



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

NOV 06 1991

Report Nos.: 50-259/91-39, 50-260/91-39, and 50-296/91-39

Licensee: Tennessee Valley Authority
6N 38A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Docket Nos.: 50-259, 50-260, 50-296

License Nos.: DPR-33, DPR-52, and DPR-68

Facility Name: Browns Ferry 1, 2, and 3

Inspection Conducted: October 21-25, 1991

Inspector: A. T. Boland 11/05/91
A. T. Boland Dated Signed

Accompanying Personnel: M. Stein (Sonalysts, Inc.)
E. Testa
E. Christnot
B. Bearden
K. Clark

Approved by: William H. Rankin 11/5/91
W. H. Rankin, Chief Dated Signed
Emergency Preparedness Section
Radiological Protection and Emergency
Preparedness Branch
Division of Radiation Safety and Safeguards

SUMMARY

Scope:

This routine, announced inspection included observation and evaluation of the annual emergency preparedness exercise. Emergency response activities were selectively observed including: the Control Room; Technical Support Center (TSC); Operations Support Center (OSC); Central Emergency Control Center (CECC); Joint Information Center (JIC); onsite Fire Brigade; and inplant repair teams. The inspection also included a review of the exercise objectives and scenario, as well as observation of the licensee's post-exercise critique activities. The exercise was a full-scale exercise with participation by the State of Alabama and local emergency response agencies. The exercise was conducted on October 23, 1991, between the hours of 8:00 a.m. and 4:00 p.m.

Results:

In the areas inspected, violations or deviations were not identified. One area was identified requiring corrective action concerning the poor coordination and communications between the TSC, OSC, and inplant repair teams. Other areas for program improvement were noted in the areas of JIC notifications, use of the auto-page system, audibility of the public address system, the availability of out-of-date uncontrolled reference materials in the CECC, accountability of control room personnel, and the technical support provided to the Site Emergency Director. Exercise and emergency preparedness program strengths included an effective and thorough self-critique, excellent coordination between the CECC and TSC management throughout the exercise, good coordination of public information activities at the JIC including implementation of improvements since the previous exercise, and effective coordination and technical support provided to the State of Alabama by TVA at Morgan County.

Within the scope of the observed exercise, the licensee met their stated exercise objectives and demonstrated the capability to protect health and safety of offsite and onsite personnel in the event of a radiological emergency.

REPORT DETAILS

1. Persons Contacted

Licensee employees

- *M. Bajestani, Manager, Technical Support
- *A. Brittain, Site Security
- *N. Catron, Manager, Emergency Preparedness - Sequoyah.
- *J. Corey, Manager, Radcon
- *T. Corelius, Manager, Emergency Preparedness - Browns Ferry
- *A. Feltman, Emergency Preparedness Engineer
- *H. Jones, Engineering Specialist
- C. Kelly, Site Security
- *R. Kitts, Manager, Emergency Preparedness - Chattanooga
- *B. Marks, Manager, Emergency Preparedness Programs
- *R. Newton, Manager, Emergency Preparedness Exercises
- *S. Rudge, Manager, Site Support
- *J. Sabados, Manager, Chemistry and Environmental
- *J. Scalice, Plant Manager
- *E. Tomliason, Shift Operations Supervisor
- *J. Wallace, Compliance Engineer
- *O. Zeringue, Vice President, BFN Operations

Other licensee employees contacted during this inspection included engineers, operators, mechanics, security force members, technicians, and administrative personnel.

Nuclear Regulatory Commission

- *B. Bearden, Resident Inspector
- *E. Christnot, Resident Inspector
- *C. Patterson, Senior Resident Inspector

2. Exercise Scenario (82302)

The scenario for the emergency exercise was reviewed to determine that provisions had been made to test an integrated emergency response capability as well as the basic elements existing within the licensee, State, and local Emergency Plans and organization as required by 10 CFR 50.47(b)(14), 10 CFR 50, Appendix E, Paragraph IV.F, and the specific criteria in NUREG-0654, Section II.N.

The exercise scenario package including the exercise objectives was provided to NRC approximately 45 days in advance of the exercise, and was discussed with licensee representatives prior to the onsite exercise. The final exercise data and message package were provided to the inspector on October 21, 1991.

The inspector's review of the scenario prior to the exercise revealed no significant inconsistencies. One area regarding



the Emergency Action Level criteria for the General Emergency was discussed with exercise controllers prior to the exercise. Specifically, the controllers assumed during scenario development that the EAL "ECCS Failure (Pumps not running or unable to maintain reactor water level leading to fuel melt)" required confirmation of core damage prior to declaration of the General Emergency. The inspector informed licensee representatives that the EAL was anticipatory in nature and would be literally satisfied upon loss of all injection regardless of confirmed core damage. The inspector noted that the EAL misinterpretation by the controllers did not impact the exercise in that the Site Emergency Director (SED) appropriately interpreted the EAL and classified the General Emergency promptly.

The exercise objectives were comprehensive, and the scenario was adequate to exercise fully the onsite and offsite emergency organizations of the licensee and provided sufficient emergency information to the State and local government agencies for their participation in the exercise. In addition, the controllers and evaluators adequately supported the exercise, and the inspector noted appropriate interactions between the controllers and players. No controller prompting was observed during the exercise.

For the first time during an annual exercise at the Browns Ferry facility, the licensee employed the use of mock-ups for anticipated Reactor Core Isolation Cooling (RCIC) valve and Control Rod Drive (CRD) motor repair activities. The mock-ups provided the opportunity for realistic demonstration of repair activities, and the licensee was encouraged to pursue continued use of this training mechanism.

The attachment to this report documents the licensee's exercise objectives and presents a narrative and graphical summary of the scenario timeline.

No violations or deviations were identified.

3. Onsite Emergency Organization (82301)

This area was observed to determine that primary responsibilities for emergency response by the licensee had been specifically established and that adequate staff was available to respond to an emergency as required by 10 CFR 50.47(b)(1), 10 CFR 50.47(b)(2), 10 CFR 50, Appendix E, Paragraph IV.A, and the specific criteria in NUREG-0654, Section II.A.

Through a review of the licensee's Emergency Plan and Implementing Procedures, the inspector determined that the initial onsite emergency organization was adequately defined

and that primary and alternate assignments for the positions in the augmented emergency organization were clearly designated. During the exercise the inspector observed that staff was available to fill key functional positions within the initial onsite emergency organization. Augmentation of the initial organization was accomplished through mobilization of additional day shift personnel. During the course of the exercise, facility managers discussed and simulated preparations for long term staffing; however, because of the scenario scope and objectives, continuous staffing of the emergency response facilities was not required.

