APPENDIX

U. S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-313/85-11 Licenses: DPR-51
50-368/85-11 NPF-6

Dockets: 50-313
50-368

Licensee: Arkansas Power & Light Company
P. O. Box 551
Little Rock, Arkansas 72203

Facility Name: Arkansas Nuclear One (ANO) Units 1 and 2

Inspection At: Arkansas Nuclear One, Russellville, Arkansas

Inspection Conducted: May 20-24, 1985

Inspector: Charles A. Hackney 3-28-86
C. A. Hackney, Emergency Preparedness Analyst Date

Headquarters Support:

E. Williams, Reactor Safety Engineer, NRC

Other Accompanying Personnel:

Terc, N., Emergency Preparedness Analyst, NRC
Bethke, G. W., Reactor Operations, Comex Corporation
McBride, K. C., Senior Research Scientist, PNL
Martin, G. F., Nuclear Scientist, PNL
Swift, J. J., Health Physicist, NRC
Lapinsky, G. W., Engineering Psychologist, NRC
Ramsdell, J. V., Senior Research Scientist, PNL
Wohl, M. L., Nuclear Engineer, NRC
Good, M. I., Comex Corporation

Approved: LA Yandell 3/28/86
L. A. Yandell, Chief, Emergency Preparedness Date
Section

8604080254 860401
PDR ADOCK 05000313
Q PDR

Inspection Summary

Inspection Conducted May 20-24, 1985 (Report 50-313/85-11; 50-368/85-11)

Areas Inspected: An announced appraisal of the Emergency Response Facilities (ERF's) was conducted to determine if the licensee had successfully implemented the requirements in Supplement 1 to NUREG-0737 and the regulations. The appraisal included the Technical Support Center (TSC), Operational Support Center (OSC), Emergency Operations Facility (EOF), backup EOF and TSC, the emergency data acquisition systems as well as the instrumentation, supplies and equipment for these facilities. The appraisal involved 360 hours onsite by 11 NRC inspectors and NRC contractors.

Results: Within the emergency response facilities inspected, no violations or deviations were identified. One unresolved item relating to the habitability of the backup TSC in the Emergency Control Center and the need for an additional backup TSC in Russellville, Arkansas, was identified. This item was resolved by the NRC and is addressed to the licensee in this report. Deficiencies were identified that are to be addressed to the NRC by the licensee are as follows:

1. The absence of backup power for essential equipment for the primary TSC. (Section 1.1.3.4)

2. The inadequate reliability and validation of the Safety Parameter Display System (SPDS) and the Gaseous Effluent Radiation Monitoring System (GERMS) as emergency data acquistion systems. (Section 1.2.2)

3. The point-by-point database verification to assure the reliability of data communications is not complete. (Section 1.2.2)

4. The inability to make adequate and reliable consequence assessments of dose. (Section 1.2.4.5)

5. The lack of positive pressure needed to obtain the required habitability provided by the HVAC system for the primary EOF and the backup TSC. (Section 3.1.1.3)

Table of Contents For The Detailed ERF Evaluation

Page Number

DETAILS

1. Persons Contacted

*Snellings, D. D.
*Poole, J. Computer Support
*Baker, T., Technical Analyst Superintendent
*Boyd, D. W., Emergency Planning Coordinator
*Ward, J. R., Training Supervisor
*Levine, J. M., ANO General Manager
Smith, A., Air Quality Engineer, Technical Services
Williams, S., Air Quality Engineer, Technical Services
Roberson, J., Instrumentation & Controls

*Denotes those present at the exit interview

1.0 Technical Support Center (TSC)

1.1 Physical Facilities

1.1.1 Design

1.1.1.1 Location, Structure, Habitability/Environment

The primary TSC for Arkansas Nuclear One Units 1 and 2 is located in the south end of the third floor of the Administration Building. This location is within the protected area and is convenient to the control room and the OSC. Since the primary TSC does not meet the habitability requirements recommended in Supplement 1 to NUREG-0737, a backup TSC is provided in a habitable portion of the Emergency Control Center located 0.65 miles northeast of the plant. If the EOF building containing the TSC were to be evacuated, the backup TSC would be relocated along with the EOF to the AP&L District Offices in Russellville, approximately 7 miles from the plant.

The Administration Building containing the primary TSC, the Emergency Control Center building containing the backup TSC, and the AP&L District Offices containing the back up EOF/TSC were all constructed according to the Southern Standard Building Code.

The primary TSC has no special design features to ensure habitability and is, therefore, assumed to have a protection factor of 1. Since the primary TSC does not meet the recommended habitability requirements, a backup TSC is provided adjacent to the EOF in the same building. The primary TSC is equipped with a NMS CAM model CRM-52M system capable of monitoring particulates and gases and an Eberline SAM 2 is provided for analysis of air monitoring cartridges from portable air samplers. Habitability for the EOF is addressed in section 3.1.1.3. The primary and backup TSC concept was presented to the NRC in a letter to Mr. O. G. Eisenhut dated January 17, 1980, and approved in a letter from Mr. Eisenhut to AP&L dated April 15, 1980.

Environmental conditions are controlled in the primary and back-up TSC locations to provide air temperature, humidity and cleanliness within acceptable limits for personnel and equipment.

The issue regarding the need for the Russellville location for an additional backup TSC was resolved by the NRC on September 11, 1985, by determining that the backup TSC located in the Emergency Control Center has the same radiological habitability as the control room. (See Section 3.1.1) Since there is no need for a TSC in the event that the control room is evacuated, there is no need for an additional backup TSC in Russellville. Although the Russellville TSC was evaluated during this ERF Appraisal the results will not be reported.

1.1.1.2 Size

a. Primary TSC:

The primary TSC is located on site in the administration building. The area dedicated to the TSC function is a room of approximately 900 square feet, augumented by an overflow area, "the break room," for some members of the dose assessment team. The licensee has assigned 17 people to the TSC room and 4-5 to the "break room." The staff's walkthrough demonstrated that this space was adequate for approximately 25 people. The licensee has developed the size requirements based on drills and exercises. The TSC area was increased to its present size based on experience during exercises.

b. Backup TSC:

The backup TSC is housed in the Emergency Control Center adjacent to the EOF. It is a dual-purpose area, normally used as a training room. The size is approximately 700 square feet with an overflow area of the same size in the immediate proximity. Size recommendations were made based on a pre-construction design review and were later verified during exercises. The size of the secondary TSC is adequate to accommodate the estimated 25 personnel expected to be assigned to the area.

1.1.1.3 Layout

The layouts of the primary and backup TSCs appear adequate to support the functions of the TSC, considering the expected traffic and communications flows.

1.1.1.4 Display Interfaces

a. Primary and Backup TSC:

Operations information is displayed by video and status boards. Status boards are updated in grease pencil by the TSC communicator who is in direct telephone contact with the control room. The status boards contain limited information with emphasis on actuation of safety systems. The status boards are readable and use a consistent format throughout the ERFs.

The primary source of operations information is the video display system. This system is the ANO-1 Safety Parameter Display System (SPDS). It is a computer-based data acquisition and display system utilizing both color-graphics and monochrome cathode-ray tubes (CRT). User interaction is via touch screens and traditional keyboard input. Access to displays is easy and computer response times are consistently fast.

The following are recommended improvement items:

(1) The readability of the graphics CRTs was degraded by glare; the licensee is considering installation of egg-crate diffusers to alleviate the problem.

