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THE 1987 FEDERAL FIELD EXERCISE:
THE DOE EXPERIENCE

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FOREWORD

This document is a compilation of material describing the U.S. Department of Energy (DOE) involvement in the second Federal Radiological Emergency Response Plan (FRERP) Field Exercise. This exercise took place in June 1987 at the Zion Nuclear Power Station, Zion, Illinois. Participants in the exercise, which was held to test the FRERP, included the utility (Commonwealth Edison Company), the states of Illinois and Wisconsin, and federal agencies.

This material has been compiled to provide a record of the activity and to assist those planning future DOE exercises and responses. This report is not intended to serve as the evaluation report for the exercise. An evaluation of the exercise and recommendations for improvements in the federal response can be found in *Federal Radiological Emergency Response Plan (FRERP) Field Exercise Report, Vol. I, Exercise Planning*, Federal Emergency Management Agency, July 14, 1988, and *Federal Radiological Emergency Response Plan (FRERP) Field Exercise Report, Vol. II, Exercise Results*, Federal Emergency Management Agency, April 28, 1988. In some cases, the contents have been taken almost verbatim, with appropriate identification, from materials that were prepared for the planning and execution of the exercise. Some of the figures are copied from other planning materials. Information on the overall exercise has been included so that the DOE role can be placed in context.

Because of space limitations, much of the available background information is not included in this document. The materials listed in Appendix A are available in the Emergency Technology Library, Energy Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

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The Federal Emergency Management Agency and the agency's contractor, BDM, Inc., for use of excerpts from documents they prepared for the exercise.

ACRONYMS AND INITIALISMS

AGL	Above Ground Level
AMS	Aerial Measurement System
ANL	Argonne National Laboratory (DOE)
ARAC	Atmospheric Release Advisory Capability
BDM	FEMA Contractor
BNL	Brookhaven National Laboratory (DOE)
CDT	Central Daylight Time
CECo	Commonwealth Edison Company
CFA	Cognizant Federal Agency
CH	Chicago Operations Office (DOE)
cpm	Counts per Minute
CRCPD	Conference of Radiation Control Program Directors
DITS	Digital Imagery Transmission System
DOC	U.S. Department of Commerce
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOS	U.S. Department of State
DOT	U.S. Department of Transportation
EG&G/EM	DOE Contractor
EOC	Emergency Operations Center
EOF	Emergency Operations Facility (Zion Station)
EPA	U.S. Environmental Protection Agency
EPZ	Emergency Planning Zone
FDA	U.S. Food and Drug Administration (HHS)
FEMA	Federal Emergency Management Agency
FEE	Federal Field Exercise (1984)
FFE-2	Second FRERP Field Exercise (1987)
FRC	Federal Response Center
FRERP	Federal Radiological Emergency Response Plan
FRMAC	Federal Radiological Monitoring and Assessment Center
FRMAP	Federal Radiological Monitoring and Assessment Plan
FRPCC	Federal Radiological Preparedness Coordinating Committee
GM	Geiger-Müller Counter
GSA	General Services Administration
HHS	U.S. Department of Health and Human Services
HQ	Headquarters
HUD	U.S. Department of Housing and Urban Development
ID	Idaho
IDNS	Illinois Department of Nuclear Safety
IL	Illinois
IMPELL	CECo Contractor
INEL	Idaho National Engineering Laboratory (DOE)
JPIC	Joint Public Information Center
LLNL	Lawrence Livermore National Laboratory (DOE)
MERIS	Management Emergency Response Information System
mph	Miles Per Hour
NCS	National Communications System
NRC	U.S. Nuclear Regulatory Commission

ACRONYMS AND INITIALISMS (continued)

NV	Nevada Operations Office (DOE)
OR	Oak Ridge Operations Office (DOE)
ORNL	Oak Ridge National Laboratory (DOE)
OSTD	Offsite Technical Director
PBX	Private Branch Exchange
PIO	Public Information Officer
PNL	Pacific Northwest Laboratory (DOE)
PWR	Pressurized Water Reactor
REAC	Radiological Emergency Assessment Center (IL)
REECO	Reynolds Electric and Engineering Company (DOE Contractor)
SFO	Senior FEMA Official
SWG	Scenario Development, Control and Evaluation Work Group
TLD	Thermoluminescent Dosimeter
U.S.	United States
USDA	U.S. Department of Agriculture
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
VHF	Very High Frequency
VIP	Very Important Person
WI	Wisconsin

ABSTRACT

The second full-scale field exercise of the Federal Radiological Emergency Response Plan (FRERP) was held at the Zion Nuclear Power Station, Zion, Illinois, in June 1987. The exercise incorporated the annual compliance exercise for the Zion plant and involved the operating utility, Commonwealth Edison Company, the states of Illinois and Wisconsin, local governments, volunteer groups, and representatives from 12 federal agencies. The 3-day exercise was played from many locations in the Zion area; Springfield, Illinois; Madison, Wisconsin; and Washington, D.C. Approximately 1000 people participated in the exercise, which used a scenario in which an accident at the plant resulted in the release of radioactive material outside the plant boundary.

The U.S. Department of Energy (DOE) had major responsibilities during the planning, playing, and critiquing of the exercise; these functions are outlined in the report. This document describes the DOE participation in the planning and response during the exercise. During a radiological emergency, the FRERP gives DOE the responsibility for coordinating the federal radiological monitoring and assessment activities in support of the states and the cognizant federal agency. At Zion, a self-sufficient Federal Radiological Monitoring and Assessment Center was established by DOE at a nearby fairgrounds in which over 200 persons from DOE, the two states, and other federal agencies participated. Before the field exercise, a tabletop exercise and a dry run were held for training purposes.

1. CONCEPT, PURPOSE, AND OBJECTIVES OF EXERCISE

1.1 CONCEPT AND PURPOSE

The Federal Radiological Emergency Response Plan Exercise (FFE-2) was the second full-scale field test of the Federal Radiological Emergency Response Plan (FRERP).¹ The FRERP outlines the roles of the federal agencies when responding to a radiological accident. The first FRERP field exercise (FFE) was held at the St. Lucie Power Plant in 1984. As was the case for the FFE, the Subcommittee on Federal Response of the Federal Radiological Preparedness Coordinating Committee (FRPCC) took the responsibility for planning the second field exercise.

This document has been compiled to provide a record of the U.S. Department of Energy's participation in the FFE-2. It is not intended as an exercise critique, which has been published elsewhere,^{2,3} but as a document to be used by future planners.

The exercise included participants from Commonwealth Edison Company (CECo); state agencies in Illinois and Wisconsin; Lake County, Illinois; Kenosha County, Wisconsin; and the following federal agencies: Departments of Agriculture (USDA), Energy (DOE), Health and Human Services (HHS), Housing and Urban Development, the Interior (DOI), State, and Transportation, and the Environmental Protection Agency (EPA), Federal Emergency Management Agency (FEMA), General Services Administration, National Communications System, and Nuclear Regulatory Commission (NRC).

The 3-day exercise was held June 23-25, 1987, at the Zion Nuclear Power Plant, Zion, Illinois, in conjunction with the regularly scheduled compliance exercise for the utility and the states. Over 1000 players at 30 locations and more than 150 controllers/evaluators participated. In addition, there were visitors from agencies in the United States and abroad.

The FFE-2 was designed to provide an opportunity for the utility, state, and federal personnel who would respond to an actual emergency to work together in a realistic environment. In the usual compliance exercises, not all groups that would respond to an accident participate due to funding and time constraints. This limited participation and the time compression of exercise events prevent the regulatory exercises from being true tests of the interactions that would be involved in a major accident. In the FFE-2, the first day of the exercise primarily tested the emergency plans for the licensee and state and local governments as required by the NRC and FEMA. The second and third days involved extensive interaction with the federal agencies.

The states and utilities played in as realistic a manner as possible from their usual response facilities and then adapted to the influx of federal personnel and the centers they established. For example, DOE set up a Federal Radiological Monitoring and Assessment Center (FRMAC) from which to coordinate federal monitoring and assessment efforts, as required by the FRERP, and some of the state and utility personnel worked from that center.

1.2 DEVELOPMENT OF EXERCISE GOALS AND OBJECTIVES

The participating groups coordinated their efforts to develop the exercise objectives. The exercise goals and objectives were approved by the Subcommittee on Federal Response of the FRPCC with input from the participating federal agencies. Most of the participating groups also developed individual agency objectives. The DOE exercise objectives were similar to those used in the St. Lucie exercise and were approved by both DOE headquarters and the DOE Chicago Operations Office (CH), the DOE office responsible for radiological assistance in the region. The DOE objectives applied to DOE and the overall exercise of the Federal Radiological Monitoring and Assessment Plan (FRMAP) portion of the exercise.

1.3 FFE-2 EXERCISE OBJECTIVES

The overall exercise objectives were to

1. evaluate the adequacy, timeliness, and effectiveness of inter-agency procedures and hardware used to notify and update federal agencies at headquarters, onscene, and onsite;
2. evaluate the adequacy of the offsite facilities available for each agency to perform its tasks;
3. evaluate the effectiveness of the interfaces among the federal agencies, offsite authorities (i.e., state and local government authorities), and licensee, as well as the effectiveness of information sharing among these groups;
4. evaluate the effectiveness and contribution of federal response efforts in support of state and local government;
5. evaluate the efficiency of the federal response;
6. evaluate the transition of the total federal response from one response stage to another;
7. evaluate the accuracy, consistency, and timeliness of the release of public information, particularly the coordination of such information among the federal agencies, offsite authorities, and licensee, and the coordination among the state and Washington, D.C., field organizations, the Joint Public Information Center (JPIC), and the states' information centers;
8. evaluate the effectiveness of FRMAP in providing radiological assistance;
9. evaluate the effectiveness of keeping the White House informed of the situation and federal actions; and

10. evaluate the effectiveness of keeping the Congress informed of the situation and federal actions.

1.4 DOE EXERCISE OBJECTIVES

The DOE exercise objectives were to

1. organize a system under FRMAP that would effectively support both the cognizant federal agency and two affected states;
2. identify each FRMAP agency's resources and emergency responses to avoid conflicting interests and duplication of effort and authority;
3. test the interfaces during activation, notification, and response among the following agencies at the headquarters and field levels:
 - o federal resources and the state and local governments,
 - o DOE and FEMA,
 - o DOE and NRC, and
 - o DOE and FRMAP agencies;
4. test the command and control structure;
5. assess DOE's ability to coordinate radiological data collection from multiple agencies in the field;
5. evaluate the ability of DOE, in coordination with the other FRMAP agencies, to assess the radiological data;
7. demonstrate the effective flow of the radiological data to the decision makers, including those in the states;
8. evaluate the adequacy of the facilities, equipment, and communications;
9. test the communication equipment and channels;
10. test other equipment (especially recently acquired items) and resources (e.g., mobile field laboratories);
11. test the ability of the FRMAP agencies to provide information on recovery and reentry of an area;
12. evaluate the transfer of radiological monitoring responsibility from DOE to EPA; and
13. evaluate the effectiveness of the radiological support given by the FRMAP agencies to the state and local governments.

2. ORGANIZATION OF EXERCISE

2.1 PLANNING RESPONSIBILITIES

The planning for FFE-2 was initiated by FEMA, in coordination with the FRPCC. One of the initial objectives had been to involve two states in the response, and the Zion Power Plant (located in Illinois but within 10 miles of the Wisconsin border) satisfied the requirement. Commonwealth Edison, the states of Illinois and Wisconsin, and local jurisdictions within the states agreed to participate.

The planning organization was modeled on the first FFE in Florida; the states and utility were again full participants in the planning (Fig. 1). Many of the federal agency planners had been involved in planning the first exercise and brought their experience to this effort. BDM, a FEMA contractor, supported the planning activities and prepared the exercise plan and the other documents used throughout the exercise planning and execution. Copies of pertinent exercise materials are on file as part of the backup material (Appendix A). The significant exercise milestones are shown in Fig. 2. (The final evaluation reports were not produced on the schedule given.)

The Management Group, chaired by Robert S. Wilkerson, FEMA headquarters, provided general direction. Senior representatives from the utility, the emergency management and radiological health agencies from both Illinois and Wisconsin, and six federal agencies met monthly to set policy and review the activities of the four work groups:

- o Scenario Development, Control, and Evaluation Work Group;
- o Public Affairs Work Group;
- o Administration, Communications, and Logistics Work Group; and
- o Visitors Work Group.

DOE had representatives on all the groups. Appendix B lists the members of each group. The functions of each group are outlined in Sects. 2.1.1 through 2.1.5 (from ref. 4).

2.1.1 Exercise Management Group

The functions of the Exercise Management Group were to

1. establish and maintain overall direction of planning the FFE-2, implementing the FFE-2, and reporting on the FFE-2;
2. prepare and distribute an exercise development plan;

Fig. 1. FFE-2 planning, management, and work group structure.
Source: *The Federal Radiological Emergency Response Plan (FRERP) Field Exercise Development Plan (FFE-2)*, Federal Emergency Management Agency, November 14, 1986, p. III-2.

	ITEM NUMBER	COMPLETION DATE	1986					1987									
			AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
DRY RUN & FFE-2 EXERCISE PLANS (DRAFT)	1	9/24			△												
DRY RUN & FFE-2 EXERCISE PLANS (REVISION)	2	11/14				△											
TABLETOP EXERCISE MATERIAL (DRAFT)	3	11/17				△											
FFE-2 TECHNICAL DATA	4	11/26				○											
TABLETOP EXERCISE MATERIAL (REVISION)	5	12/18					△										
DRY RUN & FFE-2 SCENARIOS (DRAFT)	6	1/21						△									
TABLETOP EXERCISE	7	1/22						△									
DRY RUN & FFE-2 SCENARIOS (REVISION)	8	2/18							△								
DRY RUN PLAYERS & CONTROLLERS HOBBS (DRAFT)	9	3/11								△							
DRY-RUN PLAYERS & CON- TROLLERS HOBBS (REVISION)	10	4/8									△						
DRY RUN EXERCISE TRAINING MATERIAL	11	4/22										△					
FFE-2 PLAYERS CONTROLLERS HOBBS (DRAFT)	12	4/22										△					
DRY RUN EXERCISE	13	5/5											△				
FFE-2 PLAYERS & CON- TROLLERS HOBBS (REVISION)	14	5/20											△				
FFE-2 TRAINING MATERIAL	15	5/27												△			
FFE-2 EXERCISE	16	6/23													△		
FFE-2 AFTER-ACTION REPORT (DRAFT)	17	9/2														△	
FFE-2 AFTER-ACTION REPORT (REVISION)	18	10/1															△

LEGEND

△ DRAFT

▲ REVISION

○ INITIAL COMPILATION
WITH CONTINUING UPDATES
THEREAFTER

Fig. 2. FFE-2 project milestones. Source: *The Federal Radiological Emergency Response Plan (FRERP) Field Exercise Development Plan (FFE-2)*, Federal Emergency Management Agency, November 14, 1986, p. III-2.

3. establish interagency FFE-2 planning work groups, monitor their activities, and coordinate activities among the groups;
4. review the contents of exercise documents and material not directly related to exercise control;
5. task the work groups to accomplish unassigned work;
6. review and approve all releases to the press and Congress in advance of the exercise;
7. review and approve final arrangements for VIP tours; and
8. ensure that various sets of objectives do not conflict.

2.1.2. Scenario Development, Control, and Evaluation Work Group

The functions of the Scenario Development, Control, and Evaluation Work Group were to

1. integrate onsite and offsite scenarios;
2. ensure that there is adequate play to test all objectives;
3. develop agreed-upon source term based on participants' objectives and consistent with current source term technology;
4. develop offsite radiological data (plume exposures and deposition) for exercise based on agreed-upon source term;
5. develop the necessary message injects and simulations necessary to drive offsite play;
6. develop offsite control plan, organization, and necessary controller support materials;
7. develop plan for evaluating activities related to FRERP interfaces; and
8. identify logistic needs for conducting, controlling and evaluating the FFE.

2.1.3. Public Affairs Work Group

The Public Affairs Work Group was responsible for

1. developing and implementing a program for informing the public about the exercise before, during, and after the exercise;

2. developing and implementing a mechanism for participation of public affairs specialists in the scenario development activity of the Scenario Development, Control, and Evaluation Work Group;
3. reviewing the published procedures of all participating organizations for production, coordination, and release of public information; initiate action to reconcile inconsistencies or to develop additional procedures; and
4. developing a concept of operations and guidelines for control of public affairs and media events.

2.1.4. Administration, Communications, and Logistics

The Administration, Communications, and Logistics Work Group was responsible for

1. maintaining cognizance of requirements for facilities to accommodate the exercise and the adequacy of planned resources to satisfy the requirements;
2. developing an exercise communications plan for controllers;
3. developing an exercise communications plan for players; and
4. developing exercise logistics requirements and procedures.

2.1.5. Visitors and Observers

The functions of the Visitors and Observers Work Group were to

1. maintain cognizance of inviting and hosting visitors and observers;
2. develop policy and concept for inviting, encouraging, and accepting visitors and observers; and
3. develop a visitors program, develop requirements for a visitor center, staff the center, and make logistics arrangements.

A long lead time is necessary for planning a major field exercise. The DOE planners worked primarily in the Scenario Development, Control, and Evaluation Work Group, whose first meeting was held in Chicago in May 1986. To accommodate the state planners and to familiarize the federal planners with the area and the state facilities, some of the meetings were held in the Zion area north of Chicago or in the state emergency centers. The group met every 4 to 6 weeks, using telephone conferencing at other times. Other work groups had somewhat less rigorous schedules but also began preparation well in advance.

The writing of the scenario was directly related to the objectives developed by each participating agency. In addition, the

entire scenario had to accommodate certain limits set on it by the states and utility to satisfy both their regulatory requirements and various governmental restraints arising out of an exercise with such high public visibility. The radiological data were then calculated to reflect the agreed-upon scenario. The data required several iterations, and each state wanted the data for its use in a particular format.

