

176/ Carbone deposition at 55-56.

177/ 40 FR 59494 (Dec. 24, 1975). The notice superseded a Federal Register notice of Jan. 24, 1973. The participating agencies in the 1975 Federal Register notice are NRC, FPA, DCPA, FDAA, DOE, HEW, EPA, and DOT. As part of that federal effort, the notice called upon HEW to assist states in development of plans to prevent adverse effects of radiation exposures, including the use of drugs to protect the thyroid gland against radioactive iodine. In partial response to that notice, the Food and Drug Administration of HEW issued, about 3 months before the accident at TMI, a Federal Register notice soliciting new drug applications for production of potassium iodide (KI) for use as a thyroid-blocking agent during a radiological emergency. 43 FR 58798 (Dec. 15, 1978). As of March 28, 1979 the FDA had received no responses to its notice from pharmaceutical companies. Villforth interview at 19.

A problem in obtaining KI for the population near nuclear facilities has been lack of funding. According to Thomas Gerusky, the director of Pennsylvania's Bureau of Radiation Protection:

> Every time we went to the federal government or the state government and requested assistance in purchasing or establishing a system to get KI in, we were told the state is going to have to spend the money if they want it, and we didn't have the money to set up the KI program. (Gerusky deposition at 87.)

During the TMI accident, KI had to be produced in vast quanitities on an emergency basis. See the Report of the Office of Chief Counsel on Emergency Response.

178/ Thomas deposition at 35.

179/ Hardy deposition at 15.

180/ 40 Fed. Reg. 59494 (Dec. 24, 1975); see generally 1978 NRC Annual Report at 135-136. A description of the responsibilities of the major signatories appears in appendix 2 to this report.

181/ Collins deposition at 18-22; Montgomery depositon at 17-18.

182/ Thomas deposition at 32; Carbone deposition at 57.

183/ Id. at 31-32; McConnell deposition at 10; Carbone deposition at 57.

184/ NUREG-75/111 and Supplement 1 thereto; NUREG 0093.

185/ McConnell deposition at 10; Hardy deposition at 6-7; Galpin deposition at 6. The NRC also conducts training courses for state and local officials. Collins deposition at 31-33.

186/ Collins deposition at 26-27.

187/ Id. at 26-28.

188/ Id. See footnote 239 and accompanying text.

189/ See footnotes 36-38 and accompanying text.

190/ Collins deposition at 28.

191/ Id. at 26; McConnell deposition at 10-12; Thomas deposition at 37.

192/ See footnote 68 and accompanying text.

193/ Collins deposition at 21-22; McConnell deposition at 19-21; Montgomery deposition at 22-30.

194/ Collins deposition at 21; McConnell deposition at 21.

195/ As discussed in Section VII, however, federal financial assistance has been available from other sources for the development of state radiological plans. Pennsylvania had developed a radiological response plan using financial assistance.

196/ Collins deposition at 21.

197/ Id. at 29.

198/ DCPA, an agency within the DOD, has responsibility pursuant to the National Civil Defense Act of 1950 for preparing the United States for enemy attack. In 1976, this act was amended to extend DCPA's responsibility to include preparation for natural disasters. National Civil Defense Act of 1976.

199/ McConnell deposition at 11.

200/ Id. at 19-21.

201/ Id. at 21.

202/ Letter from Robert Ryan, director of Office of State Programs, NRC, to Dale McHard, chairman of Conference of Radiation Control Program Directors, July 28, 1977. The committee was formed as one of 12 under the Conference of Radiation Control Program Directors. Composed of 12 persons who represent the conference and state and local civil defense organizations, the committee meets five or six times a year or more frequently if necessary. The committee functions as a "sounding board" for states to respond to NRC proposals. Ryan deposition at 61-65.

203/ Letter from David Snellings, chairman of Interorganizational Committee on Emergency Response Planning and Preparedness, to Robert Ryan, Office of State Programs, March 1, 1978, with attachment, Feb. 22, 1978; Montgomery deposition at 11.

204/ Letter, with attachment, supra note 202.

205/ Id. The committee recommended that the NRC provide (1) means of funding to the states for development of radiological emergency response plans; (2) professional consultants to state and local governments in development of plans, and (3) timely guidance in areas such as scope of incident, protective action guides, instrumentation, warning capabilities, and timely notification by the utility.

206/ Montgomery deposition at 48-49.

207/ As early as April 1975, the Advisory Committee on Reactor Safeguards, NRC, reported to the NRC chairman that it had reviewed the status of emergency preparedness and found that off-site emergency planning was inadequate:

> There is a need for further improvement of response plans on the part of state and local agencies who will be responsible for protection of people in the neighborhood of plants. This includes the development of a well defined division of responsibilities and of the coordination required among people responsible for on- and off-site aspects of protective actions. . .
>
> Additional observations by the Committee are that the response plans of many states responsible for dealing with population groups in the neighborhood of nuclear power plants are only in the planning stages, or if completed, show a need for more professional knowledge in this subject area. . .
>
> The Committee recommends. . .that the NRC assume a role of leadership in coordinating the necessary efforts to foster the development of adequate state emergency response capabilities.

Letter from William Kerr, chairman, ACRC, to William A. Anders, chairman, NRC, April 8, 1975.

208/ See footnote 71 and accompanying text.

209/ Commonwealth of Pennsylvania, Disaster Operations Plan.

210/ The name-change was made in 1978, pursuant of the adoption by the state of a model act prepared by the Council of State Governments for upgrading civil defense organizations. Henderson deposition at 4.

211/ PEMA is the state agency responsible for planning, coordinating, and committing resources for the full range of potential emergencies occurring within the state. (Henderson testimony, Aug. 2, 1979, hearings, at 32.) PEMA's overall direction and policy is established by the governor. The council is required to meet at least three times a year and within 48 hours following a disaster. (Henderson deposition at 27-28.) The council consists of 16 members, including the governor, lieutenant governor, secretaries of various state agencies having primary disaster responsibilities, four members of the state legislature, and the majority and minority speakers of both state houses.

212/ U.S. Nuclear Regulatory Commission Annual Report 1978 at 290.

213/ Disaster Relief Act of 1974, as amended, Section 201(c).

214/ Id. at Section 201(d).

215/ Wilcox deposition at 6; Carbone deposition at 3-5, 19.

216/ This plan was initially developed in 1963 under a 50 percent matching grant program administered by DCPA; Pennsylvania, through its participation in this program developed only a general emergency operations plan. Prior to the existence of Annex E, the state response to a peace-time nuclear incident was planned with the normal operational roles of the state agencies as provided in the General Operations Plan. Letter from James Lothrop to Ruth Dicker of the President's Commission staff, dated Sept. 25, 1979.

217/ Excerpts from Pennsylvania Development Grant Work Plan relevant to radiological emergency response planning. Carbone to Wilcox, April 24, 1979.

218/ Henderson deposition at 9.

219/ Letter dated April 25, 1975, from Richard Gerstell, director of Pennsylvania Civil Defense, to Paul Cain, regional director of FDAA; see attaching first quarterly report under FDAA grant program.

220/ Letter dated July 24, 1975, from Richard Gerstell, director of Pennsylvania Civil Defense to Norman Steinlauf, acting regional director of FDAA, see attaching second quarterly report.

221/ See routing slip memo from Carbone to Wilcox; attaching are all quarterly reports mentioning Radiological Emergency Response Plans (RERP). In its third report, covering the period of July 1, 1975, to September 30, 1975, Pennsylvania reported that "portions of a three-part booklet for each of the three nuclear power stations in the state are in draft and under review by the Council, the Bureau of Radiological Health (BRH) and the power companies." (Letter dated Oct. 14, 1975, from C.A. Williamson, acting director of Civil Defense to Arthur Doyle, regional director, FDAA, attaching third quarterly report.) The fourth quarterly Performance Report states: "The decision was made NOT to publish the three-part booklet for each nuclear power plant site in the state as reported in Part II of the quarterly report for the period ending September 30, 1975. Instead, two site nonspecific pamphlets were drafted, one for the general public and one denoting governmental responsibilities within the state. These two documents are currently under review." Letter dated Jan. 26, 1976, from Williamson to Arthur Doyle, attaching fourth quarterly report. Col. Henderson testified during his deposition that sometime in 1976, the State Council of Civil Defense prepared a booklet to be disseminated to the general public around Three Mile Island which discussed what the public should know about radiation. In attempting to obtain concurrence on distribution of this booklet from the various state agencies, objections were raised that a separate booklet concerning radiation problems unduly emphasized dangers of a fixed nuclear site, when, in fact, Pennsylvania suffers much more from floods and snow storms. For these reasons, the BRP would not give its concurrence and the document was not published or distributed. Henderson deposition at 29-33.

222/ Henderson deposition at 9.

223/ Id.

224/ Carbone deposition at 14-15, exhibit 1.

225/ Id. at 17.

226/ Id. at 9-10.

227/ Id. at 9-13.

287/ Id. at 14. In the Aug. 1, 1978, meeting of the Inter-Organizational Advisory Committee of the Conference of Radiation Control Program Directors, the issue of FDAA funding for the development of state emergency response plans were discussed. The committee found that the use of such funding for planning efforts with regard to fixed nuclear facilities was largely dependent on the work of the regional director of FDAA. Inter-Organizational Advisory Committee Meeting, CRCPD, Aug. 1-3, 1978, Bethesda, Md.; Godwin deposition at 8.

229/ Memorandum, Alfred Hahn, HUD, to John Gibson, HUD, July 6, 1979.

230/ Quarterly Performance Report, Pennsylvania Disaster Preparedness Grant No. 207-71-1072, period ending March 31, 1978.

231/ Carbone deposition at 7-8.

232/ Quarterly Performance Report, Pennsylvania Disaster Preparedness Grant No. 207-71-1072, period ending September 30, 1978; letter from James Lothrop, plans officer, PEMA, to Ruth Dicker of the President's Commission staff, Sept. 25, 1979.

233/ McConnell deposition at 36-37.

234/ Annex E, Section VII D. BRP has two main functions: (1) inspecting, licensing, and determining regulatory compliance of all non-NRC licensed users of radioactive materials and x-ray equipment in Pennsylvania; (2) environmental monitoring and emergency planning. (Gerusky deposition at 3-4.) BRP personnel play the technical lead role in radiological matters. (Henderson deposition at 35.) Although BRP has responsibility for environmental monitoring, its monitoring program is a limited operation designed mainly to verify the accuracy of the data collected by the nuclear facility. This program is funded by the NRC in exchange for providing NRC with the data collected. At the time of the TMI accident, BRP was carrying out the minimum program required by the NRC and Thomas Gerusky, director of BRP, testified that the state's monitoring program during the accident was not adequate. (Gerusky deposition at 16-18.) In 1975, Gerusky had recommended to the Pennsylvania House Mine and Energy Management Committee that BRP's environmental monitoring program be expanded to ensure effectiveness during a nuclear accident. Although legislation was introduced that year and in later years, it had failed to pass. After the TMI accident, however, the state appropriated funds for BRP to establish an expanded monitoring program. (Gerusky deposition at 16-22.)

235/ Reilly interview at 6-7, 33.

236/ Id. at 33.

237/ Gerusky deposition at 10-12. Protection Action Guides (PAG) can best be described as "decision making points." They are radiation doses to which the public should not be exposed or which, at lower levels, call for certain protective actions. Action is required as radiation levels approach the PAGs and is not to be delayed until the levels are actually attained. Reilly interview at 11-13; Gerusky deposition at 12-13.

238/ Reilly interview at 6; Gerusky deposition at 11.

239/ Reilly interview at 19-20, 32.

240/ Id. at 19. The implementation of these plans during the course of the TMI accident is discussed in the report of the legal staff on emergency response. Margaret Reilly stated that two problems with the TMI Annex became evident during the accident: first, the information needed to assess the situation, and second, the events at the plant cannot be easily compartmentalized according to the types set out in the plant. (Reilly interview at 25-28.)

241/ DOP, Annex E, Section VI. Section 7 of the Pennsylvania State Council of Civil Defense Act of 1975, Pamphlet Law 28, provides for the creation of county and local emergency management agencies:

> Each political subdivision of this state is hereby authorized and directed to establish a local organization for civil defense in accordance with the State Civil Defense Plan and program. Each local organization for civil defense shall have a Director who shall be appointed by the Governor upon the recommendation of the executive officer or governing body of the political subdivision. The director shall be responsible for the organization, administration, and operation of such local organization for civil defense, subject to the direction and control of such executive officer or governing body.

242/ Montgomery deposition at 31-32.

243/ Id. at 31-32.

244/ Letter from F. Shirk, supervisor, Communications Services, Met Ed, to George Merkle, manager, Borough of Middletown, Pa., dated Feb. 4, 1974.

245/ Henderson deposition at 7.

246/ Molloy deposition at 27.

247/ Id. at 25-26.

248/ Id. at 13-14; Leese interview at 20, 22; Jackson interview at 10-11.

249/ Leese interview at 21.

250/ Leese interview at 13-15; Jackson interview at 6. Approximately 3 years before the TMI accident, PEMA, in conjunction with BRP and a private contractor (Systems Development Corporation of California), decided to establish 5-mile evacuation zones to provide uniformity in the state with respect to planning near nuclear power plans. At that time, Pennsylvania had three nuclear plants. The Peach Bottom plant had an LPZ of 4.6 miles, the Beaver Valley plant an LPZ of 3.6 miles, and TMI an LPZ of 2 miles. Taking the largest of the three LPZ's and adding some distance as "an extra fudge factor," a 5-mile radius was adopted. Henderson deposition at 10.

251/ Leese interview at 15; Jackson interview at 6.

252/ Testimony of Kevin Molloy, Aug. 2, 1979, President's Commission hearing at 4.

253/ Molloy deposition at 11; Leese interview at 75; Jackson interview at 7, 60.

254/ Molloy deposition at 11; Leese interview at 15; Jackson interview at 7. A general description of the 5-mile plan appears in Appendix 4.

255/ Molloy deposition at 11; Leese interview at 15; Jackson interview at 9.

256/ Molloy deposition at 27.

257/ Id. at 25.

258/ Henderson deposition at 7.

259/ Boyer interview at 5-7.

260/ See Report of the Office of Chief Counsel on Emergency Response.

APPENDIX 1

Major signatories and a brief description of their Interagency Radiological Assistance Plan (IRAP) functions follows:

1. Department of Defense -- Operates a Joint Nuclear Accident Coordinating Center (JNACC), jointly staffed by DOD and DOE, that functions as a central information contact for radiological information and assistance coordination. Provides initial accident response by the installation closest to the scene.

2. Defense Civil Preparedness Agency -- Operates an extensive "National Warning System" communications network; distributes and maintains large supplies of radiation survey meters and dosimeters.

3. Department of Health, Education, and Welfare -- Monitors foods and other substances for contamination through the Food and Drug Administration (FDA). Attempts to minimize exposure to potentially injurious radiation.

4. Environmental Protection Agency -- Coordinates radiological assistance response of EPA (Office of Radiation Programs), BRH/FDA, and the Office of the Executive Director of Regional Operations (EDRO), FDA. Response consists of maintaining regional monitoring teams to measure environmental radiation, evaluating extent of contamination, collecting and analyzing samples, and advising on actions that should be taken for protection of public health and safety.

5. Nuclear Regulatory Commission -- Collects and evaluates facts and circumstances of incidents involving radioactive materials. Maintains a large technical, managerial, and professional staff available for use under TRAP, but, unlikg DOE, does not have extensive emergency equipment available.

6. Department of Energy -- Responsible for overall management and administration to implement the TRAP. Coordinates use of its and other agencies' resources in accident response.

The other signatory agencies to TRAP are the Department of Agriculture, the Department of Commerce, the Department of Labor, the Department of Transportation, the Interstate Commerce Commission, the National Aeronautics and Space Administration, and the Postal Service.

The other major signatories to the FICCC program, other than the NRC, and a description of their major responsibilities, follows:

EPA is responsible for (1) establishing protective action guides based on projected radiation doses that might result from radiological incidents at fixed nuclear facilities and (2) recommendations as to appropriate protective actions that can be taken by governmental authorities to ameliorate the consequences of a radiological incident at a fixed nuclear facility.1/

HEW is responsible for (1) assisting state health departments and professional organizations in the development of plans for the prevention of adverse effects from exposure to radiation, including the use of prophylactic drugs to reduce radiation dose to specific organs, (2) providing guidance on appropriate planning actions necessary for evaluating and preventing radioactive contamination of foods, 2/ and (3) providing guidance on emergency radiation doses related to emergency and medical personnel who might be contaminated in the recovery operation.

DCPA is responsible for (1) assisting state and local authorities in planning emergency preparedness actions required for response to radiological incidents, and (2) providing guidance on the use of civil defense resources for use in radiological incidents.

FDAA is responsible for (1) providing guidance to state and local authorities on state emergency planning for fixed nuclear facilities and (2) recommending to NRC appropriate guidelines for evaluation and review of state and local planning activities.

FPA is responsible for monitoring federal radiological emergency planning and training activities.

FICCC also established task forces on training and instrumentation both chaired by DCPA (Carbone deposition at 59). The training task force is charged with developing means that provide the states with the necessary training for response to radiological incidents (Carbone deposition at 60). DCPA has conducted courses for the chief advisors to the governors in which procedures for responding to peace time nuclear incidents are reviewed (McConnell deposition at 25). 3/ One such course was held for Pennsylvania approximately 1 year prior to the Three Mile Island incident (McConnell deposition at 26). The instrumentation task force, chaired by a DCPA technician, was still in the research and planning stage on March 28, 1979 (McConnell deposition at 16). This task force is currently studying the possibility'of using radiation monitoring instruments, originally distributed to the states by DCPA for use in nuclear attacks, for peace-time nuclear incidents, as well as the possibility of producing additional instruments for peace time use (Id.).

NOTES TO APPENDIX 2

1/ EPA's Office of Radiation Programs took on the responsibility under FICCC for establishing a manual for protective action guides that is intended to guide state and local governments in the development of emergency response plans. Galpin interview at 8-9. These guidelines set out specific actions to be taken to protect the public from radiation exposure and actions that can be taken at lower levels to reduce exposure resulting from a major accident at a nuclear power plant. Gerusky dep. at 11-13; Galpin dep. at 58; see "A Manual of Protective Action Guides and Protection Actions for Nuclear Incidents," September 1975.

2/ At the time of TMI accident, HEW had not yet published final protective action guidelines for food and milk. Villforth deposition at 14-151.

3/ These training courses cover, among other things, analysis of radiation readings and protective action.

A brief summary of the major provisions of BRP plans follows:

1. BRP Plan for a Nuclear Power Generating Station Incident, September 1977

Section 1 -- Scope. A general discussion of the scope of the plan which includes both the governmental structure of emergency management and steps to be taken to protect the public health.

Section II. Sets out three classifications of radiation incidents and establishes protocol for notifications and action, based in part on information given in NRC Guide 1.16 "Reporting of Operating Information - Appendix A, Technical Specifications."

- Class I incidents. Events of potential off-site "interest" but having little or no off-site radiological impact. The facility operator will directly advise BRP and will also directly advise the county civil defense organization for routine support services.

- Class II incidents. Events that involve actual loss or major reduction in the protection provided to the health and safety of the public. The facility operator will contact PEMA, who will then disseminate notice to BRP, appropriate county civil defense agencies, and federal agencies.

- Class III incidents. Events that threaten to lead to the release of radioactive materials to off-site areas in quantities and types sufficient to suggest action by off-site agencies for the protection of off-site population against inhalation and direct exposure hazards. The facility operator will immediately contact the county civil defense agency and PEMA. PEMA will then notify various levels of government, including BRP, and appropriate neighboring states and federal agencies.

The plan's basic premise is that a facility operator has the best knowledge of the status of his facility. Government agency responsibilities vary according to the seriousness of the incident. Basically, for Categories II and III, BRP, after the required notice from PEMA, is responsible for contacting the facility to obtain a description of the occurrence, prognosis, and recommendations. BRP will then relay this information and its recommendations back to PEMA. PEMA is responsible for coordinating and transmitting information to other state agencies, neighboring states, and appropriate federal agencies. In Category III incidents, PEMA will establish a state Emergency Operations Center and will exercise general direction and control over state, county, and local emergency operations. County civil defense agencies act as conduits of information to local governments which are responsible for carrying out prompt response functions (police and fire protection, for example) as applicable.

Section V -- Protective Action Guides and Protective Actions. This section reproduces the EPA "Manual for Protective Action Guides and Protective Actions, Chapter 2" (September 1975).

Section VI -- Accident assessment. Places joint responsibility for accident assessment on the facility and BRP, while recognizing that primary responsibility for early accident assessment and estimation of off-site consequences rests with the facility operator.

Section VII -- Protective action options. There are four principal protective actions: evacuation, sheltering, thyroid blocking, and respiration protection. This section of the plan details radiation dose measurements that would necessitate an evacuation, notes that sheltering should be used in severe incidents when there is insufficient time for evacuation, and directs that thyroid blocking be undertaken only with the approval of the FDA. Respiratory protection requires equipment not practicable for the public at large.

Section VIII -- Food protection. Contamination of fresh milk supply is considered a serious threat in this area because of the "effect of amplification of dose commitment through the cow." In light of this amplification effect, the population at risk from consuming milk is larger than that at risk from direct exposure. The plan details factors involved in determining the extent of risk, maximum doses of radiation in milk for safe consumption, and draft FDA protective actions for milk.1/ The plan also discusses protective actions for produce and water.

Section IX -- Resources. This section of the plan lists BRP equipment, staff, and resources as well as resources of other state and federal agencies that may be used in responding to nuclear incidents. Three federal resources are listed: (1) RAP Teams, from DOE as part of its IRAP responsibilities. They are available to assist state and local agencies in assessing the consequences of radiation accidents; (2) EPA, Office of Radiation Programs, maintains laboratory facilities and personnel to assist during an emergency; (3) NRC is expected to share its environmental sampling data with BRP.

BRP "assumes" that EPA and NRC would provide assistance to the state in the event of a reactor accident.

2. Three Mile Island Annex to the Pennsylvania Plan

The TMI Annex begins with a site description, an explanation of acronyms, a telephone directory, and prepared messages for broadcast or notification. The main portion of the Annex consists of a discussion of the various categories of nuclear incidents in relation to TMI. For each category, the Annex details postulated events, the population at risk, a sequence of events for notification of and response to the incident, a communications flow-chart, and a discussion of recovery measures. Type three and four accidents also have a response checklist, identical to the one in the utility's emergency plan. The accident categories are detailed as follows:

- Type one accident. Unplanned release of substantial quantities of waterborne radioactive material into the Susquehanna.

- Type two accident. Those occurrences at TMI with the potential to lead to unplanned releases to the atmosphere. In this event, Met Ed contacts PEMA and PEMA contacts BRP. BRP then calls Met Ed to assess the status of the plant using a checklist of questions included in the plan. BRP relays the information to PEMA and others.

- Type three accident. Those failures likely to lead to the release of significant quantities of radioactive material to off-site areas. A chain of communication similar to that for type two accidents is employed in type three accidents.

- Type four accident. Those events resulting from failure of the primary coolant pressure boundary accompanied by single or multiple failure of engineered safeguards or consequence-mitigating features. The chain of communications is similar to that used for type two and three accidents.

NOTES TO APPENDIX 3

1/ The plan notes that FDA protection action guides for fresh milk have not been finalized. As stated earlier, at the time of the TMI incident they still were not in final form.

APPENDIX 4

Annex E, Nuclear Incident (fixed facility), (August 1978), a seven-page document attached to the basic disaster operations plan, establishes policies and procedures for response to fixed facility nuclear incidents and assigns responsibilities for response to such incidents to government agencies. Three categories of nuclear incidents are defined: I, incidents which have no off-site radiological consequences, which arouse public concern, and which may require the support of off-site services (fire fighting and ambulance services); II, incidents which involve an actual loss or major reduction in the protection provided for public health and safety; III, incidents of sufficient severity for off-site organizations to take action to protect populations from direct exposure and inhalation hazards.1/

Annex E, following the conceptual basis of the basic disaster operations plan, states that:

> County and local governments have primary responsibility for off-site response to a nuclear incident and will provide the initial response to the incident.
>
> The State Council of Civil Defense [PEMA] will provide state off-site coordination of emergency planning and response to nuclear incidents.

Section VII of Annex E lists in general outline form the responsibilities of local and state governments:

VII. Responsibilities

A. Local Civil Defense

1. Maintain detailed planning for emergency services to support county civil defense operations (includes fire, police, and ambulance)

2. React to protective measures recommended by County Civil Defense Director.

3. Coordinate local government responses.

4. Maintain detailed planning for emergency operation (warnings, alerts, evacuation).

B. County Civil Defense

1. Main detailed planning for emergency operations (includes fire, ambulance, police, and rescue squads).

2. Maintain detailed planning for emergency operations (warnings, alerts, evacuations).

3. Coordinate local and county emergency operations.

4. React to protective measure recommended by Bureau of Radiation Health or the operator of the facility.

C. State Council of Civil Defense (PEMA)

1. Coordinate state response in emergency operations involving nuclear incidents.

2. Coordinate the state planning for emergency operations to support nuclear incidents.

3. Notify the Bureau of Radiological Health and appropriate state agencies of reported nuclear incidents.

4. Notify appropriate neighboring states.

5. Area Civil Defense Directors coordinate the county planning effort particularly in those instances where more than one county is within five miles of a fixed facility.

D. Department of Environmental Resources (BRH, now BRP)

1. Assess nuclear accident including interpretation of radiological monitoring measurements.

2. Identify protective actions and notify:

   a. First - involved counties

   b. Second - State Council of Civil Defense and other appropriate state agencies

3. Serve as lead state agency for technical assistance for radiological health and incident assessment.

4. Coordinate assistance from federal radiation protection agencies.

5. Provide plans for each nuclear facility as guidance for preparation of plans for affected counties.

E. Facility

1. Coordinate emergency plans with off-site agencies.

2. Provide for accident diagnosis and prognoses.

3. Develop does projections for off-site areas.

4. Make appropriate protective action recommendations to off-site agencies

NOTE TO APPENDIX 4

1/ The October 1977 version of Annex E included a fourth category involving a post-III situation requiring long-range recovery and rehabilitation. The version of Annex E in place at the time of the TMI accident did not include a post-III situation.

DAUPHIN COUNTY EMERGENCY PLAN FOR COMMUNITIES NEAR THE THREE MILE ISLAND FACILITY, 1975

The stated purpose of the Dauphin County plan is to set forth procedures and guidelines to be utilized by authorized emergency personnel in Middletown, Royaltown, and Londonderry townships. The plan is intended to "provide for the orderly and efficient handling of area residents during time of serious incidents emanating from Three Mile Island." Included in the plan are areas of responsibility, communication information (telephone, radio, television) maps, mass-care sites, evacuation plans, and general information regarding radiological incidents.

The plan indicates that the heads of local government direct actions to be taken in an emergency. The county civil defense coordinator is responsible for assisting the local director in any manner requested. The local civil defense director has the overall responsibility for the coordination of information and resources.

Responsibility for the movement of people from danger areas rests jointly with PEMA, the Dauphin county civil defense director, and local civil defense directors. Decisions concerning the need for evacuation are based upon information received by the county director and/or local directors from the state, from information of anticipated events, or from reports of events which have already occurred.

YORK COUNTY -- PROCEDURES TO BE FOLLOWED SHOULD AN ACCIDENT OCCUR AT THE PEACH BOTTOM ATOMIC POWER STATION, THREE MILE ISLAND ATOMIC POWER STATION, 5-MILE EVACUATION, JUNE 1978

This eight-page plan is based on the principle that detailed plans usually are discarded in the turmoil of an emergency. Given this assumed fact, the plan provides that the best way to operate in an emergency is to get qualified people into the county emergency operations center who have established duties involving information distribution to relevant agencies and proceed based on the specific situation presented by the incident. The plan notes that in the event of an accident numerous state and federal agencies will probably appear on the scene. In regard to this, the plan states, "While we will give all agencies our complete cooperation, our first duty is to the safety of the York County resident."1/

LANCASTER COUNTY -- EMERGENCY PLAN FOR COMMUNITIES NEAR THE THREE MILE ISLAND FACILITY, OCT. 1, 1977

This plan sets forth procedures and guidelines to be utilized by emergency personnel in five Lancaster County townships and boroughs in the event of an accident at TMI requiring evacuation of people within 5 miles of the plant.

Patterned after the Dauphin County plan, it imposes responsibility for the evacuation of people from affected areas upon PEMA, Lancaster County Civil Defense, and directors of local communities. Evacuation decisions are based upon information received by the county civil defense

director or local directors from PEMA, warning notices, or reports of events which already have occurred. The 42-page document includes telephone numbers, maps, community statistics, listings of mass facilities, evacuation plans, state police plan, evacuation policies, and radiological information.

The plan provides for the participation of hospitals in the emergency response. Hospital notification procedures are included in the plan. However, hospitals are expected to provide their own plans.

Local directors located within 8 miles of the plant received copies of the 1977 plan. In February 1979 county residents within 7 miles of TMI received cards with instructions for response to a nuclear accident.

NOTE TO APPENDIX 5

1/ 8,000 information cards were printed and distributed to local residents to inform them of the existence of the plan (Jackson interview at 9).

REPORT OF THE
OFFICE OF CHIEF COUNSEL

ON

EMERGENCY RESPONSE

BY

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October 1979
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TABLE OF CONTENTS

This report is a narrative account of the actions of various individuals and organizations that responded to the accident at Three Mile Island. The purpose of the report is not to examine any particular aspect of the response in detail, but to sketch the principal events of the accident to provide an overview of an extremely complex phenomenon. For this reason, technical developments in the reactor and radiological monitoring efforts are described only to the extent that they are necessary to an understanding of the actions of those who became involved in the off-site response to the accident.

The report is the result of approximately 8 weeks of investigation in Harrisburg, King of Prussia, and Washington, D.C. Over 60 depositions and interviews were taken and several thousand pages of documents were produced. Still, this report, the product of one aspect of the legal staff's investigation, is at best a foundation. We hope that other investigations may build on the material presented here to contribute to a better understanding of the accident at Three Mile Island.

I. WEDNESDAY, MARCH 28, 1979

The problems that emerged as early as Wednesday morning developed and became more serious as the incident evolved into a protracted crisis. Federal, state, county, and utility emergency plans were devoted in large part to the establishment of procedures for notifying organizations of a radiological incident; Wednesday morning's events illustrate that process in operation.

A. EARLY NOTIFICATIONS: 4:00 A.M. TO 9:00 A.M.

1. State Organizations

The Three Mile Island accident began approximately 4:00 a.m. on March 28, when the TMI-2 turbine stopped or "tripped," causing the reactor to trip seconds later. As plant operators struggled during the next 3 hours to bring the crippled reactor under control, various radiation monitors reached their alarm set-points, indicating rapidly increasing levels of radioactivity throughout the plant. At 6:56 a.m., TMI shift supervisor William Zewe declared a "site emergency," 1/ which is defined by the TMI emergency plan as: ". . . the occurrence of an incident which could potentially result in an uncontrolled release of radioactivity to the immediate environment."2/

The declaration of a site emergency required the utility Metropolitan Edison (Met Ed), to notify the appropriate state and federal authorities under various plans applicable to radiological emergencies. 3/ The first notification by the utility began a series of telephone calls that rapidly carried the news of the TMI emergency to several organizations responsible for different aspects of a response to radiological emergencies. 4/ The state emergency plan required Met Ed to notify the Pennsylvania Emergency Management Agency (PEMA), the county civil defense offices, the state Bureau of Radiation Protection (BRP), and the Nuclear Regulatory Commission (NRC). It appears that all of these organizations were contacted directly, except BRP. The TMI plan permitted Met Ed to notify either PEMA or BRP "as required."

Zewe called the PEMA duty officer, Clarence Deller, at 7:00 a.m. and told him there had been an emergency in TMI-2 and that the unit had been shut down. Deller was also informed that "[t]here is a high level of radiation in the reactor room but no off-site release." 5/ Zewe asked Deller to notify BRP and to ask BRP to call the plant. 6/ Once notified of a radiological incident, PEMA is required to begin notifying state and county organizations. 7/ Oran Henderson, director of PEMA, described the nature of the information transmitted:

> Now, we have an understanding with all of the power plants that the call to us merely describes, in general terms, the incident or the seriousness of the incident. It does not try to get into any of the technical terminology, that our request is to, when we notify our Bureau of Radiation Protection, they in turn must go back to the plant and get more specific details on what the incident is. In the meantime, we go through the procedure of alerting other counties, and this is merely an alerting type of

procedure. It is not requiring any action or directing -- it might be preparedness -- but it is not saying do this or do that. It is merely advising them.

A few minutes later, we will get another call back from our Bureau of Radiation Protection advising us as to the seriousness of the incident, and the types of protective action that we should or should not take.8/

When Deller called BRP, however, there was no answer. He reached BRP's duty officer, William Dornsife, at home. He told Dornsife that a site emergency had been declared at TMI and asked him to call the plant to find out the details.9/

Upon receiving the call from PEMA, Dornsife began his agency's own notification procedure by calling Margaret Reilly, BRP's Chief of the Division of Environmental Radiation. Dornsife told Reilly of the TMI site emergency and asked her to call ahead to the office to establish an open line with the plant. 10/ Dornsife then called the plant, but the TMI switchboard could not connect him with the control room. 11/ He left his name and home number, and requested the control room to call him. At approximately 7:15 a.m., TMI returned Dornsife's call:

They told me that they had declared a site emergency. There were high radiation levels in the plant, and they thought they had a small loss of coolant accident, which was now terminated. They said that the leakage was terminated and the plant was stable and being cooled normally.

Then, they told me that they had taken on-site surveys, found no detectable radiation on-site outside the plant. There was no release occurring. They made no recommendation for protective action.12/

Even as Dornsife spoke to the plant, however, conditions were rapidly changing:

I remember while I was on the phone, there was an announcement in the background to evacuate the fuelhandling auxiliary building. It didn't hit me until I heard that. And I said to myself, "This is the biggie," when I heard that announcement.13/

Dornsife was quickly transferred to a member of the TMI health physics staff, who assured him that no off-site releases had occurred and promised to call back. Having already asked Reilly to establish an open line from BRP to TMI, Dornsife felt that there was nothing further for him to do but to proceed to the office.

As Dornsife spoke to the plant, PEMA's Deller completed his calls to the three affected counties, Dauphin, York, and Lancaster. There was no answer at the York County Emergency Operations Center, so Deller asked the Lancaster County emergency management agency to relay the report of the incident at TMI to the York County dispatch center. When Deller called the Dauphin County Office of Emergency Preparedness at 7:08 a.m., he found that the office had already been notified by Met Ed.

Dauphin County's director, Kevin Molloy, first learned of the incident through a call at home from BRP's Margaret Reilly, who wanted to give Molloy an "early warning" in the event the utility failed to notify county authorities. 14/ Reilly told Molloy that there was a problem "involving some high readings" at TMI, but that the incident was contained on-site and did not require an evacuation. 15/ Their conversation was interrupted by a page over Molloy's fire department monitor requesting Molloy to clear his telephone line and to call the office. When he called his office, he was told that there had been a "slight," rather than "site," emergency.16/

As Molloy drove to work, he heard over his two-way radio that the TMI incident was now a "general site emergency," but he attached no significance to the term. 17/ In the TMI plan, however, a "general emergency" is an "incident which has the potential for serious radiological consequences to the health and safety of the general public." 18/ When Molloy arrived at the office, he called PEMA and was informed that no evacuation was necessary. He began to relay the news of the incident to the towns in the immediate vicinity of the TMI plant. None of the towns had evacuation plans.19/

At the site, the general emergency had been declared by Gary Miller, TMI station manager and emergency director, based on the greater than 8 R/hr radiation reading on the reactor containment dome monitor. This reading corresponded to 800 R/hr when corrected for shielding around the detector.20/ From this reading, the Met Ed health physics staff calculated the exposure to the nearest population, using wind speed, direction, and weather conditions.21/

At 7:37 a.m., Molloy received a call from Richard Dubiel, TMI-2's supervisor of radiation protection and health physics, on the 911 emergency telephone line. The conversation was taped:

DUBIEL: Okay, we are in for real.

MOLLOY: Okay.

DUBIEL: What type, we are not exactly sure. We got the core covered right now. I don't think we got a real big problem, but we have got some bad radiation readings that could, in fact, be erroneous, but we can't rely on that, okay? What I need is, I need to get Maggie Reilly informed and back **in** touch with us as soon as possible. Okay?22/

Molloy called PEMA, not Reilly, following his normal chain of command, and asked that Reilly be contacted.23/

When Met Ed informed PEMA at 7:35 a.m. that a general emergency had been declared, PEMA had notified only the three affected, counties and BRP.24/ PEMA's operations officer, Lamison, recorded in his log that he was told by the TMI shift supervisor that he should change the "alert status to general alert situation," and that the reactor had tripped because it "failed-to-fuel."25/ Lamison called Reilly at BRP to notify her of the general emergency and to request instructions.

According to BRP Director Thomas Gerusky when BRP called the utility,

> [i]t was calculated and given to us that the dose rate directly west of the plant across the river would be 10 R/hr from noble gases. That is the information we got over the telephone.26/

Reilly relayed this information to PEMA (which according to its log interpreted the potential exposure to be 10 mr/hr off-site) 27/ and told PEMA that it would be advisable to make preparations for a possible evacuation from Brunner Island and Goldsboro, but not to execute an evacuation until further notice. 28/ PEMA immediately transmitted the BRP recommendation to York County Emergency Director Leslie Jackson, who placed his emergency personnel, many of them volunteers, on alert. Met Ed sent a monitoring team off-site by helicopter to verify the calculated 10 R/hr dose.29/

At 7:45 a.m., Henderson called Governor Richard Thornburgh, whom he had met previously only briefly. Henderson informed Thornburgh that there had been an accident at TMI and that Henderson was notifying the appropriate state authorities. Thornburgh asked Henderson to notify Lieutenant Governor William Scranton, the chairman of the Pennsylvania Emergency Management Council, and to keep the governor's office informed. 30/ The governor's conversation with Henderson was brief. The governor left a meeting at 8:13 a.m., however, to call Paul Critchlow, his press secretary and director of communications, to tell him that there was "some sort of problem" at TMI.31/ The governor asked Critchlow to inform Scranton and to find out what Critchlow could about the incident. 32/ As the incident progressed, Critchlow's role became that of investigator, confirming the reliability of information received by the governor's office through even "official" channels.

Within minutes of the governor's call to Critchlow, Met Ed confirmed that there was no measurable radiation dose off-site; this information was transmitted to Reilly, who in turn advised PEMA to lift the York County evacuation alert. 33/ As the less urgent notifications were completed by PEMA, the state emergency system waited for more information.

2. Federal Organizations

As the news of the accident was passed to state organizations by PEMA, various federal agencies were also notified. The federal agencies that were alerted on Wednesday morning can be grouped into three categories covering different responsibilities. The first agency notified was the NRC, which has direct regulatory responsibility for the actions of the licensee. The second category consisted of the agencies responsible for environmental monitoring, the Department of Energy (DOE) and the Environmental Protection Agency (EPA). The third category consisted of the federal emergency management agencies, such as the Federal Preparedness Agency (FPA) and the Defense Civil Preparedness Agency (DCPA). Although only the NRC and DOE were actively involved on Wednesday morning, all of these agencies were notified under established procedures.