(2) Colors are used indiscriminately and, in many cases, differ from accepted human factors standards for color-coding.

(3) Trend displays allow as many as eight variables to be displayed on one page: During the demonstration of the SPDS several trend lines "overprinted" each other and the operator had difficulty determining which variable was which.

b. Dose Assessment Information

Although the primary TSC has a status board for dose assessment information, the primary source of information for meteorological and radioactive effluent data is a computerized video display system know as the Gaseous Effluent Radiation Monitoring System (GERMS). The display interface consists of a Chromatics graphics display terminal with light pen and keyboard interactive devices.

1.1.2 Radiological Equipment and Supplies

1.1.2.1 Radiation Monitoring/Personnel Dosimeters

Various radiological supplies and equipment are located in the TSC. The equipment, which is operated by a health physics technician assigned to cover the Administration Building during an emergency, provides the capability to monitor TSC dose rates, radionuclide concentrations in air, and levels of personnel and surface contamination. The appraisal disclosed that the monitoring equipment was within the calibration period and showed that the portable monitor's batteries were operable. Supplies of 0-200mR self-reading pocket ion chamber dosimeters and TLDs were available. The emergency locker contained an adequate supply of protective clothing and canister-type respirators. The licensee has a procedure for checking the inventory either quarterly, after use, or if the locker seal has been broken.

1.1.2.2 Protective Supplies

Sufficient radiological supplies are maintained at the back-up TSC (EOF) to support the function of the relocated facility.

The following is a recommended improvement item:

- The guidance contained in procedure 1903.30 "Evacuation" states that 30 minutes can be allowed to determine if evacuation is necessary once the dose rate in the TSC is between 100mr/hr and

1R/hr. Since the protection factor for primary TSC is one and the self-reading pocket dosimeters contained in the TSC emergency kit have a range of 0-200mr, personnel could receive a dose greater than the pocket dosimeter limit within the 30 minutes. Pocket dosimeters with an appropriate range (0-5R or 0-10R) should be kept in the TSC emergency kit. Emergency kit inventory sheets and procedure 1903.60 should be altered to reflect this change.

1.1.3 Non-Radiological Equipment and Supplies

1.1.3.1 Communications

The ANO communications system included the Continental telephone system, the ANO plant telephone system, the Gai-tronics paging system, the ANO radio system, the NRC Emergency Notification System (ENS) telephone, the NRC Health Physics Notification (HPN) telephone and the Arkansas Power and Light microwave system. Use of the communications systems is described in Emergency Plan Implementing Procedures (EPIP) 1903.10 - "Emergency Action Level Response/Notification," 1903.13 - "Notification of Little Rock Corporate Official," 1903.14 - "Emergency Communications, and 1903.62 - Communications System Operation Procedure," with other guidance located in Emergency Plan Implementing Procedures specific to a response center or emergency response position. Emergency Plan Implementing Procedure 1903.61 described communications equipment testing which would provide for periodic testing of communications systems. The communications system for the Control Room, TSC, Backup TSC, and EOF had adequate power supplies except the radio system in the primary TSC as noted in item 1.1.3.4 below. In addition to plant telephone lines between the Control Room, TSC, and EOF, a dedicated separated line was installed between those facilities for the communicators. It was powered from vital power and had a battery backup.

The EOF activation procedures provided for changing all dual-use facility phone numbers from normal workstation numbers to preassigned emergency numbers. The same system was used to shift all TSC numbers to the same numbers in the backup TSC if the backup TSC is activated.

1.1.3.2 Records/Drawings

The Administration Building library, which is one of four onsite library facilities, is located in the room adjoining the primary TSC. This library is the area from which publication changes are controlled. Document control procedures have been computerized and the system provides a high degree of reliability in tracing the distribution and entering of changes to all technical publications and manuals. The "main" library for the site is in the building which houses the EOF/Backup TSC. The main library receives all document changes from the Administration Building library and contains a more extensive stock of less used publications. Engineering drawings are maintained at the Administration Building library in aperture card format only (i.e., no hard copy sticks on file). Access to these aperture cards is through both hard copy and aperture card indexes. The only deficiency in this excellent library system is the fact that the Administration Building library must have an operational aperture card reader in order to access most detailed engineering drawings (see further explanation under TSC Power Supplies).

1.1.3.3 Support Supplies

The following is a recommended improvement item:

- The support supplies immediately available to TSC personnel would be improved by the addition of standard engineering references such as the steam tables, break flow calculations and CRC-Type handbooks on various subjects. Standard engineering references are available at engineer's desks located in close proximity to the TSC but not in the TSC proper. A formal inventory procedure is in use to check the contents of the TSC supply lockers.

1.1.3.4 Power Supplies

The Primary TSC in the Administration Building is served by three basically different power supply schemes. For the purposes of this appraisal, the three types of power will be referred to in ascending order of reliability as follows:

- Type 1: receptacles supplied by normal offsite power,
- Type 2: receptacles supplied by both offsite power and by the security system diesel generator as a backup, and
- Type 3: receptacles supplied by offsite power, the security system generator and a battery backed DC-AC inverter.

Three pieces of key TSC support equipment are presently supplied with power from the least reliable Type 1 power supply. These pieces of equipment should be added to the more reliable Type 2 or Type 3 power supplies. These key pieces of equipment are:

- GERMS Terminal: The GERMS Terminal is the primary source of both release rate and meteorological data for the TSC. The GERMS also provides the primary means of performing dose assessment and dose projection computations for the TSC. The computer system to which GERMS is connected does have reliable power, but the system is only as reliable as the weakest link, which in this case in the TSC terminal.
- Radio Base Station: The radio base station is the TSC is connected to Type 1 power. It had previously been connected to a Type 3 power supply, but was recently moved to a new location and

connected to a normal wall receptacle. The previous radio location now has a CB radio connected to the high reliability power supply. Since the radio base station is the primary means of communicating with offsite monitoring teams, it should be connected to the most reliable power source available in the TSC.

- Library Aperture Card Reader: The reader is currently connected to Type 1 power. The reason for including the reader in the group of equipment to be connected to upgraded power is the fact that very few detailed engineering drawings (e.g., P&IDs electrical one lines, etc.) are maintained in hard paper copy in the library. Upgraded power is necessary to ensure access to the filmed portion of the library.

Equally or less important TSC equipment such as telephones, the SPDS console and a CB radio have been placed on the more reliable Type 3 power (i.e. power available from three redundant sources).

The NRC inspectors observed the following deficiency:

- Essential equipment for the primary TSC should be on back-up power, specifically: GERMS, the Radio Base Station, and the library aperture card reader. (313/8511-01; 368/8511-01).

1.2 Information Management

1.2.1 Variables Provided

1.2.1.1 Regulatory Guide 1.97 Variables

Arkansas Power and Light (AP&L) has installed satellites of the SPDS system as the primary Data Acquisition System (DAS) in both the primary TSC and the EOF/backup TSC. The GERMS dose assessment system is installed in both locations. The review of parameters available in the TSC against Regulatory Guide 1.97 considered parameters available if they were on either the SPDS or on the GERMS. The adequacy of SPDS or of the selected R. G. 1.97 variables with respect to those separate requirements of NUREG-0737, Supplement 1 will be addressed by the NRC in a future inspection.

