U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos:	50-269, 50-270, 50-287
License Nos:	DPR-38, DPR-47, DPR-55
Report No:	50-269/98-13, 50-270/98-13, 50-287/98-13
Licensee:	Duke Power Company
Facility:	Oconee Nuclear Station
Location:	78128 Rochester Highway Seneca SC 29672
Dates:	August 17-20, 1998
Inspectors:	W. Sartor, Exercise Team Leader D. Forbes, Radiation Specialist J. Kreh, Radiation Specialist G. Salyers, Emergency Preparedness Specialist
Approved by:	K. Barr, Chief, Plant Support Branch Division of Reactor Safety

EXECUTIVE SUMMARY

Oconee Nuclear Station, Unit 1, 2, and 3
NRC Inspection Report Nos. 50-269/98-13,
50-270/98-13 and 50-287/98-13

This routine, announced inspection involved the observation and evaluation of the biennial emergency preparedness exercise for the Oconee Nuclear Station. This NRC/FEMA-evaluated exercise was a plume exposure pathway exercise with offsite participation by the State of South Carolina and local governments within the plume exposure pathway. The exercise was conducted on August 18, 1998, from 7:30 a.m. to 1:15 p.m. This report summarizes the observations of the four-person NRC team that assessed the adequacy of the licensee's emergency preparedness program as it implemented its Emergency Plan and procedures in response to the simulated accident. A separate FEMA report will be issued that evaluates the performance of the State and counties.

The NRC team observed the licensee's response in the Control Room Simulator (CRS), the Technical Support Center (TSC), the Operational Support Center (OSC), and the Emergency Operations Facility (EOF). Based on the performance observed, the team concluded that the licensee successfully demonstrated its ability to implement the Emergency Plan and Implementing Procedures.

Program Areas Evaluated and Results

Scenario -The scenario developed for this exercise was effective for testing the integrated emergency response capability of the onsite and offsite emergency organizations (Section P4.1; [1C -Good]).

Control Room Simulator - The CRS was not evaluated since emergency response activities (i.e., classification and communications) were performed in the TSC.

Technical Support Center - (Section P4.2.b.1) Command and control of TSC operations was adequate (1B, 3A -Adequate). The EC and his staff failed to advise the EOF Director that a General Emergency declaration was warranted as of 11:00 a.m. when the unit blackout occurred (1B, 3A -Poor). The EC and his staff were not proactive in directing a timely assessment of the damage to the Unit 1 West Penetration Room (1B, 3A -Poor).

Operational Support Center - (Section P4.2.b.2) The OSC Manager exercised effective command and control (1B, 3A -Good). **The decision to not follow up on the damage report from Security delayed critical damage assessment of the West Penetration Room** (1C -Poor). An insufficient supply of electronic dosimeters hampered mission team response (1C -Poor).

Emergency Operations Facility - (Section P4.2.b.3) Command and control of EOF operations was adequate (1B, 3A-Adequate). Equipment problems affecting offsite communications resulted in delayed activation of the EOF (2A, 1C -Poor). **The EOF Director and his staff did not provide a timely classification of the General Emergency** (3A, 1B -Poor).

Licensee Critique -The licensee's controller/evaluator organization was proactive in identifying the significant performance deficiencies, consistent with NRC observations. Licensee management committed to another exercise in the near future in order to demonstrate the higher level of emergency response proficiency expected by management (5A, 5C -Good).

Note: Issues shown in **boldface** were identified as Exercise Weaknesses.

Report Details

IV. Plant Support

P4 Staff Knowledge and Performance in Emergency Preparedness (EP)

P4.1 Exercise Scenario

a. Inspection Scope (82302)

The inspectors reviewed the exercise scenario to determine whether provisions had been made to test the integrated capability and a major portion of the basic elements of the licensee's Emergency Plan.

b. Observations and Findings

The licensee submitted the scope and objectives for the biennial emergency exercise to the NRC with a letter dated April 30, 1998. The exercise scenario package was submitted with a letter dated June 16, 1998. A review of the package indicated that the scenario was adequate to exercise the onsite and offsite emergency organizations of the licensee and provided sufficient information to the offsite agencies to facilitate their participation in the exercise.

c. Conclusion

The scenario developed for this exercise was effective for testing the integrated emergency response capability of the onsite and offsite emergency organizations.