The inspector also observed activation, staffing, and operation of the emergency organization in the TSC, OSC, CECC, and JIC. At each response facility the required staffing and assignment of responsibility was consistent with the licensee's approved Plan and Implementing Procedures.

No violations or deviations were identified.

4. Emergency Response Support and Resources (82301)

This area was observed to determine whether arrangements for requesting and effectively using assistance resources were made, that arrangements to accommodate State and local staff at the EOF were made, and whether other organizations capable of augmenting the planned response were identified as specified by 10 CFR 50.47(b)(3), Paragraph IV.A of Appendix E to 10 CFR Part 50, and the guidance promulgated in Section II.C of NUREG-0654.

The inspector confirmed that the licensee had made adequate provisions in the Emergency Plan for interfacing with Federal and State response organizations. During the exercise, activities related to the Federal interface were not observed beyond initial notification; however, functionally the licensee appeared prepared for a telephonic as well as an onscene response. Licensee involvement and contact with State and county organizations occurred in accordance with applicable Emergency Plan Implementing Procedures. Adequate provisions were made for the State of Alabama at the CECC, and the interface between the State and licensee at the CECC was observed to be satisfactory. The inspector noted, in particular, that the liaison and technical support provided to the State at the Morgan County Emergency Operations Facility was effective and considered a program strength.

Assistance resources from offsite support agencies such as fire, hospital, and ambulance services were not observed during this exercise; however, the inspector noted that appropriate provisions existed in the Plan for acquiring

these resources if needed.

No violations or deviations were identified.

5. Emergency Classification System (82301)

This area was observed to assure that a standard emergency classification and action level scheme was in use by the nuclear facility licensee pursuant to 10 CFR 50.47(b)(4), Paragraph IV.C of Appendix E to 10 CFR 50, specific guidance promulgated in Section II.D of NUREG-0654, and guidance recommended in NRC Information Notice 83-28.

Emergency Plan Implementing Procedure (EPIP) - 1, Emergency Classification Logic was implemented by the licensee's staff to promptly identify and classify each emergency condition and to escalate to more severe classifications as the simulated accident progressed. The licensee's classifications and emergency declarations were appropriate throughout the exercise. The Notification of Unusual Event was declared by the Shift Operations Supervisor (SOS) at 0809 CST based on EAL SU1, Technical Specification LCO Requiring Plant Shutdown, due to High Pressure Core Injection (HPCI) inoperability coincident with an Automatic Depressurization System (ADS) valve 1-19 ground. The Alert was declared at 0900 CST based on EAL HA11, Fire Threatening Vital Area or Safety System, due to a fire in the intake pumping station transformer. The Site Area Emergency was declared by the Site Emergency Director at 1032 CST based on EAL FS3, Loss of Coolant Inventory Greater than Makeup Pump Capacity or Without Capability to Restore, when it was determined that the loss of RCIC and other water supplies were not sufficient to maintain reactor water level. At 1104, the classification was upgraded to a General Emergency based on EAL FG1, ECCS Failure (Pumps Not Running or Unable to Maintain Reactor Water level Leading to Fuel Melt).

Both the SOS, initially, and the SED, after TSC activation, demonstrated a good understanding of the emergency classification logic and basis identified in the BFN Plan and Implementing Procedure. Upon activation of the CECC, classification decisionmaking was effectively coordinated with the CECC Director prior to emergency declaration. Although emergency declarations were both timely and accurate, the inspector noted that the Technical Services and Operations personnel in the TSC were not aggressive in supporting the SED in assessing the plant conditions for emergency class escalation and did not appear to recognize the plant conditions associated with the Site Area and General Emergency classifications. This area was also identified during the licensee's critique process, and will be reviewed by NRC during future exercises for implementation of corrective actions.

No violations or deviations were identified.

6. Notifications Methods and Procedures (82301)

This area was observed to determine that procedures had been established for notification by the licensee of State and local response organizations and emergency personnel, and the content of initial and followup messages to response organizations had been established; and a means to provide early notification to the population within the plume exposure pathway had been established as required by 10 CFR 50.47(b)(5), 10 CFR 50, Appendix E, Paragraph IV.d, and the specific criteria in NUREG-0654, Section II.E.

The inspector reviewed the licensee's procedures for providing emergency information to Federal, State, and local response organizations, and for alerting and mobilizing the licensee's augmented emergency response organization. The inspector noted that BFN and CECC Implementing Procedures for notifications had been established and were adequate to provide guidance to personnel responsible for initial notification and continuing communications.

During the exercise, the inspector observed that the methods employed by the licensee for the notification of State and federal organizations were appropriate. Notification to the State were initiated by the Operations Duty Specialist in accordance with procedures and within 15 minutes following the declaration of each emergency event. In addition, formal updates were completed at the hourly required frequency or as emergency conditions warranted. This exercise did not provide the inspector the opportunity to observe local notifications, in that, licensee procedures require direct notifications to the local governments only when the initial emergency classification is a General Emergency. For all other emergency classifications, the licensee notifies the State who in turn notifies local response organizations. No concerns associated with this notification methodology were disclosed during the exercise.

The inspector also observed the licensee's implementation of onsite and corporate notification of augmentation personnel utilizing the computerized auto-paging system. At the CECC, the pager notifications were properly implemented immediately following the Alert classification, and no problems with activation of the system or response by personnel were noted by the inspector. However, the auto-paging system at the BFN site was inadvertently activated prematurely by the Shift Clerk at approximately 08:29 a.m. following the Notification of Unusual Event classification. According to computer documentation available to the inspector, approximately 14 pagers were activated before the



Shift Clerk realized the error and cancelled the paging process. Upon declaration of the Alert, the auto-page system was activated by the Shift Clerk appropriately.

Although the early activation of the paging system did result in premature response by some TSC and OSC personnel, overall activation of the response facilities was demonstrated. Specifically, both the TSC and OSC were staffed and activated within 22 minutes of Alert declaration but within one hour after the first paging system activation. The inspector noted that the auto-pager problems did not appear to be programmatic in nature, and the licensee was adequately addressing the issue. In addition, prior to the end of 1991, the licensee has committed to conduct an off-hour augmentation drill to fully test the auto-paging and staffing capability. This area will be reviewed during future inspections for adequate corrective actions.

The Alert Notification System (ANS) for alerting the public with the plume exposure pathway emergency planning zone (EPZ) was not actuated during this exercise.

No violations or deviation were identified.