The following parameters from R. G. 1.97, revision 2 are not available on the SPDS or the GERMS in the TSC:

- reactor coolant boron level
- containment isolation valve position
- reactor coolant radiation level (measured in situ)

- reactor coolant gamma spectrum (measured in situ)
- core flood tank pressure
- quench tank level
- quench tank pressure
- quench tank temperature
- containment cooling fan run status
- makeup and letdown flow
- liquid radwaste tank levels
- emergency ventilation damper position
- gaseous radwaste radiation level
- service water flowrate
- containment sump temperature

The above list of parameters are those for which no current plans exist for addition by the plant to the SPDS. There are other parameters not currently installed which will be added during upcoming refueling outages. The most important of these enhancement commitments appears to be the Reactor Vessel Level indication System (RVLIS). The R.G. 1.97 variables which are not being installed or being input into the SPDS are the subject of ongoing discussions with the NRC Division of Licensing, Office of Nuclear Reactor Regulation (See ANO-1 SPDS SER dated 29 June 1984, ANO-2 SPDS SER dated 30 April 1984, and ANO response to R.G. 1.97 dated 25 June 1984). The exceptions which AP&L has taken to R.G. 1.97 will be addressed in a separate report.

1.2.1.2 Other Variables

In addition to the R.G. 1.97 variables discussed in item 1.2.1.1 above, the TSC has a dedicated internal communications line between the control room, the TSC and the OF over which additional plant parameter data can be passed.

Telephone access to both National Weather Service and a private meteorological consultant provides weather forecasting information.

AP&L has installed a post accident sampling system (PASS) to comply with item II.B.3 of NUREG-0737 and in addition to normal cold and hot lab facilities has located an Nuclear Data-60 spectrometer at the nearsite EOF. Chemical and radiological analysis data available from this equipment are passed to the TSC via telephone.

The list of area radiation and process radiation monitor (ARM/PRM) points available on SPDS appears to go beyond the intent of R.G. 1.97 with nearly all such instruments provided to the SPDS.

1.2.1.3 Relationship to Functional Needs

The SPDS systems and ANO were designed to support the specific entry conditions and critical safety functions (CSF's) of each of the two different plants Emergency Operating Procedures (EOP's). Combined with the GERMS and the variables available by phone circuit, the variables available in the TSC (and the EOF) are sufficient to provide the information necessary for TSC personnel to perform their functional responsibilities. Variables available would allow evaluation of the challenges to or failure of the major fission product barriers as well as breaches in the radwaste and spent fuel areas.

1.2.2 Data Acquisition (Safety Parameter Display System)

A computer-based SPDS was implemented to provide real-time data acquisition and display for critical plant parameters. The SPDS in operation has been described in AP&L's generic letter Number 82-83, April 15, 1983, "Response to Supplement 1 to NUREG 0737 Requirements for Emergency Response Capability." The SPDS design includes one computer system for ANO Unit 1 and one for ANO Unit 2. Each of the SPDS computers gathers data continuously from both of the units (1 and 2) and are fully redundant systems. Each SPDS consists of a SEL 32/77 central processing unit with one megabyte random access memory, a three hundred megabyte hard disk, a 1600 bit per inch 9 track magnetic tape drive, and a RAMTEK color graphic display CRTs. A total of eight RAMTEK CRTs have been installed (two in the ANO Unit 1 Control Room (CR), two in ANO Unit 2 CR, two in the primary TSC, and two in the secondary TSC (EOF), one for each of the SEL CPUs in each of the locations listed above).

Sensors monitored via SPDS include 594 analog (range) and 131 digial (two state). There are 319 analog and no digital safety sensor channels monitored for ANO Units 1, 275 analog and 131 digital safety parameter sensor channels monitored for ANO Unit 2. The digital sensors provide data for control rod position. All safety parameter sensor data is acquired at a maximum rate of 4000 sensor channels per second. Every 10 seconds, all safety parameter sensor data are stored on disk. Currently, historical data for a 24 hour period are maintained on disk and the capability exists to store disk files on magnetic tape. Therefore, the safety parameter sensor data can be archived on demand.

Software has been developed to allow SPDS users to display safety parameter data readily using touch screen or keyboard commands in a menu format. Trends of any safety parameter sensor may be requested and displayed on the RAMTEK CRTs in the Control Rooms and EOF. The

SPDS has been implemented with a UPS (uniterruptable power supply) which assures continual operation for at least two hours in the event of a power loss.

Data transmission between the SPDS computers and ERF CRTs is accomplished using RGB (red-green-blue) video signal format with fiber optics serial links. Data communications between keyboard and black and white CRTs in the ERFs and SPDS computers are accomplished with asynchronous serial fiber optic links, but do not employe error detection/correction techniques for data verification. NUREG-0737 requires that the ERF data communication be reliable. Therefore, an error detection/correction capability should be implemented on SPDS computer as well as on ERF input/output devices to assure the reliability of data communications.

To aid the user, it is recommended that a "HELP" feature be added to the SPDS software. Another deficient area is to complete the point-by-point database verification currently in progress, to ensure accurate and reliable safety parameter reporting.

The NRC Inspectors observed the following deficiencies:

- An error detection/correction capability should be implemented on the SPDS computer as well as the ERF input/output devices to assure the reliability of data communications. (313/8511-02; 368/8611-02).

- The point-by-point database verification should be completed to ensure accurate safety parameter reporting. (313/8511-03; 368/8611-03).

The following is a recommended improvement item:

- "Help" feature should be added to the SPDS software.

1.2.2.1 Isolation

Isolation of data acquisition systems was accomplished using several different isolation devices. These included isolation devices from Foxboro, Energy Incorporated, and Rochester Instruments. Several of the SPDS inputs were parallel from the 8600 plant process computer which was previously isolated. Drawings were examined which had incorporated isolation devices when the SPDS was installed.

1.2.3 Data Communications

See Section 1.2.2.

1.2.3.1 Reactor Technical Support

The combination of reference material, staffing plan, workspace, communications systems, and data acquisition systems provide adequate facilities to allow both real time and projected analysis of reactor plant conditions. The elaborate trending features of the SPDS and the design of the system to support the symptomatic EOP's provide an integrated response capability, with the TSC using most of the same procedures and data as that being used by the control room operators.

1.2.4 Data Analysis

1.2.4.1 Reactor Technical Support

The data available from various systems and dedicated communicators appeared adequate to support the TSC functions during an emergency. The SPDS had the capability to display and trend reactor plant and site parameters that would allow the TSC personnel to access plant and radiological conditions. The GERMS has the capability to display and trend dose assessment information that would assist decision making for protective action recommendations. Hard copy capability was available for both systems through the use of a high quality camera system. A dedicated communicator and status board keeper was utilized between the Control Room, TSC, and EOF to manually track reactor status and retrieve information required by facility personnel.

Technical support agreements and emergency phone lists were available in the TSC that would support requesting assistance from Institute Nuclear Power Operations (INPO), Babcock and Wilcox, Bechtel, Combustion Engineering, the railroad, and other support activities.

1.2.4.2 Dose Assessment

Dose assessment procedures for the ANO Emergency Response Facilities provide for dose assessment by two modes. The primary mode is an automated, fully computerized mode. The secondary mode uses a pocket computer together with hard-copy maps and overlays. Although not included in the EPIPs, there is a third possibility, consisting of use of the maps and overlays from the second mode together with hand-calculated approximations.