Immediately after declaring a site emergency, Met Ed called the NRC Region I office in King of Prussia, Pa.34/ The call was received at

7:04 a.m. by the Region I answering service, which could not reach the duty officer, who was enroute to the office. 35/ At 7:44 a.m., the utility called Region I again, this time to notify it of the general emergency, and was told that the answering service had been unable to reach the duty officer, but that the switchboard would open at 7:45 a.m. to receive messages. At 7:50 a.m., the NRC Region I office established telephone contact with the TMI-2 control room.36/

Region I initially took three steps. In an emergency, Region I's assigned role under the NRC Headquarters emergency plan is to assume responsibility for responding to an incident while the NRC Headquarters Emergency Management Team (EMT) assembles. 37/ Thus, Region I first established its Incident Response Center (IRC) as its central emergency response station. 38/ The IRC is a reserved room in the King of Prussia offices designed to facilitate prompt information relay:

> [I]t is just a more elaborate phone system, which enables two or three people to talk at the same time and enables people to be in one room when they can transfer information back and forth to each other, and the room has status boards, and we have facility plans, emergency plans available and we have aerial maps, and some aerial photographs, and we also have some walkie-talkies, which we use, citizen band types, with government frequencies, that we can use on location.39/

The IRC was activated at 8:00 a.m., and an open telephone line to the site was established "within the next five minutes."40/

Second, Region I dispatched to the site an emergency team consisting of five NRC Region I employees: a radiation and investigation specialist, Charles Gallina; a reactor inspector, James Higgins; and three health physicists, Donald Neely, Carl Plumlee, and Ronald Minitz. 41/ The team's responsibility was "to gather information and to evaluate conditions as we see them, and relay that information to the Region and Headquarters."42/ The team left at 8:45 a.m. and arrived at the TMI control room shortly after 10:00 a.m.43/ Several other Region I representatives were dispatched during the day.44/

Third, Boyce Grier, Region I director, decided to send the region's mobile laboratory to the site. 45/ The mobile laboratory, containing a variety of "analytical equipment" is normally used in site inspections to verify the accuracy of analytical results reached by the licensee and to analyze samples collected by NRC inspectors. 46/ When the accident began, the laboratory was in use in Connecticut At Grier's instruction, George Smith, Region I's chief of the Fuel Facilities and Safety Branch, ordered the lab to return to regional headquarters, to pick up supplies, and to proceed to TMI.47/ The laboratory arrived at King of Prussia at 4:30 p.m. and at the site at 7:00 p.m.48/

NRC Headquarters in Washington-Bethesda also responded to the general emergency by activating its Incident Response Center (IRC) and establishing communications with the site. The IRC, designed to "improve the agency's [NRC] ability to respond promptly to an emergency situation,"49/ contains special communications equipment.

The first federal agency with substantial environmental monitoring capability was notified at 7:09 a.m. when Met Ed telephoned the Department of Energy Radiological Assistance Program office at Brookhaven National Laboratory. DOE was alerted to the site emergency and was placed on standby under a pre-established agreement between Met Ed and Brookhaven. 50/ Brookhaven was later notified of the general emergency at 7:35 a.m. The calls to Brookhaven were made under the Department of Energy's Radiological Assistance Program (RAP) by which DOE makes available to the states and to commercial nuclear reactor operators the resources of its network of national laboratories in detecting and monitoring radiation. 51/ Both Met Ed and BRP had made arrangements with DOE's Brookhaven National Laboratory for assistance under RAP in the event of a radiological incident. For radiological incidents requiring a broader range of federal resources, various federal agencies can be requested to provide assistance under the Interagency Radiological Assistance Plan (IRAP), which is coordinated by DOE as the lead agency.52/

Within 2 hours of the declaration of a site emergency, Brookhaven had called BRP's Reilly to inquire whether the state wanted assistance. Reilly responded that no assistance appeared to be necessary at that time, but that she would contact Brookhaven later in the day.53/ At 8:45 a.m., Brookhaven called the DOE Emergency Operations Center in Germantown, Md., to activate DOE's Emergency Action Coordinating Team (EACT), a group of senior officials authorized to commit DOE resources to assist in significant radiological emergencies.54/

The Environmental Protection Agency was notified of the incident at 9:04 a.m. by the NRC under a memorandum of understanding between the two agencies. 55/ The call was received by Floyd Galpin, director of the Environmental Analysis Division of the EPA's Office of Radiation Program (ORP). ORP performs environmental radiation monitoring and analysis and is the EPA's IRAP representative. ORP also works closely with the states in the preparation of radiological response plans and protective action guides. 56/ When notified of the TMI accident without a request for EPA assistance, Galpin reported to his supervisors that the incident had occurred, placed the ORP radiological assistance team and mobile laboratory on alert, and followed developments.57/

The federal emergency preparedness agencies were also alerted on Wednesday morning. The Defense Civil Preparedness Agency's (DCPA) Operations Office in the Pentagon learned of the incident through a wire service report, contacted its regional office in Olney, Md., and was informed that the regional office had already been notified of the incident by PEMA at 8:45 a.m., although no details on the status of the plant were known.58/ The DCPA Operations Office then called the NRC Operations Center in Bethesda in an attempt to determine the scope of the incident, 59/ and also notified DOE, HEW, and EPA.60/ These communications were part of a chain of communications established by DCPA. Under the state emergency operations plan, PEMA is required to notify DCPA in any kind of emergency, which it did.61/ The DCPA Operations Center, as part of its own standard operating procedures, notifies NRC, EPA, and DOE when it learns of any incident involving a release of radiation or toxic substances.62/

Between 9:00 and 9:30 a.m., Thomas Hardy, acting regional director of Region III of the Federal Preparedness Agency (FPA), was notified of the accident by the DOE acting regional director. Hardy confirmed the accident by calling the NRC Region I office and then informed the FPA's national office. 63/ Shortly thereafter, the FPA's national office was also notified by Harold Collins of the NRC.64/ Those notifications were made under the Federal Response Plan for Peacetime Nuclear Emergencies (FRPPNE), a plan that was not completely inished at the time of the TMI accident. 65/ Hardy then contacted PEMA and learned that Henderson did not believe that federal assistance was necessary. 66/ The Federal Disaster Assistance Administration (FDAA) learned of the incident through a news bulletin rather than through any formal notification. 67/ The FDAA was interested in sending an observer to Harrisburg and suggested that the regional office contact PEMA, which indicated that no FDAA representative appeared to be necessary.68/

As of 9:00 a.m. on Wednesday morning, the plans were working. Met Ed had promptly notified federal, state, and county emergency management authorities of developments at the site, and the information received from the utility was efficiently communicated to other persons and organizations potentially responsible for responding to the incident, although some technical information apparently had been garbled by state and county emergency personnel. When the general emergency was declared, technical personnel at Met Ed, BRP, and PEMA alerted the county director of the possibility that a small area near Goldsboro might need to be evacuated, providing a clear illustration of the relationship between the utility and state authorities as it is intended to function during a radiological incident. Events at the site and the utility's projection of off-site consequences were promptly communicated to the proper state authorities. BRP, in direct communications with the site, provided PEMA with a technical assessment that was efficiently communicated to the county and, in turn, local levels. The evacuation alert was lifted in the same manner when off-site readings indicated that there was no public health threat. After 9:00 a.m., however, the response to the accident passed into a different phase.

B. THE EARLY DEVELOPMENT OF INFORMATION AND COMMUNICATION PROBLEMS: 9:00 A.M. TO 12 NOON

After the initial notifications were completed, efficiency began to break down as pressure built on state and utility officials to acquire and to publicize information about the incident. For the state officials with the responsibility to frame and articulate the state's position and response, reliable information seemed difficult to acquire, understand, and communicate. For the utility with the responsibility to solve the problems at the site, the failure to appreciate the repercussions of easily misunderstood "routine" operations and the attempt to allay public concern with optimistic public statements caused an immediate and irreparable strain in its relations with state decision-makers. These problems began to emerge on Wednesday morning and came into clearer focus as the incident developed.

1. State Organizations

As the morning wore on in a prolonged state of alert, state, county and local emergency management officials, who were aware only that an equipment malfunction had created an emergency, felt the need for more information as inquiries from the public and the press were received. At the local level, the Middletown civil defense director described Wednesday morning as follows:

> But, anyway, we took the necessary action here, that all of our superintendents and their personnel would be briefed and know that they, we, are going into some type of emergency. And then we started getting, oh, my, the switchboard out there. When I say switchboard, now, I am talking about ten phones. They started to light up and jam us up. People wanting to know what was doing at the observation post of Met Ed's -- what with all these calls coming in, I got a hold of the police chief and requested we kick out one of our patrols to go down 441 and see what the trouble is . . . When he got there, that is when he was advised by the employees of Met Ed they were reporting for work and the guards would not let them on the Island. So this is when we started to put two and two together that something just a little bit more than an on-site emergency. . . was in . . . progress . . .69/

At the county level, the entire morning was devoted to placing calls to PEMA to learn whether there had been any developments and to relaying "what little we knew" to people at the local level. 70/ Between 9:15 and 10:45 a.m., PEMA itself had received calls concerning the accident from a television station in Portland, Ore., UPI, Nucleonics Week, and The Washington Post.71/

Lieutenant Governor Scranton was notified of the TMI incident by PEMA at 8:20 a.m. By coincidence Scranton had previously scheduled a press conference on energy matters for 10:00 a.m. When Henderson discussed the morning's events at TMI, he suggested that the Lieutenant Governor might want him present at the conference, but Scranton "considered it would detract from [the] purpose."72/

As the time for the press conference drew nearer, Scranton began to try to gather enough facts to make a public statement on the TMI incident. At 9:30, one-half hour before the scheduled press conference, the lieutenant governor's office requested BRP to send someone to brief Scranton and to participate in the press conference. William Dornsife, a nuclear engineer and the BRP duty officer originally contacted by PEMA, was selected. Before leaving for the lieutenant governor's office, Dornsife called the plant and received a detailed briefing that included the information that the plant operators were certain that there had been an amount of failed fuel. 73/ Despite Scranton's earlier indication that Henderson would not be needed at the press conference, Henderson was called by the lieutenant governor's press secretary at 9:30 a.m. and asked to attend the briefing and the press conference.74/

In the lieutenant governor's office, Dornsife briefed Scranton and a press statement was prepared stating that although there had been an

accident and a small release of radiation into the environment, no increase in normal radiation levels had been detected and there was no danger to the public health and safety.75/ As the 10:00 a.m. press conference was delayed while the statement was being prepared, Critchlow, the governor's press secretary, had mixed emotions: "I didn't feel that we knew enough. We didn't have anything to say at that point."76/

The press conference became the kind of episode that would be repeated throughout the TMI incident. Even as Scranton's press statement was being prepared, events took place that made it partially inaccurate before it was given. At approximately 9:45 a.m., Met Ed called BRP and reported that it had detected increased radiation levels off-site, including small amounts of radioiodine. 77/ Just before Dornsife went into the press conference with Scranton, he received a call from Thomas Gerusky, director of BRP, who told Dornsife about the radioiodine detected off-site. 78/ Dornsife apparently had no opportunity to pass that information to Scranton.79/

Scranton gave his prepared statement that although a small release has occurred, no increase in radiation levels had been detected. When he repeated that statement during the question and answer period, however, he was promptly contradicted by Dornsife, who had no prior experience dealing with the press:

> LIEUTENANT GOVERNOR: We have no detection, no way of telling exactly how much radiation was released, because there could not have been any detected in the atmosphere.
>
> SEXTON [reporter]: Do you know it's small because ...
>
> DORNSIFE: Metropolitan Edison immediately sent people out at the plant boundary and to Goldsboro, because the wind was blowing toward that direction to take readings. Before we came up here, I got word that they had detected a small amount of radioactive iodine in the ground.80/

According to Dornsife, his statement that radioactivity had been detected off-site "caught everybody offguard" and the lieutenant governor and his staff "weren't very pleased when I stepped up and said they found radioactivity on [sic] site."81/

Acquiring information had been difficult for state officials throughout the morning. It was just as difficult to communicate to the media what little information was available. Dornsife described the experience as follows:

> So I told them about the iodine release, the iodine sample that they found positive. And I tried to relate that to the Chinese fallout episode that had occurred two years earlier, that the levels we found were very, very high. We didn't expect that this would exceed those levels. And those levels. And there was no protection required.

Then they got into the discussion of what had happened. So, I explained that there was a problem in the secondary system and it caused the reactor to trip and started going through the sequence. I was interrupted many, many times for more information in certain areas. And I could see from the very early stage that, by the questions being very technical in nature in most cases and my answers being over the heads of the reporters, we were getting nowhere. And we just got bogged down in technical details.

Q. Are you saying that the press did not understand what you were saying?

A. That's the impression I got, by the questions they were asking, it was obvious that my discussion of what had happened was completely over their heads. It was difficult for me to get any -- down on any lower level and still keep the substance of what had happened, because it is very difficult when somebody is asking engineering questions to answer with anything other than engineering answers. And they just weren't equipped to -- they had the right questions, but they just couldn't get the answers. And all this caused more questions -- more confusion.82/

Scranton ended the press conference at 11:30 a.m. and then briefed the governor. As he left the governor's office at noon, he received his first indication that there would be communication problems with Metropolitan Edison. A reporter told him of a news report that Met Ed had said that there was no release of radiation off-site, a contradiction of Scranton's statement at the press conference one-half hour earlier. Scranton could only reply that to his knowledge there was off-site radiation and that he was sticking with that story.83/

2. Federal Organization

Jessica Tuchman Mathews of the National Security Council (NSC) staff was notified of the general emergency at 9:00 a.m. by NRC Commissioner Victor Gilinsky.84/ The contact was purely informal -- Gilinsky felt that "somebody in the White House should be aware this had happened," 85/ and he and Mathews, who holds a doctorate in biophysics, had on prior occasions discussed nuclear issues, one of Mathews' areas of responsibility at the NSC.

Mathews prepared a memorandum setting out the little information she learned from her conversation with Gilinsky, and carried it to the President's national security advisor, Zbigniew Brzezinski.

He read it. He asked me was this a major incident. I said it was too soon to tell, but it seemed to have the potential to be, and that the news was being made public.

He said did I think it was important enough for the President to be informed of. I said yes, and he then took this memo and went down to inform the President.86/

Mathews was directed to keep informed about the incident.87/

At the TMI plant, there appeared to be no off-site hazard, but the on-site radiation levels were disturbingly high, causing Met Ed to relocate some employees out of the immediate area. When the Region I team arrived at the site shortly after 10:00 a.m., the commotion at the gate indicated that something "significant was going on."88/ The team passed through the site's "processing center," where they obtained on-site badges, and proceeded to the TMI-1 control room. 89/ On the way there, they noticed that TMI "was essentially evacuated."90/

The NRC team arrived at the TMI-1 control room at approximately 10:20 a.m.91/ and was briefed on the status of the reactor by the TMI-1 superintendent, James Seelinger. 92/ After the briefing, NRC's Higgins and Neely left the others to go to the TMI-2 control room. 93/ Circumstances there were somewhat more alarming than in TMI-1:

> [W]hen we first wanted to go, just about that time, they had high radiation, airborne radiation in Unit 2 control room and other parts of the Unit 2 plant, and so we had to get respirators before we could get over there, and got our respirators, and after that delay, did get over to the Unit 2 control room.
>
> Q. What was the situation at Unit 2 control room when you got there?
>
> HIGGINS: The situation at Unit 2 control room there were probably 20 to 30 people in the Unit 2 control room, operators, supervisors, and some health physics and maintenance personnel in the Unit 2 control room. Everybody in the Unit 2 control room was in respirators by that time, and we brought our own with us, and had to stay in the respirators until sometime later in the afternoon.
>
> Q. How did the need to use resporators complicate the ongoing activities in the Unit 2 control room?
>
> HIGGINS: It made communications very difficult. It was difficult to discuss plans and actual situations, and this type of thing and made communications difficult not only among the plant operators and plant management and the various people that were involved in the discussions, trying to decide which course of action to take, but also for communications back over the phones that I was trying to make, back to the region and the region back to Washington.94/

Met Ed was using the TMI-1 control room "as an emergency response center to address the radiological aspects of the incident," 95/ while the accident was being actively managed from the TMI-2 control room.

The different functions of the two control rooms resulted in a separation of information -- radiological information came from TMI-1, operations information from TMI-2. Region I personnel in TMI-1, the radiological information center, had a direct line to the King of Prussia offices and another line to BRP.96/ Lines between King of Prussia and BRP were less direct: "If Region I wanted to tell the State anything,

they would have to tell the NRC inspector on the site, and then have him go to another phone to relay the message." 97/ The TMI-2 control room also had a direct line to Region I offices, enabling the NRC regional personnel to obtain information concerning the status of the reactor. 98/ The region did not at any time have direct communication with the plant observation center, an important center of activity during the accident.99/

Communications between headquarters and the site were breaking down. As Victor Stello stated:

> The original communication system was very poor. We had an arrangement where an engineer sitting here in the operations center was talking to another engineer in Region I who was in turn talking to someone from the site. The communication system was burdened with requests and the need for information of a variety of sources that could bypass the system that we had here saying it in a different way, people could call up Region I and ask Region I directly to try to get information, as well as the engineer sitting here communicating with Region I, so there was a burden on the one link of the communications system, and for some period of time we had lost communications. Communications got very difficult when they had to put on masks and they had to leave the control room to go over to Unit 1 and get back and forth for information, so the ability to get information was strained. It was not very good.100/

At about noon, NRC Headquarters requested that the Region I direct line be changed to link the TMI-2 control room to Headquarters rather than to the Region I office. The result was that NRC Headquarters had direct access to operations information from the TMI-2 control room, while Region I had direct access to TMI-1 radiological information. As Boyce Grier, the regional director, stated:

> [W]hen that was done, we really were, to a great extent, out of the relay of information, at least as far as the information from the Unit 2 control room went. Now, we had two channels of communication with the site, with Unit 2 control room and with Unit 1 control room where the licensee had established his emergency operations center, so we used the information, the communication channel from Unit 2 control room to pass operational information, and the communications with Unit 1 control room to pass radiation and environmental information. We were continuing to relay radiological and environmental information, but direct headquarters communication was established about the middle of the day with Unit 2 control room, so in effect we were out of the relay at that time.101/

The NRC Headquarters' desire to have a direct communications link was shared by the federal emergency planning agencies. After receiving a status report from the NRC, Robert McConnell, the assistant director of DCPA, called the DCPA regional office in Olney and instructed the acting director to have a DCPA field representative report to the PEMA Emergency Operations Center and to remain there until further notice.102/ Since DCPA funded 50 percent of PEMA's operations, McConnell felt justified

in sending personnel even though DCPA had no explicit authority to do so:

> First, if the State Office of Emergency Management became involved they are in fact 50% paid by DCPA and therefore, we're always interested in what they're doing and we offer our services to help. Without any specific authority to do so, we always respond with our regional staff to work with the state staff to perform in an assistance role, not to take over or to handle any particular task, but merely to release them of duties should they become involved in a peacetime emergency.103/

McConnell informed Henderson of this decision; Henderson "didn't object."104/

At approximately 10:00 a.m., FDAA Administrator William Wilcox, having learned of the TMI accident through a news service bulletin,105/ called Robert Adamcik, the regional director of FDAA, and suggested that Adamcik go to PEMA offices in Harrisburg "as an observer" because this seemed to be "an unusual situation." 106/ Adamcik had not heard about the accident, but indicated to Wilcox that he did not think it appropriate to send an FDAA representative. 107/ Adamcik's deputy called PEMA and was informed that the situation appeared to be under control and that PEMA did not think an FDAA representative was necessary.108/

Earlier, DOE's Brookhaven National Laboratory had offered assistance and BRP had declined. By 9:45 a.m., however, it became evident to BRP's Reilly that radioactivity was reaching the environment off-site. When Brookhaven called again to offer assistance, she accepted. 109/ In response to the BRP request, DOE dispatched a Radiological Assistance Program (RAP) team from Brookhaven by Coast Guard helicopter. When the team arrived at the site, it made contact with BRP and fanned out around the facility to take soil, air, and vegetation samples.110/

At approximately the time of BRP request, DOE offered to provide to …he NRC an Aerial Measuring System/Nuclear Emergency Search Team (AMS/NEST) equipped with aircraft capable of tracking the plume of any radioactivity above the TMI plant. The NRC at first declined the offer of an AMS survey (and of a Brookhaven RAP team), but at 11:00 a.m. requested that the AMS aircraft be dispatched to Harrisburg.lll/

C. INFORMATION GATHERING: 12 NOON TO 12 MIDNIGHT

To state officials and to the press, information about the accident seemed difficult to acquire and to understand. Even worse, as early as Wednesday afternoon sources reporting on conditions at the site seemed to contradict one another, a problem that would exasperate decision-makers and the press, and escalate public anxiety over the next 5 days.

At noon, Scranton was told by a reporter that Met Ed had stated that there was no off-site radiation. At his press conference, however, Scranton had stated there had been a small release and Dornsife had said that radioiodine had been detected off-site. More alarming, however,

was the report received early Wednesday afternoon from BRP Director Thomas Geruksy that increases in radioactivity -- apparently resulting from a venting by Met Ed -- had been monitored for a period of more than 2 hours between 11:00 a.m. and 1:30 p.m.112/ Not only had Met E! reportedly contradicted the state's first public statement about the presence of radiation off-site, but it appeared that the utilty was intentionally venting radioactivity into the atmosphere without consulting the state. Scranton's staff, extremely upset that the state had not been notified of the release, asked Met Ed to send a representative to the lieutenant governor's office that afternoon so that the state could determine first- hand what was happening at the site. Paul Critchlow, the governor's press secretary, was disturbed enough to want a lawyer present; he requested a deputy attorney general to attend the meeting.113/

John Herbein, Met Ed vice president for generation, arrived at the lieutenant governor's office at 2:30 p.m. With him was George Kunder and Gary Miller, who did not want to leave the management of the accident at the site, but was "strongly urged" by Met Ed management to attend Scranton's briefing. 114/ Herbein denied that any Met Ed representative had said that there had been an off-site radiation release as a result of the accident. 115/ Gerusky told Herbein that a radioactive release had been monitored between 11:00 a.m. and 1:30 p.m. and complained about Met Ed's failure to notify the state. Herbein admitted that the release had occurred, but remarked that the release was merely "normal ventilation" to relieve pressure. He also revealed that some controlled steam venting might later be required as the system recovered from the accident. Asked why he had not revealed the release during his own press conference earlier in the day, Herbein replied that "it didn't come up."116/

Scranton described the tone of the meeting:

> Herbein came up here and told us that they had not lied to anybody, that there was a venting, and we were very upset and indicated that there had been no indication to us that there has been any venting, and that he said he didn't know of anybody from Met Ed that had said that there was no off-site radiation. They were a little bit on the defensive. It was not the most cheery get together.117/

The 2:30 p.m. meeting strained relations between state officials and Met Ed to the point where state officials practically dismissed Met Ed as a credible information source. The increasing participation of the executive officials brought to the decision-making process a concern for the public's perception of events that the technical staffs never fully appreciated. An indication of the state's concern was that the state officials considered it extremely important to extract explicit assurances from Herbein that the state "would be kept informed in a moment-by-moment basis of any releases, planned or unplanned."118/ Although no one in the state government accused Met Ed of deception, it was believed that the utility did not understand the repercussions of actions, such as the afternoon venting, and that it would be likely to be optimistic in its interpretation and description of events.119/ Paul Critchlow stated:

> I knew then that their MO was likely to be minimal -- was likely to minimize all these kinds of events. Right from that moment on, we had virtually nothing to do with Met Ed.120/

Met Ed's lack of credibility led state officials to avoid associating the governor and lieutenant governor with the utility in public statements and appearances. Near the conclusion of the meeting with Herbein, someone suggested to Critchlow that Herbein and Scranton hold a press conference to clear up the discrepancy. Critchlow, who "wanted to preserve the Governor and the Lieutenant Governor's credibility," 121/ refused, saying "I have deep suspicions about Herbein and I am not going to associate the Lt. Governor with him."122/ It was a policy that was consistently followed throughout the incident.

It was decided after the meeting that Scranton should hold another press conference, which was scheduled for 4:30 p.m. In his prepared statement, Scranton pointedly disassociated the state from the actions and statements of Met Ed and implied strongly that Met Ed's credibility was questionable:

> This situation is more complex than the company first led us to believe. We are taking more tests. And at this point, we believe there is still no danger to public health.
>
> Metropolitan Edison has given you and us conflicting information. We just concluded a meeting with company officials and hope this briefing will clear up most of your questions.
>
> The Pennsylvania Department of Environmental Resources was not notified of the release until about the time it was halted. The company has said that further discharges may be necessary and has promised to notify us in that event.123/

As the lieutenant governor met with Herbein Wednesday afternoon, the emergency management agencies remained on alert, filtering information through the chain of command from PEMA to the counties to the municipalities. Earlier in the day, PEMA had notified BRP of its need for a "situation report" and that its office would call every hour for a report. Throughout Wednesday afternoon and evening, BRP reported to PEMA that conditions at the plant appeared to be stabilizing, with the result that PEMA reported to the counties and entered into its log "no change." 124/ At 8:35 p.m. on Wednesday, BRP reported to PEMA: "reactor coming under control . . . situation should be normal in a few hours."125/

On Wednesday afternoon, the Brookhaven RAP teams began to arrive and to set up their command center at the Capital City Airport. The first DOE AMS flight was made at 1:45 p.m., and other health physicists and monitoring teams arrived to begin work throughout the afternoon. As Reilly of BRP stated:

[T]hey [DOE] came into the office and then went out doing their thing. One thing I appreciated with the Federal response teams, when they came, they didn't line up and say, OK, what do you want us to do; they just went out, you know grabbed a map and went out and did stuff, which was far better than my wildest dreams whenever I'd postulate this stuff in the past.

Q. So you found them both cooperative and very effective?

A. Yes. And they said, we are -- we report to you. We are at the first line out of them, which I was quite delighted with.126/

In Washington, Jessica Mathews was trying to gather as much information as she could about conditions at the site. Her source of information continued to be NRC Commissioner Gilinsky. 127/ At 7:30 p.m. she prepared another memorandum for Brzezinski summarizing where things appeared to stand:

The reactor itself is now under better control than it has been for most of the day.... The two radioactivity meters inside the containment vessel are recording vastly different levels of radioactivity -- 10 and 6,000 rems/hr. (Normal reading is 5-10.) It is possible, though unlikely, that both are correct, since they are in quite different locations inside the vessel. The biggest problem we now face is how to get inside the containment vessel in order to take actual samples. NRC has a team working on this tonight.

The local utility has been in constant touch with the Governor's office and with the Pennsylvania Civil Defense Council . . . The local Congressman and Senators have been briefed by the NRC. In short all seems under control on the political front.

The cause of the accident is still unknown.128/

Mathews found it difficult to establish precisely the problems at the site -- "lilt was not clear, the constant change in information indicated that there was an awful lot that we didn't know about what was going on."129/ Brzezinski used the Mathews memorandum that evening to brief the President.130/

At the site, NRC Region I health physicists had been taking off-site radiation readings during the afternoon. Their initial findings, despite frequent minor plant releases, indicated to them that there was no significant health threat. On-site levels "were not extremely significant, but higher than anything we had ever seen."131/ Consequently, attention was focused on stopping the intermittent releases of radiation.132/

The presence of NRC personnel at the site presented an alternative source of information for state authorities, who were struggling to understand the incident and its implications. As Mark Knouse, Scranton's press secretary, explained:

> Well, that we just realized then, I think, that the problem was getting pretty large and that we really couldn't count on anybody at Met Ed for any type of information. And we wanted to get a hold of some NRC people to find out exactly what was happening and we wanted some backup monitoring system.133/

NRC Region I team members began to receive telephone calls from Scranton's staff. Nat Goldhaber called the NRC's Higgins and Neely at about 5:30 p.m. for information on the state of the reactor. This call was followed by another at 7:15 p.m. from Mark Knouse, 134/ and another to Gallina at TMI-1 by a member of Scranton's staff.135/ Finally, Gallina, Higgins, and Neely were asked to leave the site to brief the lieutenant governor in Harrisburg.136/ Neely never got off the site, however, because of radiation detected on his clothing.137/

Gallina and Higgins arrived at the lieutenant governor's office with Robert Friess of DOE and met with Scranton, Critchlow, Knouse, Gerusky, and State Representative Deweese, a member of the Emergency Management Council. Henderson and his assistant arrived later. The meeting marked the first contact between state and NRC authorities and, with the participation of Jay Waldman, the governor's executive assistant, the first significant involvement of the governor's office in the management of the incident. The meeting also illuminated a communication gap between the technicians and the decision-makers, as Waldman's description of the briefing indicates:

> I remember listening to a technical briefing or explanation from [Gallina] and at least one other NRC representative. They went on for a period of about twenty to thirty minutes, highly technical. At this point, I remember asking some pointed questions to try to cut through the technical jargon. I remember asking him to please explain in simple English terms what the hell happened here, what could happen, what were the probabilities that each of these options could develop, what -- was there a price in case any of them did develop, and what kind of time did we have? I recall that it was quite difficult to get them to answer questions like that for awhile.138/

State officials were told that Gallina suspected that there may have been some exposure of the core during the accident and that the worst possible event was a meltdown, although the probabilities of a meltdown were extraordinarily low and 20 to 30 hours would be available in which to react.139/ The opinion of the NRC representatives was that there was no substantial risk or danger off-site. Following the meeting Scranton called the governor to tell him what had been learned from the NRC and to arrange for a briefing later in the evening at the governor's mansion.

At 10:00 p.m., Scranton held a press conference in which he reported that during his meeting with Gallina and Higgins he had learned that there was radioactive material in the auxiliary building and that the building was being ventilated with no critical level of radioactivity found off-site.140/ Scranton then permitted reporters to question Higgins and Gallina; their report was optimistic. Gallina told the

press that there was no permanent damage to the plant and that there appeared to be no significant damage to the core. He predicted that it would take about a day to remove the radioactive water from the auxiliary building and that the "reactor should be in cold shutdown within a day also."141/

Following the press conference, Scranton, Gallina and Higgins went to the governor's mansion for the briefing. According to Thornburgh, the briefing was held "simply so that we could begin the next day with at least an agreement among the people who were involved in the decision-making fact-finding level at precisely where we stood." 142/ Again, a communication gap opened between the technical experts and the state officials -- it was difficult to find the common point at which a description of technical events became useable information for decision-making. According to Gallina:

> We tried to put the dose readings into perspective for him so he would have some idea what we were talking about, being a layman, and he seemed to be satisfied that he was getting the straight story as to what was going on. We didn't try to any way to minimize our concern. We still had an off-site problem and reported that what had gotten offsite to this point was not significant, and no dire threat to the health of the population, and that it was more of an onsite problem. At this point, we didn't see any danger of things escalating past where it was up to that time. At this point we knew that they had fuel damage, but we were still thinking in terms of failed fuel, not severe core damage. This was not something we were aware of until Thursday afternoon and Thursday evening, so we just told him what we knew as we saw it at this time.143/

The governor was not interested in technical explanations, but in obtaining the experts' assessment of what was likely to happen and how much time was available in which to react. Thornburgh and Waldman, both former prosecutors, used the same technique to extract the information they perceived to be relevant. There was, as Thornburgh testified, "a lot of crossexamination, and an attempt to lower their jargon level to something that we could understand."144/

At the end of the briefing, Thornburgh was satisfied that a consensus existed as to conditions at the plant: although an early resolution of the problem did not appear possible, "there certainly was no sense of urgency about the steps that had to be taken." 145/ After the meeting, however, the governor became concerned that the NRC experts had not discussed damage to the core. The governor had read "We Almost Lost Detroit" a few years before and remembered "the ghastly scenario that was laid out about the core damage." He went to bed intending to raise the question with the experts the next day.146/

II. THURSDAY, MARCH 29, 1979

On Thursday, the accident seemed to be stabilizing. PEMA continued to receive messages from BRP indicating that the plant was progressing toward cold shutdown. 147/ PEMA spent the day passing information to county organizations and requesting the three affected counties to review their 5-mile evacuation plans.148/ The same process was taking place at the local level, although the municipalities within a 5-mile radius of the site were not working on their evacuation plans with the same intensity as they had on Wednesday.149/ Events seemed encouraging enough that PEMA declined an offer of assistance from the regional DCPA off ice .150/

BRP Director Gerusky asked his nuclear engineer, William Dornsife, to go to the site, find out what was going on, and establish a line of communication. 151/ Dornsife's assessment was that "the thing was winding down . . . essentially over,"152/ although he recalls some significant readings:

> I do remember very vividly seeing some readings at the plant vent being relayed out to the Communications Center of well in excess of 1,200 mr/hr that caused all the panic the next day. I remember one being as high as 3,000 mr/hr at the plant vicinity.153/

Gallina shared the same optimism:

> It was a lot calmer than it was on Wednesday. By that time -- I don't mean to imply that it was any type of panic situation, but more assurance was felt that the reactor was stable, and the releases had decreased significantly, although there were puffs here and there, but not a constant radioactivity, and the off-site levels had gone down. We appeared to know where the releases were coming from, and it was the matter of pumping the water off the floor into the tanks, which was ongoing. Once this occurred, the releases that we were seeing dropped dramatically, and things started to get into a more recovery-oriented atmosphere, rather than the emergency affair that existed the day before.
>
> We still had significant problems with respect to health physics, but that was all on-site. Our concerns off-site had diminished many orders of magnitude.154/

Radiation levels in the control room were no longer a problem. 155/ Although "the feeling was that the emergency had passed with respect to the reactor," 156/ Met Ed and NRC officials were concerned about the amount of damage the accident had caused to the reactor itself; the degree of damage could not be reliably known until Met Ed was able to collect a primary coolant sample.157/

A. THE POLITICAL AND MEDIA CONVERGENCE EFFECT: 7:00 A.M. to 3:00 P.M.

On Thursday morning it was clear that Wednesday's accident had drawn national attention. The country's major daily newspapers had published stories and Walter Creitz, president of Met Ed, had appeared

with representatives of anti-nuclear groups on both NBC's Today Show and ABC's Good Morning America.158/ Senator Gary Hart of Colorado was also interviewed on the Today Show and indicated that his Senate subcommittee would investigate the causes of the accident. 159/ Members of Congress, including Senators Hart and Heinz, were planning to visit the site at noon.160/ At 10:00 a.m., Met Ed held a press conference that drew national coverage.

Not much of the morning's media coverage included state officials. Scranton began to explore the possibility of his visiting the site with his assistant and the press secretaries for the governor and the Department of Environmental Resources (DER): 161/

> Q. Thursday morning, then, as the press began to arrive in more significant numbers and calls began to come in, what were the main themes? What were you being asked? What was your staff being asked? Was it mostly status of the plant, amount of radiation, what went wrong, fuel damage -- all of those?
>
> CRITCHLOW: Yes. Oh, let's see. Well, there were not a lot of inquiries coming to us in the morning because Metropolitan Edison held a press conference that morning, at 10 in the morning. And that really absorbed the press' attention at that point.
>
> We decided to try to get Scranton into the plant and, oh, an hour or two trying to arrange it.162/

When Scranton finally talked with Walter Creitz about the possibility of visiting the site, Creitz suggested that Scranton accompany the Senators, but Scranton declined. Creitz pointed out that he would be with the Senators at the time of Scranton's visit, and it was arranged that Scranton would receive a guide and a tour of the plant.163/ Scranton described his visit as follows:

> While Senator Hart and I guess John Heinz were at the observation tower, we went over to the Island, and I told them when I got there that I wanted to see the control room and I wanted to see the auxiliary room, and we spent several hours down there from about noon or thereafter until about 4 we got back, putting on and off suits and things of this sort. I wanted to see how much water was on the floor of the auxiliary building, because that is where it was coming from, how much radiation is in there, and there were about -- I remember their dosimeter -- not the dosimeter, but the radiation, the geigercounter or whatever it is showed about 3,000 millirems.164/

The stated reason for the Scranton visit was to assess the mood at the plant and to reassure the public that conditions were safe.165/ Scranton's assessment of the mood of the plant was that "things seemed to be pretty calm down there, and they were. The people down there seemed to be pretty calm."166/ That evening, Scranton was interviewed about his visit on the McNeil/Lehrer Report.167/

B. THE MET ED WASTEWATER DISCHARGE, PART I: 2:30 P.M.

Shortly after the accident began on Wednesday, Met Ed stopped discharging wastewater from toilets, showers, and drains into the Susquehanna. In normal circumstances, the wastewater would not be radioactive. It was known, however, that noble gases were dissolved in the water, although Met Ed and BRP officials believed the concentrations were well below the maximum permissible concentrations (MPC) set for in the proposed federal technical specifications governing liquid discharges. 168/ Nearly 400,000 gallons of the water had accumulated by Thursday, and if the wastes were not released through the effluent discharge system, the tanks would overflow, draining undiluted wastewater directly into the river.169/

Gallina was asked by Met Ed if the release would be acceptable to the NRC, and he replied that it would be if it were within NRC limitations:

> I had been asked that day if the release could be done if it were within NRC limits, and I said, as far as I am concerned, if it is within NRC limits, it can be released. The trouble was that it was a gas dissolved in liquid, and we have release limits for liquids, and we have release limits for gas. They asked, "How do you handle this?" assuming that when you release all the gas contained in the liquid, it will be released in the atmosphere, and either way, as I remember it, it would not have exceeded the limits, either as a liquid or a gas. I said, you check through Bill Fisher with headquarters and make sure you get the okay, and from what I gather, they did.170/

Early on Thursday Met Ed made the same inquiry of NRC Region I and had been told by George H. Smith, the chief of the Fuel Facilities and Safety Branch, that the discharge would be acceptable to the NRC if it complied with NRC standards. 171/ After a discussion with Met Ed personnel, Smith spoke to NRC headquarters. The understanding in the regional office and in headquarters was that Met Ed would begin to discharge the industrial wastewater if it met the appropriate limitations. The Region I mobile lab analyzed a sample of the wastewater and found it presented "no problem."172/ NRC did not explicitly approve the discharge, but it certainly acquiesced.173/

Met Ed also called Reilly at BRP to check with her before discharging wastewater into the Susquehanna. Reilly perceived the call from Met Ed's Dubiel as both a notification of the proposed release and a request for permission:

> REILLY: [H]e indicated that if we don't get permission to dump it that the sumps are going to run over and it is going to go out as an uncontrolled discharge through a storm [sewer] anyway. So you know, you don't have a whole lot of choices there, and it was less than MPC [maximum permissible concentration], so I said, "No, it doesn't give me heartache."

Q. And my question about the phrase "it doesn't give me heartache," I mean, did you perceive that as giving permission?

A. Yes, I'd say about 60 percent.174/

BRP Director Gerusky was also aware of the proposed discharge. Gerusky indicated to the NRC that the state had no problem with the discharge of the water as long as downstream users were notified.175/ Having consulted the state and the NRC, Met Ed began the discharge later in the afternoon. 176/ As Gerusky admitted, "We were reacting from a technical point of view, and we were not considering the public relations problem. "177/

On Wednesday, state executive officials had been drawn into the incident by gathering facts and making public statements, but there were no guideposts to mark where the responsibility for certain decisions lay -- NRC, Met Ed, and state technical staffs clearly believed they were in a position to make what they perceived to be technical decisions without consulting the governor's office or NRC commissioners. At the same time, however, the technical staffs obviously did not appreciate either the serious repercussions the proposed discharge could have if it were misunderstood by the media and the public or the extent to which high level NRC and state officials would want to be involved in the decision. The technical staffs were having problems enough coping with the immediate demands placed on them. The DOE coordinator's description of what he found at his first meeting with BRP officials on Thursday indicates the dimensions of the problem:

DEAL: When we went to visit with the state people, it was -- the way I characterize it, their circuits were completely overloaded. They were not in a position to really respond to anything very rationally.

I don't mean they were irrational, but they were just exhausted . . . They did not have a staff available to handle that kind of incident. They were completely swamped with responding to requests from the Governor and their own state officials, and doing some interfacing with the public and the press.

And the press was all over the place. It was a very overloaded situation, is the best I can put it.178/

The technical staffs' decision to permit the discharge of the wastewater was one of the issues that later on Thursday drew the executive officers more deeply into active management of the response to the accident.

C. THE SECRETARY OF HEALTH'S EVACUATION PROPOSAL: 1:30 P.M. TO 4:30 P.M.

Thursday afternoon marked the first significant involvement in the incident of Pennsylvania Secretary of Health Gordon MacLeod. On Wednesday, MacLeod had flown from California to Pittsburgh, where he went to the Department of Health's regional office. At 8:30 a.m., MacLeod had received a telephone call from Joseph Romano, the department's public information officer, who informed him that an accident had occurred at the Three Mile Island nuclear power plant.

MACLEOD: . . . I asked immediately for the person responsible for radiation health within the Department and found out that there was no unit. I then asked for the liaison person within the Department of Environmental Resources and this Bureau of Radiation Health, and found that there was a person who had had that responsibility and left the department some six months previously.

I further asked for the library references -- the technical resources in terms of literature and journal articles and found out that the library of the Department had been dismantled some two years previously for budgetary purposes.179/

There was no radiation health capability within the Department of Health, and MacLeod did not pursue the matter further. Throughout the remainder of Wednesday, MacLeod was kept informed by Romano, who was obtaining his own information from the wire services.180/

On Thursday afternoon, MacLeod received an unexpected telephone call from Anthony Robbins, director of the National Institute of Occupational Safety and Health, within the U. S. Department of Health, Education, and Welfare. Robbins and MacLeod had known each other for many years, and MacLeod was aware that Robbins had served as health commissioner in Colorado and in Vermont. Robbins told MacLeod that he was concerned about the events at Three Mile Island and described his experience as health commissioner in Colorado, when he had ordered an evacuation from a sparsely populated area around the Ft. St. Vrain nuclear reactor during a reported accident. As MacLeod described the conversation,

He said, "Gordon, I am Concerned about the events at Three Mile Island. I am concerned."