7. Emergency Communications (82301)

This area was observed to verify that provisions existed for prompt communications among principal response organizations and emergency personnel as required by 10 CFR 50.47(b)(6), 10 CFR 50, Appendix E, Paragraph IV.E, and the specific criteria in NUREG-0654, Section II.F.

The inspector observed that adequate communications capability existed among the licensee's emergency organizations, and between the licensee's emergency response organizations and offsite authorities.

The inspector did not note any significant problems with the communications equipment utilized during the exercise, and backup systems were not required to be implemented. Minor problems were noted with the TSC and OSC electronic status boards; however, the difficulties were resolved by personnel during the course of the exercise. In addition, some problems with radio communications were observed by the inspector related to the fire brigade, environmental monitoring team, and inplant repair team responses. The problems noted, dead spots and high background noise, did not, however, interfere with the licensee's ability to respond in any of these areas. The licensee's critique similarly identified these weaknesses, and this area will be evaluated for improvement during future inspections.



The inspector also observed the use of the interim Safety Parameter Display System (SPDS) in the TSC and CECC. The SPDS was observed to display adequate exercise parameters for plant system analysis; however, the inspector noted that the system parameter outputs were not always consistent with the manual data sheet requirements (i.e. inconsistent units). Although the inconsistencies did not impact licensee performance during the exercise, the inspector discussed the potential for transposition errors with licensee personnel.

No violations or deviations were identified.

8. Emergency Facilities and Equipment (82301)

This area was observed to determine that adequate emergency facilities and equipment to support an emergency response are provided and maintained as required by 10 CFR 50.47(b)(8), 10 CFR 50, Appendix E, Paragraph IV.E, and the specific criteria in NUREG-0654, Section II.H.

The inspector observed activation, staffing, and operation of the emergency response facilities including the Control Room, TSC, OSC, CECC, and JIC. In addition, the inspector observed the fire drill and the RCIC mock-up repair activities.

a. Control Room

The Control Room utilized for the exercise was the Unit 3 Control Room, although the simulated casualty was related to Unit 2. The Shift Operations Supervisor (SOS) assigned to the exercise assumed the duties of the Site Emergency Director promptly upon initiation of the simulated emergency, and demonstrated a clear understanding of the emergency classification system for the Notification of Unusual Event and Alert declarations. The SOS demonstrated excellent command and control throughout the exercise. The SOS appropriately focused on his role as Site Emergency Director without becoming overly involved in operational details, and effectively established goals and priorities for emergency response personnel. The SOS directed the response until formally relieved by the Plant Manager; however, the SOS as well as the Assistant SOS continued to maintain management of Control Room activities and conducted frequent, thorough briefings of the Control Room personnel throughout the exercise.

During the exercise, the inspector noted that public address (PA) announcements were either very difficult



to understand or were not heard at all in the "horseshoe" area of the Unit 3 Control Room. The audibility of PA announcements in the hallway connecting the Unit 3 and Units 1 and 2 Control Room was also noted as marginal. This area was also identified through the licensee's critique process. Licensee representatives informed the inspector that the operability of the two PA speakers in questions would be evaluated immediately; however, PA audibility was a continuing problem. A complete PA/alarm system upgrade to meet NRC Bulletin 79-18 commitments is scheduled for completion during the next Unit 2 refueling outage. Licensee corrective actions in this area will be evaluated during future inspections.

b. Technical Support Center (TSC)

The TSC was declared operational approximately 22 minutes after the Alert classification. The turnover of emergency responsibilities from the SOS to the Plant Manager was considered adequate. The facility staff appeared to be cognizant of their duties, authorities and responsibilities. The Plant Manager/Site Emergency Director maintained a clear understanding of the plant status and ongoing events throughout the exercise, and demonstrated a thorough knowledge of the Emergency Plan, particularly related to emergency classification. Communications between the TSC and the CECC were good, and effective and timely transmission of information was demonstrated. The SED provided frequent briefings to emergency response personnel throughout the exercise using the PA system; however, the inspector observed that the frequency of briefings appeared to be based on the time elapsed since the previous briefing rather than on the progression of events. Status boards and other graphical aids were maintained throughout the exercise by support personnel and contained information appropriate to the scenario sequence of events. The inspector did note, however, that the team tracking board in the TSC did not always agree with the OSC team tracking status board. This item is discussed further in Paragraph 8.c.

c. Operations Support Center (OSC)

The OSC was activated simultaneously with the TSC approximate 22 minutes after Alert declaration. The inspector noted the arrival of some OSC personnel ahead of the drill schedule due to the inadvertent actuation of the auto-paging system; however, as discussed in Paragraph 6, this did not affect the licensee's demonstration of timely facility activation. Overall,



the transition into OSC activation was satisfactory with adequate information on plant status being received by the OSC Director. Approximately 27 repair team were formed during the exercise with 25 sent into the field to perform various repair functions.

Although direction and control of OSC and repair team activities were considered adequate, the inspector observed generally weak command and control of this facility. Overall coordination and communications between the OSC, TSC, and repair teams related to accident mitigation activities was poor as indicated by the following:

- The established priorities of the TSC were not effectively understood and/or communicated to the OSC staff, repair teams, and staging area personnel.
- Poor coordination of repair team composition particularly with respect to the RCIC repair activities. This lack of coordination and direction significantly contributed to the failure to complete RCIC mitigation activities as prescribed by the scenario.
- The failure of the OSC to consistently provide feedback to the TSC on repair activities. In particular, the TSC was unaware of the root cause of the RCIC inoperability until briefed by the controllers after the exercise.
- Mitigation initiatives were not consistently brought to a conclusion in a thorough and expeditious manner. Examples of this area include the restoration activities for the 1B CRD motor repair, and the achievement of final resolution on the establishment of HPCI as a high pressure injection source or as a cooldown/depressurization steam load.

The licensee's critique process fully disclosed the problem areas associated with TSC, OSC, and repair team actions. In response to the identified problems, the licensee committed to conduct additional drills with each of the three predesignated emergency teams to focus on TSC and OSC interactions. In addition, a special briefing of all emergency response organization members will be conducted to highlight exercise problems and to exchange information on needed improvements. The inspector informed licensee representatives that this area would be tracked as an



Inspection Followup Item (IFI).

IFI 50-259,260,296/91-39-01: Overall poor communications and coordination between the TSC, OSC, and repair team activities.

d. Central Emergency Control Center (CECC)

The CECC was staffed and activated within 40 minutes of the Alert emergency declaration. The facility staff were knowledgeable and familiar with their duties, authorities, and emergency responsibilities. Overall, command and control by the CECC Director was considered good. The CECC facility was provided with adequate equipment to support the assigned staff. Security and access control was observed to be appropriately established and maintained. Status boards and other graphical aids were strategically located and appropriately maintained.