The primary dose assessment system at ANO is utilized for dose assessment from the Control Room, from the Technical Support Center and from the primary and backup Emergency Operations Facilities, and is referred to as the GERMS (Gaseous Effluent Radiation Monitoring System) system. The GERMS computers are two redundant Nuclear Data 6650 computers, each of which receives data from the ANO meteorological tower, processes it, and distributes it to Chromatics terminals and other outlets. Principal user access is via one of a number of Chromatic terminals which include a color monitor and user interaction with the display by means of a light pen. Two redundant data concentrators, Eberline Control Terminals, collect data from the Radiation Monitoring System, including the ten SPING-4 systems, and feed it to the GERMS computers.

The normal Chromatics presentation is a graphical display of the position of the plume superimposed on 10 or 50 mile site maps. The results of the dose computations can be displayed in numeric form. Hard copy of a Chromatic display may be obtained using a camera and Polaroid film. If paper copies of the GERMS output are required, a DECWRITER terminal may be used in place of a Chromatics terminal. When this is done, the map display is not reproduced. However, the plume extent may be sketched on a map.

The master program (operating system) for the GERMS computers executes user commands to run programs, manipulates files, etc. The primary dose assessment program in GERMS is named the Emergency Dose Calculation (EDC) program.

The primary dose assessment mode uses the EDC program with the most recent 10-minute average of the meteorological data and the Radiation Monitoring System data to calculate release plume doses dowrwind, and once initiated, will continue automatically to produce updated calculations at intervals of about 10 minutes. The EDC program uses a variable trajectory segmented Gaussian plume model that satisfies the requirements for a Class A model specified in Appendix 2 to NUREG-0654, Rev. 1. This dose assessment mode is the mainstream mode of the GERMS system. However, it is not a dose projection; it essentially calculates in near-real time an estimate of where the plume is, i.e., it does plume tracking.

The GERM system also permits dose calculations, using much of the same framework, in parallel to the mainstream calculations. In this way the licensee can make timely plume exposure dose projections for adequate protective action recommendations for the 10 mile EPZ.

The GERMS dose assessment program estimates dose commitment rates and total dose commitment for lung and thyroid inhalation pathways using dose conversion factors for 17 radionuclides taken from Regulatory Guide 1.109. The conversation factors used are for a child. Whole body rates and doses from the plume and ground shine are also computed. A semi-infinite cloud approximation with a correction for off-centerline distance is used in the computation of external whole body rates and doses due to the plume. Dose rates and doses are estimated for receptors located at 6 distances in each of 16 directions from the plant.

In addition to the computation made using the segmented plume model, GERMS makes the following site boundary computations: MPC fraction, whole body dose rate, and thyroid dose commitment rate (child's). These computations are made using default meteorological conditions in the form of standard X/Q values and real time meteorological conditions. The results of these computations are compared with emergency class criteria and the appropriate classification is displayed on a GERMS Chromatics terminal.

The GERMS system can also calculate doses and deposition of radionuclides out to 50 miles, which can provide the information basic to protective action recommendations for the food pathways and also serve for determining the necessity to deploy radiological monitoring teams and the locations thereof. The system and procedures provide for the use of field monitoring data to correct or modify the dose calculations, by modifying recirculation factors to adjust calculated concentrations to match those observed, and by modifying the ratios of chemical groups, e.g. the ratio of iodines to noble gases.

Provisions have been made to supply the necessary variables to the TSC, in most cases by direct input to the GERMS system.

The secondary mode for dose assessment calculations utilizes a TRS-80 pocket computer with storage on a mini-cassette recorder. This procedures uses stored source terms; meteorological data must be input by hand. It calculates centerline doses for a straight-line Gaussian plume; the implications of the calculated doses for selection of protective actions, etc., can be judged by selecting the appropriate map overlay for the meteorological conditions. In this mode, only releases of noble gases and iodine are considered.

1.2.4.3 Central Processor Capability

The following discussion applies to source term evaluations in the Technical Support Center (TSC). The principal release points for leakage of radionuclides to the environment are the Unit 1 Containment Purge Vent, the Unit 1 Radwaste Area, the Unit 1 Fuel Handling Area, the Unit 1 Emergency Penetration Room, the Unit 2 Containment Purge Vent, the Unit 2 Radwaste Area, the Unit 2 Fuel Handling Area, the Unit 2 Emergency Penetration Room, the Post Accident Sampling Building, the Unit 2 Auxiliary Building Extension, and a Composite Site Total Unmonitored Pathways point. See section 1.2.2 for additional discussion on data systems.

Concentrations in uCi/cm^3 and release rates in Ci/sec are directly monitored for the above release points for the following radionuclides: I-131, I-132, I-133, I-134, I-135, Kr-85, Kr-87, Kr-88, Xe-135, Ru-106, Te-132, Cs-134, Cs-137, La-140, Ba-140, and Ce-144. These radionuclides, their concentrations and release rates (computed from monitored flow rates) are directly input to the GERMS computer/graphics system for computation of offsite doses.

Source terms may also be determined from liquid grab samples, CAM (continuous air monitors) measurements, or PASS samples of various gaseous effluent streams. Examples of manual procedures for a variety of source terms include source term determinations via the High Range Hydrogen Purge Monitor, the dose rate reading (mr/hr) is multiplied by the Vent flow rate (CFM) recorded by Flow Monitor and the product multiplied by two conversion factors. This yields the gross noble gas release rate in Ci/sec. The iodine release rate is estimated by multiplying the noble gas release rate by the appropriate value of the I/NG time-dependent ratio (as pre-calculated in EPIP 1904.04). Grab-samples may be analyzed using the ND-60 Multichannel Analyzer. PASS samples can be drawn from the RCS letdown line, hot leg, pressurizer surgelines, pressurizer steam volume, and containment sump. Constituent radionuclide concentration determinations of these samples are performed in the PASS building with an ND-6620-gamma-ray spectroscopy unit which utilizes a high-purity Intrinsic Germanium Detector with gamma peak resolution sensitivity in the 80 keV-2 Mev energy range. This system identifies gamma ray peaks with high resolution.

Coupling these radionuclide concentrations with the appropriate flow rate, source term release rates may be computed.

Additionally, dose calculations may be made based on samples taken by licensee radiological monitoring team in the field, which can be dispatched via an emergency response vehicle. Silver-zeolite is used in field counting equipment with an RM-14 used to monitor filter cartridges. These samples may then be analyzed for radionuclide content on the ND-60 Multichannel Analyzer. Also available in the field are 44 licensee TLD's and the same number of NRC TLD's (monitored by State of Arkansas personnel). TLD readings may be evaluated by a Harshaw-2271 TLD counter in the EOF.

