July 16, 1979

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

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| TOLEDO EDISON COMPANY AND THE CLEVELAND ELECTRIC ILLUMINATING COMPANY | ) | Docket No. 50-346 |
| DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1 | ) | Request under 10 C.F.R. § 2.206 |

LICENSEES' RESPONSE TO TOLEDO COALITION FOR SAFE ENERGY'S REQUEST UNDER 10 C.F.R. § 2.206

By letter to Mr. James G. Keppler, Director, Region III, Office of Inspection and Enforcement, dated April 24, 1979 (as clarified in a letter to Mr. Stephen Burns, OELD, dated May 23, 1979, and in a letter to Mr. Harold Denton, Director, Office of Nuclear Reactor Regulation, dated June 12, 1979), and by letter to Mr. Harold Denton dated July 9, 1979 (enclosing a "Motion for Preliminary Injunction" ("Motion") and a "Complaint and Memorandum of Particulars" ("Complaint")), Toledo Coalition for Safe Energy ("TCSE") requests the Director to institute a proceeding to cause certain modifications to the emergency plan for Davis-Besse Nuclear Power Station, Unit 1. Further, in the Motion, TCSE moves "for a preliminary injunction or suspension of power generating operations at Davis-Besse Nuclear Power

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Station, Unit No. 1, with an injunction to Toledo Edison Company (TECo) and the Cleveland Electric Illuminating Company (CEI) ["Licensees"]... pending a final determination of the need for and implementation of definitive corrective measures to be taken upon the operating license issued to said respondents, from restarting Davis-Besse I..."

Licensees hereby respond to TCSE's request. As will be demonstrated below, TCSE is misinformed, has alleged factually inaccurate statements, and has not demonstrated that Licensees are in violation of any NRC regulations or that a potentially hazardous condition exists sufficient to institute a "show cause" proceeding under 10 C.F.R. § 2.202. Further, TCSE has no right to move for a preliminary injunction, and even if it did, TCSE has not, and could not, make a showing of irreparable injury or likelihood of success on the merits which would justify even considering the extraordinary legal remedy of injunction.

## I. THE DOCUMENT WITH WHICH TCSE FINDS FAULT IS NOT LICENSEES' EMERGENCY PLAN

The gravamen of TCSE's Complaint and the basis for its request under § 2.206 is the allegation that Licensees "have failed to formulate a comprehensive, workable and dependable emergency and evacuation plan, and have thus ignored federal requirements." (Complaint at 3). TCSE apparently

believes Licensees' presently effective emergency plan is the document entitled "Davis-Besse Nuclear Power Station Emergency Plan" found at Appendix 13-D of the "Final Safety Analysis Report of the Davis-Besse Nuclear Power Station" ("FSAR"). In fact, the effective emergency plan, which is incorporated into the operating license for Davis-Besse Nuclear Power Station Unit No. 1, is an Administrative Document entitled "Davis-Besse Nuclear Power Station Unit No. 1, Administrative Procedure AD 1827.00, Emergency Plan" (the "Emergency Plan"), which was originally issued on November 12, 1975. The Emergency Plan is supported by twenty-four Emergency Plan Implementing Procedures, all bound in a volume over two inches thick. No mention is made by TCSE of this document. The Emergency Plan and the Emergency Plan Implementing Procedures provide specific, detailed guidance for actions and responsibilities of plant personnel in the event of an emergency, as compared to the more general guidance found in the FSAR Emergency Plan. Thus the document with which TCSE seeks to find fault is not Licensees' Emergency Plan.

## II. LICENSEES' EMERGENCY PLAN MEETS ALL APPLICABLE NRC REQUIREMENTS

Licensees' Emergency Plan meets all NRC requirements. The Emergency Plan has been inspected against all applicable NRC requirements annually since 1975 by Region III, Office of

Inspection and Enforcement ("I&E"). The most recent inspection, completed on June 15, 1979, resulted in one deviation from requirements -- the documentation of the station review of the Emergency Plan was entered three days late. As required by 10 C.F.R. Part 50, Appendix E, an annual drill to test the Emergency Plan's effectiveness has been held since 1975. The last such drill, conducted in 1978, was observed by Mr. Al Januska from Region III, I&E.

In addition to having reviewed the wrong emergency plan, TCSE used the wrong documents in attempting to determine if the emergency plan met NRC requirements. For example, TCSE faults the FSAR Emergency Plan for not complying with the recommendations of the NRC and EPA's Task Force on Emergency Planning in "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants", NUREG-0396/EPA 520/1-78-016 (December, 1978) ("Planning Basis"). The purpose of the Planning Basis "is to provide a basis for Federal, State and local government emergency preparedness organizations to determine the appropriate degree of emergency response planning efforts in the environs of nuclear power plants." (Planning Basis at i). The Planning Basis does not address directly licensee emergency plans and, in any event, is only a report which makes recommendations to the Commission; its recommendations are not requirements of the NRC or any other federal agency. TCSE has misapplied this document.

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In Appendix A (attached hereto) we address TCSE's specific allegations in the Complaint of Licensees' failure to meet NRC requirements.

III. THE COMMISSION HAS INITIATED PROPOSED RULEMAKING TO DEAL WITH THE ADEQUACY AND ACCEPTANCE OF EMERGENCY PLANNING AROUND NUCLEAR FACILITIES ON A GENERIC BASIS; INSTITUTING A SHOW CAUSE PROCEEDING CONCERNING LICENSEES' EMERGENCY PLAN WHICH MEETS PRESENT COMMISSION REQUIREMENTS WOULD BE AN INAPPROPRIATE AND INEFFICIENT METHOD OF DEALING WITH THE GENERIC ISSUES

TCSE's request raises a number of generic issues that are presently under consideration by the Commission as part of a comprehensive review of federal, state, local and licensee emergency planning and coordination. As a result of the lessons learned during the Three Mile Island accident, emergency planning is undergoing intensive review within the Commission and throughout the country by federal, state and local governmental units. As indicated in the next section, this has been especially true for Licensees and the State of Ohio who have been actively evaluating their present emergency planning assumptions and procedures. Even before Three Mile Island, emergency planning was undergoing Commission review as indicated in the NRC/EPA Task Force Report, Planning Basis. The Commission has currently pending a proposed rule which would require licensees to address emergency planning considerations to areas outside the low population zone. 43 Fed. Reg. 37473 (August 23, 1978).

Furthermore, a number of organizations, including Critical Mass and Public Interest Research Groups, have joined in a petition for rulemaking concerning the operational details of evacuation planning. See 44 Fed. Reg. 32486 (June 6, 1979). TCSE specifically agreed to treat the "demands" set forth in its April 24, 1979 letter to Mr. Keppler as a petition for rulemaking to be consolidated with the Critical Mass petition. See TCSE letter to Mr Harold Denton dated June 12, 1979. The issues raised by TCSE with respect to emergency planning are more appropriately addressed in a rulemaking proceeding.

On June 7, 1979, the Commission established a Task Force on Emergency Planning, which was given the following charter for its initial phase of activities:

> Task 1 - Develop for Commission consideration a list of major issues, with tentative alternative solutions, that should be addressed through rulemaking proceedings. ...
>
> Task 2 - Concurrently with Task 1, describe and objectively critique NRC's current emergency planning process, especially considering recent TMI lessons learned.
>
> Task 3 - Define and recommend an approach for developing a comprehensive plan that would formulate the scope, direction, and pace for NRC's overall emergency planning activities.
>
> Task 4 - Brief the Commission on results of Tasks 1-3, issues requiring Commission guidance, and future plans.

The second phase assignment of the Task Force is to develop a comprehensive plan for the Commission to deal with emergency

planning issues by early August, 1979. (See memorandum to all NRC Office Directors from Lee Gossick dated June 11, 1979.)

The Task Force briefed the Commission on June 28, 1979, identifying the major issues to be addressed. The Task Force noted that additionally I&E and the NRR Task Force on "lessons learned" from Three Mile Island were both delving into the emergency planning issues. Some of the issues raised by TCSE (such as the 10 mile Emergency Planning Zone for state emergency plans) were discussed by the Task Force as issues to be considered. (See Transcript of NRC Commissioners' Public Meeting, Briefing on Emergency Planning Task Force, Washington, D.C., (June 28, 1979)).

On July 12, 1979, the Commission published an Advance Notice of Proposed Rulemaking (attached hereto as Appendix B) soliciting public comment on "objectives for effective plans, acceptance criteria for State/local emergency plans, NRC concurrence in State and local plans as a requirement for issuance of an operating license or for continued operation of a nuclear facility, and coordination between licensee plan and State and local plans." The public, including TCSE if it so desires, will have 45 days after publication in the Federal Register to comment on the proposed rulemaking. Moreover, as mentioned above, TCSE is already participating in the proposed rulemaking initiated by the Critical Mass petition.

It is clear that the Commission is actively considering the issues raised by TCSE and many other emergency

planning issues on a generic basis. Because the Licensees presently meet NRC requirements, it would be inappropriate and inefficient for the Director to deal with these same issues in a show cause proceeding.[1]

## IV. LICENSEES AND THE STATE OF OHIO HAVE INITIATED THEIR OWN REVIEWS OF EMERGENCY PLANNING

The Licensees have been actively engaged in a continuing program for upgrading, updating, and improving the Emergency Plan. Immediately after the Three Mile Island accident in March, this program was intensified and formalized with the formation of an Emergency Plan Task Force under the direction of the Davis-Besse Nuclear Power Station Administrative Coordinator. Plant employees assigned to the Task Force have already expended considerable effort in discharging their assigned responsibilities to ensure that current regulatory requirements are satisfied, to continually review and test the Emergency Plan to ensure that it is practical and workable, to ensure that the lines of communication between company and outside officials are kept open and

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1 Nowhere in the Advance Notice of Proposed Rulemaking, or in the transcripts of the Commissioners' meetings establishing or being briefed by the Task Force on Emergency Planning, or in the NRC/EPA Planning Basis, has the suggestion be made that the public health and safety requires immediate revisions to emergency plans.

current, to work with local and State government officials to ensure coordination of emergency preparedness, and to ensure that adequate reporting and information dissemination will be available. In reviewing and upgrading the Emergency Plan, the Licensees have gone well beyond current NRC regulatory requirements. The Task Force, for example, is currently in the process of modifying the plan to meet the latest NRC recommendations in Regulatory Guide 1.101, guidance which is not a requirement under the Davis-Besse license.

In addition, a corporate level task force, under the direction of the Vice-President for Administrative Services, was formed to develop comprehensive emergency plans which encompass not only plans for the station but additionally such areas as the adequacy of security, communication, public protection, support facilities, and liaison with the press and governmental bodies.

While the Davis-Besse Emergency Plan, including the response of its outside supporting agencies, has been tested annually, The Toledo Edison Company is assuming a role of leadership in planning a much more comprehensive test of emergency planning this year which will coordinate the efforts for all levels of emergency planning in the State of Ohio. Planning efforts have already been initiated with the participation of the Ohio State Nuclear Preparedness Officer, the NRC and the Davis-Besse Nuclear Power Station. A briefing for agencies representing Ottawa County has been scheduled in the

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near future. A series of coordinating meetings will be carried out to effect an annual drill which will exercise on a coordinated basis the Ohio State, Ottawa County and Davis-Besse station emergency plans.

As part of the Davis-Besse emergency preparednes program, the Licensees have had continuing contact with representatives of the public to provide information regarding emergency planning. These efforts have included meetings with State, Ottawa County and Carroll Township officials and governing bodies, as well as testimony before the Committee on Energy and Environment of the Ohio State Hous of Representatives.

Toledo Edison officials have also been involved in the extensive activities by the State of Ohio in the review and modification of the Ohio State Emergency Plan. The State has had an emergency plan in effect since before Davis-Besse became operational, and has recently made comprehensive changes to the plan for the purpose of conforming with all 70 elements of the NRC's primary emergency planning guidance. The revised Ohio State Emergency Plan, which was submitted to the NRC in June, includes evacuation and emergency planning for Ottawa County and Carroll Township, and encompasses at least the area within a ten-mile radius of the plant.

In addition, the Governor of Ohio has appointed a Task Force on Nuclear Plant Safety to review safety programs at the three nuclear power plants in Ohio, with specific attention

directed toward existing emergency plans and the procedures for coordinating the plans with local officials. The investigations are ongoing, but the Task Force reported to the Governor in April of this year its initial findings that the plans in effect meet the standards of the Federal government and are considered adequate for the health and safety of Ohio citizens.

## V. AS A MATTER OF LAW TCSE IS NOT ENTITLED TO THE EMERGENCY RELIEF REQUESTED IN THE MOTION

There can be no question that TCSE's series of submissions, including four letters and the instant Complaint and Motion, constitute and were intended to constitute a request under 10 C.F.R. § 2.206 for the institution of a § 2.202 show cause proceeding. Moreover, the Motion is, if anything, a request to the Director to issue an immediately effective order under 10 C.F.R. § 2.202(f) shutting down the reactor while the show cause proceeding runs its course.

TCSE has no right to file a request for an immediately effective order. While 10 C.F.R. § 2.206(a) permits "[a]ny person [to] file a request with the Director...to institute a proceeding pursuant to § 2.202 to modify, suspend or revoke a license, or for such other action as may be proper", both the decision on whether to institute the proceeding and, if so, whether to issue an immediately effective order, lie entirely within the discretion of the Director. Section 2.202(f) states:

> When the Director...finds that the public health, safety or interest so requires or that the violation is willful, the order to show cause may provide, for stated reasons, that the proposed action be temporarily effective pending further order.

Thus, the issuance of an immediately effective order cannot be compelled by a "motion" or petition from a party outside the Commission and, if the Director fails or refuses to issue such an order, his decision is not reviewable by the Courts. Honicker v. United States Nuclear Regulatory Commission, 590 F.2d 1207, 1209 (1978). On the other hand, the Director may find it necessary to make an order immediately effective if one or both conditions in 10 C.F.R. § 2.202(f) are met, i.e., if "the public health, safety or interest so requires" or if the licensee's "violation is willful". Nuclear Engineering Company, Inc. (Sheffield, Illinois Low-level Waste Radioactive Disposal Site), Docket No. 27-39 (June 6, 1979), slip opinion at p. 5.

The powers vested in the Director by 10 C.F.R. § 2.202(f) (and in the Commission as reflected in a parallel provision in § 2.204) have been exercised sparingly, and appropriately so. The action taken under these provisions often involves (as would be the case here) "a drastic procedure which can radically and summarily affect the rights and interests of others." Such emergency powers "must be responsibly exercised." Petition for Emergency and Remedial Action, CLI-78-6, 7 NRC 400, 404 (1978); Licensees Authorized to

Possess or Transport Strategic Quantities of Special Nuclear Material, CLI-77-3, 5 NRC 16, 20 (1977). In determining whether to order an operating reactor to shut down, the Director must decide whether the facts alleged and information supplied by the petitioners "mandated the requested relief in order to provide reasonable assurance that the public health and safety are protected." Petition for Emergency and Remedial Action, supra, 7 NRC at 404-405; Licensees, supra, 5 NRC at 20-21.

Because of the drastic nature of the remedy, the cases in which a § 2.202(f) order have been issued are few and always involve extreme situations. The most recent instance of such an order was in Nuclear Engineering Company, Inc., supra, where the Commission upheld an order by the Director, Nuclear Materials Safety and Safeguards, to an operator of a low-level radioactive waste disposal site to resume its license responsibilities immediately, after the licensee had unilaterally terminated all patrol, maintenance and environmental activities at the site. The Commission held that the immediately effective order was justified because the operator's refusal to maintain and monitor the site was willful and constituted a possible violation of health and safety regulations, and because that refusal could be reasonably expected to lead to off-site migration of radioactive materials which could expose the public to health and safety dangers. Nuclear Engineering

Company, Inc. supra, slip opinion at 6. Another analogous situation was found in Consumer Power Co. (Midland Plant, Units 1 and 2), CLI-74-3, 7 AEC 10-12 (1974), where the Commission upheld an order by the Director of Regulation directing a licensee to suspend certain construction activities because an inspection showed quality assurance violations that could have resulted in structural defects not correctable in the future. Needless to say, the circumstances in this case are not even remotely similar to those presented in those two actions. Here, there is neither an imminent threat of danger to the public, as in Nuclear Engineering Company, nor a substantial shortcoming that may not be corrected in the future, as in Consumer Power Company. Therefore, there is absolutely no need for emergency relief.

In deciding whether an immediately effective order should be issued it may also prove helpful, by analogy, to review the criteria set forth in 10 C.F.R. § 2.788(e) for determining whether a stay of the decision of a Licensing or Appeal Board should be granted pending appeal. These criteria, which are based on Virginia Petroleum Jobbers Association v. Federal Power Commission, 259 F.2d 921, 925 (D.C. Cir. 1958), are: (1) whether the petitioner has made a strong showing that is is likely to prevail on the merits; (2) whether the petitioner will be irreparably injured unless a stay is granted; (3) whether the granting of a stay would harm other parties;

and (4) where the public interest lies.[2] While these criteria may not be directly applicable to a § 2.202(f) order, they illustrate the considerations that would have to be borne in mind before an immediate shutdown could be granted. With respect to the second of these four factors, neither TCSE nor the public in general will suffer irreparable injury if the Davis-Besse unit is not shut down immediately. Even assuming (contrary to fact) that the Emergency Plan were deficient, there is not the slightest indication that the Plan will need to be put into effect while the show cause proceeding (if instituted) is pending. Absent such a clear showing of irreparable injury, emergency relief must be denied. See, e.g., Long Island Lighting Co. (Jamesport Nuclear Power Station, Units 1 and 2), ALAB-521, 9 NRC 51, 52 (1979); Public Service Co. of Oklahoma, et al (Black Fox Station, Units 1 and 2), ALAB-505, 8 NRC 527, 530 (1978); Public Service Co. of

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2 These criteria are also identical to those employed by the courts in deciding whether to grant preliminary injunctive relief in judicial proceedings. Thus, it is well established that preliminary injunctive relief is an "extraordinary and drastic remedy which should not be granted unless the movant clearly carries the burden of persuasion". Canal Authority of State of Florida v. Callaway, 489 F.2d 567, 573 (5th Cir. 1974); the power to issue such relief should be sparingly exercised, and only upon "a clear showing that there is clear likelihood of success and irreparable injury". Schneider v. Whaley, 541 F.2d 916, 921-22 (2d Cir. 1976); Sierra Club v. Hickel, 433 F.2d 24, 33 (9th Cir. 1970), aff'd on other grounds sub. nom. Sierra Club v. Morton, 405 U.S. 727 (1972); Dorfman v. Boozer, 414 F.2d 1168, 1171 (D.C. Cir. 1969).

Indiana, Inc. (Marble Hill Nuclear Generating Station, Units 1 and 2), ALAB-493, 8 NRC 253, 270-271 (1978) and ALAB-437, 6 NRC 630, 631 (1977). By contrast, the Licensees and the ratepayers stand to lose hundreds of thousands of dollars a day in added power costs if Davis-Besse is shut down, thus the third factor strongly points against the granting of emergency relief. And, to the extent that the public interest might require a review at this time of the emergency and evacuation procedures currently in force at Davis-Besse and other nuclear plants, such a requirement is being met by the ongoing generic Commission investigations of the matter. In this energy-conscious era, the public interest is not served by a wasteful and expensive shutdown of an operating power plant (particularly where replacement power, if available at all, is most likely to be oil-fired generation).

In light of the way in which the other three factors point against a shutdown of Davis-Besse, "it would take an overwhelming showing of likelihood of success on the merits" for TCSE to obtain the extraordinary relief it seeks. Public Service Co. of Indiana (Marble Hill Nuclear Generating Station, Units 1 and 2), supra, 6 NRC at 635; Florida Power & Light Co. (St. Lucie Nuclear Power Plant, Unit No. 2), ALAB 404, 5 NRC 1185, 1189 (1977). Instead of such a showing, our preceding discussion shows that TCSE's charges are gratuitous, inaccurate and misinformed[3] and would stand little chance of being upheld

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3 The Complaint cannot be relied on by the Director as (continued next page)

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by the Director were a show cause proceeding to be instituted. Therefore, no basis exists for a shutdown of the plant and TCSE's Motion must be summarily rejected.

VI. THE REQUEST FOR A SHOW CAUSE PROCEEDING SHOULD BE DENIED

The Director, of course, is not required to institute a show cause proceeding upon a filing of a request under 10 C.F.R. § 2.206. All that the regulations require is that "[w]ithin a reasonable time after a request...has been received, the...Director...shall either institute the requested proceeding in accordance with this subpart or shall advise the person who made the request in writing that no proceeding will be instituted in whole or in part, with respect to his request, and the reasons therefor." 10 C.F.R. § 2.206(b).

To institute a proceeding to show cause, the Director must "allege violations with which the licensee is charged, or the potentially hazardous conditions or other facts deemed to be sufficient ground for the proposed action." 10 C.F.R. § 2.202(a)(1). As established above, Licensees' Emergency Plan meets all NRC requirements. To the extent TCSE believes

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the basis for the extraordinary relief requested, in any event, in that the factual allegations are not offered in the form of an affidavit to which TCSE has attested under oath or affirmation. In fact, the factual allegations are almost totally inaccurate.

changes are warranted in the emergency planning by federal, State and local bodies or by Licensees, such matters are being addressed: (1) generically by the Commission, (2) by the State of Ohio and (3) by Licensees' own task forces. A show cause proceeding raising issues already being addressed, which are beyond present Commission regulations, would be inappropriate and duplicative of present NRC efforts in NRR and I&E, and by the Commission's own Task Force.

Accordingly, no basis in fact, law or public policy exists for the issuance of a show cause order, immediately effective or otherwise, and the Director should deny TCSE's request under § 2.206.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

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Dated: July 16, 1979

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Appendix A

LICENSEES' RESPONSE TO ALLEGATIONS OF TOLEDO COALITION FOR SAFE ENERGY

Following are Licensees' responses to the specific allegations of TCSE with respect to deficiencies in the Davis-Besse Unit 1 Emergency Plan. Most of TCSE's errors seem to have arisen (a) from a misunderstanding of the NRC/EPA Planning Basis document, (b) from failure to consult the correct Davis-Besse Emergency Plan document, (c) from misinformation concerning the Licensees' activities related to its Emergency Plan or (d) from an apparent unawareness of the existence of the Ohio State Emergency Plan.

1. TCSE alleges that "the planing radius known as the low population zone (LPZ) in the Davis-Besse Emergency Plan is insufficient and inappropriate to guarantee public health and safety". (Complaint at 3-8).

a. Licensees' two mile radius LPZ is established in accordance with NRC regulations in 10 C.F.R. § 100.11, as set forth in § 2.1.3.3 of the FSAR and approved by the NRC in § 2.1 of the Safety Evaluation Report.

b. The Planning basis does not recommend a ten mile radius to be utilized for the LPZ around light water reactors

as alleged by TCSE. Rather the NRC/EPA Task Force recommends a ten mile Emergency Planning Zone for state and local government planning. In fact, Figure I of the Planning Basis (at page 12) clearly indicates the distinction between the LPZ and the Emergency Planning Zone. The Ohio State Emergency Plan, in fact, establishes a ten mile Emergency Planning Zone as recommended in the Planning Basis.

2. TCSE alleges that "Licensees have failed to consider more than one possible offsite accident sequence in selecting an adequate evacuation radius, placing nearby residents outside the present radius in unnecessary danger." (Complaint at 8).

a. Again TCSE misapplies the Planning Basis in comparing it to the Emergency Plan. The Emergency Plan contemplates a spectrum of potential accidents and the station's response to those accidents. The Emergency Plan does not deal with evacuation procedures. Evacuation is within the sole purview of state and local authorities and is dealt with in detail in the Ohio State Emergency Plan.

3. TCSE alleges that Licensees' provisions for offsite treatment of radiation victims are inadequate. (Complaint at 9-13).

a. Licensees are not required by NRC regulations to formulate arrangements with two hospitals for treatment of radiological accident victims. Licensees have established an arrangement with Magruder Hospital and, while not required, plans are being made to establish arrangements with a second hospital as a back-up.

b. The letter agreements cited by TCSE in its Complaint (at paragraph 20) are outdated. Letter agreements with hospitals, ambulance services, doctors and the Ottawa, County Board of Health are renewed each year. The current agreements are attached to the Emergency Plan.

c. More than one doctor is available at Magruder Hospital to treat radiological victims, and Licensees' agreements with Doctors Akins, Wagner and Crisologo provide that all three doctors will be on call in the case of an emergency.

d. Emergency drills have been conducted by Licensees, and Radiation Management Corporation has participated in every one of them. Radiation Management Corporation has annually reviewed the Emergency Plan and has established medical evacuation plans in the event that evacuation is necessary.

e. Licensees originally had established emergency transportation arrangements with Robinson Funeral Home. After Robinson Funderal Home discontinued its ambulance service, arrangements were made with Mid-Counties Ambulance Service, Oak Harbor, Ohio, to provide transportation in the event of an emergency. This agreement has been renewed each year. TCSE's allegations with respect to Licensees' arrangements for medical care, emergency transportation and medical evacuation are based on inaccurate information.

f. TCSE's criticism of the Ottawa County Emergency Plan (Complaint at 12 and 24, 25) appears to be founded in

TCSE's unawareness of the Ohio State Emergency Plan and the revised Ottawa County Emergency Plan (which is incorporated in the Ohio State plan and supersedes the Ottawa County Emergency Plan attached to TCSE's Complaint). The Ohio State Emergency Plan is presently undergoing NRC review for its concurrence based on NRC's seventy criteria.

4. TCSE alleges that "the utility assigns excessive tasks and responsibilities to the plant shift foreman, which could not realistically be addressed during an emergency situation." (Complaint at 13-16).

a. While the shift foreman is responsible for actions to be taken under the Emergency Plan, the Emergency Plan provides a breakdown of actions and responsibilities of station personnel to whom the duties have been delegated during a state of emergency.

b. The Emergency Plan details training requirements for (1) the Emergency Duty Officer: (2) the Radiation Monitoring Team; (3) the Fire Brigade; (4) First-Aid Team; (5) Magruder Hospital; (6) the Ambulance Service; (7) Oak Harbor Fire Department; and (8) Corporate Support Personnel.

5. TCSE alleges that "Licensees have failed to comply with NRC guidance concerning the identification of milk processing plants in the Emergency Planning Zone." (Complaint at 16).

a. There are no NRC requirements for the Emergency Plan to make note of milk plants within a ten mile radius of

Davis-Besse. The Ohio State Emergency Plan addresses coordination with, and monitoring of impacts of any emergency on, agricultural and dairy facilities.

6. TCSE alleges that "the Licensees have failed to conduct emergency drills, in contradictions of NRC guidelines in their own alleged arrangements." (Complaint at 17-19).

a. Licensees have conducted annual drills as required by 10 C.F.R. Part 50, Appendix E. All such drills have included the participation of the Ottawa County Sheriff, the Fire Department of Oak Harbor, Magruder Hospital, the contracted ambulance service and Radiation Management Corporation. The last such drill conducted in 1978 was observed by Mr. Al Januska from Region III, I&E.

7. TCSE alleges that "Licensees have failed to quantify estimated evacuation times and expected required times to notify the population in the LPZ." (Complaint at 20-22).

a. The Ohio State Emergency Plan deals with the estimated evacuation times and expected required times to notify the population in the vicinity of the Davis-Besse Plant.

b. The Emergency Plan meets the requirements of 10 C.F.R. Part 50, Appendix E (IV)(C) and (D), including establishment of criteria and procedures for notification and participation of local, State and Federal agencies.

c. Licensees have installed direct, open, continous communication ties with the NRC and have committed to report

any unusual or abnormal occurrence within one hour of the time the reactor is not in a controlled or expected condition of operation. See Letter from Mr. J.S. Grant, Vice President, Energy Supply, TECO, to Mr. James Keppler, Region III, I&E, dated May 4, 1979. This prompt notification link is tested daily. In addition, radio communications with the Ottawa County Sheriff's office is tested at least three times daily.