The inspector observed that controlled procedures used by the CECC staff during the exercise were current and complete. However, the inspector performed a detailed audit of CECC resources and identified numerous examples of outdated, uncontrolled telephone lists, State telephone directories, Public Information plant background information, and Codes of Federal Regulations. In addition, the inspector also expressed concern regarding uncontrolled computer User's Manuals which could not be clearly identified as being the most recent revision. The licensee took immediate action to remove the uncontrolled outdated material prior to the exercise, and verified that the computer manuals were current and maintained as Quality Assurance documents. Subsequent to the onsite inspection, the licensee informed the inspector that an audit of materials in the TSC and OSC had also been performed, and no additional examples of outdated materials were identified. The licensee further stated that all uncontrolled documents onsite were labelled "For Information Only," and actions were in progress to convert all computer User's Manuals to controlled documents. Corrective actions related to the maintenance of uncontrolled reference materials will be reviewed during future inspections.

The inspector selectively reviewed the training records for key CECC personnel. The records were found to be complete, and personnel were trained as stated in the Emergency Plan.

e. Joint Information Center (JIC)



The JIC for Browns Ferry is located at the Calhoun State Community College in Decatur, Alabama. The facility was fully activated, with the exception of the State; approximately one hour after the Alert declaration. Activation of the JIC is discretionary at the Alert, and is required following a Site Area Emergency declaration. Activities at the JIC included the issuance of simulated news releases and the conduct of joint State and licensee news conferences. Technical briefings were provided to real and mock news persons who attended the exercise. The inspector noted that information flow to the media was both timely and accurate. Significant improvements were observed during this exercise regarding the technical accuracy of press releases. Space and equipment available at the JIC for use by response personnel and members of the media was considered adequate to support emergency operations. Overall, the coordination between the licensee and the State at the JIC was good and considered a program strength.

However, two areas were brought to the licensee's attention for program improvement:

- The press releases issued by the licensee prior to JIC activation were not numbered nor labelled with the time of issuance; however, press releases issued after JIC activation were appropriately timed and sequenced.
- During the exercise, the inspector and licensee determined that one JIC activation notification to a media representative was not completed and several were untimely. In several cases, exercise messages were left with an answering service or on an answering machine resulting in delayed notification.

The licensee also identified the weakness in the media notification procedures in their critique process, and agreed to evaluate the area for needed improvements. Although the two areas discussed above did not degrade the overall performance of the JIC, they will be reviewed during future inspections for adequacy of corrective actions.

f. Fire Drill

The inspector observed the initial response and mitigation activities associated with the simulated fire in the intake pumping station transformer. The Fire Brigade's efforts were both timely and effective.

The On-scene Commander demonstrated effective command and control. Good communications between the On-scene Commander and the Control Room were observed, and upon activation of the OSC, the inspector further noted the satisfactory turnover of Fire Brigade communications' responsibilities. Radiological protection and chemical support provided at the scene were appropriate. Minor radio communications problems were encountered between the Brigade entry personnel and the On-scene Commander; however, the difficulties were easily overcome and did not impede the response. Several questions regarding the presence of polychlorinated biphenyls arose after fire extinguishing efforts were completed; however, appropriate assessments and offsite notifications related to the chemical hazards were performed by the TSC staff.

No violations or deviations were identified.

9. Accident Assessment (82301)

This area was observed to assure that methods, systems, and equipment for assessing and monitoring actual or potential offsite consequences of a radiological emergency condition were in use as required by 10 CFR 50.47(b)(9), 10 CFR 50, appendix E, Paragraph IV.B, and the specific criteria in NUREG-0654, Section II.I.

The accident assessment program reviewed by the inspector included an engineering assessment of plant status and an assessment of radiological hazards to both onsite and offsite personnel resulting from the simulated accident. The inspector observed the conduct of dose assessment and core damage assessment activities in the CECC and determined them to be in accordance with procedure. Assessment conclusions were appropriately factored into the decisionmaking process and provided to State representatives as appropriate. Engineering assessments were adequately performed by the Technical Assessment group; however, the recommendations were not always brought to conclusion. This area is discussed further in Paragraph 8.c.

The activities of onsite and offsite radiological monitoring teams were not directly observed by the inspector.

No violations or deviations were identified.

10. Protective Responses (82301)

This area was observed to verify that guidelines for protective actions during the emergency, consistent with Federal guidance, were developed and in place, and

protective actions for emergency workers, including evacuation of nonessential personnel, were implemented promptly as required by 10 CFR 50.47(b)(10), and the specific criteria in NUREG-0654, Section II.J.

The inspector verified that the licensee had and adequately used emergency procedures for formulating protective action recommendations (PARs) for the offsite populace with the 10-mile EPZ. For the simulated event, the licensee recommended initial PARs when the General Emergency was declared and appropriately upgraded the PAR when conditions indicated the potential for significant offsite doses. In general, PARs recommended by the CECC were timely, made in accordance with procedures, and made after consultation with plant systems, radiological dose assessment and TSC staffs.

The inspector observed that protective actions were initiated for onsite workers following declaration of the Alert by conducting an accountability of those personnel inside the protected area. Using a computer based personnel accounting system (PREAS), the licensee demonstrated the ability to account for all persons in the protected area within 30 minutes; however, the initial report identified eight personnel missing. All eight personnel were subsequently located within approximately 18 minutes. One concern related to the accountability process was discussed with licensee representatives. The inspector noted that the Unit 3 Control Room did not have a PREAS station which required each Control Room staff member to individually exit the area to use the station adjacent to the TSC. Although this was not overly burdensome nor did personnel violate badging/security procedures, consideration should be given to addition of a Unit 3 Control PREAS station. This improvement was also identified by the licensee's critique and will be evaluated by NRC during future exercises.

Other protective response activities observed by the inspectors included the simulated use of potassium iodide, the simulated evacuation of non-essential site personnel, and the use of respiratory protection by plant repair team personnel.

No violations or deviations were identified.

11. Exercise Critique (82301)

The licensee's critique of the emergency exercise was observed to determine the deficiencies identified as a result of the exercise and weaknesses noted in the licensee's emergency response organization were formally presented to licensee management for corrective actions as required by 10 CFR 50.47(b)(14), 10 CFR 50, Appendix E,



required by 10 CFR 50.47(b)(14), 10 CFR 50, Appendix E, Paragraph IV.F, and specific criteria in NUREG-0654, Section II.N.