I said, "Tony, from all the reports I have had, is that we have had very little radiation exposure as a result of the accident." He said, "Gordon, I am not concerned about that. I am concerned primarily about the shutdown process." I said, "I don't know what you are talking about, please explain." He said he thought we were in an experimental mode. I think that was the word he used, and that we didn't know how to shut down the reactor as a result of this accident and he said he was in consultation with the Bureau of Radiological Health, which is a part of the Food and Drug Administration . . . and based upon his experience and this consultation, he urged me to consider recommending that an evacuation take place.181/

MacLeod characterizes Robbins' statement as "a strong recommendation."182/

Robbins denies that he recommended any evacuation to MacLeod, and maintains that the telephone call was merely an informal contact to offer MacLeod support and assistance. 183/ Lending support to MacLeod's recollection, however, is the fact that MacLeod immediately arranged a conference call among Henderson, Gerusky, John Pierce of the lieutenant governor's office, and himself. 184/ MacLeod described the Robbins call.185/ The reaction of the three men was that no evacuation was

needed because there was nothing to indicate that the shutdown was in an "experimental mode" and radiation levels did not appear high enough to warrant evacuation.186/ At MacLeod's urging, they agreed to reconsider Robbins' recommendation if it appeared that the technicians were attempting an experimental shutdown. MacLeod then inquired "about the desirability of moving all pregnant women and children under the age of 2 out of the area,"187/ a concern prompted by MacLeod's general medical knowledge that fetuses and developing children are more vulnerable to radiation exposure than other groups. MacLeod stated that he was careful to point out that he was not recommending consideration of an evacuation order by the governor, but only that the governor "advise them to leave the area."188/ Again, the participants in the call concluded that the recommendation was not necessary.189/

The telephone conversations about TMI had been MacLeod's first official involvement in the accident; following the calls he went to the governor's office "just to get a sense of what was going on."190/ On Thursday afternoon and during the following days, members of the governor's and lieutenant governor's staffs met frequently in the governor's office. 191/ The participants do not have precise recollections of the times and substance of meetings, but MacLeod, Waldman, and Gerusky each vaguely remembered a meeting, apparently held on Thursday afternoon, in which evacuation and radiation levels were discussed. Waldman recalled receiving an account of "some incident that had happened in Colorado at some time, talking about an evacuation that was executed there,"192/ which suggests that the meeting was held after MacLeod had talked to Robbins. Indeed, Gerusky recalled MacLeod raised the question of evacuating pregnant women and young children. 193/ MacLeod was asked several technical questions about radiation health, and it was decided that a telephone call should be placed to Dr. Neal Ward of the University of Pittsburgh. 194/ Ward was consulted over a speaker telephone about exposure levels that would require protective action, and Waldman recalls that he "quickly ascertained that we were not at the levels of exposure that would seem to justify the evacuation." 195/ That evening, MacLeod returned to Philadelphia to attend a meeting the following morning.

D. THE GOVERNOR'S FIRST PUBLIC STATEMENT ON THE TMI ACCIDENT: 4:00 P.M. TO 6:30 P.M.

It was apparent that public apprehension about the accident was increasing. Earlier in the afternoon, Dr. Ernest Sternglass of the University of Pittsburgh, was interviewed by a Harrisburg radio station and urged the evacuation of pregnant women and pre-school children. Shortly after the Sternglass interview, a representative of the Department of Health went on the air to assure the public that evacuation was not necessary, but the incident caused several calls to local authorities.196/ In addition, on Thursday afternoon local authorities learned from alarmed members of the public that people outside the Harrisburg area were calling their Harrisburg relatives with rumors that evacuations had been undertaken.197/

With public concern building, Governor Thornburgh believed it was necessary to try to calm the public mood. 198/ At 3:45 p.m., a meeting was held in the governor's office during which Scranton, Gallina, and Higgins briefed the governor about conditions at the site. The governor

raised his concern of the previous evening about core damage, and was informed that although there was some core damage, conditions appeared to be stabilizing. 199/ Scranton, having returned from the site, reported that technicians at the plant appeared to be working in an atmosphere of "calm competence."200/

Following the briefing, the governor held his first press conference on the Three Mile Island incident. He began his statement as follows:

> Good afternoon. I'd like to address my initial remarks to the people of Central Pennsylvania. I believe, at this point, that there is no cause for alarm, nor any reason to disrupt your daily routine, nor any reason to feel that public health has been affected by the events on Three Mile Island. This applies to pregnant women, this applies to small children and this applies to our food supplies. I realize that you are being subjected to a conflicting array of information from a wide variety of sources. So am I. I spent virtually the entire last 36 hours trying to separate fact from fiction about this situation. I feel that we have succeeded on the more important questions.201/

During the question period, Scranton briefly described his trip to the plant. The remainder of the press conference was devoted to technical questions directed to the NRC's Higgins and Gallina. At three different times during the press conference, Gallina stated that the danger was over for the people off-site.202/ That statement, the governor believes, marked a turning point:

> THORNBURGH: The principal focus of concern from that press conference on was a feeling of the whole factual situation beginning to crumble. I think to a man we were all very much concerned with Mr. Gallina's characterization at the end of that press conference that the off-site problem was over, the trouble was over, in effect writing a finis to this event. We didn't believe it.
>
> Q. Why not?
>
> A. It just didn't sound right. I can't tell you, it just didn't go well with me, and from that point on, the thing began to deteriorate rather badly 203/

E. THE MET ED WASTEWATER DISCHARGE, PART II: 4:30 P.M. TO 12 MIDNIGHT

As the Thornburgh press conference was taking place, confusion about the release of the Met Ed wastewater became so great that the issue consumed nearly the entire evening. The discharge had been "approved" earlier in the afternoon by Reilly in her conversation with Met Ed's Dubiel, Gerusky was notified of the discharge, and NRC personnel at the site, Region I, and Headquarters had been informed of the discharge and had, in effect, passed the decision to the utility.

When NRC Chairman Joseph Hendrie learned of the discharge, however, he ordered it stopped in a telephone call to Edson Case, deputy director

of the Office of Nuclear Reactor Regulation, and John Davis, acting director of the Office of Inspection and Enforcement:

HENDRIE: What's going on with this dump down at Three Mile into the Susgn"hanna?

I just got a report they'd released 400,000 gallons of slightly contaminated water into the river.

DAVIS: It was my understanding they were in the process of controlled release. Whether the 400,000 gallons have gone out, I don't know, we'll have to check.

HENDRIE: I thought they weren't going to do things like that without letting us know.

CASE: Well, they let -- as I understand it, they let us know they were dumping the -- they maintained -- I gather that it was in the licensed limits.

.A. a. .A.

HENDRIE: Now, it would be -- if you -- if Three Mile were operating normally then the licensee might find it within his license that he can go ahead and make this release, that would be all right. In the circumstances, why the impression everybody will have is that he is dumping the contaminated water into the river.

CASE: Bad PR, agreed.

.A. .A. .A.

CASE: Why don't we just call them up right now and tell them to stop if he hasn't stopped it?

HENDRIE: I think something like that would be use -- be more useful if we had started a little earlier. Now, it may, you know, this may be a separate set of water someplace and if we can all agree and shake hands that, oh, this is fine, you walk through a tank this is another set of stuff, there is a trace of stuff in it, but it's well within limits, and so on, okay. But I don't find it very happy to have him just cranking a valve and running this stuff into the river. You know, supposedly, supposedly we've got a team down there that's keeping track of things and I'm going around telling Congressmen we have a good, close communications and that we and the state people and everybody else are working closely together so that we all know what is going on, all agree on the steps, and I don't find that compatible with him just deciding what the hell I'll dump 100,000 gallons, even they're -- you know, even if the level is, in fact, minimal and the -- and it's a perfectly

acceptable release. He's not quite running a plant, a normal, everyday configuration down there for God's sake.

CASE: Well, the word has now gone -- gone back through our chain to the licensee to stop.

HENDRIE: Okay. Well, maybe it will turn out he hadn't opened the valve and was checking, I don't know. So, do you have any reflection down from the site about what the state people are going to --

CASE: The state was, as I understand, was aware -- aware of it.

HENDRIE: Like us, they were just told he was dumping it?

CASE: Yes.

HENDRIE: Jesus Christ, I bet they are calling the Governor. Those god damn fools down there are dumping their stuff in the river, they can't think what to do with it. Would you please get hold of the state people and find out what's going on or, you know, what -- what kind of information they have been given and so on.

CASE: All right, we'll do that, right.

HENDRIE: At least a release like this at a time like this needs to be one on which both the state, health and radiation people and we agree with the licensee is proper, and needs to be done and it's okay to do it.204/

About 40,000 gallons of the wastewater had already been discharged when NRC personnel at the site and in the regional office learned that Headquarters had issued a "very terse instruction . . . that all releases were to stop."205/ Smith, in the regional office, was told to relay the instruction to the licensee. 206/ Smith tried to explain that if the water were not discharged soon in a controlled manner, "it will go over the side, because it is overflowing . . . ."207/ but he "got hell for asking questions," and pursued the matter no further.208/ Gallina recalled that:

> [T]here was some flap just starting to occur about this release of industrial waste water. The site had been given permission to release it even though it had radioactivity, within NRC limits, and I just got a briefing on that from Karl Abraham, our Public Affairs officer, who told me that they are releasing industrial waste water, and that it may be a problem because the word "release" was becoming a dirty word, and that anything to be released was something to be careful of because the press gets excited, and politics may take over 209/

Boyce Grier, director of Region I, formally notified Met Ed to stop the discharge by calling Gary Miller.210/ Miller complied, but with reservations.211/

After the discharge was stopped, Peter Duncan, deputy secretary of DER, and David Milne, the DER press secretary, began to investigate the discharge on behalf of the state. Although they learned that Gerusky and Reilly had considered the wastewater safe to discharge, Duncan and Milne wanted to have the state perform its own analysis of a sample. They discovered that not only did the state not have the facilities to perform the analysis, but delaying the discharge risked an uncontrolled draining of the wastewater undiluted into the river.212/ When they called the NRC laboratory and were assured that the wastewater could be discharged well within safe limits, they notified downstream users and drafted a press release stating that DER had approved the discharge.213/

The draft DER press release was given by Milne to Karl Abraham, the NRC Region I press officer who was working out of an office next to Critchlow's. At that point, Critchlow and Milne came to believe that the state was merely being notified of the discharge; it did not have final authority to prevent it.214/ Although both the state and the NRC agreed that the discharge was necessary and safe, a dispute flared between the NRC and state press secretaries about whether the NRC or the state would publicly take responsibility for the decision. 215/ Milne discarded the draft press release edited by Abraham: "Why should I do it? I mean, why should we take the responsibility for this when in fact we don't have any authority over it?"216/

Critchlow believed that the NRC was trying to pass off to the governor its responsibility -- and "the stigma" 217/ of making and announcing "what was certain to be a very unpopular decision."218/ As Critchlow described one part of the conversation:

> CRITCHLOW: I said [to Abraham], at one point I said, I am not going to let the Governor be associated with this stigma if he does not have to be. And Karl said, "Well, you have got a Lt. Governor." [sic] And the Lt. Governor's executive assistant was sitting there, I think. He was just shocked. It was just a clear effort by someone at the NRC to take a public relations angle to get them out from under this thing and we were starting to get very concerned.219/

At about midnight, after the reporters had missed their deadlines, Abraham, Critchlow, and Milne finally agreed on the text of the statement that was issued over the name of Clifford L. Jones, secretary of the state Department of Environmental Resources. The statement announced that Met Ed and the NRC had informed DER that there was an urgent need to discharge the wastewater and that DER, after review of the problem, "reluctantly agrees that the action must be taken." The remainder of the statement describes the problem caused by the accumulation of the wastewater and that the NRC and DOE had assured the state the discharge would be made without harmful levels of radioactivity. 220/

The wastewater discharge incident increased the state officials' distrust of Met Ed and created doubts in the governor's office about the good faith of the NRC. Thornburgh -- despite Met Ed's notification to BRP and Reilly's approval of the discharge -- felt that the incident contributed to a "developing sense on my part that Met Ed was at least

insensitive to our responsibilities to both inform the public and take appropriate action in response to what was going on out there."221/ The NRC, as far as Thornburgh is concerned, "was trying to hang this one on us, in effect."222/

F. THE HIGGINS CALL TO CRITCHLOW FORESHADOWING FRIDAY'S EVENTS: 10:00 P.M. TO 12 MIDNIGHT

That same Thursday evening, one more event occurred adding to the Thornburgh administration's doubts about the NRC's reliability. At the afternoon press conference, Gallina had optimistically predicted that the danger was over for the people off-site, a remark to which Thornburgh had reacted with skepticism. 223/ At 10:00 p.m., Critchlow received a telephone call from Higgins, who revealed that the problems at the plant were more serious than the NRC had previously thought.

At about 6:30 p.m., Gallina and Higgins had returned from the press conference and learned the results of an analysis of a primary coolant sample: damage to the core was far more substantial than the two men had expected. Higgins testified:

> I was shocked personally to hear the magnitude of radiation coming from the sample; it was much higher than I had ever expected or had ever heard of before. At that point, that was really the first time -- because of the high radiation levels in containment, the levels in the auxiliary building throughout the first two days, and because of other various radiation monitors throughout the plant, radiation monitors throughout the plant, there was certainly indication that it was a very abnormal situation, that there was a potential for some fuel damage, this type of thing, but until the primary coolant sample on Wednesday [sic: Thursday], that was really the first indication that I had, or I think, that anybody had that they really believed, which told them that there was as much fuel damage as there really was, and that really brought it home to me for the first time how serious it was.224/

Gallina and Higgins recognized that their briefing of the governor earlier in the day did not include this important information.225/ Higgins called the governor's office later that evening:

> I felt, based on the information I had then from the primary coolant sample, and based on the impression we had left with the Governor as to the amount of possible core damage that they really weren't the same, and that I felt that it was my personal responsibility to correct that wrong impression that I felt I had left with him, so late that evening, probably 10:00 or 11:00 o'clock, I did call back, and I wasn't sure really who to call, or just what to do at this point, but I did call back Paul Critchlow, his personal press secretary, and told him that I wanted to pass on the latest information that I had from the site. I wasn't sure if he had it yet or not, but I just wanted to be sure to pass it on to him. I felt they would probably get it through the normal channels anyway.226/

Critchlow interpreted the call to be a confidential report that was not intended to be given by Higgins in his capacity as an NRC representative. 227/ Critchlow called Karl Abraham, without identifying Higgins, and asked for a confirmation of the information he had just received. After Abraham made a telephone call to Headquarters, he told Critchlow, "I can confirm there is more fuel damage. It does mean more longterm problems, but no, it does not mean that we will have sustained low-level radiation leaks."228/ Higgins, however, had indicated that there was a greater possibility of radiation releases.229/

At 11:30 p.m., Critchlow called the governor to summarize the progress of the discussions concerning the wastewater discharge and to relay the serious news that Higgins had revealed. 230/ Concerned about the Higgins call and the credibility of the NRC, Thornburgh recalled that throughout the entire evening and well into the next morning, he thought:

> . . . we better get somebody here who we can rely on and not have to engage in this constant cross-checking and cross-examination of people whose reliability seems to erode almost as quickly as they get on the stand.231/

III. FRIDAY, MARCH 30, 1979

A. THE EVACUATION DECISIONS: 7:00 A.M. TO 12:30 P.M.

1. The Site, Part I

Early Friday morning in the TMI-2 control room, Jim Floyd, the shift supervisor, decided to transfer radioactive gases from the make-up tank to the waste gas decay tank, a normal operation to prevent pressure from building up in the make-up tank.232/ As Floyd recalls his decision, "I realized what had us and what had to be done, and that meant open that valve. So I ordered the valve opened."233/ There were leaks in the system, however, and he expected the venting of the tank to result in a significant release of radiation. Shortly after 7:00 a.m., Floyd began the transfer. Floyd picked up a direct line to the Emergency Control Station at the Observation Center to notify the station that he would be releasing "some activity" and to request that a helicopter and off-site monitoring teams be deployed.234/ Floyd believed that he also told the NRC inspector that he was opening the valve.235/

According to Floyd, he expected the venting of the tank to result in a significant release of radiation. Others who were at the site have disagreed. Gallina testified before the Commission as follows:

> GALLINA: . . . The incidents that Mr. Floyd testified about differ somewhat from my understanding of what was actually happening that morning. True, the make-up tanks were being vented because of over-pressure as he described. The releases associated with that venting were expected to some extent because we knew that there was some minor leakage in the system that would vent in the aux[iliary] building.
>
> That is one of the primary reasons why the helicopter was put in the air because everytime a transfer was made where we believed there might be some kind of leak, we would assign a team downwind plus the helicopter in the air, so if we did see an increased level we could terminate that release right away.
>
> To the best of my understanding, it was pressurizer or release valves downstream from that operation that did lift inadvertently. The impression I got in listening to Mr. Floyd's testimony was he expected [a significant release] when he was doing this transfer.
>
> My understanding of the situation was that we knew a transfer was occurring, but did not expect a . . . [significant] release.236/

In any event, Floyd stated that at the time he made the decision to vent continuously, he was concerned that if radiation levels were high, the remote possibility existed that the valve would fail to reclose on command. 237/ If the valve malfunctioned during venting, it might be necessary to evacuate the population downwind. Floyd decided to call PEMA to find out whether it was prepared to evacuate people.

Floyd's account of the conversations that ensued differs dramatically from that given by civil defense officials. It is possible, however, that an incredible breakdown in communications occurred. Floyd had previously called PEMA occasionally during drills, although his prior contact with the agency was limited. He dialed PEMA and reached the duty officer. He described the conversation this way:

> I gave him my name, my position, my company, the fact that we were probably releasing additional radiation or expected to be releasing additional radiation. And would they be prepared to evacuate, if we needed people moved? . . . He said that they were in fact prepared to move people, at which time I probably cordially thanked him and rang off the phone. . . . I don't know if I asked him how many busses he had standing by or not. Usually in previous years when it came time in the drill to move people, I inquire how many busses they had available to move people. . . . I may have said, how many busses do you have available. Whether he said 68 or 98, I wouldn't know. As long as it was a number in excess of 50, I probably would have been happy.238/

Floyd recalled that after talking with PEMA, he would not have been surprised to have received a call from BRP, given the message that TMI would be releasing radiation. The next call, however, came from PEMA. Floyd recalled very little about the conversation, but "hypothesized" it as follows:

> He could have said, are you ready to evacuate? And I could have meant the people on the Island or people in the control room. And my answer would have been, yes, we are in a state of preparedness.
>
> We are always ready to evacuate. I probably wouldn't have been that concise. He would have heard my yes and probably wouldn't have heard anything after it.239/

Floyd insists that he did not intend to order an evacuation. He opened the valve as an "intentional, controlled release" and carefully monitored the activity levels, which at approximately 8:00 a.m. had peaked above the plant at 1,200 mR/hr. Floyd said he knew at the time that the release would be diluted by a factor of 1,000 by the time it reached the east shore, and "that's certainly no reason to evacuate."240/

Civil defense officials maintain that Floyd's calls conveyed quite a different message. Kevin Molloy, the Dauphin County emergency preparedness director, testified that he received a call from Floyd at 8:34 a.m. Floyd seemed hurried and stated only, "We had a release. Have PEMA call me."241/ Molloy relayed the message to Carl Kuehn at PEMA. Shortly afterwards, there were two simultaneous telephone conversations between PEMA and the control room. One of the calls, received by James Cassidy of PEMA, is recorded in the PEMA log as follows:

> 0840 Call from Three Mile Island Control Room-release in progress began at 0832. A Site Emergency has been declared. Reading 14 mr at site fence. 600 ft. 1.2 r/hr. (1200 mr/hr) over facility.242/

PEMA employees were not able to identify the caller, but they recall the demeanor of the caller as being calm -- "He was giving us a report."243/

The second call received from PEMA identifies Floyd as the caller and is recorded in the PEMA log as follows:

> 0840 Call from Jim Floyd (TMI) -- uncontrolled release -- please call Radiological Health. Need help -- may have to evacuate down wind -- reports winds 340 degrees SE -- will remain in contact with this agency. 244/

The call was recorded by Carl Kuehn, who reported to PEMA officials that Floyd seemed excited -- "This guy is going ape" -- and had said that personnel at the plant were preparing to evacuate. 245/ As a result of these calls, PEMA contacted BRP and reached Reilly, who had already heard of the 1,200 mr/hr. release through a call from the site. She had interpreted that call merely as a notification so that she would know the reason for temporarily high readings. 246/ Both PEMA and BRP officials believe that the Floyd calls should have been made not to PEMA, but to BRP.247/

At the site, Gallina learned from Met Ed that there had been a release of radioactivity around 7:00 a.m. -- "a release that we were surprised about." 248/ Later in the morning, Gallina was told by a Met Ed coordinator that at 8:00 a.m. another release had occurred that had been measured by a helicopter at 1,200 mr/hr, but Gallina was not concerned -- off-site there were no significant readings.249/

2. NRC-Bethesda

At the NRC Incident Response Center (IRC) in Bethesda, communications were even worse. The IRC was divided into two sections: a room for the staff, where information was being received from the plant and other sources, and a section separated by a glass partition for senior management. Phones were ringing and people were conversing and filtering in and out of the center -- "[f]ar more people in the thing than the thing was designed for."250/ Information about conditions at the plant and radiological measurements was arriving at the center sporadically, and the senior management officials were having difficulty relating one piece of information to another as they sat around a large U-shaped table equipped with a battery of telephones.

As Denton stated:

> We could get information and react to it. But the information we were getting back from our people was largely non-discriminatory. They were just telling us whatever was going on. Back in the Incident Center we were having trouble separating the wheat from the chaff and yelling at that guy to find out what happened here and there. So it was pretty chaotic in retrospect 251/

A result of the communications problem was that the NRC senior management was not "really convinced that the people on-site had a handle on what was going on and they didn't feel they in the center had a handle on what was going on."252/

Throughout Thursday and early Friday morning, NRC engineers believed the plant to be relatively stable, but they were concerned about the level of the waste gas decay tanks, in which radioactive gases from primary coolant were stored and allowed to decay. If the tanks filled to capacity, an automatic relief valve would open and directly vent unfiltered radioactivity into the environment.253/

A few minutes before 9:00 a.m. on Friday morning, Lake Barrett, an NRC engineer, was told that new information had just arrived: the waste gas decay tanks were full, the relief valves were open, and an unfiltered release of radioactivity was occurring. Barrett, who had been performing mathematical calculations of radiation doses throughout the incident, quickly computed that a radioactive release of approximately 63 curies per second could be expected, based on what he already knew about the system. He relayed his calculation to John Davis, then acting director of NRC's Office of Inspection and Enforcement, who suggested that Barrett immediately accompany him to the room where the NRC's senior management was working.254/

During this time, Karl Abraham called the IRC to confirm a report he had heard:

ABRAHAM: Some company official at the site, somebody at the plant has informed the Civil Defense people that they had sometime this morning an uncontrolled release of airborne activity from a release point in one of the cooling towers. And, that the measurement numbers that are being recorded by Civil Defense to the Governor's office are 1,200 mr per hour. The Civil Defense people are saying that if that's true, they are going to immediately start implementing some preparation for evacuation, although the Governor has to give the final say on an actual evacuation. They are asking us whether it's true or not.

VOICE: What's the question?

ABRAHAM: Where did the Civil Defense get the 1,200 number?

VOICE: Yeah, what point is it supposed to be?

ABRAHAM: -- got that number from the plant official that called them.

VOICE: Karl, at what point is that supposed to be? Off-site, nearest point?

ABRAHAM: I have no other information than what I've given you. The Governor --

VOICE: It must be off-site.

The unidentified voice added, "The best we know here'is some sort of a release is going on. We're trying to figure out what it is. It could be in that range."255/

When Davis and Barrett arrived at the IRC, Barrett, at Davis's request, informed the NRC senior management, including Harold Denton, that the waste gas decay tanks were filled and that a continuous release of radiation was occurring. Barrett was asked what the release rate would be, and he gave the rounded number 60 curies per second. Barrett was then asked what the "off-site consequences" would be,256/ given that release rate. Barrett performed a rough calculation in his head and told the group that the "off-site consequences [would approximate] 1,200 mr/hr."257/ At that point, someone in the room told the group that the NRC had just received a telephone report that the licensee was reporting a reading of 1,200 mrem/hr; everyone thought that Barrett's calculation had been confirmed.258/

> BARRETT: My perception was that that had a very profound impact on the whole center, that we had shifted from sort of a lack of information on things and nothing really firm to, well, here is a real piece of meaty information that has significance to it. I believe it took a hypothetical situation and rather carved it in stone and set it on a mountain with a burning bush behind it. There was considerable concern. I remember a few people making some statements that that was over the protective action guidelines, that action should be taken. . . . People immediately started talking about evacuation 259/

When Denton heard of the 1,200 mrem/hr release and learned the calcuated dose off-site, he thought the release possibly was a continuing one that might soon exceed the EPA protective action guides.260/ The news of the release combined in his mind with "another element that is hard to recreate":

> On Friday morning, there were increasing concerns on all sides. It was not just the releases, but by Friday morning, the whole picture was one of uncertainty, not being sure of the actual status of the case and I sort of saw this puff release of radiation as being the last straw. It kind of destroyed my confidence that we really knew what was going on up there. . . .
>
> I think the reason I recommend[ed] evacuation was the uncertainty that being told that no one knew where this release was coming from, what is the containment leaking and was it really full of fix [sic: fission] products and can you stop it.
>
> The important thing is to get out there and get people moving before the plume gets there. We didn't have time to do an elaborate evaluation and so forth.261/

During the discussion about the need for evacuation, Denton turned to Barrett, an engineer with no experience in emergency planning, and asked him for a recommendation on how far the evacuation should extend.262/ Barrett replied that he could make no recommendation. Denton asked a second time, this time more emphatically. Barrett described his reaction with remarkable candor:

A lot of things went through my mind at that point. One thing I had not seen, the Pennsylvania plan for evacuation or access to any of those things. So I wondered what he knew that I didn't know, which was considerable, in my opinion, because he had access to a lot of the systems information as far as the core cooling status and that sort of thing. So I let that sink for a millisecond or so and I decided, well, if I'm going to have to give a number and I'm not getting any help from any place else, I'm going to give a conservative number. And I put a qualifier on that, at least I felt I had sufficiently, that if we're going to have to have a number, I'd make it high. And that was the first I said to him, you know, I'm not sure, I can't tell you for sure, but 10 miles is more than enough, 10 miles is plenty, or something like that.263/

The senior management in the IRC immediately began to discuss whether the evacuation should extend 5 or 10 miles. Although Barrett recalls a consensus being reached on a 5-mile evacuation. 264/ Harold Collins, assistant director of Emergency Preparedness in the Office of State Programs, remembers no decision on a specific number. 265/ Even if no specific distances were indicated, Collins was instructed by Denton to call the state and to transmit the NRC's recommendation that people start evacuating.266/

3. The State

Collins called PEMA and reached Henderson. Collins did not immediately recommend evacuation; his conversation with Henderson was guarded. He opened the discussion by asking Henderson what the state knew "about a release that is either going on now or that is to be going on," to which Henderson replied that the state had been informed of a 1,200 mrem/hr release recorded 600 feet above the plant. Collins then asked whether any evacuation orders had been issued, and Henderson responded:

We have not. We were supposed to be getting word right back from the plant whether -- they put us on a real advance alert and we've notified all local municipalities to be prepared for alert.

COLLINS: You've notified the locals to be prepared for an evacuation?

HENDERSON: Yes.

COLLINS: We're recommending here that you go ahead and evacuate --

HENDERSON: Okay.

COLLINS: -- those communities from our Operations Center. That is our recommendation . . . we recommend that you evacuate people out to ten miles from that plume, in the direction of the plume.

HENDERSON: Well, we'll start with five maybe.

COLLINS: That is, of course, your option, but I certainly would start with at least that and you'd better start thinking about moving from five to ten.267/

Existing evacuation plans covered only a 5-mile radius from the plant.

After receiving the NRC recommendation at 9:15 a.m., Henderson placed a call to Scranton at home and told him of the recommendation. Scranton promised to contact the governor. 268/ Henderson then called Molloy and notified him that within a matter of moments Molloy would receive "the official word" to evacuate a 5-mile area around the plant. Molloy interpreted Henderson's call as an advance warning, and immediately contacted a local radio station that permitted him to broadcast instructions to the public about what to do in the event that an evacuation were ordered.269/

After the NRC recommendation was called into PEMA, Henderson's deputy Craig Williamson notified Gerusky of the NRC recommendation. Gerusky was aware of the release, but did not believe it to be serious. He was also irritated that the NRC had called PEMA rather than BRP, apparently unaware that Collins had contacted PEMA two or three times during the week.270/ To find out why the recommendation had been made, Gerusky placed a call to the site while Dornsife and Reilly called Collins in Bethesda.271/

Dornsife and Reilly, furious about the recommendation, reached Collins in Bethesda and tried to find out who was responsible:

REILLY: Name some names.

COLLINS: I don't know whether I should, Margaret. You don't really need to know names at this point in time. But Defeyette was here with me, okay? Okay, so we did this. We did what we were told. Okay. Then I called, then I called you. All right, then Henderson, you know, said, then we got in touch with him later and he said he knew that the, you folks didn't agree with him. And he wanted to do something. He wanted to evacuate, so, you know, I guess maybe he's making up his own mind too as to what he wants to do. So you know, you got communications and organizational problems I guess on both sides of the fence.

REILLY: Welcome to the club.

COLLINS: Yeah, right. So, --

REILLY: Sorry about getting nasty, Doc, but that was a low blow for those turkeys.

COLLINS: [Y]ou know, these people are, are way uptight about this whole thing. They don't want to, they don't want to, they don't want anything to go wrong. They're, they're using terms like precautionary evacuation.

REILLY: Right.

COLLINS: And they'd rather be safe than sorry, you know. They, they would much rather be safe than sorry, and I think this is what

motivates them, you know. So you have to look at that aspect too, you know. So there's no hardies between you and me, I hope.

REILLY: No, I'll get over it.

COLLINS: Yeah, okay. So I didn't do this on my own, I want you to understand this.272/

Collins must have had second thoughts about whether his call was understood to be more than his own recommendation. He placed a second call to Henderson. According to Henderson, Collins wanted to make certain "that I understood that this was not his recommendation but has the backing or support, and I am confused now whether he said 'the Commissioner' or 'the Commissioners,' but it lent emphasis in my mind, at least, to the seriousness of this incident-273/

As Gerusky was placing his call to the site, NRC officials there were completely unaware of the alarm spreading from Bethesda to Harrisburg. About 9:30 a.m., 15 minutes after Collins had called PEMA, a Met Ed employee had told Gallina about the 1,200 millirem release. Gallina understood that the release had been measured above the plant, not off-site. According to Gallina, stagnant meteorological conditions had caused the activity to fall over the site, where measurements of 1,400 millirems per hour were recorded. 274/ There was "hardly anything" off-site. 275/ When Gerusky reached the site by telephone, he believes he spoke to Gallina, who was extremely surprised to hear that an evacuation recommendation had been made by the NRC. Gerusky was told that NRC personnel on-site had not recommended evacuation and would try to contact Washington to stop the order.276/

Reilly and Dornsife had found that Collins would not reveal the source of the NRC evacuation recommendation; Gerusky had learned that NRC officials at the site were not even aware that the recommendation had been made. As far as Gerusky, Reilly, and Dornsife knew, radiation levels at the site did not require protective action. Gerusky and Dornsife tried to call the governor's office and PEMA to alert them that there was no need for evacuation, but the telephone lines were jammed. While Reilly assumed charge of the BRP office, Dornsife ran to PEMA and Gerusky to the governor's office to try to stop the evacuation.277/

After learning of the NRC recommendation from Henderson, Scranton tried unsuccessfully to reach the governor, who was en route to the office. 278/ He then called Critchlow and told him of the evacuation recommendation. Critchlow asked, "Do we have any idea who Collins is?" Scranton replied, "He is with NRC. I do not know much more about him."279/ Critchlow suggested that Scranton try to call BRP to cross-check the seriousness of the radiation readings.280/ Critchlow himself called the NRC Region I press officer, Karl Abraham.

Governor Thornburgh arrived in his office and returned Scranton's call. According to Scranton,

I told him exactly what Ken Henderson had told me . . . the Governor asked me, he said, "What is it DER said and who is this

> Collins?" and I couldn't answer either of the questions. I said, "I don't know. I am just here and I got the message, and I don't know about it."281/

Having rejected Met Ed as a credible source on Wednesday and with Thursday's growing suspicion about the NRC still fresh in his mind, Thornburgh was skeptical about the Collins recommendation:

> I don't know Harold Collins, and I don't mean this ad hominum [sic], but he was not a credible source to me. That was a bit of information that I had to verify.282/

Thornburgh spoke to Critchlow and asked him to check with Karl Abraham to find out who Harold Collins was and whether he had authority to make evacuation recommendations. Thornburgh then called Henderson and asked him how well Henderson knew Collins. Henderson told the governor that he knew Collins at least by reputation, which appeared to be good. Henderson volunteered that PEMA was prepared to evacuate a 5-mile area. According to Henderson, the governor then asked Henderson for his own recommendation, which was to start a 5-mile evacuation, since nothing had been heard from BRP.283/ Thornburgh has denied, however, that he asked Henderson for an evacuation recommendation and said that the only recommendation Henderson gave him was to relay the Collins recommendation.284/

Skepticism about the Collins recommendation increased when Abraham confirmed to Critchlow that Harold Collins had indeed recommended evacuation, but said that he did not think Collins had the authority to do so.285/ To make matters more confusing, Dornsife had arrived at PEMA with the word that BRP's data did not indicate that evacuation was necessary. Although Gerusky had not yet reached the governor's office, Dornsife's message was relayed by Henderson to Critchlow, who passed it on to the governor.286/

At this point, the governor decided to call Chairman Hendrie.287/

4. The Commissioners

As the Collins call was being made, NRC Commissioner Victor Gilinsky received a telephone call from Lee Gossick: "He was extremely agitated, and I remember him saying something like, all hell has broken loose here. You Commissioners better get down here."288/ The commissioners assembled at 9:30 to discover that "the accident was not under control the way we had thought it had been the day before."289/ As they sat around a large conference table, the commissioners received a report over the speaker phone from the staff in Bethesda.

When the commissioners and staff began their conversation, Joseph Fouchard, director of the Office of Public Affairs, had just learned from Karl Abraham that Thornburgh felt that the information he had received was ambiguous and wanted recommendations from the NRC.290/ Denton described the calculations Lake Barrett had made and told the commissioners that "[w]hat we are trying to do is to figure out what to tell the Governor, who is insisting on accurate information from the NRC about what he does about evacuation."291/

The discussion that followed Denton's comment, however, made it clear that the NRC did not have much information to offer the governor. The commissioners asked several questions about actual radiation measurements at the site, the length of the release, and meteorological data, but the staff was unable to provide specific answers. As Denton pointed out, "[W]e do have our people in the control room who search out the answers. But with regard to an actual or hard number for release, rate, curies, quantities, off-site, that process seems to take hours."292/

When the question of recommending a precautionary evacuation was raised, Hendrie responded that "it is operating totally in the blind"293/ and shortly thereafter, proposed establishing a better communications link to the site to obtain advance notice of company actions for evaluation and protective action "so we don't go through yesterday's flap on the sewerage."294/ The idea of sending Denton to the site began to take shape:

> DENTON: Well, people who go up there fall into a morass, it seems like they are never heard from. It seems like you might want to consider having something like rotating shifts through senior people there in the control room or in a room off the control room that we could communicate with about these kinds of things directly. I would be happy to volunteer and see how things go along for a while.
>
> HENDRIE: You decide whether you ought to be [the] one, Harold, but it seems to me that we ought to back Vollmer up with coverage as this could go around the clock for the next couple of days. I don't know what you can do to improve the communication situation, but it is certainly lousy.
>
> Now, Joe, it seems to me I have got to call the Governor --
>
> FOUCHARD: I do. I think you have got to talk to him immediately.
>
> HENDRIE: -- to do it immediately. We are operating almost totally in the blind. His information is ambiguous, mine is non-existent and -- I don't know, it's like a couple of blind men staggering around making decisions.
>
> Is there a consensus there that we ought to recommend to the Governor he move people out within the five-mile quadrant?
>
> DENTON: I certainly recommend we do it when we first got the word, Commissioner. Since the rains have stopped and the plume is going --
>
> I would still recommend a precautionary evacuation in front and under. If it turns out to have been too conservative --
>
> GRIMES: My view is that it might have been useful right near the site, but it is now below the EPA particular [sic: particulate] level so, it probably is the most that should be done and my view, is to tell people to stay inside this morning.295/

Hendrie then unsuccessfully tried to call the governor.

Hendrie testified that he recognized that the staff had recommended an evacuation but he reasoned that the release had stopped and had not been "substantial in an accident sense," i.e., below the EPA protective action guides. 296/ In addition, he was concerned that if people were ordered to evacuate, they might move to a location under the drifting cloud of radioactivity. Although Commissioner Bradford suggested that the conservative approach would be to confirm the staff's evacuation recommendation,297/ Hendrie reacted to the insufficient and conflicting information by recommending more limited action than evacuation:

> HENDRIE: Yes, [a recommendation that people stay indoors] seemed to me that much the best thing to do, particularly in view of the very erratic nature of the reporting and what was going on and so on, it was really very harum-scarum sort of limited bits and pieces of information that didn't tie together. Nobody seemed to have a consistent story and so on. It seemed to me best to say, wait a minute. The best thing to do is the people off-site and in the area, why don't they stay indoors this morning and in a little bit, we will get a better handle on thing[s].298/

A call was completed at 10:07 a.m., apparently initiated by Governor Thornburgh:

> THORNBURGH: Chairman Hendrie?
>
> HENDRIE: Governor Thornburgh, glad to get in touch with you at last.
>
> I am here with the Commissioners. I must say that the state of our information is not much better than I understand yours is. It appears to us that it would be desirable to suggest that people out in that northeast quadrant within five miles of the plant stay indoors for the next half hour. . . .
>
> THORNBURGH: So your immediate recommendation would be for people to stay indoors?
>
> HENDRIE: Yes, out in that -- out in the northeast direction from the plant.
>
> THORNBURGH: The northeast direction of the plant to a distance of?
>
> HENDRIE: To a distance of about five miles.299/

Hendrie then asked Thornburgh to keep the line open while he received some new data from the site. It was reported that the 1,200 mrem/hr reading was taken over the plant. Hendrie told Thornburgh that the dose on the ground would be about 120 mrem/hr, although Hendrie noted that the event was long since over. Critchlow pointed out over the speaker phone that BRP figures were much lower and that Gerusky had concluded "it probably didn't make any difference now whether people stayed indoors or not." Hendrie responded, "I think that's probably not a bad judgment.

I think our suggestion about people staying indoors is more of a precautionary one of a feeling that the materials is there."300/

Still bothered about the Collins recommendation, the governor initiated the following exchange:

> THORNBURGH: Was your person, Mr. Collins, in your operations center, justified in ordering an evacuation at 9:15 a.m. or recommending that we evacuate at 9:15 a.m. or was that based on misinformation? We really need to know that.
>
> HENDRIE: I can't tell what the--I can go back and take a check, governor, but I can't tell you at the moment. I don't know.
>
> THORNBURGH: Yes. We are not asking to be judgmental about it, --
>
> HENDRIE: Yes. I just don't know.
>
> THORNBURGH: Okay. That will be extremely helpful, because if we get any such further recommendations, we really have to know what the basis of those are.
>
> HENDRIE: Yes.301/

Hendrie indicated that there was no guarantee that more releases would not occur, but suggested that a precautionary evacuation was not necessary at that point.302/ By that time, the NRC staff had more information and concluded that "we had overreacted."303/

No formal press statement was prepared concerning the recommendation to stay indoors. Paul Critchlow and David Milne, press secretary for DER, went to the newsroom and laid "all this information out; everything he [Hendrie] told us, including readings as well as the recommendation from the governor, as recommended to the governor by Henry [sic: Hendrie] that people stay indoors to a ten-mile radius."304/ In fact, however, Hendrie had recommended that people stay indoors in the northeast direction from the plant for a distance of 5 miles. Critchlow and Milne had misunderstood Hendrie.