8. TCSE alleges that Licensees have completely omitted from the utility plan any identification of egress routes and their capacity characteristics, and have summarily failed to identify LPZ residents having special evacuation needs." (Complaint at 22-23).

a. Egress routes and any special evacuation problems are dealt with in the Ohio State Emergency Plan.

9. TCSE alleges that "Licensees have had since at least 1975 to update, revise and upgraded the status of Davis-Besse Emergency Plans." (Complaint at 23-25).

a. The Emergency Plan was originally issued November 12, 1975. It was subsequently revised August 12, 1976; April 7, 1977; May 3, 1978; and June 26, 1979, and is up-to-date.

10. TCSE alleges that "Licensees' plant has among the poorest operating records of any commercial reactor in the United States, and a consequently greater need for workable emergency and evacuation plans." (Complaint at 25-28).

a. The Licensees' operating history and their actions in light of the Three Mile Island accident were the

subject of detailed review by the Director and Commission. This review took place prior to the removal of the May 16, 1979 NRC Suspension Order which allowed Davis-Besse Unit 1 to resume operation.

[7590-01]

# NUCLEAR REGULATORY COMMISSION
## (10 CFR Part 50 Appendix E)
## ADEQUACY AND ACCEPTANCE OF EMERGENCY PLANNING AROUND NUCLEAR FACILITIES

AGENCY: U.S. Nuclear Regulatory Commission

ACTION: Advance Notice of Proposed Rulemaking

SUMMARY: The Nuclear Regulatory Commission is considering the adoption of additional regulations which will establish as conditions of power reactor operation increased emergency readiness for public protection in the vicinity of nuclear power reactors on the part of both the licensee and local and state authorities. The Commission is interested in receiving public comment on objectives for effective plans, acceptance criteria for State/local emergency plans, NRC concurrence in State and Local plans as a requirement for issuance of an operating license or for continued operation of a nuclear facility, and coordination between the licensee plan and State and local plans. The Commission seeks written comments on what items should be included in the rule.

DATES: Comments are due no later than (45 days after publication in the Federal Register).

ADDRESSES: Written comments concerning these issues should be submitted to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, DC, 20555.

FOR FURTHER INFORMATION CONTACT:

tion Branch, Office of Standards Commission, Washington, DC, 205

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P.O. Box 4545
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April 24, 1979

Mr. James G. Keppler, Director
Nuclear Regulatory Commission, Region III
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799 Roosevelt Rd.
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Dear Mr. Keppler:

We have followed with considerable interest the actions of the NRC and Toledo Edison, operator of the Davis-Besse nuclear plant, since the Three Mile Island disaster. After reading your comments in the April 20, 1979 Toledo Blade concerning personnel performance at Davis-Besse, we are greatly concerned about the irresponsibility of the NRC decision to allow Davis-Besse to go back on line before numerous safety questions have been answered.

Our concerns have been redoubled by the April 19 findings of the Ohio Public Interest Research Group (OPIRG) that documents the gross inadequacies of emergency and evacuation plans in the event of a serious accident at Davis-Besse. The NRC appears to be an accomplice in a no-win situation, allowing a less-than-public spirited utility to return to power generation while that utility continues to maintain incompetent staff and substandard emergency preparations.

Therefore, the Toledo Coalition for Safe Energy demands that the following steps be taken by your office immediately:

1/ That Toledo Edison officials be restrained from reopening Davis-Besse until such time as all possible operational problems, human and mechanical, have been corrected;

2/ That revised and updated evacuation plans be posted in visible public places within a 50 mile radius of Davis-Besse within 30 days of your receipt of this notice, and prior to D-B's reopening;

3/ That a full-scale disaster drill be conducted within a 10 mile radius of the plant prior to its return to power generation;

4/ That all consumers in the Toledo Edison and Cleveland Electric Illuminating jurisdictions receive a complete written description of emergency procedures with their last electric bills prior to the startup of Davis-Besse;

5/ That these and other matters become the subject of full and open public hearings initiated by the NRC prior to D-B's startup.



Your earliest written response to these urgent requests will be

greatly appreciated. Thank you.

Sincerely,

Terry D. Lodge
Chairman
TCSE Legal Action
Committee

cc: Members, U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Senator Howard Metzenbaum
234 Summit St.
Toledo, OH 43604

1243 031

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

May 17, 1979

Mr. Terry J. Lodge, Chairman
Toledo Coalition for Safe Energy
P.O. Box 4545
Toledo, Ohio 43620



Dear Mr. Lodge:

This is in reply to your letter of April 24, 1979, identifying steps which you believe should be taken relative to resumption of operations of the Davis-Besse nuclear plant. As you probably know, based on information obtained to date from the Three Mile Island accident, the NRC issued an Order to all operating reactor licensees owning Babcock and Wilcox Company nuclear steam supply systems, including Davis-Besse, requiring certain design modifications and changes in operating procedures. A copy of the Order to Toledo Edison Company is provided as an enclosure. The reactor will not be permitted to return to operation until the actions specified in the Order have been completed to the satisfaction of the NRC.

With respect to the actions specified in your letter, we are treating your letter as a request for a formal Hearing in accordance with Part 2.206 of the NRC Rules and Regulations (Title 10 - Chapter 1 Code of Federal Regulations). As such, I have forwarded your letter to our Headquarters staff for consideration of your request. You can expect to hear directly from them regarding this matter.

If you have additional questions regarding the NRC's actions in this matter, please let me know.

Sincerely,

James G. Keppler

James G. Keppler
Director

Enclosure:
Order to Toledo Edison Company

bcc w/o enclosure:
Dudley Thompson, X00S

P.O. Box 2091
Toledo, OH 43603
May 23, 1979

Mr. Stephen Burns
Office of Executive Legal Director
Nuclear Regulatory Commission
1717 H Street, N.W.
Washington, D.C. 20555

RE: Complaint of Toledo Coalition for Safe Energy

Dear Mr. Burns:

I am writing in confirmation of our telephone conversation of Monday, May 21, at which time you apprised me of the fact that your office is treating my April 24 letter as a request for a formal hearing per 10 CFR §2.206. For the record, I am ratifying that determination on behalf of my client, the Toledo Coalition for Safe Energy, and wish to preserve TCSE's procedural rights to properly pursue this matter.

Enclosed per your request are the April 20, 1979 Toledo Blade news article referenced in my April 24 letter, and the Wednesday, April 18, 1979 news release of the Ohio Public Interest Research Group concerning inadequacies of evacuation preparations at the Davis-Besse I Nuclear Power Station near Port Clinton, Ohio.

You are doubtless aware that Davis-Besse is a Babcock & Wilcox reactor, closely related from a design standpoint to Three Mile Island I. It is thus understandable that the Coalition might draw unsettling conclusions from the juxtaposed comments of James G. Keppler of the NRC Region III office, and the publicly-proclaimed inadequacies of emergency plans.

In the coming weeks, legal research people from TCSE will be attempting to verify the existence of other questionable aspects of both the utility and State of Ohio emergency plans for Davis-Besse. As all of this help will come from volunteers, we ask that you allow us the time to take up our inquiry where OPIRG left off.

While I will not reiterate all of the elements of relief which my client seeks through the complaint process, I hope that the NRC will be able to make a policy determination that the safety aspects of this poorly-managed reactor override the economic considerations which may force Davis-Besse back on line before emergency contingencies are fully addressed.

Sincerely,

Terry J. Lodge
Attorney
Toledo Coalition for Safe Energy

DUPLICATE

enc

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OHIO PUBLIC INTEREST RESEARCH GROUP

STATE OFFICE · 65 S. 4th ST. · COLUMBUS, OHIO 43215 · [614] 461-0136

OTHER OFFICES: OBERLIN COLLEGE, WITTENBERG UNIVERSITY,
UNIVERSITY OF DAYTON, WILMINGTON COLLEGE, CAPITAL UNIVERSITY

FOR IMMEDIATE RELEASE

Wednesday, April 18, 1979

Contact: Janis White
614-461-0136
614-299-8827

Kathy Westby
216-775-8137
216-775-5283

# EMERGENCY EVACUATION PLANS AT DAVIS-BESSE PLANT INADEQUATE

Plans to safely evacuate the residents of the area near the Davis-Besse nuclear power plant in case of a nuclear accident appear to be inadequate, according to the Ohio Public Interest Research Group (OPIRG). The group has called for a full scale evacuation drill before the plant reopens.

"We have discovered that neither the utility nor the state emergency plans meet all the recommended federal guidelines and that the two plans differ in many aspects which could affect the smooth functioning of an actual evacuation," said Kathy Westby, research coordinator.

"Government and utility personnel charged with responsibilities in the plans do not always know what those responsibilities are," Westby said.

Developing and implementing emergency evacuation procedures are the joint responsibility of the Toledo Edison Co., the operator of the Davis-Besse plant, and the Ohio Disaster Services Agency. The utility plan, filed with the Nuclear Regulatory Commission, covers emergency procedures within the plant and plans for off-site support by government agencies. The state's draft plan, incomplete although the plant has been in operation, establishes the roles and responsibil-

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-more-

-more-

ities of government personnel in the event of an emergency.

According to Westby, the only employee of the Ottawa County Disaster Services Agency was not aware that he is supposed to play a major role in evacuating residents and arranging for their relocation. Instead, he believed his role was a minor one, simply to act as a liaison between the plant and state officials to provide needed support after the accident.

One fire official said, "We don't have any of that wicked stuff [dangerous radiation] here [at the plant]." He told OPIRG researchers he had formed this opinion based on information he had received from Davis-Besse officials.

The utility company is required to contract with two hospitals for the provision of emergency medical services. The principle hospital identified in the utility plan is the Magruder Memorial Hospital in Port Clinton, approximately eleven miles from the plant. They are only equipped to handle up to 80 serious radiological victims.

The second hospital named in the plan is the University of Pennsylvania Hospital in Philadelphia. An administrator at Magruder however, thought the second hospital was probably St. Charles Hospital in Toledo and was totally unaware of the role of the University of Pennsylvania Hospital.

"Given the fact that the primary hospital is within the possible radiation zone, and that the other one is almost 400 miles away with no apparent plans for transporting victims, makes us question the adequacy of medical provisions in the plan," said Westby.

Current plans would evacuate residents within a 2 mile radius of the plant, although there has been some recent discussion of extending that to a 20 mile radius.

"A full scale nuclear accident could affect an area the size of Pennsylvania. What good would these plans do us then?" said Janis White, Director of OPIRG.

"Even if a less serious accident occurred, it could become necessary to

evacuate the Toledo area which is only 35 miles from the plant," she added.

The state draft plan equates nuclear evacuation procedures with those used in the event of a natural disaster such as floods or high water.

"Nuclear accidents and natural disasters are not equivalent and cannot be handled in the same way. Differences in warning times and signals, as well as the health hazards connected with radiation exposure require special consideration for a nuclear emergency. By comparing the two, the state is demonstrating its lack of awareness of the real dangers of a nuclear disaster," White said.

"Neither plan meets all the recommended federal guidelines," Westby added. "For instance, estimates of expected accident assessment times, evacuation times, or traffic capacities of evacuation routes are not mentioned at all in the plans."

"OPIRG questions the effectiveness of these plans. Our research indicates that they are ambiguous, contradictory, incomplete, and untested," said Westby.

"A few of the agencies listed in the plans have held their own practice drills, but no coordinated, full scale drills have been conducted based on the plans," continued White. "The public has never been told how they will be contacted or what they should do in case of a nuclear emergency."

"In the states where nuclear evacuation drills have been conducted, evacuation plans have had to be rewritten to reflect reality," she added.

"We call on Toledo Edison and the state of Ohio to schedule a full scale evacuation drill before the Davis-Besse plant is put back in operation," said White. "They have accepted the public responsibility to protect Ohioans - we have the right to see if the plans on paper will work in practice."

OPIRG is a statewide, university based research and advocacy organization concerned with consumer protection, environmental quality, human rights, government responsiveness, and corporate responsibility.

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# State and Utility Evacuation Plans:

## Are They Inadequate?

Utility companies and the state share the responsibility for developing and implementing emergency evacuation plans in the event of a nuclear accident. The Nuclear Regulatory Commission requires the utility company to file a plan dealing with both in-plant and off-site procedures. The state plan delineates the roles and responsibilities of off-site agencies involved in evacuation procedures.

Evacuation plans for the Davis-Besse nuclear power plant have been developed by the Toledo Edison Co. and the Ohio Disaster Services Agency (draft plan).

OPIRG has analyzed whether the Toledo Edison plan and the State of Ohio plan meet federal standards. Officials named in the two plans were also contacted by letter and/or phone to find out what they believe they are supposed to do in case of a nuclear emergency.

## Failure To Meet Federal Guidelines

Both plans fail to meet some of the recommended federal guidelines.

The utility plan does not contain:
- the expected accident assessment time
- the expected time required to notify the population
- estimates of evacuation times for the areas which would be affected
- estimates of the traffic capacities of egress routes
- arrangements with contiguous states

The state draft plan does not contain:
- planning coordination with nearby states
- a population chart by sectors around the plant
- an account of institutions and transient populations which may impair mobility
- egress routes and their traffic capacities
- plans for yearly drills and exercises

## Ambiguities and Contradictions

The following chart compares what the plans state should happen with what the officials interviewed believe they would do:

| THE PLANS SAY: | THE OFFICIALS SAY: |
|---|---|
| 1. SHIFT FOREMAN<br>Utility Plan: evaluates accident, notifies off-site support groups in case of emergency, contacts other plant officials, county sheriff, medical assistance and fire department if needed.<br>State Plan: does not specify who from | would contact Toledo Edison - company would then contact sheriff. |

plant notifies off-site support groups.

II. COUNTY SHERIFF

Utility Plan: contacts O[illegible]nd Ottawa County Disaster Services Agencies, initiates emergency notification system, sets up road blocks and other evacuation procedures.

State Plan: notifies all county and state agencies involved, notifies residents in affected area, designates road blocks.

would contact relevant agencies and help evacuate people.

III. OTTAWA COUNTY ENGINEER

Utility Plan: assist in traffic control and back-up communications.

State Plan: provide barriers, make equipment and manpower available, support evacuation, assist in door to door notification.

would help evacuate, notify public, set up road blocks, assess equipment and get more help if needed.

IV. OHIO DISASTER SERVICES AGENCY

Utility Plan: work with sheriff to determine evacuation routes and relocation centers, arrange for food, lodging, and medical care.

State Plan: not mentioned in text.

have prepared draft state plan - doesn't deal with evacuation routes, does have list of potential care centers for Ottawa county.

V. OTTAWA COUNTY DISASTER SERVICES AGENCY

Utility Plan: not mentioned in text.

State Plan: evacuate residents, identify and prepare evacuation centers, arrange for 10 days support, coordinate emergency planning with other county agencies.

consists of one employee who believes his role is after the disaster, would contact Ohio Disaster Services Agency for help, said he would play minor role.

VI. FIRE DEPARTMENT

Utility Plan: contacted if needed.

State Plan: assist sheriff with public notification, assist in evacuation procedures and fight any fires.

would help put out plant fires (however do not have any special equipment at Department for fighting radiological fires), would help with public notification.

VII. MEDICAL SUPPORT

A. AMBULANCE SERVICE

Utility Plan: provided by Robinson Funeral Home, Oak Harbor.

State Plan: not mentioned in text.

no longer provided by Robinson Funeral Home - sold to Carroll Township Emergency Medical Service - unable to find supervisor there.

B. MAGRUDER MEMORIAL HOSPITAL, Port Clinton

Utility Plan: radiation emergency area ready if needed, have special

could handle up to 80 serious cases of radiation exposure, informal agree-

equipment.
State Plan: not mentioned in text.

ments with other area hospitals to handle overflow.

C. UNIVERSITY OF PENNSYLVANIA HOSPITAL, Philadelphia
Utility Plan: second facility named to handle radiation exposure cases.
State Plan: not mentioned in text.

not contacted (Magruder Hospital administrator not aware that University of Pennsylvania Hospital is the back-up hospital).

D. RADIATION MANAGEMENT CORPORATION
Utility Plan: provide training and and evaluation of emergency edical plans.
State Plan: not mentioned in text.

did not respond to OPIRG letter.

VIII. TOLEDO EDISON CO.
Utility Plan: release public information.
State Plan: not mentioned in text.

Public Relations staff person knew little about plan or procedures.

Some other agencies are listed in the plans as playing secondary roles, but were not contacted by OPIRG.

OHIO PUBLIC INTEREST RESEARCH GROUP
461-0136

4/17/79

# Frequency Of Errors By Personnel At Davis-Besse Is Under NRC Study

## Number Called Unusually High

By MICHAEL WOODS
Blade Science Editor

WASHINGTON — The U.S. Nuclear Regulatory Commission is trying to determine why the Davis-Besse Nuclear Power Station near Toledo continues to be plagued by an unusually high number of personnel errors.

James Keppler, director of NRC's Chicago regional office, said the frequency and potential seriousness of mistakes made by plant personnel have given Davis-Besse one of the poorest reputations for operator precision in the region.

The Chicago regional office oversees 21 nuclear power plants spread through a broad section of the Midwest.

Many of the personnel errors at Davis-Besse have been minor, Mr. Keppler said. But others have involved crucial safety systems, where mistakes carry the potential for the most serious kinds of nuclear reactor accidents.

**Turned Off Wrong Valves**

Mr. Keppler cited, as an illustration, one incident last month in which a plant operator was supposed to turn off a specific valve at the facility. Instead of turning off the correct valve, he turned off two other valves — a mistake that partially inactivated the reactor's crucial emergency core cooling system.

The Toledo Edison Co., which has charge of operations at Davis-Besse, may be fined for the incident, Mr. Keppler said. Toledo Edison is co-owner of Davis-Besse, along with the Cleveland Electric Illuminating Co.

Davis-Besse has come under sharp NRC scrutiny in recent weeks in the aftermath of the accident at the Three Mile Island nuclear power plant near Harrisburg, Pa.

Davis-Besse's reactor is a sister to the reactor at Three Mile Island, both having been built by the nuclear engineering firm of Babcock & Wilcox. In addition, NRC has identified malfunctions similar to those at Three Mile Island that occurred in less serious form early in the operating life of Davis-Besse.

**Shutdown Urged**

The plant's continuing problem with personnel errors, which Mr. Keppler discussed during an interview Thursday, are an additional factor.

Mr. Kepler said that mistakes by personnel operating Davis-Besse became so worrisome that an NRC inspector recently urged Mr. Keppler to shut the plant down and keep it closed until the situation could be corrected.

Davis-Besse currently remains shut down, following a scheduled outage for maintenance. Mr. Keppler said he does not intend to order Edison to keep the plant shut — partly because of assurance from Toledo Edison President John Williamson that operation will not resume until the personnel problem is solved.

**No Action To Prevent Restart**

NRC has taken no action that would prevent Edison from restarting the plant immediately. Technically, all Edison would have to do is notify NRC of its plans to "go critical" with the plant.

Another factor, Mr. Keppler said, is that Edison personnel at the plant do seem capable of operating the facility in a "passable" fashion.

If he were to rate operator performance there on a "pass-fail" basis, Mr. Keppler said he would confer a passing grade.

Turn to Page 7, Col. 3





THE BLADE: TOLEDO, OHIO, FRIDAY, APRIL 20, 1979

# Davis-Besse Personnel Errors Under Study

Continued from First Page

But he also indicated that on a scale of A, B, C, D, or F, he probably would grade plant personnel performance with a "D."

Transcripts of a closed NRC meeting held here April 5, a week after the Three Mile Island incident, mention Davis-Besse's continuing problems. John Davis, acting director of NRC's office of inspection and enforcement, noted during the meeting: "If we did have a rating system of A, B, C, we would put Davis-Besse C on this scale. It should be a better plant."

Mr. Keppler acknowledged that personnel errors do tend to be more frequent during the early months of operation at any new atomic power plant, when the staff is new and relatively inexperienced. And, indeed, personnel errors were more frequent at Davis-Besse in the months following startup in August, 1977.

But personnel errors have remained unusually high at the plant and show no indication of dropping off after two years of operating experience.

**Poor Motivation, Discipline**

The reasons, Mr. Keppler said, are perplexing. Among the possibilities being considered by NRC are inadequate training of the operators, poor motivation, and poor discipline. Ironically plant personnel scored well on the federal licensing examination for reactor operators, Mr. Keppler noted.

Mr. Keppler said that Edison realizes that there have been problems with personnel at the plant and has agreed to submit a plan for correcting them.

Mr. Williamson said Thursday he has made a personal decision to keep Davis-Besse shut down until he is certain that operation can resume safely.

Performance of plant personnel has improved recently, Mr. Williamson said, noting that operators — some of whom are former navy personnel with reactor experience — have been trained well.

**Assuring Complete Safety**

Some of the plant operators will be trained shortly in new procedures stemming from the Three Mile Island incident. Training will be on a computer simulator at the Babcock & Wilcox nuclear facility in Lynchburg, Va.

The primary concern at this point is assuring complete safety of the plant and not the economic impact of the shutdown, he noted. Mr. Williamson said it probably will be a matter of weeks, rather than days or months, before the plant is set to resume operations.

JUNE 1 1979

Docket No.: 50-346



Mr. Terry J. Lodge
Toledo Coalition for
Safe Energy
P. O. Box 4545
Toledo, Ohio 43620

Dear Mr. Lodge:

This letter is sent to acknowledge receipt of your petition on behalf of the Toledo Coalition for Safe Energy requesting that the Office of Inspection and Enforcement issue an order that the Davis-Besse nuclear plant not be restarted until certain emergency and evacuation actions are taken by Toledo Edison and public hearings are held. Your petition has been referred to the Director of Nuclear Reactor Regulation because the subject matter of the petition is within the jurisdiction of this office.

Your petition is being treated under 10 CFR 2.206 of the Commission's regulations, and accordingly, appropriate action will be taken within a reasonable time. I enclose for your information a copy of the notice that is being filed for publication with the Office of the Federal Register.

Sincerely,
Original Signed by
H. R. Denton

Harold R. Denton, Director
Office of Nuclear Reactor
Regulation

Enclosure:
Notice



1243 041

JUNE 1 1979

Docket No.: 50-346

Mr. Lowell E. Roe
Vice President, Facilities
Development
Toledo Edison Company
Edison Plaza
300 Madison Avenue
Toledo, Ohio 43652



Dear Mr. Roe:

I enclose for your information a copy of a petition filed on behalf of the Toledo Coalition for Safe Energy which requests that an order be issued that the Davis-Besse nuclear plant not be restarted until certain actions are taken concerning emergency and evacuation procedures and public hearings have been held. The petition is being treated under 10 CFR 2.206 of the Commission's regulations, and accordingly, appropriate action will be taken on the petition within a reasonable time.

I also enclose for your information a copy of the notice that will be filed for publication with the Office of the Federal Register.

Sincerely,

Original Signed by
H. R. Denton

Harold R. Denton, Director
Office of Nuclear Reactor
Regulation

Enclosures:
1. Petition
2. Notice

cc w/enclosures: See next page

1243 042



7907110017

cc w/enclosure(s):

Mr. Donald H. Hauser, Esq.
The Cleveland Electric
Illuminating Company
P. O. Box 5000
Cleveland, Ohio 44101

Gerald Charnoff, Esq.
Shaw, Pittman, Potts
and Trowbridge
1800 M Street, N.W.
Washington, D.C. 20036

Leslie Henry, Esq.
Fuller, Seney, Henry and Hodge
300 Madison Avenue
Toledo, Ohio 43604

Mr. Robert B. Borsum
Babcock & Wilcox
Nuclear Power Generation Division
Suite 420, 7735 Old Georgetown Road
Bethesda, Maryland 20014

Ida Rupp Public Library
310 Madison Street
Port Clinton, Ohio 43452

President, Board of County
Commissioners of Ottawa County
Port Clinton, Ohio 43452

Attorney General
Department of Attorney General
30 East Broad Street
Columbus, Ohio 43215

Harold Kahn, Staff Scientist
Power Siting Commission
361 East Broad Street
Columbus, Ohio 43216

Director, Technical Assessment
Division
Office of Radiation Programs
(AW-459)
U. S. Environmental Protection Agency
Crystal Mall #2
Arlington, Virginia 20460

U. S. Environmental Protection Agency
Federal Activities Branch
Region V Office
ATTN: EIS COORDINATOR
230 South Dearborn Street
Chicago, Illinois 60604

Ohio Department of Health
ATTN: Director of Health
450 East Town Street
Columbus, Ohio 43216

7590-01

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

TOLEDO EDISON COMPANY AND
THE CLEVELAND ELECTRIC ILLUMINATING
COMPANY

DAVIS-BESSE NUCLEAR POWER STATION,
UNIT NO. 1

DOCKET NO. 50-346

REQUEST FOR ACTION UNDER 10 CFR 2.206

Notice is hereby given that by petition dated April 24, 1979, the Toledo Coalition for Safe Energy requested that an order be issued that the Davis-Besse Nuclear Power Station, Unit No. 1, not be restarted until certain actions are taken concerning emergency and evacuation procedures and public hearings have been held. This petition is being treated as a request for action under 10 CFR 2.206 of the Commission's regulations, and accordingly, action will be taken on the peitition within a reasonable time.

Copies of the petition are available for inspection in the Commission's Public Document Room at 1717 H Street, N.W., Washington, D.C. 20555 and in the local public document room at the Ida Rupp Public Library, 310 Madison Street, Port Clinton, Ohio 43452.

FOR THE NUCLEAR REGULATORY COMMISSION

Harold R. Denton

Harold R. Denton, Director
Office of Nuclear Reactor
Regulation

Dated at Bethesda, Maryland,
this 1st day of June 1979.

SHAW, PITTMAN, POTTS & TROWBRIDGE
1800 M STREET, N. W.
WASHINGTON, D. C. 20036

RAMSAY D. POTTS
STEUART L. PITTMAN
GEORGE F. TROWBRIDGE
STEPHEN D. POTTS
GENA D. CHARNOFF
PHILIP D. DOSTWICK
R. TIMOTHY HANLON
GEORGE M. ROGERS, JR.
JOHN B. RHINELANDER
BRUCE W. CHURCHILL
LESLIE A. NICHOLSON, JR.
MARTIN D. KRALL
RICHARD J. KENDALL
JAY E. SILBERG
BARBARA M. MOSSOTTI
GEORGE V. ALLEN, JR.
WM. BRADFORD REYNOLDS
FRED A. LITTLE
FRED GRASNER
NATHANIEL P. BREED, JR.
MARK AUGENBLICK
ERNEST L. BLAKE, JR.
CARLETON S. JONES
THOMAS A. BAXTER
JAMES M. BURGER
SHELDON J. WEISEL
JOHN A. MCCULLOUGH
JAMES THOMAS LENHART

STEVEN L. MELTZER
DEAN D. AULICK
JOHN ENGEL
STEPHEN B. HUTTLER
WINTHROP N. BROWN
JAMES D. HAMLIN
ROBERT E. ZAMLER
RICHARD E. GALEN
HOBERT B. ROBBINS
LAURA R. FARRAND
MATIAS F. TRAVIESO-DIAZ
VICTORIA J. PERKINS
JOHN H. O'NEILL, JR.
JAY A. EPSTEIN
FRANKLIN O. CHU
GEORGE D. CROWLEY, JR.
MICHAEL D. HAYS
THOMAS H. MCCORMICK
SUSAN D. FALKSON
STEVEN M. LUCAS
RAND L. ALLEN
ALAN J. WEISBARD
WILLIAM P. BARR
ALAN R. YUSPEH
JOHN L. CARR, III
PHILIP J. HARVEY
KAY L. RICHMAN

(202) 331-4100

TELECOPIER
(202) 296-0684 & 296-1760

TELEX
89-2693 (SHAWLAW WSH)
CABLE "SHAWLAW"

JOHN H. SHARON
EDWARD B. CROSLAND
COUNSEL

June 8, 1979

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re: Davis-Besse Nuclear Power Station,
Unit No. 1, Docket No. 50-346

Dear Mr. Denton:

By letter dated April 24, 1979, the Toledo Coalition for Safe Energy has made several demands related to the operation of the Davis-Besse Nuclear Power Station, Unit No. 1. This letter is being treated by the Director of Nuclear Reactor Regulation as a request for action under 10 C.F.R. §2.206.