The licensee conducted player critiques in each facility immediately following the exercise. On October 24, 1991, the licensee also conducted evaluator/controller critiques in preparation for the formal presentation to facility management on the following day. The inspector observed the critique process to be well organized and included a review of the exercise objectives for each functional area. The licensee critique identified both substantive areas requiring corrective actions and areas needing improvement, and these findings were appropriately documented and characterized for licensee management. The licensee's action on identified items will be reviewed during subsequent inspections. Overall, the licensee's critique process was observed to be probing, detailed and effective, and was considered a strength of the licensee's emergency preparedness program.

12. Federal Emergency Management Agency (FEMA) Report

A report on FEMA's evaluation of offsite preparedness will be issued at a later date and will be provided by a separate transmittal.

13. Exit Interview

The inspection scope and results were summarized on October 25, 1991, with those persons indicated in Paragraph 1. The exercise Team Leader described the areas inspected and discussed in detail the inspection results including perceived exercise strengths, areas for improvement, and the Inspector Followup Item (IFI) listed below. Regarding the IFI, the licensee formally committed to conduct additional drills for all response personnel focusing on TSC/OSC interactions as well as conduct interactive training to discuss the specific drill observations. Although proprietary information may have been reviewed during the inspection, none is contained in this report. Dissenting comments were not received from the licensee.

Item Number

Description and Reference

50-259, 260, 296/91-39-01

IFI - Overall poor coordination and communications between TSC, OSC, and repair teams.

Scenario



BROWNS FERRY NUCLEAR PLANT (BFN) 1991 GRADED
EXERCISE SCENARIO NARRATIVE SUMMARY

INITIAL CONDITIONS

Detailed initial conditions will be provided to players through pre-exercise initial condition packages and are summarized as follows:

UNIT 1

- * Cold Shutdown - Core Unloaded.
- * The following Unit 2 related equipment is out-of-service for repair:
 - 1) CRD pump 1B for motor rewind.

UNIT 2

- * Currently operating at the end of Cycle 6 on day 100 of a continuous run with power currently at 95% and preconditioning after a rod sequence exchange.
- * Main transformer 2B is currently running with a high temperature of 82 degrees C.
- * Resin trap 2D is tagged for replacement.
- * Three fuel oil trucks due during day shift.
- * A problem with ADS valve 1-19 is being investigated. The valve currently has no position indication available in the Control Room.
- * Reactor coolant conditions are:
 - 1) I-131 equivalent activity @ $1.9E-1$ uCi/gm.
- * The following equipment is out-of-service for repair:
 - 1) HPCI for rebuild of the auxiliary oil pump, currently in Day 1 of a 7 day LCO.
 - 2) SLC pump 2B for replacement of a leaking grease seal in the gear case. The new seal is being shipped and is to be delivered on the midnight shift. Currently in Day 3 of 7 day LCO.

UNIT 3

- * Cold Shutdown - Core Unloaded.
- * Electrical maintenance is troubleshooting a ground on Unit 3 250vdc.

EXERCISE

At the initiation of the exercise (T=00:00) the shift is informed that the problem with ADS valve 1-19 appears to be a ground in the control circuit inside the drywell. HPCI is already inoperable which requires the plant to be in Shutdown within the next 12 hours. The Shift Operations Supervisor (SOS) should determine that conditions exist for the classification of a Notification of Unusual Event (NUE) due to the technical specification required shutdown (SU1).

Approximately twenty minutes into the exercise (T=00:20) a controlled shutdown should be initiated due to technical specification requirements.



BROWNS FERRY NUCLEAR PLANT (BFN) 1991 GRADED
EXERCISE SCENARIO NARRATIVE SUMMARY

Forty minutes into the exercise (T=00:40), a fire occurs in an intake pumping station transformer. The Control Room is alerted to this event by a fire/smoke alarm indicating a fire in the intake pumping station and smoke is observed in the Unit 3 turbine building coming from the cable tunnel. This fire results in closure of the 2C GCW pump discharge valve due to a short in the wiring in a control panel located next to the transformer, but the valve may be reopened manually. The Shift Operations Supervisor (SOS) should determine that conditions exist for the classification of an Alert due to a fire threatening a vital area/safety system (H11).

One hour and ten minutes into the exercise (T=01:10), an intermittent short in the ADS control circuitry will result in all ADS safety relief valves cycling open/closed several times. A reactor scram will occur on low water level as a direct result of the cycling of the ADS valves.

- 1) Due to vibrations induced in the drywell by the cycling of the ADS valves a floor grating mispositioned during the last outage becomes dislodged and falls (T=01:45) striking the lines of both divisions of the drywell control air system and also snaps the power supply cable for the inboard MSIV drain line valve (2-FCV-1-55), the effects of this event will become apparent later in the exercise.
- 2) The RWCU system will receive an isolation signal on low water level. When it attempts to isolate the inboard drywell isolation valve 69-1 sticks open and indicates mid-position on the Control Room panel while the outboard drywell isolation valve 69-2 isolates properly.
- 3) Area radiation levels in the Reactor Building will increase in the scram discharge volume area to normal post-scram levels and will gradually increase in the above torus area to approximately 1000 mr/hr at T=01:25 due to the SRV releases to the torus.

One hour and twenty five minutes into the exercise (T=01:25), the 2A CRD pump is lost when the drive coupling shears. The CRD pump will remain inoperable for the remainder of the exercise.

One hour and forty five minutes into the exercise (T=01:45), drywell control air is lost when the supply lines break due to the damage caused by the floor grating. As a result of the loss of drywell control air:

- 1) Further ADS valve operations deplete the accumulator volumes leaving only the valve safety function operable.
- 2) Inboard MSIVs drift closed (T=01:55), isolating the reactor vessel.
- 3) Feedwater is lost due to the isolation of MSIVs.

Two hours into the exercise (T=02:00), the fire in the intake pumping station is extinguished.

Two hours and five minutes into the exercise (T=02:05), a mechanical failure of the RCIC overspeed trip mechanism occurs due to a broken shaft linkage. The Site Emergency Director (SED) should determine that conditions exist for the classification of a Site Area Emergency (SAE) due to a loss of coolant inventory greater than make-up pump capacity (FS3).

BROWNS FERRY NUCLEAR PLANT (BFN) 1991 GRADED
EXERCISE SCENARIO NARRATIVE SUMMARY

At this time the vessel is isolated with no substantial inventory makeup method and the only pressure control method is the safety function of the safety/relief valves. As a result, the safety/relief valves will cycle mechanically to maintain vessel pressure below the lowest safety setpoint and with each pressure reduction inventory is lost causing a gradual decrease in vessel level.

Two hours and twenty five minutes into the exercise (T=02:25), Standby Liquid Control (SLC) pump 2A is aligned to the test tank for inventory makeup.