Core damage estimation is partitioned into fuel conditions: (1) no damage, (2) cladding failure, (3) fuel overheat, or (4) fuel melt. The core conditions best describing the "no damage" state are that all the core exit thermocouple (CET) readings indicate that core damage is unlikely and that no excess amount of hydrogen is found in the containment atmosphere. The core conditions best describing cladding failure are that one or more of the CET readings indicate the possibility of cladding failures and that (a) no excess amount of hydrogen is found in the primary system and (b) no detectable hydrogen is found in the containment atmosphere. If the ratio of the activity of any of several isotopes (Kr-85m, Kr-87, Kr-88, Xe-131m, Xe-133, I-131, I-133, I-135, Te-132, Ba-140, Ru-103, Cs-136, Cs-137, and Cs-138) to the total gap release activity estimate is greater than 1, there is a possibility that some fuel overheating or fuel melting has occurred. To determine whether either of those conditions has occurred, indicators are: (a) one or more CET readings indicating the possibility of fuel pellet overheat, followed by detection of excess hydrogen in the containment atmosphere or the primary system; and (b) the presence of any low-volatility fission products indicating that some fuel melting may have occurred. (Te-132, Ba-140, or Ru-103). The core conditions best describing fuel overheating are that there has been an abnormal shutdown and a possibility that the fuel has been partially uncovered for a period of time greater than a few minutes. Other parameters verifying that there has been fuel overheating are: (a) one or more CET readings indicating the possibility of fuel pellet overheat; and (b) excess hydrogen is found in the primary coolant or a detectable amount of it is found in the containment atmosphere. Procedures involving ratios of specific isotopic noble gas inventories to total core inventories of these radionuclides allow a determination of broad-scale range of the degree of fuel overheating (≤ 50%). If low-volatility radionuclides (Te-132, Ru-103, or Ba-140) are detected, fuel melting may have occurred. The core conditions best describing fuel melting are that there has been a severe accident and the core has been uncovered for a long period of time. Parameters indicating that there has been fuel melting are: (a) more than one CET reading indicating the possibility of fuel pellet overheat; (b) one or more CET readings indicating the possibility of fuel pellet melt; and (c) an excess amount of hydrogen is found in the primary coolant or a detectable amount of hydrogen is found in the containment atmosphere. The fuel melting estimates are primarily based on the data from low-volatiles (Te, Ba, Ru) since Xe, Kr, I, and Cs radionuclides are released in significant quantities during fuel overheating.

An additional source of fuel damage indication is certain key isotopic abundance ratios in the reactor coolant. Isotopic abundance may be calculated from Table VII and VII.A of the Core Damage Procedures. Additional ratios from releases can be calculated from the release fractions of Attachment B to the Procedures. The ratios are I-131:I-133; I-133:I-135; Cs-137:Cs-136; and Cs-137:Cs-138. Relative values of these ratios indicate whether the reactor coolant is exhibiting radionuclide activity which is (a) normal, (b) due to transient spiking, (c) due to gap release, or (d) due to fuel matrix release. Recommended spiking factors are given in Table VII of the Core Damage Procedures.

1.2.4.4 Meteorology

Meteorological data collected from the ANO tower include wind direction and speed at the 10 m and 55 m levels, sigma theta at the 55 m level, dry-bulb and dew-point temperatures at the 10 m level, and temperature difference between the 10 m and 55 m levels. The data are transmitted to the GERMS computers at 10 minute intervals where they are stored for later use. In addition, wind direction and speed, temperature difference, and sigma theta are continuously recorded on strip charts in the Unit 1 control room. ANO does not have a backup tower and does not make precipitation measurements. If meteorological data are needed when site data are not available, procedures exist for obtaining information from the National Weather Service, Weather Services International, or the Middle South Utilities System dispatcher by telephone. Weather forecasts for use in the TSC and EOF may be obtained from the same sources. Forecasts of extreme weather are supplied to the control rooms by the Middle South Utilities dispatcher.

Atmospheric dispersions estimates are made in one of three ways. The primary method uses the GERMS computers, and a variable trajectory, Gaussian, segmented plume model. Transport and diffusion are based on the atmospheric conditions at the ANO tower. This method is available for use in the control rooms, the TSC, and the EOF. The second method, which uses a straight-line Gaussian plume model, is a backup to GERMS and is programmed on a TRS-80 pocket computer. The backup procedures can be used in all locations. The third model is a manual approximation to the primary method. It is available for use in the TSC and EOF.

The GERMS system estimates dispersion from 12 release points; 10 of these points are associated with monitored release paths, the eleventh is for unmonitored releases, and the twelfth is for special dispersion estimates. The monitored release pathways vent to the atmosphere at the top of the containment building and are treated as if they were through a free-standing stack of the same height. Unmonitored releases are assumed to be ground-level releases.

1.2.4.5 Conclusions and Recommendations

The GERMS programs are capable of providing dose rate and dose estimates within 15-minutes. The program does not explicitly treat uncertainties in either atmospheric dispersion or dose estimates. Written procedures in the 1904 EPIP series compensate for uncertainties in plume location when the plume is near major terrain features.

The dose assessment provisions appear adequate. However, they are strongly oriented around releases of radioactivity that are currently taking place or have already occurred; the projection of impacts of potential releases that are not yet taking place receives less emphasis.

The following are recommended improvement items:

a. Map showing topographic features to a distance of at least 10 and 50 miles should be provided for use in the TSC and EOF and backup EOF.

b. The GERMS treatment of winds below instrument threshold and invalid meteorological data should be reviewed to ensure that the treatment is appropriate. Specific attention should be given to the number of times that past data may be substituted for invalid data without explicit action on the part of the operator.

c. The dose assessment programs in GERMS should be reviewed and revised if appropriate to decrease the time required to make dose projections. The review should consider simplification of the basic models, optimization of the coding of the models, and addition of utility programs to simplify and speed-up user interactions in the manual mode of operation.

d. Printers should be supplied for each of the GERMS Chromatics terminals.

e. Much stronger emphasis should be given the concept of dose projection sufficiently in advance to permit effective implementation of protective measures.

f. An upgraded severe accident source term and dose assessment capability effort (to augment the Core Damage Procedure - Attachment B release fraction matrix) should be instituted, factoring in current and emerging PWR sequences, such as EVENT V or TMLB'. This should also include assessment capabilities for the generation/projection of immersion, inhalation, ingestion, skyshine, and groundshine sources. These types of analyses are important in generating real-time emergency response actions as described in NUREG-0396 (see, for example, Figure I-II) and in NUREG-0654.

g. Methods of approximating Ci/sec release rates inferred (back calculated) from field emplaced TLD's should be developed and incorporated in the EPIP's.

h. The dose assessment and dose projection results should contain a representation of their uncertainty, so that the uncertainty can be more readily taken into consideration in arriving at protective action recommendations.

i. The Chromatics terminal display and other GERMS system outputs should provide the units for each dose output.

The NRC inspectors observed the following deficiency:

- The licensee does not have the ability to make adequate and reliable consequence assessments of dose. (313/8511-04; 368/8511-04).

  The summary factors leading to this conclusion are:

  (1) Treatment of release from the vents at the top of containment as elevated releases.

  (2) Use of the default (annual average) X/Q values for determining dose rates for comparison with criteria for the Notification of Unusual Event and Alert emergency classes. The default values may be non-conservative in some cases.

  (3) Meteorological data availability for 1984 was less than 90%. Three of 12 periods of reduced onsite meteorological data availability extended for more than 100 hours, while only one period was less than 24 hours in duration.

  (4) Use of the semi-infinite cloud assumption for computing whole body doses from elevated releases.

1.2.5 Data Storage

See Section 1.2.2.