2.2 SEQUENCE OF EXERCISES

As was the case for the first FFE, FFE-2 included several preliminary exercises as part of the preparation for the final play. A more detailed description of these exercises is given in the *FFE-2 Evaluation Report, Volume I, Exercise Planning*². Such preliminary exercises are common before power plant compliance exercises and were considered very important to the FFE-2. The first, the Tabletop Exercise, which involved over 100 participants, was held in a large ballroom at the O'Hare Sheraton, Chicago, Illinois, on January 22, 1987. All the agencies had senior representatives playing. The players were seated first by agency and later by the facility from which they would be working as the "accident" progressed. Following briefings that gave an overview of the agencies' responses, a moderator described possible situations to prompt discussion. The participants discussed the notifications, information flow, and interactions among the groups. Some of the misunderstandings of the role of the federal response facilities, which surfaced during the Tabletop, reinforced the Chicago Operations Office's belief that a series of workshops would be useful for agencies which would be participating in the radiological monitoring and assessment portion of the exercise.

A Dry Run, played from the agencies' field locations, was held May 5-6, 1987. Approximately 500 persons participated as players, controllers, and evaluators and tested the arrangements which would be used during the actual event. The Dry Run scenario simulated an accident at the Zion Nuclear Plant that would have offsite consequences of about the same magnitude as the accident used in the FFE-2 scenario. The exercise was divided into three 4-h segments corresponding to scenario days 1, 2, and 10 of the FFE-2. DOE installed most of its communications equipment for the Dry Run and deployed the senior personnel and the control and evaluation staff who would be participating in the June full-scale exercise.

The 3-day FFE-2 was held June 23-25, 1987. DOE and other agencies brought the equipment and personnel necessary (with the exception of aircraft) for a full-scale response; DOE established a FRMAC to coordinate the federal radiological monitoring and assessment efforts. The exercise was played during daylight hours. Exercise days 1 and 2 corresponded to scenario days 1 and 2, but exercise day 3 was played as scenario day 10. The FRMAC began play as a fully organized facility at the beginning of exercise day 2, although DOE and other agencies had participated earlier in the notification process.

2.3 FFE-2 EXERCISE SCENARIO ACTIVITIES

The scenario was designed to prompt the participants to take actions which would help meet the exercise objectives. The types of activities expected on each day are described in Sects. 2.3.1 through 2.3.3 (ref. 3).

2.3.1. Scenario Day 1

Actions expected on the first day of the exercise included

1. initiation of a power plant emergency which created significant onsite problems and a large offsite release;
2. notifications of emergency to response organizations;
3. activation of state, local, licensee, and federal response plans;
4. decision making on protective actions by all parties involved;
5. deployment and onscene operation of state, local, licensee, and federal response resources;
6. radiation monitoring offsite;
7. notification of the public;
8. notification of the Congress; and
9. notification of the White House.

2.3.2. Scenario Day 2

Planners expected the following response actions on the second day of the exercise:

1. offsite radiological field monitoring, sample collection, and analysis;
2. assessment of radiological data and preparation of data presentations;
3. consideration of further public protective actions;
4. response to public and media concerns about the effects of offsite radioactive contamination and related implications;
5. reports of the onsite situation;
6. provision of federal assistance to states;

7. consideration of the need for accident recovery resources; and
8. consideration of reentry and relocation concerns.

2.3.3. Scenario Day 10

The players were expected to address the following recovery issues on the third day (scenario day 10):

1. determination of relocation and return of the evacuated public;
2. establishment of the restricted area;
3. consideration of reentry into the restricted area;
4. determination of the appropriate actions relative to contaminated food, land, and property;
5. assessment of the dose and health effects to the public;
6. consideration of decontamination procedures, both immediate and long term;
7. consideration of human needs;
8. consideration of possible legal liability;
9. response to media and public concerns; and
10. consideration of possible changes in organizational responsibility as the response to the emergency changes, such as
 - a. transfer of responsibility for managing FRMAC operations;
 - b. relinquishment of the cognizant federal agency role by NRC; and
 - c. long-term role of the Senior FEMA Official and Federal Response Center (FRC).

A chronology of representative events is given in Appendix C.

2.4 EXERCISE LOCATIONS

As indicated earlier, the Tabletop Exercise was held at the O'Hare Sheraton, Chicago, Illinois. The response activities for the Dry Run and FFE-2 were carried out from preestablished locations which would or could be used in the event of a real emergency. The CECo Emergency Operations Facility (EOF), located within a mile of the Zion Plant, was the focal point for onsite operations. In addition, the senior NRC and FEMA officials, and representatives from the states

were located there. CECO's corporate command center was at its headquarters in Chicago. The states of Illinois and Wisconsin operated from their usual Emergency Operations Centers (EOC) in their state capitols, as well as from the field locations in the plant area as described in their emergency plans. The Illinois Forward Command Post and Radiological Assessment Forward Team were at Gurnee, Illinois; the Wisconsin group was in Kenosha, Wisconsin. The JPIC was set up in Highland Park, Illinois. The Lake County, Illinois, emergency responders were located in Libertyville. The federal agencies played from their Washington, D.C., headquarters and their regional offices, until they established field operations. Many notifications took place from the regional offices during the first day.

During the exercise, in accordance with the DOE CH plan, DOE established the FRMAC in an exhibition building at the Lake County fairgrounds, Grays Lake, Illinois (about 15 miles from the Zion plant). DOE has established general criteria for the selection of a FRMAC location. A specific site is not selected until the magnitude of the accident, and therefore the staffing and size of the facility needed for the response, can be estimated. DOE preselected this building for the exercise so that it could be reserved and be available at the time of the exercise and so that the communications could be installed on a nonemergency basis. The building had adequate space and electrical power, and access to the building could be controlled.

FEMA established the FRC in another building on the fairgrounds; this building also housed the central control and simulation cells. The JPIC was housed in a new CECO facility in Highland Park, Illinois. Visitors' activities were based at the Lake County Community College. Although power and space were adequate at most facilities, additional telephone lines were installed to supplement other communication equipment.

2.5 PARTICIPANTS' RESPONSIBILITIES

During the Tabletop, Dry Run, and FFE-2, there were three categories of participants: players, controllers, and evaluators. All participants received preliminary briefings and written material to acquaint them with the ground rules of exercise play.

2.5.1 Players

The players in the FFE-2 were the same personnel from the local, state, and federal agencies who would normally respond to such an accident. DOE CH planned and managed the DOE response; they were supported by extensive EG&G-managed DOE resources from Las Vegas, Nevada (Appendix D), and personnel from other DOE operations offices and contractors. In future major radiological accidents and large exercises, the Nevada Operations Office will assume the management responsibility for FRMAC. The DOE operations office in whose region the accident occurs will provide the initial response and have the liaison responsibility with the affected states.

2.5.2 Controllers

Those involved in the planning of the FFE-2 were called upon to help control the exercise. In addition, a number of other personnel were recruited. An Exercise Control Group, made up of representatives from NRC, FEMA, DOE, CECO, and the states of Illinois and Wisconsin guided the overall exercise from the exercise control center at the Lake County fairgrounds. Most of the federal representatives in this group had been heavily involved from the outset in the planning process. The states were shorthanded, with some of their planners also playing during portions of the exercise. A contractor familiar with the state plans and exercise scenario filled the Wisconsin position. The Exercise Control Group members were Bernard Weiss (NRC), chairman; Terry Blackmon (CECO); Jana Fairrow (Illinois); Vernon Adler (FEMA); William F. Wolff (DOE); and Nancy Lane (IMPELL), who represented Wisconsin. The simulation cell, located adjacent to the Exercise Control Group's area at the fairgrounds, was staffed by representatives from DOE and other agencies. The simulators injected messages by telephone. An additional five-person simulation cell operated in Washington, D.C. Controllers were assigned to each field location. The federal agencies provided the controllers for their own facilities. A diagram of the exercise control organization is shown in Fig. 3.

2.5.3 Evaluators

The FFE-2 was evaluated on three levels. NRC and FEMA evaluated the utility and the state and local governments in the compliance portion of the exercise, most of which was completed by the end of day 1. In addition, the overall FRERP exercise was evaluated by controller/evaluators from the various agencies and some special evaluators who looked primarily at the interfaces among agencies as outlined in the FRERP. Individual agencies also performed self-evaluations using members of their staffs or appropriate contractors. DOE evaluators were located in the FRMAC and at DOE Washington headquarters. Evaluators for the FRMAC included two state representatives from the Conference of Radiation Control Program Directors (CRCPD), as well as staff from DOE Headquarters; DOE Operations Offices in Albuquerque, Idaho, Oak Ridge, Richland, and San Francisco; EG&G/EM; Brookhaven National Laboratory (BNL), Lawrence Livermore National Laboratory (LLNL), Oak Ridge National Laboratory (ORNL), Pacific Northwest Laboratory; West Valley Nuclear Services, Reynolds Electrical and Engineering Company (REECO), Westinghouse Idaho, Westinghouse Materials Company of Ohio, Dames and Moore, Suffolk County (New York) Health Department, Sargent and Lundy, NRC Regions I

..... INDICATES SIMILAR CONTROL INFRASTRUCTURE
WILL BE IDENTIFIED FOR EACH FACILITY
ACCORDING TO SCENARIO REQUIREMENTS

———— INDICATES LINES OF COMMUNICATION FOR
MANAGING CONTROL OF THE EXERCISE

Fig. 3. Exercise control system organization. Source: *The Federal Radiological Emergency Response Plan (FRERP) Field Exercise Controller Handbook*, Federal Emergency Management Agency, June 8, 1987, p. 11-2.

and II, HHS headquarters, ETA Corporation (for EPA headquarters), and BDM. The evaluators looked both at the interaction of the agencies under the FRERP and at the technical aspects of the FRMAC operation. Players in the FRMAC and DOE personnel who served as liaisons to the FRC, EOF, and JPIC also filled out evaluation forms.

3. DOE PLANNING AND EXERCISE ACTIVITIES

3.1 PLANNING ACTIVITIES

3.1.1 Chicago Operations Office Planning Activities

Personnel from DOE CH were involved in two types of planning activities before the exercise. Some staff members worked on the overall planning for the exercise (as members of the Management Group, Scenario Work Group, etc.); others, who would be players in the exercise, planned their response. The DOE players' planning activities involved personnel from other DOE operations offices, EG&G/EM, other federal agencies, and the states.

The Region 5 (DOE CH) plan for response to radiological emergencies⁵ was completed in 1986. This plan formed the basis for the development of more detailed procedures for the operation of the FRMAC, information flow, field team, and mobile laboratory activities.

The Tabletop Exercise in January could be considered the initial training session for all participants. Following the Tabletop, DOE CH organized a number of meetings to identify and work on potential response problems. In February, some of the Chicago staff met with the Illinois Department of Nuclear Safety to discuss general concerns and with EG&G/EM to discuss the logistic support supplied by that contractor. A meeting with the Wisconsin Section on Radiation Protection followed in March. A series of workshops on the use of liaisons, field monitoring, and sample analysis, and the first of two data evaluation meetings was also held in March. The agendas for these meetings are given in Appendix E.

The second data evaluation group meeting and an orientation for the DOE CH players were held at the Operations Office in April. The May Dry Run and the player orientation that preceded it provided further training. At a meeting in early June, FRMAC manager Donald L. Bray, the Offsite Technical Director (OSTD), discussed the handling of action requests and the approval chain for data leaving the FRMAC (Appendix F) with the key FRMAC representatives from other federal and state agencies. Another player orientation, discussing rules of play and the layout of the FRMAC, preceded the full-scale FFE-2 in late June.

3.1.2 Other DOE Planning Activities

In addition to DOE CH, DOE representatives from headquarters, the Nevada Operations Office, and DOE contractors, particularly EG&G/EM and ORNL, assisted in the planning effort.

William F. Wolff, DOE Office of Nuclear Safety, and Edward J. Jascewsky, DOE CH, were on the Management Group. Jascewsky, Harvey C. Clark (EG&G/EM), and Martha V. Adler and Kathy S. Gant, both from ORNL, served on the Scenario Development, Control, and Evaluation Work Group. Clark's major assignment was to generate the radiological data

needed for the exercise. Following the Dry Run, much of the data was reformatted to accommodate the state players. Because the state players would be graded on their performance during the regulatory exercise, they wanted all the data presented in their usual exercise formats. John Britis (Sargent and Lundy), a contractor for CECO, worked with Clark to reformat the data. Clark's detailed explanation of the data development process is included as Appendix G. Adler and Grant did general planning and prepared the message injects relating to FRMAC activities.

The activities of the Scenario Development, Control, and Evaluation Work Group were complicated by the fact that a number of key members (e.g., Jascewsky, state members) would also be players in the exercise; thus, under the ground rules established by the Management Group at the beginning of the planning, these planners were not allowed to see the scenario or related data.

DOE also had representatives on the other work groups. Charles A. Gladden (EG&G/EM) represented DOE on the Administration, Communications, and Logistics Work Group. Gail Bradshaw from DOE headquarters and Gary Pitchford from DOE CH were members of the Public Affairs Work Group. Pitchford also served as the DOE member of the Visitors and Observers Work Group.

3.2 EXERCISE PLAY DURING THE FFE-2

The FFE-2 was played from a number of locations in and around the Zion Nuclear Power Plant, at the federal agency regional offices, and in Washington, D.C.

3.2.1 DOE Headquarters Play

Play began early on the first day with notification of the DOE headquarter and interaction with personnel in DOE CH. As the incident progressed, DOE headquarters alerted the Nevada Operations Office and put the resources at EG&G/EM on standby. At the site emergency level, DOE notified the other federal agencies participating in the FRMAP and then dispatched its Nevada resources when requested. The Emergency Management Team at headquarters was not activated for this exercise. Gerald L. Combs and Rudolph Engelmann acted in all the team's capacities for the duration of the exercise.

3.2.2 FRMAC Operations During the FFE-2

The following material was adapted and expanded from information prepared by DOE for the FFE-2 evaluation report.³

Under the FRERP, DOE has the responsibility for coordinating all the federal offsite radiological monitoring and assessment assistance to the states during the emergency phase of an accident. DOE and its contractors provided the necessary equipment to support the FRMAC operations, which were under the direction of Donald L. Bray, a senior manager from DOE CH, who was the OSTD.

To allow the states and CECo to conduct the regulatory portion of the exercise on the first day with a minimum of interference, the FRMAC was activated at the beginning of play on day 2. On the first day of the exercise, DOE headquarters and DOE CH notified the other agencies of the emergency and of DOE's intent to establish a FRMAC. Agency representatives were assumed to have arrived onscene during the night and thus were prepared for full participation at the beginning of the second day. A briefing on the previous day's activities, and raw data, simulating data collected by the states and utility during the night, were given to the FRMAC participants at the beginning of the second day.

Six other federal agencies or departments joined DOE in the FRMAC: EPA, HHS, FEMA, NRC, DOI, and USDA. The DOE presence included representatives from the DOE operations offices at Chicago, Oak Ridge, Nevada, Richland, San Francisco, and Savannah River, as well as personnel from the following DOE contractors: Argonne National Laboratory (ANL), BNL, EG&G/EM, LLNL, and REECO. EG&G/EM, a prime contractor for DOE, brought the support equipment for the FRMAC (Appendix D) from Las Vegas, Nevada. Representatives from the states of Illinois and Wisconsin were active participants in FRMAC activities. CECo also sent representatives to the FRMAC to help coordinate the offsite and onsite activities. The Region 5 organization chart for the FRMAC is given in Fig. 4.

Key DOE or DOE contractor personnel in the FRMAC included the following:

- o OSTD - Donald L. Bray (DOE CH)
- o Deputy OSTD, Emergency Manager - Edward J. Jascewsky (DOE CH)
- o Operational Resources, Support Manager - John F. Doyle (EG&G/EM)
 - Safety/Medical Coordinator - Justin Zamirowski (DOE CH)
 - Legal Coordinator - Gloria Walach (DOE CH)
 - Communications Coordinator - Charles A. Gladden (EG&G/EM)
 - Logistics Coordinator - Harold R. English (EG&G/EM)
- o Liaison Manager - Mary Grace (DOE CH)
- o Monitoring and Evaluation Manager - Roger Mayes (DOE CH)
 - Field Monitoring Coordinator - Jeffrey Slack (DOE OR)
 - Sample Analysis Coordinator - Kathleen McIntyre (BNL)
 - Data Control - Eugene L. Feimster (EG&G/EM)
 - Data Evaluation Coordinator - Zolin Burson (EG&G/EM)
 - Contamination Control Coordinator - Layton O'Neill (DOE NV)
- o Administrative Support - Pat MacLean, Ellie Monahan (DOE CH)

There were 193 people badged as FRMAC players on scenario day 2 and 202 badged on scenario day 10. Average organizational staffing levels were as follows: DOE (excluding contractors), 30; ANL, 10; BNL, 3; EG&G/EM, 44; LLNL, 2; REECO, 3; DOI, 5; EPA, 26; FEMA, 1; HHS, 21; NRC, 21; USDA, 1; Illinois, 24; Wisconsin, 4; and CECo, 4.

The EPA, NRC, DOE CH, and the state of Illinois sent mobile laboratories to the FRMAC. Wisconsin's mobile laboratory capabilities were stationed in Kenosha, Wisconsin. These mobile laboratories were

Fig. 4. FRMAC management organization. Source: *The Federal Radiological Monitoring and Assessment Plan, U.S. Department of Energy Radiological Assistance Plan, Region 5, April 1987, p. 1-8.*

capable of analyzing environmental samples for radiological contamination. The FRMAC hot-line operations, sample preparation and control, and instrument calibration facility were all located outside at the rear of the building. This location was an artificiality of the exercise designed to provide maximum visibility of these activities for the more than 200 visitors.

The DOE and EPA field teams, along with HHS's Food and Drug Administration sampling teams and simulated USDA sampling teams, were dispatched from the FRMAC. The Illinois field teams operated from the Illinois Forward Command Post at Warren Township; the Wisconsin teams were dispatched from their Forward Command Post at the Kenosha Health Department; and the CECo teams were dispatched from Zion Station. The activities of the Illinois, Wisconsin, and CECo teams were coordinated with those of the federal teams at the field monitoring coordination table in the FRMAC; representatives from Wisconsin, Illinois, CECo, DOE, EPA, FDA, USDA, and NRC were involved in the coordination effort. Telephone and radio were used to communicate with the sampling teams.

The OSTD sent additional DOE and DOE contractor representatives to serve as liaisons from the FRMAC to the CECo EOF, the FRC, the JPIC, the Wisconsin EOC at Madison, and the Illinois Radiation Emergency Assessment Center (REAC) at Springfield. The liaisons provided a link to the FRMAC for transferring information and interpreted information coming from the FRMAC, when necessary. At the JPIC, the DOE representative discussed the type of activities going on in the FRMAC, the DOE response, and provided any needed background information on radiation assessments released by the states and NRC.