Three hours into the exercise (T=03:00), recirculation pumps trip on low water level.

Three hours and fifteen minutes into the exercise (T=03:15), Standby Liquid Control pump 2A seizes.

Three hours and forty five minutes into the exercise (T=03:45), level has decreased to the top of active fuel (IAF) and continues to decrease until a low level is reached at approximately T=04:25. This gradual, prolonged fuel uncover eventually results in about 50% clad damage, 35% fuel overheat, 30% fuel melt, and a subsequent release of radioactivity into the vessel.

Four hours and ten minutes into the exercise (T=04:10), significant core damage and associated hydrogen generation begins. Hydrogen level increases in the drywell/torus become evident due to the core damage at approximately this same time. Radiation levels in the above torus area will reach a maximum of 15,000 R/hr due to the transport of non-condensable gases, and entrained iodines and particulates into the torus via the SRVs and will reach a maximum of 2,700 R/hr in the drywell as torus pressure is relieved back to the drywell. The Control Room will be alerted to this condition by radiation monitor alarms. The Site Emergency Director (SED) should determine that conditions exist for the classification of a General Emergency (GE) due to ECCS failure leading to fuel melt (FGI).

Four hours and twenty minutes into the exercise (T=04:20), drywell venting begins due to high hydrogen concentrations in containment. Venting is initiated via the torus. This venting results in a significant release via the stack and increased radiation levels at various locations on Reactor Building elevations 565 and 621. Area radiation levels near the torus vent lines rise to approximately 1,200 mr/hr on elevation 565 and to 16,000 mr/hr on elevation 621. The Control Room will be alerted to this condition by the stack radiation monitor alarms.

Four hours and twenty five minutes into the exercise (T=04:25), a leak of approximately 8 gpm occurs in the RWCU heat exchanger room originating from the valve packing on RWCU isolation valve 69-2. This release into the reactor building will result in airborne radioactivity and steam coming out onto elevations 593, 621, and 565. After approximately one minute the release into the heat exchanger room decreases to a point that the HX room ventilation to SGTs is able to contain the release within the room.

BROWNS FERRY NUCLEAR PLANT (BFN) 1991 GRADED
EXERCISE SCENARIO NARRATIVE SUMMARY

Reactor building radiation levels due to the RWCU leak will reach a maximum of 1000 R/hr in the HX room and 400 mr/hr on the remainder of elevation 593, less than 1 mr/hr on elevation 565, 180 mr/hr on elevation 621, and 78 mr/hr on elevation 639. This condition combined with the ongoing containment venting process results in an offsite release through the Standby Gas Treatment System (SBGTS).

The offsite release to the environment occurs via the stack in a plume traveling in a NNW direction from the plant. This release results in external whole body dose rates exceeding 2 R/hr at various locations and Iodine-131 concentrations in excess of $1E-6$ micro-curies/cc. (Maximum thyroid dose calculated is 11 Rem.)

Four hours and 30 minutes into the exercise (T=04:30), RCIC is returned to service and water level is slowly restored to cover the fuel with the TAF being reached at approximately T=05:00.

Five hours and fifteen minutes into the exercise (T=05:15), RHR pump A fails due to high temperature brought on by a pump cooler failure. This will be indicated in the Control Room by high temperature alarms and will initiate a manual trip of the pump.

Approximately eight hours into the exercise (T=08:00), the exercise terminates.

2559E



Objectives



BROWNS FERRY NUCLEAR PLANT (BFN)
EMERGENCY PLAN EXERCISE

GOALS AND OBJECTIVES

The 1991 BFN EP Exercise will be a full scale exercise requiring full participation by TVA, the State, and Local emergency response agencies. The Joint Information Center (JIC) will be manned to support CECC operations.

Exercise Goals

TVA's goals for the 1991 BFN exercise are as follows:

1. Allow plant and offsite personnel to demonstrate and test the capabilities of the emergency response organization to protect the health and safety of plant personnel and the general public in accordance with the Nuclear Power - Radiological Emergency Plan (NP-REP), BFN Emergency Plan Implementing Procedures (EPIPs), and CECC EPIPs.
2. Identify significant weaknesses, strengths and areas which may be improved in emergency response capabilities, organization or emergency plans.
3. Provide an interactive exercise to ensure proficiency is maintained in plant and offsite emergency response capabilities.