The first demand, related to "all possible operational problems, human and mechanical" is so broad and vague it must be dismissed; its lack of specificity permits no reasoned response by the NRC Staff. The next three demands are all related to emergency plans, and are actions which are neither required nor authorized by NRC regulations; as such they could be considered, if at all, only as a request for rulemaking, and not as actions relating to the status of a particular license. The fifth and final demand -- for a hearing on the previous four demands -- is thus an empty request.

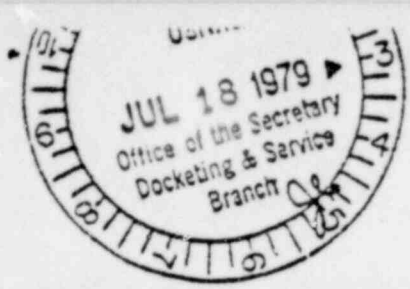
Accordingly, the Licensees respectfully submit that the Coalition's request should be denied.

Sincerely yours,

Bruce W. Churchill
Counsel for The Toledo Edison Company and The Cleveland Electric Illuminating Company, Licensees

BWC:cp
cc: Toledo Coalition for Safe Energy

1243 046




P.O. Box 2091
Toledo, OH 43603
July 9, 1979

Mr. Harold Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
1717 H Street, N.W.
Washington, D.C. 20555

RE: Davis-Besse Nuclear Power Station
Docket No. 50-346

Dear Mr. Dentor:

Thank you for your correspondence of June 27, 1979. I believe that the enclosed might be of assistance to the Commission in revisiting its decision to allow Davis-Besse to restart.

Please find herein a verifie. .opy of (1) a motion by the Toledo Coalition for Safe Energy to this Commission seeking a preliminary injunction or any NRC order having the practical effect of closing down Davis-Besse pending sweeping revisions to emergency plans for the plant; and (2) a Complaint and Memorandum of Particulars in support of that motion. We have included a number of documentary appendices in support of our allegations which we hope will facilitate NRC staff assessment and verification of our conclusions.

In light of the chaos that prevailed among the public and state emergency preparedness officials during the Three Mile Island crisis, it is imperative that the NRC place increased stress upon emergency preparations in the event of nuclear accidents. To do less is to ignore the threat to public health and safety which is posed by nuclear power. With particular respect to Davis-Besse, the incredibly poor operator and technical performance record of the plant underscores the need for emergency plans to be revised and proven workable now, before they might be required.

Because of the imminent threat to health and safety which is posed by lax arrangements for emergencies at Davis-Besse, I hereby request that the NRC take all steps to expedite TCSE's complaint. If we do not have confirmation of definitive action by the NRC within fourteen (14) days of this date, we will be forced to examine the options of federal court facilitation. However, I am certain that the NRC is not willing to see the chaotic emergency preparations during the TMI crisis repeated, and will adopt the same dim view of Davis-Besse emergency plans that TCSE has, and that the Commission will act quickly and responsibly.

We await your earliest processing of our complaint and request for restraining order. Thank you for your timely consideration.

Respectfully,

Terry J. Lodge
Counsel for TCSE

cc: Mr. Stephen Burns, OELD
Mr. Bruce Churchill, Counsel for Licensees

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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USNRC-CELD

| | |
|---|---|
| TOLEDO EDISON COMPANY AND THE CLEVELAND ELECTRIC ILLUMINATING COMPANY | DOCKET NO. 50-346 |
| DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1 | MOTION FOR PRELIMINARY INJUNCTION |

Toledo Coalition for Safe Energy (TCSE), plaintiff herein, moves the U.S. Nuclear Regulatory Commission for a preliminary injunction, or suspension of power generating operations at Davis-Besse Nuclear Power Station, Unit No. 1, with an injunction to Toledo Edison Company (TECo) and the Cleveland Electric Illuminating Company (CEI), their agents, servants, employees and attorneys and all persons in active concert and participation with them, pending a final determination of the need for and implementation of definitive corrective measures to be taken upon the operating license issued to said respondents, from restarting Davis-Besse I on the grounds that

(1) Unless restrained by this Commission, the respondents will perform the acts referred to;

(2) Such action by the respondents will result in exposing the plaintiffs hereto and other parties proximately situated to Davis-Besse to unnecessary and undue but substantial risks of irreparable loss, harm and damage to persons and property, as more particularly set forth in the verified Complaint of TCSE, attached to this Motion;

(3) The issuance of a preliminary injunction or order suspending operations at Davis-Besse by this Commission will not cause undue convenience to respondents, or loss thereto, but will prevent irreparable injury to plaintiffs and other persons closely situated to Davis-Besse.

This Commission has the power to afford Complainants the relief sought herein. Further, 10 CFR §2.206 et. seq. sets forth procedures for modification of an operating license. By acting pursuant to these procedures, this Commission sits in place of the appropriate Federal District Court.

42 U.S.C. §2232 requires this Commission to ensure that nuclear operating licenses contain adequate conditions to "provide adequate protection to the health and safety of the public" (a). The injunctive relief sought herein is designed to afford this Commission the means to protect the public as required.

Upon the verified Complaint herein, TCSE moves this Commission to issue a preliminary injunction or equivalent order of suspension of operations at Davis-Besse, as prayed for in the Complaint and on the grounds therein set forth.

7/9/79
Date

Terry J. Lodge
Counsel for the Toledo Coalition
for Safe Energy

Served by me this day via certified mail upon Bruce Churchill, Counsel for TECo and CEI.

Terry J. Lodge

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

| | |
|---|---|
| TOLEDO EDISON COMPANY AND THE CLEVELAND ELECTRIC ILLUMINATING COMPANY<br><br>DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1 | DOCKET NO. 50-346<br><br>COMPLAINT AND MEMORANDUM OF PARTICULARS |

1. Complainant Toledo Coalition for Safe Energy (TCSE) is a nonprofit corporation under the laws of Ohio, and is a coalition of customers of Toledo Edison Company (TECo) with the common aims of pursuing safely-produced, equitably-priced energy, utilizing all legal devices of civil redress and action. Most of the membership of TCSE lives within a twenty-five (25) mile radius of Davis-Besse Nuclear Power Station, Unit No. 1 (Davis-Besse), and stand to suffer irreparable personal injury, damage and loss in the event of a serious accident at Davis-Besse.

2. The Davis-Besse Nuclear Power Station is, from a generic design standpoint, closely related to the Babcock & Wilcox nuclear reactor Three Mile Island II, near Harrisburg, Pennsylvania (TMI). In fact, because of defective design and personnel procedures which gave rise to the serious accident at TMI on March 28, 1979, this Commission ordered TECo and its co-licensee of Davis-Besse, Cleveland Electric Illuminating Company (CEI) to implement certain design changes and personnel retraining prior

start Davis-Besse. This order

3. On April 24, 1979, TC

James Keppler of NRC-Chicago of

1243 050

OTTAWA COUNTY

RADIOLOGICAL EMERGENCY PLAN

1243 051

NUREG-0396
EPA 520/1-78-016

# PLANNING BASIS FOR THE DEVELOPMENT OF STATE AND LOCAL GOVERNMENT RADIOLOGICAL EMERGENCY RESPONSE PLANS IN SUPPORT OF LIGHT WATER NUCLEAR POWER PLANTS

A Report Prepared by a
U. S. Nuclear Regulatory Commission and
U. S. Environmental Protection Agency
Task Force on Emergency Planning

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Co-Chairmen of Task Force
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Manuscript Completed: November 1978
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## I. INTRODUCTION

Nuclear facility licensees are required by NRC regulations to develop emergency response plans[1]. Portions of these regulations require the licensees to coordinate their plans with State and local agencies. Published Federal guidance[2,3] recommends that State and local governments formalize their emergency response plans in support of these facilities to protect public health and safety in the unlikely event of a significant release of radioactive material from a nuclear facility to the environment.

Present Federal guidance* suggests the use of a spectrum of accidents as a basis for developing emergency response plans. For various reasons,* in 1976 an ad hoc Task Force of the Conference of (State) Radiation Control Program Directors passed a resolution requesting NRC to "make a determination of the most severe accident basis for which radiological emergency response plans should be developed by offsite agencies". Additionally, the NRC and EPA received other comments from State and local governments relating to this recommendation.

*See Appendix II.

In November 1976, a Task Force consisting of NRC and EPA representatives was convened to address this Conference request and related issues. The Task Force reviewed what is currently being done in terms of emergency planning for newly licensed plants and found that substantial efforts were being made both in on-site and off-site planning. It also reviewed current guidance from Federal Agencies regarding emergency response planning[2,3,4] and concluded that adequate guidance was available or was being developed with regard to the elements of a plan. While the previous guidance has not precisely specified distances to which planning elements should be applied, the actual current application of previous guidance on a case basis during the licensing process has in practice extended to substantial distances from reactor sites, i.e., independent of specific Low Population Zone distances used for siting purposes. However, information regarding the consequences and characteristics of the accident situation for which planning was being recommended had not been fully defined.

The Task Force accepts the principle noted in existing NRC and EPA guidance[2, 3] that acceptable values for emergency doses to the public under the actual conditions of a nuclear accident cannot be predetermined. The emergency actions taken in any individual case

must be based on the actual conditions that exist and are projected at the time of an accident. For very serious accidents, predetermined protective actions would be taken if projected doses, at any place and time during an actual accident, appeared to be at or above the applicable proposed Protective Action Guides (PAGs), based on information readily available in the reactor control room, i.e., at predetermined emergency action levels[4]. Of course, ad hoc actions, based on plant or environmental measurements, could be taken at any time.

The concept of Protective Action Guides was introduced to radiological emergency response planning to assist public health and other governmental authorities in deciding how much of a radiation hazard in the environment constitutes a basis for initiating emergency protective actions. These guides (PAGs) are expressed in units of radiation dose (rem) and represent trigger or initiation levels, which warrant pre-selected protective actions for the public if the projected (future) dose received by an individual in the absence of a protective action exceeds the PAG. PAGs are defined or definable for all pathways of radiation exposure to man and are proposed as guidance to be used as a basis for taking action to minimize the impact on individuals.

The nature of PAGs is such that they cannot be used to assure that a given level of exposure to individuals in the population is prevented. In any particular response situation, a range of doses may be experienced, principally depending on the distance from the point of release. Some of these doses may be well in excess of the PAG levels and clearly warrant the initiation of any feasible protective actions. This does not mean, however, that doses above PAG levels can be prevented or that emergency response plans should have as their objective preventing doses above PAG levels. Furthermore, PAGs represent only trigger levels and are not intended to represent acceptable dose levels. PAGs are tools to be used as a decision aid in the actual response situation. Methods for the implementation of Protective Action Guides are an essential element of emergency planning. These include the predetermination of emergency conditions for which planned protective actions such as shelter and/or evacuation would be implemented offsite. Details of these methods are being provided as separate guidance[3,4] and are not included in this report.

Accident Considerations

After considerable discussion, the Task Force concluded that there was no specific accident sequence that could be isolated as the one for which to plan, because each accident could have different

consequences, both in nature and degree. Further, the range of possible selections for a planning basis is very large, starting with a zero point of requiring no planning at all because significant offsite radiological accident consequences are unlikely to occur, to planning for the worst physically possible accident regardless of its extremely low likelihood. As an alternative to attempting to define a specific accident sequence, the Task Force decided to identify the bounds of the parameters for which planning is recommended based upon a knowledge of the potential consequences, timing, and release characteristics of a spectrum of accidents.

The Task Force recognized that more specific guidance with respect to accidents whose consequences would be more severe than the design basis accidents explicitly considered in the licensing process was appropriate. Additional discussions regarding the need to plan for consequences of such accidents (commonly known as Class 9 accidents*) may be found in Appendix III.

The Task Force concluded that the objective of emergency response plans should be to provide dose savings for a spectrum of accidents that could produce offsite doses in excess of the PAGs. Although the selected

*Throughout this report, "Class 9 accidents" will refer to those accidents in which there is melting of the core and/or containment failure.

planning basis is independent of a specific accident sequence, a number of accident descriptions were reviewed including the design basis accident with various active engineered safety features, and the accident release categories of the Reactor Safety Study*[5].

Additional information regarding the rationale for the recommended planning basis, the background of Federal emergency planning efforts, the Task Force deliberations on Class 9 accidents, the relationship between emergency planning and siting criteria, and the difference between PAGs and dose criteria used for siting can be found in the appendices to this report.

*The Task Force has used information in the RSS as a basis to perform calculations which illustrate the likelihood of certain offsite dose levels given a core melt accident. Various aspects of the study have been debated by reviewers and additional programs are underway to extend or refine the study. While the RSS is considered by the Task Force to have limited use in dealing with plant/site specific factors, it provides the best currently available source of information on the relative likelihood of large accidental releases of radioactivity given a core melt event. The results derived from the RSS-based work served to confirm the Task Force judgment that offsite planning for a generic distance around nuclear power plants is prudent and useful.

## II. PLANNING NEEDS

The Task Force reviewed the types of information that State and local governments need to develop emergency response plans and determined that the information fell into two categories; site specific and generic. The site specific information such as population distribution and topography must be available to State and local officials as part of the planning process. Such information is summarized in Environmental Reports and Safety Analysis Reports prepared by applicants for a permit to construct and operate a nuclear power facility and is useful for emergency planning purposes. Some generic information related to the planning effort is already being provided by Federal agencies[2,3,4]. The Federal generic guidance provided includes the topics which should be addressed in an emergency plan[2,4], protective action guides[3], the types of protective action appropriate[3] and emergency instrumentation considerations[4,6,7].

If it were possible to identify a single accident on which to base emergency response planning, one could use the release characteristics of that single accident in connection with site specific characteristics and other generic information to specify the planning effort. Having determined that a single specific accident sequence for a light water

reactor nuclear power plant cannot be identified as a planning basis, the Task Force chose to provide recommendations in terms of the consequences or characteristics of accidents that would be important in determining the extent of the planning effort. The planning basis elements needed to scope the planning effort were determined to be:

1. The distance to which planning for the initiation of predetermined protective actions is warranted.
2. The time dependent characteristics of potential releases and exposures.
3. The kinds of radioactive materials that can potentially be released to the environment.

The most important guidance for planning officials is the distance from the nuclear facility which defines the area over which planning for predetermined actions should be carried out. The other elements of guidance provide supporting information for planning and preparedness.

The need for specification of distance for the major exposure pathways is evident. The location of the population for whom actions may be needed, responsible authorities who would carry out these actions and the means of communication to these authorities are all dependent on the size of the planning area.

Information on the time frames of the accidents is also important. The time between the initial recognition at the nuclear facility that a serious accident is in progress and the beginning of the radioactive release to the surrounding environment is critical in determining the type of protective actions which are feasible immediately following an accident. Likewise, knowledge of the potential duration of release and the time available before exposures are expected several miles offsite is important in determining what specific instructions can be given to the public.

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

In this report, emergency preparedness is related to two predominant exposure pathways. They are:

1. Plume exposure pathway -- The principal exposure sources from this pathway are (a) whole body external exposure to gamma radiation from the plume and from deposited material and (b) inhalation exposure from the passing radioactive plume. The time of potential exposure could range from hours to days.

2. Ingestion exposure pathway -- The principal exposure from this pathway would be from ingestion of contaminated water or foods such as milk or fresh vegetables. The time of potential exposure could range in length from hours to months.

The Task Force has provided separate guidance for these two exposure pathways, although a single emergency plan would include elements common to assessing or taking protective actions for both pathways.

## III. RECOMMENDED PLANNING BASIS

### A. Emergency Planning Zones

With regard to the area over which planning efforts should be carried out, the Task Force recommends that "Emergency Planning Zones" (EPZs) about each nuclear facility be defined both for the short term "plume exposure pathway" and for the longer term "ingestion exposure pathways." The Emergency Planning Zone concept is illustrated in figure 1. EPZs are designated as the areas for which planning is recommended to assure that prompt and effective actions can be taken to protect the public in the event of an accident. Responsible government officials should apply the applicable planning items listed in NUREG-75/111[2] in the development of radiological emergency response plans. The following are example planning elements considered appropriate for the EPZs:

(1) Identify responsible onsite and offsite emergency response organizations and the mechanisms for activating their services,

(2) Establish effective communication networks to promptly notify cognizant authorities and the public,

(3) Designate pre-determined actions as appropriate[2,3,4],

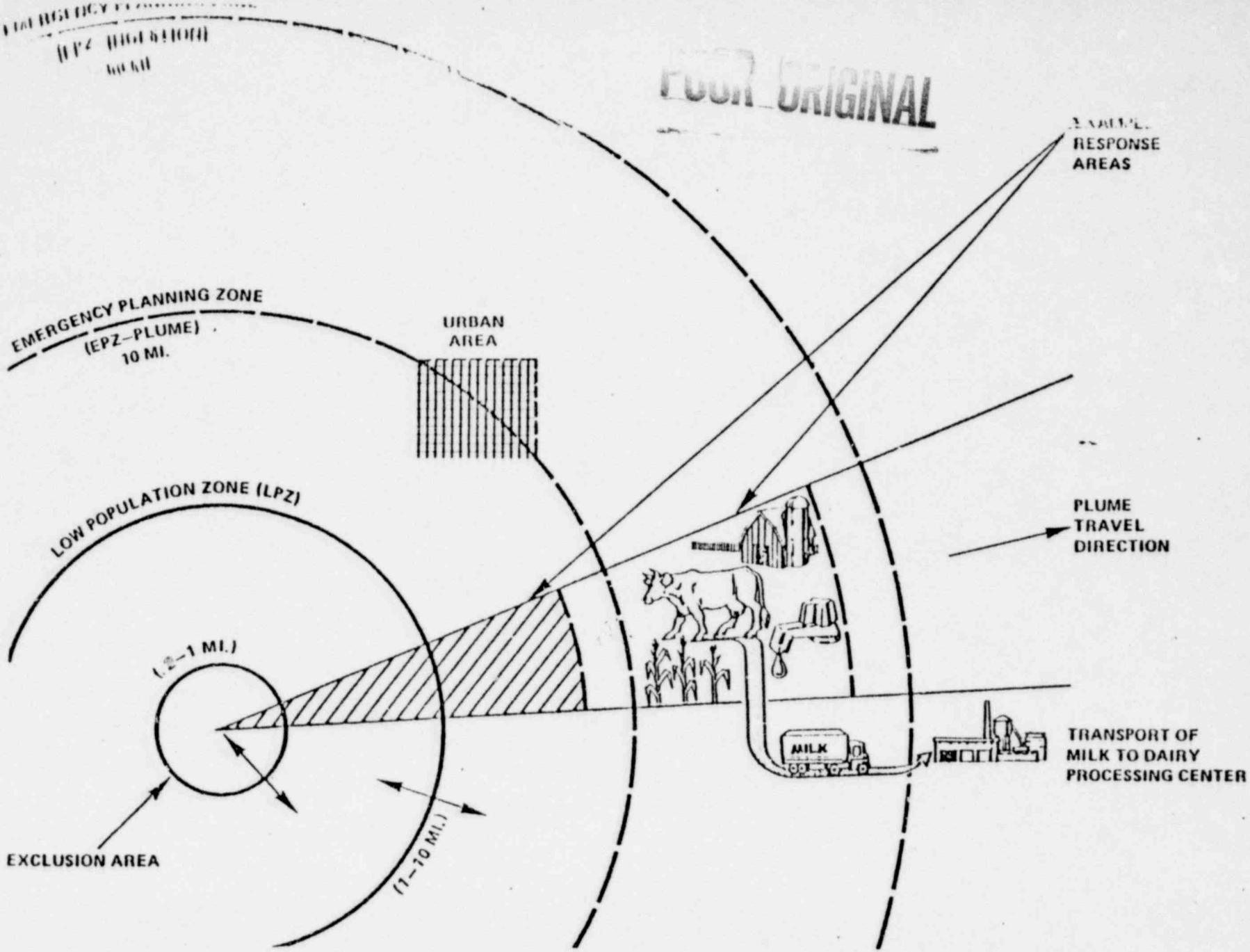



Figure 1 Concept of Emergency Planning Zones

(4) Develop procedures for use by emergency workers,

(5) Identify applicable radiation measurement equipment,

(6) Identify emergency operations centers and alternate locations, assembly points, and radiation monitoring locations,

(7) Implement training programs for emergency workers as appropriate, and

(8) Develop test procedures for emergency response plans.

Emergency planning should predetermine appropriate emergency responses within the EPZ as a function of population groups, environmental conditions[3], plant conditions[4] and time available to respond. For the plume exposure phase, shelter and/or evacuation would likely be the principal immediate protective actions to be recommended for the general public within the EPZ. The ability to best reduce exposure should determine the appropriate response. The key to effective planning is good communication to authorities who know what they are going to do under pre-determined conditions.

For the ingestion exposure Emergency Planning Zone, the planning effort involves the identification of major exposure pathways from contaminated food and water and the associated

control points and mechanisms. The ingestion pathway exposures in general would represent a longer term problem, although some early protective actions to minimize subsequent contamination of milk or other supplies should be initiated (e.g., put cows on stored feed).

It is expected that judgment of the planner will be used in determining the precise size and shape of the EPZs considering local conditions such as demography, topography and land use characteristics, access routes, jurisdictional boundaries, and arrangements with the nuclear facility operator for notification and response assistance.

The EPZ guidance does not change the requirements for emergency planning, it only sets bounds on the planning problem. The Task Force does not recommend that massive emergency preparedness programs be established around all nuclear power stations. The following examples are given to further clarify the Task Force guidance on EPZs:

No special local decontamination provisions for the general public (e.g., blankets, changes of clothing, food, special showers)

No stockpiles of anti-contamination equipment for the general public

No construction of specially equipped fallout shelters

No special radiological medical provisions for the general public

No new construction of special public facilities for emergency use

No special stockpiles of emergency animal feed

No special decontamination equipment for property and equipment

No participation by the general public in test exercises of emergency plans.

Some capabilities in these areas, of course, already exist under the general emergency plans of Federal and State agencies.

B. Size of the Emergency Planning Zone

Several possible rationales were considered for establishing the size of the EPZs. These included risk, probability, cost effectiveness and accident consequence spectrum. After reviewing these alternatives, the Task Force chose to base the rationale on a full spectrum of accidents and corresponding consequences tempered by probability considerations. These rationales are discussed more fully in Appendix I.

The Task Force agreed that emergency response plans should be useful for responding to any accident that would produce offsite doses in excess of the PAGs. This would include the more severe design basis accidents and the accident spectrum analyzed in the RSS. After reviewing the potential consequences associated with

these types of accidents, it was the concensus of the Task Force that emergency plans could be based upon a generic distance out to which predetermined actions would provide dose savings for any such accidents. Beyond this generic distance it was concluded that actions could be taken on an ad hoc basis using the same considerations that went into the initial action determinations.

The Task Force judgment on the extent of the Emergency Planning Zone is derived from the characteristics of design basis and Class 9 accident consequences. Based on the information provided in Appendix I and the applicable PAGs a radius of about 10 miles was selected for the plume exposure pathway and a radius of about 50 miles was selected for the ingestion exposure pathway, as shown in table 1. Although the radius for the EPZ implies a circular area, the actual shape would depend upon the characteristics of a particular site. The circular or other defined area would be for planning whereas initial response would likely involve only a portion of the total area.

The EPZ recommended is of sufficient size to provide dose savings to the population in areas where the projected dose from design basis accidents could be expected to exceed the applicable PAGs under unfavorable atmospheric conditions. As illustrated in Appendix I, consequences of less severe Class 9 accidents would not exceed the

PAG levels outside the recommended EPZ distance. In addition, the EPZ is of sufficient size to provide for substantial reduction in early severe health effects (injuries or deaths) in the event of the more severe Class 9 accidents.

Table 1. Guidance on Size of the Emergency Planning Zone

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

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

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

***The recommended size of the ingestion exposure EPZ is based on an expected revision of milk pathway Protective Action Guides based on FDA-Bureau of Radiological Health recommendations. The Task Force understands that measures such as placing dairy cows on stored feed will be recommended for projected exposure levels as low as about 1.5 rem to the infant thyroid. Should the current FRC guidelines, 10 rem(3), be maintained, an EPZ of about 25 miles would achieve the objectives of the Task Force.

C. Time Factors Associated with Releases

The planning time frames are based on design basis accident considerations and the results of calculations reported in the Reactor Safety Study[5]. The guidance cannot be very specific because of the wide range of time frames associated with the spectrum of accidents considered. Therefore, it will be necessary for planners to consider the possible different time periods between the initiating event and arrival of the plume and possible time periods of releases in relationship to time needed to implement protective actions. The Reactor Safety Study indicates, for example, that major releases may begin in the range of one-half hour to as much as 30 hours after an initiating event and that the duration of the releases may range from one-half hour to several days with the major portion of the release occurring well within the first day. In addition, significant plume travel times are associated with the most adverse meteorological conditions that might result in large potential exposures far from the site. For example, under poor dispersion conditions associated with low windspeeds, two hours or more might be required for the plume to travel a distance of five miles. Higher windspeeds would result in shorter travel times but would provide more dispersion, making high exposures at long distances much less likely. Therefore, in most cases, significant advance warning

of high concentrations should be available since NRC regulations[1,4] require early notification of offsite authorities for major releases of radioactive material. The warning time could be somewhat different for reactors with different containment characteristics than those analyzed in the Reactor Safety Study. The range of times, however, is judged suitably representative for the purpose of developing emergency plans. Shorter release initiation times are typically associated with design basis events of much smaller potential consequences or with the more severe Reactor Safety Study accident sequences.

The planning basis for the time dependence of a release is expressed as a range of time values in which to implement protective action. This range of values prior to the start of a major release is of the order of one-half hour to several hours. The subsequent time period over which radioactive material may be expected to be released is of the order of one-half hour (short-term release) to a few days (continuous release). Table 2 summarizes the Task Force guidance on the time of the release.

The time available for action is strongly related to the time consumed in notification that conditions exist that could cause a major release or that a major release is occurring. Development and periodic testing of procedures for rapid notification are encouraged.

Table 2 - Guidance on Initiation and Duration of Release

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

D. Radiological Characteristics of Releases

To specify the characteristics of monitoring instrumentation,* develop decisional aids to estimate projected doses, and identify critical exposure modes, planners will need information on the characteristics of potential radioactivity releases. For atmospheric releases from nuclear power facilities, three dominant exposure modes have been identified. These are (1) whole body (bone marrow) exposure from external gamma radiation and from ingestion of radioactive material; (2) thyroid exposure from inhalation or ingestion of radiodines; and

*An Interagency Task Force on Emergency Instrumentation (offsite) is now preparing guidance(7) on the type and quantity of instruments needed for the various exposure pathways. Federal agencies represented on the Instrumentation Task Force include NRC, EPA, DCPA, HEW, and DOE.