In addition to sending liaisons to other facilities, DOE established several electronic communication channels. DOE set up facsimile machines in the Illinois REAC, Wisconsin EOC, CECo EOF, and at NRC headquarters to facilitate the transfer of the data to all of the FRMAC's customers. The FRMAC also provided a Digital Imagery Transmission System (DITS) terminal to these locations. The DITS, which has the capability to send graphic overlays and digital color photographs to personal computers, was used to send radiological isodose curves overlaid on a map of the affected area. A digital electronic camera was set up at both states' EOCs. DOE also set up a compressed video system between the EOF and the FRMAC. This made it possible for the DOE liaisons at the EOF to see and hear the various briefings held throughout the exercise. Three VHF radio networks with repeaters were established to provide mobile communications throughout the greater north Chicago area. Over 100 telephones were installed and served by a local PBX in the FRMAC; the PBX was connected to 24 trunklines via microwave to the central telephone office. Most communications were set up in the FRMAC during the exercise. The connections to the local telephone system were scheduled on a non-emergency basis before the exercise began.

Having an interagency operations center simplified the coordination of the field monitoring activities, mobile laboratory analyses, data evaluation, and assessment activities. The FRMAC provided and maintained a validated, consistent set of data and assessed that data to provide a picture of the radiological situation and the radiation doses that would be expected under certain

conditions. The FRMAC provided this information, as well as any other assessments that were requested, to the states and the NRC.

The proper handling of radiological information in the FRMAC ensures that only correct information is released and that the information is released only to the proper agencies or with those agencies' approval. Radiological information and data arrived at the FRMAC from federal, state, or utility field monitoring teams, from laboratory analyses of environmental samples, and from predictive models, such as DOE's Atmospheric Release Advisory Capability, and from aerial radiation surveys done by the DOE Aerial Measurements System (these surveys were simulated during the exercise). One group in the FRMAC checked all incoming data for reasonableness and consistency before release to the other FRMAC participants and addition to the overall data base. The interagency evaluation group in the FRMAC then organized, assessed, and interpreted the data to provide a technical basis for decision making. After the assessed data were approved by state, NRC, EPA, and DOE representatives in the FRMAC, the OSTD approved the release of the compiled data and assessments to the NRC at the EOF and the states. The assessed data were also given to federal agency representatives in the FRMAC (Fig. 5). In accordance with operational policy determined before the exercise, the assessments and data were not sent by the FRMAC to federal agency headquarters or to FRC without prior NRC approval. Data flow from the FRMAC is shown in Fig. 6.

FRMAC did not make decisions and recommendations involving the protection of the public. The states retain the primary responsibility for protecting their residents. The FRMAC, however, provided the technical information that the states needed to make many of these decisions, and state participants in the FRMAC were involved in these decisions. Some federal agencies have statutory responsibilities during a radiological emergency which require early access to radiological information. These agencies felt that the restriction on the release of data from the FRMAC impeded their meeting their statutory responsibilities regarding the safety of food, milk, crops, etc.

All incoming requests for information were evaluated by a management subgroup, consisting of the management representatives of the NRC, Illinois, and Wisconsin. This subgroup set the priorities for data collection and evaluation. The OSTD assigned the senior EPA representative the responsibility of coordinating the activities of the subgroup. The participants worked out the details of the interagency coordination in the various working groups, such as field monitoring, under the guidance of the DOE Region 5 Plan.⁵

Under the FRERP, the responsibility for coordinating the federal radiological assistance is to be transferred to the EPA, once the emergency phase has ended. There is no set time for this turnover, but in general, it would occur when the plant is stable, no further releases are expected, the radioactive contamination has been mapped and characterized, and some type of long-term monitoring plan has been developed. Both DOE and EPA must agree to the change in coordination of the federal efforts.

During the exercise, EPA assumed the responsibility for the coordination of the federal radiological assistance early on the

Fig. 5. Data flow within FRMAC. Source: DOE Chicago Operations Office Training Materials, May 1987.

Fig. 6. Data flow from FRMAC to primary locations. Note: Does not include status reports. Source: DOE Chicago Operations Office Training Materials, May 1987.

afternoon of the last day. The transfer agreement was negotiated by the DOE and EPA representatives in the FRMAC and approved by their headquarters. Before the agreement was signed, it was reviewed by representatives of all the other federal and state agencies in the FRMAC. These representatives later initialed the signed document (Appendix H).

The activities in the FRMAC continued with little change after the transition. The only observable difference was that the senior EPA representative became the OSTD, replacing the senior DOE player. The senior DOE player then acted as associate OSTD, to facilitate the continued DOE support of the FRMAC.

4. CONTROL AND EVALUATION OF THE FFE-2

4.1 DOE CONTROL RESPONSIBILITIES

The general control organization has been described previously. DOE provided its own controller at DOE headquarters to provide information to William F. Wolff, the DOE representative on the Exercise Control Group. In addition, DOE assumed the responsibility for providing controllers and evaluators for the FRMAC, mobile laboratories, and federal field monitoring teams. Some FRMAC field monitoring team controllers were also sent to the states' radiological field locations to accompany state monitoring teams on the first two days of the exercise.

FRMAC controllers included DOE and DOE contractor personnel as well as representatives of other agencies which were playing in the FRMAC. Harvey W. Clark (EG&G) and Kathy S. Gant (ORNL) were the lead controllers in the FRMAC, in charge of radiological data and the facility control organization, respectively. A DOE representative helped staff the simulation cell adjacent to the Exercise Control Group. Control assignments for some members of the group were changed periodically to allow them to see different aspects of the FRMAC operation. Two representatives from CRCPD, one each from the states of Mississippi and Missouri, were also controllers in the FRMAC. A list of FRMAC controllers and other DOE controllers/evaluators and their assignments is given in Appendix I.

4.2 EVALUATION OF THE FFE-2

Evaluation forms and critiques indicated that planners, participants, and evaluators considered the FFE-2 to be a successful exercise. The formal evaluation process elicited many comments which are summarized in the evaluation reports.^{2,3} The Scenario Work Group, working with BDM, compiled the initial reports, which were subsequently reviewed and approved by the Management Group. Because of many comments on the planning process itself, it was agreed to publish the evaluation report as two volumes: one on the planning process, the other on the exercise results. This resulted in some delay in the publication of the documents.

The FFE-2, which was a test of the FRERP and its application to a power plant accident affecting two states, revealed some minor changes that can be made in the FRERP and a number of procedural changes that individual agencies may consider. The FRPCC and affected agencies are working on these.

Following the Dry Run and FFE-2 exercises, DOE developed comments which are included as Appendices J and K. A summary of lessons learned from the Tabletop Exercise was compiled by the management group for use by the participants (Appendix L).

4.3 DEVELOPMENT AND USE OF EVALUATION MATERIALS

BDM, the FEMA contractor, developed the evaluation packets to assess the efficacy of the FRERP interfaces in the FFE-2. The evaluation was adapted from the FEMA modules used for compliance exercises. Evaluators at each of the locations kept logs, filled out prepared forms, and interviewed key players.

The evaluation forms were as follows:

- o Notification, activation, and deployment;
- o Onsite/offsite activity coordination and control;
- o Protective actions, reentry and recovery;
- o Offsite radiological monitoring and assessment coordination;
- o Coordination of other federal assistance;
- o Public information coordination;
- o White House and congressional information;
- o Evaluator observations; and
- o Player observation/interview guide.

The BDM-prepared forms were used in the FRMAC, in addition to specific forms developed by ORNL for the FRMAC evaluation. The DOE/FRMAC forms were based on those used in the FFE-1. The topics were specific to functional areas (e.g., activities at the FRMAC, field monitoring, mobile laboratories, and DOE headquarters) and addressed both the interfaces among agencies and the technical work being performed. A set of the evaluation forms is included in the background materials (Appendix A) filed in the Emergency Technology Library at ORNL. Players were also asked to complete questionnaires and make comments. Because DOE had no evaluators at some locations (e.g., the FRC and EOF), the DOE players at those locations filled out more extensive questionnaires. All forms were color-coded to distinguish BDM, FRMAC evaluator, and FRMAC player comments easily.

Informal meetings of the controllers followed each day of the exercise, and all participants in the FRMAC conducted a self-critique of the play on day 3. In addition, all the lead controllers met to compare comments in preparation for the public meeting held following the exercise.

Following the exercise, BDM collated comments from their forms; Gant and Adler (ORNL) compiled the comments applicable to DOE. The official DOE comments on the FFE-2, concurred in by DOE headquarters and DOE CH, are included as Appendix K.

4.4 DOE LESSONS LEARNED

The DOE/FRMAC lessons learned are included in the reports cited above. The major change since the FFE-2 is DOE's decision to place the Nevada Operations Office in charge of a FRMAC response anywhere in the country. This will provide consistent management and efficient use of the EG&G-managed resources. The regional radiological assist-

response. Regional personnel will concentrate on the coordination of the response with the state and local governments and other regional federal agency personnel.

5. VISITORS' PROGRAM, PRESS COVERAGE, VIDEO DOCUMENTATION, AND FOLLOW-UP ACTIVITIES

5.1 VISITORS' PROGRAM

Because of the high visibility of this major field exercise and its great potential for training, careful plans were made for the Visitors' Program. Each agency was responsible for developing its own list of prospective visitors, who were invited through the Visitors' Work Group. An information center was set up at the College of Lake County. Small groups of visitors were bussed from there to the various facilities on scenario day 2.

Visitors to the FRMAC were able to view the operations from the periphery of the building without interfering with the play. A briefing area was set up by EG&G/EM, and John F. Doyle and others of that organization escorted visitors around the edge of the FRMAC, where EG&G/EM had set up displays and equipment demonstrations.

5.2 PRESS COVERAGE

Efforts were made to coordinate the early public information releases about the exercise. In each exercise, there is both the real world press coverage before, during, and after the event, and the simulated press playing during the exercise. Representatives from DOE CH and Washington headquarters handled these activities. Information sheets were developed on the FRMAC and DOE response for use by the real-world press before the exercise. There was moderate, favorable local coverage of the FFE-2 by the local press, and no demonstrations or disruptions were noted.

5.3 VIDEO DOCUMENTATION

Before the June FFE-2, the NRC convened a small group of representatives from FEMA, DOE, CECo, and the state of Illinois to discuss videotaping portions of the exercise. Wisconsin did not plan to tape any of its activities. The NRC wanted to compile portions of any tapes into a training tape which would explain the roles of the state and federal agencies responding to a nuclear power plant accident under the FRERP.

The NRC arranged for a video group at ANL to handle the production. Al Rucker, the director of the video group, hired a script writer (Larry Ponte) and oversaw production of the video.

The interagency video group had extensive input, reviewing and approving the script and the tape segments used. This group, chaired by Sheldon A. Schwartz (NRC), included Stacey Gerrard (FEMA), Martha Adler (ORNL for DOE), Mary Snow (Illinois), and Robin Moon (CECo). Bernard Weiss (NRC) and William F. Wolff (DOE) provided advice and guidance to the group. The group arranged for FEMA, DOE (EG&G/EM),

Illinois, CECo, and when necessary, ANL crews to tape the appropriate activities (including some in Wisconsin). These activities were chosen from the scenario and one of the participating agencies was assigned to tape that event. The group also planned and coordinated the taping of after-action interviews with selected players and controller/evaluators.

M. Douglas Schroeder (EG&G/EM), with the assistance of Adler, videotaped selected portions of the FRMAC operations and interviews with FRMAC participants. Adler then annotated these tapes and gave them to ANL in the form that had been requested. The completed videotape, "Federal Response to Nuclear Power Plant Emergencies," was distributed to the participating federal agencies in July 1988.

5.4 FOLLOW-UP ACTIVITIES TO THE FFE-2

5.4.1 Interagency Activities

Members of the Scenario Development, Control, and Evaluation Work Group spent many months reviewing the evaluation comments on the exercise before recommending changes in procedures or policy to the Management Group. Members of the Management Group, many of whom are also members of the Subcommittee on Federal Response of the FRPCC, in turn are working with the Subcommittee to get needed changes made in agency plans and in the FRERP. The FRERP is being revised, both for clarity and content. In addition, the group is working on ways to educate more responders to the intricacies of the FRERP during the interim period between field exercises. More tabletop exercises, regional workshops, etc., are being considered.

5.4.2 DOE Activities

Following the exercise, DOE CH sent letters and certificates of participation appreciation to all DOE and DOE-contractor personnel in the FRMAC.

As indicated earlier, DOE is transferring the responsibility for coordination of the FRMAC activities from the Radiological Assistance Office responsible for the region in which the accident occurs to the Nevada Operations Office. The regional offices will still have a critical role in the response. A deputy FRMAC director will come from their office, and their personnel will continue to provide the initial response and interact with the local and state governments and regional federal agency representatives. The overall organization of a DOE response that can be applied to all types of radiological accidents is now being worked out. The DOE radiological assistance offices will then be able to adapt their response plans to the new organizational structure.

A series of work groups have been organized by the Nevada Operations Office to address procedural questions in the FRMAC operation. Members of all the DOE operations offices, DOE headquarters, and representatives from other federal agencies have been

asked to participate. A Management Panel will coordinate the efforts of the following work groups: Operations, Field Monitoring, Evaluation and Assessment, Regional Emergency Coordinators, Contamination Control, and Training and Exercises.

6. REFERENCES

1. "Federal Radiological Emergency Response Plan (FRERP)," *Federal Register*, Vol. 50(217), pp. 46542-46570, November 8, 1985.
2. *Federal Radiological Emergency Response Plan (FRERP) Field Exercise Report, Vol. I, Exercise Planning*, Federal Emergency Management Agency, July 14, 1988.
3. *Federal Radiological Emergency Response Plan (FRERP) Field Exercise Report, Vol. II, Exercise Results*, Federal Emergency Management Agency, April 28, 1988.
4. *The Federal Radiological Emergency Response Plan (FRERP) Field Exercise Development Plan (FFE-2)*, Federal Emergency Management Agency, November 14, 1986.
5. *Federal Radiological Monitoring and Assessment Plan, U.S. Department of Energy Region 5*, Chicago Operations Office, April 1987.

Appendix A

FRERP FIELD EXERCISE 1987 BACKGROUND MATERIALS

Appendix A

FRERP FIELD EXERCISE 1987 BACKGROUND MATERIALS

These materials are filed in the Emergency Technology Library, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

1. *The Federal Radiological Emergency Response Plan (FRERP) Field Exercise Development Plan (FFE-2)*, Federal Emergency Management Agency, November 14, 1986.
2. Materials (agenda, instructions, scenario) for the Tabletop Exercise, January 22, 1987, Federal Emergency Management Agency.
3. Materials (agenda, instructions, scenario) for the Dry Run Exercise, May 5-6, 1987, Federal Emergency Management Agency.
4. *Controllers' Handbook for FFE-2*, Federal Emergency Management Agency, June 8, 1987.
5. *Players' Handbook for FFE-2*, Federal Emergency Management Agency, June 8, 1987.
6. *Federal Radiological Monitoring and Assessment Plan, U. S. Department of Energy Region 5*, Chicago Operations Office, April 1987.
7. *Federal Radiological Emergency Response Plan (FRERP) Field Exercise Evaluation Report, Vol. I., Exercise Planning*, July 14, 1989.
8. *Federal Radiological Emergency Response Plan (FRERP) Field Exercise Evaluation Report, Vol. II., Exercise Results*, April 28, 1988.
9. DOE/Federal Radiological Monitoring and Assessment Center evaluation forms, controller/evaluator instructions, sample log book.
10. *Public Affairs Plan, Federal Field Exercise No. 2*, Public Affairs Work Group, rev. February 18, 1987.

11. Letters from DOE headquarters to Chicago, Nevada, and other DOE operations offices requesting participation in FFE-2.
12. "Federal Radiological Emergency Response Plan (FRERP)," *Federal Register*, Vol. 50(217), pp. 46542-46570, November 8, 1985.

Appendix B

EXERCISE PLANNING PARTICIPANTS

B-1/B-2

Appendix B

EXERCISE PLANNING PARTICIPANTS*

Management Group

The Management Group consisted of the following personnel and organizations:

<u>Member</u>	<u>Representative</u>	<u>Representative's Organization</u>
FEMA	Robert Wilkerson, Chairman	Headquarters
	Vernon Adler, Executive Secretary	Headquarters
	Ronald Buddecke	Region V
Illinois	Gary Wright Dave Smith	Department of Nuclear Safety Emergency Services and Disaster Agency
Wisconsin	Dave Speerschneider	Division of Emergency Government
	Tom Johnson	Division of Health
	Lawrence J. McDonnell	Division of Health
Commonwealth Edison	John Golden Del Butterfield	Corporate Emergency Planning Nuclear Services Technical
NRC	Ed Jordan/Ken Perkins John Hind	Headquarters Region III
DOE	William F. Wolff Edward Jascewsky	Headquarters Chicago Operations Office
EPA	Harry W. Calley	Headquarters
USDA	George Bickerton	Headquarters
HHS	Franklin Marks	Headquarters

*This material was taken from *The Federal Radiological Emergency Response Plan (FRERP) Field Exercise Development Plan (FFE-2)*, Federal Emergency Management Agency, Nov. 14, 1986, rev. Jan. 14, 1987, pp. III-3—III-9.