1.2.6 System Reliability

1.2.6.1 Validation and Verification

a. SPDS:

The ANO-1 SPDS was subjected to a verification and validation (V&V) process. The SPDS verification included a system requirements review and a design review based on the system requirements. Validation included testing and evaluation of the completed system, hardware and software, to ensure compliance with design, function, performance and interface requirements. This testing confirmed field input calibration; input source to computer point identification relationship; software programs for the acquisition, conversion, manipulation and display of data from field inputs; and proper operation of the central processors, related circuits and memory, and peripheral devices. In addition, the primary SPDS display has been reviewed and studied by Sandia Labs during the Interim Reliability Evaluation Program and by a Honeywell study team for EPRI. These reviews concluded that the ANO-1 primary display is useful in providing the operator with information necessary for assessment of plant safety status. Furthermore, AP&L has included the SPDS in the scope of the Control Room Design Review (CRDR) program to formally evaluate the proper incorporation of human factors principles including equipment location, display formats and characteristics, operator interfaces, and compatibility with the EOPs.

b. GERMS

The GERMS system, hardware and software, was procured as a package from Nuclear Data (N.D.). According to AP&L staff neither AP&L nor N.D. performed a V&V on the system. AP&L did correlate GERMS data with readings from control room indicators as part of its acceptance testing program.

1.2.6.2 Computer Based Systems Reliability

a. SPDS:

AP&L did a "rough calculation" of system availability based on hardware specifications. The result was an established availability of greater than .90. Although the system has been in use for over a year, no reliability data has been gathered, e.g., software change requests, maintenance logs, time-on-line. The only evidence of system reliability is the reportable event log; AP&L considers it a reportable event when both SPDS computers are down for more than 15 minutes simultaneously. According to the AP&L staff such an event has never been reported.

b. GERMS:

AP&L could not provide any estimate of system reliability for the GERMS system. The vendor provided no data or estimates of reliability to AP&L. The licensee has not kept availability records or maintenance logs on the system. Although the general configuration would appear to be highly reliable, i.e., two redundant computers with an uninterruptible power supply, the licensee has experienced failures of the system during exercises.

The NRC inspectors consider the reliability of these data systems to be inadequate, as stated in 1.2.2 above. It is recommended that AP&L initiate a system of record-keeping for the purpose of tracking the reliability of the SPDS and the GERMS systems. It should include measures that are reflective of hardware and software reliability.

1.2.6.3 Manual Systems

In order to assure that manually gathered data are reliable, AP&L provides pre-formatted status boards and checklists in the TSC for use by the operations communicator and the assessment specialist.

1.2.7 On Shift Dose Assessment

The GERMS system is complicated, and not user-friendly. However, the licensee demonstrated that their staff included at least four people (two on-site and two in the Little Rock, Arkansas office) who were satisfactorily proficient with the system. These people would be on staff of the TSC and EOF, to operate the GERMS system. The same GERMS system is accessible for dose assessment from the control room of either unit at ANO. The shift Administrative Assistant in each control room is a GERMS system user designated to do dose assessment calculations, thus providing an on-shift capability in the Control Room until the TSC is manned.

1.2.7.1 Dose Assessment Proficiency

The GERMS programs are capable of providing dose rate and dose estimates within 15 minutes. The program does not explicitly treat uncertainties. (Section 1.2.4.5 above)

1.3 Functional Capabilities and Walkthroughs

The functional capability of the TSC was evaluated by presenting a NRC developed accident scenario to key members of the licensee's staff normally assigned to the facility during an emergency. Licensee personnel responded to the postulated circumstances by describing their actions and how the equipment and supplies available in the TSC and backup TSCs would be used. The evaluation showed that the primary TSC would be adequately staffed and that the secondary TSC located in the EOF could be adequately staffed and capable of performing assigned TSC functions. Procedure 1903.30 "Evacuation" provides for relocation of the on-site TSC to the EOF location with uninterrupted operation of the primary TSC functions. However, no provisions could be found to ensure that TSC personnel in the secondary TSC would be provided with the necessary physical access to the Control Room.

1.3.1 Walkthroughs (Facility Demonstration)

The walkthrough technique utilized was refined to concentrate more on the facilities and less on the flow of the scenario. In two or three instances where the licensee team seemed unsure of the terminal aspects of the scenario, the walk-through leader provided correct answers so that discussions did not digress into questions of personnel knowledge of the plant and procedures.

The following is a recommended improvement item:

- Appropriate procedures should be developed and implemented to ensure rapid physical access of TSC personnel traveling between the secondary TSC and the control room under accident conditions.

2.0 Operational Support Center (OSC)

2.1 Physical Facilities (Design, Location, Alternate OSC)

The entire ANO administration building is considered the OSC. OSC functions are carried out in various locations within the building. Health Physics functions are on the 1st floor, dosimetry is on the 4th floor, administration is on the 5th floor, and medical, mechanical, I&C, and chemistry are on the 2nd floor. OSC personnel operate out of their normal working space unless evacuated. The building structure is the same as the primary TSC previously described in section 1.1.1. No radiological habitability design features are incorporated into the structure. The ventilation system does provide temperature and humidity control.

In the event that radiological, or other conditions necessitate the abandonment of the OSC, the licensee has identified an alternate location for these functions. The alternate location is on the 1st floor of the EOF which is provided with the same radiological protection as the EOF.

2.1.1 Operations Support Center Size/Layout

The entire administration building is considered by the licensee to be its OSC. Certain floors are dedicated to certain functions. OSC managers are assigned to the TSC area of the Administration building and communicate with their respective teams and team leaders by phone or direct face-to-face contact. Emergency classification and general plant conditions are announced over the public address system. A conference room is available that appears adequate to accommodate assigned OSC personnel.

The adequacy of the size and layout of the OSC facility has been demonstrated at previous exercises. The environmental conditions are standard office building conditions, i.e., temperature-controlled, low-noise, well-lit.

2.1.2 Display Interface

The only displays used in the OSC are status boards in the health physics area.

The following is a recommended improvement item:

- The health physics and maintenance areas should be equipped with a series of plant maps that can be marked with grease pencil to show radiation levels in different areas of the plant.

2.1.3 Radiological Equipment and Supplies

The OSC has been supplied with appropriate equipment which has been stored in emergency lockers located in the hallway outside the health physics area. The radiological instruments available provide measurement of the anticipated dose rates under accident conditions, measurement of the containment levels and collection of samples of airborne activity. Protective clothing, including respiratory protective equipment, is available. However, the main supply of protective clothing and instrumentation is provided at the access control point. A variety of personnel monitoring devices, including 0-5R, 0-200R, 0-200mr direct reading pocket dosimeters and TLDs are kept in the emergency lockers. The inspection disclosed that the monitoring equipment was within the calibration period and tests indicated that the batteries in the portable instruments were in working condition. The emergency lockers contained radiologically related supplies such as survey maps, signs, plastic sheets, rope, and procedures. The emergency lockers are inventoried in accordance with procedures 1903.60 "Emergency Supplies and Equipment" and 1000.09 "Surveillance Test Program Control."

In the event the primary OSC is abandoned radiological instrumentation would have to be transported to the back-up location and other supplies would be available at the secondary location.

2.1.3.1 Staffing

The OSC is staffed by key foreman level personnel in the disciplines of maintenance, health physics, operations, and chemistry. For the most part, these managers and their personnel operate from their normal office spaces within the administration building.

2.1.3.2 Activation

Activation of the OSC occurs at the Alert classification. Key personnel carry all lists on laminated plastic cards to perform the notification and call in of other non-represented personnel. Craft personnel are called in through use of the normal overtime call list which is maintained by the key foreman.

2.1.3.3 Onsite Interface and Coordination, Assignment, Proficiency, and Walkthroughs (Facility Demonstration)

The OSC walkthrough consisted of a series of question from the OSC section of the ERF appraisal module followed by a problem solving session involving the front to back planning of an emergency maintenance task.