(3) exposure of other organs (e.g., lung) from inhalation or ingestion of radioactive materials. Any of these exposure modes could dominate (i.e., result in the largest exposures) depending upon the relative quantities of various isotopes released.

Radioactive materials produced in the operation of nuclear reactors include fission products and transuranics generated within the fuel material itself and activation products generated by neutron exposure of the structural and other materials within and immediately around the reactor core. The fission products consist of a very large number of different kinds of isotopes (nuclides), almost all of which are initially radioactive. The amounts of these fission products and their potential for escape from their normal places of confinement represent the dominant potential for consequences to the public. Radioactive fission products exist in a variety of physical and chemical forms of varied volatility. Virtually all activation products and transuranics exist as non-volatile solids. The characteristics of these materials shows quite clearly that the potential for releases to the environment decreases dramatically in this order: (1) gaseous materials; (2) volatile solids; and (3) non-volatile solids. For this reason, guidance for source terms representing hypothetical fission product activity within

a nuclear power plant containment structure emphasizes the development of plans relating to the release of noble gases and of volatiles such as iodine. However, consideration of particulate materials should not be completely neglected. For example, capability to determine the presence or absence of key particulate radionuclides will be needed to identify requirements for additional resources.

Table 3 provides a list of key radionuclides that might be expected to be dominant for each exposure pathway. More detailed lists of core inventories are presented in Chapter 15 of recent Safety Analysis Reports and in Appendix V of the Reactor Safety Study. Both of these sources give details on the time histories of the release fractions for a spectrum of postulated accidents.

Table 3

RADIONUCLIDES WITH SIGNIFICANT CONTRIBUTION TO DOMINANT EXPOSURE MODES

Radionuclides with Significant Contribution to Thyroid Exposure

| Radionuclide | Half Life (days) |
|---|---|
| I-131 | 8.05 |
| I-132 | 0.0858 |
| I-133 | 0.875 |
| I-134 | 0.0366 |
| I-135 | .028 |
| Te-132 | 3.25 |
| Kr-88 | 0.117 |

Radionuclides with Significant Contribution to Whole Body Exposure

| Radionuclide | Half Life (days) |
|---|---|
| I-131 | 8.05 |
| Te-132 | 3.25 |
| Xe-133 | 5.28 |
| I-133 | 0.875 |
| Xe-135 | 0,384 |
| I-135 | .028 |
| Cs-134 | 750 |
| Kr-88 | 0.117 |
| Cs-137 | 11,000 |

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

| Radionuclide | Half Life (days) |
|---|---|
| I-131 | 8.05 |
| I-132 | 0.0858 |
| I-133 | 0.875 |
| I-134 | 0.0366 |
| I-135 | .028 |
| Cs-134 | 750 |
| Kr-88 | 0.117 |
| Cs-137 | 11,000 |
| Ru-106 | 365 |
| Te-132 | 3.25 |
| Ce-144 | 284 |



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

## IV. CONCLUSIONS

In summary, the Task Force concludes that:

- A spectrum of accidents (not the source term from a single accident sequence) should be considered in developing a basis for emergency planning.

- The establishment of Emergency Planning Zones of about 10 miles for the plume exposure pathway and about 50 miles for the ingestion pathway is sufficient to scope the areas in which planning for the initiation of predetermined protective action is warranted for any given nuclear power plant.

- The establishment of time frames and radiological characteristics of releases provides supporting information for planning and preparedness.

- If previous consideration has been given to the basic planning elements put forth in existing guidance documents[2,3,4], the establishment of Emergency Planning Zones should not result in large incremental increases in required planning and preparedness resources.

REFERENCES


1. 10 CFR Part 50, Licensing of Production and Utilization Facility, Appendix E, U. S. Nuclear Regulatory Commission, Washington, D. C.

2. Guide and Check List for the Development and Evaluation of State and Local Government Radiological Emergency Response Plans in Support of Fixed Nuclear Facilities, NUREG-75/111, Dec. 1974, U.S. Nuclear Regulatory Commission.

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

4. Emergency Planning for Nuclear Power Plants, Regulatory Guide 1.101, Mar. 1977. U.S. Nuclear Regulatory Commission, Washington, D. C.

5. Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants, (NUREG-75/014), October 1975, WASH-1400, U.S. Nuclear Regulatory Commission.

6. Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant Conditions During and Following an Accident, Regulatory Guide 1.97, Dec. 1975, U.S. Nuclear Regulatory Commission, Washington, D. C.

7. Interim Guidance on Offsite Radiation Measurement Systems, A Report to Developers of State Radiological Emergency Response Plans by the Federal Interagency Task Force on (offsite) Emergency Instrumentation for Nuclear Incidents at Fixed Facilities, August 1977, U.S. Nuclear Regulatory Commission, Washington, D. C.

8. Federal Radiation Council Staff Report No. 5, July 1964; Staff Report No. 7, May 1965.

9. Federal Response Plan for Peacetime Nuclear Emergencies (Interim Guidance) April 1977, Federal Preparedness Agency, General Services Administration.

10. Disaster Operations, A Handbook for Local Governments (CPG 1-6) July 1972, & Change No. 1, June 1974, Defense Civil Preparedness Agency.

11. Radiological Incident Emergency Response Planning, Fixed Facilities and Transportation: Interagency Responsibilities, Federal Preparedness Agency General Services Administration, Federal Register Notice, Vol. 40, No. 248 December 24, 1975.

## GLOSSARY

**Class 9 Accident**

An accident considered to be so low in probability as not to require specific additional provisions in the design of a reactor facility. Such accidents would involve sequences of successive failures more severe than those postulated for the purpose of establishing the design basis for protective systems and engineered safety features. (Class 9 event sequences include those leading to total core melt and consequent degradation of the containment boundary and those leading to gross fuel clad failure or partial melt with independent failures of the containment boundary).

**Consequences**

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

**Core Melt Accident**

A postulated reactor accident in which the fuel melts because of overheating.

| | |
|---|---|
| Emergency Planning Zone (EPZ) | A generic area defined about a nuclear facility to facilitate emergency planning offsite. It is defined for the plume and ingestion exposure pathways. In relation to emergency response an EPZ is an area in which best effort is performed making use of existing emergency plans and is not an area in which particular criteria must be met. |
| Ingestion Exposure Pathway | The principal exposure from this pathway would be from ingestion of contaminated water or foods such as milk or fresh vegetables. The time of potential exposure could range in length from hours to months. |
| Planning Basis | Guidance in terms of (1) Size of Planning Area (Distance); (2) Time Dependence of Release; and (3) Radiological Characteristics of Releases. |

| | |
|---|---|
| Plume Exposure Pathway | The principal exposure sources from this pathway are: (a) whole body external exposure to gamma radiation from the plume and from deposited materials and (b) inhalation exposure from the passing radioactive plume. The time of potential exposure could range in length from hours to days. |
| Projected Dose | An estimate of the radiation dose which affected population groups could potentially receive if protective actions are not taken. |
| Protective Action | An action taken to avoid or reduce a projected dose. (Sometimes referred to as protective measure). |
| Protective Action Guide | Projected absorbed dose to individuals in the general population which warrants protective action following a contaminating event. |
| Source Term | Radioisotope inventory of the reactor core, or radioisotope release to the environment, often as a function of time. |

APPENDIX I

RATIONALE FOR THE PLANNING BASIS

A. General Considerations

The Task Force considered various rationales for establishing a planning basis; including risk, probability, cost effectiveness, and consequence spectrum. After studying the various approaches discussed below, the Task Force chose to base the rationale for the planning basis on a spectrum of consequences, tempered by probability considerations.

With respect to the risk* rationale, such an approach would establish "planning guidance" that could be compared with the risks associated with non-nuclear accidents. This rationale would seemingly give a uniform basis for emergency planning and would clearly indicate the level of risk that could be mitigated by advanced planning. However, emergency planning for non-nuclear hazards is not based upon quantified risk analyses. Risk is not generally thought of in terms of probabilities and consequences, rather it is an intuitive feeling of the threat posed to the public. Reactors are unique in this regard: radiation tends to be perceived as more dangerous than other hazards because the nature of radiation effects are less commonly

*Risk is defined as accident consequences times the probability of accident occurrence.

understood and the public generally associates radiation effects with the fear of nuclear weapons effects. In addition, a risk-related rationale might imply the determination of an acceptable level of risk which is outside the scope of the Task Force effort. Choosing a risk comparable to non-nuclear events, therefore, was not directly used as the rationale for an emergency planning basis.



With respect to a probability rationale, one could arrive at "planning guidance" by selecting an accident probability below which development of an emergency plan could not be justified. Factors favoring using this rationale center around providing a quantitative probability basis, which could be compared with the probabilities of other types of emergencies for which plans are prepared.

Factors arguing against the probability rationale are similar to those against the risk approach. Emergency planning is not based upon quantified probabilities of incidents or accidents. On the basis of the accident probabilities presented in the Reactor Safety Study (nuclear and non-nuclear) society tolerates much more probable non-nuclear events with similar consequence spectrums without any specific planning. Radiological emergency planning is not based upon probabilities, but on public perceptions of the problem and what could be done to protect health and safety. In essence, it is a matter of prudence rather than necessity.

A generic "probability of an event" appropriate for planning has many implications felt to be outside the scope of the Task Force objective. However, the concept of accident probability is important and does have a place in terms of evaluating the range of the consequences of accident sequences and setting some reasonable bounds on the planning basis. The probability rationale was used by the Task Force to gain additional perspective on the planning basis finally chosen.

With respect to a cost-effectiveness rationale, the level of emergency planning effort would be based on an analysis of what it costs to develop different levels of such a plan and the potential consequences that could be averted by that degree of development. The factor favoring the cost-effectiveness rationale is that an emergency plan could be developed on the basis of cost per potential health effect averted. Factors arguing against the cost-effectiveness rationale are the difficulty in arriving at costs of plan development and maintenance and considerations that general and radiological emergency response plans have already been developed. In addition, absent an actual accident, it would be very difficult to assign a dollar value to the effectiveness of the plan in terms of health effects averted.

Lastly, the calculated consequences from a spectrum of postulated accidents was considered as the rationale for the planning basis.

Such a rationale could be used to help identify desirable planning elements and establish bounds on the planning effort. Further, a planning basis could be easily stated and understood in terms of the areas or distances, time frames and radiological characteristics that would correspond to the consequences from a range of possible accidents. Consequence oriented guidance would also provide a consistency and uniformity in the amount of planning recommended to State and local governments. The Task Force therefore judged that the consequences of a spectrum of accidents should be the principal rationale behind the planning basis.



B. Consequence Considerations

The Task Force considered the complete spectrum of accidents postulated for various purposes, including those discussed in environmental reports (i.e. best estimate Class 1 through 8 accidents), accidents postulated for purposes of evaluating plant designs (e.g. the DBA/LOCA), and the spectrum of accidents assessed by the Reactor Safety Study. The Task Force concluded that the environmental report discussions (Class 1-8) were too limited in scope and detail to be useful in emergency planning.

1. Design Basis Accidents

Under NRC Regulations, the site/reactor design combination must be such that the consequences of design basis accidents are

below the plume exposure guidelines of 10 CFR Part 100. The design basis loss-of-coolant accident (DBA-LOCA) has been typically the most severe design basis accident in that it results in the largest calculated offsite doses of any accident in this class. The DBA-LOCA is not a realistic accident scenario in that the release magnitudes are much more severe than would be realistically expected and may exceed that of some core-melt type accidents. A best estimate assessment of the release following a LOCA would be significantly smaller than the DBA-LOCA used for siting purposes. An analysis of this accident has been performed for most of the power plants licensed or under review by NRC to determine the dose/distance relationships as computed by traditionally conservative assumptions used under 10 CFR Part 100 requirements. Results of this study are presented later in this appendix. The study concluded that the higher PAG plume exposures of 25 rem (thyroid) and 5 rem (whole body) would not be exceeded beyond 10 miles for any site analyzed. Even under the most restrictive PAG plume exposure values of 5 rem to the thyroid and 1 rem whole body, over 70 percent of the plants would not require any consideration of emergency responses beyond 10 miles. It should be noted that even for the DBA-LOCA, the lower range of the plume PAGs would likely not be exceeded outside the low population zone (LPZ) for average meteorological conditions.

For the ingestion pathways, under the same DBA-LOCA conditions, the downwind range within which a PAG of 1.5 rem thyroid could be exceeded would be limited to within 50 miles even under the conservative 10 CFR 100 assumptions. The 50 mile distance is also justified as a maximum planning distance because of likely significant wind shifts within this distance that would further restrict the radius of the spread of radioactive material.



2. Class 9 Accidents

"Class 9" accidents cover a full spectrum of releases which range from those accidents which are of the same order as the DBA-LOCA type of releases; i.e., doses on the order of PAGs within 10 miles to those accidents which release significant fractions of the available radioactive materials in the reactor to the atmosphere thus having potential for life-threatening doses. The lower range of the spectrum would include accidents in which a core "melt-through" of the containment would occur. As in the DBA-LOCA class, the doses from "melt-through" releases (involving thousands of curies) generally would not exceed even the most restrictive PAG beyond about 10 miles from a power plant. The upper range of the core-melt accidents is categorized by those in which the containment catastrophically fails and releases large quantities of radioactive materials directly to the atmosphere because of over-pressurization or a steam explosion. These

accidents have the potential to release very large quantities (hundreds of millions of curies) of radioactive materials. There is a full spectrum of releases between the lower and upper range with all of these releases involving some combination of atmospheric and melt-through accidents. These very severe accidents have the potential for causing serious injuries and deaths. Therefore, emergency response for these conditions must have as its first priority the reduction of early severe health effects. Studies[6,7] have been performed which indicate that if emergency actions such as sheltering or evacuation were taken within about 10 miles of a power plant, there would be significant savings of early injuries and deaths from even the most "severe" atmospheric releases.

For the ingestion pathways, (due to the airborne releases and under Class 9 accident conditions), the downwind range within which significant contamination could occur would generally be limited to about 50 miles from a power plant, because of wind shifts during the release and travel periods. There may also be conversion of iodine in the atmosphere (for long time periods) to chemical forms which do not readily enter the ingestion pathway. Additionally, much of the particulate materials in a cloud would have been deposited on the ground within about 50 miles.

C. Probability Considerations

An additional perspective can be gained when the planning basis is considered in terms of the likelihood (probability) of accidents which could require some emergency response.

Probabilities can be used to give a perspective to the emergency planner by comparing the chance of a reactor accident to other emergencies for which plans and action may be required. This consideration forms an additional basis upon which the Task Force selected the planning basis. The Reactor Safety Study (RSS) estimated the probabilities* of various severe accidents occurring at nuclear power plants. The probability of a loss-of-coolant accident (LOCA) from a large pipe break was estimated to be approximately one chance in 10,000 ($1 \times 10^{-4}$) of occurring per reactor-year. LOCA accidents would not necessarily lead to the melting of the reactor core since emergency core cooling systems (ECCS) are designed to protect the core in such an event. In fact, other accident initiating events such as the loss-of-coolant accident from a small pipe break or transient events have a higher chance of leading to core-melt than do large LOCA accidents. Core-melt type accidents were calculated to have a probability of about one chance in 20,000 of occurring per reactor-year. There is a significant degree of uncertainty associated with both of the above probability estimates.



* Use of the RSS probability estimates, in the context of emergency planning has been thoroughly examined. It is recognized that there is a large range of uncertainties in these numbers (as indicated in the Risk Assessment Review Group Report, NUREG/CR-0400), but the perspective gained when considering the probabilities is important in making a rational decision concerning a basis for emergency planning.

The degree of uncertainty is such that no differentiation can be confidently made, on a probabilistic basis, between the DBA/LOCA and the releases associated with less severe core-melt categories.

As discussed in Appendix III, the Task Force has concluded that both the design basis accidents and less severe core-melt accidents should be considered when selecting a basis for planning predetermined protective actions and that certain features of the more severe core-melt accidents should be considered in planning to assure that some capability exists to reduce the consequences of even the most severe accidents. The low probabilities associated with core-melt reactor accidents (e.g. one chance in 20,000 or $5 \times 10^{-5}$ per reactor-year) are not easy to comprehend and additional perspectives are useful. Within the next few years, there will have been accumulated approximately 500 reactor-years of civilian nuclear power plant operation in this country. Less than 30% of all core melt accidents would result in high exposure outside the recommended planning distances. Therefore, over this time period* the probability of an accident within the USA with exposures exceeding the plume or ingestion PAGs outside the planning basis distances would be about $1.5 \times 10^{-5}$** x 500 or about 1 chance in

* The Reactor Safety Study explicitly limits its analyses to the first 100 reactors and five years (through 1980).

** This estimate is based upon the assumptions of the RSS. It should be noted that there is a large uncertainty on this number.

100. To restate this, there is about a 1% chance of emergency plans being activated in the U.S. beyond the recommended EPZs within the next few years. For a single State, this probability drops appreciably. For a State with ten reactors within or adjacent to its borders, the probability of exceeding PAGs outside the planning basis radius for the plume exposure pathway is about $1.5 \times 10^{-5} \times 10$ or about one chance in 6000 per year according to the Reactor Safety Study analysis.

For perspective, a comparison between reactor accidents and other emergency situations can be made. Considerations of emergency planning for reactor accidents are quite similar to many other emergencies; floods, for example, have many characteristics which are comparable. Timing, response measures and potential consequences, such as property damage are similar for both events.

Flood risk analysis has been carried out by the Flood Insurance Program of the Department of Housing and Urban Development and the Corps of Engineers. Flood plains have been designated for all areas of the country by computing the probability of being flooded within a certain period of time; ie., the 100-year flood plain designates those areas which can be expected to be under water when the worst flood in a century occurs. Even with this relatively high probability of severe flood occurrence there are no explicit requirements for emergency response planning.

Hurricanes and tornadoes are two potential threats for which some emergency planning is required. Approximately 2 hurricanes per year may be expected to hit the Atlantic coastal States which require emergency response. For individual States, the hurricane frequency ranges from 0.01 to 0.65 per year. Tornadoes have a very high probability of occurrence per year. A severe tornado can be characterized by wind speeds of over 200 miles per hour. Such tornadoes are capable of lifting cars off the ground, tearing roofs and walls off frame houses, overturning trains, and uprooting or snapping most trees. Emergency actions would probably be taken for such tornadoes. The frequency of severe tornadoes for individual States, ranges from about 0.1 to 4 per year.

Severe reactor accidents are at least 100 times less likely to occur than these other disasters requiring emergency response. We nevertheless believe, that it is appropriate to develop flexible emergency response capabilities which will assure that consequences from nuclear reactor accidents are minimized.

## D. Emergency Planning Considerations Derived from Siting, Meteorological Models and Licensing Criteria

### 1. Siting

As indicated in 10 CFR Part 100 (Siting Criteria), an applicant for a construction permit to build a nuclear power plant must designate an exclusion area, a low population zone (LPZ) and a population center based upon consideration of population distribution. The exclusion area must be of such a size that an individual located at any point on its boundary for two hours immediately following the onset of a postulated design basis accident fission product release from the reactor plant would not receive a total radiation dose to the whole body of 25 rem or 300 rem to the thyroid from radioactive plume exposures. The LPZ must be of such a size that an individual located at any point on its outer boundary who is exposed to the radioactive cloud during its entire period (30 days) of passage would not receive a total radiation dose to the whole body of 25 rem or 300 rem thyroid. Calculated doses are usually substantially less than these doses. Protective measures are not assumed to be taken to avoid or mitigate these doses during the denoted time periods. In addition, site related requirements are placed on the exclusion area and the LPZ. The licensee must have authority over all activities within the exclusion area, which normally requires ownership of the area. There must

be a reasonable probability that appropriate protective measures, including evacuation, could be taken for the residents in the LPZ in the event of a serious accident. Dose guideline values are not given for the population center, although the expected doses would be less than within the LPZ. Demographic characteristics within 50 miles of sites are discussed in detail in Environmental Reports and in Chapter 2 of Safety Analysis Reports for each nuclear power plant and in Reference 1.

Assumptions used by the NRC staff to assess conformance with these regulations are contained in various Regulatory Guides (e.g. Regulatory Guides 1.3 and 1.4) and the NRC staff's Standard Review Plans for Chapter 15 of Safety Analysis Reports submitted by applicants for construction permits and operating licenses. Although various assumptions are utilized in this guidance, certain common features are shared: systems containing potentially significant quantities of radionuclides are postulated to fail for an unspecified reason, releasing all or substantial fractions of their inventories from their normal location to the reactor plant containment structure;* various installed safety systems in the containment designed to mitigate the consequences of the postulated release, are assumed to be inoperable at the time of the event,

*In particular, for the worst case DBA/LOCA postulated for containment design, 100% of the noble gases and 50% of the radioiodines in the reactor core are presumed to be released from the core and primary pressure boundary to the containment, which is assumed to isolate and leak at a specified volumetric leak rate.

or are assumed to be operating in a degraded mode, or combinations thereof; the resulting fractional release to the atmosphere is assumed to occur at ground level under extremely unfavorable dispersion conditions, i.e., under conditions such that the calculated dose for the given fractional release would not be exceeded more than five percent of the time at the site under review; and dose models which overestimate the dose on a plume centerline for the given release fraction are used in the dose calculation. For all of these postulated, simultaneously occurring circumstances, 10 CFR Part 100 dose guideline values must not be exceeded at the specified distances from the site.

Perspective on the implications of these 10 CFR 100 reactor siting criteria for emergency planning can be obtained by relating the calculated doses to the EPA PAGs, to guidelines for milk ingestion, and to certain meteorological aspects of dispersion in the atmosphere. For ground level releases, without a wind shift, dose decreases with downwind distance (r) in proportion to $r^{-a}$, where a is between 1.5 and 3, depending on the stability class prevailing at the time.[2] (Stability classes are measures of atmospheric dispersion and are classified by the letters A through G, with A denoting extremely dispersive conditions (see Table I-1)[3]). For the NRC staff assumption conditions (e.g., class F conditions with low wind

## Table I-1 — RELATION OF TURBULENCE TYPES TO WEATHER CONDITIONS

A — Extremely unstable conditions
B — Moderately unstable conditions
C — Slightly unstable conditions
D — Neutral conditions*
E — Slightly stable conditions
F — Moderately stable conditions

| Surface wind speed, m/sec | Daytime insolation | | | Nighttime conditions | |
|---|---|---|---|---|---|
| | Strong | Moderate | Slight | Thin overcast or ≥ 4/8 cloudiness† | ≤ 3/8 cloudiness |
| <2 | A | A – B | B | | |
| 2 | A – B | B | C | E | F |
| 4 | B | B – C | C | D | E |
| 6 | C | C – D | D | D | D |
| >6 | C | D | D | D | D |

*Applicable to heavy overcast, day or night.

†The degree of cloudiness is defined as that fraction of the sky above the local apparent horizon which is covered by clouds.

REF: METEOROLOGY AND ATOMIC ENERGY - 1968

speed) and for "average" dispersion conditions (e.g., class D stability), a value of $\underline{a} = 1.5$ provides a good approximation for purposes of projecting dose rates with distance from an exclusion area boundary. Table I-2 and figure I-1 illustrate this dose rate decrease. For illustrative purposes, figure I-1 also shows the decrease for values of $\underline{a}$ equal to 1 and 2. Except for stability class A, which seldom occurs, dose rate should decrease with distance within the $1/r$ and $1/r^2$ curves in this figure, barring a significant wind shift during a release period.

For purposes of this discussion, dose vs distance extrapolations of the exclusion radius dose rate for LWR accidents are of the greatest interest. Table I-2 presents projected upper bound (no wind shift) values of 2 hour whole body and thyroid doses at various distances given a 25 rem and 300 rem dose level at an exclusion radius ($r_o$). For a site with an exclusion radius of one mile, the upper limits of the proposed EPA PAGs for plume exposures would be exceeded within 3 miles (whole body PAG) and 5 miles (thyroid PAG) of the reactor plant containment structure; the lower limits could be exceeded within 8 miles (whole body) and 15 miles (thyroid) of the reactor plant containment structure. For a site with an exclusion radius of 0.5 miles (about the median for currently licensed plants),

## TABLE I-2

UPPER BOUND PLUME EXPOSURE PATHWAY

PROJECTED DOSES BASED ON

10 CFR PART 100.11 VALUES

| $r/r_o$ | $(r/r_o)^{-1.5}$ | 0 to 2 HR DOSE LIMIT (REM) Whole Body | THYROID | ETA (hrs) |
|---|---|---|---|---|
| 1. | 1. | 25 | 300 | 0.5 |
| 1.5 | 0.54 | 14 | 162 | 0.75 |
| 2 | 0.35 | 8.8 | 105 | 1 |
| 3 | 0.19 | 4.8 | 57 | 1.5 |
| 4 | 0.13 | 3.3 | 39 | 2 |
| 5 | 0.089 | 2.2 | 27 | 2.5 |
| 6 | 0.068 | 1.7 | 20 | 3 |
| 8 | 0.044 | 1.1 | 13 | 4 |
| 10 | 0.032 | 0.8 | 9.6 | 5 |
| 15 | 0.017 | 0.43 | 5.2 | 7.5 |
| 20 | 0.011 | 0.28 | 3.3 | 10 |

NOTES: (1) Dose = Dose commitment on plume centerline.

(2) $r_o$ = Exclusion area boundary, or exclusion radius for a given site; $r/r_o$ = multiple of exclusion radius; lefthand column can be read as miles if $r_o$ = 1 mile.

(3) Presumes 100% of noble gases and 50% of radioidines in core inventory released to containment, constant volumetric leak rate from containment, "five percentile" meteorology, straight line of sight travel of the plume, and conservative dose factors for plume exposure.

(4) ETA = Estimated time of arrival of plume front based on $r_o$ = 1 mile and 2 mph wind speed. Higher wind speeds reduce travel times and calculated doses.