Scenario Development, Control, and Evaluation Work Group

The following people and organizations comprised the Scenario Development, Control, and Evaluation Work Group:

<u>Number</u>	<u>Representative</u>	<u>Representative's Organization</u>
NRC	Bernie Weiss, Chairman Tom Polski Joe Keller	Headquarters Region III Contractor (INEL/WINCO)
Illinois	Andrea Pepper Jana Fairow	Department of Nuclear Safety Emergency Services and Disaster Agency
Wisconsin Government	Garrett Neilsen Larry McDonnell	Division of Emergency Division of Health
Commonwealth Edison	Terry Blackmon Mark Berlin Krista Licari Mark Carnahan Randall Mika Leslie Holden John Brtis John Medema	Corporate Emergency Planning Corporate Emergency Planning Corporate Emergency Planning Zion Zion Zion Contractor (Sargent & Lundy) Contractor (Impell)
FEMA	Vernon Adler Walter Kordek Wallace Weaver	Headquarters Contractor (BDM) Region V
DOE	Martha Adler Kathy Gant Harvey Clark Edward Jascewsky	Contractor (ORNL) Contractor (ORNL) Contractor (EG&G/EM) Chicago Operations Office
EPA	Joe Logsdon Larry Jensen	Headquarters Region V
DOC	Loran Weaver Ray Waldman	NOAA Headquarters NOAA/NWS Rosemont
HHS	Alex Martin James Kraeger	FDA Headquarters FDA Region V
USDA	Cheryl Malina	Headquarters

Public Affairs Work Group

The Public Affairs Work Group was created with these personnel from the listed organizations:

<u>Member</u>	<u>Representative</u>	<u>Representative's Organization</u>
FEMA	Bill McAda, Chairman Pat Buckley	Headquarters Region V
NRC	Bob Newlin, Vice Chairman Jan Strasma	Headquarters Region III
DOE	Gail Bradshaw Gary Pitchford	Headquarters Chicago Operations Office
Commonwealth Edison	Robert Dwyer Krista Licari	Communications Services Corporate Emergency Planning
Illinois	Bruce Rodman Dave Smith John Plunk	Department of Nuclear Safety Emergency Services and Disaster Agency Emergency Services and Disaster Agency
Wisconsin	Gail Gawenda	Public Service Commission

Administration, Communications and Logistics Work Group

The following personnel and organizations comprised the Administration, Communications and Logistics Work Group:

<u>Member</u>	<u>Representative</u>	<u>Representative's Organization</u>
FEMA	Phil Zaferopulos, Chairman Douglas Ford	Region V Headquarters
NRC	Ray Priebe Linda Kers	Headquarters Region III
DOE	Chuck Gladden	Contractor (EG&G/EM)
Commonwealth Edison	Frank Johnson	Corporate Emergency Planning

Administration, Communications and Logistics Work Group (Continued)

<u>Member</u>	<u>Representative</u>	<u>Representative's Organization</u>
Illinois	Jack Cole Don Prindle	Department of Nuclear Safety Emergency Services and Disaster Agency
Wisconsin	Lawrence Reed, III	Division of Emergency Government
Kenosha County	Doran Hughes	Emergency Government

Visitors Work Group

The Visitors Work Group consisted of the following organizations and personnel:

<u>Member</u>	<u>Representative</u>	<u>Representative's Organization</u>
Commonwealth Edison	George Travers, Chairman	Corporate Headquarters
	Dennis Bieschke	Corporate Headquarters
DOE	Gary Pitchford	Chicago Operations Office
NRC	Dave Mathews	Headquarters
	Carol Eberhard	Headquarters
	Roiland Lickus	Region III
Illinois	Gail Melson	Department of Nuclear Safety Emergency Service and Disaster Agency
	Bill King	
Wisconsin	Lawrence Reed	Department of Administration
FEMA	Kathy Gaaserud	Headquarters
	Sharon Wolf	Region V

Appendix C

FFE-2 SCENARIO CHRONOLOGY

Appendix C

FFE-2 SCENARIO CHRONOLOGY

The following is a chronology of representative events that occurred during the FFE-2.*

Day 1 (Scenario Day 1)

At 6:20 a.m., Commonwealth Edison declared an Unusual Event for Zion Unit 1, because of high activity in the coolant. The NRC Operations Center in Bethesda, Maryland, was informed, and notifications were made. The reactor was operating at 99 per cent of full power, and actions to achieve a controlled shutdown were initiated.

At 6:40 a.m., Commonwealth Edison upgraded the event classification to an Alert. The NRC went into standby mode at 7:05 a.m. Appropriate notifications were made, and the Regional Incident Response Center and the NRC Operations Center were manned. The NRC, FEMA, and DOE—each of which has responsibilities for notifying other agencies about the emergency situation—began notifying other agencies as changes occurred in the emergency situation.

At 8:00 a.m., as a precautionary measure, the NRC upgraded its response mode to Initial Activation because of slowly increasing pressure in the containment. At 8:18 a.m., the states of Illinois and Wisconsin requested federal assistance. The reactor was manually shut down at 8:34 a.m. because of a decreasing pressurizer level. At 8:36 a.m., Commonwealth Edison declared a Site Area Emergency. FEMA appointed a Senior FEMA Official (SFO) and decided to deploy the Emergency Response Team at 9:00 a.m.

At 9:18 a.m., Zion lost offsite power. The plant was being maintained in a stable shutdown condition with adequate core cooling. There were, however, indications of a high percentage of failed fuel, and the primary system leak had increased to about 300 gal/min. Containment building integrity was being maintained, but radiation levels were high (approximately 400 R/h). Nonessential onsite personnel were evacuated from the plant in accordance with procedures.

At 9:26 a.m., the states of Illinois and Wisconsin made the following protective action recommendations (PARs) to the public: Illinois—evacuate 0-2 miles for all sectors; Wisconsin—shelter in place 2-5 miles all sectors, confine milk producing animals and place on stored feed out to 10 miles.

At 10:02 a.m., the FEMA Headquarters Emergency Support Team (EST) was activated, and the NRC Site Team arrived onsite and at the EOF.

*This material has been adapted from the *FFE-2 Evaluation Report, Vol. II. Exercise Results*, Federal Emergency Management Agency, April 28, 1988, pp. B-3-B-8, F-1.

At 10:05 a.m., Commonwealth Edison upgraded the event classification to General Emergency. The states of Illinois and Wisconsin each declared a state of emergency and expanded their PARs to the following:

- o All people within a 2-mile radius of the plant evacuate;
- o All people within the three downwind sectors, 2-5 miles of the plant and west, northwest from the plant evacuate;
- o All people within 5-10 miles, and west, northwest seek shelter; and
- o All milk producing animals within 20 miles of the plant should be put on stored feed.

These actions were recommended to reduce potential exposures to the public due to the measured potential of the large release of radioactive material from the containment.

At 10:20 a.m., the Department of Energy was requested to establish a FRMAC. The NRC Chairman appointed a Director of Site Operations at 10:30 a.m. The FEMA regional Emergency Response Team deployed to a predesignated Federal Response Center (FRC) site at 11:00 a.m.

At noon, due to continual rising containment radiation monitor readings, the states of Illinois and Wisconsin further modified their PARs to include evacuation of all persons out to 5 miles, 360 degrees around the plant, and sheltering for all persons 5-10 miles, 360 degrees around the plant. By 1:30 p.m., the states of Illinois and Wisconsin had simulated the evacuation of 138,230 people, 136,600 of which were in Illinois and 1,630 in Wisconsin. The total time of evacuation was 3 h 45 min.

At 2:45 p.m., Wisconsin simulated the distribution of potassium iodide (KI) for their emergency workers. Commonwealth Edison reported uncontrolled releases of radioactive material into the atmosphere over a 3-h period beginning at 3:15 p.m. and terminating at 6:15 p.m. At the time of the release, the wind was blowing inland from the lake toward the northwest. Shortly after the release ended, the wind shifted and blew toward the southwest, while rain began to fall. Ground contamination was detected in the west-southwest, west, and west-northwest sectors from the plant out to a distance of approximately 10 miles. Radiation levels in the three affected sectors varied from near background to about 1000 times background, with the higher levels being within 3 miles of the plant in a general west to west-northwest direction. The noble gas and iodine release was $0.5 \mu\text{Ci}/\text{cm}^3$ of air at a stack flow rate of $67,000 \text{ ft}^3/\text{min}$ or approximately 10 Ci/s.

At 3:30 p.m., the FRC was activated by the Deputy SFO and the advance Emergency Response Team members at the Lake County Fair Grounds. Initial radio and telephone communications were installed by FEMA Region V personnel. Additional communications equipment and personnel for the FRC were enroute from Washington, D.C., and Denver, Colorado.

By the end of scenario day 1, 7:00 p.m., all emergency response facilities were operational except the FRMAC.

Day 2 (Scenario Day 2)

Scenario Day 2 began with exercise controllers providing a break message to all participants. The break message summarized players' decisions during day 1, identified events simulated to have occurred during the overnight break in exercise play, and established the initial conditions for day 2 exercise play.

At 8:00 a.m., the FRC was fully staffed and all communications systems were installed and operational.

The FRMAC also was fully staffed and activated at 8:30 a.m., following a 1-h recapitulation of day 1 events designed to bring all of the FRMAC staff up to date on the exercise and to give them an overview of the data that would have been acquired in the FRMAC during the early stages of the accident.

Exercise play began with Unit 1 at the Zion plant in a controlled-shutdown mode. Plant conditions were stable and containment integrity was intact. The emergency action level at the plant was still General Emergency.

Evacuation conditions at the beginning of day 2 were:

- o Illinois - Approximately 80 percent of 168,000 people who reside in the EPZ in Lake County registered at four different congregate care shelters and were monitored by the Illinois Department of Nuclear Safety.
- o Wisconsin - Approximately 4500 of the 5500 people who live in the affected area evacuated. A total of 1930 of these people were processed through the county reception center and housed in two congregate care centers.

At 8:30 a.m., Commonwealth Edison reported that a relief valve on the waste gas decay tank's common header was near its relief set point and would provide a direct release path to the atmosphere. CECO requested permission to release, under controlled conditions, the contents of these waste decay tanks.

Airspace restrictions were in place within a 10-mile radius of the plant, and Lake Michigan boat traffic was advised to stay 20 miles from the plant. The Chicago-Northwest railroad tracks, which traverse the Zion area, were closed. Interstate Highway 94 (I-94) was closed, and numerous traffic control points were established which closed most local roads. All farm animals within 20 miles were sheltered. Wisconsin designated some farmers as emergency workers and distributed KI to them at 9:10 a.m., so they could reenter the area to care for animals. Illinois also designated 12 farmers as emergency workers.

At 11:30 a.m., the FRMAC had 19 field monitoring teams and 4 mobile labs in operation. The teams went beyond the 10-mile EPZ to take measurements in areas not previously monitored.

CECo was granted permission to release the waste gas at 1:15 p.m. At 1:36 p.m., CECO reported that a controlled release of gases in the waste gas decay tanks was in progress. The controlled release was

within regulatory limits and did not result in a change to the announced PARs.

At 3:00 p.m., the Illinois National Guard was activated to support traffic and access control points.

At 3:40 p.m., Illinois requested permission to allow the public to reenter sectors J, K, and L from 2-10 miles of the plant. Soil samples from sectors J, K, and L indicated that the radiation levels there were background. NRC concurred with the Illinois request at 4:30 p.m.

At 3:45 p.m., the Governor of Wisconsin requested a Presidential Disaster Declaration on behalf of Kenosha County to supplement the assistance available under the Price-Anderson Act.

Scenario day 2 ended with Unit 1 in a controlled shutdown mode, the power plant in stable condition, and the event classification still at General Emergency.

Day 3 (Scenario Day 10)

Scenario Day 10 began at 8:00 a.m. with exercise controllers providing a break message to all participants.

Exercise play began at 8:30 a.m. with Unit 1 in a stable shutdown mode and containment integrity intact. Plant classification remained at General Emergency with plant access through the southern gates.

The status of evacuees was as follows:

- o Illinois - No additional congregate care centers were opened, however, 75,000 persons were still in the four operational centers.
- o Wisconsin - Approximately 4,000 persons remained evacuated with 1,450 in two congregate care centers.

All emergency response facilities were still operational, but some were operating with reduced staffing. Airspace was still restricted within a 10-mile radius of the plant. Rail traffic remained banned within the affected area. Farm animals were still on stored feed.

At 9:00 a.m., the Governor of Illinois formally requested a Presidential Disaster Declaration. FEMA indicated that a decision on the Illinois and Wisconsin disaster requests would be made within three days.

At 10:00 a.m., FEMA provided the names of nominees in response to a White House request for establishment of a Blue Ribbon Committee to examine the Zion accident.

At 10:45 a.m., the Governor of Illinois reopened I-94 in Illinois. Two of the four congregate care centers in Illinois were closed.

At 12:45 p.m., Illinois and Wisconsin recommended allowing reentry. Airspace restriction was lifted and I-94 was reopened in Wisconsin.

At 1:44 p.m., NRC concurred in reclassification of General Emergency to Recovery (onsite). DOE and EPA began negotiating the

transfer of the responsibility for operating the FRMAC. A Nuclear Accident Response System (NARS) message at 2:05 p.m. announced the recovery phase. DOE transferred the responsibility for coordinating the long-term radiological monitoring to EPA; both agencies signed an agreement at 2:05 p.m.

Exercise play ended at 3:00 p.m. (CDT) on scenario day 10 and the exercise terminated.

Appendix D

**U.S. DEPARTMENT OF ENERGY RESOURCES
BROUGHT FROM EG&G/EM FOR FFE-2 (JUNE 1987)**

Appendix D

U.S. DEPARTMENT OF ENERGY RESOURCES BROUGHT FROM EG&G/EM FOR FFE-2 (JUNE 1987)

		<u>Number of people</u>	<u>Length of Time</u>
Operational Support Services			
Badging, clerical support, comfort services, personnel and equipment management.	Doyle, John F. Greve, Christopher M. Klob, Diana J. Maina, Lola M. Sasso, L. Gene Selph, Bette J.	6	5 days
Logistic Support Services			
Arrangements for FRMAC site & furnishings, transportation, onsite fabrication and repairs.	English, Harold R. Mazurkewiz, Robert J.	2	8 days
Mechanical Support Services			
Material handling, FRMAC setup, electrical service, onsite fabrication, and repairs.	Baldwin, C. Eugene Bearden, Wayne L. Behary, James G.	3	5 days

Number Length
of people of Time

Communications Support

Compressed video between EOF and FRMAC (requires microwave link); DITS from FRMAC to EOF, Illinois REAC, and Wisconsin EOC; 3-DES (encrypted) radio nets plus radios for FRMAC site, with beepers; telephone switch, instruments, and operator for FRMAC; FAX equipment for FRMAC, EOF, Illinois REAC, Illinois RAFT, and Wisconsin.	Gladden, Charles A. Brune, David R. Cenicola, Philip L. Cobb, Barbara G. Hinnars, Melinda C. Irvine, Emilie A. Korous, Jack E. (EOF) Marino, John L. (Springfield, Ill.) Rhodes, Charles E. (Madison, WI) Saunders, Melvyn W. (EOC) Taylor, Charles J. Tichenor, Douglas D. VanVranken, David L.	14	10 days
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Health Physics Support

Dosimetry support for all FRMAC staff, "Hot Line" support, decontamination and rad waste control; radioactive source for instrument calibration; supplemental monitoring instruments and supplies, e.g., anti-Cs, etc.; packaging and transportation of radioactive material.	Seals, James L.	1	5 days
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Field Monitoring Support

In-situ gamma analysis field team with equipment.	Reiman, Ronald T.	1	5 days
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Number Length
of people of Time

Aerial Monitoring Support

Poster display illustrating airborne plume tracking and sampling aircraft. (Aerial radiological survey helicopter and mobile data analysis van were deleted.)	Feimster, Eugene L.	1	5 days
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Data Control & Assessment/ Hazards & Effects Assessment

Compilation of comprehensive data set and computerized data base; quality assurance; preparation of data abstracts and graphics presentation.	Burson, Zolin G. Ballatore, Lynne A. Berry, Hollis A. Forsstrom, Linnie M. Guss, Paul P. Hall, Laura L. McGlothen, R. Elaine Torres, Irma	8	5 days
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Technical Liaison Support

Technical liaisons to EOF, Illinois REAC, Wisconsin EOC, and FRC; briefings on FRMAC capabilities and facilitating requests to FRMAC.	Lamonds, Harold A. (EOF) Jobst, Joel E. (Madison, WI) Dahlstrom, Thomas S. (Springfield, IL)	3	4 days
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Photographic Support Services

Vertical and oblique aerial photographs of Zion NPP; documentary photography of all agencies' operations at key facilities; some onsite processing--photo pod not deployed (in renovation).	Meibaum, Robert A. Knighten, M. Kirk Roed, James M. Smith, Eugene W.	4	5 days
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	<u>Number of people</u>	<u>Length of Time</u>
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Video Support Services

Documentary video for
future video presentations.
Video pod not deployed (in
renovation).

See
visitor
briefing
support
below.

Graphic Arts Support

Preparation of signs,
displays and illustrations.

Sandgren, Ronald C.

1

5 days

Visitor Briefing Support

Poster board displays;
visitor briefings employing
MERIS as a briefing tool to
combine live action with
prepared "viewfoils" and
video tapes.

Schroeder, M. Douglas

1

5 days

TOTAL	45
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Appendix E

AGENDAS FOR DOE CHICAGO OPERATIONS OFFICE WORKSHOPS BEFORE THE FFE-2

Appendix E

AGENDAS FOR DOE CHICAGO OPERATIONS OFFICE WORKSHOPS BEFORE THE FFE-2

1. FFE-2 FRMAC Players' Workshop Liaisons' Group--March 10, 1987

Communication Channels
Role of Each Location Liaison
Role of Each Liaison at the FRMAC
Type of Information Expected and its Form
Interfaces Expected
Logistical Needs

2. FFE-2 FRMAC Players' Workshop Field Monitoring Group--March 10-11, 1987

(Chairperson - J. Slack, DOE/OR)

Tuesday A.M.

Welcome
Instructions
FRMAC Organizational Structure
Radio Communication
Data Control/Quality Evaluation
Dosimetry for FRMAC Personnel
AMS Resources at FFE-2
Contamination Control at the FRMAC
Field Team Response to Media
ARAC at FFE-2

Tuesday P.M./Wednesday A.M.