P4.2 Emergency Response Facility (ERF) Observations and Critique

a. Exercise Evaluation Scope

During this inspection, the inspectors observed and evaluated the licensee's biennial, full-participation emergency preparedness exercise in the Technical Support Center (TSC), Operational Support Center (OSC), and Emergency Operations Facility (EOF). The inspectors assessed licensee recognition of abnormal plant conditions, classification of emergency conditions, notification of offsite agencies, development of protective action recommendations (PARs), command and control, communications, and the overall implementation of the Emergency Plan. In addition, the inspectors attended the post-exercise critique to evaluate the licensee's self-assessment of the exercise. Acceptance criteria are contained in Appendix E to 10 CFR Part 50, Site Emergency Plan, Emergency Plan Implementing Procedures, and industry guidance in NUREG-0654/FEMA-REP-1, Rev. 1, "Criteria for Preparations and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants."

b. ERF Observations, Findings, and Facility Critiques

b.1 Technical Support Center (TSC)

Observations and Findings

The order to staff the TSC, OSC, and EOF was issued by means of an announcement on the public-address system (PA) at 8:07 a.m. at the same time as the Alert declaration was made and announced. TSC positions were filled expeditiously. The designated Emergency Coordinator (EC) assumed command and briefed the TSC staff at 8:51 a.m.

The TSC staff functioned efficiently and professionally. Personnel continuously monitored plant conditions using information from video monitors which displayed (simulated) plant data in real time. These data were supplemented by status boards which documented such information as essential equipment out of service and event chronology. Command and control of TSC operations by the Emergency Coordinator were effective. The EC briefed the TSC staff when conditions changed and conducted periodic round-table discussions that provided for the sharing of information among TSC personnel. Periodic PA briefings (heard throughout the TSC and in the OSC) further facilitated the flow and exchange of plant status information.

At 10:50 a.m., the EOF was declared fully activated, at which time the responsibility for classification, protective action recommendations (PARs), and offsite notifications transferred from the TSC to the EOF, while the TSC assumed an advisory role with respect to those functions in accordance with the licensee's Emergency Plan and procedures. The EC subsequently failed to advise the EOF Director that a General Emergency (GE) declaration was warranted as of 11:00 a.m. when the unit blackout occurred. At that time, the GE emergency action level (EAL) for Loss of Power was met in that Main Feeder Buses (MFBs) 1 and 2 were de-energized, the Standby Shutdown Facility (SSF) failed to maintain hot shutdown conditions (a given since the facility was out of service), and restoration of power to at least one MFB within 4 hours was not likely based on current information. The licensee's basis in the Emergency Plan for this EAL stated: "A The likelihood of restoring at least one emergency bus should be based on a realistic appraisal of the situation since a delay in an upgrade decision based on only a chance [emphasis added] of mitigating the event could result in a loss of valuable time in preparing and implementing public protective actions." At 11:00 a.m., there was no information available that restoration of power to at least one MFB within 4 hours was a realistic possibility. As a result, a GE should have been declared. The GE declaration was made at 11:55 a.m., 55 minutes after the initiating event. The delay in declaring a GE was categorized as an Exercise Weakness, and is further discussed in Section P4.2.b.3, below.

The EC and his staff were not proactive in directing a timely assessment of the damage to the Unit 1 West Penetration Room, in spite of controller-provided cues that an explosion of some sort had occurred behind the TSC at 11:26 a.m. The delay in initiating appropriate damage assessment activities was categorized as an Exercise Weakness, and is further discussed in Section P4.2.b.2, below.