# DOSE FALLOFF WITH DISTANCE

(ALONG ACTUAL PLUME TRACK)

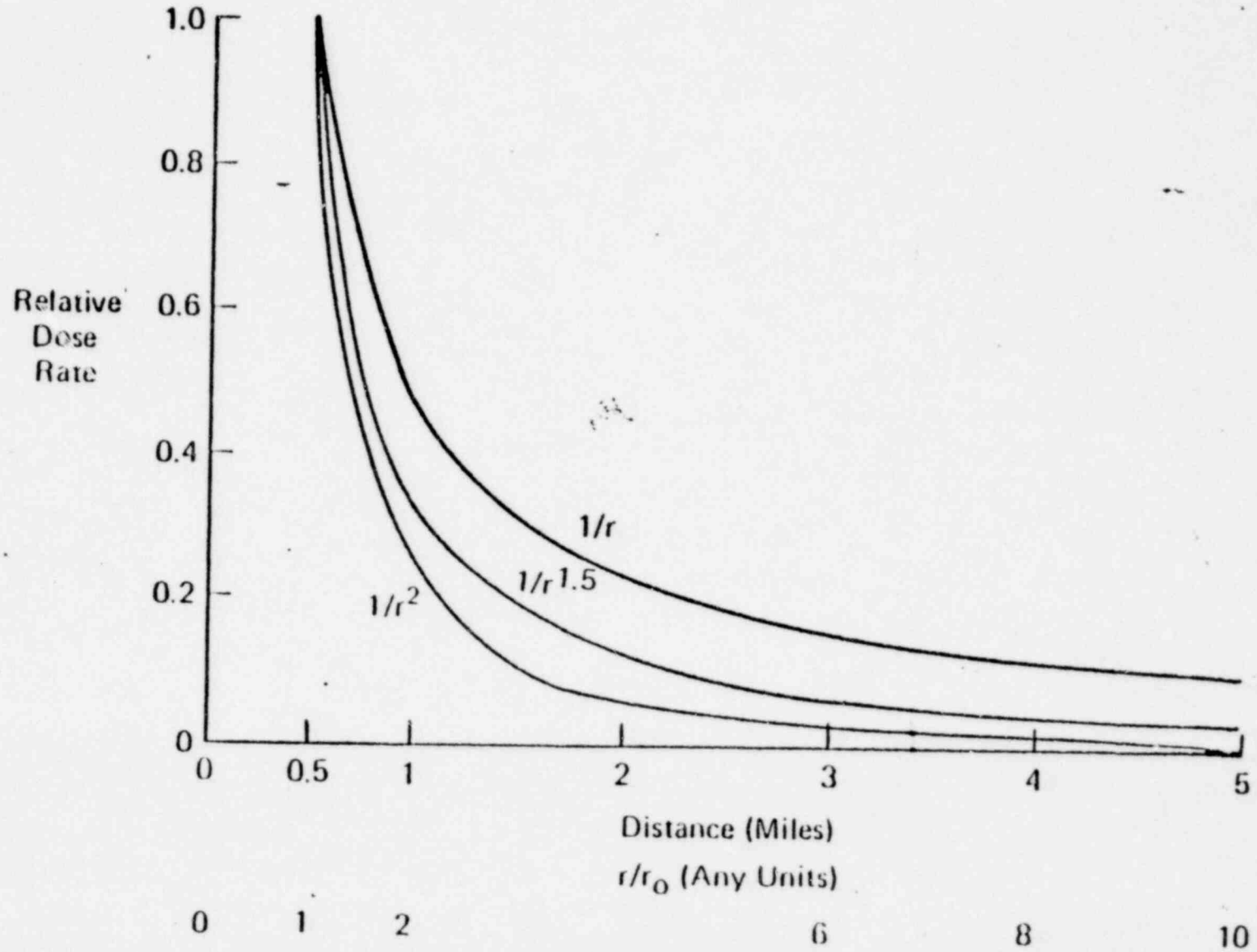



FIGURE I-1

these limits could be exceeded within half the denoted distances. Calculated course-of-accident doses could be several times larger than the above values.

A second perspective from which to peruse the data in table I-2 is that of the thyroid PAGs for the milk ingestion pathway. The ratio of thyroid dose commitment factor (related to air concentration) for the milk pathway to the inhalation (plume exposure) pathway is of the order of 300 for I-131.* From this perspective it is clear that, without a wind shift during the release period, potential dose commitments via the milk pathway could exceed the ingestion PAG for tens of miles from the reactor site for the presumed conditions, given the presence of dairy herds and pasture in the downwind direction. Clearly, wherever there is a potential to exceed a plume exposure PAG for the thyroid, there is a much greater potential to exceed the milk pathway thyroid PAG. Alternately, much lower releases of radioiodine could result in projected doses in excess of the ingestion PAG without there being a potential to exceed plume exposure PAGs.

*For a core release, I-131 activity would be about one eighth the total radioiodine activity. Initially (for a day or so) I-133 or I-135 activities would be dominant. Thus, although I-131 would dominate the projected dose commitment rate, the key early indicators for monitoring purposes would be the hard (1-2 MeV) gamma emissions from I-135.

2. Meteorological Considerations

Although actual atmospheric diffusion is unlikely to behave as simple theory would suggest, initial projections of dose during an incident would most likely be based in part on the simple, theoretical, gaussian plume model (i.e., Pasquill diffusion). Shown in figure I-2 are theoretical "widths" of gaussian shaped plumes[4] (the concentration of a pollutant at the selected width of the plume is about 1% of the center-line concentration). Travel times of plume fronts for different wind speeds are also illustrated in figure I-2. Stability class, wind speed and wind direction might be considerably different at the same time at different locations in the vicinity of a site and local topography could significantly influence wind patterns. Nevertheless, the information displayed in figure I-2 could be useful for scoping initial emergency response actions, especially for those areas within a couple of miles of a site. For example, for a wind speed of 2 miles per hour and class F stability ( corresponding roughly to the meteorological conditions assumed for the worst case (5%) design basis accident considered for purposes of containment design), a plume front would not arrive at a location two miles downwind for almost one hour. For this hypothetical case, given timely warning, and using crosswind travel, an individual could, barring any obstacles, walk out of the potentially impacted area before the plume front extends to two miles,

Three sigma half-widths of Gaussian shaped plumes vs downwind distance, for Pasquill stability classes B, D and F. Also shown are travel times of plume fronts for wind speeds of 1, 2 and 5 m/sec, and crosswind travel times for travel speeds of 2, 5 and 10 mph.

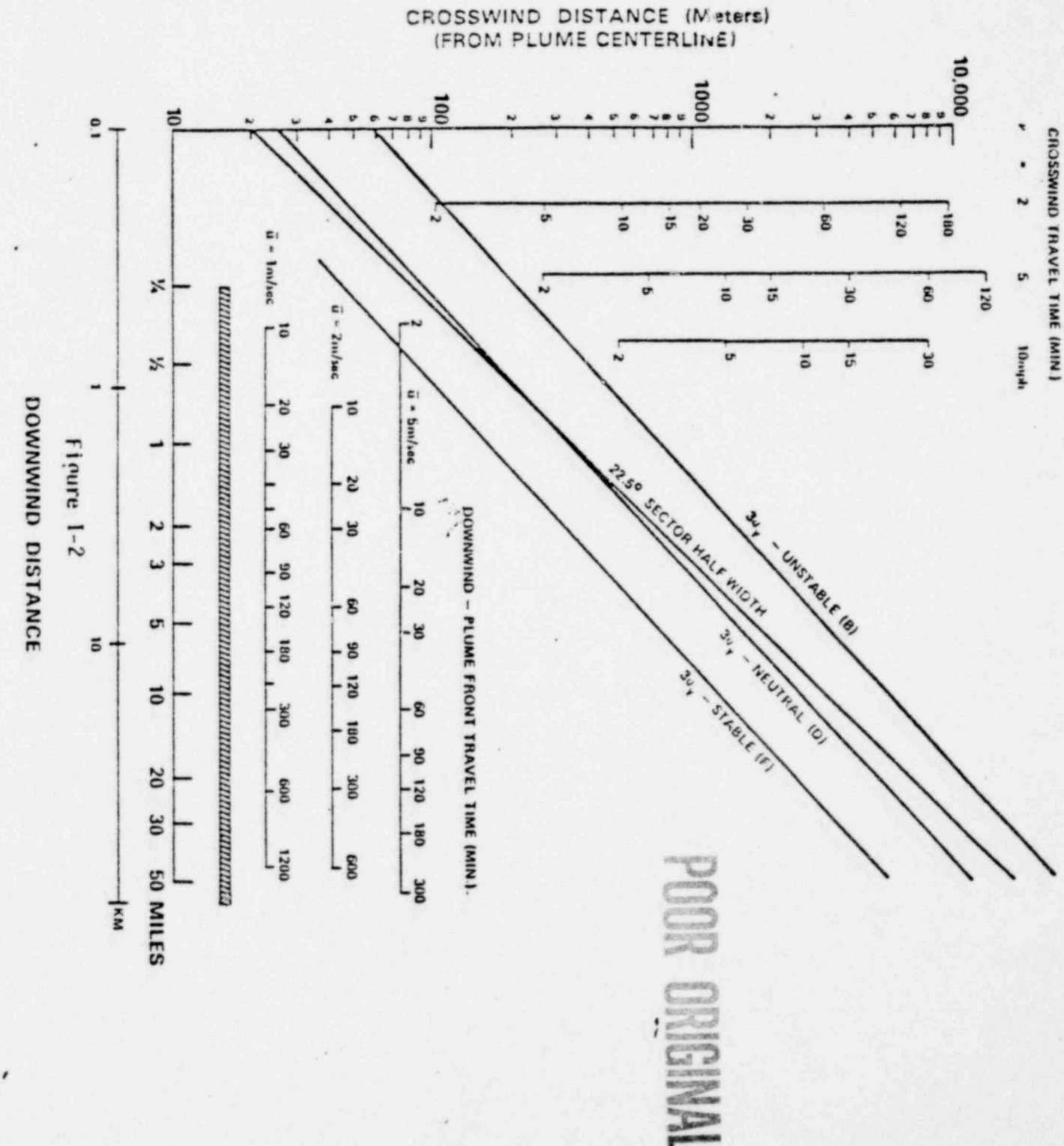



Figure 1-2

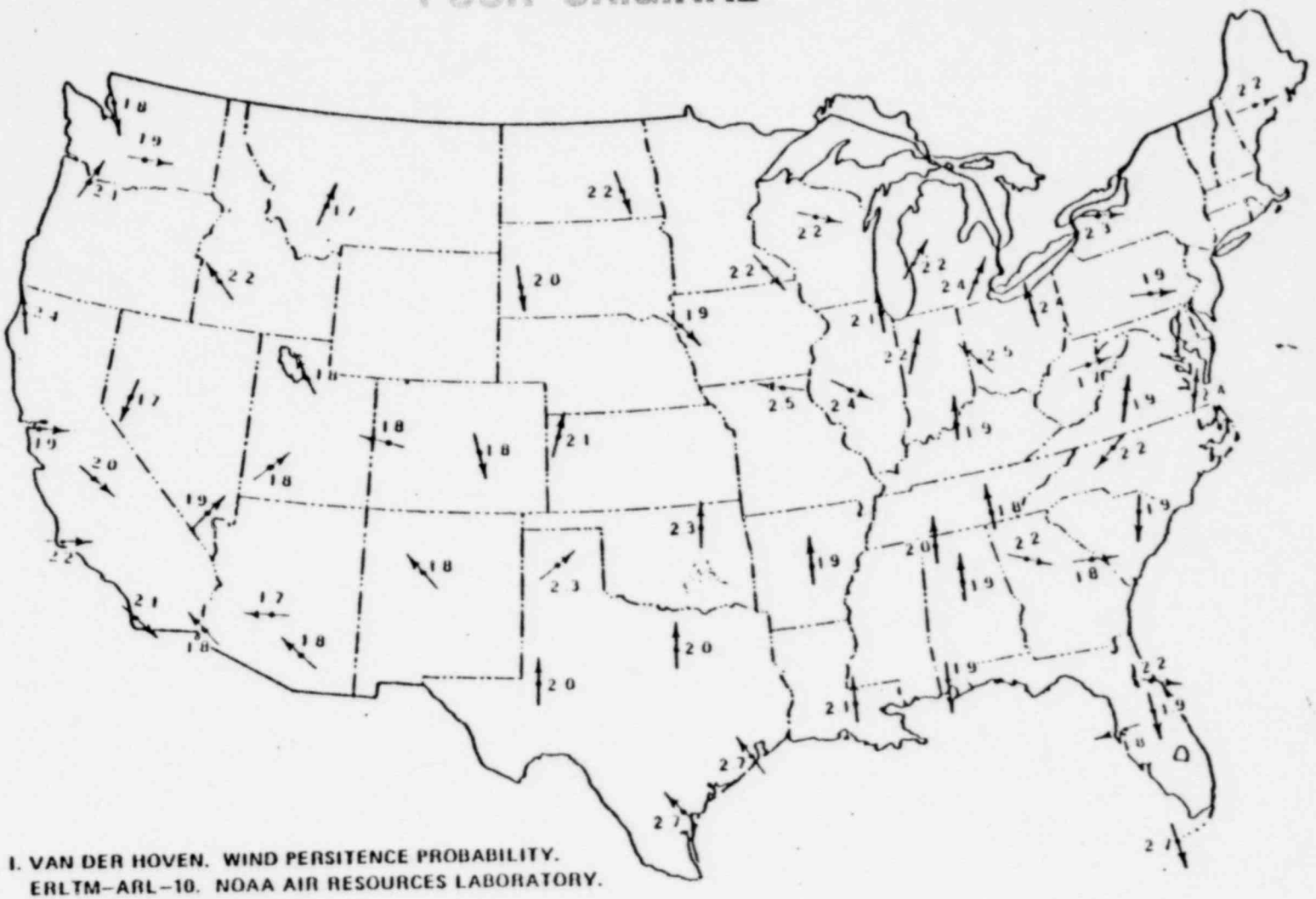
since the individual would have to travel for about six minutes to do so. Generally, higher wind speeds result in lower dose rates for a given release fraction (source term), but time of arrival of a plume front at a specific distance is shorter.



In the for going, on several occasions note was made of the possible influence of a wind shift. Clearly, upon a wind shift the plume exposure dose commitment rate of persons in the original downwind direction, due to the passage of a plume, would end, and a different population dose commitment rate would begin in the new downwind direction.

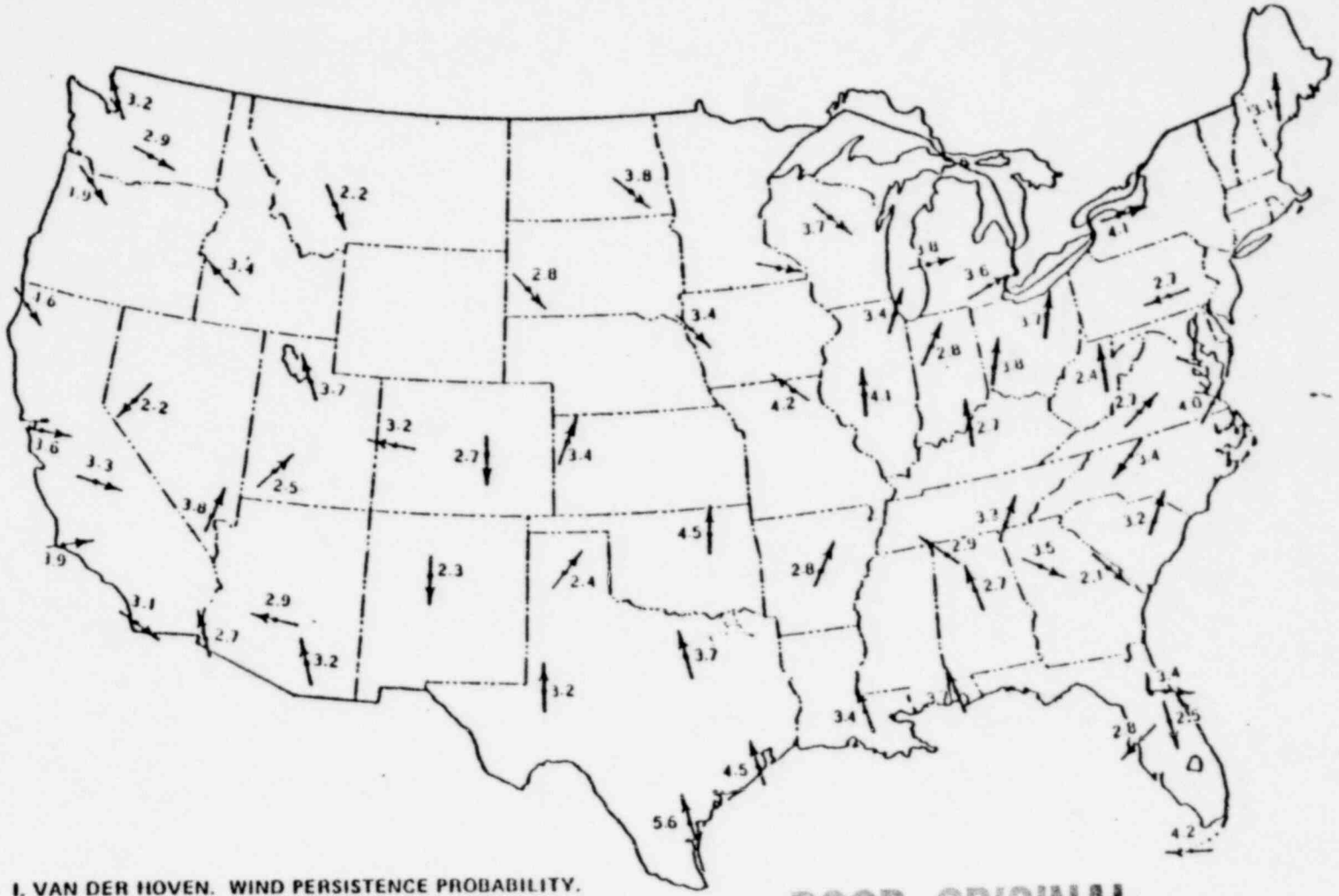
NOAA[5] has analyzed National Weather Station meteorological data across the United States and has presented results in the form of graphical displays of the probability of hours of wind persistence in $22.5^{\circ}$ and $67.5^{\circ}$ sectors (Figure I-3 and I-4). The study concludes that there is an even chance of a significant wind shift occurring in the next two to four hours at any given location in the United States. A few general observations are of import to emergency planning and/or response:

". . . the higher the wind speed, the greater is the tendency for the wind to remain in a given direction. Conversely, it is in the lowest wind speed categories of calm and 1 to 5 mph that the least direction persistence is found."




Highest 50-percent probability of hours of wind persistence in a $22\frac{1}{2}^{0}$ sector centered on the indicated direction.

Figure I-3.




REF. I. VAN DER HOVEN. WIND PERSISTENCE PROBABILITY. ERLTM-ARL-10. NOAA AIR RESOURCES LABORATORY. SILVER SPRING, MD. 20910



Highest 50-percent probability of hours of wind persistence in a $67\frac{1}{2}^{o}$ sector centered on the indicated directions.

Figure I-4.

and ". . . wind roses (frequency) that favor a particular sector will also tend to persist in that sector."

Three caveats to the meteorological discussion are worth noting. The first has to do with precipitation. Rainfall could occur either at the time of a radioactive release or some time during transport, possibly many miles away from the source of the release. Rainfall is usually a very efficient scavenger of particles in the atmosphere. Should a radioactive release to the atmosphere occur during rainfall, one should expect to find relatively greater ground deposition close to the source of the release, independent of the height of the release, than one would find during clear weather. Under rainy conditions, relatively less air and ground concentrations of radioactive material should be found at greater distances from the source of the release. On the other hand, a release could occur during dry weather yet the release could intercept a rainfall at some distance away; at this distance particles could be deposited on the earth, vegetation, structures, water, etc., very efficiently. In a strong rainfall a substantial fraction of deposited radioactive material could even be washed away. Rainfall interception could be the most important meteorological phenomena of concern for the case of a strongly elevated release, such as due to plume rise of a thermally hot release which is probable with larger accidents.

The second caveat concerns real world meteorology. As noted earlier, plumes or puffs do not normally follow straight lines, especially in low wind speed conditions. Nor do they maintain a constant windspeed and stability. Puffs can double back and return from where they came and slow down or speed up. Clearly, the track of a major radioactive release would be of great interest and concern. As illustrated in Figure 7.15 of reference (3), radiation signals well above natural background should be observed even miles away from a plume at the center of which the dose rate is as low as one rem per hour, and even less. Such plumes could be tracked using aircraft and generally available instrumentation such as Geiger counters and "cutie pies."

It is also important to realize that a substantial amount of energy could be associated with major releases. This energy will tend to lift the radioactive material off of the ground and form a cloud or plume. If this occurs, tracking of the material could be much more difficult since the wind direction can change dramatically with attitude.

3. Licensing Considerations

NRC regulation require applicants for licenses to construct and operate nuclear power facilities to make accident dose calculations. Such calculations take into consideration plant designs and site characteristics. They are based in part on the DBA-LOCA accident scenario.

1243 106

Inherent in the consequence calculations for the postulated DBA-LOCA is the presumption of "five percentile" meteorology, i.e., the presumption that atmospheric dispersion at a site

at the time of the postulated accident should be more favorable (leading to lower doses) ninety-five percent of the time. Alternately, given the postulated accident, the odds are at least twenty to one against the doses being as large as calculated for the DBA-LOCA. This "five-percentile" meteorology is derived from measurements made at the site during, or previous to, the construction period. It can nominally be characterized by class F stability and very low wind speeds (e.g., 2 miles/hour or less), i.e., the very conditions for which a wind shift is most likely. These data are presented in Chapter 2 of current Safety Analysis Reports for each nuclear power facility and are given as funcions of elapsed time and distance.

The results of the conservative licensing calculations for the DBA-LOCA vary from plant-to-plant because of plant design and variation in meteorology. For this reason a large number plants were analyzed in order to report the likely range of the conservative DBA-LOCA doses. Data from seventy safety analysis reports were collected and used for this purpose. The seventy plants consisted of 129 separate nuclear units. The resulting distribution of DBA-LOCA doses calculated for these facilities are indicative of plants that are now operating and plants that will be operating in the near future.

An example of the results of such calculations is shown in

figure I-5. As is seen in the figure, the major portion of the radioactive material will be released in the first few hours, after the accident. Fortunately, for release durations of more than a couple of hours there will be significant wind shifts and cloud meander (especially associated with the 5% to meteorological conditions postulated). Therefore, for purposes of these calculations it was assumed that the dose of any individual would be limited to that of the first two hours after the accident.

The results of the analysis are depicted in figures I-6 through I-9. Figure I-6 shows the 2 hour thyroid dose versus distance for the 50 percentile and 10 percentile cases. The 50 percentile curve is the median dose for all 129 units; thus half of the units had doses less than that indicated and the other half had greater doses. The 10 percentile curve means that 10% of the units had doses greater than that indicated. This figure also shows a rapid decrease in thyroid dose out to almost 10 miles with a leveling off at greater distances. It shows that at ten miles, the 2 hour thyroid dose would be typically about 4 rem and that in a few cases it may exceed 10 rem. Figure I-7 takes the same data but plots the dose at 10 miles against the cumulative frequency of reactor units. It can be seen that the DBA-LOCA doses were calculated to exceed the lower PAG range for only 30% of the units.

Figure I-8 and I-9 provide similar plots for the whole body

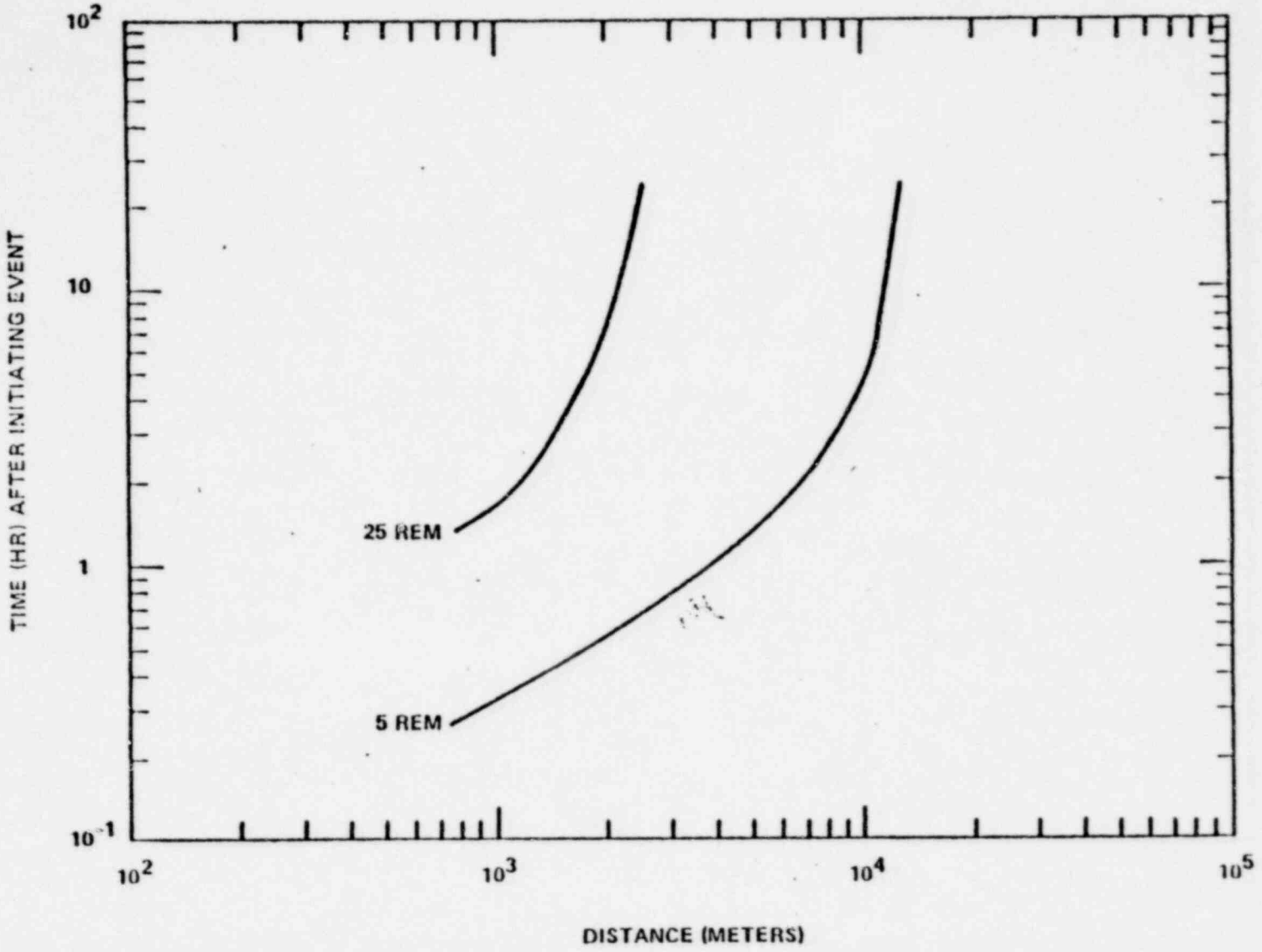



Figure I-5. Example of Time-Dose-Distance Relationships for Thyroid Inhalation Dose From DBA/LOCA (5% Meteorology and Straightline Plume Trajectory)

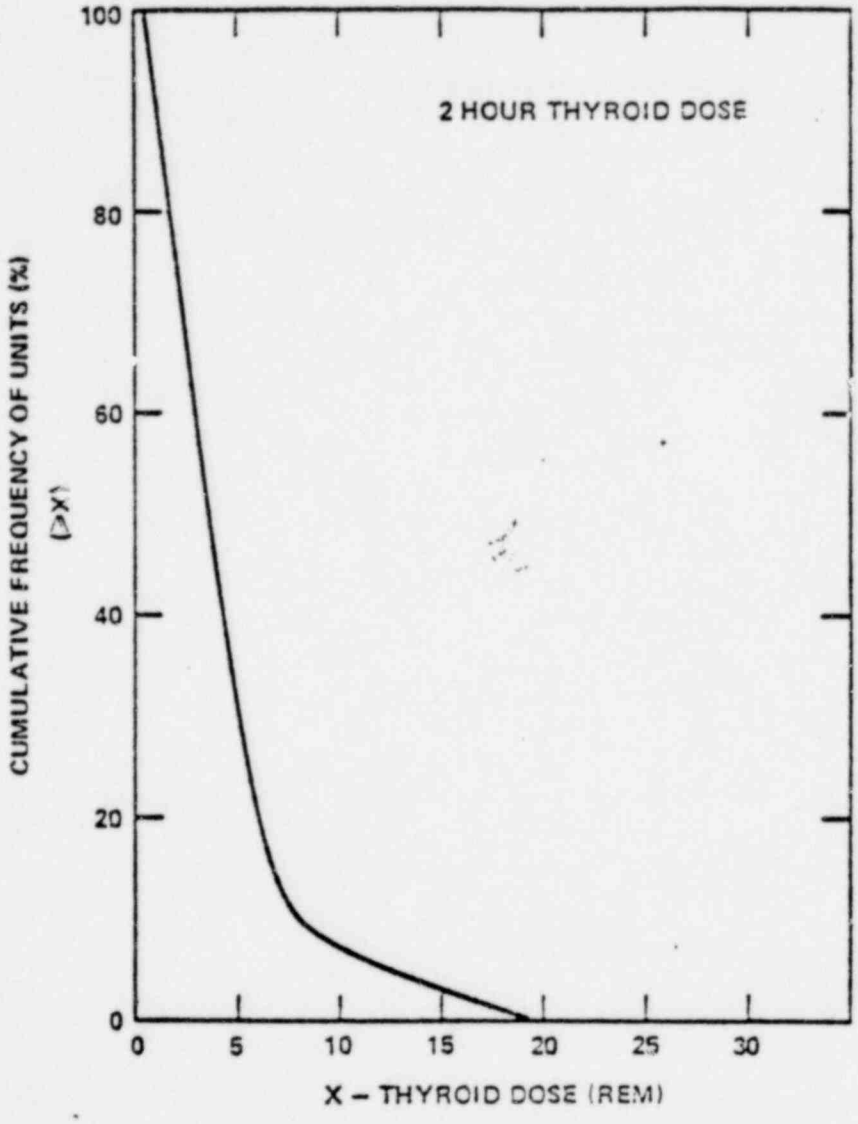



Figure I-7. Cumulative Frequency of Units Versus Dose at 10 Miles for Licensing Calculation of DBA/LOCA at 2 Hours Assuming 5 Percentile Meteorology and Straight Line Trajectory.