2.1.4 Non-Radiological Equipment and Supplies

2.1.4.1 Communications

The communications systems available for use have been discussed in section 1.1.3.1 above.

The OSC function at Arkansas Nuclear One was fragmented into several areas within the administration building. This was apparently done in an attempt to allow major areas (i.e. Health Physics, Maintenance, Administration Support, etc.) to work out of their normal work areas. The communications flowpath for information transfer was between the applicable area manager in the TSC to the area manager in the OSC. There was not a single OSC manager which managed all OSC functions in a central OSC area. Briefings to the entire OSC function on plant and radiological conditions during an emergency were not provided for and were carried out on a functional area basis. This meant that on a plant status change each TSC manager would brief his OSC counterpart rather than dedicated communicators passing information to the OSC and having and OSC manager given all OSC personnel one briefing. This would appear to "tie up" key TSC managers passing updated information in parallel to several OSC functional managers during critical times in an emergency when plant conditions are changing.

The following is a recommended improvement item:

- Provide a means for briefing all OSC personnel simultaneously on plant and radiological conditions without tying up key TSC managers.

2.1.4.2 Support Supplies

Drawings, Technical Manuals, and other plant reference material were available to the OSC from the Technical Library on the 3rd floor of the Administrative Building. The TSC and OSC use the Technical

Library as a source of information rather than prestaging selected plant drawings and reference material in a centralized area. Provisions were made for adequate staffing during emergencies to provide needed reference material. There were no prestaged status boards in the OSC that would allow for visual indication of repair and maintenance team locations, desired routing of teams to avoid high radiation areas, compositions of teams by name, team leader by name, or other information that would allow efficient coordination of various plant teams during an emergency.

The following is a recommended improvement item:

- Provide prestaged status boards in the OSC to allow for indication of repairs and maintenance team locations, desired routing of teams, composition of teams, and other applicable information.

3.0 Emergency Operations Facility (EOF)

3.1 Physical Facilities

3.1.1 Design (Location, Structure)

The ANO Emergency Operations Facility (EOF) is located approximately 0.65 miles northeast of the Reactor Buildings on a hill overlooking the facility. This same building houses the backup TSC and OSC. The heating ventilation air conditioning (HVAC) system for the EOF provides temperature and humidity control of the facility. The HVAC system for the EOF, which includes high efficiency particulate air (HEPA) filters, can be manually placed in a recirculating mode of operation. The failure of the HVAC system to operate satisfactorily during a demonstration requested by the inspectors indicates the need for a routine testing and maintenance program. The licensee was unable to confirm whether the system had undergone initial testing to determine if the installed system met the design specifications or to verify the filter efficiency. The EOF has adequate lighting, restroom facilities, and other features essential for its operations. The facility has been constructed to meet the Southern Standard Building Code.

Calculations provided by the licensee indicate that this facility has a protection factor of approximately 4 and its radiological habitability is essentially the same as the control room for a design basis accident assuming the worst case meteorology. This habitability was evaluated after the completion of the ERF Appraisal and verified by NRC on September 11, 1985.

3.1.1.1 Size

a. Primary EOF:

The primary EOF for ANO is a building known as the Emergency Control Center or ECC. It is a multi-use building, used normally as a training center and as an EOF during emergencies.

The building has approximately 72,000 square feel of useable space and provides ample space for the estimated 45 people assigned to the EOF. Space requirements were developed during a pre-construction design review and later verified during exercises.

b. <u>Back-up EOF</u>

The back-up EOF is housed in the AP&L local office in Russellville. The areas designated as EOF areas are approximately 2,000 square feet. The areas appear to be marginally adequate to accommodate the estimated 45 people assigned to EOF.

The following is a recommended improvement item:

- The space allotted for the back-up EOF should be increased to 3,000 square feet minimum to better accommodate the estimated 45 people assigned to it.

The licensee has not verified the adequacy of the size of the back-up EOF during exercises or drills, nor has any design review been done to verify that adequate space is available for all response team members.

3.1.1.2 <u>Layout</u>

a. <u>Primary EOF</u>:

The primary EOF appears well laid out with appropriate consideration given to necessary communications and traffic links. The adequacy of the layout has been verified by the license during exercises.

b. <u>Back-up EOF</u>:

The layout of the back-up EOF appears to be suboptimal. The radiological/environmental assessment manager and dose assessment supervisor are isolated from each other, as are the health physics supervisor and the maintenance coordinator. The communications manager and the telecommunications/radio staff are at opposite ends of the building.

The following are recommended improvement items:

- Review functional interfaces and consider arranging those groups accordingly.

- Drills and exercises should be conducted to verify the size and layout of the backup EOF.

3.1.1.3 Habitability/Environmental

A survey of the EOF/HVAC system was performed. This review resulted in an appraisal deficiency. A description of the deficiency is provided below:

The west end of the EOF building is separated from the east end by sets of double doors on both the upper and lower floors. Under accident (potential plume exposure) conditions, the doors separating the two ends of the building are to be shut and the ventilation system shifted to a mode which takes outside air through sets of HEPA and charcoal filters to pressurize the emergency facility end of the building above outside atmospheric pressure. A test of the HVAC system to demonstrate the system's capability of maintaining a positive pressure in the emergency facilities failed. When in the emergency configuration, the system actually crates a negative pressure on the bottom floor and a positive pressure on the upper floor. This pressure gradient would draw unfiltered airborne particulates into the building on the bottom floor and distribute them throughout the building. The problems appeared to be caused by one or more problems such as:

- Some ventilation dampers did not operate properly on switch over to the emergency mode. One damper may have failed to change positions and another appeared to stick in mid cycle.
- Building occupants are allowed to throttle ventilation dampers at will to control temperature in their normal work spaces.

The NRC inspectors observed the following deficiency:

- The HVAC system does not maintain positive pressure on the habitable portion of the EOF. (313/8511-05, 386/8511-05).

The following is recommended to resolve this deficiency:

a. An immediate program to repair or realign the system.

b. A continuing test program to periodically check that the system is capable of shifting to the emergency mode.

c. Administrative controls to prevent unauthorized personnel fr adjusting ventilation dampers within the building.

d. Although the HVAC system is rarely operated in the emergency mode, periodic testing of charcoal and HEPA filters is recommended (semi-or tri-annual testing suggested).

3.1.1.4 Display Interface

The primary EOF uses the same display systems as the TSC; therefore, the comments and recommendations of Section 1.1.1.3 are applicable. In addition, the staff discussed a security issue with the licensee at the time of the appraisal and recommended improvement.

The back-up EOF has no installed display systems. A GERMS terminal would be transported to the building if the primary EOF was evacuated.

The following is a recommended improvement item:

- The staff recommends that status boards be made available and that they be consistent with those in the primary TSC and EOF. In addition, data checklists for radiological conditions and plant operations data should be made available.

3.1.2 Radiological Equipment and Supplies

A variety of radiation detection and measurement instruments are available at the EOF. These instruments appear adequate to monitor personnel exposure and radiological conditions in the EOF under accident conditions. The EOF has an installed radiation monitoring system which consists of 8 Eberline GM detectors (6 general area and 2 on the HVAC system) connected to an annunicator panel in the secondary TSC portion of the EOF. The annunicator has both visual and audible alarms and a High Alarm will cause the doors to the habitable portion of the building to automatically close. Radiation monitoring equipment and supplies are available for use by personnel assigned to perform offsite monitoring. Other radiation instrumentation available in the EOF consists of two whole body counters, four portal monitors, a TLD reader, and a multi-channel analyzer.