At his deposition months later, Hendrie reflected on his call and recommendation to Thornburgh:

> It didn't sound all that bad to me and it didn't sound like the prudent thing to do to evacuate. And the Governor's information, when I talked to him that first time around, his people were saying, you know, what evacuation? You know, what are those nuts up to in Washington?
>
> He had a better tie to the site at that point than I did.305/

5. The President

At the White House, Jessica Mathews had heard from Commissioner Gilinsky that a serious, uncontrolled release had occurred at the

plant.306/ She had given this information to Brzezinski with the observation that this development signified a different phase of the incident. Brzezinski, at Mathews's suggestion, went to inform the President while Mathews tried to obtain more information.307/

Shortly after 10:30, the President spoke with Hendrie over the telephone. Hendrie summarized the information he had about conditions at the site, and informed the President that he had just told Governor Thornburgh that although there did not seem to be a need for a general evacuation, people in the area of the plant should stay indoors. 308/ The President wanted to know what he could do to help. Hendrie said that the NRC was having "savage communication problems," and the President promised to provide assistance through the White House communication line.309/ According to Hendrie, the President thought that "we should have a senior federal officer on the site who would speak for the federal government and for him, and wanted to know whom I recommended." 310/ Hendrie replied that he already had Harold Denton "packing his bags."311/

When Brzezinski returned from his conference with the President, he told Mathews of the President's telephone conversation with Hendrie. Brzezinski informed Mathews that the President had directed that a White House communications line be established between the site, the NRC, and the White House, and that helicopters be provided to transport an NRC team to the site.312/ The President had further directed the staff to investigate whether the NRC should take over direct operation of the plant and to arrange a meeting of the federal agencies that could provide assistance in the crisis. 313/ Brzezinski indicated that the President was unsuccessfully trying tq call the governor.314/

At approximately 11:15 a.m., President Carter reached Governor Thornburgh. The President said that he thought the governor had made the right decision not to undertake a massive evacuation. The President, having had difficulty reaching the governor himself, indicated that he was aware of the governor's communications problem, and informed Thornburgh that a White House communications system would be established between the site, the White House, the governor's office, and the NRC. The President also named Jessica Mathews as the member of his staff assigned to deal directly with the governor's office concerning the Three Mile Island accident.315/ Critchlow recalled the governor saying,

> Everybody is speaking to this thing and everybody is saying different things. It is getting really bad. Can you send us someone -- one good person who can speak to the technical problems here with authority? 316/

The President told Thornburgh that Harold Denton was being dispatched to the site and would be the President's "personal representative." 317/ The conversation was brief.

Following the President's call, members of the governor's staff met with Gerusky and the Department of Health's Emmett Welch to discuss conditions at the site. During the conversation a siren sounded in downtown Harrisburg and caused considerable confusion.318/ Scranton

called PEMA to have the siren turned off while Milne and Critchlow went to the newsroom to advise the press that the siren was a mistake and not intended to indicate a turn for the worse.319/ The focus of the discussion then became how to calm the people. 320/ According to Gerusky, the proposal was made to hold a press conference and "to explain what had happened at the plant and that the levels were decreasing, and that there was no need for anybody to evacuate."321/

6. The Advisory to Pregnant Women and Preschool Children

The first telephone conversation between Chairman Hendrie and Governor Thornburgh had concluded with a request from the governor's office that Hendrie determine whether Collins had been justified in recommending evacuation to Henderson and call the governor back.322/ By 11:30 a.m., however, Hendrie had not called and the commissioners had not refined any recommendations concerning evacuation. Commissioner Bradford said to those assembled in Hendrie's office that he thought there was a consensus that there should be an evacuation,323/ but as Bradford's legal assistant, Thomas Gibbon, recalled:

> I must say, about this time I was growing increasingly frustrated with the way the Commission was working because they were not deciding what to do. That is, they were not making a decision on evacuation or nonevacuation. They were just kind of letting things slide, in the sense that they were waiting for more information.
>
> That is one way of deciding, to wait for more information. That was the way the Chairman decided to go, was to wait for more information-324/

Ten minutes later, at 11:40 a.m., Chairman Hendrie called the governor again, but with no specific recommendation having been articulated. By this time, the NRC staff was aware that their 9:15 a.m. evacuation recommendation had been based on erroneous information and a misunderstanding of conditions at the site.325/ According to Gerusky, who listened to the conversation over the governor's speaker phone, Hendrie began the conversation by apologizing for the error the NRC staff had made in recommending evacuation. 326/ Hendrie admitted that "we really don't know what is going on," and that there might be future releases at the plant.327/ After Thornburgh and Hendrie discussed the White House communications system to be installed and the impending arrival of Harold Denton, the conversation turned to evacuation. Gerusky described the discussion as follows:

> GERUSKY: Then they discussed the situation at the plant and the question came up, that the Secretary of Health had recommended that pregnant women and infants be evacuated from the immediate vicinity of the plant.
>
> I think the governor said that to Hendrie and Hendrie's response, I think, was, "If my wife were pregnant and I had small children in the area, I would get them out because we don't know what is going

to happen." He said, "I go along with you on that, governor, and I think there ought to be an evacuation." The governor said, "What are you talking about distance-wise?" He said, "Two or three miles."

At that point it got down that two or three miles is ridiculous. There was a discussion of how far out we were going to go, and what the logistics of such an evacuation -- it was just a recommendation, it was not a call for evacuation.

He said, "If I were you, governor, I would recommend that. I would concur on that." I just put up my hand and said, there is nothing we can do. If something goes wrong at the plant now, I see no reason to evacuate. But if something goes wrong at the plant and pregnant women and small children are still there and we didn't evacuate, we are in trouble. We we have to go along with that recommendation, although I don't agree with it.

Q. How was the five-mile figure reached?

A. Well, I think in the continuing discussion with Hendrie, I believe, he was asked how far out, and he said, "Oh, a mile or two." The governor said, "Well, that is going to be difficult, because the exposures aren't that different two or three miles away."

I probably said five miles because that seemed like that was our area of concern at that point. We had a plan out to five miles and we could handle it.

I said, "I think it could be handled up to five miles," and that was the way it was decided.

Beyond five miles, the exposures weren't that significant, anyway. Even in the worst-case accidents in areas that we were thinking of, the exposures beyond five miles, were not that significant.328/

The idea of evacuating pregnant women and small children from the area around the reactor had germinated in both the state government and the NRC on Thursday. 329/ Gordon MacLeod, after proposing the idea to Gerusky, Henderson, and Pierce, had flown to Philadelphia to attend a meeting on Friday. While in his hotel room on Thursday night, MacLeod learned from the governor's staff that Met Ed had discharged the radioactive wastewater into the river, and he either mistakenly concluded or was misinformed that the discharge was the result of "human error." The news of the discharge combined with Wednesday's technical failures in MacLeod's mind and moved him to instruct his deputy early Friday morning to urge the governor to consider evacuating pregnant women and infants.330/

At the NRC on Thursday, Commissioner Bradford had discussed with Gibbon, his legal assistant, the possible dangers posed by the accident to pregnant women and had asked his technical assistant to perform some

calculations on the impact of various doses on pregnant women.331/ During the discussions about the releases on Friday morning, the matter was briefly raised again when Commissioner Ahearne overheard Gibbon ask Bradford whether some consideration should be given to pregnant women, a point on which there was no resolution. 332/ Hendrie himself recalled that Bradford had posed the question in a prior discussion: "I can remember him saying, well, you know, what would we do if we had a good friend and his pregnant wife and small children, you know, in Middletown and we weren't Commissioners?"333/

When the question was being discussed during the second Hendrie-Thornburgh conversation, Bradford slipped Hendrie a note suggesting that the recommendation might be phrased "women who might be pregnant. According to Gibbon, Hendrie apparently forgot to propose the language to Thornburgh and was unhappy with himself after the conversation had ended: "Damn it, I did not put that phrase in."334/

When the conversation with Hendrie was concluded, the officials in the governor's office discussed the method of implementing the recommendation and announcing it to the public. The problem was that it would be difficult to specify "infants" in the evacuation advisory -- there was no way to draw lines between the ages of young children. Consequently, it was decided to recommend the evacuation of preschool children. 335/ It was pointed out, however, that mothers with preschool children and school children would not be likely to take only the preschool children out of the area and leave the school children behind. Closing the schools seemed to be the solution. 336/ After a discussion of the governor's power to close schools, it was decided to use the term "order" the schools closed in the press statement.337/

At 12:30 p.m., the governor issued the following statement:

> Based on the advice of the Chairman of the NRC, and in the interests of taking every precaution, I am advising those who may be particularly susceptible to the effects of radiation, that is, pregnant women and pre-school aged children, to leave the area within a five-mile radius of the Three Mile Island facility until further notice. We have also ordered the closing of any schools within this area. I repeat that this and other contingency measures are based on my belief that an excess of caution is best. Current readings are no higher than they were yesterday. However, the continued presence of radioactivity in the area and the possibility of further emissions lead me to exercise the utmost of caution.338/

7. The Hydrogen Bubble

Only 10 minutes after Thornburgh made his announcement, the commissioners received a telephone call from an agitated Roger Mattson, the NRC's director of the Division of Systems Safety, who was in Bethesda.339/ Mattson told Hendrie that he had concluded that the core had been uncovered and remained uncovered for a long period of time, resulting in "failure modes the likes of which has never been analyzed." 340/ An important clue had come 3 hours before, when Met Ed reported to the NRC for the first time that a 28-pound-per-square-inch containment pressure

spike had been recorded on Wednesday; the NRC believed the spike indicated that an explosion of hydrogen gas had occurred. Even worse, utility and NRC engineers had calculated that a 1,000 cubic foot hydrogen bubble had formed in the reactor vessel. There was a danger that the bubble could expand and uncover the core.341/ No one know what to do:

> MATTSON: . . . They can't get rid of the bubble. They have tried cycling and pressurizing and depressurizing. They tried natural convertion [sic] a couple of days ago, they have been on forced circulation, they have steamed out the pressurizer, they have liquided-out the pressurizer. The bubble stays.342/

Mattson told Hendrie that "[W]e have not every systems engineer we can find, except the ones we put in the helicopter, thinking the problem"343/ but there was no apparent way to bring the plant to cold shutdown safely with the bubble in the system:

> . . . I think, you know, we have got the best you got, Joe, and they are not coming up with answers. We have got the Navy working, we've got Calvert Cliffs working who had a similar problem, only without the bubble. B&W in constant communication with GPU decision makers at this point. We don't have a solution, but maybe they are coming up with one.344/

Mattson had outlined some possible courses of action, but even preserving the status quo seemed risky. Mattson considered the danger to be substantial:

> HENDRIE: It sounds to me like we ought to say where we are. I don't like the sound of depressurizing and letting that bubble creep down into the core.
>
> MATTSON: Not yet. I don't think we want to depressurize yet.
>
> The latest burst didn't hurt many people. I'm not sure why you are not moving people. Got to say it. I have been saying it down here. I don't know what we are protecting at this point. I think we ought to be moving people.
>
> KENNEDY: How far out?
>
> HENDRIE: How far out?
>
> MATTSON: I would get them down-wind, and unfortunately the wind is still meandering, but at these dose levels that is probably not bad because it is (inaudible).
>
> KENNEDY: But down-wind how far?
>
> MATTSON: I might add, you aren't going to kill any people out to 10 miles. There aren't that many people and these people have bnn [sic: been] -- they have had two days to get ready and prepare.

KENNEDY: Ten miles is Harrisburg.

MATTSON: 40,000 (inaudible) five miles.

HENDRIE: Yes. I don't know, Roger, you --

MATTSON: It's too little information too late unfortunately, and it is the same way every partial core melt-down has gone. People haven't believed the instrumentation as they went along. It took us until midnight last night to convince anybody that those God-damn temperature measurements meant something. By 4:00 o'clock this morning, B&W agreed.

HENDRIE: Okay, get back on the phone with them and if you will keep us posted as you go along.

MATTSON: Yes, sir.345/

The commissioners present began to discuss the information they had just received, and much of the discussion concerned the status of the reactor and its implications. Commissioner Ahearne raised the question of whether the governor should be informed about the new development.346/ The consensus, according to Gibbon, appeared to be that if the commission called Thornburgh it should be prepared to make a recommendation.347 Before any decision was reached, however, Hendrie left for a meeting at the White House. The governor was not contacted. 348/

8. The Site, Part II

At the site, news of the NRC recommendations at first confused and then angered NRC and utility personnel. Gallina was in the TMI-1 control room at about 10:00 a.m. when a Met Ed employee barged into the room and demanded to know "what the hell the NRC was doing."349/ The employee's wife had heard a radio announcement "ordering evacuation downwind" and she was in the process of removing their children from school.350/

Gallina attempted to check the validity of the report with persons in the TMI-2 control room. Donald Beckman, a Met Ed employee, asked around the control room and reported that nobody there had ordered an evacuation.351/ Gallina called the regional office and told George Smith:

> For God's sake, somebody came in and said they heard a radio report that the NRC has ordered evacuation. Try to find out if that is true, and if it is, pull that order back because there is absolutely nothing here environmentally that calls for evacuation.352/

Smith himself was unaware of any evacuation orders. 353/ Smith recalled that Gallina was rather "unstrung" by the report -- even to the point of "blaming" Smith.354/ "Essentially, I was trying to calm him down and find out what he had heard because I knew nothing of an evacuation order-355/

Smith called NRC Headquarters and asked James Sniezek, director of the Fuel Facilities and Materials Safety Inspection Division, to issue a

press release stating that "this was false."356/ Sniezek told Smith that "decisions were being made by people in higher positions and that I should calm down a little bit."357/

Smith called Gallina back to tell him that these decisions apparently were coming out of headquarters and that Gallina, too, should calm down.358/ Despite Sniezek's advice, Gallina was extremely upset:

> I was mad. They are circumventing the licensee's procedures and circumventing the state's procedures by doing that. I was mad at the NRC headquarters. I was really livid. The procedures say that if the site believes a condition exists where the protective action guides will be exceeded, they notify the Bureau of Radiological Health, so you have two intelligent people who at least knew the jargon and meaning of the stuff, and if they agree, then the site or the state may make a recommendation, or the Bureau of Health concurs or doesn't, and then they go to the governor for the order, and then somebody completely circumvented the whole system, and it was done directly from the NRC headquarters, which has no business recommending evacuation of anyone, and it had gone to Civil Defense, which doesn't know what these numbers mean, and they are causing a panic, and I said "We got to stop it."359/

Smith informed Gallina, by then "thoroughly disgusted," 360/ of the Thornburgh-Hendrie conversations, and although Gallina still thought evacuation unnecessary, he agreed with Smith that the matter was beyond their control.361/

Reilly of the BRP was just as angry, but more philosophical:

> For years they [NRC] had been preaching to the states that offsite consequence management is yours, that is not NRC, it is yours. Then it came down to being ours and they just couldn't let it alone.362/

B. THE AFTERMATH OF FRIDAY MORNING: STRUCTURING FEDERAL SUPPORT

The events of Friday morning had a profound impact on federal, state, and county emergency management agencies. The NRC-Collins 10-mile evacuation recommendation and the governor's own 10-mile shelter advisory -- still in effect on Friday afternoon -- demonstrated beyond doubt that the effects of the accident could extend far beyond the 5-mile planning zone and require emergency management agencies to direct protective action for tens of thousands of people on short notice. That realization provoked a period of intense activity at all levels of government, particularly within the federal executive agencies, to plan and marshal resources for a potentially massive evacuation.

Prior to Friday morning the federal agencies (other than NRC and DOE) that ultimately became involved in the accident had not taken any substantial action and had not been expected to do so by the state. Friday morning's events, however, moved several federal agencies independently toward action in the absence of -- or in spite of -- requests from the organizations and institutions actively involved in

managing the response to the accident. The initial reactions of some of the federal agencies to Friday morning's events illustrate the diversity of their institutional concerns and the responses those concerns stimulated.

1. Federal Organizations

a. Federal Disaster Assistance Administration (FDAA)

As soon as the TMI accident became known, the FDAA was interested in sending representatives to the site to critique PEMA's emergency response. Throughout Wednesday and Thursday, the FDAA's regional director, Robert Adamcik, was pressured by FDAA Administrator William Wilcox to dispatch FDAA personnel to the site, although Henderson repeatedly insisted that no federal presence was necessary. Adamci had successfully resisted:

> . . . Here again, we had to be very careful, and I had to be very careful that I did not, in my philosophy or general attitude from Wednesday until Friday morning, was that -- and it always had been in dealing with the state -- I don't go where I'm not invited. I go at the request of the governor or some of his staff people to provide assistance.
>
> That is the attitude and approach that I adopted from Wednesday through Friday. During both conversations that I had with our national office Wednesday and Thursday, there was some indication just short of insistence that I dispatch someone to the scene or go to the scene personally.363/

After Friday morning's events, however, Wilcox instructed Adamcik to send someone from the regional office to Harrisburg to monitor the situation -- regardless of Henderson's reaction:

> QUESTION: Do you know whether Colonel Henderson changed his mind at that point, that he wanted somebody from your agency up at the site?
>
> WILCOX: I don't think we gave him the opportunity to change his mind .... And I said, tell Henderson you are sending him and don't ask him. And that I do recall. In any event, I said, you know, either go or send someone, but don't ask him. I remember the latter part of that: don't ask him.364/

Adamcik resisted no longer and notified Henderson that he or Wilcox would be arriving in Harrisbug to critique the emergency response.365/ Henderson politely replied that there was always an open invitation for the FDAA.366/

b. Federal Preparedness Agency (FPA)

Since Wednesday the FPA had been considering the possibility of convening a meeting of various federal agencies to frame a federal response to the accident. After Friday's events indicated a more acute emergency, the FPA's Thomas Hardy, acting regional director, was instructed

to arrange such a meeting-367/ When Hardy informed PEMA that the FPA intended to organize a federal response, PEMA objected:

> They felt there were just too many federal people there already. They didn't see any need at that point for more Federal people to be there.
>
> They were having trouble doing their job because there were too many Federal agency representatives milling around so to speak.
>
> Generally, when there is an emergency situation the state is the first higher level to respond. Then federal representatives come in and most of their time is spent talking to the state trying to find out what is going on and if you are trying to work on the emergency, after a while it gets pretty tense when everybody is coming up to you and saying, What is going on? There is the idea just to leave me alone and let me do my job.368/

FPA's effort to coordinate the federal response was preempted later, however, when the White House assigned that role to the FDAA.

c. Defense Civil Prepardness Agency (DCPA)

DCPA dispatched representatives to PEMA as soon as it learned of the accident on Wednesday. As indicated earlier, during emergencies DCPA routinely sends a representative to emergency management agencies it substantially funds.369/ Although Henderson declined an offer of additional DCPA assistance on Thursday, he accepted the renewed offer on Friday and two DCPA representatives were assigned to each of the four counties surrounding TMI to assist in planning activities.370/

These three federal agencies had obviously charted independent courses for themselves from the start of the accident, a problem that may be eliminated in the future by their recent consolidation into the Federal Emergency Management Agency. During the TMI accident, however, their activities were quickly coordinated by the White House when it became obvious on Friday that federal assistance would be provided.

d. The White House

As a result of his conversations with Hendrie and Thornburgh on Friday morning, the President directed that the federal government assist the state as much as possible. 371/ Within the White House, Mathews and Brzezinski had been monitoring developments and briefing the President, an assignment evolving more from Mathews's technical background than any institutional arrangement. As of Friday morning, however, it was clear that formal assignments would be made, and Mathews was directed to brief Jack Watson, the President's assistant for intergovernmental affairs.372/

In the Carter Administration, Jack Watson and his staff act as the President's representatives in dealing with state and local elected officials and are responsible for coordinating the federal response to natural disasters or other domestic crises where presidential involve-

ment is required. Watson had, on other occasions, convened and directed ad hoc task forces to provide specialized federal assistance, and his office was the logical choice to coordinate the federal response to the TMI accident. 373/

Watson and his deputy, Eugene Eidenberg, were briefed about 11:30 a.m. by Mathews and other NSC staff.374/ It was decided that it would be useful to meet with representatives of the various agencies likely to be involved in providing the federal assistance that might be required. A meeting with the federal emergency mauagement agencies, DOE, DOD, and NRC, was set for 1:30 p.m.

At 1:15 p.m., Mathews prepared a memorandum for the President to inform him of the events that had taken place since his telephone conversations with Thornburgh and Hendrie:

> The situation inside the reactor appears to have worsened. There is a bubble of hydrogen gas inside the reactor vessel. Some parts of the core are now quite hot (fuel rods at boiling point). There has been extensive fuel damage. The problem is that in order to provide more cooling water to the core, the pressure inside the reactor vessel must be lowered. But when the pressure is lowered, the hydrogen bubble will just expand, leaving the top of the core uncovered and growing hotter. The NRC is working now on how to manipulate the system to solve this problem.
>
> The NRC has recommended to the governor that as a precautionary measure, pregnant women and children within five miles be evacuated. We are not yet certain whether the governor has decided to do so.
>
> Chairman Hendrie has spoken with the President of Metropolitan Edison and has assurances that the utility will not take any important steps without consulting with the NRC first. The NRC Commissioners are unanimous in the view that their working relationship with the utility is fully satisfactory, and that they can direct whatever steps they feel should be taken.375/

Thornburgh, however, had not yet been informed of the existence of the hydrogen bubble.

Hendrie left the meeting of the commissioners to attend the 1:30 White House meeting, at which he was to deliver a briefing on conditions at the site. In addition to Hendrie's briefing, the meeting was to cover plans for federal assistance and the coordination of press and public statements by federal agencies. 376/ The meeting was held in the Situation Room and was attended by representatives of the White House, the Department of Defense, the Joint Chiefs of Staff, the National Security Council, DOE, FDAA, FDA, and DCPA, in addition to Hendrie. The meeting opened with Hendrie's summary of the problems in the reactor, and he explained how the hydrogen bubble could expand, uncover the core, and thereby cause a release of radioactivity into containment. The summary of the meeting records the rest of Hendrie's remarks:

He estimated a "few percentage" probability that this [radioactive] material, zion and cryton [sic: xenon and kryton], could escape into the open air and contaminate the surrounding area. If this occurs, he estimates that we will have six to twelve hours notice and that evacuation of population in about a 20-mile downwind range would be required .... The 20-mile downwind area could effect [sic] as much as 100,000 population.377/

After Hendrie's briefing, the discussion turned to the manner in which federal emergency management efforts could be organized. Brzezinski proposed, and it was agreed, that Jack Watson should direct the White House effort, in effect removing the NSC from the role it had played during the previous two days.378/ According to Watson, there had been no explicit directive at this point from the President that a federal response be organized; the President had merely asked that Watson be briefed. Implicit in that request, as far as Watson was concerned, was the President's assumption that Watson would make contact with the governor and federal agencies and begin to assess the appropriate level of federal assistance.379/

With responsibility of the White House having been transferred to Watson, two federal coordination points at the site were established. It was decided that Denton would be the single source of information about conditions at the plant, communicating directly by White House communications line to the White House, Thornburgh, and the NRC.380/ This decision was not intended (at this meeting) to designate Denton as the sole source of information for the media, but to identify for government authorities a reliable presidentially delegated spokesman on developments at the site.381/ The second federal coordination point was established when it was agreed that the FDAA would serve as the coordinating agency for evacuation planning.382/

The final topic on the agenda was public information. Although the subject did not receive extended attention, it was agreed that press briefings and public releases concerning the activities of federal agencies would be coordinated by Jody Powell, the President's press secretary, who was present.383/ At the meeting, that arrangement was merely set out in broad outline. 384/ The mechanics for coordinating public information became more formalized later in the afternoon, particularly in the identification of Denton as the sole source of information at the site.

After the meeting, Watson and Eugene Eidenberg, his deputy, met in Watson's office with the FDAA and DCPA officials to select the federal representatives to be dispatched to the site.385/ John McConnell of the DCPA was assigned the responsibility of assisting the state in emergency planning. 386/ William Wilcox had volunteered during the meeting to serve as the on-site coordinator. When the proposal was raised again it was rejected because of Wilcox's prior association with the Shapp administration in Pennsylvania 387/ and because he would be needed in Washington as administrator of the FDAA.388/ It was decided to appoint Robert Adamcik, the FDAA regional director, as the lead federal official to provide to the state any needed assistance and to keep the White House advised of developments.389/

e. Environmental Protection Agency (EPA)

Friday's events moved the Department of Health, Education, and Welfare (HEW) and the Environmental Protection Agency (EPA) to form an alliance to provide what they perceived to be the public health expertise and orientation missing in the response to the accident. Although neither agency was specifically requested by the state or the White House to respond, both moved quickly to establish a presence at the site and in the federal decision-making process in Washington.

The EPA was notified of the accident by the NRC under a bilateral agreement. 390/ The notification came to its Office of Radiation Programs (ORP), which is the office responsible for environmental radiation monitoring, the development of protective action guides for the states, and other EPA activities concerning environmental radiation. ORP, in fact, is signatory on behalf of EPA to IRAP.391/ ORP kept informed of developments at the site and notified its radiological assistance teams and mobile laboratory in Montgomery, Ala., to stay on alert in the event the state requested assistance.392/ The ORP alert remained in effect throughout Wednesday and Thursday.

At 8:30 a.m. Friday morning, before any evacuation recommendations had been issued by the NRC, EPA Administrator, Douglas Costle met with Stephen Gage, director of EPA's Office of Research and Development (ORD), and Edward Tuerk of the Office of Air, Noise, and Radiation, ORP's parent office. 393/ Costle's meeting with Tuerk and Gage was prompted by a telephone call he had just received from Califano:

> GAGE: I think his initial response was based on that parti-cular call from Secretary Califano. The Administrator respected the Secretary's judgment a great deal and the Secretary, I think, was very concerned that if something very serious did happen up there [at TMI] which threatened the public health, that it could be the kind of a conflagration which would involve not just the state government but the entire federal government in a very real question of public credibility in the face of this kind of a threat.
>
> He just was encouraging Mr. Costle to be ready to whatever extent he could be ready.394/

Costle asked Gage and Tuerk to describe EPA's capability to respond to An incident like the TMI accident if, assuming the worst, there was a significant release of radiation.

Tuerk, according to Gage, said ORP could send "eight to ten people and a mobile van which they had instrumented ....[with] a very limited amount of radiation monitoring equipment." 395/ Gage reported that ORD could provide a team from EPA's Las Vegas monitoring laboratory, which supports DOE nucl ' weapons testing, that could deploy an airplane and approximately 30 radiation monitoring stations around the facility.396/ Both were asked by Costle to put their monitoring teams on alert.

Gage returned to his office and called Erich Bretthauer, director of the Nuclear Radiation Assessment Division of the Las Vegas labora-

tory, to ascertain the monitoring capability of the team and informed Bretthauer there was a possibility that his team would be sent to Harrisburg. In the meanwhile, however, Costle was informed by NRC Commissioner Peter Bradford that conditions at the site were much more serious than during the previous 2 days.397/ Bradford recalled that he and Costle spoke several times that day, but concerning EPA's involvement,

> BRADFORD: One of the first questions I remember him asking us on Friday was he said EPA had a plant which was capable of very sensitive radiation detection. It was used in the weapons areas out west. Should they fly it east? I said I couldn't see how it could hurt anything and it might be helpful to have it in the Harrisburg area.398/

Tuerk, Gage, and Costle met with Richard Dowd, Costle's science advisor, at 11:00 a.m. Costle reported his conversation with Bradford, and Gage indicated that the Las Vegas team could send 30 monitors, an instrumented aircraft, and 15-18 staff members. Tuerk reported that the ORP mobile laboratory had been alerted, ORP had offered assistance to the state and been asked to stand by, and had learned from the NRC that morning of what appeared to be a more serious threat of releases. Costle decided to send an EPA team to the site, although a request from the state had not been received, and that the Las Vegas team would be sent.399/ Although ORP had been on alert under TRAP for 2 days, an ad hoc response was fashioned under Gage, who was made the "response director" for EPA's activities at Three Mile Island and who was unfamiliar with IRAP:400/

> QUESTION: So that as of Friday morning and even up until Saturday evening, what was happening at least within the EPA was the creation of an ad hoc response and chain of command and monitoring response to the TMI incident?
>
> GAGE: Yes.401/

f. Department of Health, Education, and Welfare (HEW)

When HEW Secretary Califano's office was notified of the incident on Wednesday, William Foege, director of the Center for Disease Control (CDC), was contacted to offer assistance to the state.402/ On Friday, at around 8:30 a.m., however, the secretary received a call from a United States Senator who wanted to know HEW's involvement in the TMI accident. That inquiry prompted Califano to instruct Richard Cotton to contact top HEW health officials to determine the level of HEW's involvement and to call Costle to determine EPA's involvement. 403/ By coincidence, HEW officials were in a staff meeting that morning. They met later with the secretary, who learned that FDA was sampling food in the Harrisburg area and that the CDC had contacted the state health department to offer assistance. Contacts were established with the NRC, EPA, and the White House. HEW and EPA staff members met later that day to discuss the level of involvement the two agencies planned, and to obtain information about the incident in preparation for a meeting involving Califano and Costle to be held after the staff meeting.404/

Costle told Bradford in the early afternoon that he and Califano intended to hold a meeting later that day to discuss EPA and HEW involvement in the response to the accident. He asked Bradford to "come and give them some feel for the accident as we saw it."405/ Bradford, a lawyer, felt that it would be helpful to have someone attend who could answer technical questions, so Gilinsky and two technical assistants were also asked to attend.406/

The meeting between Califano, Costle, Bradford, Gilinsky, and their staffs was held at 5:00 p.m. The purpose of the meeting was to obtain information concerning conditions and data collection at the site and to explore the ways in which the three agencies might cooperate in data collection and dissemination. HEW, even at that point, was interested in compiling data for future health effects studies.407/ Bradford recalled,

> It really wasn't a matter of our urging them [HEW officials] to do anything. They had strong opinions and strong concerns themselves. They were really trying to get answers. I think they were prepared to make their own decision about how involved to get.408/

During the meeting, the NRC representatives were repeatedly pressed to estimate the minimum amount of lead time that would be available in the event that an evacuation were necessary. When Commissioner Gilinsky indicated that 6 hours was probably the shortest period, a discussion followed about whether the local population should be notified that an evacuation might be necessary in that period of time.409/ No resolution of the issue was reached, but it was agreed that EPA and HEW would send representatives to the NRC Incident Response Center to facilitate information and data exchange among the three agencies.410/ It was also decided to attempt to locate supplies of potassium iodide, a drug that can protect the thyroid gland against the effects of radioactive iodine. 411/ Califano indicated that he wanted to make personal recommendations to the White House, although he did not reveal them.412/

After the meeting with the NRC and EPA, a second meeting was held by HEW officials alone to discuss HEW's operational response and the recommendations Califano ought to make to the White House concerning evacuation. Various assignments were made and incorporated in a memorandum dated the following day, March 31.413/ The activities to be undertaken included food and water sampling by FDA, placement of HEW liaison personnel in NRC's Incident Response Center, procurement of potassium iodide supplies, training of Public Health Service physicians in the treatment of radiation injuries, and the assessment of data collection in light of future public health studies. Although the question of evacuation was discussed, the HEW officials felt there was insufficient information on which to base an evacuation recommendation. There was agreement, however, that the public should be notified if it might be called upon to evacuate in as short a time as 6 hours.414/ Califano asked that a memorandum be drafted incorporating the advice of the health officials that he could review the following morning.415/

Part of some HEW and EPA officials' desire to involve their agencies in the Till response was based on a concern that agencies not committed

to the development or maintenance of nuclear technology, but rather to public health and environemntal matters, be included:

> QUESTION: So, it is fair to say that the public debate that's been generated over the past couple of years concerning DOE's alleged conflict of interest with respect to radiation research and monitoring on the one hand, and nuclear power development or nuclear technology development on the other, was a tacit assumption at some of these meetings?
>
> GAGE: I think that's very likely the case. I think to a considerable extent maybe a lot of the people involved in these activities had internalized the thinking and operated, as I said earlier, from a certain set of assumptions that we'd better get out there and do out job as public health agencies as best we can. And at least we felt, in EPA, that we had better get out there and do the best job we could, keep our nose clean in the process so that we would continue to have a good reputation over the longer period of time that we felt this thing might be going on.
>
> QUESTION: Was there discussion concerning DOE's credibility if it was the only monitoring agency on-site?
>
> GAGE: At some point, and I don't know exactly when, we began to recognize that in fact, the data which the NRC was releasing during those early hours was really DOE data, and a little bit of utility data; that NRC had no independent monitoring capability. And after that realization sank in all our minds, then I think that this was possibly as early as the Friday evening meeting, that there was very much an unspoken feeling that we in fact did think there ought to be independent radiation monitoring up there; independent from the viewpoint that it was not tied with what the members of the public might characterize as a pro-nuclear cabal. You know, DOE, NRC, and the utility. 416/

2. State Organization

When the governor's advisory to pregnant women and preschool children was announced, it was so extensively reported by the news media that county emergency management authorities did not feel the need to make special announcements. 417/ State Secretary of Health MacLeod heard the advisory over the radio on his way back from Philadelphia, and presumed that the governor had acted on his recommendation. 418/ MacLeod recalled thinking at the time that the governor's extension of MacLeod's recommendation from 2-year-olds to preschool children was a wise "practical move."419/

As PEMA and Red Cross workers began setting up an evacuation center at the Hershey Sports Arena 420/, Henderson and other PEMA officials began extending the evacuation plans to cover a 10-mile radius. As soon as he heard the Collins 10-mile evacuation recommendation, Henderson realized that the evacuation plans in place were not adequate. There were no plans beyond the 5-mile radius. Within five miles of the plant,

there was a population of approximately 25,000 people and only two nursing homes. All evacuees could be moved and sheltered within and by the affected counties. If the radius were extended to 10 miles, however, there were 136,000 people, three hospitals, and nearly 20 nursing homes to be evacuated. The 10-mile evacuation would require coordination with other counties, which complicates planning and the allocation of resources. 421/ Henderson was concerned enough about the prospect of a 10-mile evacuation that when he was asked to attend a meeting in the governor's office, he requested permission to send his deputy so that he could remain at PEMA to direct the 10-mile planning.422/ He accepted the DCPA assistance he had declined the previous day, and immediately started working with the counties on 10-mile plans.423/

The NRC commissioners were also concerned about the depth of Pennsylvania's evacuation planning -- Mattson was still urging an evacuation. While Hendrie was at the 1:30 White House meeting, Mattson told Gilinsky over the telephone that "we may have found a way to remove the bubble." Analyses were still being performed, however, because "(i)t is a failure mode that has never been studied. It is just unbelievable. "424/ To this point, the principal concern was whether the bubble would expand and uncover the core. Mattson was thinking about measures to remove the bubble from the reactor and he feared the possibility of a core melt, which raised the question of evacuation:

MATTSON: If I would rather go with one of these maneuvers right now, I would want you to move people as far as you felt comfortable moving them.

GILINSKY: And --

MATTSON: I must say to you, I have been recommending moving people since about four hours ago.

GILINSKY: Okay, now that's the next question I want to ask. What sort of evacuation plans are there, in other words, if someone decides to move right now, are there plans?

MATTSON: Oh, yes. The people would begin to move. The word I had is that some people have moved, that there were children and pregnant women who had been moved....

GILINSKY: We will get to Davis on that, but why don't you let me ask you: What is your principal concern right at this minute?

MATTSON: Well, my principal concern is that we have got an accident that we have never been designed to accommodate, and it's, in the best estimate, deteriorating slowly, and the most pessimistic estimate it is on the threshold of turning bad. And I don't have a reas(. 'or not moving people. I don't know what you are protecting by not moving people.425/

Gilinsky, after hearing Mattson's concern, wanted Collins to call the state to find out whether the state was prepared to execute an evacuation, but Commissioner Kennedy resisted, "It is going to be in the newspapers this evening at 5:00 o'clock: NRC contemplating evacuating' if that's what you want, all right."426/ It was decided that Collins would make the call, but Fouchard would be warned that there might be press inquiries.427/

Collins spoke with Henderson about the evacuation plans and reported back to the commissioners. Gilinsky wanted to know how much time would be required to evacuate the 10-mile area, but Collins had not asked.

GILINSKY: Now, what is your thought on that?

COLLINS: My thought on it, just sort of a gut feeling, up to 10 miles, at about three say 22 and a half degree sector which is, say, 70 degrees wide, I would think they would be able to get them out inside of an hour, at the most two.

GILINSKY: Are you talking about Harrisburg too?

COLLINS: I would have to include that, if it went toward Harrisburg.

GILINKSY: Let me ask you, do those three counties include Harrisburg?

COLLINS: Let's see, Harrisburg is in which county? (Mubling [sic] to himself obviously looking at a map.)

Yes, there are a lot of little towns around there, too, but the sector would be, you know, 70 degrees wide. I would say they ought to be able to get all the small towns in the counties and the local folks out within an hour, and probably certainly have the city cleared by two or, you know, something on that order. I'm estimating, since I don't live there, I really don't know. You know. It is a difficult question, Commissioner.428/

Although the Mattson call had escalated concern among the commissioners about whether an evacuation would be necessary, no movement was made toward making a recommendation to the governor or even informing the governor that the hydrogen bubble existed and had caused new and substantial problems. As Gibbon saw the situation, "People had been deferring to the Chairman; and so, when he left, it virtually made a decision by the Commissioners impossible. "429/ The transcript of the meeting supports Gibbon's statement: both Gilinsky430/ and Kennedy431/ indicated that they were waiting for the chairman to return before making decisions.432/

With the advent of federal assistance in Harrisburg, the governor's office and the White House began to exchange information and to coordinate their efforts through a series of telephone calls. Mathews, who at first had been designated by the President as the White House contact,

called the governor's executive assistant, Jay Waldman, to brief him on the problems at the reactor. She informed Waldman that Jack Watson was now in charge of the federal TMI response. As in his other briefings from technical experts, Waldman pressed Mathews for her evaluation of the worst-case scenario and the amount of time that state officials would have to react. Mathews responded that the worst possible case was a meltdown of the core, and that as few as 4 to 6 hours would be available in which to react, a shorter period than had been previously suggested to the state officials by any other expert.433/ Waldman also learned that the TMI problem was unprecedented.

Shortly after the Mathews call, Watson called Thornburgh to establish two separate channels of information for the state and the White House, obviously a result of the 1:30 p.m. White House meeting.434/ Thornburgh described the Watson call in a memorandum dictated immediately after the call took place:

> Watson enumerated the desire to establish two separate circuits of information:
>
> A. The technical information developed from the site, i.e., 'what's happening,' which will be handled by Dr. Denton.
>
> B. The response circuit intended to evaluate and access (sic) the need for and performance of state, local and federal agencies.
>
> With respect to the latter responsibilities, Watson stated that he has assigned John McConnell, assistant director of emergency management, and Bill Wilcox, director of the Federal Disaster Assistance Administration, to keep the White House advised through contact with Col. Henderson and others in Pennsylvania. Our contact should be with the regional on-site coordinator, Bob Adamcek (sic), the regional director of the Federal Disaster Assistance Administration. 435/

Watson emphasized that the designation of contact persons was purely informal to promote the flow of information between the state and the White House and that his deputy, Eugene Eidenberg, was to be Pennsylvania's "full-time contact" with respect to the TMI accident.

The Watson call had been preceeded by another call from Mathews, and this time she spoke to Thornburgh himself. Mathews's information came from Denton, who had by then arrived at the site. Mathews revealed that the increase in radioactivity that morning was caused by a deliberate venting. She suggested that "Jody Powell and Paul Critchlow are really going to have to carefully coordinate the public message." 436/ The news appeared to be getting worse. Although Mathews described conditions at the site as "a stable situation," state officials recall being told by Mathews that a hydrogen bubble had developed in the reactor vessel and that the top of the core had been uncovered. 437/ The major problems facing the experts were removing the hydrogen bubble and keeping the core covered. The Mathews conversation was the first time the governor's office was informed that a hydrogen bubble had formed in the reactor. Mathews said that experts at the site did not have "a good picture" of what was actually wrong with the reactor.