Exercise Objectives

A.. Control Room Objectives

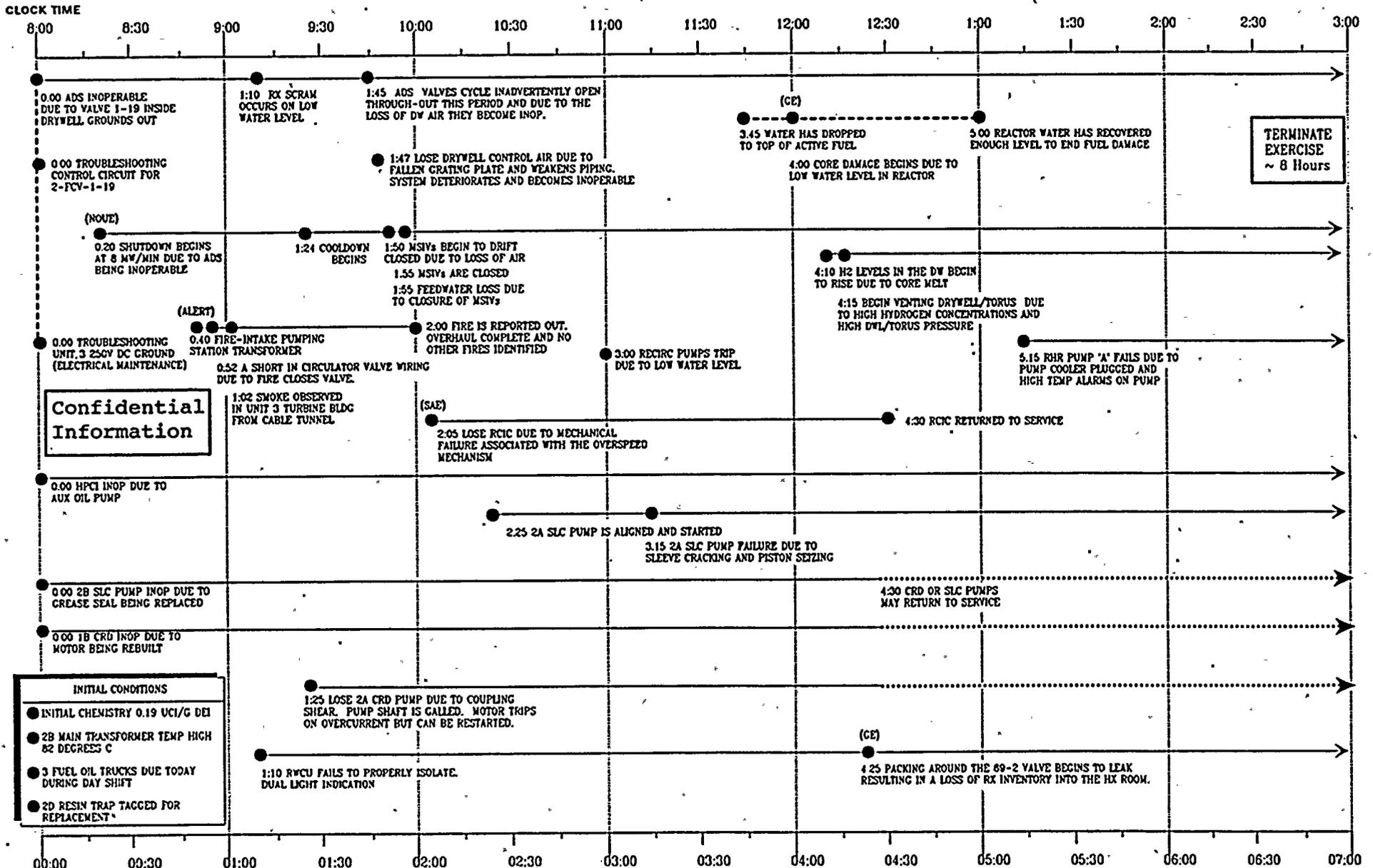
1. Demonstrate the ability of the Shift Operations Supervisor to recognize conditions, classify emergencies, and make required notifications in a timely manner.
2. Demonstrate the Control Room staff's ability to perform initial dose assessments if required.
3. Demonstrate the Control Room staff's ability to formulate, implement, and track initial onsite protective action measures.
4. Demonstrate the ability of the SOS to manage Control Room activities in a manner to prevent interference with the classification, analysis, or mitigation of an accident.
5. Demonstrate the ability of the Control Room staff to organize, dispatch and track response teams as needed until the OSC is functional.
6. Demonstrate the ability to perform a precise and clear transfer of responsibilities from the Control Room staff to the Technical Support Center (TSC) staff.



OCTOBER 4, 1991

Browns Ferry Nuclear Plant

1991 GRADED EXERCISE





7. Demonstrate the ability to recognize problems that cannot be quickly resolved by the Control Room staff and their deferral to the TSC for resolution.
8. Demonstrate the ability of the Shift Operations Supervisor to periodically inform the Control Room staff of the status of the emergency situation and of actions currently being planned by the TSC.
9. Demonstrate the ability of the Control Room staff to keep onsite personnel apprised of the emergency status through periodic PA system announcements, prior to activation of the TSC.
10. Demonstrate the ability of the Control Room staff to use proper procedures.
11. Demonstrate the ability of the Control Room staff, through detailed logkeeping, to maintain an accurate chronological account of equipment and plant status including corrective actions taken.
12. Demonstrate the ability of the Control Room staff, through an effective command and control process, to make a timely determination of the cause of an incident and perform mitigating actions to place the unit in a safe and stable condition.
13. Demonstrate the ability to provide an effective flow of information between the Control Room, TSC, OSC, NRC, and CECC.
14. Demonstrate the adequacy of Control Room facilities, resources, and equipment to support emergency operations.
15. Demonstrate the Control Room staff's ability to continuously evaluate available information to redefine/confirm the conditions and event classification.
16. Demonstrate the adequacy of Control Room communication systems to support emergency operations.

B. Technical Support Center (TSC) Objectives

1. Demonstrate the ability to alert and mobilize TSC emergency response personnel and activate the TSC in a timely manner.
2. Demonstrate the Site Emergency Director's (SED) ability to provide effective command and control in the TSC.
3. Demonstrate the ability of the SED to manage TSC activities in a manner to prevent interference with the classification, analysis, or mitigation of an accident.
4. Demonstrate the problem-solving capabilities of the TSC staff in support of the effort to identify the causes of the incident, mitigate the consequences, and place the unit in a safe and stable condition.



5. Demonstrate the TSC's ability to manage corporate resources, radiological effluent/environs monitoring, dose projections, notifications, and protective action recommendations prior to CECC activation.
6. Demonstrate the SED's proficiency in classification of conditions and direction of mitigation activities.
7. Demonstrate the Site Director's (Site Vice President) proficiency in directing site resources to support accident mitigation activities.
8. Demonstrate the TSC's ability to direct RADCON and Security activities in order to formulate, coordinate, implement, and track onsite protective actions.
9. Demonstrate the TSC's ability to perform timely assessments of onsite radiological conditions through surveys and/or installed monitoring equipment information.
10. Demonstrate the TSC's ability to maintain an accurate account of equipment status, plant status and corrective actions through detailed chronological logkeeping.
11. Demonstrate the TSC's ability to determine the appropriate sampling and monitoring required to support accident investigation and mitigation.
12. Demonstrate the TSC's ability to maintain effective communications between the Operations Support Center (OSC), Control Room, CECC, and NRC.
13. Demonstrate the TSC's ability to maintain effective communications between the various groups within the TSC.
14. Demonstrate the adequacy of TSC communication systems to support emergency operations.
15. Demonstrate the ability of the SED to perform periodic briefings for TSC/OSC staff and onsite personnel.
16. Demonstrate the ability to assemble onsite personnel within the protected area and provide an accountability report to the SED within thirty minutes of sounding the emergency siren.
17. Demonstrate Security's ability to maintain effective site and control room access controls.
18. Demonstrate the adequacy of TSC facilities, resources, and equipment to support emergency operations.
19. Demonstrate the ability of the TSC staff to use proper procedures.

20. Demonstrate the TSC's ability to dispatch plant environmental monitoring teams as required.
21. Demonstrate the ability of the TSC to continuously evaluate available information to redefine/confirm plant conditions and event classification.
22. Demonstrate the ability to perform a precise and clear transfer of responsibilities from the Control Room staff to the Technical Support Center (TSC) staff.