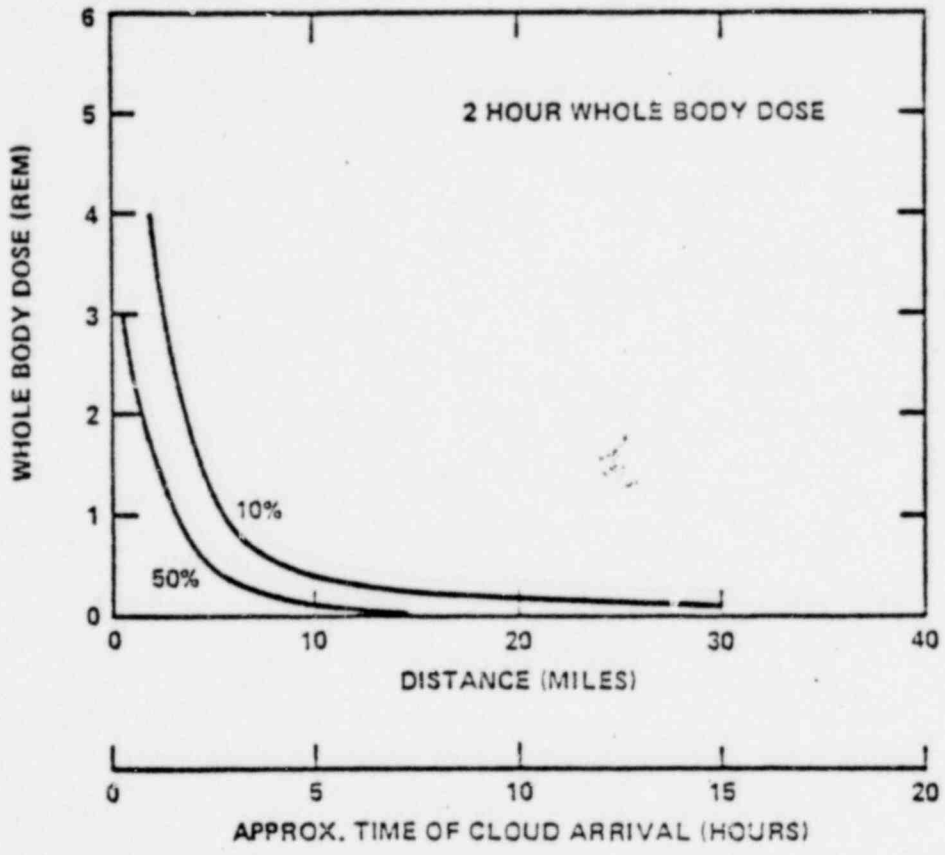



Figure I-8. Centerline Dose Versus Distance for Licensing Calculation of DBA/LOCA at 2 Hours Assuming 5 Percentile Meteorology and Straight Line Plume Trajectory.

50% Curve is Median of 67 Actual Site Calculations
10% Curve is Highest 10% of Calculations

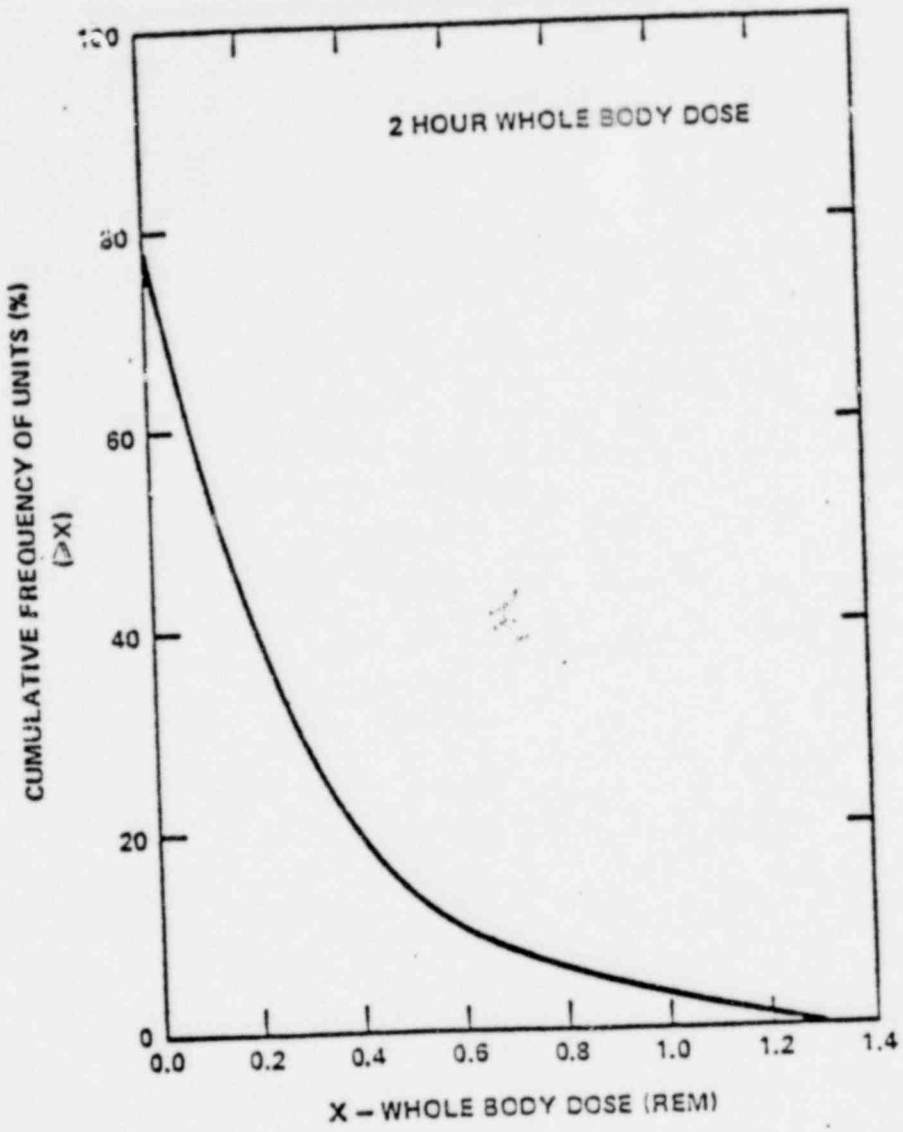



**Figure I-9.** Cumulative Frequency of Units Versus Dose at 10 Miles for Licensing Calculation of DBA/LOCA at 2 Hours Assuming 5 Percentile Meteorology and Straight Line Trajectory.

dose case. The results are similar to the thyroid case. The dose is seen to sharply decrease within 10 miles and to decrease slowly at greater distances. At 10 miles the whole body dose for the median plant was about 1/10 of a rem and very few plants had doses in excess of 1/2 rem whole body.

From these results, the Task Force concluded that about a 10 mile Emergency Planning Zone for the plume exposure pathway was justified to assure that predetermined actions would be planned in those areas where PAGs could be exceeded in the event of a release comparable to a design basis accident.

For the ingestion pathway, figure I-10 was developed showing a distance relationship of potential dose to an infant's thyroid from milk consumption. As was done for the plume exposure, conservative calculational techniques were used to attempt to bound the results of the ingestion exposure. For example, the straight line trajectory was used with no credit taken for wind shifts. All of the assumptions of the Reactor Safety Study for the calculation of thyroid dose from milk ingestion were used for this analysis. The results of Figure I-10 show that for the DBA-LOCA, ingestion doses above PAG's are unlikely to occur beyond about 50 miles from power plants.

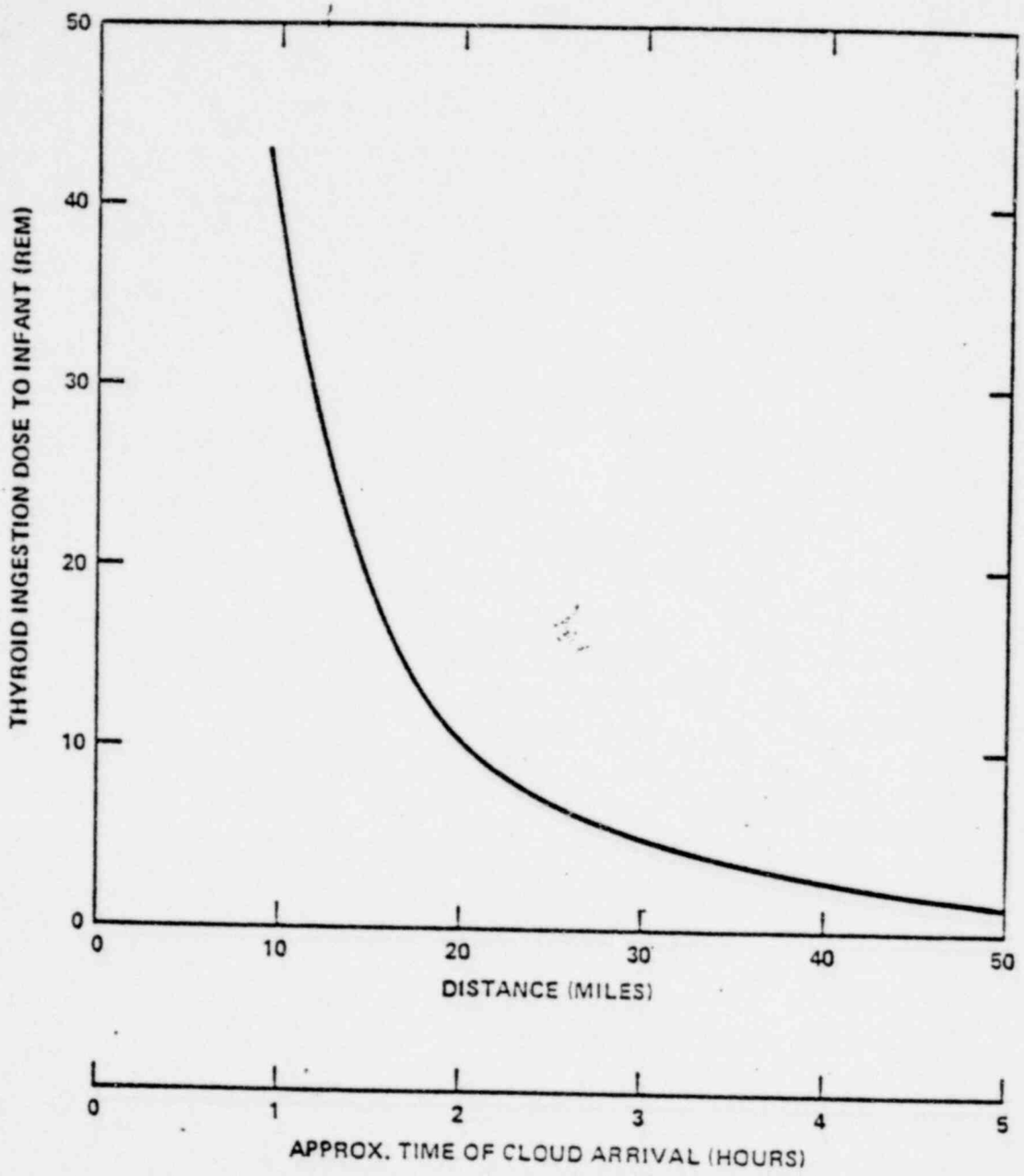



**Figure I-10.** Maximum Thyroid Dose (Milk Pathway) to Infant Versus Distance, From I-131, for DBA/LOCA Assuming Worst Possible Meteorology and Straight Line Trajectory.

E. Emergency Planning Consideration Derived from The Reactor Safety Study (WASH-1400)

The Reactor Safety Study (RSS) attempts to provide a detailed quantitative assessment of the probability and consequences of "Class 9" accidents. The study concluded that the public risk from nuclear reactor accidents was dominated by accidents in which there was substantial damage to the reactor core and that the probabilities of such accidents were very small.* Since emergency planners are encouraged to develop response plans which will be flexible enough to respond to most accident situations, some understanding of "Class 9" accidents and the relationships between them and emergency planning is needed.

The Reactor Safety Study developed the mathematical techniques and data base to provide an understanding of these relationships. To obtain an appreciation for the distances to which or areas within which emergency planning might be required, a perspective on the relative probabilities of certain critical doses as a function of distance from the power plant for these accidents

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*Probability of a "core-melt" accident was estimated to be approximately 1 in 20,000 ($5 \times 10^{-5}$) per reactor year. There is a large uncertainty on this number.

is needed. A set of such curves has been prepared for all of the RSS accident release categories (figure I-11). These curves include both Pressurized and Boiling Water Reactor (PWR & BWR) accidents. Doses are given for the critical values for which emergency planners should be concerned. One and five rem whole body doses correspond to the lower range of the PAGs; 50 rem whole body corresponds to the dosage at which early illnesses start to occur; and 200 rem whole body is the dose at which significant early injuries start to occur. As can be seen from figure I-11, core melt accidents can be severe, but the probability of large doses drops off substantially at about 10 miles from the reactor. Similar conclusions can be reached by evaluating the other critical organs of lung and thyroid shown in figures I-12 and I-13, respectively. For the lung, the doses of 5, 25, 300 and 3000 rem were plotted as a function of distance and probability of occurence. For the thyroid, the reference doses of 5, 25, 300 rem, which correspond to the lower and upper PAG levels, and the guideline exposure used for siting purposes are presented.

Given a core melt accident, there is about a 70% chance of exceeding the PAG doses at 2 miles, a 40% chance at 5 miles, and a 30% chance at 10 miles from a power plant. That is, the probability of exceeding PAG doses at 10 miles is $1.5 \times 10^{-5}$

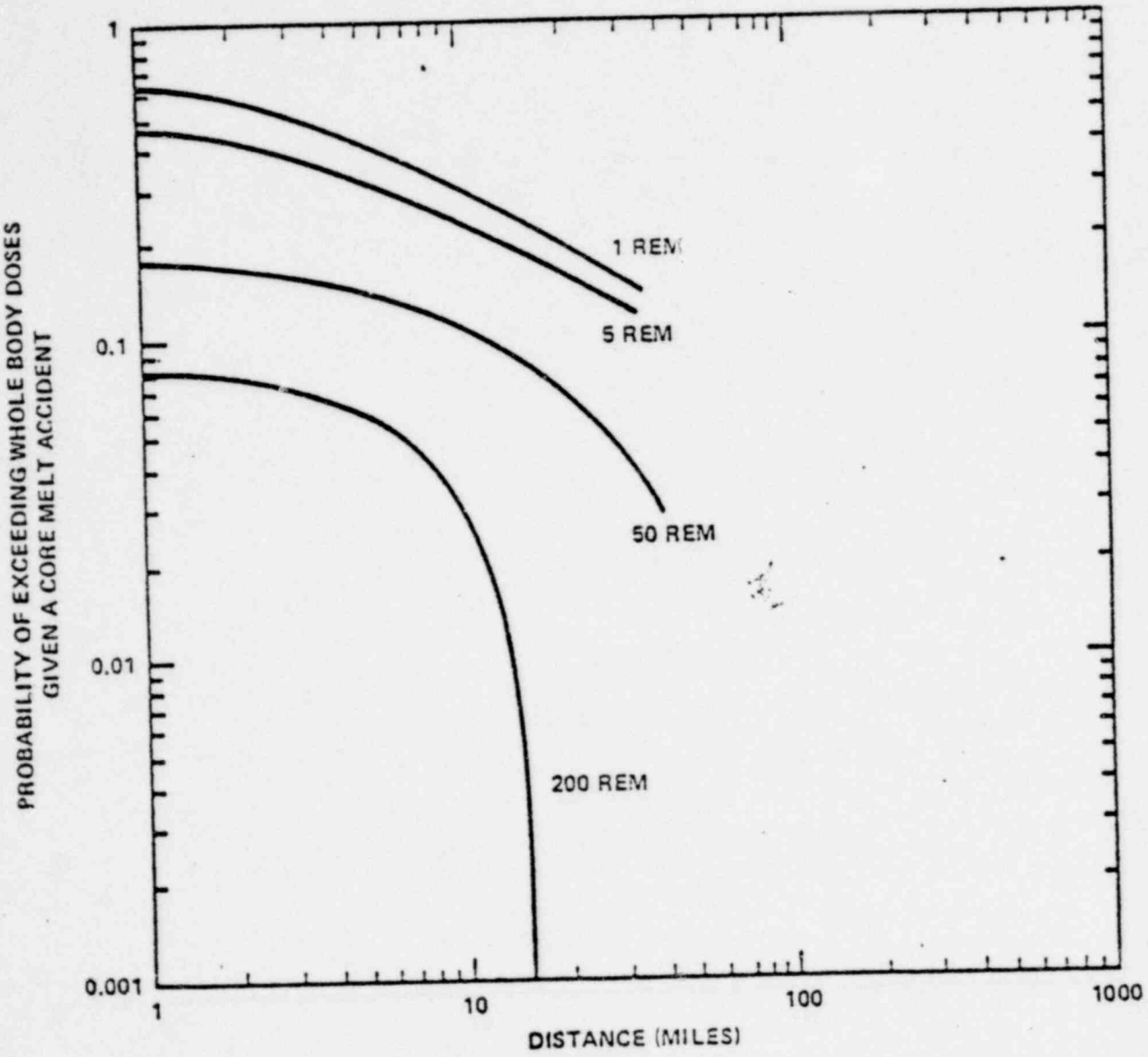


**Figure I-11.** Conditional Probability of Exceeding Whole Body Dose Versus Distance. Probabilities are Conditional on a Core Melt Accident ($5 \times 10^{-5}$).

Whole body dose calculated includes: external dose to the whole body due to the passing cloud, exposure to radionuclides on ground, and the dose to the whole body from inhaled radionuclides.

Dose calculations assumed no protective actions taken, and straight line plume trajectory.

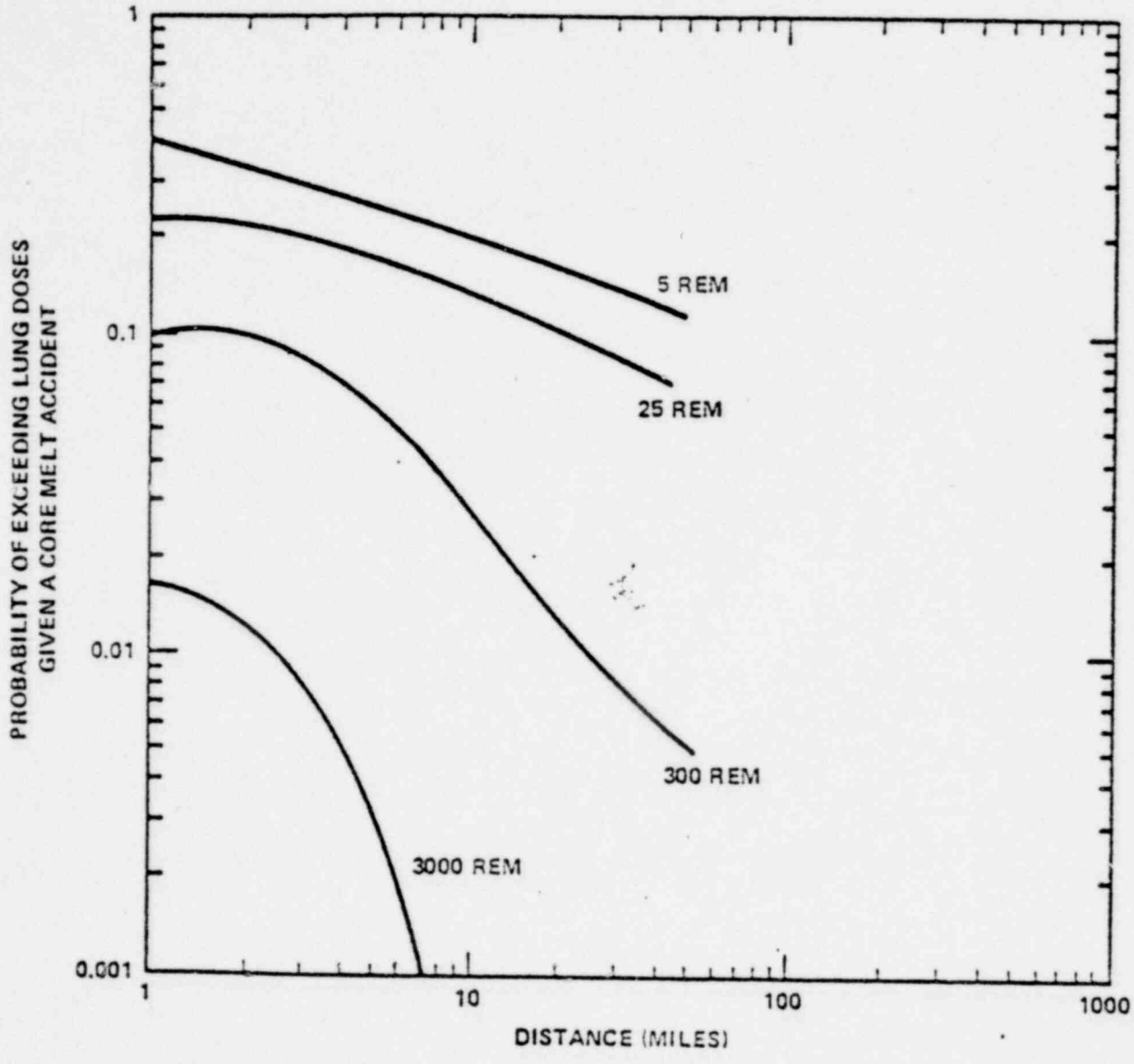


**Figure I-12.** Conditional Probability of Exceeding Lung Doses Versus Distance. Probabilities are Conditional on a Core Melt Accident ($5 \times 10^{-5}$).

Lung dose calculated includes: external dose to the lung due to the passing cloud, exposure to radionuclides on ground, and the dose to the lung from inhaled radionuclides within 1 year.

Dose calculations assumed no protective actions taken, and straight line trajectory.

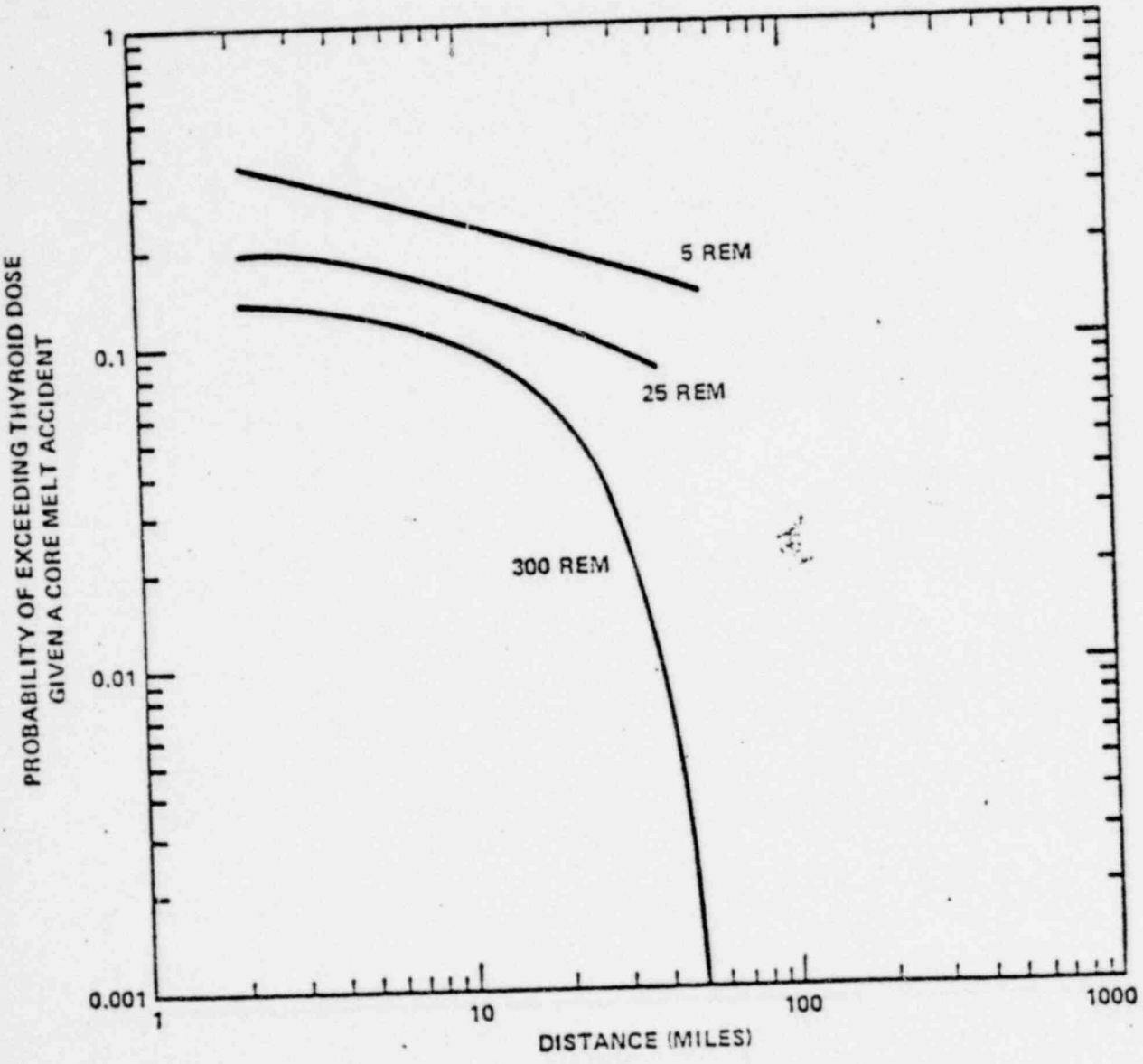


Figure I-13. Conditional Probability of Exceeding Thyroid Doses Versus Distance. Probabilities are Conditional on a Core Melt Accident ($5 \times 10^{-5}$).

Thyroid dose calculated includes: external dose to the thyroid due to the passing cloud, exposure to radionuclides on ground, and the dose to the thyroid from inhaled radionuclides.

Dose calculations assumed no protective actions taken, and straight line trajectory.

per reactor year* (one chance in 50,000 per reactor-year) from the Reactor Safety Study analysis.

Based in part upon the above information the Task Force judged that a 10 mile plume EPZ would be appropriate to deal with core melt accidents.

Potential ingestion doses to the thyroid (through the cow/milk pathway) from core melt accidents are given in figure I-14. The distance for which emergency planning is needed is not easily determined from the information given in the figure. It is evident that doses can potentially be quite high out to considerable distances.