When Hendrie returned from the White House, he summarized the substance of the meeting for the other commissioners, 438/ and said that the judgment on evacuation should be made by Denton, the sole source of information at the site.439/ When Ahearne brought up the Mattson call, Hendrie responded that he thought that Denton ought to be given a chance at the site,440/ and outlined the two situations in which he saw the need for evacuation: a deterioration of the condition of the core or a deliberate manipulation of the hydrogen bubble. 441/ Bradford stated that the governor should be told about these developments, but there was no explicit resolution of this point; the commissioners were waiting for Denton to call.442/ They were not aware that at that time -- shortly after 3:00 p.m. -- that Jessica Mathews was telling Thornburgh about the bubble.

Denton called at 3:16 p.m. and gave a brief summary of conditions at the site.443/ Hendrie raised the question of a precautionary evacuation, but Denton replied:

> I guess I'd like to defer that until I can meet with the people in the area a little bit, at least having gotten here and gotten some people all talking to each other I'd like to get back with them to see what they think the situation really is as you would expect start talking to the staff here there are a lot of details that we didn't have back in Bethesda.444/

The discussion turned back to technical issues, and later to whether Denton and Hendrie should give press conferences, but the decision evolved during the conversation that Denton and Hendrie should both call the governor, with Hendrie's call being placed first. With the call to the governor imminent, Ahearne asked Denton for his recommendation:

> AHEARNE: Harold, one of the issues that obviously we're trying to think through is as you know before you left, Mattson and Case had recommended evacuation. And obviously we're waiting to find out after you're now there and have your people talking to the licensee and have a better feeling for at least that view, what your recommendation is.
>
> DENTON: I think -- one of the things that at least is encouraging, we kind of had the feeling this morning, back there that the licensee doesn't even recognize the problems that we're facing with regard to the bubble and damage and what might happen if we were to lose vacuum and so forth and the brief discussions we've had, they seem to comprehend the same sorts of problems and have preliminary plans to cope with it. This takes a little bit of the pressure off the immediacy of my concern this morning 445/

Hendrie called the governor. He opened with a lengthy, highly technical summary of the conditions inside the reactor. In the middle of his narration he mentioned the bubble:

> ....There is at least one element, however, that still reads over saturation, and that strongly suggests there is some blockage in that element and steaming going on so that that thermocouple is in

a steam atmosphere. Now, in addition there is pretty fair reason to believe that we've had some metal-water reaction and the experts project that there is a hydrogen bubble up in the top of the vessel -- things are setting fairly stablely [sic] at the moment and continue that way for some days I think, but we need to, our people and the licensee's people are working hard figuring out how to come down out of this situation. System pressure is about 1,000 psi, temperature in the bulk temperature is about 280 Fahrenheit -- there is continuous letdown stream of about 10 gallons per minute 446/

Hendrie could not have known that his mentioning the hydrogen bubble over the speaker phone brought a strong reaction from Gerusky, who put his head in his hands as soon as he heard it.447/ When Hendrie was through with his summary, Thornburgh said to Hendrie that "some of our folks here indicated there were a couple of things you said triggered some questions." The first question was:

VOICE: What are the potentials for an explosion that would rupture the core? Rupture the vessel?

HENDRIE: There isn't any oxygen in there to combine with that hydrogen so the answer as far as I know is pretty close to zero.448/

The possibility of the bubble exploding was not pursued further.449/ Later in the discussion, Hendrie suggested that the emergency workers should be placed on alert and, that "if we suspected getting a fairly husky release," the evacuation might extend 20 miles.450/

THORNBURGH: Is there anyone in the country who has experience with the health consequences of such a release?

HENDRIE: Ah -- not in the sense that it's been studied and understood in any real way... .451/

The conversation lasted a few more minutes, but Thornburgh was interested in talking to Denton. When it appeared that Denton was on the other line, Thornburgh quickly concluded his conversation with Hendrie.

At 4:05 p.m., Denton and the governor spoke for the first time. Denton told Thornburgh that because of the hydrogen spike registered earlier in the week, NRC knew there was a hydrogen bubble on top of the core. The presence of the bubble and the extensive core damage would require more analysis, but there would be no significant change in the mode of cooling the core for several days.452/ Denton described plant conditions as "relatively stable," with no significant danger off-site. Arrangements were made for Denton to come to brief the governor personally at 7:00 p.m.

Shortly after the Denton call, Watson called Jay Waldman, telling him that FDAA Director Wilcox was pressing for a declaration of emergency for "bureaucratic" reasons relating to payment for assistance given to the state. Waldman described the conversation:

Jack Watson asked me if we could please not request the President to declare a state of emergency or disaster. .

He said that it was their belief that they could generate unnecessary panic, that the **mere** statement that the President has declared this area an emergency and disaster area would trigger a substantial panic; and he assured me that we were getting every type and level of Federal assistance that we would get if there had been a declaration. I told him that I would have to have his word on that, an absolute assurance, and that if it were true, I would go to the Governor with his request that we not formally ask for a declaration. 453/

Waldman quoted Watson as saying, "It is a tactical and political judgement."454/ According to Waldman, if Watson had not assured him that the level of assistance would be the same, a declaration would have been requested.455/

Watson and his deputy testified that there was no such request made to the state:

Q: Was there any suggestion by you or from your office that you know of to the Governor or the Governor's office not to request a declaration of disaster. Was that request ever made?

WATSON: No, not to my knowledge. Certainly not by me. Not by my deputy. Maybe it is fair to say not by anyone authorized to make such a suggestion. That question was a question really for the Governor to decide....

The concern was a concern addressed to the effect of such a move on the population around the area, and that was, of course, one of the Governor's greatest concerns. His other concern was being assured that he was getting everything that he needed and that we were capable of delivering without the declaration.

I assured him that that was being done. Therefore, he continued on the view that he did not choose to make the request.456/

The governor has stated that although he was concerned that the state receive full support and that a declaration might escalate public anxiety, he was not really involved in these discussions -- "Jay handled that with Jack."457/ In any event, no request was made and the state was satisfied with the federal assistance it received during the accident.458/

C. CENTRALIZING PUBLIC INFORMATION: 4:00 A.M. TO 12 MIDNIGHT

On Wednesday and Thursday, the media and the public had found that information about the accident, though difficult to understand, seemed to conflict, even when only Met Ed and the state commented on developements at the site. Friday's events added to the cast Harold Denton, the NRC in Bethesda, various federal agencies, and the White House, all of which were in a position to make public statements about some aspect of the accident. By mid-afternoon, Denton had given a press

conference at the site, Jody Powell had held a press conference at the White House, and the NRC commissioners were discussing a Hendrie press conference and a possible appearance by an NRC official on the McNeil/Lehrer Report.459/ The potential for conflicting reports was becoming obvious.

At the 1:30 p.m. White House meeting, information sources had been established to provide the various federal agencies with clearly defined, reliable channels of information: Denton would be the source of information about conditions at the site, the governor for protective action, and the White House for the activities of federal agencies other than the NRC.460/ Although this arrangement extended at the meeting to the flow of information to the public,461/ that extension began on Friday afternoon. Jody Powell, the President's Press Secretary, began to lay the foundation for the coordination of statements to the press. Mathews worked with Powell on Friday afternoon to prepare for a 5:15 p.m. press conference:

> MATHEWS: But in the course of the afternoon the discussions that I had with Powell, his feeling was that in order to avoid confusion there should be three principal sources of information.... But the NRC should be the source of information about technical aspects and what was happening at the site; that he [Powell] would brief on what the Federal Government was doing. All activities that were being set in motion to support the state; and that Critchlow, the Governor's office, would brief on everything that the state was doing....
>
> Q. So your understanding that what he was setting up here was a troika of exclusive sources of information concerning particular subject areas?
>
> A. Yes.462/

Powell's office began to make telephone calls to inform federal agencies of the arrangement.463/

One of the recipients of a call from Powell's office was HEW. Richard Cotton, executive secretary, understood the directive to be "very clear that no information was to be disseminated publicly, except through either the White House press office or the NRC public information officer on the scene."464/ Hendrie received a call from Powell on Friday afternoon, and recalled that Powell was "concerned precisely about the panic side of it creating an unnecessary unease and perhaps panic down there."465/ Hendrie summarized the arrangement for his fellow commissioners:

> What he is suggesting is maybe we ought to go a little lower key up here.... We might be able to provide some kind of background information up here in terms of NRC activities with regard to the federal coordination of disaster relief and emergency actions and so that is Jody Powell's and the White House and anything with regard to civilian protective action and so on, that's the Governor's.466/

Critchlow received a similar call from Powell and agreed to the proposal on behalf of the governor's office.467/

As Powell was attempting to centralize the flow of public information, the NRC in Bethesda was holding a press conference to try to explain the technical problems in the reactor, a subject entirely within the NRC's sphere of responsibility under the arrangement Powell was constructing. The press conference proved that centralization of information was not a complete solution to the problem Powell wanted to solve: there were also problems of presentation.

During the press conference, Dudley Thompson, an NRC official in the Office of Inspection and Enforcement, tried to explain why the NRC was concerned that decreasing the pressure in the reactor vessel could expand the hydrogen bubble and expose the core. In doing so, he acknowledged that the possibility of a meltdown though remote could not be absolutely ruled out. The press began to report the story.468/

At 5:15 p.m., Powell held a press conference at which he announced the centralization of information:

> Let me, first of all, say in terms of how we will try to keep people informed here, the information on the situation on-site will come through the Nuclear Regulatory Commission, either through Mr. Denton and his associates there, or through the Commission here in Washington.
>
> Information and announcements with regard to steps need to be taken or may need to be taken in civilian population, safety precautions and so forth, will come through the Governor's office in Harrisburg.
>
> The information that we will be able to provide you here in the White House will relate to the Federal Government's coordinating role in support of primarily state and local officials there in Pennsylvania.469/

At the NRC, when Hendrie first heard the report about Thompson's statement he was skeptical ("I know he didn't say it"), 470/, but he later understood the context: "Dudley Thompson got wandering off about what might happen if the gas bubble expanded.... Got to talking about the possibility of meltdowns."471/ The story had spread quickly to Harrisburg:

> DENTON: I can understand Dick Vollmer's problem now. Christ, all I've done is get on the phone.
>
> HENDRIE: Yeah.
>
> DENTON: Governor's office calls every few minutes.
>
> HENDRIE: Yeah....
>
> DENTON: That was the first question I was hit from when I told him why I was here was that word from NRC was concern about meltdown.

HENDRIE: Oh, for Christ's sake. Yeah -- I know.

DENTON: I gave him my view that there was no imminent hazard 472/

The Commissioners themselves then began to draft a press release to balance the story.473/

Denton was delayed an hour and a half for his 7:00 p.m. briefing of the governor. When he arrived, he reported to the governor that although fuel damage was great, there was no immediate need for evacuation. The principal problem was that pressure in the reactor had to be lowered for core cooling but a lower pressure might expand the bubble and uncover the core. The governor kept pressing Denton on whether an evacuation should be ordered. Denton maintained that an evacuation was not necessary at that point, but state authorities should be on alert.474/ Denton assured the governor and his staff that the chance of explosion or other catastrophic event was remote, and an adequate amount of time would be available in which to respond.475/

After the briefing, the governor and Denton held their first joint news conference. Thornburgh, in his opening remarks, told the media that Denton had provided him with "What I believe to be the best information available on this matter," and continued:

> Based on what he had told me, I have made the following three decisions:
>
> One, no evacuation order is necessary at this time.
>
> Two, my earlier recommendation that pregnant women and pre-school children stay out of the area within five miles of the plant site will remain in effect at least until some time tomorrow, when we expect to provide you with further advice.
>
> Three, my earlier advice, that people living within ten miles of the plant site try to remain indoors will expire at midnight.478/

Denton was asked several questions during the press conference and it was becoming clearer that his role would be that of principal public spokesman about conditions at the site. Although President Carter had called him shortly after Denton arrived at the site and asked him to inform the public fully and accurately about events, Denton had not sought the responsibility.

> DENTON: So I briefed the Governor Friday night, and then we went out to make a press release. He read a press release and I had never been much involved in press releases before, and then someone asked a question, and he said, "Well, Denton will answer those." And so from that time on, it became sort of a regular ritual, and so I tried as best as I could just to let people know what I knew.477/

Henderson, who had been at the meeting, recalled Denton suggesting that it would be prudent to start planning for a 20-mile evacuation. When Henderson returned to his office at 10:30 p.m., he ordered the counties to extend the planning to a 20-mile evacuation. Six counties, rather than four, were directly affected, and 30 additional counties would be required to provide some kind of assistance. Within the 20-mile evacuation radius there were over 650,000 people, 13 hospitals, and a prison.478/

In Washington, Hendrie was becoming more concerned about the hydrogen bubble. Late Friday afternoon, Lee Gossick, the NRC's executive director for operations, had told the commissioners that "Mattson's word that they thought maybe they'd caught some glimmer of hope on the way to get rid of the bubble ... doesn't seem to be jelling and they're still working."479/ At an evening commissioner's meeting, the reason for Hendrie's concern had emerged:

> GILINSKY: Let me ask you, what is the problem about just leaving it [the reactor] the way it is? Is it the growth of the bubble or -- I mean it does seem to have cooled down a bit and as you were pointing out, there are less of these bubbling rods.
>
> HENDRIE: Yeah. I think it ought to stay the way it is probably for a couple of days. Over the long term, this is an unsatisfactory configuration for the machine to be in. We've got to get it down cold.
>
> GILINSKY: I mean it's not moving at any significant rate the way the temperature is. Is that what you're saying?
>
> HENDRIE: Well, --
>
> BRADFORD: Why wouldn't it go cold this way?
>
> HENDRIE: The problem with this thing is that -- I'll get to Roger and his troops later tonight. I want a calculation of the radiolytic disassociation [sic] rate. At the moment, we've got a hydrogen bubble with some steam -- maybe some steam in it in the had of the vessel. It's probably pretty pure hydrogen. The reason is that the evolution is from a metal-water reaction in which you just get hydrogen, you don't get anything else in a gaseous form. There are two other ways you get hydrogen in these situations, however, and the one which is of concern is the radiolytic disasociation [sic] of water, just ionization; just ionizing the particles on water gives you hydrogen and oxygen.
>
> Now some of the oxygen will trap out as oxide on the structure but some of it will work its way back up. So over some period of time which is probably of the order of many days or a week or weeks, you're going to begin to get enough oxygen up in there to worry about the thing. And if there's anything I don't particularly think I need at the moment it's flammable -- you know, for the bubble to be in a flammable configuration.480/

Hendrie told the Commissioners that "[t)here's probably no oxygen up there now but as time goes on, definitely why you'll keep building oxygen," which could become flammable when it reached 4 percent of volume. 481/ Earlier in the day, Hendrie had said during the afternoon telephone call to Thornburgh that the potential for explosion was "close to zero" because of the lack of oxygen in the reactor vessel482/ earlier that day483/ -- about the possibility of oxygen being generated over the following days.

The concern about the hydrogen bubble now was not only that it would interfere with cooling, but that it might become explosive. Friday night, Hendrie called Roger Mattson:

HENDRIE: It's trivial, but I'm worried about the oxygen buildup.

MATTSON: Oxygen build up where?

HENDRIE: In the bubble over there in the dome. Why do people, why I am duly worried about that? Nobody else seems to be.

MATTSON: That's the first time I've heard the question asked. I'm not an expert on that. Tell me why that's important.

HENDRIE: If you build up the oxygen content in that bubble, you get flammable.

MATTSON: Inside that --

HENDRIE: Yep. Can we stand the bang in there? That core doesn't sound to me like it's in much shape to get rattled.

MATTSON: I think we'd better get somebody thinking about that.

HENDRIE: And furthermore, the time to go before it gets flammable doesn't sound that far away. I had kind of hoped it would be a couple of weeks before we got to that stage, and that, you know, so if necessary, we could sit here and take a little useful, after the decay. We may be pressed to go before that. Anyway, I wish you'd work the problem, Rog.

MATTSON: Yeah, with the oxygen thing, yeah. I think what we'll do is get with Danny and get Taylor thinking. That question, I'm not sure who to turn to here, but I'll find somebody here to --

HENDRIE: Let me make a suggestion to you. I'd be interested in having a different set of guys make a content on the evolution rate.

MATTSON: From a radiologist?

HENDRIE: Yeah.

MATTSON: Let's see --

HENDRIE: Just to keep the, you know, the, everybody, people are getting a little tired.

MATTSON: Yeah.

HENDRIE: I don't want to slip anything.

MATTSON: Let me ask you another one.

HENDRIE: Yeah?

MATTSON: I'm wondering what the guys are doing up there. They seem to be scheduling into a mode of operation that I don't quite like and I haven't had a chance to talk to Harold about it.

HENDRIE: Yeah, I know what your concern is. We're beginning to run the plant.

MATTSON: Yeah. I've got four guys in the control room, and two guys in the --

HENDRIE: Yeah.

MATTSON: And I don't like it.

HENDRIE: Well, it's not a mode, though we prefer to be in. But I'm afraid this operating organization isn't strong enough for us to stand back.484/

IV. SATURDAY, MARCH 31, 1979

A. EMERGENCY PLANNING AND EFFECTS: 12:01 A.M. TO 9:30 A.M.

Throughout Friday night and early Saturday morning, PEMA officials worked to identify the basic geographical spread of population within the 5-, 10-, 20-mile evacuation radii. Evacuation routes were then assigned over the major roads out of the evacuation areas to coordinate movement from one county to another. 485/ The state police and Department of Transportation were working with PEMA to develop instructions for the counties on the assignment and use of evacuation routes to coordinate the flow of vehicle traffic, the first step in evacuation planning. More difficult problems remained in arranging for the resources necessary to transport people, particularly the incapacitated, and to secure relocation centers.

Shortly after midnight, Kevin Molloy received a telephone call from the administrator of the Frye Village Retirement Center in Middletown, who had decided to evacuate the center immediately to avoid having to evacuate under emergency conditions. 486/ The center had arranged for relocation space in several different nursing homes outside of the 10-mile radius, and the county agreed to provide ambulances to assist in the transportation of the residents. Similar arrangements were made later that morning with the Odd Fellows Home in Lower Swatara Township, **and** both evacuations were carried out on Saturday. 487/ Evacuation of the two nursing homes emphasized to county officials the special problems inherent in the evacuation of sick or elderly people.

During early Saturday morning, the EPA team from Las Vegas had encountered problems reaching Harrisburg:

> Q. We were talking about the logistical problem of getting people on a moment's notice from Las Vegas to Harrisburg. Just generally, what were some of the problems you had?
>
> A. Well, the first thing that we did, we had to worry about getting our people and equipment to Harrisburg. We had determined that we wanted a staff -- we had a staff available for immediate deployment of about 17 people, and we recognized that United Airlines was going out on strike that evening at midnight. We called around to try to charter an aircraft, all the major companies that do that, to the best of our knowledge, and they couldn't get one there for at least a day. We discussed the situation with TWA, and they said that they would see that we got there. This apparently meant bumping many people to see that our team got there. They were extremely cooperative, and they told them that we needed all this equipment out there, and they agreed to let the paperwork come later.
>
> ... At 12:00 o'clock (Friday) the first load left, Pacific Standard Time, the equipment left Las Vegas. It went to Philadelphia. We couldn't get it into Harrisburg. There it was picked up by the regional office and we had contacted them and they brought it to

Harrisburg. The remaining of the equipment followed on most of the remaining equipment followed on the flight with us.

We left that evening, at 2050, 8:50 [Friday], I guess, and connected through Los Angeles to Chicago to Harrisburg, and there were problems. That night, United was going on strike and we couldn't get a direct flight to Harrisburg from Chicago like we usually can. We had to go through Los Angeles. While we were in Los Angeles, Frank got bumped, and he didn't get there....

The rest of us all made it. We got to Chicago, and we had a four-hour delay. An airplane was there, but they didn't have a flight crew, so we had a four-hour delay there waiting for a crew, and we arrived at 1500 -- we arrived at 1200 [Saturday], approximately, early afternoon, and began setting up our equipment.

We also had a plane which left what we call our Turtle Beach, which is the monitoring aircraft, which left Las Vegas at 1700 Friday and it got in there at 1500 the next day, into Harrisburg.488/

Once the EPA team arrived, however, it quickly set up its analytical laboratory and 31 call stations around the reactor, and began taking samples.

As of Saturday morning, the only federal agency other than DOE performing environmental monitoring at the site was the Food and Drug Administration (FDA), sampling food, water, and milk. On an ad hoc basis, the FDA also made available to the state over 200 thermoluminescent dosimeters (TLD) for radiation monitoring. The state accepted the offer, and the TLDs were deployed to upgrade the state's limited monitoring capabilities.489/

The Washington office of the Food and Drug Administration had been working through Friday night and Saturday morning to locate supplies of potassium iodide. Between the time of the Friday evening meeting at HEW and 3:00 a.m.

Saturday, there were a series of discussions between the staff of the Bureau of Radiological Health of the FDA and the Bureau of Drugs, also part of the FDA, about the location of supplies of the drug. John Villforth, the coordinator for the HEW response to the accident, at first believed that a sufficient supply might be available through local pharmacies in the Harrisburg area.490/ He requested that the FDA's executive director of regional operations and the FDA field force in Philadelphia, Baltimore, and Harrisburg consider a survey of local pharmacies. 491/ The executive director was reluctant to do so, however, because he felt "it would increase apprehension and anxiety among the staff."492/ Consequently, Jerome Halperin of FDA's Bureau of Drugs was consulted.

Mr. Halperin did some calculations and realized that the amount of powdered potassium iodide that would be needed was something like a little more than a ton and the probability of it being available

in the Harrisburg area was remote. He then took it upon himself to try and locate a commercial supply since, you should note, there is no commercially available approved potassium iodide drug used for this purpose.493/

To obtain sufficient quantities of the drug, Halperin contacted the Mallinckrodt Chemical Company of St. Louis, which had a pharmaceuticals product division that could supply the required medicinal form.494/ Shortly after 3:00 a.m. on Saturday, Halperin reached an agreement with Mallinckrodt to begin an emergency effort to produce approximately 250,000 bottles of potassium iodide. 495/ Without a signed contract or written purchase order, production and bottling by Mallinckrodt, with assistance from Parke-Davis, another pharmaceutical firm, began immediately; the first shipments arrived in Harrisburg less than 24 hours later.

Early Saturday morning, a few hours after speaking with Mattson, Hendrie was still working on the bubble problem. He had performed his own calculations and had begun to call NRC staff members to start work in calculating the rate of oxygen evolution. Hendrie called Darrell Eisenhut, deputy director of the Division of Operating Reactors, who was in Bethesda, and later Matthew Taylor, who was at the site. He told both men of his concern about oxygen evolution in the reactor vessel and the possibility that an explosive mixture of hydrogen and oxygen could be created. 496/ Hendrie asked that the staff begin to evaluate the problem. By Saturday morning, NRC staff members began contacting contractors and consultants throughout the United States to work on various aspects of the hydrogen bubble problem.497/

To Bradford, the **commission's** evacuation recommendation needed reassessment:

> [By] middle to late Friday, I was uncomfortable for about 48 hours with the condition of the Commission evacuation recommendation.
>
> We had Mattson's concerns about the core. By Friday evening we had Joe Hendrie's concerns about the hydrogen oxygen evolution rate. It just seemed to me that we had an accident that had been misdiagnosed for two days at the beginning on a grand scale. Now we were placing our reliance on a sense that there was two or three percent or less oxygen one way or the other in the bubble; and having missed so much about the accident in the first 48 hours, I just wasn't comfortable that we were capable of being all that precise during the weekend.498/

B. THE HEW EVACUATION RECOMMENDATIONS TO THE WHITE HOUSE 9:30 A.M. TO 5:00 P.M.

At HEW in Washington on Saturday morning, senior health officials began to carry out the assignments that had been made by the secretary during the previous evening's meeting. At 9:30 a.m. Califano met with the directors of the National Institutes of Health and the Center for Disease Control, HEW's General Counsel, the FDA Commissioner, the director

of the Bureau of Radiological Health, and representatives of the Secretary's office to be briefed on the progress of the acquisition and shipment of potassium iodide.499/

The principal activity in HEW on Saturday morning, however, was the continuation of the previous evening's meeting on the HEW role in the TMI crisis. The secretary had made it clear on Friday evening that he wanted to make recommendations to the White House based on public health considerations500/, and HEW officials spent the morning discussing the kinds of recommendations that should be made.

Califano that morning called the President to suggest that a meeting of certain cabinet secretaries be convened for a Presidential briefing on the TMI accident. The President, who was leaving for a trip that afternoon, asked Jack Watson to discuss the matter further with Califano. 501/ Watson told Califano that he did not think a high level meeting should be held.502/

Q. What were your reasons for that?

WATSON: I thought it was unnecessary and inadvisable. Unnecessary because everything was working; the agencies were working very well together. I did not think we needed such a meeting to resolve any problems, any problems of function or performance that were occurring. Therefore, the only other reason for the meeting that I could think of was to have it as a media event, and I did not think we needed a Presidential media event on this subject at this time. And for essentially those two reasons, both of which I explained to Secretary Califano, I thought that a meeting was inadvisable....

And I don't know that Secretary Califano agreed with me, but he went along with it.503/

HEW officials began to formulate recommendations to be included in a memorandum to Jack Watson. 504/ On Friday evening, the HEW consensus had been that some form of notification should be given to the public if an evacuation with as little as 6 hours notice might become necessary within the next few days.505/ On Saturday morning, HEW officials became "more preoccupied" with evacuation, particularly with the radius of evacuation.506/ A 5-mile radius apparently had been mentioned on Friday evening and, indeed, was incorporated in an early draft of Califano's memorandum to Watson.507/

By Saturday morning, however, the health officials had concluded that a 5-mile radius was too small, and the discussion focused on whether a 10- or 20-mile evacuation would be necessary. Villforth urged a 10-mile radius,508/ while the principal proponent of the 20-mile radius was Arthur Upton, director of the National Cancer Institute. 509/ Upton, as a member of the Ford Foundation Nuclear Energy Policy Study Group, had reviewed the so-called Rasmussen Report, the WASH-1400 study. On Friday evening, as evacuation was discussed, Upton seemed to recall that the Rasmussen Report had referred to a 20-mile radius:

> I think that the figure [came] to mind as I tried to recall the Rasmussen Report, the WASH-1400 Study, in which the numbers of casualties resulting from large doses of acute exposure, the early radiation sickness and the resulting radiation casualties, were strongly dependent upon evacuation speed. And I believe I recall that their assessment was predicated on the assumption of prompt evacuation of population out to 20 miles. I didn't have the opportunity on that Friday to go back and consult WASH-1400 and so my suggestion was based on my recollection of the WASH-1400 treatment of the problem.510/

Upton apparently consulted the Ford Foundation Study Group's Report to refresh his memory about its treatment of the WASH-1400 Study and confirmed that a 20-mile evacuation radius was cited. 511/ On Saturday he was a strong proponent of a 20-mile evacuation radius. Richard Cotton, HEW executive secretariat, recalled the genesis of the 20-mile figure:

> COTTON: The discussion Friday evening had not focused carefully on the precise radius. Dr. Upton had left that discussion and apparently done some research and some thinking overnight, and he called me, it is my recollection, Saturday morning to say that he having reviewed some document and sone some research, had come to the conclusion that a twenty-mile radius was the appropriate radius.
>
> And based on his recommendation, some discussions that I had with Bill Foege, the Director of the Center for Disease Control and subsequent discussions with the Secretary; this became a matter of some urgent attent.
>
> Q. Do you recall Dr. Upton's basis for urging a 20-mile radius?
>
> A. My recollection, and it is hazy, is that he said to me that based on his review of WASH-1400, he had become convinced that twenty miles was the appropriate radius. . . [W]e felt that Dr. Upton was the Department's leading expert on radiation, and we would basically defer to his judgment.512/

Robbins of NIOSH also supported the 20-mile evacuation radius.513/

It appears that the 20-mile radius was selected in an abundance of caution. The public health officials were having great difficulty translating the previous evening's NRC briefing into public health risks on which clear recommendations could be based. Villforth recalled HEW officials discussing whether the hydrogen bubble would combine with oxygen to explode, whether the bubble would interfere with cooling, whether containment would be breached if an explosion were to occur, and the kinds of releases that could be expected if containment were breached -- "[T]hese were the kinds of discussions that all of us were talking about and I think none of us really knew what we were talking about."514/ According to Cotton, the group was:

> very clear on what they thought should be done if certain facts were true ... but the frustration that HEW constantly felt was

simply not knowing the facts; in light of not knowing the facts, trying to be very careful not to say something which would require knowledge of the facts in order to make clear recommendation.515/

Lacking a clear picture of the public health risks posed by conditions at the site, HEW officials focused their concern on whether the NRC could provide assurances that the reactor was cooling safely. Obviously, the NRC could not provide those assurances, and Califano made the following recommendation in his memorandum to Jack Watson:

> On Friday afternoon, at our meeting here, the NRC could not provide firm assurances that the reactor was cooling safely. It is my understanding that assurances were still not forthcoming early this morning.
>
> I recommend that you should seek those assurances from NRC and that, if NRC cannot provide them, you consider recommending to the Governor immediate evacuation,...
> (Emphasis in original.) 516/

Following that recommendation, Califano stated that "at a minimum" the population within 20 miles of the plant should be notified "publicly and officially" to be prepared to evacuate on notice as short as 6 hours, although an evacuation to the extent of a 20-mile radius might ultimately prove unnecessary.

Me second concern discussed at HEW on Saturday morning and incorporated into Califano's recommendations memorandum was whether the NRC would consult with public health officials before deciding what to do about intervening in the reactor. Cotton described the concern as follows:

> There was no information being made available up to that point to HEW on which to come to a sensible judgment about the nature of the risks that existed then. But there also was no process of consultation established in terms of deciding where to go.
>
> So that to the extent the NRC had put on the table the fact that it was going to be making decisions in the future with respect to what to do with the reactor that involved very perceptible, very real risks; there was clearly a desire on the part of the Public Health Service scientists and medical officials to be consulted in that process; to be able to offer to the NRC their judgment as to the best way to protect the public health.... 517/ Part of the impetus for HEW's desire to be consulted was the need to place itself in a position in which it could acquire facts on which to base recommendations. Another motivation appeared to be a concern about the NRC. Cotton stated, "There was a great uneasiness as to whether the facts were such that would justify the actions that the NRC was taking," 518/ while Villforth said that the consultation HEW officials proposed was "important because there was no doubt frustration that the NRC had the potential to make some public health decisions when NRC's credibility may not have been that good."519/

After the meeting with HEW and EPA officials the previous meeting, Gilinsky had probably formed a correct impression of their concerns:

> My impression of their feeling was that they were concerned that, in effect, a bunch of reactor engineers were making decisions that had public health consequences without adequate contributions from the government's experts in public health.520/

In an early draft of Califano's memorandum to Watson, there was no recommendation that the NRC consult with public health experts before deciding about interventions in the reactor. 521/ As the draft circulated, language was added to suggest the consultation. For the final draft, however, Califano told Cotton "to add and to strengthen that language" and "he asked that that point be pulled out as a separate point, in a separate section," and he "felt it was tremendously important." 522/ The final version of the memorandum to Watson contained the following recommendation:

> Decisions About Interventions
>
> The information that has been made available to us indicates that the interventions being considered to ease the problems with the reactor core carry a significant degree of risk to the population in the surrounding area. It is critical that the public health experts from HEW and EPA participate in assessing the seriousness of the public health risks associated with alternative interventions, in deciding which public health risks to take, and in deciding what precautionary steps, including evacuation, are needed to protect the public health when a particular intervention is selected. That is not the case now. I strongly recommend that you make certain NRC closely consults with HEW and EPA public health experts on proposed courses of intervention. (Emphasis in original.)523/

Although Califano had strongly recommended the need to prepare for evacuation and for consultation between the NRC and health officials, HEW was still unsure of its role. In his memorandum, Califano informed Watson of FDA's activities in monitoring and obtaining potassium iodide supplies, and offered the resources of HEW in the assessment of public health implications of monitoring data and in providing evacuation assistance. Califano pointed out twice in his memorandum, however, that "we need to know what responsibilities you expect us to shoulder." 524/

As the Califano memorandum indicates, HEW officials knew that the White House was coordinating an ad hoc task force of federal agencies to respond to the TMI accident. Cotton had been in contact with White House officials on Friday and Saturday "to try to understand what it was the White House was going to do," 525/ and knew that a White House meeting would be held at 5:00 p.m. to coordinate the response of the federal agencies. When HEW was invited to attend the White House meeting, Cotton, Upton, Robbins, and Villforth were selected as the HEW representatives, with Cotton serving as spokesperson. The four met Saturday afternoon to prepare for the meeting and agree on which HEW

concerns should be expressed. 526/ It was agreed that the recommendations in Califano's memorandum would be expressed "as strongly as possible," that the NRC be asked to consult "with HEW and EPA in terms of both intervenions and evacuation strategy," 527/ and that "given the current uncertain state of information about the reactor, whether it was not appropriate for there to be strong recommendations in favor of evacuation. 528/ In addition, the HEW assistant secretary for public affairs had been informed either Friday night or Saturday morning that the White House had ordered that no TMI-related information was to be publicly disseminated by federal agencies except through the White House press office or the NRC public information officer at the site.529/ The four HEW officials agreed that Cotton would raise the point that although the coordination of public information through the White House seemed a good idea, there appeared to be no attempt by the White House to obtain and disseminate information concerning the activities of the federal agencies.530/

By Saturday afternoon, the shape of HEW's response had been formed. It is clear that none of the HEW officials, except Villforth, were aware of IRAP, and although some knew of planning for peacetime nuclear emergencies, that planning appears to have had no impact on their decision-making process. As Cotton testified:

> COTTON: I say [sic: was] aware of them that they existed on paper. None of those plans or arrangements played a significant part, from my point of view, in terms of what HEW's response was.
>
> It was very much an ad hoc response, designed to respond as quickly as we could to the needs of the moment. There was nothing in place, from what I saw, that was capable of being simply tuned up and activated for the Department to respond.
>
> It was very much an ad hoc response.
>
> Q. So that -- were you familiar with the provisions of IRAP, for example? Other than the fact that that kind of plan existed on paper?
>
> A. No, I certainly wasn't familiar with it, other than that there was some plans. I'm not even sure -- I don't recognize that specific name and connect it to a document . . . I am not clear as to what piece of paper connects precisely to the name that you refer to.531/

When the Califano memorandum arrived at the White House, Watson read it and gave it to Mathews and Eidenberg to read.532/ It does not appear that there was extensive discussion of the substantive points made in the memorandum. Mathews recalled:

> There was nothing new in this memorandum that those of us who were responsible here for making a recommendation didn't already know. What was said was that here's Joe's opinion to add to our own discussion.533/

Eidenberg indicated also that those responsible for the White House response would not have been receptive to the Califano recommendations for two reasons. First, Watson and Eidenberg were inclined to leave decisions concerning the need for evacuation to those at the site, principally the NRC.534/ Second, although the White House had not precluded the possiblity of making recommendations to the Governor, the presumption was that advisory recommendations would not be made for decisions requiring a "balance of information" available only at the site.535/ As Watson testified:

> The consensus of view, in fact as I recall the unanimous view at that moment, was that an evacuation was not called for. In this situation, the one that had more votes than anybody else in my own mind at that point was Harold Denton. And it was a classic situation of where Harold Denton had said, "yes, I think we need to evacuate," it would not have mattered to me personally if 14 other people had said, "No." I would have gone with Harold Denton.536/

C. RESPONDING TO THE EMERGENCY IN HARRISBURG: 9:30 a.m. TO 3:00 p.m.

At the TMI site, Joe Deal of DOE had met with NRC representatives to determine the extent of NRC's monitoring program. According to Deal, NRC badly needed assistance in off-site monitoring, and as of Saturday DOE was the only federal agency performing substantial environmental monitoring.537/

> DEAL: Now the following day, Friday, we went down to the NRC trailer camp to talk to their people, to be sure that they knew exactly what we were doing and we know what they were doing.
>
> And it was clear that they were in almost the same overloaded situation that the state was. We were surprised that they didn't really have good area maps of the site. They were using Xeroxed copies of something that looked like roadmaps.
>
> I think they were putting Xeroxes out of the -- maybe out of the plan, the accident plan that their licensee had. But it was not a well-organized operation.
>
> Q. Did the NRC have any off-site environmental monitoring?
>
> A. They had a few people there, but, again, they were looking to us to provide them the staffing to build that up. They were looking to us for a pool of people, trained and experienced, who could help provide that information.
>
> We did have one of the groups, of the RAP team groups spend most of their time down working with the NRC supplementing their staff and working with them on this.538/

In the wake of Friday's evacuation advisory, area hospitals had quickly begun to reduce their patient populations. Elective surgery was cancelled, admissions were made only on an emergency basis, and patients able to convalesce at home without serious risk were discharged. As

evacuation planning for the general population progressed throughout the weekend, a volunteer task force in Dauphin County worked with health care providers to arrange for the transportation and relocation of patient-evacuees. By Sunday, the patient census in the five Dauphin County hospitals had been greatly reduced.539/

Other health matters were also receiving attention. Gerusky had been called by Villforth, who offered the state potassium iodide if the state "would accept it and use it."540/ Gerusky accepted. He told DER Secretary Clifford Jones that the potassium iodide would be arriving and gave his opinion that the responsibility for receiving the drug should be given either to PEMA or the Health Department. The Health Department seemed the logical choice -- MacLeod "wanted to be involved in the process"541/ and:

> [t)hey have a drug device and cosmetic program. They have people who are druggists on their staff who know how to distribute and know how to give out instructions. They would also know how to take a look at it and see whether or not it was good or bad.542/

A meeting was held with MacLeod and the Health Department agreed to assume responsibility for the shipments. Following this meeting, arrangements were made with the Pennsylvania Department of General Services to have the shipments received at the Harrisburg International Airport and stored at the warehouse, and to print 50,000 flyers that included instructions on the use of the drug.543/ To learn more about potassium iodide, MacLeod called the FDA in Washington and spoke to Dr. Paula Botstein who told him more about the shipments, the manufacturing rate, and a rare side effect called "iodism," which causes a rash.544/ MacLeod also put in a call to Secretary Califano, "my counterpart" at HEW, but was unable to reach him. Two hours later, he received a call from Arthur Upton, who suggested the names of six physicians knowledgeable in the field of radiation health.545/

At the site, Met Ed had scheduled a press conference for 11:00 a.m. Two or 3 hours before the conference, Met Ed President Walter Creitz had met with William Murray, GPU vice president for communications, and Blaine Fabian, Met Ed's press officer. During the meeting, a call was received "from Washington" in which it was suggested that it would be best to eliminate confusion by not having conflicting stories about events at the site. Murray met with Denton, and following that meeting, the utility officers agreed that "the NRC was the regulator" and should be giving the press briefing, although they thought the scheduled press conference should be held.546/ At the press conference, Creitz announced, without revealing the reason, that the press conference would be the last the company would hold.547/

The Saturday morning contact was not the only suggestion to Met Ed from government officials concerning its public information policies. The previous day, Denton had made it clear to Met Ed that the NRC did not want to issue joint press releases, 548/ and Hendrie had suggested to Met Ed that "they might want to give up their press briefing and let Harold speak for the situation."549/ The impetus for the Hendrie call came from Jody Powell, whom Hendrie described as "concerned precisely

about the panic side of it creating an unnecessary unease, and perhaps even panic down there."550/ As Denton noted, "there was concern in Washington ... and there were various pressures other than my own that led the company to terminate its practices."551/

Officials from PEMA and the Red Cross had begun setting up an evacuation center on Friday at the Hershey Sports Arena, although the prevailing feeling had been that the evacuation would last only a few hours. By Friday evening, however, Red Cross Director Edward Koast had begun to view his evacuation planning in terms of days rather than hours.