Field Teams-J. Slack, DOE/OR

Resources
Procedures
Cross Calibration
Maps
Forms/Units
Dispatching

Labs-M. Grace, DOE/CH

Resources
Procedures
Cross Calibration
Reporting/Forms/Units
Sample Tracking

Wednesday P.M.(Concluding Remarks)

Field Team Report
Lab Report
Conclusion

3. FFE-2 FRMAC Players' Workshop Data Evaluation Group--March 12, 1987

(Chairperson - Z. Burson, EG&G/EM)

- Welcome
- Instructions/Objective
- FRMAC Organizational Structure
- Liaison Workshop Summary
- Field Monitoring Report
- AMS Resources at FFE-2
- ARAC at FFE-2
- State/NRC Reporting Requirements
 - Illinois
 - Wisconsin
 - NRC
- Quality Assessment/Approval Cycle Developed
- Impact Assessment/Approval Cycle Developed
 - Dose Models
 - Maps/Forms/Units
 - References Used
 - Data Plotting
- Final Data Flow Developed
- Closing

4. FFE-2 FRMAC Players' Workshop Data Evaluation Group--April 8-9, 1987

(Chairperson - Z. Burson, EG&G/EM)

- Welcome
- Description of Data Evaluation Group
- Data Flow Through FRMAC
- Role of Computer in FRMAC
- Day 2 Activities
- Day 10 Activities

Appendix F

FRMAC DATA FLOW--SIGNATURE CHAIN AND DISTRIBUTION

Appendix F

FRMAC DATA FLOW--SIGNATURE CHAIN AND DISTRIBUTION

1. Signature Chain and Distribution for Validated Raw Data

- a. Signature Chain
 - (1) Data Evaluation - Z. Burson/D. Musolino
 - (2) Monitoring and Evaluation Manager - R. Mayes
 - (3) OSTD/DOSTD - D. Bray/E. Jascewsky
- b. Distribution
 - (1) Remote - Faxed to Illinois REAC, Wisconsin, CECo EOF, and NRC/HQ
 - (2) Within FRMAC
 - o OSTD/DOSTD
 - o Illinois
 - o Wisconsin
 - o NRC
 - o EPA
 - o HHS (FDA)
 - o USDA
 - o FEMA
 - o CECo
 - o DOI
 - o Liaison Manager
 - o Monitoring and Evaluation Manager

2. Signature Chain and Distribution for Final Data

- a. Signature Chain
 - (1) At Data Evaluation Table
 - o Data Evaluation Coordinator or Alternate
 - o Illinois
 - o Wisconsin (if available)
 - o NRC
 - o EPA
 - (2) At FRMAC Management Table
 - o Monitoring and Evaluation Manager
 - o Illinois
 - o Wisconsin
 - o NRC
 - o EPA
 - o OSTD

2. Signature Chain and Distribution for Final Data (continued)

b. Distribution

(1) Remote - Faxed to Illinois REAC, Wisconsin, EOF, NRC/HQ

(2) Within FRMAC

o OSTD/DOSTD

o Illinois

o Wisconsin

o NRC

o EPA

o HHS (FDA)

o USDA

o FEMA

o CEC

o DOI

o PIO

o Monitoring and Evaluation Manager

o Liaison Manager

Appendix G

METHOD OF PREPARATION OF THE RADIOLOGICAL IMPACT DATA FOR THE FFE-2

Appendix G

METHOD OF PREPARATION OF THE RADIOLOGICAL IMPACT DATA FOR THE FFE-2

Harvey W. Clark
EG&G Energy Measurements, Inc.

Overview

The radiological impact data created for FFE-2 were both extensive and complex. The data were derived from a source term which contained 15 radioactive nuclides. The magnitude of the source term as well as the nuclide mixture varied with time. Moreover, the volume of data prepared was extremely large. In all, almost 60,000 values were computed and tabulated. Eight figures with accompanying tables were also prepared in order to compute quickly any of 200 measureables, not previously tabulated, at any desired location and time. The data prepared included not only all offsite radiological data but also all onsite data outside the plant. Finally, an extensive set of break message data, over 700 values, was prepared to begin play on days 2 and 3, scenario days 2 and 10 respectively.

The data were prepared in a cooperative effort by both CECG and the DOE through their contractors. The participants included Sargent & Lundy Co., Westinghouse Idaho Nuclear Co., Atmospheric Release Advisory Capability (ARAC) from Lawrence Livermore National Laboratory (LLNL), and EG&G Energy Measurements, Inc. (EG&G/EM). An overview of the data preparation process is presented below.

A source term was carefully constructed not only to produce a precisely defined impact but also to be consistent with the hypothetical "accident" scenario. This involved a lengthy series of steps by members of the Scenario Development, Evaluation, and Control Work Group (SWG). First, each agency presented the type and level of play desired to meet their exercise objectives. The radiological impact required to trigger these levels of play in the targeted areas was then defined in terms of a time line, exposure rates, and radionuclide concentrations. The contamination levels were established with respect to each agency's planned action levels through discussions in the SWG meetings. Next the source term and meteorology were defined to produce the chosen plume passage characteristics and time-evolved deposition pattern. This was accomplished by modeling the impact of a trial source term and meteorology in a series of iterative steps. After a suitable source term and meteorology had been identified, the onsite accident scenario was adjusted to be consistent with the required release history. Finally, the exposure rates and radionuclide concentrations were computed from a plume dispersion model for all locations and times of interest. The completed data sets were then reviewed by members of the work group prior to use.

Initial modeling was performed by Westinghouse. However, the much more detailed modeling, required later, was conducted by ARAC at LLNL. Sargent & Lundy Co. constructed tabulated data sets to match those used routinely on CECo exercises. These tables reported approximately 500 results for each of the monitoring locations predesignated by the Illinois Department of Nuclear Safety (IDNS). EG&G/EM prepared contour plots of measureables on area maps to provide data at other locations. Tables for quickly calculating nearly 200 measureables from the plotted data accompanied the plots. An electronic spreadsheet was also provided to facilitate this calculation.

Exercise Data Preparation Procedure

1. The SWG defined the desired time line and level of play required to satisfy exercise objectives, e.g., evacuation, relocation, shelter, notification, monitoring and food embargo. Areas and agencies were targeted for different types of play according to level and time of participation desired by the participating agencies and local governments. The offsite radiological scenario was engineered so that it would not and could not affect the "evaluated" portion of the exercise in any adverse or unexpected way. Only after the evaluated portion of the exercise had concluded was the scope of the problem expanded beyond that normally used for evaluated exercises. For example, during the evaluated portion of the exercise, protective actions were driven principally by the noble gases and the impacted area was limited to sector P within the 10-mile EPZ. After the evaluated portion of the exercise, the iodine release rate was tripled and the particulate release increased by a factor of 45. This created a more interesting problem for scenario days 2 and 10.
2. CECo defined an "accident" type (PWR 5) and a release time line believed to be consistent with above requirements.
3. The exposure rates and radionuclide concentrations required to trigger the desired levels of play were defined by the SWG in terms of each agency's planned action levels. The "Draft EPA Report of Implementation Guidance for Relocation PAGs" was adopted by the SWG as the source for all dose conversion factors.
4. A source term that included 15 radionuclides was proposed by Westinghouse Idaho Nuclear Co. The release was constant for the first two hours, then iodines and the particulates increased during the last hour. Transport and dispersion of the plume was then modeled to estimate the required wind speeds, stability, and release magnitude.
5. The National Weather Service created a plausible weather scenario consistent with the required meteorology.

6. ARAC was then requested to model the radiological impact in greater detail in order to better refine the proposed source term and meteorology. ARAC responded with 37 contour plots of measureables and impacts. The data modeled included the following:
 - o Instantaneous whole body dose rate due to plume immersion at the end of the release period, i.e., worst case;
 - o Integrated whole body dose due to plume passage;
 - o Cumulative I-131 deposition;
 - o Whole body dose rate due to cumulative I-131 deposition at the end of the release period, i.e., worst case;
 - o Integrated I-131 infant thyroid dose due to plume passage;
 - o Cumulative Cs-137 deposition;
 - o Cumulative Ba-140 deposition;
 - o First year external whole body dose;
 - o Airborne concentration of I-131 each half hour during plume passage;
 - o Airborne concentration of the noble gases, Kr-88 and Xe-133, each half hour during plume passage; and
 - o Wind field data, i.e., speed and direction at several altitudes and locations.
7. The SWG reviewed the plots of the predicted impact and timing with respect to desired scenario details. Deficiencies and desirable changes were identified. The source term and meteorology were modified, and ARAC was then requested to rerun their model. This process was repeated until all members of the SWG were satisfied.

The final source term, release time line, and meteorology are summarized in Attachment A.

The downwind range of significant radiological impact was limited by two means, (1) a short duration release (3 h) and (2) rain washout. The release during the first two hours was by a monitored pathway. The increase in release rate during the final hour was related to the addition of a major unmonitored pathway. A heavy rainfall was employed throughout the area from 1630 to midnight. It was also necessary to introduce a wind shift of 30 degrees to shift the impact away from Wisconsin (sector P) and more into Illinois (sectors N & M).
8. Upon acceptance of the modeled radiological impact by the SWG, the National Weather Service was tasked to create a detailed weather scenario and supporting data for injects. These data were also forwarded to the utility's meteorology contractor for preparation of onsite data and injects. A copy of the meteorology prepared by the weather service appears as Attachment B.
9. SWG members were solicited for types and quantities of data desired for play (e.g., nuclides, types and number of measurements, units of measure, and reporting protocol). This

included instrument calibrations, sensitivities, and native units of measure (cpm, mR/h, pCi/L, etc).

10. A table of conversion factors was constructed to convert deposition concentrations to predicted radionuclide concentrations in various samples. These conversions also included the estimated effects of rain wash down.
11. Three different controller guides for radiological data, plus inject data to start off day 2 and 3, were needed during play. The three guides prepared were:
 - o Field Team Controller Guide for Day 1. This guide was produced specifically for the evaluated portion of the exercise. The format was identical to that typically used by the states and the utility for exercises. The guide was organized such that each page presented tables containing all field and laboratory measureables for a single predesignated location. Data were provided in half hour increments for the duration of the evaluated portion of the exercise on day 1.
 - o Field Team Controller Guide for Days 2 and 3. This guide was produced for the expanded portion of the exercise for federal play. The data were presented on a series of contour plots and conversion tables. The format was sufficiently flexible and general to permit relatively free play.
 - o Laboratory Controller Guide for Days 2 and 3. This guide was also produced for the period of full federal play. The purpose of this guide was to aid laboratory controllers in converting the data provided on the field team controller's sample tag to laboratory results. The form was a series of tables which on a single page presented conversion factors for all measureables during a particular time interval.
12. The predictions prepared by ARAC were then plotted on both the IDNS Zion EPZ map and a USGS map mosaic of the Zion area. The coordinates of both the Wisconsin and Illinois predesignated monitoring locations were determined in UTM coordinates. These coordinates were forwarded to ARAC. ARAC was then asked to provide tables of six predicted measureables for each of the 81 predesignated monitoring locations in sectors M, N, & P in half-hour increments from release initiation until after plume passage. The measureables included:
 - o I-131 deposition;
 - o Whole body dose rate due to plume immersion;
 - o Whole body dose rate due to deposition;
 - o I-131 air concentration;

- o Noble gas air concentration; and
- o Cumulative Cs-137 deposition.

13. The field team controller's guide for day 1 was prepared by Sargent and Lundy Co., a CECO contractor, in close coordination with the states and the utility. The format was selected not only to resemble their usual exercise field controller guides but also to minimize the risk of controller error. Little training or interpretation was required to use this guide. However, this guide constrained all play to the predesignated monitoring locations as specified in the states' and utility's emergency response plans.

The guide was constructed as follows. The tabulated data, provided by ARAC, was fed into an electronic spread sheet containing the appropriate conversion factors. The spread sheet then produced a table for each predesignated sampling location, both offsite and onsite (outside the plant). The table contained all relevant field and laboratory data, 72 measureables in all. These values were tabulated for eight half-hour intervals during the release on day 1, i.e., 1515 until 1845. Results for times prior to the release, 1515, were as read. The table included data for survey meters, air samples, and samples of water, soil and vegetation. The complete set of tables contained over 50,000 reportable values. A sample from this guide is appended as Attachment C.

The spatial variation of the radionuclide ratio for the deposition was accommodated by interpolating the source term ratios with respect to the tabulated values for cumulative I-131 and Cs-137 concentration.

14. The field team controllers' guide for days 2 and 3 was prepared by EG&G/EM, a DOE contractor, in coordination with all federal agencies requiring technical data and in particularly close coordination with Sargent & Lundy. The format of the data, i.e., contour plots and conversion tables, was chosen to optimize flexibility. However, this format did require judgments and interpolations by the field team controllers, and hence considerable training.

The guide was constructed by plotting the ARAC predictions in black ink, on blue halftone reproductions of the IDNS 10-mile EPZ map. Conversion scales were provided on each plot with decay correction factor tables where appropriate. The plots included:

- o Map of the Zion 10-mile EPZ and surrounding area;
- o Radionuclide ratios of the final deposition;
- o Whole body exposure rate due to deposition immediately after plume passage;
- o Whole body dose due to plume passage;
- o Cumulative I-131 deposition;
- o Cumulative Cs-137 deposition;
- o Personnel and equipment contamination; and
- o Thyroid scan results.

These plots are appended as Attachments D1-8 (for this publication, the plots have been reproduced in black and white).

The above radionuclide ratio of the deposition varied continuously over the impacted area. For convenience the impacted area was divided into three regions. In each of these three regions, the ratio was defined as uniform but unique to that region. This information was used for assignment of results by the laboratory controllers.

The guide also included tables of exposure rate and final I-131 deposition at the predesignated monitoring points for the controller's convenience. Exposure rates were reported for 6 in, 3 ft and 6 ft above ground level, with the beta shield both open and closed. Values were also available for a SPA-3. Final I-131 deposition values were reported with the corresponding radionuclide ratio identifier. A table of contact exposure rate conversion factors were provided so that any sample could be assigned a value, which is important in sample preparation and prioritization of sample analysis. Finally, a cross-reference table between Illinois and Wisconsin nomenclatures for predesignated monitoring locations common to both states was provided.

15. The laboratory controller's guide was prepared for use on days 2 and 3 by EG&G/EM. The guide was to aid the laboratory controller in assigning results to samples returned by field teams to the laboratory for analysis. The guide provided a means of estimating the concentrations of 13 radionuclides and the contact exposure rate for a variety of sample types. These included:

- o Water samples--pond, river and rain water in pCi/L;
- o Vegetation samples--grass and vegetables in both $\mu\text{Ci}/\text{m}^2$ and $\mu\text{Ci}/\text{kg}$;
- o Soil samples--depths of 0.5, 2.5, 5 and 10 cm in both $\mu\text{Ci}/\text{m}^2$ and $\mu\text{Ci}/\text{kg}$;
- o Milk samples--values reported for iodines and strontiums only, in pCi/L; and
- o Contact exposures--values for gamma plus beta (cpm) and also gamma only (mR/h).

Reported concentrations were decayed to the proper extent. The guide also provided a means for reporting the results of gamma in-situ spectroscopy.

Values would be assigned in the following fashion. The field team controller would attach a "Field Controller's Report" to each sample. On this report were values for the final I-131 deposition and the radionuclide ratio region identifier for the location where the sample was taken. The report also assigned contact exposures (gamma + beta and gamma only) to the sample. The laboratory controller would then turn to the table for that day and time period and radionuclide region to find the appropriate conversion factors. The results of the analysis to be reported were simply obtained by multiplying the final I-131

deposition by the set of conversion factors corresponding to the desired sample type. Work sheets were provided to aid the controller.

However, values for sample analyses were generally not assigned by this laborious method. A laptop computer with an inexpensive electronic spreadsheet was provided to most laboratory controllers. The spreadsheet calculated the results from the date/time, radionuclide region identifier and final I-131 deposition. No calculations were required of the controller.

The conversion factors used to prepare both this guide and the laboratory results in the day 1 guide were generally taken from NRC Regulatory Guide 1.109, *Calculation of Annual Doses to Man From Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I*. The conversion factor generation procedures and input data are summarized in Attachment E.

16. An extensive set (764 values) of exposure rate data was prepared for the remotely placed array of nine Reuter-Stokes ion chambers operated by IDNS. The array consisted of an ion chamber placed 1-3 miles from the plant in each sector, excluding the lake. Data from the array was telemetered to a computer in the IDNS EOC in Springfield. The exercise data were input to the IDNS computer so that automated displays would appear to function as usual. The data for day 1 were updated each half-hour until the release began, then each seven minutes. Data for day 2 were updated each half hour and at each hour on day 3. The reported exposure rate reflected not only decay but also the effects of rain and data variability. No attempt was made to model the effect of instrument contamination.
17. Extensive inject data to start play on day 2 was prepared. These data were to simulate the data and assessments that would have been obtained during the night between periods of play. Break message data were available for day 2 after the end of day 1 play. Likewise, data for day 3 were available after play on day 2.

Field monitoring data and results of laboratory analyses were prepared by EG&G/EM. They consisted of separate sets of data representing the efforts of different agencies. The set for CECo contained an isotopic analysis of a water, grass, soil and air sample from each of six locations. A set of soil and grass sample analyses were prepared for Wisconsin for each of five locations. However, the set for Illinois consisted of isotopic analysis results for a soil and either a water or grass sample or all three samples at each of 30 locations. In addition to this, results of exposure rate measurements were provided for 6 in, 3 ft, and 6 ft at 89 predesignated monitoring locations (25 outside the impact area). Approximately 10 copies of the break message data were distributed.

Plume predictions and a detailed radiological assessment were prepared by IDNS. The prediction included not only a plot

of the deposition pattern and dose projection but also an estimate of the source term and a time line for the release magnitude. This information was provided to the state assessment manager at the conclusion of day 1 play. The manager then prepared a briefing, which he presented to the federal family present in the FRMAC at the beginning of day 2 play.

18. EG&G/EM prepared Aerial Measuring System (AMS) data to be injected into play during day 2. The data consisted of a deployment and survey time line, the result of a fixed-wing survey and results of the first helicopter survey flight. The earliest data simulated the execution of a crude survey via fixed-wing aircraft during the night after the rain. The result was a "Letter Plot" for a survey conducted with 1-mile line spacing at 1000 ft above ground level (AGL). A "Letter Plot" is a plot of the path of the aircraft traced by a series of letters which correspond to contamination levels. A single copy of the plot was provided on computer plotter paper for use on a 1:250,000 USGS base map. This plot was made available after the reading of the day 2 break message.

The helicopter survey was notionally launched at noon on day 2. The data and time line simulated a survey conducted with a 500-ft line spacing at 300-ft AGL interlacing every other line until complete. Results of the first flight were released at 1600. The results were presented as contour plots of "Gross Count", related to exposure rate, and estimated I-131 deposition. A single copy of each plot was provided on computer plotter paper for use on the 2000 ft/in USGS map mosaics and aerial photographs provided by controllers.

19. Considerably less inject data was prepared for day 3. It was assumed that the focus would have shifted from monitoring to assessment. Therefore, no field monitoring data was provided. However, additional assessments, TLD results, and AMS data were prepared for the break message. Approximately 10 copies were distributed.

A definition of the source term was provided, which reported the proper radionuclide ratios and a description of the radionuclide ratio regions. Although the correct ratios were reported, the magnitudes and release time line were not divulged.