The current PAG for milk ingestion is 30 rem thyroid to an individual and 10 rem thyroid to a suitable sample of the population (usually calculated on the basis of an infant's thyroid). Given a core melt accident, there is a near 100% chance of exceeding the 10 rem thyroid PAG from milk ingestion at 1 mile, about an 80% chance at 10 miles and a 40% chance at 25 miles from a power plant. A planning basis for milk ingestion on the order of 25 miles would therefore approximately correspond to the 10 mile plume exposure distance

*There is a large uncertainty on this number.

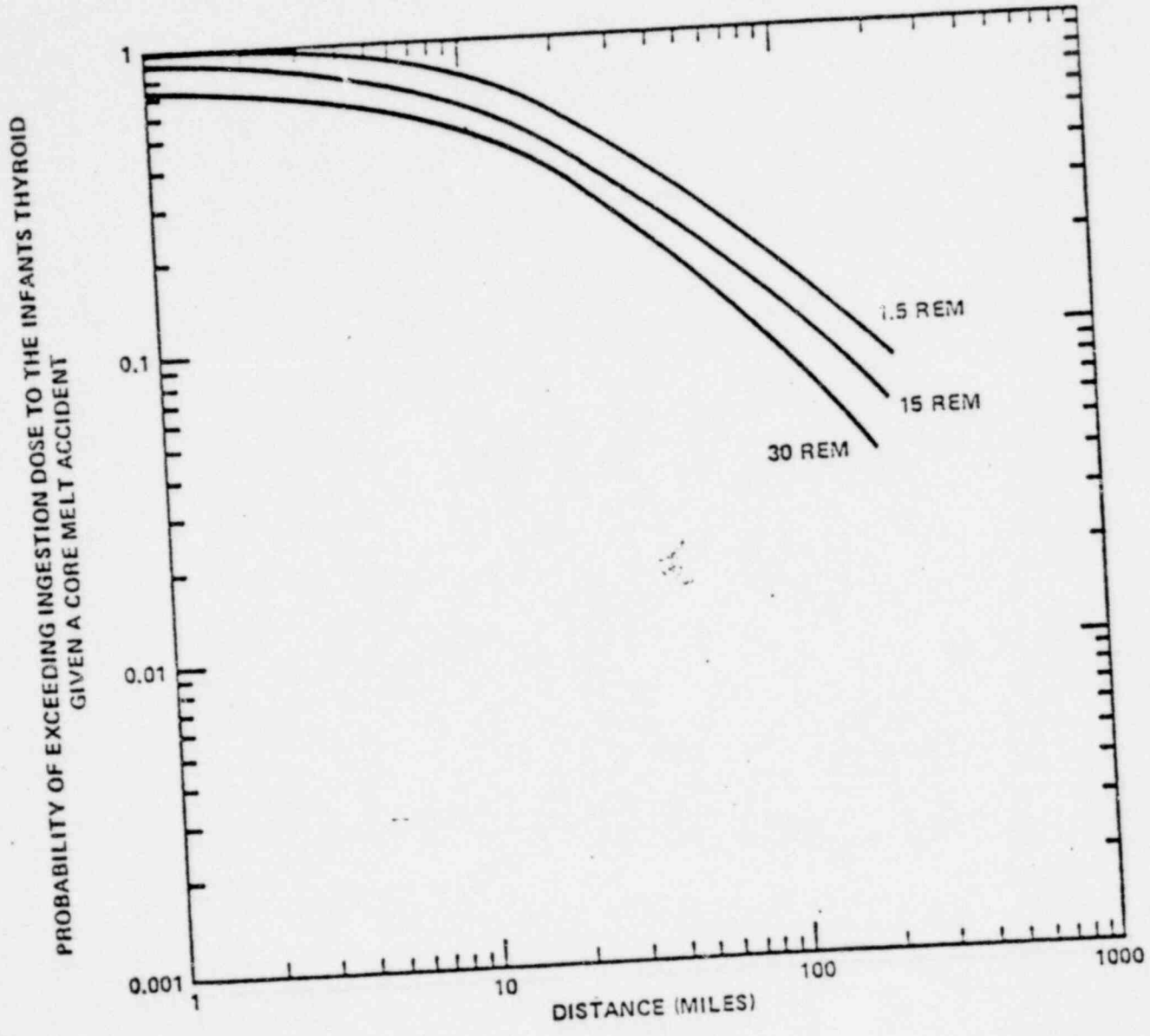


Figure I-14. Conditional Probability of Exceeding Thyroid Dose to an Infant Versus Distance. Probabilities are Conditional on a Core Melt Accident ($5 \times 10^{-3}$).

Thyroid dose calculated is due solely to radionuclide ingestion through the milk consumption pathway.

Dose calculations assumed no protective actions taken, and straight line trajectory.

if current FRC guidance were used. However, because the Task Force is aware that revision of the FRC guides may result in recommendations for certain types of preventive measures (such as putting cows on stored feed) at projected doses substantially below these levels,* the Task Force chose an ingestion pathway EPZ on the order of 50 miles.

*The recommended size of the ingestion exposure EPZ is based on an expected revision of milk pathway Protective Action Guidelines by FDA-Bureau of Radiological Health. The Task Force understands that measures such as placing dairy cows on stored feed will be recommended for projected exposure levels as low as about 1.5 rem to the infant thyroid. Should the current FRC guidelines be maintained, an EPZ of about 25 miles would be recommended by the Task Force.

F. Examination of Offsite Emergency Protective Measures for Core Melt Accidents

A recent study (6, 7) has been published which is of general use to those responsible for emergency response planning for reactor accidents in understanding the "Class 9" accident relationships and specifically the core "melt-through" and "atmospheric" accident classes. This study was undertaken to evaluate, in terms of public radiation exposure and health effects, the relative merits of possible offsite emergency protective measures for response to potential nuclear reactor accidents involving serious reactor accidents. Three types of protective measures were examined and compared: evacuation; sheltering followed by population relocation, and medical (iodine) prophylaxis. This study was based upon the Reactor Safety Study results and methodologies. The conclusions of the study not only give a perspective on the relative merits of a given protective measure, the conclusions also confirm the Task Force recommendations on the distances and times for which planning is appropriate.

Figures I-15 and I-16 give the additional perspective of the study on the probabilities and needs for emergency planning in terms of the core "melt-through" and "atmospheric" categories and a range of expected emergency actions. Figure I-15 shows the probabilities of exceeding thyroid and whole body PAGs versus distance from the reactor, conditional on the occurrence of a "melt-through" release. The probabilities are calculated for an individual located outdoors, and are presented for both lower and upper PAG levels for each organ. A similar curve is shown in figure I-16 for the "atmospheric" releases.

The figure indicates that both whole body and thyroid PAGs are likely to be exceeded at very large distances* from the reactor (and correspondingly over very large areas) if an "atmospheric" accident were to occur. Doses in excess of threshold levels for early health effects are confined to smaller areas much closer to the reactor. Therefore, in the unlikely event that an accident of this magnitude were to occur, responsible authorities might choose to direct their available

*Caution must be used in interpreting the large distances indicated. The RSS consequence model assumes an invariant wind direction following the release of radioactive material. However, because of the time required by the cloud to travel large distances, it is likely that the wind directions will, in fact, shift and that the predicted dose levels would not be observed at the reported radial distance. Rather, the distance applies more closely to the trajectory of the released cloud.

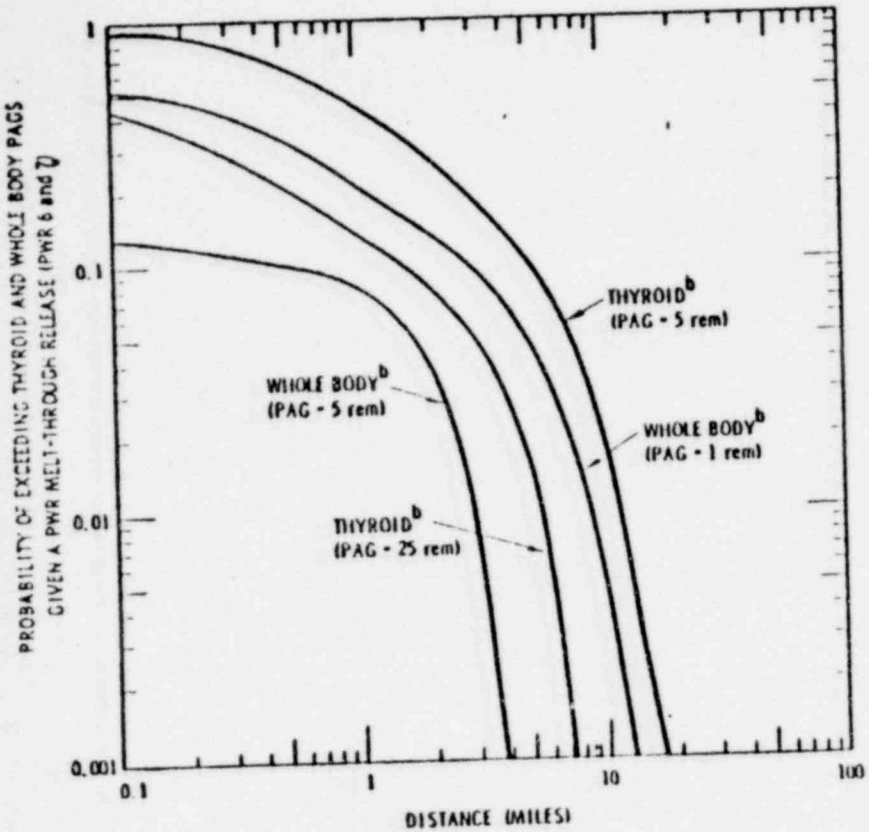


**Figure I-15.** Conditional Probability of Exceeding Thyroid and Whole Body Protective Action Guides (PAGs) Versus Distance for an Individual Located Outdoors.[a] Probabilities are Conditional on a PWR "Melt-Through" Release (PWR 6 and 7).

[a]Shielding factor for airborne radionuclides = 1.0. Shielding factor for radionuclides deposited on ground = 0.7. 1-day exposure to radionuclides on ground.

[b]Whole body (thyroid) dose calculated includes: external dose to the whole body (thyroid) due to the passing cloud and 1-day exposure to radionuclides on ground, and the dose to the whole body (thyroid) from inhaled radionuclides within 1 year.

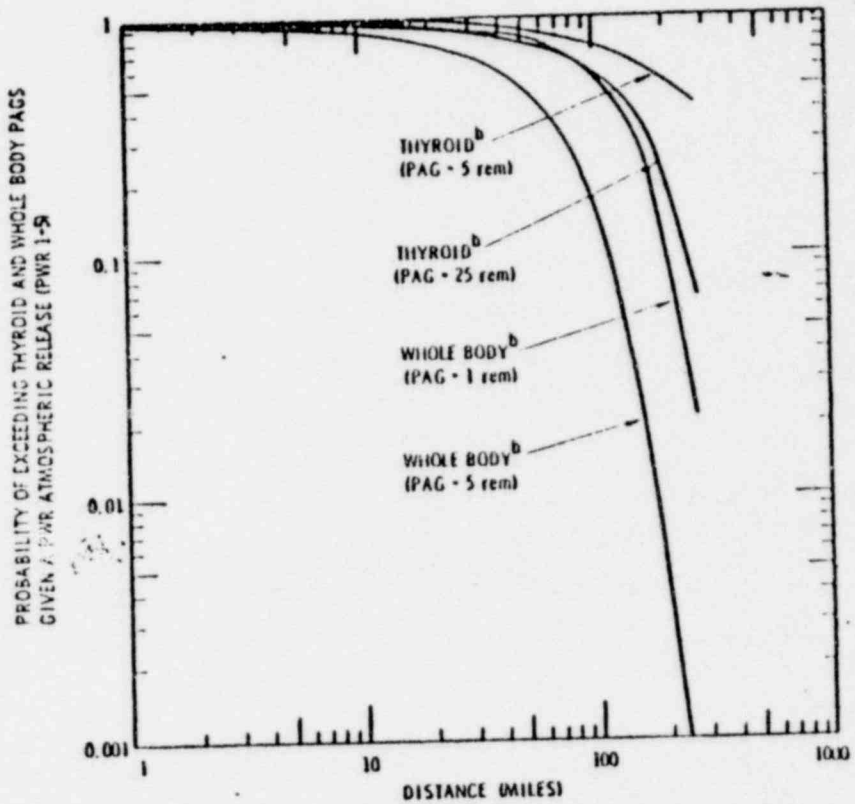


**Figure I-16.** Conditional Probability of Exceeding Thyroid and Whole Body Protective Action Guides (PAGs) Versus Distance for an Individual Located Outdoors.[a] Probabilities are Conditional on a PWR "Atmospheric" Release (PWR 1-5).

[a]Shielding factor for airborne radionuclides = 1.0. Shielding factor for radionuclides deposited on ground = 0.7. 1-day exposure to radionuclides on ground.

[b]Whole body (thyroid) dose calculated includes: external dose to the whole body (thyroid) due to the passing cloud and 1-day exposure to radionuclides on ground, and the dose to the whole body (thyroid) from inhaled radionuclides within 1 year.

resources towards limiting the life- and injury-threatening doses to individuals in those closer areas. Then, if sufficient resources are available, protective measures might also be implemented for individuals at larger distances for whom PAGs are, or are likely to be, exceeded.

Mean** numbers of projected early fatalities and injuries within selected radial intervals, conditional on an "atmospheric" release, are compared for evacuation and sheltering strategies in figures I-17 and I-18. Seven strategies are included, as defined in the key to these figures. Strategy 1 assumes that no immediate protective actions are taken. 2, 3, and 4 are selected sheltering strategies. Strategies 3 and 4 represent sheltering for regions in which a large fraction of homes have basements. Effective exposure durations to ground contamination for these two strategies are 1 day and 6 hours, respectively. Strategy 2 represents sheltering for regions in which most homes do not have basements, with 6 hours of effective exposure to ground contamination. Strategies 5, 6, and 7 represent evacuation with 5, 3 and 1 hours of delay time, respectively. The results presented in figures I-17 and I-18 assume a uniform population density of 100 people per square mile. The corresponding

** The mean refers to the average of 91 stratified weather sequences which were used to calculate a frequency distribution of early public health effects.

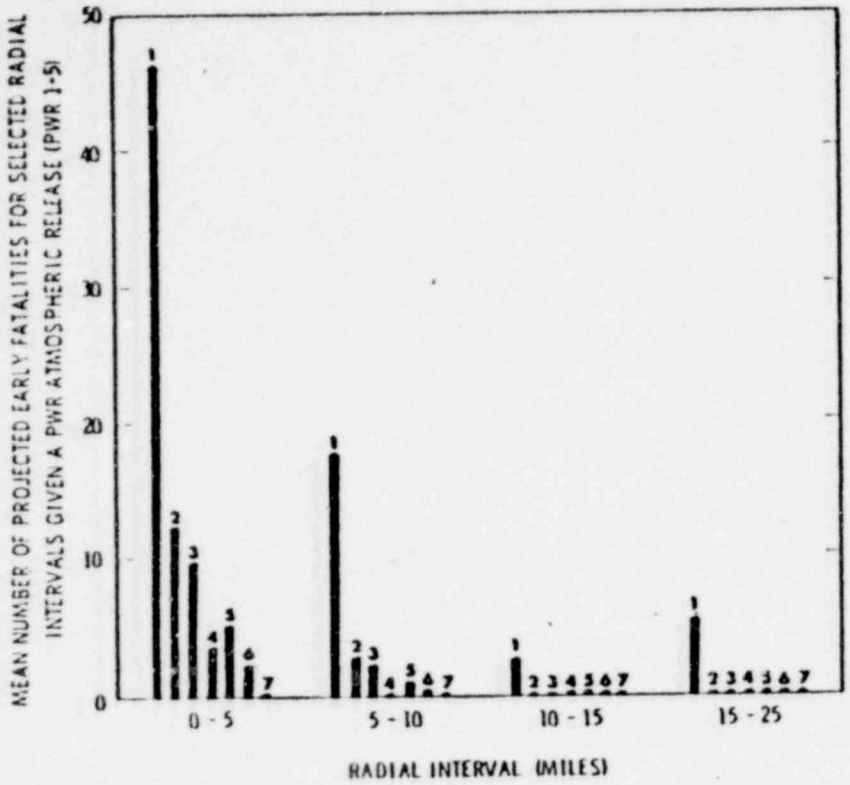


**Figure I-17.** Mean Number of Projected Early Fatalities Within Selected Radial Intervals for Evacuation and Sheltering Strategies, Given a PWR "Atmospheric" Release (PWR 1-5). A Uniform Population Density of 100 Persons per Square Mile is Assumed.

Key:
1. No immediate protective action, SF's[a] (0.75, 0.11),[b] 1-day exposure to radionuclides on ground.
2. Sheltering, SF's (0.75, 0.11), 4-hour exposure to radionuclides on ground.
3. Sheltering, SF's (0.5, 0.08), 1-day exposure to radionuclides on ground.
4. Sheltering, SF's (0.5, 0.08), 4-hour exposure to radionuclides on ground.
5. Evacuation, 5 hour delay time, 10 MPH.
6. Evacuation, 3 hour delay time, 10 MPH.
7. Evacuation, 1 hour delay time, 10 MPH.

[a] Shielding factors (airborne radionuclides, ground contamination).

[b] Shielding factors for no protective action were chosen to be the same as for sheltering in areas where most homes do not have basements (see reference 6).

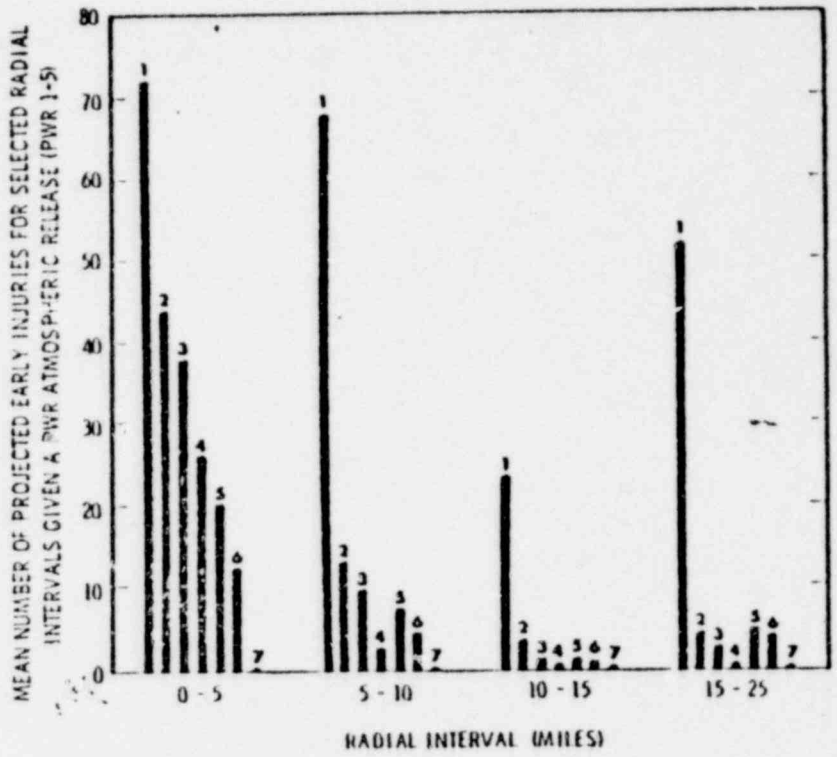


**Figure I-18.** Mean Number of Projected Early Injuries Within Selected Radial Intervals for Evacuation and Sheltering Strategies, Given a PWR "Atmospheric" Release (PWR 1-5). A Uniform Population Density of 100 Persons per Square Mile is Assumed.

Key:
1. No immediate protective action, SF's[a] (0.75, 0.11),[b] 1-day exposure to radionuclides on ground.
2. Sheltering, SF's (0.75, 0.11), 4-hour exposure to radionuclides on ground.
3. Sheltering, SF's (0.5, 0.08), 1-day exposure to radionuclides on ground.
4. Sheltering, SF's (0.5, 0.08), 4-hour exposure to radionuclides on ground.
5. Evacuation, 5 hour delay time, 10 MPH.
6. Evacuation, 3 hour delay time, 10 MPH.
7. Evacuation, 1 hour delay time, 10 MPH.

[a] Shielding factors (airborne radionuclides, ground contamination).

[b] Shielding factors for no protective action were chosen to be the same as for sheltering in areas where most homes do not have basements (see reference 6).

number of projected early fatalities and injuries for any particular site would depend on the actual population distribution surrounding the site. Nevertheless, the relative comparison of numbers for the strategies indicated is nearly independent of the population distribution within a given interval.

Several observations can be drawn from the results presented in figures I-17 and I-18. Most early fatalities resulting from "atmospheric" accidents are projected to occur within approximately 10 miles of the reactor, while early injuries are likely out to somewhat larger distances.* Within 5 miles of the reactor, evacuation appears to be more effective in reducing the number of early health effects than sheltering, as long as the delay time and nonparticipating segment of the population are kept sufficiently small. This distinction is not as apparent in the 5 to 10 mile interval. Throughout both of the intervals from 0 to 10 miles, the importance of a rapid and efficient implementation of either evacuation or sheltering is evident (small delay times for evacuation, small ground exposure times for sheltering).

*Projected early fatalities and injuries in the 15 to 25 mile interval are higher than for the 10-15 mile interval because the interval is twice as wide.

Note that evacuation (i.e., removal of population from hazardous area) with delay times of 1 hour or less will reduce the projected number early public health effects to roughly 0 in any radial interval, and will always be the most effective response measure for a severe accident, if it can be achieved. In the intervals beyond 10 miles, there is little apparent distinction between the effectiveness of evacuation and sheltering strategies in terms of projected early fatalities or injuries. The mean number of early fatalities is 0 in both of these intervals, and projected early injuries, although not 0, are greatly reduced for each of the protective strategies investigated.

Several important conclusions about the relative effectiveness of the protective measures examined, the distances to which or areas within which they might be required, and the time available for their implementation, were drawn by the study from the results provided by these analyses. For the "melt-through" class, projected whole body and thyroid doses in excess of PAGs for those organs are, for all practical purposes, confined to areas within 10 miles of the reactor. Emergency response planning for this type of accident should therefore be primarily directed towards limiting the dose to those individuals located within that distance. Evacuation appears to provide the greatest benefit of any protective measure.

However, sheltering, particularly in areas where most homes have basements, also offers substantial benefit, and may in many cases offer an acceptable alternative to evacuation. Iodine prophylaxis, if administered in sufficient time, could also offer substantial reduction in the projected dose to the thyroid.

"Atmospheric" accidents could result in the occurrence of significant numbers of early fatalities and injuries. However, doses in excess of threshold levels for significant early health effects (about 200 rem whole body) are generally confined to areas much closer to the reactor. Therefore, given an "atmospheric" accident, responsible authorities should concentrate their immediately available resources on limiting the life- and injury-threatening doses to individuals in those closer areas.* Within 5 miles of the reactor, evacuation appears to be more effective than sheltering in reducing the number of early health effects, as long as the delay time and nonparticipating fraction of the population can be kept sufficiently small. Between 5 and 10 miles, this distinction is not as apparent, and sheltering in areas where basements are widely available (followed by rapid relocation) may be as effective as evacuation with relatively small delay times. For all affected

*Then, when time permits, protective measures might be implemented for individuals at larger distances for whom PAGs are, or are likely to be, exceeded.

areas within approximately 10 miles of the reactor, the speed and efficiency with which either evacuation or sheltering and relocation are implemented strongly influence the number of projected early health effects. For areas beyond 10 miles, there is little apparent distinction between the effectiveness of evacuation and sheltering strategies in terms of projected early fatalities or injuries. Therefore, although protective actions may be required for individuals located in areas further than 10 miles from the reactor for an "atmospheric" release, the actual measures used and how rapidly or efficiently they are implemented, will not strongly influence the number of projected early health effects.

## REFERENCES FOR APPENDIX I

(1) D. Bunch, K. Murphy and J. Reyes. Demographic Statistics Pertaining to Nuclear Power Reactor Sites. (Draft) NUREG-0348. USNRC Washington, D. C. 20555 Dec. 1977

(2) D. Bruce Turner. Workbook of Atmospheric Dispersion Estimates. AP-26. USEPA Office of Air Programs, Research Triangle Park, NC 27711. 1970 Revision.

(3) USAEC. Meteorology and Atomic Energy - 1968. D. Slade, ed TID-24190. National Technical Information Service, Springfield, Va. 22151

(4) J. A. Martin, Jr. Doses While Traveling Under Well Established Plumes. Health Physics Jr. V. 32, n.4, pp. 305-307, April 1977.

(5) I. Van der Hoven. Wind Persistence Probability. ERLTM-ARL-10. NOAA Air Resources Laboratory, Silver Spring, MD 20910

(6) Aldrich, D. C., Examination of Offsite Radiological Emergency Protective Measures For Nuclear Reactor Accidents Involving Core Melt, MIT, Department of Nuclear Engineering, March, 1978.

(7) Aldrich, D. C., et al, "Examination of Offsite Emergency Protective Measures For Core Melt Accidents," American Nuclear Society Topical Meeting, Newport Beach, Ca., May, 1978.

# APPENDIX II

## BACKGROUND CONCERNING THIS REPORT

The commercial nuclear power industry has expanded greatly in the last several years and is expected to grow even larger in the years ahead as more plants go into operation. The industry to date has had an excellent safety record. The Federal government recognizes this excellent safety record and the efforts by the nuclear industry to continue to reduce even further the likelihood of accidents. It also recognizes, however, that the probability of an accident involving a significant release of radioactive material, although small, is not zero. It has been and continues to be Federal policy to adopt a cautious attitude with respect to the potential of these facilities for the release of radioactive materials in hazardous quantities. Such emergency situations are the focus of attention of Federal radiological emergency preparedness activities.

### A. NRC Reactor Siting and Emergency Planning Regulations

The U. S. NRC, as the agency with the principal regulatory authority for the construction and operation of nuclear power plants, has long recognized that emergencies could arise in the operation of such plants. One of its regulations, Reactor Site Criteria (10 CFR Part 100 published in 1962[1]) states that a capability for taking protective measures on behalf of the public in the event of a serious

accident should be established within a region called the low population zone (LPZ) surrounding a nuclear power plant site. Whether a specific number of people can, for example, be evacuated from a specific area, or instructed to take shelter, on a timely basis will depend on many factors such as: egress routes, availability of sheltering, the scope and extent of advance planning, and the actual distribution of residents within the area.

In 1970, explicit requirements for plans to cope with emergencies were published in 10 CFR 50, Appendix E. In accordance with provisions of the Atomic Energy Act of 1954, these requirements are directed to applicants who apply for licenses to operate these facilities rather than to State or local governments. With respect to a planning basis, NRC regulations in 10 CFR 50, Appendix E, do not provide explicit guidance as to the character or magnitude of accidental releases to the environment which should be considered in the development of nuclear facility or State and local government emergency plans. The Appendix E regulations also do not include any explicit references to the low population zone or other particular geographical areas other than "within and outside the site boundary". They do, however, require that applicants for construction permits for these facilities provide sufficient

information to "assure compatibility of proposed (facility) 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".

Neither the NRC nor the other Federal agencies have statutory authority over State and local governments with respect to emergency planning related to nuclear facilities. In the regulation of nuclear power plants, however, NRC requires licensees to develop an emergency response plan which contains provisions for the protection of the public. The implementation of any protective actions offsite, however, is necessarily the responsibility of offsite organizations. The NRC requires that the licensee develop procedures for notifying local, State and Federal agencies. NRC also requires that licensees' emergency plans contain agreements reached with local, State and Federal agencies which provide for the early warning of the public and the implementation of any appropriate protective actions.