> If the Governor went to the extent of issuing an order of that nature there had to be something definitely of a dangerous nature down there. Nobody was going to go back until there was definite reports that there was something clear. My concern was not now about the people that were designated as evacuees [sic] but what we were going to have to do if there were a further evacuation. This is the kind of way I was thinking and this is what I was relating to our National organization. That is why as of Friday afternoon they started pushing people in here to support me.552/

Koast initially had some difficulty convincing representatives of the Herco Corporation, the owner of the area, that the evacuation would last longer than a few hours, but "they relented and let me take over completely and operate the Arena."553/ Approximately 150 evacuees were served dinner Friday evening, although slightly fewer people stayed overnight.554/

The Red Cross had been able to set up its shelter on relatively short notice, but it was not prepared to deal with the overwhelming media interest in the evacuation center:

> They just invaded. We had more media people than we had shelter occupants. We had teams and teams of camera crews all over the place, poking cameras in people's faces while they're sleeping or while they're feeding the kids. Throwing questions, all kinds of questions at them from all angles, everybody was trying to get the attention of the first evacuees there . . . Friday afternoon, as soon as the declaration of the evacuation was made, in a couple of hours charter planes were landing in Hershey, charter helicopters were landing right alongside the Arena up there and news crews were running into the place ... people who looked more distraught getting more attention than those who seem to be relaxed and not as distraught 555/

On Saturday afternoon, the governor and his wife decided to visit the center, but their arrival was delayed to permit the news media to travel from a Denton news briefing in Middletown. 556/ According to a Red Cross official, the visit reassured occupants of the shelter, but it exacerbated the problems of controlling the media. It was decided to establish a system limiting media access to shelter residents. Following the governor's visit, reporters were required to sign in upon arrival, and the number of reporters permitted on the floor of the arena was restricted.557/

By Saturday night, there were approximately 165 evacuees at the shelter, many of them children.558/ Koast described the efforts of volunteers trying to keep the children occupied at the arena:

> Well, we had, by that time brought in a number of volunteers to babysit, to provide entertainment, the Herco people set up a number of television sets for various groups. We had youth groups in there keeping them occupied. We had bands of music in there from time to time. Trying to schedule activities to keep them active up until a particular time, maintaining their health, bathing them and making sure they had clean clothes, and food, snacks for the kids and toys. We had a minister that was an amateur magician come down every day and put on shows for them. We had another local minister who talked with them and reassure [sic] these people. Then we had our office volunteer people who came in and maintained some activity rather than just sit around thinking and becoming preoccupied with the situation .... During the day Herco people also made some of their facilities available like the Chocolate World and some of the sights around the park and arena ... small tour groups for the children. We tried to keep people active and we were utilizing them too in helping maintain the cleanliness and orderliness of the arena, using them as part of the staff.559/

Evacuees at the arena were provided with information about an offer of a cash advance made by the American Nuclear Insurance Company, which insured the TMI plant. The advance was made by the company "on the possibility that they [the evacuees] may have a claim against the company."560/ Depending on the size of the family, the company offered "anywhere from $300 to $500." The Herco Corporation offered check cashing services. At first, the evacuees were skeptical of the offer, but "gradually people said the hell with it we might as well take the money and go. It's better living in a motel."561/

D. THE WHITE HOUSE TASK FORCE MEETING: 5:30 P.M. TO 9:00 P.M.

On Saturday morning, Denton had expressed to the commissioners a concern about Met Ed:

> DENTON: I guess I've developed a management concern about the capability of the utility here to cope with new problems that come up. They're stretched very thin in some areas. I've discussed it with the local management and with the management of GPU. I think they need stem to stern reinforcements down here in many areas.
>
> What I'd really like to do is to get them turned on in terms of analyses that we require for an FSAR and do them for the core in its present situation. And I did talk to the company president this morning. He said I tried to heighten his sensitivity. That is, if I were he, that if forward looking, planning, developing procedures to cope with eventualities rather than waiting for something to fail and then trying to work your way out of it.

* * n

BRADFORD: Harold, does it require their invitation to muster the resources of the industry, or is that something we can do?

DENTON: Well, I think it really would take their initiative. I think we could always muster it ourselves. But, for example, I know from some of the discussions with B&W that they sure have the capability to do exactly what we want here and down there, and they just have not been turned on full bore to do what we're trying to do.

HENDRIE: Yeah. I think we ought to boost that effort up considerably. I thought I'd made the point with [Walter] Creitz [president of Met Ed] yesterday, but it can stand reinforcing, clearly.

DENTON: (Inaudible). If you ask them what happens if, you know, the attitude is well, maybe that won't happen and if it does, we'll cope with it then.562/

Before Hendrie could call Creitz, however, the conversation was interrupted by a White House operator, who told Denton that the President wanted to speak with him.

Since Friday afternoon, the White House had taken an active role in the response to the accident, and the President himself was being kept informed of conditions at the site by Denton. When the call from the President was connected, Denton told the President that he was concerned that Met Ed was not moving with the urgency Denton felt was needed to bring in experts to analyze the problems at the site: "I decided to use the leverage that was available to be sure that [Met Ed] would respond. 563/ The leverage was applied. The President asked Watson to contact GPU's president, Herman Dieckamp:

WATSON: In any event, that's what I did. I expressed the concern to Mr. Dieckamp. I underscored the sense of urgency that Harold Denton felt and asked for the Company's cooperation in getting those people assembled as quickly as possible. Mr. Dieckamp pledged his fullest support for his company to get that done. And, in fact, it was done quickly.564/

Hendrie told the commissioners that he had tried to call Dieckamp at the same time:

HENDRIE: Did I tell you, by the way, that we did get through to Herman DeCamp [sic] the general public utility engineering vice president [sic] whom I've known for some time, and I couldn't get to him -- I had to wait a little bit. The reason I was waiting a little bit was so that Jack Watson could read him the riot act, to get people down there.565/

Industry experts from all parts of the country began arriving to lend technical expertise.566/

Throughout the morning and early afternoon, Mathews conferred with Denton about conditions at the site.567/ This information was included by Watson in a memorandum to the President summarizing the status of the situation at the site and the federal response. 568/ In his memorandum, Watson reported that although Califano had that morning suggested that a cabinet-level meeting be convened with the President to discuss TMI,569/ Watson was already working with the appropriate federal agencies and "if a higher level session is indicated, I will convene it."570/ Watson reported that the governor "continues to share my view" that there was no need for a formal declaration of emergency, and that he had scheduled an interagency task force meeting for later in the afternoon. Watson informed the President that "the major decision will be whether to evacuate as a precaution before intervention."571/

At approximately 5:00 p.m., the federal agencies responding to the TMI crisis met in the Situation Room of the White House. The meeting, chaired by Watson, was not intended to provide a forum for making decisions, but merely a reason to exchange information about the activities of the various federal agencies responding to the crisis. 572/ Watson stressed that the information exchanged at the meeting was confidential and to be discussed only on a need-to-know basis.573/

One of the first topics of discussion was the coordination of press statements by the agencies. The minutes of the meeting record the following statement by Watson:

> Watson again emphasized the federal profile must remain low; (1) because the state and local governments have the lead, and (2) because public anxiety could increase by federal officials expounding on the situation. Watson asked that press statements not be made by the agencies, but by the White House or the state officials only.574/

The statement in the minutes can be read to mean that the agencies should not issue any press statements. At his deposition, however, Watson cautioned that the minutes "should not be accepted as something I would adopt as my own statement of what occurred and what was said."575/

> Q: Do you recall asking that press statements not be made by the agencies but by the White House or state officials only?
>
> WATSON: Okay. I would have said that differently at the meeting than is reflected in this sentence here. . . .
>
> What I cautioned at this meeting was that the agencies should not be speculating about circumstances which they did not know to be true. . . .
>
> I would not have said for no agency to speak or not to make any press statements because each agency would of course when asked by

> the press about something that it had specific knowledge and responsibility of would want to answer. . . .576/

According to the HEW representatives, however, a clear directive was issued before the meeting and reiterated at the meeting that all press inquiries and press releases were to be referred to the White House press office577/ -- "the White House was very clear that no information was to be disseminated publicly, except through either the White House press office or the NRC public information officer on the scene."578/

Cotton of HEW apparently attempted to raise the point that the restriction on the dissemination of information by agencies was limiting the amount of information ultimately released to the public, but it appears that his point was not understood to be anything more than a logistical problem. 579/ It is clear that the White House directed federal agencies to "coordinate" press statements with the White House press office,580/ but whether there was a directive intended to prohibit federal agencies from issuing press statements and responding to inquiries within their particular sphere of expertise is disputed. There is no question that HEW believed itself to be under that restriction, imposed and ultimately lifted by the White House.581/

The principal focus of the meeting was a report from the various agencies involved in the federal effort and a summary by Eidenberg, Watson's deputy, on state activities. One of the important reports was FDAA's summary of the status of evacuation plans, which indicated the number of people within a 10-mile radius was approximately 175,000 and 745,000 within a 20-mile zone.582/ The minutes summarize the FDAA report:

> The FDAA reported that the **six** counties involved are in good shape for evacuation. Within the ten-mile radius, five counties could evacuate in three hours, one county would need four hours. Within the twenty-mile radius, evacuation could be done in approximately five hours.583/

This report provided the springboard for HEW to press Califano's recommendation that the public be notified that it may have to evacuate on short notice. Cotton asked "whether anyone in the room took those estimates seriously," and urged that in the absence of assurances that the reactor was cooling safely, consideration be given to notifying the public and executing a precautionary evacuation. 584/ Watson responded that he had read Califano's memorandum and was aware of the recommendations. When it was suggested that the NRC consult with health officials in decisions about evacuation planning and interventions in the reactor, however, HEW was asked to send health professionals to the NRC Incident Response Center.585/

The White House meeting included a briefing from Commissioner Gilinsky on behalf of the NRC. He reported that the lead time in a worst-case scenario could be less than half an hour. Although conditions in the reactor seemed improved, "there is still no low-risk answer to the hydrogen bubble problem."586/

An important absentee from the meeting was the Department of Energy, which was heavily involved at the site and had been represented at the Brzezinski meeting the previous day. The failure to invite DOE apparently was "an oversight"587/ and there was no discussion about why DOE was not present.588/ It appears, however, that White House, HEW, and EPA officials attending the meeting were aware of DOE's central role at the site,589/ and discussed the fact that the monitoring agencies, such as NRC, HEW, and EPA, were having difficulty acquiring state and DOE data.590/ The participants at the meeting were not fully aware of TRAP and DOE's role under that plan or of DOE's activities at the site. The decision was made at the meeting that the NRC would be the central coordinating agency for environmental monitoring data.591/ DOE had agreed the previous day to assume precisely that role in response to a request from BRP's Gerusky.592/ Commenting on the senior federal officials' lack of knowledge about the BRP-DOE agreement, Villforth testified:

> I think that caused much of the confusion. The TRAP plan was not understood.
>
> I don't think that the department heads. . .understood about the TRAP plan. . . when we met at the White House with Jack Watson of the White House staff because there was no representative from the Department of Energy at that meeting.593/

Despite the assignment of the lead role to NRC at the White House meeting, DOE continued to serve as the lead agency for the collation and dissemination of data at the site, completely unaffected by the high-level decision. When Cotton and the assistant administrator of the EPA discovered DOE's role several days later, they brought about a change in the assignment through the White House, but by that time the crisis was over.594/ As John Villforth commented on this aspect of the federal response:

> There were these two different levels. One was the White House department head level which had one perception of what was happening, what was going on, and what should be going on. Then, the scientific level of people knowing what they had to do, and the resources and they were up there digging in the trenches and doing a good job.595/

E. THE HYDROGEN BUBBLE STORY AND THE CONTROL OF PRESS STATEMENTS: 2:00 P.M. TO 12 MIDNIGHT

When Mattson had returned to work at 9:00 a.m. on Saturday, he found that an answer had not yet been given whether oxygen was being generated in the reactor vessel.596/ At that point, Mattson started two groups working on the problem. The first group was headed by Robert Tedesco, of the NRC's Division of Systems Safety, who began to work with his own staff and with the Knolls Atomic Power Laboratory (KAPL).597/ The second group was led by Saul Levine of the NRC's Office of Nuclear Regulatory Research, who consulted with members of his staff and with Robert Ritzmann (an outside consultant), the Idaho National Engineering Laboratory (INEL), and others.598/ The principal questions the teams were to answer were the oxygen evolution rate in the reactor vessel and how soon the hydrogen-oxygen mixture might become flammable.

At 10:30 a.m., Hendrie expressed his concern to Mattson over the telephone that "if the flammability limit is a point of major concern, then we may be getting there faster than we like."599/

As the commissioners waited for the judgment of the teams working on the hydrogen bubble problem, they discussed evacuation scenarios. Six to 12 hours was mentioned as the time available for evacuation if the core began to melt,600/ but Bradford asked:

> BRADFORD: I mean, is it at all likely that there is a sequence of events that could start anytime without warning which would leave you with substantially less than 200 minutes or six hours or whatever number on that order you want to use to have people more than five or 10 miles away.
>
> HENDRIE: I don't think it's a very large possibility but you can't rule it out.
>
> KENNEDY: What would the nature of that sequence be?
>
> HENDRIE: A hydrogen explosion in the vessel.
>
> J. J J
>
> If you don't produce some sort of projectile that would put a hole or cause a penetration failure in the containment, then the concern with regard to the containment comes from two sources: one, whether the debris bed which is the core will equilibrate short of consolidating into a molten mass and, secondly, whether you've still got enough hydrogen left -- which is now loose in the containment which has 16 percent oxygen in it, so that you could have a secondary hydrogen explosion and would that be enough to breach the containment or blow out a penetration or something.
>
> J. J
>
> BRADFORD: But we are in a situation now that -- there is a sequence of events that we can't rule out that would give you well under six hours.
>
> HENDRIE: Six to twelve hours.
>
> BRADFORD: Yeah.
>
> HENDRIE: Yeah, I think that's a fair statement.
>
> BRADFORD: I think that that really ought to be told to the Governor in clear terms that it has been -- I mean, he knows about the concern --
>
> HENDRIE: Yeah.
>
> BRADFORD: But I don't think he knows that there's some low percentage possibility that we could run out in that shape.601/

Hendrie stated that he thought he should call the governor, but decided to check with Denton first. Hendrie told Denton of the concern in Bethesda that oxygen was being evolved and indicated that outside consultants were working on the problem. 602/ Hendrie suggested that the governor should be made aware of the problem, and Denton promised to tell him.603/

By early afternoon, Mattson began to receive some estimates from the consultants. Levine reported that Ritzmann estimated that there was 2-3 percent oxygen present in the hydrogen bubble, and that INEL estimated that the bubble would contain 5 percent oxygen in 4 to 5 days. Mattson testified that shortly after the report from Levine, he was told by Tedesco that Westinghouse experts, although they had not yet performed their calculations, believed that oxygen generated in the vessel would remain in solution and that recombination of hydrogen and oxygen was not likely at the temperatures then present in the reactor coolant system. KAPL's initial reaction was that free oxygen in the bubble could not be ruled out.604/ According to Mattson:

> [A]t 2 o'clock Saturday afternoon, I had an estimate that there was oxygen being generated from four independent sources, all with known credentials in this field. The estimates of how much oxygen varied, but all estimates said that there was considerable time, a matter of several days, before there was a potential combustible mixture in the reactor coolant system. 605/

With concern about the bubble building within the NRC, Hendrie agreed that afternoon to hold a press conference. A number of reporters had gathered at the IRC in Bethesda, knew that the commissioners were there, and were pressuring Frank Ingram, who was covering for Fouchard, for a statement by a commissioner.606/ In spite of the agreement to let Denton be the sole spokesman, Hendrie made a statement, answered questions, "and regretted it the rest of Saturday evening."607/ Hendrie made two important statements at the press conference. First, he responded to questions by reporters that if the NRC intervened in the reactor to remove the bubble, it might be necessary to consider a precautionary evacuation, even to distances of 10 and 20 miles.608/ Second, he acknowledged that the bubble could become flammable if oxygen were evolved. 609/ The first statement was reported promptly and escalated public concern; the second statement foreshadowed an alarming story that would appear later in the evening.

At 3:30 p.m. Mattson met with the commissioners at the IRC and told them of the preliminary judgments that oxygen was being evolved, although there was a period of days before the flammability threshold would be reached. 610/ It was recognized, however, that the estimates might change as calculations became more refined,611/ and as Mattson emphasized, conditions at the site were not good:

> MATTSON: Let me say, as frankly as I know how, bringing this plant down is risky. There's not a negligible risk in bringing this plant down. No plant has ever been in this condition, no plant has ever been tested in this condition, no plant has ever been analyzed in this condition in the history of this program... and there's risk in doing that in short order with a damaged core.612/

Nevertheless, the sentiment at the meeting was that overall, conditions seemed to be more stable than during the previous day.613/

In Harrisburg, Thornburgh returned to his office from his visit to the Hershey evacuation center and waded into a flood of inquiries from the media asking for comment on a remark made by Hendrie at a Washington news conference that a 20-mile evacuation might be necessary during the manipulation of the hydrogen bubble. As the Associated Press reported the story later in the evening: NRC Chairman Joseph M. Hendrie said earlier at a news conference in Washington that' the evacuation of citizens within 10 to 20 miles downwind of the nuclear power plant was "certainly a possibility" as a precaution if technicians tried to force the bubble out of the reactor. He would not say when a decision might be made.614/ Hendrie himself learned of the impact of his own statement during a meeting of the commissioners: "Oh, boy. No matter what you say to the press.... The Chairman said that when we try to get rid of the bubble we're going to evacuate everybody out to 10 or 20 miles. Oh, boy."615/ Bradford suggested that Hendrie should call the governor, but Thornburgh called first.

Hendrie told Thornburgh that the press was trying to "work us at cross purposes" and that he had said only that evacuation should be considered if the bubble were manipulated. 616/ Thornburgh, although irritated by the episode, 617/ discussed with Hendrie whether the advisory to pregnant women and preschool children should be lifted and whether a precautionary evacuation would be necessary. Hendrie raised the concern that the bubble might become flammable, but assured Thornburgh that it was not an immediate problem. 618/ At 5:00 p.m., the governor issued a statement saying that in consultation with Denton and Hendrie, he had concluded that the advisory to pregnant women and preschool children would remain in effect, that evacuation of a broader nature was unnecessary at that time, and that decisions concerning school closings and leave policy for state employees would be made and announced on Sunday.619/

In Bethesda, Mattson was learning from Tedesco that KAPL had concluded oxygen was being evolved and that the bubble appeared to be approaching the threshold of flammability, although spontaneous ignition seemed unlikely.620/ As NRC engineers worked during the evening to calculate the rate of the evolution of oxygen, the size of the bubble, and the potential for the hydrogen to burn or explode, some NRC staff members suggested that a mistake was being made. Warren Hazelton was asked to help other members of the Engineering Branch of the Division of Operating Reactors to determine the effects of a hydrogen explosion on the reactor vessel. He stated that he and Vincent Noonan, chief of the branch, believed that the level of oxygen they were asked to assume for their calculations was too high -- the over pressure of hydrogen in the reactor system would prevent the evolution of oxygen.621/ Although their analysis appears to have been confirmed on Saturday by independent scientists and with others at the NRC, the staff continued to calculate the effect of a flammable or detonatable level of oxygen in the reactor vessel. Saul Levine, heading one of the teams, testified that he believes he also became convinced on Saturday night that the basis for the calculations was wrong and told Mattson.622/ Still, the NRC's concern about a pos-

sible hydrogen explosion in the reactor continued through Saturday night, when it was reported by the press.

At approximately 9:00 p.m. on Saturday evening, the White House learned of an Associated Press news story, attributed to NRC named and unnamed sources, that said the hydrogen bubble was showing signs of becoming "potentially explosive."623/ As Mathews recalled, "We were trying to avoid having a lot of different voices.... [I]t was precisely that problem that this whole coordination effort had been set up to avoid."624/ Jody Powell immediately called Fouchard, who was at the site with Denton. According to Mathews:

> What he [Powell] said, was, look, Denton is doing a very good job in keeping the press up there fully informed. He is clearly capable of briefing, which is a skill in and of itself, that he choses [sic] his words carefully and knows what he is saying and is being very precise about what we know and what we don't know. Leave it to him to comment on the reactor. He is the one who is delegated to do that.625/

While Mathews and Powell were calling Fouchard, Eidenberg called the site to determine the accuracy and the source of the story. Stello the senior NRC official on site at that time, talked with NRC headquarters to find out the source of the story. He called Eidenberg back and told him that the NRC's Edson Case had talked to the press after the Hendrie press conference about the technical details of the options being considered to solve the hydrogen bubble problem.626/ Eidenberg called Case.

Case reported to Eidenberg that the NRC was besieged with calls from the press about the story. Eidenberg emphasized to Case that it was a "serious mistake" to have official information coming from multiple sources, even within the same agency, and that Case should stop taking press calls concerning the story until Denton could make a statement in response.627/ In fact, however, the AP reporter had read the story to Case -- who had agreed it was correct.628/

When Watson learned of the AP story, he immediately called Thornburgh who had been "very concerned, very distressed about Chairman Hendrie's press conference,"629/ and about the effect of the hydrogen bubble story on the people in the area.630/ According to Eidenberg, Watson also called Chairman Hendrie and Commissioner Gilinsky to express "explicit concern" about multiple sources within the NRC commenting on conditions at the site.631/

> WATSON: I don't recall specifically the sequence of events. Again, a reference to a telephone log or the other documents might be helpful. But I did have a conversation myself with Joe Hendrie sometime on Saturday at which I pointed out this difficulty being caused and at which I suggested that it would be wise to have this coordination of statements about reactor site and information coordinated better by Harold Denton as far as the reactor site was concerned and by me or with me with respect to evacuation speculation.

Joe Hendrie absolutely agreed with that, and I think it was at that point it was decided -- I don't know that I suggested this or if Joe did; whoever suggested it, the other one concurred -- that the press briefings, the routine press briefings, should not occur down here at the operations center in Bethesda, but up there at the reactor site with Harold Denton again being the primary spokesman.632/

That evening Watson reported to the President in a memorandum that he had urged Hendrie to "tighten and improve control of the NRC public information process out of Washington."633/

That same evening, another news story quoted a Met Ed spokesperson, who stated that the bubble problem was over, a statement made at the 11:00 a.m. news conference. According to Eidenberg, "We looked into that right away and discovered that the spokesman was referring to a bubble in a different facility. . . ."634/ Watson called Herman Dieckamp, president of GPU:

WATSON: I suggested to him that separate press-briefings by the company spokesman was a troublesome thing because of the -- because it presented such a fertile opportunity for misinterpretation and confusion and double tracking information and so forth.635/

Eidenberg stated at his deposition that it was not the White House's intention to control the public's access to information, but rather to insure that information came from a single source to avoid "this echo chamber effect of multiple stories, multiple sources" that was escalating public anxiety.636/ Eidenberg summarized the White House's motivation:

The public's concern was what is going to happen inside that reactor. What is going on inside that reactor. We were concerned that those events be explained to the press and to the public by a single authoritative and reliable source from the federal government.

Obviously, that was our responsibility: the federal government. We believed that Harold Denton had that mission, had that responsibility and in effect Jack [Watson] was saying to the Chairman of the NRC that he hoped that that agreement would be made as effective as it could be and that the AP story was an example of it not being effective.

That people not on-site, not there examining the situation, in full command of the dynamics of the situation and that reactor, were explaining hypothetical alternatives about what might be happening in that reactor or what could happen inside that reactor from Washington, D.C.

We thought that was the problem and believed that it violated the spirit of the agreement about Mr. Denton's role out in the field. That he would be the source of information.637/

Watson's comments follow:

> In every statement that I made verbally to every federal official or in a conversation that I had later on, sometime on Saturday with the president of the utility, Mr. Herman Diekamp [sic], and in a conversation that I had on the telephone with Joe Hendrie, the Chairman of the NRC, in which I was talking about this subject; in every one of those statements by me to anyone, I was simply underscoring the critical need for us to assist the governor in being able to put out information which would accurately describe the situation at the site and keep the public informed with a minimum of rumors and a minimum of speculative statements and speculative hypotheticals [sic] about what would or would not occur.
>
> No directive was ever given to anyone with respect to not speaking to the press or not making press statements except in the context of what I have just said.638/

In Harrisburg, Paul Critchlow called Denton as soon as the story was received and was told that the report resulted from a discussion of a hypothetical situation. Based on his conversation with Denton, Critchlow prepared a statement for the newsroom which stated:

> The news report that the gas bubble in the nuclear reactor is becoming potentially explosive is not true, according to Harold Denton. . . . [T]he report resulted erroneously from what [Denton] called a "postulation" by engineers about the potential for the bubble and that by 3 p.m. today, they had ascertained that there was no danger of explosion. He said there is no cause for alarm.639/

At 9:30 p.m., Denton arrived in Harrisburg to brief the governor and his staff. Following the briefing, Denton and Thornburgh held an 11:00 p.m. press conference at which Thornburgh appealed for "calm and resolve and patience in dealing with this situation," and announced what he had learned from Jody Powell shortly after 10:00 p.m. that the President would visit the site either Sunday or Monday. 640/ Denton told the reporters that there was "no danger of even flammability of the hydrogen in the near term." As for the conflicting stories between Bethesda and Harrisburg, Denton said, "No, there is no disagreement. I guess it is the way things get presented."641/

In fact, however, engineers in Bethesda were becoming more concerned that the oxygen content of the bubble was increasing and approaching the flammability threshold.

At the local level, the news stories were having an impact. A hoax sabotage threat had been received at the site and law enforcement authorities had been notified. 642/ County emergency officials had been receiving calls from the public about the bubble since Friday evening, but the only two reports issued by PEMA over the teletype on Saturday, at 11:30 a.m. and at 9:00 p.m., reported there was no change in plant conditions and did not refer to the bubble. 643/ Throughout Saturday evening, the counties received an increasing number of calls about the conflicting and alarming news reports about evacuation and the bubble's

potential for explosion. County officials felt unable to respond, and when they attempted to verify the reports with PEMA, they found that PEMA had no information either.644/

In the Dauphin County emergency operations center, the frustration of the workers had been building throughout Saturday evening as they tried to respond to public inquiries concerning the bubble. Events reached the breaking point at 10:45 p.m., when a teletype message was received from PEMA: "NBC broadcast that the bubble burst or bubble growing and that mass evacuation occurring was spurious." 645/

The workers told State Senator Gekas, who was in the office at the time, that they had unsuccessfully tried to reach the governor earlier in the day to obtain more information. Gekas himself then tried to reach the governor and was told the governor was too busy to talk to him; he called the lieutenant governor's office and received the same response. Kevin Molloy described what happened next:

> MOLLOY: At that point, Senator Gekas advised the Lieutenant Governor's representative that he was talking with on the phone that if they did not get in touch with a little bit more information, that we would be performing our own evacuation at, I think it was nine o'clock the next morning.
>
> Q: Was that just a way to get some kind of response, or were you seriously considering that evacuation?
>
> A: At that particular time, I would say that it was probably geared more toward getting a response. But I think had we not gotten better information that we would have very seriously considered an evacuation. Because like I said to Commissioner Minnich, it all comes down on our shoulders. It's not really on the Governor's shoulders or anyone else. We're the ones that are going to ultimately have to make a decision.646/

At 2:00 a.m., Scranton called the center and tried to defuse the evacuation talk, but county officials were unresponsive. Scranton agreed to meet with them the following morning in the Dauphin County office.

At 8:00 a.m. Sunday morning, Henderson unexpectedly arrived at the center. After listening to the complaints, Henderson said he had the same information problem. 647/ The problem was that PEMA was not receiving (and, consequently, could not transmit to the counties) timely, detailed reports about conditions at the site that would enable county officials to respond to inquiries from the public. The county organizations were to rely on media reports, but neither PEMA nor the counties were told when the governor and Denton were holding press conferences. Henderson offered no solutions, but promised to do what he could to improve the situation.648/

When Scranton arrived at 10:00 a.m., county officials described their efforts over the past 4 days to prepare for increasingly larger evacuations. According to Molloy, "I think he was just totally shocked

by what was transpiring at our level; how busy we were; how much work we were doing; how complicated it was."649/ Molloy and his workers also made it clear that they were upset about the information flow from PEMA; Scranton responded that he would make every effort to ensure that PEMA received information to be transmitted to the counties. But county authorities said the information flow did not improve.650/ Scranton described his perception of the meeting this way:

> Bob Wilburn and I went down . . . Bob was very, very concerned, very concerned about the status of the civil defense directors who have been on alert for three days, and suddenly now we are faced with having to broaden their plans and confusion and just the physical well-being . . . [t]hey are in the basement in the bunker and it is very much a bunker mentality, and that begins to grow on you, particularly if an emergency is protracted like that with so much uncertainty. I can tell it was having its toll, it was having its toll on us in the Governor's office, but it was certainly taking a toll on [them], ...651/

By Saturday night, the lack of information flowing into and within the civil defense system was beginning to impair the morale and effectiveness of the system itself. Emergency workers, many of them volunteers on alert and working on plans for three days, had no basis on which to predict the probability or the extent of protective actions they would be required to execute. Information concerning the state of the reactor was technical, confusing, and uncertain. As public concern increased, local officials wanted more detailed information about conditions at the site. State and federal authorities had agreed that information concerning the status of the reactor would come from a single source, and although this arrangement broke down through actions of the NRC and the utility, the rule was strictly followed in the state government. No attempt was made to synthesize Denton's press briefings for state and local officials or even to alert them that the briefings were to be held. In addition, PEMA and the system as a whole initially received some background information when Henderson attended the governor's briefings and press conferences. When federal emergency planners arrived on Friday, however, Henderson, who was sensitive to the need to keep local emergency officials informed, no longer attended meetings and briefings. 652/ Consequently, PEMA and local officials were cut out of the information chain, at least as far as this background information was concerned. State officials themselves did not appreciate the desire of state and local emergency workers to be informed of developments in a formalized way. As Scranton candidly stated:

> I don't think it was a great deal of concern, not in my mind and I don't think the people in the Governor's office, as to how we were going to get information out to the counties at all. Our concern was: Are the counties ready if they have to go.653/

V. SUNDAY, APRIL 1, 1979

A. THE HYDROGEN BUBBLE STIMULATES EVACUATION DISCUSSIONS: 9:00 A.M. TO 1:00 P.M.

During Saturday night and early Sunday morning, NRC staff members had been reworking the hydrogen bubble calculations to estimate more precisely the evolution rate of oxygen and the point at which the mixture would become flammable. Concern was building in Bethesda, and outside consultants were being asked to calculate the pressure pulse caused by a hydrogen explosion, given certain mixtures of hydrogen, oxygen, and steam.654/ The staff was exploring ways of removing the bubble by adding chemicals to the system to absorb the hydrogeLi, threading through the system "a snake-like device" through which the hydrogen could be drawn, or reducing the pressure in the reactor to try to release the bubble through a valve.655/

When Mattson returned to the office at 9:00 a.m. on Sunday morning, it appeared that conditions had become more serious. "It got a little more negative on Sunday morning. For some reason, my six hours off changed it from two to three days until it was flammable to it was flammable now 656/ There was some difference of opinion about whether the bubble could ignite.657/

The President had decided to visit the site on Sunday afternoon. Mattson and Hendrie planned to go to the site to confer with Denton and Stello prior to the President's briefing by Denton. At about 9:00 a.m., a meeting was held between NRC senior staff members Mattson, Levine, Budnitz, and Murley, and Commissioners Hendrie, Gilinsky, and Kennedy to "reach an NRC-Bethesda staff judgement on the hydrogen explosion potential."658/ Although there was some variation in opinion, it was agreed that 5 percent oxygen in the hydrogen bubble would make it flammable; with approximately 6 or 7 percent more oxygen, the bubble could explode. The bubble, they agreed, already contained 5 percent oxygen, and oxygen was being added at the rate of 1 percent per day.659/ A consensus having been reached, Hendrie and Mattson left for the site.

Toward the end of the meeting, Bradford had joined the group. The day before, he had called EPA Administrator Costle to alert him to the building concern in the NRC about the hydrogen bubble and to try to create pressure on the NRC to focus on the question of evacuation:

> BRADFORD: I, by Saturday morning, had become sufficiently concerned that we were not dealing with a situation -- but dealing with the evacuation situation systematically properly, that I did express that concern to Doug Costle.... in the hope that any analytical capabilities that the Executive Branch of the government might have with regard to the hydrogen oxygen evolution rate would be brought to bear.
>
> Also, if they found it to be a serious question, they would press us to focus on it more systematically than I thought we had up until then.660/

> We were being told-if there were -- if a flammability point were reached and if it could be ignited, there could be as little as half an hour to move people out of the immediate vicinity of the plant. It just didn't seem to me if that were really true people ought to be that close to the plant.661/

Late Saturday night and early Sunday morning, the NRC had begun to focus more clearly on evacuation problems, in part as a result of impetus from the White House. Following the White House Situation Room meeting on Saturday, Watson, Eidenberg, Mathews, the President's science advisor, Frank Press, and NRC Commissioners Bradford and Gilinsky had met to discuss evacuation criteria that had been developed by the NRC earlier. The group went over possible scenarios: "If event A happened, what would be the lead-time and what would be the best evacuation or the most likely evacuation necessary."662/ Watson was concerned about a report from William Wilcox of the FDAA that the state and the counties did not know what sort of evacuation the NRC was considering -- the distances involved, whether a circular area or a wedge-shaped sector downwind of the plant would be evacuated, and so on.663/ In addition, Watson testified:

> I also wanted the people at the NRC thinking very, very hard and not abstractly about the practical aspects of an evacuation. I wanted in other words to marry, to connect, practical considerations with theoretical considerations, and I wanted the people on the practical side to have a better grasp of what some of the theoretical possibilities; and I wanted the people thinking about theoretical possibilities on the technical side to know what was practically possible.664/

Gilinsky promised to have produced by Sunday a paper setting out evacuation scenarios.

> When Gilinsky returned to the office, he immediately began assembling a team to work through the night. He told the staff that he "wanted the document at six o'clock in the morning at which time I would appear to review."665/ At six o'clock, Gilinsky arrived at the IRC in Bethesda; the staff needed a few more hours to complete the work. When the document was presented to Gilinsky, I revised it substantially, mostly in the direction of cutting it down. They presented me with a rather large document. I felt for decision-making purposes if it were more than two or three pages, we wouldn't be able to use it.666/

Gilinsky and Stephen Hanauer, who had supervised part of the night's work, took the revised document to a meeting of the commissioners. The commissioners extensively discussed the document and proposed revisions.667/

B. HEW-NRC CONSULTATIONS: 11:00 A.M. TO 1:00 P.M.

Following Cotton's suggestion at the White House Situation Room meeting that the NRC consult with HEW on decisions concerning evacuation

plans and interventions in the reactor, Watson had said to NRC Commissioner Victor Gilinsky, "Please take care of that."668/ Cotton recalled that Gilinsky had appeared receptive to the idea of consulting with HEW and had indicated that the NRC was considering some evacuation scenarios that might be discussed with HEW officials.669/

After the meeting, Cotton briefed Califano and indicated that he would follow up on NRC's commitment to consult with HEW. Late Saturday evening, Cotton talked with Commissioners Bradford and Gilinsky about the proposed consultation. Gilinsky said that his staff would be working through the night to develop written evacuation options, and it was contemplated that the options would be circulated among HEW officials, who could provide the NRC with advice. 670/ On Sunday, however, Gilinsky told Cotton that no satisfactory option papers had been produced that could be transmitted to HEW for review. Instead, Gilinsky offered to provide HEW with a briefing by Brian Grimes of the NRC staff.671/

At 11:00 a.m., Grimes met with HEW officials and briefed them on conditions at the reactor. 672/ Grimes said that the reactor was continuing to cool and that measurements of the hydrogen bubble implied a more rapid shrinking in the size of the bubble than had been predicted. Grimes also reported, however, that a gradual increase in the concentration of oxygen in the bubble posed a threat of fire or explosion that could become more serious in the next 5 to 10 days. Grimes also described a series of graded evacuation plans being considered by the NRC that ranged from a recommendation for people to take shelter within a 5-mile radius to a complete evacuation of a 5-mile radius. Further evacuation could be undertaken up to 10 miles in a 90-degree sector downwind and people could take shelter out to 15 miles within the same sector. 673/ On the basis of the Grimes briefing, HEW officials recommended to Califano:

> We therefore recommend now that: (1) all persons within a 20-mile radius of the plant be brought to a state of readiness for immediate evacuation, if necessary; (2) iodide solution be available for rapid distribution within that area upon order by Public Health authorities; (3) the population affected be provided a continuous update (not less than each six hours) of the status of the alert; and (4) consideration be given to precautionary evacuation of persons not able to clear the area within four hours time.674/

According to Cotton, the Grimes briefing was arranged only because the NRC had been unable to prepare a satisfactory option paper concerning evacuation scenarios, which was to be the subject of the HEW-NRC consultation agreed to at the White House meeting. Cotton understood that there had been a staff effort to produce a paper, but that it was not suitable for release and discussion. 675/ Cotton insists that no true HEW-NRC consultation ever occurred and that even the informational briefings that were given by the NRC to HEW took place only because "I wouldn't get off the telephone ... only in response to continual telephone calls, requests, and exploration as to what the NRC was doing and how HEW could, in some sense, review it and comment on it."676/ Cotton acknowledges, however, that the NRC had no obligation to consult with HEW or even to provide the briefings. 677/ The NRC did, in fact, have the evacuation option paper ready by Sunday afternoon for a meeting with

Gilinsky, Watson, Eidenberg, Press, and Mathews. 678/ Watson, who had ordered the consultation, assumed from the lack of complaints that HEW was satisfied with the arrangement.679/

The relationship between the two organizations appears to have remained cordial, but guarded, as reflected in a summary of the staff meeting following Grimes's Sunday briefing:

> Dr. Foege, CDC ... said that the NRC seemed willing to have us set some timetable as to how long they should take before they'd do an intervention. Peter Libassi [HEW General Counsel] said that he did not want us to be in that position. He did not want the NRC to say, for example, that there was a greater danger to the public health because NRC had to give us 48 hours lead time before it intervened in some way.
>
> ... Dr. Kennedy [FDA] said that he wanted to know what the operational evacuation plans looked like. The NRC has those plans.680/

C. THE PRESIDENT'S VISIT TO THE SITE: 1:00 P.M. TO 4:00 P.M.

Sunday morning the White House staff prepared for the President's visit to the site that afternoon. Mathews had been called at home at 2:00 a.m. Sunday morning and asked to report to the office early to prepare a briefing memorandum for the President. 681/ That morning Mathews had a lengthy conversation with Denton, who said that he was feeling better about the state of the reactor, but cautioned that the NRC had still not designed a way to remove the hydrogen bubble. 682/ Brzezinski, who wanted to be brought up to date on conditions at the site,683/ was concerned that the President would be asked to characterize the situation in the reactor during his visit. Both he and Mathews agreed the President should avoid doing so.684/ Mathews then briefed Vice President Mondale by telephone on the conditions at the site and summarized the discussions concerning precautionary evacuation. According to Mathews, Mondale felt "that if we were going to lean in one direction, ... we lean more towards an evacuation earlier, rather than later."685/

Based on these consultations with Denton, Brzezinski, and Mondale, and on a conference with Powell, a briefing memorandum was prepared by Mathews and Watson for the President. The memorandum described the technical condition of the reactor and recommended that the President avoid characterizing either what could happen, the possibility of evacuation, or the eventual outcome of the crisis. 686/ The memorandum, also indicated that a precautionary evacuation of uncertain duration was a distinct possibility, if not a probability, 687/ which caused Mathews and Watson to recommend specifically the attitude the President should convey:

> One of the concerns that was on our mind that morning was that the President's visit not give the people an unrealistic sense that the thing was over, that there was no more danger. Therefore, we emphasized to him that he should make clear that his visit should not be interpreted in this way, that there continued to be standby concern -- I mean standby preparations being made that the citizens should stay alert to.688/

At the site, Denton had asked Stello the night before to look into the question of whether oxygen could be generated by radiolysis in the reactor vessel and added to the bubble. By Sunday morning Stello believed that oxygen evolution was not possible,689/ but Mattson and Hendrie were already on their way to the site with the Bethesda analysis for the President's briefing.