Results were also provided for the 67 fixed-position TLDs used for routine environmental monitoring by the NRC, CECO, Illinois and Wisconsin. The reported doses contained the dose due to plume passage, dose due to deposition up to scenario day 7, and the quarterly background since last reading prorated to scenario day 7.

AMS aerial survey results were presented as if completed and decay corrected to scenario day 8. The AMS data included the following:

- o Contour map of exposure rate as mapped by the aerial survey, decay corrected to day 8 and normalized to ground-based results;
- o Contour map of I-131 deposition as mapped by the aerial survey, decay corrected to day 8 and normalized to ground-based results; and
- o Contour map of Cs-137 deposition as mapped by the aerial survey and normalized to ground-based results.

A single copy of each plot was provided on computer plotter paper, and six copies were provided on clear acetate. The plots were scaled to fit the 2000 ft/in maps and aerial photographs provided by controllers.

To simulate the results of an assessment, the players were provided with a copy of the plot of whole body dose due to plume passage from the field controllers' guide (Attachment D-3). Finally, plots of the whole body dose due to ground shine from plume deposition after 1 year were prepared for distribution as a contingency. If players did not derive this result by 1030 on day 3, then the figure was to be distributed. It was not distributed.

20. Prior to the exercise, a half-day training session focusing on the roles of the radiological controllers was appended to the half-day training session for all controllers. The session introduced controllers to the guides and the computer spread sheet. It also provided the opportunity to make field team and lab assignments. Most importantly, the training session provided the controllers with a rehearsal of their duties. A telephone hot line was established to the chief radiological controllers so that problems could be quickly resolved and questions answered.
21. The Dry Run of the exercise provided a trial of the data, the format of the controller guides and the coordination of the radiological controllers. The Dry Run turned out to be critical. Deficiencies and errors were identified in sufficient time such that additions and corrections could be implemented. The result was a successful and challenging radiological problem for FFE-2.

ATTACHMENT A

SUMMARY OF THE FINAL SOURCE TERM PARAMETERS

<u>Nuclide</u>	<u>Release Rate (Ci/s)</u>	
	<u>1515-1715 CDT</u>	<u>1715-1815 CDT</u>
Xe-133	1.0 x E+3	1.0 x E+3
Kr-88	2.0 x E+2	2.0 x E+2
I-131	1.1 x E-1	3.4 x E-1
I-133	2.1 x E-1	6.5 x E-1
Cs-134	3.0 x E-3	1.4 x E-1
Cs-137	1.8 x E-3	8.5 x E-2
Ru-103	3.0 x E-3	1.3 x E-1
Ru-106	6.5 x E-4	2.9 x E-2
Ba-140	6.5 x E-3	2.9 x E-1
La-140	4.5 x E-4	2.0 x E-2
Zr-95	4.2 x E-4	1.9 x E-2
Nb-95	4.2 x E-4	1.9 x E-2
Sr-89	3.8 x E-3	1.7 x E-1
Sr-90	1.5 x E-4	7.0 x E-3
Sr-91	4.4 x E-4	2.0 x E-2

First two hours of release via stack. Stack description: 55.5 m high, 2.4 m diameter, 15.2 m/s flow. Pathway is monitored. Third and last hour of release adds effect of degraded and failed filters. The new pathway is unmonitored. Much more particulate is released.

Rainfall accelerates deposition from 1630 CDT until 2030 CDT to limit downwind impact. Wind shifts more into Illinois to limit Wisconsin impact.

TIME LINE

<u>Event</u>	<u>Time (CDT)</u>
Unusual Event	0615
Alert	0715
Site Emergency	0915
General Emergency	1215
Release Initiation (monitored pathway)	1515
Heavy Rain Begins	1630
Rain Becomes Light	1700
Release Increases (unmonitored path opens)	1715
Release Terminates	1815
Wind Shifts (SE to NE)	1830
End of Day 1 Play	1900
Rain Stops	2030
Venting of Holding Tank (no radiological impact)	Day 2

WEATHER

June 23, 1987

1500 CDT

Surface winds 5 mph from 110 degrees
 Upper level winds 15 mph from 50 degrees
 Stability Class C, light overcast
 Mixing layer 3280 ft
 Temperature lapse rate 1.6 degrees per 100 m

1630 CDT

Heavy rain begins, no change in wind

1700 CDT

Rain becomes light, no change in wind

1830 CDT

Wind shifts to 5 mph from 70 degrees

2030 CDT

Rain ends, no change in wind

June 24 and 25

Weather is as actually observed.

ATTACHMENT B

WEATHER FOR THE FULL FIELD RADIOLOGICAL EXERCISE

Weather Scenario, June 23, 1987 (Day 1)

SYNOPSIS: A warm front is located across northern Illinois with a low near Moline. The low is expected to move to near the southern end of Lake Michigan this evening.

PERTINENT FEATURES: Surface winds averaging 110 degrees at 5 mph backing to 050 degrees at 15 mph from the surface through the mixing layer of 3,280 feet. Surface winds shifting to around 070 degrees at 5 mph this evening. The height of the mixing layer is 3,280 ft. The stability is class C and the lapse rate is 1.6 degrees per 100 m.

Hourly Weather Summary

<u>TIME</u>	<u>WEATHER/CLOUDS</u>	<u>WINDS/DEGS/MPH</u>
5 a.m. (0500)	35,000 ft scattered	calm
6 a.m. (0600)	35,000 ft scattered	calm
7 a.m. (0700)	30,000 ft scattered	calm
8 a.m. (0800)	30,000 ft scattered	110/02
9 a.m. (0900)	25,000 ft broken	110/03
10 a.m. (1000)	20,000 ft broken	110/04
11 a.m. (1100)	15,000 ft broken	110/05
12 a.m. (1200)	12,000 ft broken	110/05
1 p.m. (1300)	11,000 ft broken	110/05
2 p.m. (1400)	10,000 ft thin/overcast	110/06
3 p.m. (1500)	8,000 ft thin/overcast	110/05
4 p.m. (1600)	4,000 ft thin/overcast	110/05
4:30 p.m. (1630)	3,000 ft overcast/heavy rain	110/05
5 p.m. (1700)	2,000 ft overcast/light rain	110/05
6 p.m. (1800)	1,500 ft overcast/light rain	110/05
6:30 p.m. (1830)	1,500 ft overcast/light rain	070/05
7 p.m. (1900)	1,500 ft overcast/light rain	070/05
8 p.m. (2000)	1,000 ft overcast/light rain	070/05
8:30 p.m. (2030)	1,000 ft overcast	070/05
9 p.m. (2100)	500 ft overcast	070/05

Weather Scenario, June 24-July 2, 1987 (Day 2-Day 10)

The low moves east-northeastward beyond the Great Lakes and is replaced by a high pressure system. Winds shift out of the northeast and increase to 15 mph. Generally fair weather prevails as the high pressure system dominates the weather over the Great Lakes.

ATTACHMENT C

M01---ZION---M01---FFE---M01---DAY 1---M01---ILL---M01

SOURCE	DETECTOR	UNITS	TIME							
			1515	1545	1615	1645	1715	1745	1815	1845
GAMMA @ 3ft	RO-2,3,5A WC	mR/hr	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	3.E-1
GAMMA @ 4ft	REUTER STOKES	uR/hr	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	3.E+2
GAMMA IN VAN	SPA-3	cpm	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	4.E+5
GAMMA @ 6ft (WC)	450,RO-2,3,5A,6A	mR/hr	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-1
GAMMA + BETA @ 6ft (WO)	450,RO-2,3,5A,6A	mR/hr	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	7.0E-1
GAMMA @ 4ft (WC)	450,RO-2,3,5A,6A	mR/hr	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	3.0E-1
GAMMA + BETA @ 4ft (WO)	450,RO-2,3,5A,6A	mR/hr	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.4E+0
GAMMA @ 6in (WC)	450,RO-2,3,5A,6A	mR/hr	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	3.7E-1
GAMMA + BETA @ 6in (WO)	450,RO-2,3,5A,6A	mR/hr	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.2E+0
SILVER ZEOLITE (30 cu ft)	HP-210/260	cpm	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
PRE-FILTER (30 cu ft)	HP-210/260	cpm	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
SILVER ZEOLITE (10 cu ft)	HP-210/260	cpm	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
PRE-FILTER (10 cu ft)	HP-210/260	cpm	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
SILVER ZEOLITE (5 cu ft)	HP-210/260	cpm	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
PRE-FILTER (5 cu ft)	HP-210/260	cpm	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
GENERAL BACKGROUND @ 3ft	HP-210/260	cpm	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	3.E+3
VEGETATION - 1l	HP-210/260	cpm *	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	3.E+8
POND/LAKE 1l WATER SMPL	HP-210/260	cpm *	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	2.E+5
.5" DEEP SOIL SAMPLE - 1l	HP-210/260	cpm *	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	3.E+7
ZEOLITE CART TO AIR CONC.	LAB	uCi/cc	SAME AS AIR GRAB SAMPLE IODINES							
PRE-FILTER TO AIR CONC.	LAB	uCi/cc	SAME AS AIR GRAB SAMPLE PARTICULATES							
ZEOLITE CART	LAB	uCi	((uCi/cc)-AIR)x(CU FT AIR SAMPLED)x(3E+4) [IODINES ONLY]							
CART PRE-FILTER	LAB	uCi	((uCi/cc)-AIR)x(CU FT AIR SAMPLED)x(3E+4) [PARTICULATES ONLY]							
AIR GRAB SMPL; I-131	LAB	uCi/cc	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
AIR GRAB SMPL; I-133	LAB	uCi/cc	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
AIR GRAB SMPL; CS-134	LAB	uCi/cc	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
AIR GRAB SMPL; CS-137	LAB	uCi/cc	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
AIR GRAB SMPL; RU-103	LAB	uCi/cc	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
AIR GRAB SMPL; RU-106	LAB	uCi/cc	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
AIR GRAB SMPL; BA-140	LAB	uCi/cc	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
AIR GRAB SMPL; ZR-95	LAB	uCi/cc	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
AIR GRAB SMPL; NB-95	LAB	uCi/cc	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
AIR GRAB SMPL; KR-88	LAB	uCi/cc	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0
AIR GRAB SMPL; XE-133	LAB	uCi/cc	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0

NOTE: - USE ACTUAL PLANT MEASUREMENTS OF BACKGROUND IF THEY ARE LARGER THAN THE TABULATED VALUES.

- PRIOR TO 1515 USE ACTUAL PLANT MEASUREMENTS OF BACKGROUND.

* TO CONVERT CONTACT HP210/260 (cpm) TO GAMMA (mR/hr) MULTIPLY BY 2.E-7

20 A

IM1

M01---ILL---M01---ILL---M01---ILL---M01---ILL---M01

ATTACHMENT C (continued)

M01—ZION—M01—FFE—M01—DAY 1—M01—ILL—M01

MEASUREMENT	DETECTOR	UNITS	TIME							
			1515	1545	1615	1645	1715	1745	1815	1845
POND/LAKE SAMPLE; I-131	LAB	pCi/l	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	3.E+3
POND/LAKE SAMPLE; I-133	LAB	pCi/l	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	5.E+3
POND/LAKE SAMPLE; CS-134	LAB	pCi/l	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	1.E+3
POND/LAKE SAMPLE; CS-137	LAB	pCi/l	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	7.E+2
POND/LAKE SAMPLE; RU-103	LAB	pCi/l	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	1.E+3
POND/LAKE SAMPLE; RU-106	LAB	pCi/l	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	2.E+2
POND/LAKE SAMPLE; BA-140	LAB	pCi/l	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	2.E+3
POND/LAKE SAMPLE; ZR-95	LAB	pCi/l	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	1.E+2
POND/LAKE SAMPLE; NB-95	LAB	pCi/l	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	1.E+2
RAIN SAMPLE			(POND/LAKE VALUE) x (3E+2)							
RIVER SAMPLE			(POND/LAKE VALUE) x (3E+1)							
LAKE MICHIGAN SAMPLE	LAB	pCi/l	AS READ							
TAP WATER SAMPLE	LAB	pCi/l	AS READ							
SOIL SAMPLE; I-131	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	8.E+0
SOIL SAMPLE; I-133	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	2.E+1
SOIL SAMPLE; CS-134	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	3.E+0
SOIL SAMPLE; CS-137	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	2.E+0
SOIL SAMPLE; RU-103	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	3.E+0
SOIL SAMPLE; RU-106	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	7.E-1
SOIL SAMPLE; BA-140	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	7.E+0
SOIL SAMPLE; ZR-95	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	4.E-1
SOIL SAMPLE; NB-95	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	4.E-1
SOIL SAMPLE 1/2" DEPTH	LAB	uCi/g	(SOIL SAMPLE (uCi/m ²)) x 5.E-5							
SOIL SAMPLE 1" DEPTH	LAB	uCi/g	(SOIL SAMPLE (uCi/m ²)) x 3.E-5							
SOIL SAMPLE 2" DEPTH	LAB	uCi/g	(SOIL SAMPLE (uCi/m ²)) x 1.E-5							
GRASS SAMPLE; I-131	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	7.E+0
GRASS SAMPLE; I-133	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	1.E+1
GRASS SAMPLE; CS-134	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	3.E-1
GRASS SAMPLE; CS-137	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	2.E-1
GRASS SAMPLE; RU-103	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	3.E-1
GRASS SAMPLE; RU-106	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	7.E-2
GRASS SAMPLE; BA-140	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	7.E-1
GRASS SAMPLE; ZR-95	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	4.E-2
GRASS SAMPLE; NB-95	LAB	uCi/m ²	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	0.E+0	4.E-2
GRASS SAMPLE	LAB	uCi/Kg	EQUAL TO GRASS SAMPLE (uCi/m ²)							
IN-PLACE AIR SAMPLERS	LAB	uCi/Kg	AS READ							
IN PLACE PRECIP SMPLRS	LAB	uCi/Kg	AS READ							

NOTE: - USE ACTUAL PLAYER MEASUREMENTS OF BACKGROUND IF THEY ARE LARGER THAN THE TABULATED VALUES 20 B
 - PRIOR TO 1515 USE ACTUAL PLAYER MEASUREMENTS OF BACKGROUND. TYPE 3

M01—ILL—M01—ILL—M01—ILL—M01—ILL—M01

D-1 MAP OF THE 2:ON NPP 10 MILE E. AND SURROUNDING AREA. Map base composed from mosaic of 1:250,000 USGS maps. Overlay is reproduction of predesignated monitoring locations and sector grid taken from the new IDAS map.

LEGEND	
●	MONITORING LOCATION
○	ACCIDENT AREA
⊙	WATER STONES LOC
→	PWR INTAKE
○	HOSPITALS PREPARED TO HANDLE CONTAMINATED PATIENTS
—	DISTANCE BETWEEN MONO IS 1 MILE

CONVERSION KEY	
LETTER LABEL	MEANING
A	First 2 hour ratios
B	Weighted Average ratios
C	Last hour ratios

D-2 RADIONUCLIDE RATIOS OF FINAL DEPOSITION. Map denotes which of the three source term radionuclide ratios reported in Table 1 best characterizes the ratios found in each region.

LEGEND	
●	MONITORING LOCATION
○	ASSEMBLY AREA
⊙	REJECTER STONES LOC
⊖	PWS INTAKE
○	HOSPITALS PREPARED TO HANDLE CONTAMINATED PATIENTS
○	DISTANCE IN TOWNSHIPS
10	1 MILE

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EXPOSURE RATE DECAY FACTOR				
Day	Time	Radioactive Ratio		
		A	B	C
2	0000 - 1300	0.79	0.64	0.66
2	1300 - 1800	0.70	0.77	0.81
10	0000 - 1800	0.13	0.32	0.41

Multiply value interpolated from figure by appropriate decay factor

G-19

Values in Sectors L & Q defined as background

CONVERSION SCALE	
LETTER LABEL	EXPOSURE RATE AFTER PLUME PASSAGE (μrem/h)
A	1
B	10
C	100
D	1,000
E	10,000

Exposure Rate After Plume Passage = Decay Factor X Exposure Rate Before Plume Passage

D-3 WHOLE BODY EXPOSURE RATE DUE TO PLUME DEPOSITION ONLY IMMEDIATELY AFTER PLUME PASSAGE. Exposure rate is due to all radionuclides in source term. Conversion scale is correct for day 2 at 0115 CDT. For exposure rates at subsequent times, apply decay factors presented in the table above. Values in Sectors "L" and "Q" are defined to be background, although they may appear to be involved in plume. Exposure rate due to natural background is 6 in 15 μrem/h. Reference: A.S.A. 7-1-1-1.

LEGEND	
●	MONITORING LOCATION
◆	ASSEMBLY AREA
⊕	ROUTED STUDIES LOC.
⊙	PWS INTAKE
○	HOSPITALS PREPARED TO HANDLE CONTAMINATED PATIENTS
—	DISTANCE BETWEEN MONS IS 1 MILE

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DC

G-20

DB

Values in Sectors
L & Q defined
as zero

CONVERSION SCALE	
LETTER LABEL	W.B. IMMERSION DOSE (mrem)
A	0.1
B	1.0
C	10
D	100
E	1000

D-4 WHOLE BODY PLUME IMMERSION DOSE (DAY 1). Dose received by exposure to plume plume passage. Dose is entered only. Estimate
per cent estimator values as 10% first dose. Values in Sectors "L" and "Q" are defined to be zero, although they may appear to be involved in
plume. Reference ARAAC Plot 2.

LEGEND	
●	MONITORING LOCATION
○	ASSEMBLY AREA
○	REUTER STORES LOC.
○	PWS INTAKE
○	HOSPITALS PRESENT/IN
○	MANUAL CONTAMINATED
○	PATIENTS
○	DISTANCE BETWEEN MONS
○	IS 1 MILE

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ILLINOIS

DC

G-22

DB

Values in Sectors
L & Q are 200

CONVERSION SCALE	
LETTER LABEL	Co-137 CONCENTRATION (uCi/gm)
A	0.25
B	0.5
C	3.0
D	50
E	200

D-6 FINAL Co-137 DEPOSITION. Concentration of Co-137 at the end of deposition on Day 2 of 0118 CDT. Values in Sectors 'L' and 'Q' are omitted as uncalculated, although they may appear to be lower. Reference ARAAC Plot 6.