B. Federal Guidance Effort

The legal authority and responsibility of local, State and Federal governments for offsite response was recognized when 10 CFR 50, Appendix E was published. NRC regulations require licensees to

corporate provisions for participation by offsite authorities organizations whose assistance may be required in the event of radiological emergency in periodic drills to test response plans. the NRC staff gained experience with these requirements, it came concerned with the abilities of State and local governments discharge their responsibilities should the need ever arise. his concern in part gave rise to a Federal Register Notice(2) hich started an Interagency program for providing radiological mergency response planning guidance and related training to tate and local government organizations. NRC exercises the ead role in this activity and several Federal Agencies, including PA, participate. Guidance has been published by NRC, EPA and other ederal agencies for use by State and local governments in developing adiological emergency response plans.

It has been Federal policy to encourage planning for a variety of radiological consequence situations "within and outside the site boundary" and the Task Force reemphasizes the necessity for emergency planners to consider a wide spectrum of situations. Existing Federal guidance documents are constructive in this regard. But these documents are not sufficiently definitive as evidenced by the continuing dialogue among Federal, State and

local agencies and licensees on this subject. Existing Federal guidance which bears on the basis for developing offsite emergency plans is summarized below.

1. 1970 - "The licensee should give particular attention to protective measures that may be necessary for individuals within the low population zone ..."(3)

2. 1974 - The NRC staff's acceptance criteria for preliminary planning at Preliminary Safety Analysis Report (PSAR) review stage refers to a basis of "calculated radiological dose consequences of an airborne release following the most serious design basis accident."(4)

3. 1974 - The NRC's principal guidance document(5) for State and local government emergency planners contains the following under an introductory heading of "Magnitude of the Accident:" "The evaluation of sites and plant designs, required testing programs, and quality assurance for the operation of such facilities all provide substantial assurance that accidents with serious consequences to the public health and safety are not likely to occur. Nevertheless, highly unlikely sequences of events are postulated and their potential consequences analyzed by the applicant in the Safety Analysis Report ~~which accompanies each application and by the (NRC)~~

staff in its Safety Evaluation Report for each plant. The (NRC) considers that it is reasonable, for purposes of emergency planning relative to nuclear facilities, to prepare for the potential consequences of accidents of severity up to and including the most serious design basis accident analyzed for siting purposes."

..."The (NRC) recognizes that accidents with more severe potential consequences than design basis accidents can be hypothesized. However, the probability of such accidents is exceedingly low. Emergency plans properly designed to cope with design basis accidents would also provide significant protection against more severe accidents, since such plans provide for all of the major elements and functions of emergency preparedness. An added element of confidence can be gained, however, if States and local governments assure that their plans for responding to radiological emergencies are coordinated with their plans for dealing with floods, earthquakes, or other disaster situations which might necessitate large scale displacement of people and the provision of shelter, food, medical aid, and other emergency services. Communications, traffic control, evacuation, public notification and other emergency responses will tend to be

the same whether or not the emergency involves radiological considerations. The (Department of Energy's) Radiological Assistance Program (RAP), the Federal Interagency Radiological Assistance Plan (IRAP), and other Radiological Emergency Assistance Plans, which are a part of the Federal capability, provide significant additional emergency resources in the event of a serious accident."

This introductory text in the "Guide and Checklist"(5) document was written for the express purpose of providing interpretive guidance to the meaning of the enumerated checklist elements in this document.

4. 1975 - With respect to evacuation as a protective measure, applicants are requested to provide "plots showing projected ground-level doses for stationary individuals, -- resulting from the most serious design basis accident analyzed in the Safety Analysis Report. These should be based on the same isotopic release rates to the atmosphere and the same dispersion model as are acceptable for use in Chapter 15 of the PSAR for the purpose of showing conformance to the siting dose criteria of 10 CFR Part 100."(6)

5. 1975 - With respect to the levels at which emergency actions should be initiated, EPA issued as Agency guidance, portions of the "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents" which provided PAGs for plume exposure and application procedures for these PAGs.(7) These bear on the areas or distances for which plans might be implemented.

6. 1977 - "Planning and implementation of measures to cope with plant related emergencies outside the site boundary with particular emphasis on the low population zone should be a coordinated effort involving the licensee, and local, State, and Federal agencies having emergency responsibilities."(8)

C. Reactor Accident Considerations

Current NRC regulatory practice requires that events which may be anticipated to occur one or more times during the lifetime of a facility lead to no significant releases of radioactive material to the environment. No design or mode of operation is, however, entirely risk free. Despite the efforts made to prevent accidental releases of significant quantities of radioactive material, the possibility does in fact exist that such accidents may occur. Each application for a license is accompanied by a detailed assessment

of such postulated accidents, and NRC staff performs an independent evaluation of these accidents before a nuclear facility license is granted.

The NRC staff has provided guidance to applicants as to the type of accidents to be considered in the design of nuclear power plants (see for example, Sections 2.3 and 15 of Regulatory Guide 1.70[9] and particularly Table 15-1 of that guide). The recommended approach by the NRC staff is to organize the postulated accidents to ensure that a broad spectrum of events have been considered and then to categorize the events by type and expected frequency so that only the limiting (i.e., more severe) cases in each group need to be quantitatively analyzed.

NRC staff has categorized postulated accidents into four major groups as follows:

1. Events of moderate frequency (anticipated operational occurrences) leading to no significant radioactive releases from the facility.

2. Events of low probability with potential for small radioactive release from the facility.

5. 1975 - With respect to the levels at which emergency actions should be initiated, EPA issued as Agency guidance, portions of the "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents" which provided PAGs for plume exposure and application procedures for these PAGs.(7) These bear on the areas or distances for which plans might be implemented.

6. 1977 - "Planning and implementation of measures to cope with plant related emergencies outside the site boundary with particular emphasis on the low population zone should be a coordinated effort involving the licensee, and local, State, and Federal agencies having emergency responsibilities."(8)

C. Reactor Accident Considerations

Current NRC regulatory practice requires that events which may be anticipated to occur one or more times during the lifetime of a facility lead to no significant releases of radioactive material to the environment. No design or mode of operation is, however, entirely risk free. Despite the efforts made to prevent accidental releases of significant quantities of radioactive material, the possibility does in fact exist that such accidents may occur. Each application for a license is accompanied by a detailed assessment

of such postulated accidents, and NRC staff performs an independent evaluation of these accidents before a nuclear facility license is granted.

The NRC staff has provided guidance to applicants as to the type of accidents to be considered in the design of nuclear power plants (see for example, Sections 2.3 and 15 of Regulatory Guide 1.70[9] and particularly Table 15-1 of that guide). The recommended approach by the NRC staff is to organize the postulated accidents to ensure that a broad spectrum of events have been considered and then to categorize the events by type and expected frequency so that only the limiting (i.e., more severe) cases in each group need to be quantitatively analyzed.

NRC staff has categorized postulated accidents into four major groups as follows:

1. Events of moderate frequency (anticipated operational occurrences) leading to no significant radioactive releases from the facility.

2. Events of low probability with potential for small radioactive release from the facility.

3. Events of very low probability with potential for large radioactive releases from the facility and whose consequences are evaluated to establish the performance requirements of engineered safety features and to evaluate the acceptability of the reactor site. These events, some of which assume unlikely failures or fission product releases are referred to as design basis accidents (DBAs).

4. A fourth group of accidents, the so-called "Class 9"* accidents, which include any situation not specifically included in the foregoing groups of events and which typically are represented by some combination of failures which lead to coremelting and/or containment failure. These larger events are generally considered in the regulatory process by reducing their probability of occurrence to acceptably low values through design of the plant and its engineered safety features. This group includes external events such as severe natural phenomena as well as accidents initiated within the

*The first three groups have also been divided into eight categories in some accident assessments. The eight categories plus a "Class 9" category are defined in the proposed Annex to Appendix D to 10 CFR Part 50 dated December 1, 1971. (Also listed in NUREG 0099, Regulatory Guide 4.2, Appendix I).

facility. Unlike groups 1 through 3, the consequences of events in group 4, are not specifically analyzed in most applications.

One design basis accident in the third group routinely considered in the safety analysis performed by the staff is a loss-of-coolant accident (LOCA) where it is assumed that a large fission product release from the containment also occurs. The analysis of this accident is used in connection with the site suitability evaluations done to establish compliance with 10 CFR Part 100 of the NRC regulations by comparing computed accident consequences with exposure guidelines given in the regulations.

The Task Force considers the events described in NRC Regulatory Guide 1.70 as a useful source of information on the type of events in groups 1 through 3 above. Each application will have detailed information on these possible events, including important plant and site-specific factors that affect the probability and consequences of accidents. Safety Analysis Reports submitted by licensees are not likely to include a discussion of Class 9 accidents. Other documents, such as the Reactor Safety Study[10], discuss the Class 9 type accidents and their consequences. The Task Force believes that the findings on types of severe accidents reported in WASH-1400 provide a useful supplement to the Safety Analysis Reports in developing a basis for emergency planning.

The current version of NRC Regulatory Guide 1.70 requests applicants to provide two separate analyses of accident consequences: one using conservative assumptions to verify that plant design is adequate and a second using best estimate assumptions. One purpose for the latter assessment is to illustrate the margins of conservatism used in designing plant engineered safety features. This provision is a recent addition and consequently there are few analyses of this type actually available. Therefore, while the nuclear facility Safety Analysis Report will contain a great deal of information on credible accidents and how they are accommodated by design, there is likely to be little information provided on the expected consequences of such initiating events.

Best estimate consequences of a number of representative initiating events are addressed in the staff's environmental impact statements. The Task Force has reviewed the summary information on accident consequences provided in connection with these statements and we conclude that these best estimate analyses are too limited in scope and detail to be useful in emergency planning. It is apparent, however, from these analyses as well as from the NRC Regulatory Guide 1.70 analyses, that best estimate consequences are likely to be a factor of 10 or so smaller, from the standpoint of meteorological considerations alone, than the consequences of

accidents as typically presented in Safety Analysis Reports and in NRC staff safety evaluation reports for the purpose of site and plant design feature evaluation.

D. Establishment of the Task Force

To prepare adequate emergency response procedures, basic information regarding an accident, such as the time characteristics of an accident, the radioactive material release characteristics, and the extent of the area potentially impacted is required. Past practice has been to use a spectrum of accidents, including design basis accidents for emergency response planning. These accidents, however, were developed for the specific purposes of reactor siting and the design of containment and engineered safety features. Further, the description of the DBAs in Safety Analysis Reports does not always contain the information needed for developing emergency response plans. In addition, since the publication of the Reactor Safety Study in 1975, there has been some concern and confusion among State and local goverment emergency response planning and preparedness organizations as to how the accidents described in the Reactor Safety Study relate to emergency planning.

As a result of some perceived confusion in how accident analyses should relate to emergency planning, the Conference of (State) Radiation Control Program Directors passed a resolution in 1976 requesting NRC to "make a determination of the most severe accident basis for which radiological emergency response plans should be developed by offsite agencies." Additionally, the NRC and EPA received correspondence from a few States, and local governments in this regard.

In response to this dialogue, a Task Force consisting of NRC and EPA representatives was assembled to address this Conference request and related issues in November 1976. The Task Force interpreted the request as a charge to provide a clearer definition of the types of radiological accidents for which States and local governments should plan and develop preparedness programs.

Appendix II

## REFERENCES


1. Title 10 Code of Federal Regulations, Part 100 Reactor Site Criteria.

2. Radiological Incident Emergency Response Planning, Fixed Facilities and Transportation: Interagency Responsibilities, Federal Preparedness Agency, General Services Administration, Federal Register Notice, Vol. 40, No. 248, December 24, 1975.

3. "Guides to the Preparation of Emergency Plans for Production and Utilization Facilities, December 1970, U. S. Atomic Energy Commission.

4. "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 13.3 - Emergency Planning, NUREG 75/087, September 1975, U. S. Nuclear Regulatory Commission.

5. Guide and Check List for the Development and Evaluation of State and Local Government Radiological Emergency Response Plans in Support of Fixed Nuclear Facilities, NUREG 75/111, Dec. 1974, U. S. Nuclear Regulatory Commission.

6. "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants, LWR Edition," Section 13.3 - Emergency Planning, NUREG 75/094 (Rev. 2), September 1975, U. S. Nuclear Regulatory Commission.

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

8. "Emergency Planning for Nuclear Power Plants," Regulatory Guide 1.101, Rev. 1, March 1977.

9. "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants, LWR Edition," Regulatory Guide 1.70, Rev. 2, September 1975, U. S. Nuclear Regulatory Commission.

10. Reactor Safety Study: An Assessment of Accident Risks in U. S. Commercial Nuclear Power Plants, (NUREG-75/014), (WASH-1400), October 1975, U. S. Nuclear Regulatory Commission.

APPENDIX III

RELATED ISSUES CONSIDERED BY THE TASK FORCE

Certain issues related to providing a more definitive planning basis were considered by the Task Force. These issues were examined in the light of existing Federal guidance and particularly in light of guidance promulgated by the former AEC regulatory arm (Now the NRC).

There are four principal issues:

A. Issue: Whether and to what extent, so-called "Class 9" events having consequences beyond the most serious design basis accidents analyzed for siting purposes, should be considered in developing emergency plans.

Commentary:

The Task Force believes that States should be encouraged to develop a breadth, versatility and flexibility in emergency response preparations and capabilities - and that some consideration of Class 9 events in emergency planning is consistent with this view. Further, the potential consequences of improbable but nevertheless severe power reactor accidents, while comparable in some sense to severe natural or man-made disasters which would trigger an ultimate protective measure such as

evacuation, do require some specialized planning considerations. We do not suggest that these specialized planning considerations are or ought to be excessively burdensome. Rather, we recommend that they be considered and developed as a matter of prudence.

The Task Force recognized from the start that there is no specific design basis accident or Class 9 accident scenario which can be isolated as the one for which to plan because each such accident would have different consequences, both in nature and degree. It is for this reason that NRC and EPA have encouraged State and local agencies to concentrate their efforts on devising response preparations and capabilities that are versatile and that also take into account the unique aspects of radiological accidents.

The Reactor Safety Study (RSS)[2] provides a detailed assessment of the probability and consequences of Class 9 accidents. Various aspects of that study have been debated by reviewers. Additional programs are underway to extend or refine the study. It should be noted that the RSS is based on an analysis of two specific reactors, and the consequences presented are based on a spectrum of data compiled from many sites. The report therefore is of limited use in dealing with plant/site specific factors.

Nonetheless, the RSS provides the best currently available source of information on this subject.

The Task Force had to decide whether to place reliance on general emergency plans for coping with the events of Class 9 accidents for emergency planning purposes, or whether to recommend developing specific plans and organizational capabilities to contend with such accidents. The Task Force believes that it is not appropriate to develop specific plans for the most severe and most improbable Class 9 events. The Task Force, however, does believe that consideration should be given to the characteristics of Class 9 events in judging whether emergency plans based primarily on smaller accidents can be expanded to cope with larger events. This is a means of providing flexibility of response capability and at the same time giving reasonable assurance that some capability exists to minimize the impacts of even the most severe accidents.

For example, if we are dealing with a very large release of radioactive material, the principal goal is to prevent serious adverse health effects to individuals. The measures required to minimize health effects and to cope with secondary effects of a large accidental release (such as

land or water contamination, and the housing and feeding of any people required to be relocated for substantial time periods) would, in all likelihood, require the involvement of Federal agencies in addition to State and local governments.

The planning basis recommended by the Task Force therefore includes some of the key characteristics of very large releases to assure that site specific capabilities could be effectively augmented with general emergency preparedness (response) resources of the Federal government should the need arise.

NRC and other Federal agency emergency planning guidance has perhaps been misinterpreted as reflecting a position that no consideration should be given to so-called Class 9 accidents for emergency planning purposes. The Task Force, after considering the published guidance and available documentation,[1-4] concludes that Class 9 accidents have been given some consideration in emergency planning. It has been, and continues to be the Federal position that it is possible (but exceedingly improbable) that accidents could occur calling for additional resources beyond those that are identified in specific emergency plans developed

to support specific individual nuclear facilities. Further, the NRC and Federal position has been and continues to be, that as in other disaster situations, additional resources would be mobilized by State and Federal agencies.

B. Issue: Is there a need to plan beyond the Low Population Zone?

Commentary

The Low Population Zone (LPZ) is determined in accordance with the requirements of NRC Reactor Siting Criteria, 10 CFR Part 100[5]. While the consequences of postulated design basis accidents would be expected to be substantially lower than the guideline values of 10 CFR Part 100, there are three reasons why some planning beyond the LPZ is useful:

First, if an accidental release were as severe as the design basis releases analyzed for purposes of 10 CFR Part 100, doses could be above the Protective Action Guide (PAG)[6] levels beyond the LPZ. In this instance, the responsible officials should take reasonable and practical measures to reduce exposures to individuals beyond the LPZ.

Second, the deposition of radioactivity, and its subsequent uptake in foodstuffs such as milk products could be significant beyond the LPZ even if the plume exposure pathway doses did not exceed the PAG level at the LPZ outer boundary, because of the reconcentration of certain radionuclides in the food chain. Emergency protective measures in that situation should be taken to minimize exposures from the food chain via the ingestion pathway.

Third, there is a very small probability that releases larger than those from design basis accidents used in evaluating the acceptability of the reactor site could occur which could have consequences substantially in excess of the PAG levels outside the LPZ outer boundary. As discussed in Issue "A" the Task Force concluded that such larger accidents should be considered in developing the basis on which emergency plans are developed.

The Task Force considered these factors in establishing the size of the emergency planning zone. Two basic options were considered. One option was to develop site specific guidance based on the low population zone (LPZ) with some modifications to better assure that actions could be extended beyond the LPZ if needed. The second option was the concept of a planning

area completely independent of the LPZ. The Task Force recognized that the LPZ is included in NRC regulations for siting of nuclear facilities, and is closely connected to design basis accident consequences. We also recognized that actual emergency response actions would be based on proposed Protective Action Guides. Given these factors, the Task Force concluded that the concept of Emergency Planning Zones (EPZs) around each nuclear power facility would best serve to scope the desired spectrum of situations for which emergency planning should be accomplished. EPZs for both the "plume exposure pathway" and the "ingestion exposure pathway" are proposed. The separation of this concept from NRC siting considerations is discussed in Issue D.

While the Task Force recognizes that there are site-to-site variations in LPZs, due in part to varying features of the plant, the Task Force concluded that the size of the EPZs need not be site specific. The principal reason for this is that the size of the LPZ is determined primarily by the type and extent of engineered safety features installed in the reactor plant and their response to design basis accidents. The loss of either some or all engineered safety features are

postulated in Class 9 accidents. 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 approoriate.

A principal aim in establishing EPZs is to foster a breadth, versatility and flexibility in response preparation and capabilities in a systematic manner. From the standpoint of general emergency planning guidance, emergency planning needs seem to be best served by adopting uniform Emergency Planning Zones for initial planning studies for all light water reactors.

C. Issue: Whether there is a conflict between Protective Action Guides for plume exposures and dose criteria for siting and design of nuclear power facilities.

Commentary

The Reactor Site Criteria (10 CFR Part 100) require that an applicant identify an area surrounding a nuclear power reactor, defined as a Low Population Zone (LPZ). The consequences of the most severe "design basis accidents" analyzed for siting purposes should not result in exposures in excess of 300 rem to the thyroid from radioiodine exposure or 25 rem to the whole body for an individual located at any point on the outer boundary of the Low Population Zone (LPZ).

Protective action guides (PAGs) for plume exposure have been provided to State and local government agencies for use as EPA agency guidance in developing State and local government radiological emergency response plans for areas around nuclear facilities. One might reasonably ask whether it is inconsistent for the Federal government to recommend the development of plans to implement protective actions at projected dose levels lower than the projected doses associated with siting criteria. The discussion that follows reviews this issue.

The dose guideline values in 10 CFR Part 100 do not constitute acceptable limits for emergency doses to the public under accident conditions. The numerical values of 25 rem whole body and 300 rem thyroid can be considered values above which prevention of serious health effects would be the paramount concern. Good health physics practice would indicate that radiological exposures of these magnitudes should not be allowed to take place if reasonable and practical measures can prevent such exposures.

The assumptions used for siting purposes in calculating the doses that could result from design basis accidents are conservative. The actual doses that would result

from releases postulated to occur from a design basis accident therefore would be expected to be much lower than the dose guidelines of 10 CFR Part 100 under most meteorological conditions. The inhalation and direct exposure doses from the releases postulated for design basis accidents are not likely to exceed the PAG levels beyond the LPZ under average meteorological conditions. It has been, however, the NRC's position that a spectrum of postulated conditions be considered in emergency planning including adverse meteorological conditions.

Protective Action Guides were devised for purposes of dose savings and are defined as the projected absorbed dose to individuals in the general population that warrants protective action following a contaminating event. Emergency response plans should include them as trigger values to aid in decisions to implement protective actions, and responsible officials should plan to implement protective actions if projected doses exceed the PAGs. The PAGs, which have numerical values smaller than the 10 CFR Part 100 guidelines*, are decision

*The PAGs for the plume exposure pathway are expressed as a range of 1 to 5 rem whole body dose and 5 to 25 rem thyroid dose to individuals in the population. PAGs for the ingestion exposure pathway have no parallel in the 10 CFR Part 100 guidelines.

aids in devising best efforts, considering existing constraints. They have been set at levels below those that would produce detectable short term biological effects and at levels that would minimize long term biological effects. In the event of an accident they should be considered as criteria against which available options for various types of emergency actions can be weighed. Officials responsible for implementing the protective actions must take into account constraints that exist at the time and use professional judgment in determining the actions appropriate to protect the public.

The nature of PAGs is such that they cannot be used to assure that a given exposure to individuals in the population is prevented. In any particular response situation, a range of doses will be projected, principally depending on the distance from the point of the radioactive release. Some of these projected doses may be well in excess of PAG levels and clearly warrant the initiation of any feasible protective actions. This does not mean, however, that doses above PAG levels can be prevented, or that emergency response plans should have as their objective preventing exposures above PAG levels. Furthermore, PAGs represent only trigger levels and are not intended to

represent acceptable dose levels. PAGs are tools to be used as a decision aid in the actual response situation.

As discussed above, PAGs and Part 100 dose guidelines serve distinctly separate functions. The concept of Emergency Planning Zones (EPZs) introduced in this report is an attempt to provide guidance on the areas for which offsite officials should be prepared to make judgments using the PAGs, to initiate predetermined actions.

D. Issue: Whether the guidance in this document for offsite emergency planning can be separated from siting considerations in the NRC licensing process.

Commentary

The NRC siting criteria as related to accidental releases of radioactivity are given in 10 CFR Part 100 of the Federal regulations, and are supplemented by the Statement of Considerations published with this regulation in 1962 and in various regulatory guides and standard review plans used by the NRC staff. These criteria are used in the review of applications for nuclear power plant construction permits, operating licenses and operating license amendments. The evaluation performed under 10 CFR 100 primarily involves; (1) assuring that possible effects of all relevant natural and man-made phenomena on the nuclear facility have been

identified and expressed as design conditions for the facility, (2) determining that adequate engineered safety features have been provided to assure that postulated releases of radioactivity resulting from design basis accidents will not lead to radiological exposures that are in excess of the numerical guidelines of 10 CFR Part 100 at specified offsite locations, even under adverse meteorological conditions, (3) evaluating the distance to the nearest densely populated area to allow calculation of the offsite location at which certain of the Part 100 exposure guidelines must be met, and (4) evaluating the general current and projected population density around the proposed facility out to about 30 miles. The first three evaluation areas are reexamined at the operating license review stage and occasionally over the plant lifetime as facility or site conditions change. The fourth area (population density) is only evaluated in a prospective manner to assure the use of low population density sites when such are available and is generally not reexamined. The objective of the evaluations performed during the Part 100 siting review is to assure that the risk from any accident (including a Class 9 accident) is low.

The definition of the Low Population Zone (LPZ) in 10 CFR Part 100 states that it is an area which contains residents, the total number and density of which are such that there is a reasonable probability that protective measures could be taken, in their behalf in the event of serious accident. The outer boundary of the LPZ is one of the locations at which Part 100 exposure guidelines must be met. The outer boundary of the LPZ must also be less than a fixed fraction of the distance to the nearest boundary of a densely populated center containing more than about 25,000 residents. These are not in practice siting constraints because restrictions on the 2 hour exposure from design basis accidents at the site (exclusion area) boundary generally provide ample time to take action within a few miles to cope with postulated design basis releases and because additional engineered safety features could be added to the facility design, at some additional cost, to allow the outer boundary of the LPZ to be as small as the site boundary.

The current NRC staff evaluation of emergency plans for a particular facility is substantially independent of the siting criteria. The staff review includes facility emergency plans and plans for at least the offsite area referred to in 10 CFR Part 100 as the Low Population

Zone (LPZ) and in current licensing reviews often extends to substantially longer distances, particularly for the ingestion pathway. Emergency plans are reviewed by the NRC staff during the construction permit and operating license review stages and audited during the plant lifetime.

Emergency offsite response to large accidents may be less effective for sites located in an area of general high population density. Such sites, which may have adequate engineered safety features to meet the explicit criteria of 10 CFR Part 100, tend to be eliminated by the NRC staff guidelines on the general population density around prospective sites.

We recognize that there would be a reduction in exposures through the emergency response of the facility staff and local authorities even without planning. This is based on experience in coping with more common emergencies such as those associated with large chemical releases or dam failures. It seems reasonable that some additional reduction in exposures may be obtained by certain planning activities related to emergency preparedness at any site. However, the reduction in exposures from planned actions would be difficult to take into account in a quantitative or qualitative way in siting reviews.

In view of the above we conclude that although there is an indirect relationship between siting and emergency planning, the two can and should be considered separately in the NRC licensing process. Some clarification of the NRC regulations may be desirable to make clear the separation of these issues in the licensing process.

Appendix III

## REFERENCES


1. Radiological Incident Emergency Response Planning, Fixed Facilities and Transportation: Interagency Responsibilities, Federal Preparedness Agency General Services Administration, Federal Register Notice, Vol. 40, No. 248, December 24, 1975.

2. Reactor Safety Study: An Assessment of Accident Risks In U. S. Commercial Nuclear Power Plants, (NUREG-75/014), October 1975, WASH-1400, U. S. Nuclear Regulatory Commission.

3. Disaster Operations, A Handbook for Local Governments (CPG 1-6) July 1972, & Change No. 1, June 1974, Defense Civil Preparedness Agency.

4. Federal Response Plan for Peacetime Nuclear Emergencies (Interim Guidance) April 1977, Federal Preparedness Agency, General Services Administration.

5. Title 10, Code of Federal Regulations, Part 100, Reactor Site Criteria.

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

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This report suggests a planning basis for State and local government emergency organizations to determine the scope of planning efforts for nuclear power plants. The Task Force determined that a specific single accident could not be identified as the planning basis. Instead, the Task Force recommended establishing two generic Emergency Planning Zones (EPZs) around light water nuclear power plants. The inner zone of about 10 miles would be established for the plume exposure pathways and an outer zone of about 50 miles would be established for the ingestion exposure pathways. The precise size and shape of the EPZs would be based on the judgement of the emergency planner after considering local conditions. The Task Force concluded that planning for predetermined protective actions, such as sheltering in the plume exposure zone, is warranted within these zones in the event of a serious accident at a power plant. The Task Force also recommended time frames and radiological characteristics of the accidents for use in determining the appropriate emergency actions which could be taken to reduce the accident consequences. The Task Force concluded that if the basic planning elements in existing emergency planning guidance documents are already being considered, the establishment of EPZs should not result in large increases in State and local government emergency planning and preparedness costs.

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