When Hendrie and Mattson arrived, they summarized Bethesda's figures, indicating that the flammability point had been reached and that oxygen was continuing to evolve. At his deposition, Mattson described how this information was received:

> Mr. Stello's initial reaction upon hearing the information was that it was wrong, and that we had miscalculated the radiolysis rate, and that in any event, the oxygen generated by radiolysis would recombine. He was convinced it would. He couldn't prove it, didn't have an expert to back him, but he knew we were wrong.690/

Mattson's interview, however, conveys better the flavor of the moment:

> Stello tells me I'm crazy, that he doesn't believe it, that he thinks we've made an error in the rate of calculation, the two errors I've described.
>
> ... Stello says we're nuts and poor Harold is there, he's got to meet with the President in five minutes and tell it like it is.... And here he is. His two experts are not together. One comes armed to the teeth with all these national laboratories and naval reactors people and highfaluting Ph.D.'s around the country, saying this is what it is and this is his best summary. And his other, [thel operating reactors division director, is saying, "I don't believe it. I can't prove it yet, but I don't believe it. I think it's wrong."691/

President and Mrs. Carter arrived at the Pennsylvania National Guard facility in Middletown at 1:00 p.m. Denton gave the President both Stello's and Mattson's views at the briefing. After the briefing, the Carters and Denton toured the plant with Governor Thornburgh, after which the President made a public statement at the Middletown Borough Hall. Carter's statement indicated that although the reactor core was "stable," important decisions would be made within the next few days to bring the reactor to cold shutdown. Carter continued:

> I would like to say to the people who live around the Three Mile Island plant that if it does become necessary, your Governor, Governor Thornburgh, will ask you and others in this area to take appropriate actions to insure your safety. If he does, I want to urge that these instructions be carried out calmly and exactly, as they have been in the past few days. This will not indicate that the danger is high. It will indicate that a change is being made in the operation of the cooling water system to permanently correct the present state of the reactor and it is strictly a precautionary measure.692/

Mayor Reid of Middletown described the effect of Carter's visit:

> People felt that with him coming, he wouldn't come here if things were really that bad, and the main thing was that there were very few people on the streets. People weren't talking to one another. They were cooped up in their homes, and when he came, it seemed like everyone came out to see the President and it was really a shot in the arm.... I saw humor but it was that type of humor, did you ever see people like they're ready to laugh but ready to cry at the same time?693/

While the President was touring the plant with Denton, Hendrie and Stello went alone to an NRC trailer at the site. Stello told the chairman that he did not believe that oxygen could be evolved in the system. He reasoned that the hydrogen overpressure in the reactor would force a reaction that would suppress the net generation of oxygen, and told Hendrie that Taylor's analysis was that even if oxygen were being evolved, it could not be added at the rate the NRC-Bethesda staff had calculated. Stello asked Hendrie to wait before taking any action so that Stello could confirm his analysis with outside experts.694/

D. THE IMPLEMENTATION OF FEDERAL EMERGENCY PLANNING ASSISTANCE WITHOUT A DECLARATION OF EMERGENCY: SUNDAY AFTERNOON

FDAA's Adamcik, the federal on-site coordinator who arrived Friday evening, had drafted a request for a declara-tion of disaster and advised the governor the draft was available. It became clear, however, that a declaration was not forthcoming, and Adamcik was concerned that the absence of a declaration might affect his ability to marshal resources:

> [It was] [V]ery unique, very interesting because traditionally when I have the formal authority to react to a situation like that, I can commandeer all the federal resources. I can direct agencies to perform missions, I can choose to reimburse the agencies, if necessary. I have the authority to expend funds, to make financial commitments for resources. A number of things that I have under the formal delegation that I did not have under the formal appointment. Initially, I had to stop and consider just what -- how I was going to function under these conditions, and I chose a path, which based on the instructions I received which said I had all the authority as if I was the Federal Coordinating Officer. I picked up the ball and I ran with it, and I acted as if I had the authority.695/

Initially, some federal agencies questioned his authority and resisted giving him full support and information. 696/ For example, there was some hesitancy on the part of the military when Adamcik requested an inventory of military resources, such as personnel, ambulances, doctors, nurses, and aircraft. The military was concerned that supplying the inventory would divulge information which might affect "national security" and also wanted to know whether it would be reimbursed for its costs. Had a disaster declaration been made, Adamcik said he "would have been a representative of the President and then there would have

been no doubt about any authority as to my responsibility to direct their activities."697/ Faced with this resistance, Adamcik called the White House over the weekend and was assured that he was acting with its full support.698/ Throughout the TMI accident, Adamcik referred to this White House call when dealing with the federal agencies -- his "trump card."699/

The first federal coordinating meeting on-site took place Sunday evening.700/ Adamcik announced that similar meetings would be held daily at which he would brief the agencies on the plant's status and on evacuation preparations. By the time of the Monday coordinating meeting, Adamcik believed that he was no longer handicapped by the absence of a formal Presidential disaster declaration. In fact, he ultimately concluded that even without the declaration the response of the federal agencies was excellent.701/ The problem, as William Wilcox, administrator of FDAA, acknowledged, was merely one of adjustment in a bureaucratic setting:

> Q. When did you come to feel comfortable with the fact that you were acting informally in this situation?
>
> WILCOX: Well, one accommodates in government to whatever set of circumstances one is faced with, and after a while, after a brief while, it became clear to me that Thornburgh didn't want a declaration and for whatever reason, the White House staff agreed with him; and that to raise the issue any further would only adversely affect my credibility with the White House rather than accomplish the purpose.
>
> So, I just dropped the issue and decided to live with it. But I don't know that I ever during this period was exactly comfortable on anything.702/

E. THE BUBBLE MISTAKE IS REALIZED: 1:15 P.M. TO 7:00 P.M.

In Bethesda, the commissioners had stopped work on Gilinsky's evacuation option paper to hear the latest opinion about the bubble:

> THOMPSON: You want me to report back on where we think we stand on the hydrogen bubble?
>
> Right now we believe it takes 5 percent of oxygen to become flammable; 11 percent to be a detonation mixture. Right now we think we've got 5 percent. And they're doing some quick recalculations because they think the 5 percent flammability number may be high, like it may be 4.8 or 4.7. But so, for all practical purposes, we've got to assume the mixture is flammable, but I don't think anybody is assuming right now that he thinks it's an explosive mixture.703/

That report was followed later by a briefing by Robert Budnitz, deputy director of the Office of Nuclear Regulatory Research. Budnitz explained that at the 5 percent oxygen level the bubble would not explode, but if

the bubble were ignited, there would occur a 10 millisecond chemical burning process that would produce a pressure pulse of 5,500 psi in the reactor vessel.704/ The pressure pulse could damage the vessel:

> BUDNITZ: And from the inside out it's going to be like that. That's the way it's called hoop stress. And we might lose that vessel, which we can't afford. Although, by the way, losing it at the top is going to be like a LOCA [loss of coolant accident]; it's not like losing in at the bottom, but it still is bad.
>
> BRADFORD: Do you expect any kind of time sequence?
>
> BUDNITZ: There is going to be a propagated pulse everywhere in the system. We're going to lose valves; we're going to lose seals; we're going to lose the pumps. We just can't stand that.
>
> There was a time only yesterday when people were saying that, Well, if it burns, it burns.705/

Budnitz told the commissioners that the most explosive mixture of hydrogen and oxygen was two-thirds hydrogen and one-third oxygen (H20). As more oxygen evolved and was added to the system to bring the mixture closer to that proportion, the energy required to initiate an explosion would be progressively less.706/

Later in the afternoon the commissioners received a report about evacuation planning from Collins, who told them that Henderson felt that PEMA needed 4 hours advance notice for an evacuation, principally because it would take time to mobilize the state police and National Guard, which would carry out the evacuation. 707/ With that report having been received and Gilinsky at the White House to discuss the evacuation option papers, Bradford, Ahearne, and Kennedy were left to discuss whether a precautionary evacuation should be recommended. Kennedy observed that if the information were reviewed from a "worst case" perspective, "we ought to be seriously thinking about the precautionary evacuation."708/

> AHEARNE: I guess my worry is that we now are getting on to 4:00 o'clock. We've got the dusk falling there, and if you're worried you can make the recommendation of say, clearing out to some distance, and it really should be done and acknowledged, rather than waiting until 7:00 o'clock.
>
> BRADFORD: There are ... you can be telling people that they do not have to evacuate, or you could be saying, "Make up your own mind, but here is our best statement of the situation."
>
> ... But if you take all the worst figures out of there, you have a situation in which the only thing that stands between something really difficult to handle happening before, and the present situation, is that no one -- no one as yet has been able to come up with an ignition mechanism.
>
> And I guess I'd be more comfortable if a lot of the people who have been working for a lot of years on this question, instead of some very tired people who have been on it for 24 hours.709/

Kennedy pointed out that Hendrie was at the site to attend in meeting on the technical problems, and suggested that the commissioners wait for the results of the meeting before making a recommendation that a precautionary evacuation be advised. That proposal was modified:

> AHEARNE: [T]he three of us in Bethesda had reached the conclusion that there was a significant hazard, and under the technical people, who by that time the major technical people on the site, Denton, Hendrie, Stills [sic], the people who understood the system, were all up there and senior technical people in the agency were up there on TMI. Unless they had something different, then we felt there should be this precautionary evacuation, as I recall, of two miles.... 710/

The three commissioners called Gilinsky at the White House and told him their opinion -- "They were asking me if I would go along with that message to Mr. Hendrie and I said yes."711/ Just as Gilinsky was being reached at the White House, however, Hendrie called.712/

At the site, Stello had been calling experts at the Bettis laboratory and at General Electric and "the results I got from these phone calls supported my contention that there was unanimous agreement that you could not get radiolysis ...."713/ Stello had realized that oxygen could not be evolved because the reactor system maintained a hydrogen overpressure that would suppress radiolysis. 714/ The original NRC calculations were based on an NRC regulatory guide that specified "how one should calculate the accumulation of hydrogen in the containment building ... whereas the TMI reactor was at a thousand pounds pressure, and this is quite a different situation."715/ As Denton described it,

> It was like a sudden light dawning. By God, you are right, Vic .... It has sort of been taken as a given that the oxygen generation rate for an open vessel applied here and then everyone sort of went right from there as to what are the pressures generated in a vessel given in an explosion and the basic premise was incorrect.716/

As Stello continued to obtain agreement from the experts, Hendrie became convinced. 717/ When Commissioner Kennedy told Hendrie that the other commissioners recommended a precautionary evacuation because of their concern about the bubble, Hendrie explained what had been learned at the site.718/ There had never been any danger of an explosion.

By the next morning all of the experts, such as Westinghouse, had agreed that given the hydrogen overpressure, oxygen would not be evolved in the reactor vessel by radiolysis. 719/ It was evident that an error had been made. Ironically, Hendrie, who was among the first to raise the questions of oxygen generation, had purposely involved several experts to avoid error. As he said on Saturday, when the experts were concluding that oxygen was being evolved:

> Yeah, and what we have to do, and now on the hydrogen problem in particular, why, we have got most of the ranking world experts, you know, working in several parallel groups so there will be cross-check

of independently done calculations by different people in a helpful way to avoid getting caught in errors in assumptions or arithmetic.720/

As Denton pointed out, the problem had been the premise.721/

QUESTION: Did Dr. Mattson indicate why he had not previously focused on the oxygen generation or availability questions that you and Mr. Stello focused on to come to the opposite conclusion?

DENTON: I have since found out later that he didn't think of it. It was oxygen generation in an open tank and with such a hectic pace going on the person doing the calculations didn't realize that it had a thousand PSI hydrogen overpressure over the water and he asked the wrong question or he didn't tell the calculator the full dimensions of the problem.722/

The pressure of the accident surely contributed to the NRC's errors in reacting to the hydrogen bubble problem:

QUESTION: During a prior appearance that you did make before the President's Commission, Mr. Mattson, it was suggested by Commissioner Pigford that the NRC could have adequately analyzed the oxygen generation question using data already available to the NRC .... Have you had any opportunity to confirm if that is true?

MATTSON: That is probably true.

QUESTION: Why wasn't that kind of data available or brought to the surface in the course of this chronology you have just given us of the hydrogen/oxygen treatment?

ANSWER: Crisis.

QUESTION: Crisis?

ANSWER: A failure to use the information that should have been standard, and I can only explain that because of crisis.723/

F. THE EVACUATION ADVISORY REMAINS IN EIIECT: SUNDAY EVENING DECISIONS

When Watson returned from the site with the President, he met with Gilinsky to discuss the evacuation option paper the NRC had prepared. According to Eidenberg, a principal topic at the meeting was "the lack of compatibility between some of the assumptions under [NRC] evacuation scenarios and the actual evacuation planning that was going on at the site."724/ NRC's evacuation scenarios, for example, contemplated 2-mile precautionary evacuations, while evacuation planning at the site was based on 5-, 10-, and 20-mile increments. In addition, the NRC document, entitled "NRC Procedures for Decision to Recommend Evacuation," included evacuations within a 90 degree sector or quadrant, while evacuation planning by state authorities was based on circular areas.725/ The NRC document placed responsibility for recommending an evacuation, except in the most extreme case, on the NRC chairman and commissioners:

Who decides

1. Combination of consequences and times require immediate initiation of evacuation: Senior NRC official onsite recommends to Governor.

2. Unplanned event with substantial risk takes place or is imminent or situation judged excessively risky, but there is time for consultation: Senior NRC official notifies Governor and NRC HQ. Chairman makes recommendation to Governor after consulting with Commissioners if possible.

3. Planned event involving significant additional risk. Chairman and Commissioners make recommendation.726/

It was decided at the meeting that it would be important to get the document to Hendrie, who was about to meet with Thornburgh, so that the governor could resolve any differing assumptions about evacuation scenarios.727/

In Harrisburg, early Sunday morning, the first shipment of potassium iodide, 11,100 doses, had arrived from Mallinckrodt. Some problems with the shipment were identified by Jack Ogun, director of the Division of Drugs, Devices, and Cosmetics in the Pennsylvania Department of Health. Of the 11,100 bottles, 6,000 were unlabelled,728/ and "many of the bottles contained hairlike filamentous material and other particulate matter...." 729/ Leakage from some of the bottles was also observed. Subsequent shipments, however, were "in better order with better labels" although a problem with dropper volume that could have led to improper doses remained.730/ The shipments were placed in a warehouse in Harrisburg and planning began for distribution.731/ On Sunday night, MacLeod consulted with Wald and Denton, and decided that conditions did not indicate that the drug should be administered to workers at the plant or moved from the warehouse to distribution points.732/

For the governor, the problem still remained of whether to end or to continue the evacuation advisory and school closings. The advisory had been continued on Saturday by an announcement at the evening press conference. Before Monday, however, schools and state offices would need to know whether they should plan to open or remain closed. Late Sunday afternoon, Thornburgh received two memoranda from Robert Wilburn outlining options for state office operations and school closings. With respect to state office operations, Wilburn suggested there were three options: (1) call back essential personnel only, (2) keep the offices open with flexible leave policies for employees who could not or chose not to come to work, or (3) a "business as usual" policy.733/ The governor's decision was announced in a press statement, issued in the early evening, stating that state offices would "continue to conduct business as usual," and personal or vacation leaves would be granted and charged to absentees. State employees who were pregnant or mothers of preschool children living within a 5-mile radius of the plant would be excused with no loss of vacation time.734/

Wilburn wrote a second memorandum about school closings in which he set out five options, one of which suggested opening all schools; three suggested closing all schools within 5-, 10-, or 20-mile radii of the plant. The fifth option suggested closing all schools within the 5-mile radius and permitting school authorities in the 10- to 20-mile radius to make their own decisions. 735/ In his statement, Thornburgh recommended, he did not order, schools within the 5-mile radius to remain closed until further notice. For schools outside that area, the governor noted that independent actions had been taken on Friday and that the decision was a local prerogative. He made it clear, however, that there was "no evidence of hazards to health or safety that would require such action." Thornburgh also advised pregnant women and preschool children to stay out of the area within a 5-mile radius of the plant.736/ By Sunday night there were approximately 175 evacuees at the Hershey Arena, although only about 100 stayed the night. Of those, approximately 80 percent were pregnant women and preschool children.737/

That evening, Thornburgh met with Denton and Hendrie. Denton advised the governor that the bubble had reduced from 800 to 300 cubic feet, but did not reveal the question that had been raised about the oxygen evolution. The governor, meeting Hendrie face-to-face, asked if Hendrie had determined how or why the Collins evacuation recommendation had been made on Friday morning. According to Critchlow, Hendrie acted surprised, said that he did not know, and apologized for his previous day's statements concerning the possibility of a precautionary evacuation.738/

VI. MONDAY, APRIL 2, 1979

A. THE BUBBLE BEGINS TO DISAPPEAR: MONDAY MORNING

On Monday morning, Jessica Mathews learned from Denton that the bubble was even smaller than it had been the night before. She summarized the briefing in a memorandum:

> The situation at the reactor this morning is encouraging but somewhat anomalous. While the pressure in the reactor is constantly fluctuating, current measurements indicate that the bubble this morning is only 150 cu ft. This is down from 350 last night, and over 800 cu ft earlier. While [sic] it is good news that the bubble is coming down, it is coming down much faster than calculations indicate it should. Perhaps there was more steam mixed in the bubble than we thought, or perhaps we are quite wrong about what we think is happening.739/

An NRC memorandum indicates, however, that a different method of taking measurements was used. Reporting to Mattson on work performed concerning the hydrogen bubble, the chief of an analysis branch in the NRC stated:

> . . . During the course of our work we also recognized that the anomalous behavior of the letdown line during the bubble measurements introduced large uncertainties in the bubble size. We recommend, therefore, to close the letdown line during measurements.
>
> All of this information was communicated to Davis on the evening of April 1 and early a.m. April 2. My understanding is that the recommendation to close the letdown line during measurements was followed. All measurements taken on late April 1 and early on April 2 had the line closed and showed a significantly smaller bubble size than previous measurements.740/

At 8:30 a.m., Met Ed announced that the bubble was practically gone.741/ Denton gave a press conference at 11:15 a.m. and admitted that the bubble's size was greatly reduced, but he refused to say that it was as small as Met Ed had announced. Denton did not, however, disclose that NRC calculations concerning oxygen generation were in error. Rather, he characterized the NRC's figures as "conservative":

> There's an emerging consensus of technical opinion that ... for situations such as this where there's high oxygen overpressure in a vessel, that the oxygen yesterday -- I think I quoted a number on the order of one percent a day -- is very, very conservative, and the actual rate is much lower than that. 742/

B. HEW POTASSIUM IODIDE RECOMMENDATIONS: MONDAY AFTERNOON

At a Monday morning staff meeting, Dr. Donald Frederickson, director of the National Institutes of Health, and Dr. Upton discussed their staff's weekend's work in formulating recommendations about the use of potassium iodide at the site. After assessing the available information,

including a report of many curies of radioactive iodine in the containment and some slight releases to the environment,

> [there was] almost unanimous opinion on the part of all the people attending that the risks of giving potassium iodide were so minimal, that all of us felt that were there to occur a serious release of 1-131 [radioactive iodine] from the containment vessel, the workers on the site would certainly not have sufficient time to effectively block their thyroid [sic] glands from taking up radioactivity.743/

Frederickson sent a memorandum to Villforth recommending that the workers at the site be given potassium iodide and that the drug be available to all persons within a 20-mile radius of the plant within an hour's notice.744/

Frederickson did not know it at the time, but the White House had requested HEW to provide recommendations concerning potassium iodide for transmittal to the state. Eidenberg testified that although he did not recall who initiated the idea of HEW recommendations, it was:

> the result of conversations I had had with Jay Waldman and others in the Governor's office regarding the advisability of prophylactic administration of the potassium iodide ... I did make the request to the Public Health Service for advice on'that question.... 745/

The federal officials did not realize that MacLeod had decided the previous evening not to distribute or administer the drug to anyone.746/ With the next 2 days, however, the recommendations would be expanded by HEW, sent to the state by the White House, and made public at a Senate Committee hearing.

C. THE IMMEDIATE DANGER PASSES: MONDAY EVENING

As Monday passed, all indications were that the situation at the site was improving. President Carter had held a regularly scheduled cabinet meeting, attended by Watson and Eidenberg, at which he had given a short briefing on the status of the TMI accident and summarized his previous day's trip. 747/ Watson, Eidenberg, Mathews, and Hendrie met to discuss the conditions at the site, and Eidenberg's impression was "a general sense all day long that the situation was stablizing and improving." 748/

Denton recognized that events were shifting the accident into a new phase. Although the problems were far from over, the danger of the hydrogen bubble had passed and there had been no significant release of radiation to raise Friday's fears. The industry group assembled at the site could provide the technical depth that had been lacking during the first days of the accident. The problem, as Denton told the commissioners, was moving the reactor toward cold shutdown:

> DENTON: And what I think is the missing role and the one Dick and Roger were earlier trying to simulate, now is -- Let's get out of this flabby mode (inaudible), and let's seriously consider ways and pros and cons for getting this thing down. Because I don't think

DeCamp [sic: Dieckamp] has any perception of the federal, state, and social costs that are going on. He would probably be just as happy to stay in this mode for the next six months -- you know, "don't touch a thing."

You know, "We know what we're doing now, why move?" And it's not a bad posture to be in if the whole social system could stand it.749/

The problem, however, extended beyond the utility:.

DENTON: I guess what I need a feel from you [the Commissioners] on is: How critical is the need to show progress now? The whole -- many of the technical staff, I am sure, would take the view that, "why rock the boat?" We can sit right here and next week the core power level will be 5 megawatts. You know, that's a -- and why make any changes in the stable system so that you might have a prime release, or some problem would develop or something would happen?

The state is on readiness alert, and they're [sic] resources are thin. So there is high social and political cost in maintaining this kind of -- this steady condition. I don't know -- I guess I don't have a feel for how destructive this is for the whole governmental process.750/

In Harrisburg, Thornburgh, himself recognizing the new phase, ordered his policy research staff to begin to produce post-TMI recovery ideas. AT 7:50 p.m., Denton came to the governor's office for the daily briefing and reported that the bubble had almost diminished. A disturbing revelation at the briefing, however, was Gerusky's statement that low levels of iodine had been found in milk samples. 751/ The govornor asked Gerusky and DER Secretary Jones to confirm the figures and release the information to the public. When the figures were finally confirmed, however, news deadlines had passed. A statement was released the following day revealing very low levels of iodine in the milk. 752/ Monday evening Thornburg also issued an announcement that the previous evening's statement concerning state employees, school closings, and the evacuation advisory to pregnant women and preschool children would remain in effect until further notice. 753/

Although Denton told the governor Monday that the bubble appeared to be almost diminished, Thornburgh and his staff were never told by Denton -- or any official NRC source -- that calculational errors had occurred in NRC estimates of the nature, dimension, and flammability of the bubble. Mathews, on the other hand, had been told that morning. 754/ For state officials, word drifted through informal sources to the governor's office much later in the week that there were "some people who now think the bubble scare was not totally founded." 755/

In Washington, late Monday evening, Watson submitted his fourth status report to the President. In that memorandum, Watson reported that contingency plans for evacuation were "in place and in a state of

operational readiness," and described actions he had authorized within the previous 72 hours, including the manufacture and delivery of potassium iodide, the procurement of special deliveries of gasoline to service stations along evacuation routes, transportation and delivery of lead bricks to the reactor site, and the placement on alert status of military personnel to assist in evacuation, particularly of invalids and newborn babies.756/

Conditions at the site were also summarized, based on the day's briefing with Hendrie. Watson noted in his memorandum that Hendrie believed that by the following evening, "we will have passed through the acute phase of this incident, and will be entering a chronic phase of reduced -- but still serious -- risk." (emphasis in original.)757/

Watson reported that he and state officials had agreed that emergency plans would be reviewed to identify changes necessary for preparedness under "chronic" conditions. Watson's memorandum concluded:

> Is is clear that we cannot, and should not, keep the current "high alert" status indefinitely. It is equally clear to me that we should not simply return to the status quo ante. We need to define and recommend a maintenance mode of emergency preparedness that will meet the conditions we anticipate to last over the next weeks and perhaps months. 758/

The optimism was guarded, understandably so in view of the events of the previous 5 days. In his telephone briefing to the commissioners, Denton summarized the attitudes of many toward Monday's quiescence and the prospect of a new phase:

> DENTON: I think I will have to overcome the resistance of the staff, you know, to make any change. Obviously, there are a lot of views that just maintaining it right now, don't change a single temperature, pressure or anything in the system, let's just hold it. 759/

VII. THE AFTERMATH

During the first few weeks of April, there emerged in different contexts the problems of marking the point at which the acute crisis phase of the accident had passed and of designing the framework for the long-term response. This section of the report briefly sketches three examples of those problems and illustrates some difficulties inherent in blending different governmental organizations' activities.

A. THE POTASSIUM IODIDE ISSUE: DIFFERENT PERCEPTIONS OF RISK

Secretary of Health MacLeod had decided on Sunday, April 1, not to place received and expected shipments of potassium iodide at distribution points, but to continue to store the supplies in a warehouse in downtown Harrisburg. MacLeod, in consultation with Denton and Dr. Neil Wald of the University of Pittsburgh, had based his decision on the low levels of radioiodine released, the fear of creating panic by announcing that the drug was available, the opinion that the danger posed by the accident was diminishing, and a concern about the quality of the shipments received and the possibility of side effects.760/

On Monday, however, Frederickson of the National Institutes of Health (NIH), unaware of MacLeod's decision, had prepared a memorandum for Villforth in which Frederickson recommended that potassium iodide be immediately administered to the workers and be made available to the population within a 20-mile radius of TMI so that the drug could be available on an hour's notice. The basis of the Frederickson recommendations, made after consultation with his staff, was that the risks associated with the administration of the drug were minimal when weighed against the danger of the workers receiving a dose of radioactivity before being able to take the drug.761/

Frederickson's knowledge of conditions at the site was principally derived from the previous day's NRC briefing of HEW officials, when the bubble still seemed a danger. He was also aware that radioiodine was present in containment and that small amounts had been detected off-site. 762/ Frederickson appears to have been unaware on Monday of the extent to which the concern about a substantial, sudden release had diminished at the site on Sunday evening and Monday morning:

> QUESTION: All right. And was it your understanding at least as of the time that these recommendations were formulated on Monday, that there was still a significant or immiment [sic] danger of an explosion that could cause a radioactive release of radioiodine?
>
> FREDERICKSON: Yes, we still felt that the briefing we had had, I guess the last by Grimes on Sunday had led us to believe there still was some contributing risk of release.763/

Frederickson had not been specifically asked to prepare the recommendations; it seemed to be "a general assumption" from the time the potassium iodide had been ordered on Friday that NIH would investigate dosages, contraindications, and other aspects of its use.764/ The Frederickson potassium iodide recommendations were combined in the same memorandum with recommendations on other subjects.

At approximately the same time that the Frederickson recommendations were being developed, Eidenberg, apparently as a result of conversations with Waldman and others in the governor's office, asked HEW to provide advice concerning the administration of potassium iodide. 765/ In response to Eidenberg's request, Frederickson's Monday morning memorandum along with advice from the FDA staff, formed the basis of a memorandum from Surgeon General Julius Richmond to Califano. 766/ Califano, in turn, attached the Richmond memorandum to one of his own, dated April 3; both were immediately sent to Jack Watson.

The White House received Califano's memorandum on Tuesday, called the governor's office to indicate that the HEW recommendations had been received, and sent the Califano and Richmond memoranda by telecopier. The Califano memorandum read:

> Enclosed are recommendations of the Surgeon General with respect to thyroid blocking. Both [sic] the Director of the National Institutes of Health, and the Director of the National Cancer Institute, and the Commissioner of the Food and Drug Administration support these recommendations. These recommendations are:
>
> 1. Have workers in the plant and others on the island begin taking blocking doses now.
>
> 2. Have potassium iodide now personally available to all persons whose proximity to the site is such (perhaps up to ten miles distance) that they will not have as much as 30 minutes advance warning of 1-131 exposure.
>
> 3. Have potassium iodide available at convenient distribution points for distribution to other persons who may be exposed, such that they can have the medication at least 30 to 60 minutes in advance of possible exposure.
>
> 4. Accompany all distribution with notification to the effect that: All persons may take potassium iodide safely for a short time. All persons who: a) have goiter or known thyroid disease, or b) are pregnant or c) are breastfeeding a child should notify their physician when they start taking iodide and after they have stopped.
>
> 5. Preparations must be made for reducing the iodide dose after two weeks of administration of the amount on the labels. We will help you devise instructions for this if you wish.
>
> 6. Those in immediate touch with local situation should assess these recommendations in light of knowledge about current risks and about the likelihood of advance warning of releases.767/

With these recommendations having been received, the governor became involved in the decision. A meeting was held at 1:00 p.m. in the governor's office, attended by Thornburgh, Scranton, MacLeod, Jones of DER, representatives of the federal emergency management agencies, and members of the governor's staff. Later discussions were held with

Denton and Gordon Johnson of the FDA, who was on site. At both meetings Thornburgh decided not to distribute the drug, in part because of the low radiation levels and MacLeod's concern about side effects and the packaging of the solution, but also because of his desire to avoid creating panic:

> THORNBURGH: [Y]ou go around, knock on the door and hand people little vials of the stuff they have never seen before, and they ask you, "Well, do I take this now?" And you say, "No, not until the cloud comes," or something like that. You just really -- that may be logistically a very sound thing to do, but the psychological effect that it might have on recipients of that information or that particular item could be devastating.768/

That evening, MacLeod and Waldman showed the memorandum to Wald, who "was definitely suprised and didn't feel that it was medically sound or even an acceptable course of action." 769/ Wald was particularly concerned about the suggestion that workers be administered potassium iodide in advance of exposure because "in any occupational health situation you don't treat in advance and give workers a basis for being careless about how they do their job."770/

Califano learned of the state's decision when he talked with Thornburgh by telephone the following morning, a call made because Califano was to testify about the accident before Senator Kennedy's Subcommittee on Health and Scientific Research. At the hearing, Califano told the subcommittee that the recommendations had been made but not adopted, and because the HEW officials still believed the workers should be given potassium iodide immediately, they intended to call state health authorities that day.771/ Richmond and Frederickson had just learned of the state's decision that morning and that MacLeod "was somewhat annoyed with us."772/

After the hearing, Frederickson, Richmond, and FDA Commissioner Kennedy called MacLeod. As Frederickson testified:

> FREDERICKSON: . . . I myself was disturbed that he [MacLeod] was upset. We had not meant to embarrass him or compel him to do anything. That is why Richmond and I decided to call him.773/

Richmond described the call:

> So we called and again, I just reinforced the notion that we had always said that the people who were on the scene ought to make the judgment as to whether it should be utilized and he also seemed to think that somehow or other that we were being critical of them. And I said, well, in the testimony that we had given that morning I had had occasion to commend the Governor and all of the state officials for the way in which they had been handling the situation and that's in the testimony . . . . So he seemed to be somewhat reassured that we were not being critical, and rather being supportive.774/

From MacLeod's point of view, the issue flared again the next day with the **publication of a Washington Post article headlined, "Power**

Firm, Pennsylvania Reject Anti-Cancer Medicine." The article indicated that Pennsylvania and Metropolitan Edison had turned down

> a U.S. Surgeon General's recommendation that plant workers be given medicine to ward off possible cancer of the thyroid caused by radioactive iodine. . . [and] a recommendation that the medicine be made "personally available" to people living in a radius of 10 miles from Three Mile Island.775/

The article reported that state officials refused to comment, but "federal sources speculate that Thornburgh and Metropolitan Edison fear that distribution of the medicine might trigger a panic."

MacLeod responded to the article in a letter to the editor of the Washington Post 10 days later and cited his concerns about side effects, panic, and drug effectiveness. He said that he had received advice from the NRC, HEW's Bureau of Radiological Health, DOE, The National Council on Radiation Protection, and leading medical specialists, all of whom were in agreement that "we hold the drug in readiness and not administer it unless there was an expectation of imminent exposure to at least 10,000 millirems of radiation." 776/ He also prepared a 22 page document entitled, "The Decision to Withhold Distribution of Potassium Iodide during the Three Mile Island Event: Internal Working Document"777/ for distribution to high level officials in the executive branch of the state government.

If a serious, unexpected release of radioiodine had occurred, there would have been formidable obstacles to the successful distribution and administration of potassium iodide to people on both sides of the river, particularly in view of the need for dosage instructions. MacLeod has been criticized for not at least moving the supplies out of the Harrisburg warehouse to less centralized distribution points778/ and for refusing requests to make supplies of the drug available to DER and other technicians working at the site for administration in the event of a serious release.779/ Attention to the issue dissipated, however, as the threat of releases seemed less likely. The FDA has reclaimed the shipments and transported them to Little Rock, Ark., for storage.780/

B. THE WITHDRAWAL OF THE ADVISORY TO PREGNANT WOMEN AND PRESCHOOL CHILDREN: SEARCHING FOR STANDARDS

By Monday, some of the evacuees who had left the arena with their insurance checks in hand had returned having spent the money. As Koast explained, "Well, some of them said it didn't go as far as they thought it would and, well, this was closer to home than going out to some of the other counties. . . ."781/ For the duration of the week, the governor's advisory remained in effect, but the evacuee population at the arena decreased. When at the end of the week there were fewer than 50 people there, a discussion was held among representatives of Herco, the Red Cross, and the governor's office. The decision was made to close the arena as an evacuation center and to move the remaining evacuees to a smaller shelter.782/

On Saturday, Molloy received a telephone call from the governor's office requesting that he allow a press release announcing the closing of the arena to be issued over his name.783/ Molloy was told that the Red Cross did not want to announce it, but he did not know why he had been asked -- he had not been involved in the decision. Molloy speculated:

> Well you know, like I said earlier, I guess . . . nobody else wanted to do it. I don't know. I don't know. Maybe. . . I can't speak for what was going through their minds . . . . It was a unique request.784/

The release read in part:

> . . . The number of men, women, and children residing in the Hershey Park Arena is small enough that more private accommodations are available. . . Hershey Park Arena has been the relocation center for evacuees from around the Three Mile Island power plant for the past seven days. As many as 175 people set up temporary housekeeping on the floor of the arena. The remaining evacuees will be moved to the Community Center on Chocolate Avenue in Hershey.785/

The arena was closed Saturday morning, April 7. There were so few evacuees remaining that they were moved not to the Community Center, but to a motel, and even "they were out of there on Sunday."786/

It was evident that the crisis had passed, but the governor had not lifted the advisory. State and NRC officals had been waiting for cold shutdown of the plant as a clear signal that the crisis was over, but it was becoming apparent that cold shutdown could not be achieved for some time:

> GERUSKY: Almost every day the Governor asked Denton if the pregnant women -- if that advisory could be lifted. Denton said, "Well, we would like to come to a point where there is a break, something that happens like cold shutdown, and we think there will be a cold shutdown tomorrow. By tomorrow afternoon I will be able to tell you that if there is a cold shutdown you can bring the women back." That happened almost every day.
>
> After a week it got to the point where, "Hey, we are not going to see cold shutdown. Cold shutdown isn't going to come the way they are talking. If it does come, it will be a couple of weeks from now and there is no reason to leave these people out there."
>
> Everybody agreed that we have to bring them back, the crisis was over. The potential for a release was basically small and we had lots of time to get them out if something did occur.
>
> We wanted to hold -- NRC wanted to hold until they had a break point.
>
> Finally, I got on the phone with Dornsife [BRP's nuclear engineer] who was down at the plant to talk to Denton and say, "Look, try to

convince him to come up with some three or four items that could be used as a break point. The levels of radiation are decreasing from the plant. The plant is in the state of being readied for cold shutdown. There is nothing that could occur that could cause people to have a massive exposure before we would be able to get them out."

There were four or five items they finally put together and he and Hendrie came together to a meeting in the governor's office and said, "Because of these things, we think that it would be appopriate to advise the women to come back."787/

The NRC commissioners voted on whether the advisory should be lifted. When they had approved the action, Thornburgh -- on April 9 -- made the official announcement that he was lifting his "previous recommendations, advisories, and directives":

This meant it is now considered safe for pregnant women and preschool cildren to return to their homes within a five-mile radius of the Three Mile Island site.

This means that schools in that area around the site may reopen tomorrow.

This means that state offices can return completely to business as usual.

This means that I am ordering our Civil Defense and Emergency Preparedness forces to shift from a full alert status to an on-call status. This does not mean that we will relax our vigil. We will continue to monitor the entire situation on a 24-hour basis.788/

At the press conference announcing the end of the advisory, the reporters sensed a change in the criteria for pronouncing the crisis over. The last question was:

REPORTER: Mr. Denton: one question, the Saturday of the bubble problem, and Met Ed said the crisis wouldn't be over until there was a complete shutdown. Do you still stand by that statement?

DENTON: Well at the time, I guess I used cold shutdown to be a blanket term to describe an activity that I now perceive to be multi-faceted. There are lots of different issues that remain at the plant. There continues to be a lot of radioactivity. But when I look at the entire spectrum across the board, from containment to noble gasses, iodines, I consider the crisis over today with the, with regard to the status of the core.789/

C. THE SELECTION OF THE LEAD RADIOLOGICAL MONITORING AGENCY: AGENCY POLITICS

At the White House Situation Room meeting on Saturday, March 31, it was believed that the NRC would serve as the lead agency at the site for

the collection and dissemination of environmental monitoring data for other agencies and the public. 790/ In fact, however, DOE assumed that role as a result of a request from Gerusky and with the full cooperation of the NRC.791/ Several days after the acute emergency phase of the accident had passed, high level officials in HEW and the EPA learned that DOE was the de facto coordinator at the site.792/

QUESTION: What was your reaction to that report?

COTTON: My reaction was that this was very inappropriate.

QUESTION: Why?

ANSWER: I thought that the purpose of collecting that data was to get an accurate understanding of the potential public health and environmental impact of any releases of radioactivity.

I think historically there has been a problem with the whole development of nuclear power, in terms of placing the responsibility for the regulation and protection of the public health in the hands of the same agency for many, many years that was charged to develop it.

I think that mistake was being repeated by placing the Department of Energy in a coordinating role in terms of the data collection at Three Mile Island.

So that my reaction was a very strong one, that it made no sense, either from a point of view of who ought to have the responsibility in a rational sense for overseeing that responsibility, and it certainly made no sense in terms of being a position to prevent and assure both the Congress and the public that the data was being collected carefully and objectively.

QUESTION: Did you have any indication at that point that the data was not being collected objectively?

ANSWER: None whatsoever.793/

After Cotton learned of DOE's role at the site, he verified the information with the HEW on-site coordinator and the NRC, and informed Stephen Gage of the EPA.794/ He then called Eidenberg to determine whether the White House had either made or approved the designation.795. When Eidenberg told him that the White House was unaware of DOE's role, Cotton raised the point with Califano. 796/ Califano instructed Cotton to go back to Eidenberg to determine whether the White House would want to make a formal designation.797.

Cotton and Gage arranged to meet Eidenberg at the White House, prepared to urge that the EPA be designated the lead agency for long-term environmental monitoring. Cotton had been told by FDA

technical people, however, that DOE's monitoring capability was still needed at the site. Consequently, at the same time he was seeking a transfer of the lead agency role, Cotton was prepared to request that the White House extract from DOE "an explicit commitment" that it "continue to participate and to make its equipment and expertise available to continue the monitoring."798/

When Cotton, Gage, and Eidenberg met at the White House, DOE's role at the site was discussed. It was urged that the EPA was the appropriate agency for the long-term monitoring assignment. According to Gage, the conversation was also "very blunt and to the point that DOE first probably does not have the credibility ... to be believed by the public to take responsibility for providing the environmental measurements in the long-term." 799/ Eidenberg recognized the benefit of a clear allocation of responsibility for the long term, and was receptive to the argument that "it was very important to protect the public's sense of the objective collection and maintenance of the data."800/ He asked Cotton and Gage to develop a draft of a memorandum assigning the lead agency role.801/

A draft memorandum was prepared by Gage and Cotton, dated April 10, from Jack Watson to Califano, Schlesinger, and Cotton with a copy to Hendrie, designating EPA as the lead agency for the long-term environmental monitoring effort, while making specific monitoring assignments to HEW and DOE.802/ The draft was revised in the White House. When an acceptable version was developed, Eidenberg called Schlesinger, told him what was in the memorandum Jack Watson was prepared to sign, and asked him "whether he had any difficulty with it."803/ Schlesinger, although noting that DOE could perform the lead agency function, did not object.804/ A memorandum dated April 13 assigning EPA the lead agency role was signed by Jack Watson, who viewed EPA as the appropriate agency for the environmental monitoring assignment and for whom the credibility of DOE as the lead agency was not a factor.805/

A postscript may be in order. Ironically, the EPA team at Three Mile Island was dispatched from Las Vegas, Nev., where its principal function is to perform radiological monitoring at the DOE nuclear test site. Salaries and expenses of the team are paid in full by DOE under a reimbursable agreement with EPA.806/

VIII. CONCLUSION

This report does not presume to be a definitive description of the response to the accident at Three Mile Island; it has sought only to sketch an overview of the principal events to provide a basis for some of the Commission's findings and recommendations. When the Commission's work is completed, it is hoped that this and other staff documents may assist others investigating the TMI accident, enable them to build on the Commission's work, and contribute to a clearer understanding of the accident.

NOTES

1/ NRC, Investigation into the March 28, 1979, Three Mile Island Accident by the Office of Inspection and Enforcement, NUREG-0600, 1-3-39. (Hereinafter NUREG-0600); and President's Commission on the Accident at Three Mile Island Hearings (hereinafter Commission Hearings), May 31, 1979, p. 6.