C. Operations Support Center (OSC) Objectives

1. Demonstrate the ability to alert and mobilize OSC response personnel and activate the OSC in a timely manner.
2. Demonstrate the ability of the OSC staff, through an effective command and control process, to initiate and coordinate activities in a timely manner.
3. Demonstrate the ability of the OSC staff to properly plan required tasks; then, organize, brief, and promptly dispatch response teams.
4. Demonstrate the ability of the OSC response teams to quickly and effectively enter the plant, make necessary repairs, and adequately de-brief upon their return.
5. Demonstrate the adequacy of communications between OSC response teams and the OSC and the OSC's ability to track each team.
6. Demonstrate the effective transfer of information between the OSC, TSC, RADCON laboratory, and Chemistry laboratory including briefings to keep OSC personnel apprised of the emergency status.
7. Demonstrate the adequacy of OSC resources, facilities, and equipment to support emergency operations.
8. Demonstrate the adequacy of OSC logkeeping.
9. Demonstrate the adequacy of RADCON activities and personnel to effectively support accident mitigation efforts while ensuring adequate worker protection.
10. Demonstrate the ability of the OSC staff to use proper procedures.
11. Demonstrate the adequacy of OSC fire protection and/or medical response.
12. Demonstrate the ability of the RADCON staff to perform effective inplant and site boundary surveys during radiological emergencies while using proper procedures and following good RADCON and ALARA practices.



13. Demonstrate the OSC's ability to track changing radiological conditions through survey results and/or in-plant monitors; and incorporate the information into personnel protective actions.
14. Demonstrate the OSC's ability to control internal and external exposures, and personnel contamination of onsite emergency workers including exposure tracking.
15. Demonstrate the timely and efficient activation of the plant environmental monitoring van including establishment of adequate communications.
16. Demonstrate the ability to conduct habitability surveys for the TSC, OSC, and Control Room.
17. Demonstrate the OSC's ability to obtain and analyze postaccident chemistry samples within the required time and dose limits.
18. Demonstrate the OSC's ability to maintain effective communications between the various groups within the OSC.
19. Demonstrate the adequacy of OSC communication systems to support emergency operations.
20. Demonstrate the OSC's ability to maintain the OSC status board information accurate and up to date.

D. Central Emergency Control Center (CECC) Objectives

1. Demonstrate the Operations Duty Specialist's ability to make initial notification to State agencies in a timely manner.
2. Demonstrate the ability to alert and mobilize CECC emergency response personnel and activate the CECC in a timely manner including alerting federal and industrial contacts.
3. Demonstrate the CECC Director's ability to maintain effective command and control in the CECC, and provide periodic briefings to the CECC staff.
4. Demonstrate the CECC's ability to effectively call upon and utilize TVA corporate or outside support organizations and to obtain vendor or other outside resources as appropriate.
5. Demonstrate the precise and clear transfer of accurate information between the various emergency centers (CECC, TSC, JIC, State).
6. Demonstrate the CECC staff's ability to direct and coordinate the deployment of Radiological Monitoring Teams and periodically inform and update RMCC personnel regarding the status of the emergency.
7. Demonstrate the Dose Assessment Team's ability to obtain, analyze, and utilize onsite and/or offsite radiological conditions and meteorological information to develop dose assessments.

8. Demonstrate the CECC's ability to inform, update, and coordinate with State Radiological Health personnel regarding meteorological and dose assessment information.
9. Demonstrate the CECC Plant Assessment Team's ability to analyze current plant conditions, identify projected trends and determine potential consequences.
10. Demonstrate the CECC Director's ability to provide in a timely manner; to the State, periodic updates of onsite status and protective action recommendations.
11. Demonstrate the Core Damage Assessment Team's ability to generate source term information in a timely manner.
12. Demonstrate the ability to establish a timely and effective flow of information between CECC Radiological and Plant Assessment Teams.
13. Demonstrate the ability to establish proper security for the CECC.
14. Demonstrate the adequacy of CECC facilities, resources, and equipment to support emergency operations.
15. Demonstrate the CECC's ability to maintain an effective interface with NRC responders.
16. Demonstrate the adequacy of meteorological data to support dose assessment and PAG recommendations.
17. Demonstrate the CECC's ability to provide governmental liaison, logistics support, and financial interface.
18. Demonstrate the familiarization of CECC personnel with procedures, equipment, and proper methods.
19. Demonstrate the CECC's ability to maintain adequate logs and documentation.
20. Demonstrate the CECC's ability to effectively dispatch, control, and coordinate Radiological Monitoring Teams in conjunction with the State when applicable.
21. Demonstrate the ability of Radiological Monitoring Teams to efficiently and effectively operate and utilize their procedures to perform dose rate surveys, collection and analysis of radiological samples, and other prescribed radiological monitoring activities.
22. Demonstrate Radiological Monitoring Teams' abilities to adhere to contamination control procedures under field conditions.



23. Demonstrate the CECC's ability to monitor and control the exposure levels of offsite TVA personnel.
24. Demonstrate the effective transfer of survey information from the field and emergency briefings to the field teams.
25. Demonstrate the adequacy of the monitoring vans, environmental equipment and supplies, and communications systems.
26. Demonstrate the CECC's ability to continuously evaluate available information to redefine/confirm the conditions and event classification.
27. Demonstrate the adequacy of the communications link between the CECC and State Emergency Operations Center.
28. Demonstrate the CECC's ability to maintain CECC status board information accurate and up to date.

E. Joint Information Center/ Public Information Objectives

1. Demonstrate the ability of the JIC to coordinate information with non-TVA agencies from the CECC.
2. Demonstrate the ability of the Communications staff in the CECC to develop timely and accurate news releases.
3. Demonstrate the ability of the JIC to provide timely and accurate information to the public during periodic JIC briefings and coordinate public news briefings with State and Federal agencies.
4. Demonstrate the ability of the CECC Information Manager to exercise effective command and control of the overall communications response.
5. Demonstrate the ability of media relations at the JIC to answer telephone calls from the media.
6. Demonstrate the ability of TVA's public information staff in the JIC to provide timely and accurate information to anyone calling the public information telephone numbers.
7. Demonstrate the ability to provide reasonable media access with minimal impact on emergency response activities.
8. Demonstrate the safeguards incorporated to ensure accurate information is released by media representatives and the corrective actions taken for any inaccuracies.
9. Demonstrate the ability to provide information to the public that is technically accurate and understandable.
10. Demonstrate the adequacy of the media communications system.



F. The following drills will be conducted in the course of this exercise:

1. Post Accident Sampling Drill
2. Fire Drill
3. Accountability Drill
4. Plant Radiological Monitoring Drill (Environs Monitoring)
5. CECC/State Communications Drill
6. TSC/CECC Communications Drill
7. CECC Radiological Dose Assessment Drill
8. Plant RADCON Drill
9. CECC/Federal Agencies Communications Drill
10. CECC/Field Monitoring Teams Communications Drill