LEGEND	
●	MONITORING LOCATION
○	ADVISORY AREA
◐	HEATED STOKES LAC
◑	PUR INTAKE
○	HOSPITALS PREPARED TO RECEIVE CONTAMINATED PATIENTS
○	CONTAMINATED ZONE

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CONVERSION TABLE		
LITTER LABEL	SURFACE CONTAMINATION (ppm/100 cm²)	
	DAY 1	DAY 2
A	10,000	1,000
B	100,000	10,000
C	1,000,000	100,000

D-7 PERSONNEL AND EQUIPMENT CONTAMINATION. Surface contamination of objects and material in contact with ground. Indirect contact results in only 1% of indicated values.

LEGEND	
●	IDENTIFIED LOCATION
○	UNIDENTIFIED AREA
◊	WATER STREET LOC.
◐	POW. PLANTS
○	HOSPITALS PRESENTLY
○	HOSPITALS CONTAMINATED
○	PATENTS
○	DISTANCE BETWEEN
○	IS 1 MILE

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DC

G-24

DB

CONVERSION KEY	
LETTER LABEL	MEASURING
A	Positive Score, with Hal detector
B	Positive Score, with survey meter

D-8
THYROID SCAN RESULTS. Figure identifies regions in which unexposed individuals exposed to entire 10-hour plane passage exhibit a positive result for thyroid scan. Results are reported for a survey instrument and 2" x 2" Hal detector.

ATTACHMENT E

FFE-2 SAMPLE ANALYSIS DATA GENERATION PROCEDURE

Let $S_i(0)$ be the release rate of the i th nuclide at $t=0$ (i.e., day 2 at 0115) where I-131 is $i=1$.

Then

$$R_i(t) = S_i(t)/S_i(0),$$

the ratio of the concentration of the i th nuclide at time t relative to the final I-131 deposition.

$$R_i(t) = S_i(0) * \exp(-\ln(2)*t/T)/S_i(0),$$

where T is the halflife in days, and t is in days. Then

$$t = (\text{day} - 2) + (\text{int}(\text{time}/100) + (\text{time}/100 - \text{int}(\text{time}/100))/0.6)/24,$$

where day is the current day and time is CDT.

In-Situ Results

$$C_i(t) = C_i(0) * R_i(t)$$

for all i , where $C_i(0)$ is the final I-131 deposition.

Soil Results

Assume soil density is 1.5 g/cm^3 or 1500 kg/m^3 , $K=6.67 \times 10^{-2} (\mu\text{Ci/kg})/(\mu\text{Ci/cm}^2)$, and depth is the depth in cm. Then

$$C_i(t) = K * C_i(0) * R_i(t)/\text{depth}.$$

Water Results

Assume dilution, D , is as follows:

$$\begin{aligned} D &= 1/3000 \text{ cm}^{-1} \text{ for pond (3 m deep)} \\ D &= 1/10,000 \text{ cm}^{-1} \text{ for river (10 m deep)} \\ D &= 1/10 \text{ cm}^{-1} \text{ for rain (1 cm deep)} \end{aligned}$$

Then

$$C_i(\tau) = D * C_i(0) * R_i(t).$$

Vegetation Results

Assume that the density, p , is 2.0 kg/m^2 for vegetables and 0.7 kg/m^2 for grass. Assume that the retention factor, r_i , is 0.9 for $i=1,2$ (I-131, I-133) and 0.1 for all other values of i (all other nuclides).

Then the concentration per unit area is

$$C_i(t) = r_i * C_i(0) * R_i(t).$$

The concentration per unit mass is

$$C_i(t) = r_i * C_i(0) * R_i(t)/p.$$

Milk Results

Milk results were defined only for iodine and strontium. The quantity assumes one day on contaminated feed, no decay. The quantity is for one cow.

$K = 0.15 (\mu\text{Ci/L})/(\mu\text{Ci/m}^2)$ for iodine

$K = 0.03 (\mu\text{Ci/L})/(\mu\text{Ci/m}^2)$ for Sr-89, Sr-90, and Sr-91

$$C_i(t) = K * r_i * C_i(0) * R_i(t).$$

If the sample comes from a dairy, reduce the concentration by 100. If animal was on contaminated feed for more than one day, multiply by the number of days on contaminated feed.

Appendix H

EXERCISE DOCUMENT TRANSFERRING FRMAC COORDINATION RESPONSIBILITY FROM DOE TO EPA

Appendix H

EXERCISE DOCUMENT TRANSFERRING FRMAC COORDINATION RESPONSIBILITY FROM DOE TO EPA

The following document was developed to transfer the FRMAC coordination responsibility from the U.S. Department of Energy to the U.S. Environmental Protection Agency during the FFE-2. This document was signed by Donald L. Bray for DOE and Charles R. Phillips for EPA. FRMAC representatives from all the other agencies initialed the agreement.

June 1987 Federal Field Exercise Memorandum of Understanding

Transferring OSTD Responsibility

THIS IS AN EXERCISE

MEMORANDUM OF UNDERSTANDING relating to responsibilities for offsite monitoring around Zion Nuclear Power Station.

In accordance with the Federal Radiological Emergency Response Plan (FRERP) and the Federal Monitoring and Assistance Plan-5 (FRMAP-5), the Department of Energy (DOE), Environmental Protection Agency (EPA), and other Federal agencies have provided offsite radiological monitoring during the emergency phase following a radiological accident. At this point, the Federal response is entering the intermediate phase since the Cognizant Federal Agency (CFA), the Nuclear Regulatory Commission (NRC) has declared that the immediate emergency situation has stabilized and that offsite radiological conditions have been documented and their consequences have been evaluated. During the emergency phase of the situation, DOE has been the Offsite Technical Director (OSTD) responsible for coordinating the efforts of all Federal agencies in offsite monitoring and assistance.

In accordance with the FRERP and FRMAP-5, it is therefore appropriate for the transfer of OSTD responsibility to the EPA.

NOW, THEREFORE:

1. EPA and DOE both agree that the Federal response effort has entered the intermediate phase of monitoring.
2. EPA agrees to assume from DOE the responsibility of coordinating the Federal offsite monitoring around the Zion Nuclear Power Station. As such, EPA will coordinate with the CFA (NRC), the States, and all other interested agencies.

3. DOE agrees to relinquish OSTD responsibility to EPA, but will retain a senior DOE official at the FRMAC-5 as a liaison between DOE resources and EPA to ensure the continued adequacy of these efforts.
4. DOE agrees to maintain support facilities, technical and administrative, at a mutually agreeable practicable level as long as Federal response effort under FRMAP-5 is in place.
5. All Federal agencies involved in the offsite radiological monitoring program agree to continue to make their resources and capabilities available to EPA at a mutually agreeable practicable level as long as the Federal response effort under FRMAP-5 is in place.
6. This agreement will remain in effect until the full FRMAP-5 response is terminated by the EPA Administrator.

This will occur when he/she determines:

- A. That there is no longer a threat to public health and safety and the environment; or
- B. That state and local resources are adequate for the situation; or
- C. That Federal agencies are carrying out only non-emergency statutory responsibilities.

Department of Energy

Environmental Protection Agency

Agency Representatives:

NRC (as CFA) _____
Illinois _____
Wisconsin _____
USDA _____
FDA _____
FEMA _____

Appendix I

DOE CONTROLLERS FOR THE FFE-2 AND OTHER FRMAC CONTROLLERS

Appendix I

DOE CONTROLLERS FOR THE FFE-2 AND OTHER FRMAC CONTROLLERS

The FFE-2 provided excellent training both for the players who responded to the simulated accident and those who acted as controllers, many of whom might be called in a real emergency. Representatives from many agencies controlled and observed the play in the FRMAC; some assisted as controllers with the Illinois and Wisconsin field teams during the exercise. The chart below gives the general assignments of the controllers; some controllers had more than one assignment as they were given different responsibilities from day to day in response to the exercise demands. Many of the controllers also completed evaluation forms.

<u>Assignment</u>	<u>Location</u>	<u>Name (Affiliation)</u>
Exercise Control Group	Exercise Control Center	William F. Wolff (DOE/HQ)
Headquarters Controller	DOE Headquarters	Timothy Pflaum (DOE/HQ)
Event Tracking Group	Exercise Control Center	Marvin R. Dockter (DOE/MV)
Simulator	Libertyville Simulation Cell	Ari Patrinos (DOE/HQ)
FRMAC Lead Controller (General)	FRMAC	Kathy S. Gant (ORNL)
Asst. Controller	FRMAC	Martha V. Adler (ORNL)
Event Tracking	FRMAC	John A. Lewis (DOE/AL)
OSTD	FRMAC	Judy L. Tokarz (DOE/RL)
State Interaction with OSTD	FRMAC	Gary W. McNutt (Missouri Rad. Health) Eric P. Schuld (LLNL)
CFA Interaction with OSTD	FRMAC	Anthony P. Malinauskas (ORNL)

<u>Assignment</u>	<u>Location</u>	<u>Name (Affiliation)</u>
EPA Interaction with OSTD	FRMAC	Don Kirwan (EPA)
FRMAC Support Services	FRMAC	Barbara H. Thomas (DOE/HQ)
FRMAC Public Information and Support	FRMAC	W. Mayo Lee (DOE/HQ)
Evaluation of Data Flow	FRMAC	Alan V. Kuehner (BNL)
Data Evaluation/ Assessment	FRMAC	Richard L. Dickson Jerry V. Stangeland (PNL)
Data Evaluation/Assessment	FRMAC	Gregg D. Dempsey (Mississippi Dept. of Health)
Field Team Coordination	FRMAC	William Baer (DOE/AL) Robert J. Sheppard (Suffolk Co., NY, Health Dept.)
Overall DOE Response	FRMAC	Jay G. McDonald (DOE/HQ)
FDA/Other Federal Agencies	FRMAC	Alex Martin (PHS)
Interagency Coordination (FRERP Interfaces)	FRMAC	Donald Nitti (BDM)
Internal Illinois Evaluation	FRMAC	Jay M. Thompson (Illinois Dept. Nuclear Safety)
Hot Line Operations	FRMAC	Ralph R. Kopenhaver (DOE/SF)
FRMAC Lead Controller (Data)	FRMAC	Harvey W. Clark (EG&G/EM)
Senior Data Controllers	FRMAC	Robert J. Bores (NRC/Reg. I) John S. Brtis (Sargent & Lundy)
Chief Mobile Laboratory Controller	FRMAC	J. Ray Fielding (EG&G/ID)

<u>Assignment</u>	<u>Location</u>	<u>Name (Affiliation)</u>
Mobile Laboratory Controllers	FRMAC (one controller assigned to Wisconsin Mobile Lab in Kenosha)	Lih-Ching Chu (Illinois Dept. Nuclear Safety) Douglas M. Collins (NRC/Reg. II) Richard L. Jaussi (Westinghouse Idaho Nuclear Co.) Mark A. Smith (DOE/OR)
Chief Field Team Controller	FRMAC	Dennis E. Vetter (REECO)
Field Team Controllers	FRMAC	Scott L. Davis (DOE/OR) Richard L. Dickson (DOE/ID) Daniel A. Gonzalez (REECO) Joseph W. Gordon (Dames & Moore) Richard L. Jaussi (Westinghouse Idaho Nuclear Co.) Ralph R. Kopenhaver (DOE/SF) Alan V. Kuehner (BNL) Francis R. O'Donnell (ORNL) Andrea L. Sjoreen (ORNL) C. Lynn Sowder (ORNL) Mark A. Smith (DOE/OR) Jerry V. Stangeland (PNL) Donald C. Tharnish (West Valley Nuclear Services) Larry Tomczak (Westinghouse Materials Co. of Ohio) Steven J. Wentzel (Westinghouse Materials Co. of Ohio)

Appendix J

U.S. DEPARTMENT OF ENERGY COMMENTS ON DRY RUN

Appendix J

U.S. DEPARTMENT OF ENERGY COMMENTS ON DRY RUN

The following was compiled by Kathy S. Gant from comments from FRMAC controllers/evaluators after the FFE-2 Dry Run. No attempt was made to make a polished document; items were listed as they appeared, although in some cases they have been grouped by subject.

COMMENTS ON DRY RUN FROM CONTROLLERS & SELECTED PLAYERS WHO RECEIVED FRMAC EVALUATION FORMS

Planning and execution of Dry Run done well.

FRMAC play should begin late on day 1 to demonstrate activation. There is a difference in activation and being fully operational. The rudiments of the FRMAC would be there on day 1. The notifications and early organization should take place as people arrive. There should be an organizational meeting for FRMAC at the beginning of day 2 to explain the FRMAC, the rules, procedures, and resources available. No notifications were in OSTD log at Dry Run. (NOTE: After the last Scenario Development, Evaluation, and Control Work Group Meeting, activation at the end of day 1 seems unlikely; the organizational meeting at the beginning of play at day 2 is then very important.)

There were problems in getting information from state to federal agencies and from federal to state agencies. It is apparent that there needs to be a greater effort to coordinate information (flow and gathering) between all involved agencies. Some state field teams did not fully understand the function of the FRMAC, its jurisdiction, or the support that it could provide.

A team concept needs to be developed. Some state field team members thought that their techniques and data were being gathered to compare against the information the federal teams got. The response should not be a competition.

There were still some problems with the federal communication. The interface with FRC was not clear, but may have been going well. HHS felt it had problems keeping its HQ informed. It seemed that the technical liaison between HHS HQ and NRC Operations Center was minimal.

Accident-specific criteria need to be developed for the DOE-EPA turnover as part of the exercise. EPA needs to agree exactly what needs to be done before agreeing to the turnover. What about state input?

Need to play contamination line. This will require some idea of external readings on samples. Some players suggest simulating the contamination of a laboratory and then checking FRMAC players to find out who is spreading contamination.

Suggestions for scenario: (1) To challenge recovery, have interstate or other main transportation line contaminated to just above EPA relocation criteria at one point and to just above NRC unrestricted release criteria at another point. (2) Have a liquid release to test

liquid pathway analysis methods. (3) Have result of the release cause isolated "hot spots" (about 100 times nearby area).

The relationship of the Reentry & Recovery Planning Group to the FRMAC was not clear. Were they integrated into the system? Were they duplicating the FRMAC assessments?

We need to decide when monitoring helicopter could be on site and adjust MSELs and injected results accordingly.

FRMAC Comments

FRMAC needs (1) public address system, (2) large clock at front of building, (3) status boards, (4) better fax and xerox capabilities, and (5) copies of press releases.

Data flow should be made clear to all originators and consumers of data.

A greater use of action requests should be encouraged. An in-out box at each table with a "mail box" may be useful in encouraging transmission of action requests and results through appropriate paths.

All fax input should have complete information (originator, destination, date, time, etc.)

Unreleased and/or unreviewed data were available (1) direct from posted maps, (2) from comments during briefings, (3) from some raw data sources (state, ARAC, fax, and others, and (4) workers at dose assessment table, i.e., NRC or FDA player in Data Evaluation and Assessment Group may give data to other persons in his agency. These sources may result in inappropriate release of some data if it is not clear to all players that these data are unreviewed and that unreviewed data should not leave the FRMAC.

Improved maps would be helpful. Description and addresses of the monitoring area would expedite data acquisition.

Priorities for sampling and monitoring have to be set by someone or some group in FRMAC.

Request for action from FRMAC from states not as frequent as would probably be in a real situation. Perhaps could ask states for needs and priorities.

Hourly reports/updates should be managed from a check-off sheet; i.e., order of report given by name on report sheet.

The time for data to get out of the FRMAC seemed unreasonably long.

Question arose as to whether FRMAC should get in-containment measurements to correlate and back up field measurements and how those measurements should properly be obtained. CECO representative apparently asked dose assessment group to get these measurements so they could be compared to field data. He was told to get them, at the EOF. He had assumed that filling out the FRMAC request form was the proper procedure.

Some good coordination between states and feds in dose assessment area.

State and CECO data did not come in promptly on day 2 play.

Illinois van required some additional electrical maintenance from FRMAC. This required about 40 min to obtain.

Field Team Monitoring & Coordination

A universal map with grids and coordinates is required. There was a definite problem with this for the field teams.

No personal safety recommendations were given to the dispatched field teams. The use of protective equipment was not discussed as a simulated item.

Field teams hesitated to request assistance when needed. "Most probably they wanted to look like they knew what they were doing."

The field teams did not document data that was collected on the field monitoring data log.

Federal-State Field Team Coordination and Direction

Coordination--Initial deployment of field teams was disorganized. No co-ordination was apparent. Teams were dispatched without any obvious exchange of information between state and federal agencies. Coordination was better on second day (scenario day 10). Internal procedures and responsibilities were being defined. FDA and CECO should have representatives at this table.

Direction--There was no direction given to the Field Monitoring Group from the dose assessment table or the FRMAC management. There was little input from the state. With lack of direction, the federal field monitoring group sent out teams where they thought they should go. Someone should be setting priorities for this group.

Need to improve organization and function of offsite monitoring/field team function: (1) standardize where possible data collection and identification, (2) establish methods for prioritizing requests for samples, (3) coordinate results, and (4) procedures/use of forms/interfaces, etc.

There seemed to be a disconnect between Illinois and Wisconsin field teams.

The amount of simulation vs reality for the field team needs to be clarified; i.e., response to actual point or merely "go somewhere."

Samples and Laboratories

Samples were not logged on the sampling data log.

Sample collection not organized. All groups used their own labeling conventions. DOE did excellent job of putting samples together after they arrived.

Sample coordination between mobile labs went well. The procedure was generally to allow the states to do their own sample analysis. If they became overloaded, the field coordinator routed samples to the federal field labs. Communication between labs improved as exercise went on.

Samples were given to mobile labs without directions as to the desired results, e.g., gross count, spectroanalysis, gross iodine, I-131/I-133, alpha, etc. Labs would do analyses based upon what they thought was needed. No direction or priorities of needed results.

No briefings of mobile lab personnel.

Lack of priorities in sampling was biggest problem. There did not seem to be coordination between field teams and dose evaluation group.

Control Comments

We need more controllers/evaluators for the FRMAC. Controllers need name badges.

Facility controller needs routine copies of logs and action sheets.

Field team controllers need much better maps. Controllers should have same maps as everyone else with the monitoring stations clearly labeled. They need detailed street maps. In some other areas, the state/local emergency operations people keep detailed local maps.

Controllers should be assigned specific areas/topics to be evaluated for field monitoring, data assessment, data control, etc., and be aware of their assignments.