2/ TMI Site Emergency Plan, Section 2.1. (TMI Plan.)

3/ TMI Plan Section 4.1.4.

4/ See "Office of the Chief Counsel Report on Emergency Preparedness to the President's Commission."

5/ PEMA Action Log, March 28, 1979, 0702.

6/ PEMA Action (0702) Log; Henderson deposition at 38.

7/ Under the Pennsylvania Disaster Operation Plan, PEMA must notify county civil defense, BRP, the governor's office, the state police, the National Guard, other state agencies, and contiguous states. It appears not all of these notifications were made by 9:00 a.m., with the exception of notification to contiguous states. PEMA Action Log.

8/ Hendrie deposition at 36-37.

9/ Dornsife deposition at 17-18.

10/ Id. at 17-21.

11/ Id. at 18-19

12/ Id.

13/ Id. at 20.

14/ Reilly interview at 56; Molloy deposition at 20-21.

15/ Molloy deposition at 20.

16/ Molloy interview at 13. Molloy confirmed that his dispatcher meant "slight" rather than "site."

17/ Molloy deposition at 22.

18/ TMI Site Emergency Plan, Procedure No. 1004., 2.1.

19/ Commission Hearings, August 2, 1979, at 7.

20/ NUREG-0600 at II-A-23.

21/ Gerusky deposition at 31.

22/ Molloy deposition at 28.

23/ Id. at 29.

24/ See note 4 above. The site police were notified by the utility at 7:14 a.m. A corporal had dispatched two troopers to the site. State Police Interview at 13.

25/ PEMA Action Log, March 28, 1979, 0735.

26/ Gerusky deposition at 31. See also Reilly interview at 75-76.

27/ PEMA Action Log, March 28, 1979, 0745.

28/ Reilly interview at 75-76.

29/ Reilly interview at 76.

30/ Thornburgh deposition at 5.

31/ Critchlow Interview at 39.

32/ Thornburgh deposition at 5-6.

33/ Reilly interview at 51; PEMA Action Log, March 28, 1979, 0815.

34/ NUREG-0600.

35/ NUREG-0600, 1-3-39.

36/ Id. at I-A53.

37/ Grier deposition at 24-25.

38/ Higgins deposition at 5.

39/ Gallina deposition at 10-11.

40/ Bores deposition at 46-47.

41/ Gallina deposition at 17.

42/ Gallina deposition at 22; Smith deposition at 33-34; Grier deposition at 31.

43/ Higgins deposition at 6-8.

44/ Smith deposition at 34.

45/ Grier deposition at 31.

46/ Id. at 32.

47/ Smith deposition at 32-33.

48/ Id.

49/ Stello deposition at 74-75.

50/ Deal deposition, Exhibit 2; Deal deposition at 12; Deal Interview at 25; NUREG-0600, II-A-17.

51/ Office of Chief Counsel Report on Emergency Preparedness to the President's Commission on Three Mile Island (hereinafter Report on Emergency Preparedness).

52/ Id.

53/ Reilly interview at 63.

54/ Deal interview at 29-30.

55/ Galpin deposition at 20-21.

56/ Id. at 4-15.

57/ Id. at 21-27.

58/ McConnell deposition at 35.

59/ Id. at 35.

60/ Id. at 36.

61/ Id. at 35-36.

62/ Id. at 36.

63/ Hardy deposition at 26-27; Thomas deposition at 46.

64/ Thomas deposition at 47.

65/ See Id. at 9. See also "Report on Emergency Preparedness."

66/ Hardy deposition at 27.

67/ Wilcox deposition at 26-27; Adamcik deposition at 28-29.

68/ Id.

69/ Ryan Interview at 24-25.

70/ Molloy deposition at 35.

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71/ PEMA Action Log, March 28, 1979, 0915.

72/ PEMA Action Log, March 28, 1979, 0820.

73/ Dornsife deposition at 25-27.

74/ PEMA Action Log, March 28, 1979, 0930; Henderson Interview at 4-5.

75/ Scranton Press Conference, March 28, 1979, 11:58 a.m.

76/ Critchlow interview at 41.

77/ Gerusky deposition at 34; Reilly interview at 64-70; Dornsife deposition at 29-31. Because of the presence of radioactivity in the TMI laboratory, the utility arranged with BRP to transport samples by helicopter to Harrisburg to be analyzed in the BRP laboratory. Reilly interview at 65-66; State Police interview at 20. Detectable iodine was found, although the results were later found to be unreliable. Dornsife deposition at 29.

78/ Dornsife deposition at 29-34.

79/ Id.; Dornsife interview at 47-48.

80/ Scranton press conference, March 28, 1979, 11:58 a.m.

81/ Dornsife interview at 48.

82/ Dornsife deposition at 30-31.

83/ Scranton Interview at 15-16

84/ Matthews deposition at 7.

85/ Id. at 7.

86/ Id. at 11.

87/ Id. at 12.

88/ Higgins deposition at 8-9.

89/ Id. at 9.

90/ Id. at 7-9.

91/ Higgins deposition at 11-12.

92/ Id. at 10-11.

93/ Id. at 12.

94/ Id. at 12-15.

95/ Id. at 10; Gallina deposition at 20.

96/ Gallina deposition at 15.

97/ Id.

98/ Grier deposition at 37.

99/ Id.

100/ Stello deposition at 74-75; see also, Higgins deposition at 36.

101/ Grier deposition at 36-37.

102/ McConnell deposition at 42.

103/ Id. at 45-46.

104/ Id. at 46.

105/ Wilcox deposition at 26-27.

106/ Id. at 27.

107/ Id. at 28; Adamcik deposition at 36, 39-40.

108/ Wilcox deposition at 27; Adamcik deposition at 31.

109/ Reilly interview at 65-66; Gerusky deposition at 34.

110/ Deal deposition at 15.

111/ Deal deposition at 13; Deal deposition, Exhibit 2.

112/ Critchlow interview at 44-45; Scranton interview at 16.

113/ Critchlow interview at 46-47.

114/ Commission Hearing, May 31, 1979, at 125.

115/ Scranton interview at 16.

116/ Governor's Log, March 28, 1979, 2:30 p.m.; Critchlow interview at 47.

117/ Scranton interview at 16.

118/ Knouse interview at 20. Earlier in the day, however, the Met Ed technical staff had notified BRP that a venting of the system was planned. BRP's Reilly reported to PEMA that the situation at the plant was "currently normal" and that a venting under stringent control was planned later in the day. PEMA reported the anticipated venting to "all state agencies" and emphasized that the venting would not cause "outside implications," although there might be "some release of gases." PEMA Action Log, March 28, 1979, 0835.

119/ Thornburgh deposition at 45-49.

120/ Critchlow interview tape #2, at 49.

121/ Id. Tape #1 at 48.

122/ Id. at 48.

123/ Press statement, March 28, 1979, 4:30 p.m.

124/ PEMA Action Log, March 28, 1979, 1045.

125/ Id. at 2035.

126/ Reilly interview at 74.

127/ Mathews deposition at 15.

128/ Mathews deposition, Exhibit 2.

129/ Mathews deposition at 14.

130/ Id. at 17.

131/ Gallina deposition at 26-29.

132/ Id. at 30.

133/ Knouse interview at 19.

134/ Higgins deposition at 28-29.

135/ Gallina deposition at 35.

136/ Higgins deposition at 29-30.

137/ Id. 31.

138/ Waldman interview at 8.

139/ Id. at 10-11; Critchlow interview tape #1 at 60. Knouse, however, does not recall meltdown being mentioned. Knouse interview at 25.

140/ Scranton press conference, March 28, 1979, 10:00 p.m.

141/ Id.

142/ Thornburgh deposition at 23.

143/ Gallina deposition at 40.

144/ Thornburgh deposition at 24.

145/ Id. at 26.

146/ Id. at 25.

147/ Henderson deposition at 51.

148/ Id. at 48.

149/ Molloy deposition at 37-38; Molloy interview at 29.

150/ Henderson deposition at 50.

151/ Dornsife deposition at 46-47.

152/ Id. at 53.

153/ Id. at 53.

154/ Gallina deposition at 53.

155/ Id. at 48.

156/ Id. at 45.

157/ Id. at 49-50.

158/ NBC, ABC transcripts, March 29, 1979.

159/ NBC transcripts, March 29, 1979.

160/ Scranton interview at 21-22.

161/ Scranton interview at 21-22; Knouse interview at 29.

162/ Critchlow interview tape #1 at 68.

163/ Scranton interview at 22.

164/ Id.

165/ Thornburgh deposition at 23-33; Knouse Interview at 29.

166/ Scranton interview at 23.

167/ McNeil/Lehrer Report transcripts, March 29, 1979.

168/ Reilly interview at 92-93.

169/ Id. at 94.

170/ Gallina deposition at 56-57.

171/ Smith deposition at 35-37.

172/ Grier deposition at 44.

173/ Smith deposition at 37; Abraham deposition at 53.

174/ Reilly interview at 94.

175/ Gerusky interview at 24. See also NRC transcripts 02-037-CH2-ec-3,5.

176/ Milne interview, tape 1, at 73.

177/ Gerusky interview at 24.

178/ Deal deposition at 22.

179/ MacLeod deposition at 5.

180/ Id. at 16.

181/ Id. at 22-23.

182/ Id. at 24.

183/ Robbins deposition at 35-36.

184/ MacLeod deposition at 27-31.

185/ Id. at 29.

186/ Id. at 30.

187/ Id. at 31.

188/ Id. at 33.

189/ Id. at 33.

190/ Id. at 38.

191/ Thornburgh deposition at 17.

192/ Waldman interview at 16.

193/ Gerusky deposition at 47-49.

194/ MacLeod deposition at 39.

195/ Waldman interview at 16. See also MacLeod deposition at 39-40.

196/ Molloy deposition at 38-40.

197/ Molloy interview at 34.

198/ Critchlow interview, tape #1, at 69.

199/ Id. at 70-71.

200/ Thornburgh deposition at 37-38.

201/ Thornburgh press conference, March 29, 1979, 10:20 p.m. [sic: 5:15 P.M.].

202/ Id.

203/ Thornburgh deposition at 39-40.

204/ NRC transcript 02-228-CH6/KD-2-6. Members of the Commission staff have compared the tape recording to the NRC transcription and have identified speakers who are indicated only as "voice" on the NRC transcript.

205/ Smith deposition at 37-38.

206/ Id.

207/ Id. at 39. See also NRC transcript 02-084-CH/21-KD-7.

208/ Smith deposition at 39.

209/ Gallina deposition at 56.

210/ Grier deposition at 43.

211/ Id. at 46.

212/ Milne interview, tape #1, at 76.

213/ Id.; tape #1 at 79; tape #2 at 1-2.

214/ Id.; tape #2, at 6.

215/ For a detailed examination of the dispute, see Public Information Task Force Time Line.

216/ Milne interview, tape #2, at 6.

217/ Critchlow interview, tape #2, at 19-20.

218/ Id.; tape #1, at 76.

219/ Id., tape #2, at 21.

220/ Press Release by Clifford Jones, March 29, 1979.

221/ Thornburgh deposition at 41.

222/ Id. at 42.

223/ Id. at 39-40.

224/ Higgins deposition at 42.

225/ Gallina deposition at 60.

226/ Higgins deposition at 45-46.

227/ Critchlow interview, tape #2, at 8-11.

228/ Id. at 11-12.

229/ Critchlow interview at 11-12, 18-19.

230/ Thornburgh deposition at 44-45; governor's chronology.

231/ Id.; Thornburgh deposition at 42-43.

232/ Commission Hearing, May 31, 1979, at 173-74; Floyd interview, tape #1, at 68. For a technical explanation of this operation, see President's Commission on the Accident at Three Mile Island staff report, "Radiation Releases and Venting of Tanks on Friday Morning, March 30, 1979."

233/ Floyd interview, tape #1, at 68.

234/ Id., tape #3, at 2.

235/ Id., tape #1, at 68.

236/ Commission Hearings, May 31, 1979, at 262-263.

237/ Id. at 176-177.

238/ Floyd interview, tape #1, at 74-75. See also Commission Hearings, May 31, 1979, at 177-78.

239/ Floyd interview, tape #1, at 76. See also Commission Hearings, May 31, 1979, at 178-79.

240/ Floyd interview, tape #3, at 1.

241/ Molloy deposition at 45.

242/ PEMA Action Log, March 30, 1979, 0840.

243/ Williamson interview at 52.

244/ PEMA Action Log, March 30, 1979, 0840.

245/ Henderson deposition at 51; Commission Hearings, Aug. 2, 1979, at 39-41; Williamson interview at 52.

246/ Reilly interview at 113.

247/ Id.; Williamson interview at 46.

248/ Gallina deposition at 67-70.

249/ Id. at 70-71.

250/ Collins deposition at 44-48.

251/ Denton deposition at 140.

252/ Id. at 57.

253/ Barrett deposition at 38-44.

254/ Id. at 45-49.

255/ NRC transcript.

256/ Barrett deposition at 54-55.

257/ Commission Hearings, Aug. 2, 1979, at 298; Barrett deposition at 54.

258/ Id. at 56-57.

259/ Commission Hearings, Aug. 2, 1979, at 299-300.

260/ Denton deposition at 124; 127-128.

261/ Id. at 126-127.

262/ Barrett deposition at 65.

263/ Commission Hearings, Aug. 2, 1979, at 301-302.

264/ Id. at 302.

265/ Collins deposition at 72. Denton has no clear recollection, eith Denton deposition at 125.

266/ Collins deposition at 70; Denton deposition at 124-25.

267/ NRC transcript 03-019-CH2/20 SW-10.

268/ Scranton interview at 54.

269/ Molloy deposition at 48-49.

270/ See, e.g., PEMA Action Log, March 30, 1979, 9:22 a.m.

271/ Gerusky deposition at 53; Dornsife deposition at 61; Reilly deposition at 119-21.

272/ NRC transcript 03-117-CH4/22-CLB-8-9. Members of the President's Commission staff have compared the NRC transcript to the tape recording and have identified the speakers.

273/ Commission Hearings, Aug. 2, 1979, at 41-42.

274/ Gallina deposition at 70.

275/ Id. at 71.

276/ Gerusky deposition at 53-54.

277/ Dornsife deposition at 75-76.

278/ Scranton interview at 54.

279/ Critchlow interview, tape #1, at 42.

280/ Id. at 40-41.

281/ Scranton interview at 25.

282/ Thornburgh deposition at 56.

283/ Henderson deposition at 56-57.

284/ Thornburgh deposition at 56.

285/ Critchlow interview, tape #2, at 31.

286/ Id. at 31-32.

287/ Thornburgh deposition at 56.

288/ Gilinsky deposition at 155.

289/ Bradford deposition at 182.

290/ NRC transcript of commission meeting, March 30, 1979, 9:37 a.m., at 5.

291/ Id. at 2-3.

292/ Id. at 11.

293/ Id. at 14.

293/ Id. at 13.

295/ NRC meeting transcript, March 30, 1979, at 13-16.

296/ Hendrie deposition at 220.

297/ Gibbon deposition at 19-20.

298/ Hendrie deposition at 221.

299/ NRC transcript (tab 25c), p. 18-19.

300/ Id. at 24-25.

301/ Id. at 26-27.

302/ Id. at 27-28.

303/ Critchlow, tape #3, at 33.

304/ Id.

305/ Hendrie deposition at 222.

306/ Mathews deposition at 21-22.

307/ Id. at 23.

308/ Hendrie deposition at 230.

309/ Id.; Mathews deposition at26.

310/ Hendrie deposition at 230.

311/ Id.

312/ Id.; Mathews deposition at 26-27.

313/ Id. at 27.

314/ Id. at 28-29.

315/ Waldman interview at 60-66.

316/ Critchlow interview, tape #3, at 36.

317 Id.

318/ Gerusky deposition at 60; Scranton interview at 64. Another source has indicated that the siren sounded during a later conversation between Thornburgh and President Carter. Critchlow interview tape #3, at 36.

319/ Id. at 36.

320/ Gerusky deposition at 60-61. During TMI-2 licensing hearing in 1977, Molloy testified that a siren was a useful instrument in emergencies. Transcript of April 8, 1977, TMI-2 Licensing Hearings.

321/ Gerusky deposition at 60.

322/ NRC Commission Meeting Transcript, March 30, 1979, at 29.

323/ Gibbon deposition at 31-32.

324/ Id. at 37-38. Gibbon testified that during the conversation, Hendrie was given a note to the effect that a new release had occurred and that Denton was again recommending evacuation; which prompted Hendrie to recommend the advisory. (Id. at 38-42.) Hendrie testified that he could not recall the note and stated that he would not have been influenced by such a note. (Hendrie deposition at 223-226.)

325/ Aug. 2, 1979 President's Commission Hearings at 303; Aug. 23, 1979, Hearings at 52-53.

326/ Gerusky deposition at 62.

327/ Id. at 63.

328/ Id. at 64-65, 67. Commission Hearings, Aug. 2, 1979, at 143. In earlier testimony, MacLeod indicated that the telephone call carried "the implication that [the wastewater discharge] wasn't an error in judgment." MacLeod deposition at 42:

329/ Sternglass had also urged over the radio that pregnant women evacuate, but his advice was publicly rebutted by a representative of the Department of Health. See text accompanying note 195, supra.

330/ Commission Hearings, Aug. 2, 1979, at 143-144.

331/ Gibbon deposition at 42-43.

332/ Id. at 43-44.

333/ Hendrie deposition at 24.

334/ Gibbon deposition at 46.

335/ Gerusky deposition at 67-69.

336/ Id. at 68.

337/ Id.

338/ Governor's press conference, March 30, 1979, 12:30 p.m.

339/ Gibbon deposition at 49-50.

340/ NRC Commission Hearing Transcript, March 30, 1979, at 60.

341/ Id. at 61-63.

342/ Id. at 62.

343/ Id. at 63.

344/ Id. at 67.

345/ Id. at 69-70.

346/ Gibbon deposition at 52.

347/ Id. at 54-55.

348/ Id. at 54-55. Gibbon has testified that the commissioners were "unwilling to proceed without the Chairman in the conversation." Id.

349/ Gallina deposition at 81-82.

350/ Id. at 82.

351/ Id. at 83-84.

352/ Id. at 84.

353/ Id. at 85.

354/ Smith deposition at 49.

355/ Id.

356/ Id. at 50.

357/ Id.

358/ Id. at 51.

359/ Gallina deposition at 88.

360/ Id. at 92.

361/ Id. at 92.

362/ Reilly interview at 119.

363/ Adamcik deposition at 40.

364/ Wilcox deposition at 31.

365/ Adamcik deposition at 43-44.

366/ Id. at 42-44.

367/ Hardy deposition at 40-43; Thomas deposition at 56-57.

368/ Hardy deposition at 40-42.

369/ See text accompanying note 102, supra.

370/ Henderson deposition at 50; McConnell deposition at 46.

371/ Mathews deposition at 31.

372/ Id.

373/ Watson deposition at 7.

374/ Id. at 16.

375/ Mathews deposition, Exhibit 4.

376/ Eidenberg deposition, Exhibit 1.

377/ Mathews deposition, Exhibit 5.

378/ Mathews deposition at 65-66; Eidenberg deposition at 31,Exhibit 2; Watson deposition at 26.

379/ Watson deposition at 18; 26. Mathews recalls, however, that an explicit directive was made by the President prior to the meeting that federal assistance be made available. Mathews deposition at 31.

380/ Watson deposition at 27.

381/ Watson deposition at 27-28; Eidenberg deposition at 25-26; Mathews deposition at 60-61.

382/ Watson deposition at 30, Exhibit 1.

383/ Watson deposition at 27-28, Exhibit 1; Eidenberg deposition at 36-37; Mathews Exhibit #5.

384/ Eidenberg deposition at 38.

385/ Eidenberg deposition at 40-41.

386/ McConnell deposition at 55.

387/ Wilcox deposition at 34-35.

388/ Eidenberg deposition at 41-42.

389/ Id. at 42.

390/ Galpin deposition at 20-21.

391/ Id. at 45.

392/ Id. at 26-27.

393/ Gage deposition at 14-15.

394/ Id. at 16-17.

395/ Id. at 20.

396/ Id. at 20-21.

397/ Id. at 25-30.

398/ Bradford deposition at 196.

399/ Gage deposition at 29-34.

400/ Id. at 33.

401/ Id. at 34.

402/ Foege deposition at 6.

403/ Cotton deposition at 7.

404/ Id. at 8-12.

405/ _Bradford deposition at 195.

406/ Id.

407/ Cotton deposition at 13.

408/ Bradford deposition at 196.

409/ Cotton deposition at 23-24.

410/ Id. at 25; Bradford deposition at 197-98.

411/ Id.at 24; Mathews deposition at 73-74; Fredrickson deposition at 21.

412/ Cotton deposition at 25; 29.

413/ Cotton deposition, Exhibit 2.

414/ Upton deposition at 8.

415/ Cotton deposition at 28-29.

416/ Gage deposition at 66; 72.

417/ Molloy deposition at 57.

418/ MacLeod deposition at 45.

419/ Id. at 56.

420/ Henderson deposition at 70.

421/ Id. at 65.

422/ Id. at 65-66.

423/ Id. at 67-68.

424/ NRC meeting transcript 3/31/79, at 77.

425/ Id. at 85; 82-84.

426/ Id. at 90.

427/ Id. at 90-92.

428/ Id. at 96. The parenthetical notation appears in the NRC Transcript.

429/ Gibbon deposition at 55.

430/ NRC meeting transcript, March 30, 1979, at 84.

431/ Id.

432/ Id.

433/ Critchlow tape #2 at 50; governor's chronology, March 30, 1979.

434/ Governor's chronology, March 30, 1979, at 11, 13-15.

435/ Memo to file from Governor Thornburgh (March 30, 1979) attached to governor's chronology.

436/ Critchlow interview, tape #3, at 52.

437/ Id. at 51.

438/ NRC meeting transcript at 99-100.

439/ Gibbon deposition at 59.

440/ Id.; NRC meeting transcript, March 30, 1979, at 101.

441/ NRC meeting transcript, March 30, 1979, at 103.

442/ Gibbon deposition at 60-62.

443/ Id. at 62; NRC meeting transcript, May 30, 1979, at 106.

444/ NRC meeting transcripts, March 30, 1979, at 110-111.

445/ Id. at 117-118.

446/ Id. at 123-124.

447/ Critchlow interview, tape #3, at 52.

448/ NRC meeting transcript, March 30, 1979, at 126-127.

449/ Id.

450/ Id. at 128.

451/ Id. at 128-129.

452/ Critchlow tape #2, 54-55.

453/ Waldman interview at 68-69.

454/ Waldman memorandum to James Sife attached to governor's chronology.

455/ Waldman interview at 69; Thornburgh deposition at 78-79.

456/ Watson deposition at 46-47. Eidenburg deposition at 45-50.

457/ Thornburgh deposition at 78.

458/ August 2, 1979, Commission Hearings at 194.

459/ NRC meeting transcript March 30, 1979, at 118-21; 134-38.

460/ Eidenburg deposition at 25-36; Mathews deposition at 50-57.

461/ Eidenburg deposition at 26.

462/ Mathews deposition at 61-62.

463/ Id. at 63.

464/ Cotton deposition at 47.

465/ Hendrie deposition at 217-18.

466/ NRC meeting transcript, March 30, 1979, at 137.

467/ Critchlow tape #2, 55-56.

468/ The genesis of this story is fully documented and appears **in** the report of the Public Information Task Force.

469/ Powell press conference, March 30, 1979, 5:15 p.m.

470/ NRC hearing transcript, March 30, 1979, at 148.

471/ Id. at 156.

472/ Id. at 158.

473 / NRC meeting transcript, March 30, 1979, at 173-185.

474/ Knouse interview at 71.

475/ Id. at 71-73.

476/ Governor Thornburgh's press conference, March 30, 1979, 10:00 p.m.

477/ Commission Hearings, May 31, 1979, at 316-317.

478/ Henderson deposition at 72-73.

479/ NRC meeting transcript, March 30, 1979, at 214.

480/ Id. at 216-217.

481/ Id. at 220-221.

482/ Id. at 127.

483/ Hendrie deposition at 197-198.

484/ NRC/IRC transcript, 03-235-CH6/24-EC-11-13.

485/ Henderson deposition at 79.

486/ Molloy deposition at 65-66.

487/ Id. at 67.

488/ Bretthauer interview at 20-22.

489/ Villforth interview at 21-29.

490/ Villforth deposition at 33-34.

491/ Id. at 34.

492/ Id.

493/ Id.

494/ Halperin interview at 4.

495/ Villforth deposition at 35.

496/ Document: NRC chronology of TMI-2 hydrogen bubble concerns, at 6.

497/ Mattson deposition at 184-185.

498/ Bradford deposition at 185-186.

499/ HEW document: summary by Kathleen Buto of meeting in secretary's office, March 31, 1979, 9:30 a.m.

500/ Cotton deposition at 29.

501/ Watson deposition at 65-66; Eidenberg deposition at 72-73.

502/ Watson deposition at 66.

503/ Id. at 66-67.

504/ Cotton deposition at 27; Cotton deposition, Exhibit 3.

505/ Cotton deposition at 28.

506/ Richmond deposition at 21.

507/ Cotton deposition, Exhibit 4.

508/ Villforth deposition at 59.

509/ Id.; Cotton deposition at 41-42.

510/ Upton deposition at 9.

511/ Id. at 9-10.

512/ Cotton deposition at 42-43.

513/ Villforth deposition at 68-69.

514/ Id. at 58-60.

515/ Cotton deposition at 33.

516/ Cotton deposition, Exhibit 3, p. 2; Upton deposition, Exhibit 1, p. 2.

517/ Cotton deposition at 35.

518/ Id. at 33.

519/ Villforth deposition at 53.

520/ Gilinsky deposition at 114.

521/ Cotton deposition, Exhibit 5.

522/ Cotton deposition at 44-45. As Robbins recalled:

> I think I can quote the Secretary properly because he said it on at least three occasions during these days. He said, "If I were the chairman of the NRC, I would have called the Surgeon General and I would have not let him leave my side during this whole episode. They need public health advice over there and they are not asking for it." [Robbins deposition at 67. Compare Watson deposition at 118.]

523/ Cotton deposition, Exhibit 3, p. 3; Upton deposition, Exhibit 1, p 2

524/ Id. at 4.

525/ Cotton deposition at 46.

526/ Cotton deposition at 49.

527/ Id.

528/ Id. at 51.

529/ Id. at 47.

530/ Id. at 49-50.

531/ Id. at 123-124.

532/ Mathews deposition at 93.

533/ Id. at 96.

534/ Eidenberg deposition at 65-66.

535/ Id. at 67-68.

536/ Watson deposition at 63.

537/ Deal deposition at 23-24; 46.

538/ Id. at 23-24.

539/ Molloy depostion at 65-69.

540/ Gerusky deposition at 86.

541/ Id. at 86-87.

542/ Id. at 89.

543/ Pennsylvania Dept. of Gen. Serv. Chronology at 2.

544/ MacLeod deposition at 65-66.

545/ Id. at 65.

546/ Fabian interview at 61-64.

547/ Met Ed Press Conference, March 31, 1979, 11:00 a.m.

548/ President's Commission on TMI Hearings, May 31, 1979, at 318-319. See also Creitz interview, tape #1, at 20.

549/ Hendrie deposition at 217.

550/ Id. at 218.

551/ Commission Hearings, May 31, 1979, at 320.

552/ Koast interview at 44.

553/ Id. at 44.

554/ Id. at 46.

555/ Id. at 39-40.

556/ Governor's chronology, March 31, 1979, at 21.

557/ Koast interview, 59-61.

558/ Id. at 62.

559/ Id. at 62.

560/ Id. at 55.

561/ Id. at 55.

562/ NRC meeting transcript, March 31, 1979, at 6-9.

563/ President's Commission on TMI Hearings at 312.

564/ Watson deposition at 104-05.

565/ NRC meeting transcript, March 31, 1979, at 26.

566/ Id. at 310; see also id., June 1, 1979, at 11-14.

567/ Mathews deposition at 97.

568/ Watson deposition, Exhibit 5.

569/ Watson deposition at 65.

570/ Watson deposition, Exhibit 5.

571/ Id.

572/ Eidenberg deposition at 74; Cotton deposition at 54-55; Eidenberg Exhibit #8.

573/ Watson deposition, Exhibit 6; Cotton deposition at 55.

574/ Watson deposition, Exhibit 6.

575/ Watson deposition at 69-70.

576/ Id. at 70.

577/ Villforth deposition at 21; Cotton deposition at 76.

578/ Cotton deposition at 47-48.

579/ Compare Cotton deposition at 50, 55-56, with Eidenberg deposition at 79-80 and Exhibit 8.

580/ Eidenberg deposition at 80-83; Mathews deposition at 110-111.

581/ Villforth deposition at 71-73. Compare Villforth interview at 6-14 with Watson deposition at 70; Eidenberg deposition at 82-83.

582/ Watson deposition, Exhibit 6.

583/ Id.

584/ Cotton deposition at 68-69.

585/ Watson deposition, Exhibit 6. But see Cotton deposition at 56-57.

586/ Eidenberg deposition, Exhibit 8.

587/ Eidenberg deposition, at 76.

588/ Gage deposition at 63. Gage, however, said that DOE might not have been present because of an "unspoken concern" about the validity of the monitoring data. Id.

589/ See, e.g., Mathews deposition at 107-08; Eidenberg deposition at 76-77; Cotton deposition at 75, Gage deposition at 62-63.

590/ Gage deposition at 63.

591/ Gage deposition at 74.

592/ Deal deposition at 38.

593/ Villforth deposition at 42-43.

594/ Cotton deposition at 99-118.

595/ Villforth deposition at 93.

596/ Mattson deposition at 181.

597/ Id. at 182.

598/ Id. at 183

599/ NRC meeting transcript, March 31, 1979, at 4-5. See also NRC chronology of TMI-2 hydrogen bubble concerns, at 8.

600/ Id. at 36-49 (Section I).

601/ Id. at 45-49 (Section I).

602/ Id. at 12-13 (Section II).

603/ Id. at 14 (Section II).

604/ Mattson deposition at 185-86.

605/ Id. at 186. The information was relayed to Hendrie.

606/ Hendrie deposition at 210-11.

607/ Id. at 218. For a full discussion of the press conference, see report of the Task Force on the Public's Right to Information.

608/ NRC press conference transcript, March 31, 1979, 2:45 p.m.

609/ Id. at 14.

610/ NRC meeting transcript, March 31, 1979, at 28-29; 40.

611/ Id. at 38-40.

612/ Id. at 45-46.

613/ Id. at 49-50; 59.

614/ The story is reproduced in the report of the Task Force on the Public's Right to Information.

615/ NRC meeting transcript, March 31, 1979, at 61-62.

616/ Id. at 23.

617/ See governor's chronology, March 31, 1979, p. 22.

618/ NRC meeting transcript, March 31, 1979, at 4-8.

619/ Thornburgh press statement, March 31, 1979; governor's chronology, March 31, 1979.

620/ Mattson deposition at 188-189.

621/ NRC chronology of TMI-2 hydrogen bubble concerns at 11-12, and memorandum attached thereto.

622/ Levine deposition at 37.

623/ A complete discussion of this event is contained in report of the Task Force on the Public's Right to Information.

624/ Mathews deposition at 114.

625/ Id. at 115.

626/ Eidenberg deposition at 85.

627/ Id. at 88-89.

628/ See report of the Task Force on the Public's Right to Information.

629/ Watson deposition at 87.

630/ Eidenberg deposition at 105.

631/ Id. at 101-102.

632/ Watson deposition at 87-88.

633/ Eidenberg deposition, Exhibit 9.

634/ Eidenberg deposition at 107.

635/ Watson deposition at 90-91.

636/ Eidenberg deposition at 91.

637/ Id. at 104-105.

638/ Watson deposition at 72-73.

639/ Press statement, March 31, 1979.

640/ Press conference, March 31, 1979.

641/ Id. at 2-3.

642/ See Grier deposition at 67-70; NRC transcripts 05-213-CH 6/23-CLB-7, 05-193-CH 6/24-PD-1.

643/ Molloy deposition at 85.

644/ Id. at 87.

645/ Id. at 85.

646/ Id. at 88-89.

647/ Molloy deposition at 95-97.

648/ Id. at 98-99.

649/ Id. at 100.

650/ Id. at 102-103.

651/ Scranton interview at 86-87.

652/ Id. at 48-49; Henderson deposition at 88-90.

653/ Scranton interview at 91-92.

654/ See NRC chronology of TMI-2 hydrogen bubble concerns at 22-49.

655/ Budnitz deposition (Aug. 1, 1979) at 15; Levine deposition (Aug. 8, 1979) at 41-45.

656/ Mattson deposition at 194.

657/ See NRC chronology of TMI-2 hydrogen bubble concerns at 25.

658/ Mattson deposition at 191-92.

659/ Id. at 192; see also, NRC chronology of TMI-2 hydrogen bubble concerns at 26-27.

660/ Bradford deposition at 186. See also id. at 198-199.

661/ Id. at 199.

662/ Mathews deposition at 112.

663/ Gilinsky deposition at 122; Watson deposition at 81.

664/ Watson deposition at 81.

665/ Gilinsky deposition at 122-123.

666/ Id. at 123-124.

667/ See NRC meeting transcript, April 1, 1979, passim.

668/ Cotton deposition at 57.

669/ Id. at 58.

670/ Id. at 59.

671/ Id. at 64-65.

672/ HEW document: Summary by Kathleen Buto of Brian Grimes briefing, April 1, 1979.

673/ Id.

674/ Id.

675/ Id. at 65-66.

676/ Cotton deposition at 62.

677/ Eidenburg deposition at 125-126.

678/ Cotton deposition at 63.

679/ Watson deposition at 85-86.

680/ HEW document: summary of Kathleen Buto of staff Meeting, April 1, 1979.

681/ Mathews deposition at 117-118.

682/ Id. at 118-120.

683/ Id. at 121.

684/ Id.

685/ Id. at 122.

686/ Id. at 125.

687/ Id. at 128-129

688/ Id. at 129-130.

689/ Stello deposition at 110-112; Denton deposition at 104.

690/ Mattson deposition at 193.

691/ Mattson interview, cassette 16, part 5 and 6, at 35-36; parts 7 and 8, at 2.

692/ President Carter's press statement, 4-1-79, Middletown, Pa.

693/ Reid interview at 48.

694/ Stello deposition at 109-111.

695/ Adamcik deposition at 52-53.

696/ Id. at 54-55.

697/ Id. at 55-56.

698/ Id. at 58.

699/ Id. at 77.

700/ Id. at 67-68.

701/ Id. at 76-77.

702/ Wilcox deposition at 49.

703/ NRC commission meeting transcript, April 1, 1979, Section #7 at 21.

704/ Id. at Section #2 at 25.

705/ Id. at Section #2 at 27.

706/ Id. at Section #2 at 28-29.

707/ Id. at Section #2 at 42-43.

708/ Id. at Section #3 at 3.

709/ Id. at 3; 57.

710/ Ahearne deposition at 209.

711/ Gilinsky deposition at 152.

712/ NRC commission meeting transcript, April 1, 1979, Section #3 at 15.

713/ Stello deposition at 111.

714/ Denton deposition at 107.

715/ Levine deposition at 12.

716/ Denton deposition at 105.

717/ Stello deposition at 111.

718/ Ahearne deposition at 210.

719/ Mattson deposition at 193; NRC chronology of TMI-2 hydrogen bubble concerns at 34-37.

720/ NRC meeting transcript, March 31, 1979, at 28.

721/ Denton deposition at 105.

722/ Id. at 114.

723/ Mattson deposition at 197-98.

724/ Eidenberg deposition at 126.

725/ Watson deposition at 83-84; Exhibit 7.

726/ Watson deposition, Exhibit 7.

727/ Eidenberg deposition at 127; Eidenberg deposition at 125-126.

728/ MacLeod deposition at 70.

729/ "The Decision to Withhold Distribution of Potassium Iodide during the Three Mile Island Event: Internal Working Document" by Gordon MacLeod, M.D., at 5.

730/ MacLeod deposition at 71-72.

731/ Id. at 74-75.

732/ MacLeod deposition at 79.

733/ Memorandum of Robert C. Wilburn to Governor Thornburgh 4-1-79 (Subject: State Office Operations).

734/ Thornburgh press statement, 4-1-79.

735/ Memorandum of Robert C. Wilburn to Governor Thornburgh, 4-1-79 (Subject: State Office Operations).

736/ Thornburgh press statement, April 1, 1979.

737/ Koast interview at 70-71.

738/ Critchlow interview, tape 4, at 24-25.

739/ Mathews deposition, Exhibit 10.

740/ NRC chronology of TMI-2 hydrogen bubble concerns at 32. It was suggested in the same memorandum that B&W's method for calculating the size of the bubble contained errors.

741/ See report of the Task Force on the Public's Right to Information.

742/ Denton press conference transcript, at 4.

743/ Frederickson deposition at 47.

744/ Frederickson deposition exhibit #6.

745/ Eidenberg deposition at 138-39.

746/ Frederickson deposition at 60.

747/ Eidenberg deposition at 130.

748/ Id.

749/ NRC Commission meeting transcript, April 2, 1979, at 17.

750/ Id. at 23.

751/ Critchlow interview, tape 4, at 26.

752/ Id. at 27.

753/ Thornburgh press statement, April 2, 1979.

754/ Mathews deposition exhibit 10.

755/ Critchlow interview, tape 4, at 28.

756/ Eidenberg deposition exhibit 12.

757/ Id.

758/ Id.

759/ NRC commission meeting transcript, April 2, 1979, at 23.

760/ Document: "The Decision to Withhold Distribution of Potassium Iodide during the TMI Event: Internal Working Document" by Gordon K. MacLeod.

761/ Frederickson deposition at 54-55.

762/ Id. at 55-56.

763/ Id. at 55.

764/ Id. at 56.

765/ See text accompanying note 758, supra.

766/ Richmond deposition at 32.

767/ Frederickson deposition, Exhibit 8.

768/ Thornburgh deposition at 79-81. See also governor's chronology, April 3, 1979.

769/ Wald deposition at 100.

770/ Id.

771/ Hearings, Senate Subcommittee on Health and Scientific Research of the Committee on Human Resources (April 4, 1979) at 123-24.

772/ Frederickson deposition at 63-64.

773/ Id. at 64.

774/ Richmond deposition at 40-41.

775/ The Washington Post, April 5, 1979.

776/ Id., April 16, 1979.

777/ MacLeod deposition, Exhibit 2.

778/ Villforth deposition at 104-06.

779/ Gerusky deposition at 93-94.

780/ Villforth deposition at 106.

781/ Koast interview at 73.

782/ Molloy deposition at 114-115.

783/ Id. at 115.

784/ Molloy interview' at 172.

785/ Id.

786/ Koast interview at 74.

787/ Gerusky deposition at 82-84.

788/ Thornburgh press statement, April 7, 1979, at 1.

789/ Id. at Part III, p. 6B.

790/ Villforth deposition at 37; 91-92.

791/ Deal deposition at 32; 28-39.

792/ Villforth deposition at 92-93; Cotton deposition at 99; Gage deposition at 89.

793/ Cotton deposition at 99-101.

794/ Cotton deposition at 103-04.

795/ Id. at 108.

796/ Id. at 107.

797/ Id.

798/ Id. at 109.

799/ Gage deposition at 86.

800/ Eidenberg deposition at 147.

801/ Id. at 147-48.

802/ Eidenherg deposition, Exhibit 14.

803/ Eidenberg deposition at 151.

804/ Id.

805/ Watson deposition at 40.

806/ Gage deposition at 8-10; Bretthauer interview at 13; see Deal deposition at 73-74. Cotton was unaware of the EPA team's affiliation with DOE. Cotton deposition at 118-120. It should be noted that DOE is the lead agency under IRAP. Gerusky and Reilly of BRP and Villforth of the federal Bureau of Radiological Health were surprised that the EPA's Las Vegas team was selected for TMI over the Office of Radiation Programs and were somewhat critical of the EPA's choice. See Gerusky deposition at 97-100; Reilly interview at 166-69; Villforth interview tape 2 at 18-33. There is also some indication that the selection of the Las Vegas team caused some resentment on the part of ORP within EPA. ORP, for example, unsuccessfully attempted to become involved in the TMI effects. See Bretthauer interview at 35; 42.

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THREE MILE ISLAND

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Emergency Preparedness, Emergency Response, Reports of the Office of Chief Counsel

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