TLDs and self-reading pocket dosimeters with ranges of a 0-200mr and 0-5R are available to monitor exposures received by personnel working in the EOF.

Various other additional radiological supplies necessary for the functions performed in the EOF are also available. A decontamination area and supplies are present in the EOF. No radiological instrumentation or supplies are maintained at the back-up EOF. All instrumentation and supplies necessary for the operation of the relocated EOF will be brought by the EOF personnel when they move. Procedures do not clearly identify the logistics of moving equipment and supplies to ensure an adequate quantity for operation upon arrival nor do they specify the individuals responsible.

The following is a recommended improvement item:

- The logistics of moving personnel, instrumentation and supplies, including assignments of responsibility, from the primary to the backup TSC and from the EOF to the back-up EOF in Russellville should be clearly stated by procedure.

3.1.3 Non-Radiological Equipment and Supplies

3.1.3.1 Communications

Communications systems available for use during an emergency are discussed in section 1.1.3.1. As the EOF located in the training building is a dual use facility, it must be set up to be ready to perform the EOF function during an emergency. From a communication standpoint, this involves setting up telephones from the overhead of rooms and shifting the telephone numbers from normal use to emergency numbers. If the normal use number is dialed during an emergency after the shift has taken place, it would not work and appear to be ringing with no answer. The system is controlled from the training building by a system of redundant computers with a normal disk for programming normal use numbers and an emergency disk for programming emergency numbers. It is located within the habitability envelope within the training building. Phone lists of selected technical agencies are available in the EOF for requesting offsite assistance.

3.1.3.2 Records/Drawings

The most extensive library onsite is located in the habitable area of the building containing the EOF. Documents and drawings on file are more extensive than the satisfactory supply in the TSC area library. The EOF/backup TSC library does contain drawings in hard copy form and film reader machines powered from the EOF emergency diesel generator.

3.1.3.3 Support Supplies

Based on checklists of equipment staged in the bottom floor lockers and cabinets, this area appeared adequate.

3.1.3.4 Power Supplies

The following are recommended improvement items:

- The EOF emergency diesel generator should be placed on a preventive maintenance program to ensure its availability during emergency conditions. At the time of this appraisal, no action had been completed to place the diesel generator on a program as outlined in ANO Action Tracking Item ANNIN-850321-221, dated 21 March 1985.
- A review of EOF power supplies revealed that the ND-60 system in the bottom floor laboratory had been inadvertently wired to the normal power transformer. The power panel for the ND-60 receptacles has an emergency designation (EL4-A). AP&L should consider rewiring the panel to the proper transformer.

3.2 Information Management System

3.2.1 Variables Provided

3.2.1.1 Regulatory Guide 1.97 Variables

The EOF/backup TSC SPDS and GERMS terminals are identical to those provided in the primary TSC. One improved feature of the data acquisition system (DAS) for the EOF/backup TSC is that the GERMS terminal is supplied by both normal and emergency diesel generator power. Variables not provided are the same as discussed in item 1.2.1.1.

3.2.1.2 Other Variables

See discussion under item 1.2.1.2.

3.2.1.3 Relationship to Functional Needs

See discussion under item 1.2.1.3.

3.2.2 Data Analysis

3.2.2.1 Reactor Technical Support

See discussion under item 1.2.4.1.

3.2.2.2 Dose Assessment

Dose assessment in the EOF is performed using the methods that are used in the TSC. Identical GERMS terminals and TRS-80 pocket computers are located in both facilities.

3.2.3 System Reliability

The primary EOF uses the same systems as the TSC; therefore, the comments and concerns raised in Section 1.2.6 are applicable.

The back-up EOF may present unique reliability problems since the plan is to transport and set up a GERMS terminal at the time of evacuation of the primary EOF. The licensee could not provide evidence that the GERMS terminal/information system will be highly reliable in the back-up EOF.

3.3 Functional Capabilities and Walkthroughs

3.3.1 Operations

The functional capabilities of the EOF were evaluated by presenting a NRC developed accident scenario to key members of the licensee's staff normally assigned to the facility during an emergency. The individuals responded to the postulated circumstance by describing the actions that would be taken and by demonstrating how the equipment and supplies would be used. The evaluation indicated that the primary EOF would be adequately staffed with individuals capable of performing its assigned functions. However, it was not clear from discussions nor has it been demonstrated during drills or exercises that the EOF could be relocated to the back-up location in Russellville and function successfully.

The following is a recommended improvement item:

- Demonstrate through exercises and drills the capability to relocate the EOF to Russellville and maintain it as fully functional.

3.3.2 Logistical Support

Current support agreements are in effect which should provide for fire fighting, medical, and laboratory assistance in the event of an emergency. Support for repair parts was provided by 24-hour storekeeper support to research and draw spare parts. This support was backed up by additional on-call personnel. While additional vehicle support was not specifically provided, about 15 vehicles were available from the local office in Russellville. While these vehicles were assigned to normal operations, it appeared that they would have been available in a reasonable amount of time for use in an emergency. Lodging and meals for personnel during an extended emergency were not provided for by specific support agreements. The city of Russellville is located nearby and has restaurants and hotels to provide for support personnel.

3.3.3 EOF Functions

3.3.3.1 Dose Assessment

Dose Assessment in the EOF is performed using the methods that are used in the TSC. Identical GERMS terminals and TRS-80 pocket computers are located in both facilities. Transfer of the dose assessment function from the TSC to the EOF is a phased evolution that includes movement of the dose assessment team.

3.3.3.2 Coordination of Radiological and Environmental Assessment

In the initial phases of an emergency, the Emergency Radiation Teams are under the direction of the HP Superintendent. Upon arriving at the EOF, the Offsite Monitoring Section of the Emergency Radiation Team directs them from the EOF. Laboratory analysis and procurement of environmental samples appears adequate. Team deployment plans indicate adequate coordination and adequate provision for radio communications. One area potentially needing improvement is the assignment of vehicles for offsite monitoring. Sufficient priority should be given the offsite monitoring to assure an adequate supply of vehicles.

The following is a recommended improvement item:

- Review procedures for obtaining offsite monitoring vehicles and assuring their availability.

3.3.3.3 Walk-throughs (Facility Demonstration)

Because the backup TSC is located adjacent to the EOF, the same base facilities are available to the EOF as those available to the primary TSC. Personnel present for the EOF walk-through were the same as those present for the TSC walk-through. Therefore, a scenario was not used and this item consisted of the NRC team asking individual questions about activation and use of the EOF.

4.0 Exit Interview

The exit interview was conducted on May 24, 1985, with licensee representatives. Mr. W. Johnson, senior resident inspector was in attendance. Mr. C. A. Hackney, the NRC team leader; Mr. E. Williams, Reactor Safety Engineer, I&E; Mr. G. S. Vissing, Project Manager, ANO Unit 1; NRR; and Mr. R. S. Lee, Project Manager, ANO Unit-2, along with other staff members represented the NRC. Mr. C. A. Hackney summarized the team comments and observations in the subject areas of the Emergency Response Facility Appraisal. The licensee representatives were informed of the unresolved item, and the five deficiencies. It was stated that the NRC would respond to the unresolved item, and the licensee was to respond in writing to the deficiencies. Further, it was stated that there would be improvement items that did not require a response but were recommendations made by the ERF Appraisal Team for enhancing the ANO emergency preparedness program.