There was a delay in dispatching controllers to IDNS field teams. Wisconsin did not have a field team controller after the first morning. Field team controllers need assignments a day in advance so they don't hold up the progress of the scenario.

Need to clarify that we are not evaluating field team performance.

Controller logs need to have same holes punched as the data.

Injected data and maps should be clearly marked as exercise material and distinguished from material prepared during exercise play.

Several areas need a controller who is familiar with data and can respond quickly to questions concerning its accuracy, etc. Need two additional controllers for this purpose, along with Harvey Clark.

Data

Data need to be easier to handle, and the controllers need more time to get familiar with the data.

The data information is too complicated for field use. It is more of a test of the controller's ability to compute information than to provide information for the field team.

Controller data should be simplified or maybe a desk top computer should be available to provide sampling data. Laboratory data controllers will need a map with the monitoring sites for the states marked which also shows their relationship to the plume. They should also have a copy of the forms that are used by the players.

Controller data did not coordinate with instruments available to the state.

Data were developed to provide flexibility and realistic detail. At first, it was hard to interpret the data quickly, particularly decays and isotopic ratios. It probably could be simplified, but might be difficult to change from the Dry Run. Suggest looking for ways of simplification, but staying with the basic approach. Person who made these comments is nervous at the idea of portable PCs. "Without a flavor of the data in front of you, this approach can also be error provocative."

Most data tables were easy to use. The table for specific radionuclide concentration/inventories was a little too difficult to understand. One suggestion--a table showing gamma spectroscopy analysis of

ground deposition from 2-10 days with associated concentrations. Another table could show gross beta concentrations from days 2-120. In other words, create specific tables addressing the results for common analyses (gamma spec, gross beta, gross alpha, on ground, air filters, etc.)

Someone who can interpret all the tables should be available at all times to assist any of the field team controllers.

Have states and CECO convert dose rates and concentrations of air samples, etc. for field monitoring teams to cpm or other measurables.

Need more timely method of providing isotopic analysis.

Consider adding tellurium to source term.

Get thyroid monitoring action points from states to use in survey lines.

Training for controllers should be done in quiet place, with overhead projectors. They should go over all the data tables one by one.

Controller with Illinois teams reported needing whole body exposure readings at 6 in and 3 ft and GM reading from charcoal and filter paper air samples in either $\mu\text{R/hr}$ or cpm. Others need 6 m readings for air samples. Needed readings for specific instruments (PIC-6A, SPA-3, GM) for 6-in and 3-ft measurements. Also GM readings for air samples taken in the field (charcoal filter, particulate silver zeolite) and a better way to provide dosimeter readings.

State field team controllers need conversion factors for changing data into cpm. Rules of thumb for getting dose into readings on the outside of a sample would be useful, e.g., a water sample with a concentration of 10 nCi/ml would read 1 mR/hr.

EPA may be providing $\mu\text{R/hr}$ instruments for state field teams during exercise.

There was considerable confusion surrounding the data supplied in the scenario and given in the break messages. Recommend at least two other people check the generated data for consistency and for level which will drive expected response.

Break Messages

Technical data in break messages needs to be presented in more organized manner. The evaluation group spent too much time trying to assimilate the break message data.

In compressed time, the break data should somehow be loaded on the computer for the assessment group to have already digested it. It is difficult for them to adjust to new data "in one lump" and maintain their momentum.

Break message data should be in the form that is appropriate at the point it is entered into play.

Appendix K

**U.S. DEPARTMENT OF ENERGY
COMMENTS ON SECOND FEDERAL FIELD EXERCISE (FFE-2)
JUNE 23-25, 1987**

Appendix K

U.S. DEPARTMENT OF ENERGY COMMENTS ON SECOND FEDERAL FIELD EXERCISE (FFE-2) JUNE 23-25, 1987

General Comments on Exercise*

The FRERP worked and the federal agencies demonstrated an ability to support two states during a simulated radiological emergency. Cooperation and coordination among the agencies at the Federal Radiological Monitoring and Assessment Center (FRMAC) was excellent.

Observation: The role of the reentry/recovery group is unclear. The time constraints imposed by the exercise limited the activities of the group.

Implications: The mechanism for performing this important function in support of the states has not been institutionalized. Its activities, membership, and activities are not clear to the states and other participants.

Recommendations: The role of the reentry/recovery group (if this is the manner in which this planning is to be done) should be clarified and the relationship of this group to the other operating entities (such as the FRMAC) should be defined. Should the group, its function, membership, and activities be defined in the FRERP?

Observation: Potential responders need more training on their roles, the roles and capabilities of other agencies, and on the need for communication among facilities. Resources and expertise seemed not to be used at times because the players did not know of their existence or the experts did not know what was going on at various places in order to offer their assistance at the right place.

Implications: Information that would have been useful to players in other facilities was sometimes not transmitted simply because it never occurred to the players that someone might need it.

Recommendations: Additional training on the overall response should be held before an exercise or incident. During the exercise or actual incident, more complete reports of activities within the facility or in other facilities would be helpful.

DOE/FRMAP Comments Related to Overall FFE-2 Objectives

The following are specific comments relating to the objectives of the FFE-2 from the perspective of DOE and its FRMAC operations:

*These comments were derived from material in the evaluation forms filled out by evaluators and players at the end of the exercise and were submitted (in the agreed-upon form) as the official DOE comments on the exercise.

1. Notification and Updates.

Observation: Notification of the exercise incident followed the normal channels established in the state and regional federal plans. The telephone was the basic tool used to accomplish the notification process. The initial notifications from the states appeared timely and their needs were identified. Follow-up calls by DOE were made to satisfy the requests. Regional federal agencies addressed in the regional FRMAP were notified and informed of DOE's intention to activate a FRMAC and its proposed location. The adequacy, timeliness, and effectiveness of the notification and updates are considered adequate.

2. Adequacy of facilities.

Observation: The primary offsite facility used by DOE was a building located on the Lake County fairgrounds. The FRMAC facility provided adequate space to achieve the overall mission. This facility was chosen after consideration of several others as part of the preplanning effort and therefore was available for the play of the exercise. Space in other offsite facilities used for the DOE response included the utility's EOF, JPIC, FRC, and both States' EOCs. The space allotted was adequate for DOE to perform its task.

3. Effectiveness of interfaces, information sharing.

Observation: The FRMAC established by the DOE included personnel from both states, NRC, EPA, HHS, USDA, FEMA, DOE, and the licensee. The presence of these agencies within the FRMAC allowed for one-on-one contact as well as group sessions. In addition, DOE established liaisons with the CFA at the licensee's EOF, with the states at the Madison EOC and at the Illinois REAC center, and at NRC HQ. These were the locations where approved data were released.

Implications: This close interface allowed the key agencies to be an integral part of the decision process on actions and for sharing information among the groups.

Recommendations: Although the systems were in place and data was transmitted as planned, there is a need to review the administrative process for release of not only the "qualified raw data" but also the "assessed data". The review should be aimed at streamlining the process and to reviewing the effectiveness and timeliness of the data packages being transmitted by NRC HQ to other federal agencies at the Washington level.

4. Contribution of federal response effort to state/local government.

Observation: Based upon comments from both Illinois and Wisconsin, the states were very pleased with the interface with the federal response effort. They were especially pleased with the fact that they were an integral part of the various FRMAC activities in that their input in identifying their needs, establishing the game plan, and assigning of priorities was sought out. Overall, the effectiveness and contributions of the federal response to support the states was good.

Implications: The colocation of state and federal personnel at the FRMAC, as well as at other facilities, and the equipment and other resources provided under the FRMAP enhanced the states' own resources.

Recommendations: Continued education of the states as to the role of the federal government, with emphasis on the importance of colocation of key responders and liaison personnel, is necessary.

5. Efficiency of federal response.

Observation: The slowness with which the initial data was assimilated and then transmitted from the FRMAC caused some problems during the initial exercise play on the beginning of day 2. The federal agencies in the FRMAC (especially the regional representatives) did not play their usual response role in the early hours of the "accident" because of the decision to have the FRMAC start play fully staffed at the beginning of day 2 rather than having a phased start.

Implications: Play in other facilities was dependant on FRMAC input and may have been slower than would have been the case in an accident situation.

Recommendations: In future FFEs options should be explored to make the start of the federal play more realistic and the data glut more manageable. These options might include the activation of the federal response and initial play of the regional federal agencies in their usual emergency response time frame, extension of time of play on the first day of the exercise, the use of a "day 0" for players who might otherwise have been working through the night to assimilate and process the data, and/or the presentation of "approved" data with the break message.

Observation: The FRMAC and staff were in place at the start of day 2 so the efficiency aspect of the set-up and initial coordination was not tested.

Implications: The initial activation of the FRMAC with transition from a RAP to a FRMAC response was not carried out. With the number of agencies involved, this could have been a confusing period.

Recommendation: A more realistic way of starting federal FRMAC play should be considered. See the previous comment.

Observation: The efficiency of the FRMAC operations overall appeared to be adequate. Some improvements regarding the release of the "qualified raw data" and the "assessed data", internal information flow, review of resolved action requests by the FRMAC management, and the need for computerization of some of the dose evaluation activities should be considered.

Implications: Data is the FRMAC product, and its accuracy and timeliness is of critical importance.

Recommendation: DOE staff, in conjunction with appropriate other Federal agency personnel who would work within the FRMAP structure, should review the procedures and suggest modifications.

6. Transition of federal response.

Observation: The transition of the coordination of the federal offsite monitoring and assessment activities from the DOE to EPA was accomplished successfully. The time compression of the exercise caused the change to occur very rapidly after stabilization of the reactor conditions. However, a draft memorandum of understanding (MOU) was prepared and provided to NRC, the states of Illinois and Wisconsin, USDA, FDA, FEMA, EPA, and DOE for their review. The MOU provided the ground rules for the transition. At the appropriate time during the exercise a formal meeting was held where all parties concurred in the transfer by signing the MOU. An announcement was then made to the FRMAC players that the transition was occurring. There was no impact on the operations of the facility. The transfer was not played realistically because of the time compression of the exercise.

Implications: The smooth transfer of the coordinating responsibility, after the emergency phase of the incident is over, is important for the personnel involved and is necessary to maintain credibility with the supported states. During an actual accident, there would most likely be more involvement of DOE headquarters and EPA headquarters in the development of the MOU and input from the states on a long-term monitoring plan.

Recommendations: DOE and EPA should continue to explore the general conditions under which the transfer could be made.

7. Public information.

Observation: DOE has no public information responsibilities as such other than to provide support to the JIC and general information on the DOE response. These were satisfactory. The release of radiological data ("qualified raw data" and "assessed data") from the FRMAC was tightly controlled. It was DOE's responsibility to provide the data to the FRMAC players, the states and the NRC. By agreement, it was NRC's responsibility to release the data to the federal agencies, especially at the Washington level.

Implications: Agencies with statutory responsibilities may need data quickly. However, the problems inherent in and confusion resulting from having many data release points are obvious so mechanisms for timely release of accurate data are important.

Recommendations: Should the mechanism for release of the data by the CFA HQ be formalized in the FRERP? Although data transfer was accomplished, it is believed that the process should be reviewed in total to firm up the policy and to determine if the process can be streamlined.

Observation: There was concern that the flow of technical information to the press center was slow.

Implications: There is a need to provide timely, significant information to the public in order to reassure the public and maintain the credibility of the responders.

Recommendation: Flow of technical data to the public should be reviewed by those responsible for making it available.

8. Evaluate FRMAP.

Observation: The organization as detailed in the regional FRMAP, a plan developed by DOE CH, worked well. The establishment of the FRMAC and the presence of the states and appropriate personnel from a number of federal agencies, in conjunction with their supporting equipment and other resources, provided the necessary radiological assistance to the states and the NRC during the exercise. The capability of providing data to remote state and NRC locations also functioned well.

Observation: The use of the management subgroup at the management table was successful in establishing a close and cooperative working arrangement among the federal and state agencies present. The management groups identified the needs of the states early in the play of day 2. These needs were transformed to written action requests that were prioritized by the group and approved for implementation by the OSTD's signature. A system was established to maintain a log of these requests and a specific individual was assigned the responsibility of tracking them to completion.

Implications: The FRMAC supports the CFA and the states, and close cooperation is necessary to respond to their needs. When large numbers of requests are received and action items are identified, an efficient method of handling them is needed, so that the management representatives can focus more on the overall situation.

Recommendation: The manner in which the action requests were handled should be reviewed by DOE to try to develop more efficient management procedures.

Observation: The FRMAC organization structure provided for good integration of the federal and state personnel in field monitoring, data evaluation, etc.

Implications: Coordination among the personnel is important to standardize procedures to the extent possible and avoid duplication of effort.

Recommendation: The creation of federal interagency working committees, under the auspices of DOE or the FRPCC, to discuss such areas as the dose assessment products that would need to be prepared in the FRMAC, and standardization of federal sampling and analysis procedures should be considered.

Observation: The overall management of the FRMAC suffered from a shortage of management personnel. The Emergency Manager and the Deputy Offsite Technical Director positions were filled by the same person.

Implications: An adequate number of trained personnel with a knowledge of the total operation are needed to focus the operations of this complex organization.

Recommendation: Specific manpower should be made available for both the Emergency Manager and the Deputy Offsite Technical Director positions.

Observation: Data flow within the FRMAC and to outside agencies, while adequate, was not as quick or efficient as it might be.

Implications: Speed and accuracy are very important to the FRMAC operation.

Recommendation: The flow of data within and from the FRMAC should be reviewed by DOE and changes made as appropriate.

Appendix L

LESSONS LEARNED FROM THE FFE-2 TABLETOP EXERCISE

Appendix L

LESSONS LEARNED FROM THE FFE-2 TABLETOP EXERCISE

A Tabletop Exercise involving the key players and planners for the FFE-2 was held in January 1987. Following the exercise, the Federal Emergency Management Agency developed a "Lessons Learned" document to be used by all the agencies in continuing the preparation for the FFE-2. It was distributed to members of the FFE-2 Management Group by the chairman, Robert S. Wilkerson, in February 1987 and is reproduced below.

TABLETOP LESSONS LEARNED

One of the major objectives of the Zion Tabletop (held at the Sheraton International at O'Hare on January 22, 1987) was to identify areas of conflict or concern that needed resolution prior to the FFE scheduled for June 1987. In that respect, the issues listed below which were identified by the participants as needing resolution comprise the major Lessons Learned from that Tabletop. The agencies or organizations that were identified for resolving the issue or concern are listed below each item. Asterisks (*) identify the agency or organization that should assume the lead in resolving the issue.

1. Address the need to consolidate requests for information from the Control Room by outside agencies.

Commonwealth Edison*

Nuclear Regulatory Commission

Illinois Department of Nuclear Safety

Wisconsin Division of Health

2. Resolve the concern regarding the need and authority of a State agency to reclassify an emergency classification declared by a licensee.

Nuclear Regulatory Commission*

Commonwealth Edison

Illinois Department of Nuclear Safety

Wisconsin Division of Health

3. Develop a rational basis for the deployment and actions of those Federal agencies who may need to take actions prior to a State request for their assistance.

Federal Emergency Management Agency*

Other Federal Agencies

4. Better define the manner in which public affairs activities will be conducted and coordinated before the JPIC is established and staffed with representatives from the key State and Federal agencies.

Illinois Emergency Services and Disaster Agency*
Wisconsin Division of Emergency Government
Commonwealth Edison
Nuclear Regulatory Commission
Federal Emergency Management Agency

5. Clarify the role of the FRMAC in dose assessment and the role of the CFA in coordinating any Federal protective action recommendations with offsite authorities.

Nuclear Regulatory Commission*
All Other Agencies or Organizations

6. Better define the detailed procedures for disseminating data and assessments from the FRMAC to emergency responders, e.g., content and format of the data, method of transmission, retransmission to secondary recipients, etc.

Department of Energy*
Nuclear Regulatory Commission
Environmental Protection Agency
Illinois Department of Nuclear Safety
Wisconsin Division of Health

7. A "generic" set of information relating to Federal resources available to State and Local agencies should be made available.

Federal Emergency Management Agency*

8. Foster a better understanding of dose assessment models; their assumptions and application.

Nuclear Regulatory Commission*
Commonwealth Edison
Illinois Department of Nuclear Safety
Wisconsin Division of Health
Department of Energy

9. Foster a better understanding of the basis for severe incident protective action decision making and accident consequence assessments, e.g., emergency classification assessments, source term assessments, and field monitoring assessments.

Nuclear Regulatory Commission*
Commonwealth Edison
Illinois Department of Nuclear Safety

Wisconsin Division of Health
Department of Energy
Federal Emergency Management Agency

10. Clarify the process by which key decision makers will develop a coordinated protective action recommendation in a timely manner prior to the establishment of the FRMAC.

Commonwealth Edison*
Nuclear Regulatory Commission
Illinois Agencies
Wisconsin Agencies

11. Develop a better understanding of the concurrent and multilevel flow of information through executive/political channels and staff level/technical channels of communication, i.e., in particular discussions concerning protective action recommendations or assessments.

Nuclear Regulatory Commission*
Illinois Emergency Services and Disaster Agency
Illinois Department of Nuclear Safety
Wisconsin Division of Emergency Government
Wisconsin Division of Health
Commonwealth Edison
Department of Energy

12. Better define the role, organization and timing of a "Recovery/Reentry Advisory Group" to develop a State or other organization Recovery Plan.

Nuclear Regulatory Commission*
All Other Agencies or Organizations

13. Clarify the role of the CFA and other key Federal agencies to the FFE participants.

Nuclear Regulatory Commission*
Federal Emergency Management Agency*
Other Federal Agencies Designated in the FRERP

14. Provide a more comprehensive explanation of how actions taken by decision makers in Washington, D.C. would be properly coordinated with the CFA, State officials and others in the field.

Federal Emergency Management Agency*
Other Federal Agencies

15. Provide training to Federal agency responders on generic emergency preplanning and responses to nuclear power plant accidents.

Federal Emergency Management Agency*
Other Federal Agencies

16. Better define the role of the CFA, FEMA and the States in coordinating information to Congressmen and their staffs in the field and the Congress in Washington, D.C.

Federal Emergency Management Agency*
Nuclear Regulatory Commission
Illinois Agencies
Wisconsin Agencies

17. Clarify the process of notifying and updating international agencies who have a legitimate interest in a severe nuclear accident in the U.S.

Nuclear Regulatory Commission*
Federal Emergency Management Agency
Department of State*

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