The declarations of Alert and Site Area Emergency (SAE) were correct. However, the inspectors questioned the licensee's procedure for determining the time at which an emergency is to be declared. Procedure RP/0/B/1000/01, "Emergency Classification" (Revision 4, dated December 11, 1996), specified in Step 1.6.1 that the event classification time was to be recorded as the time at which the EC/EOF Director signed the initial Emergency Notification Form. This practice was inconsistent with NRC guidance in various documents and conflicted with the previous step (1.6) of the procedure, which stated that "emergency conditions shall be classified as soon as the Emergency Coordinator/EOF Director assessment determines that the Emergency Action Levels for the Initiating Condition have been exceeded." Licensee management agreed that this procedural direction was inappropriate and stated that corrective action would be considered.

Offsite emergency notification messages were transmitted to State and local authorities in a timely manner despite some problems with facsimile equipment. Several messages contained errors and/or confusing information. The following instances of failure to follow the specific or general requirements of RP/0/B/1000/15B, Offsite Communications from the Technical Support Center (Revision 1, dated June 29, 1998), were identified in the notification messages:

Message 1: The time and date of EC approval were entered at line 9A instead of line 6, which was completed during verbal transmission of the message to State and local agencies.

Message 2: The time and date of reactor shutdown (line 9A) were entered in error, since the affected unit was not shut down at that time.

Messages 3 and 5: The newest and/or most significant information was not entered first on line 7.

Message 4: The follow-up message in line 7 contained no substantive information regarding the conditions which generated the SAE declaration.

Any or all errors such as those cited above could contribute to delays and misunderstandings during an actual emergency response effort.

Conclusions

Command and control of TSC operations by the Emergency Coordinator were generally adequate. The TSC staff functioned efficiently and professionally. However, the EC and his staff (a) failed to advise the EOF Director that a General Emergency declaration was warranted as of 11:00 a.m. when the unit blackout occurred, and (b) were not proactive in directing a timely assessment of the damage to the Unit 1 West Penetration Room.

b.2 Operational Support Center

Observations and Findings

The inspectors observed the OSC Coordinator exercise effective command and control. The Coordinator conducted OSC briefings that were consistently clear, thorough, and sufficiently frequent. Briefings were announced prior to starting and personnel in the OSC were attentive. Key personnel in the OSC were asked to participate in the briefings. Also, the OSC monitored Technical Support Center (TSC) briefings. The OSC and TSC would compare Repair Mission (Team) status for priority, mission scope, and status. The OSC Communicator often discussed plant conditions and anticipated conditions with the appropriate OSC managers.

Radiation Protection, Chemistry, Operations, Maintenance, Safety, and Mission Coordinators worked well together in efficiently dispatching repair missions. An emergency Radiation Work Permit (RWP) was written for the exercise. As repair missions were needed, tracking sheets were used to assemble, brief, track, and debrief repair teams. However, a decision to not follow up on the damage report from security delayed critical damage assessment of the West Penetration Room. This was identified as an exercise weakness. IFI 50-269,270,287/98-13-01 Failure to follow up on the damage report from Security that delayed critical damage assessment. This is discussed further in Section P4.2.b.1 above. Repair missions were effectively tracked on a mission status board that was continuously updated as to mission, status, priority, and team composition. The OSC missions were re-prioritized as plant emergency conditions changed. Repair missions personnel were briefed regarding safety aspects relating to plant conditions, and radiation levels. The OSC effectively disptched 29 repair missions in a timely manner. The licensee reported that one mission team member entered the Radiation Controlled Area (RCA) without an alarming dosimetry as required by the RWP. The licensee initiated a Problem Investigative Process (PIP) report to address the issue.

The OSC equipment staged for use, including communications equipment, was in good operating condition and the OSC accommodated the assigned staff and mission teams.

The inspectors reviewed the Emergency Plan Implementing Procedures used in the OSC and determined the licensee was complying with the procedures. A problem was observed with alarming dosimetry not being readily available for all responding mission team members as specified in the Emergency Plan. This issue was also addressed by the licensee during the exercise debriefings.

The inspectors observed that radiological surveys were periodically taken in the OSC to monitor potential changes in radiological conditions. However, the inspectors observed that the licensee did not establish a contamination control point at the OSC entrance(s) although personnel were re-entering the OSC after being outside in the plume area. The inspectors also observed that personnel exposures were not being tracked for mission teams returning to evaluate the reuse of these people for further mission assignments.

Conclusions

The Operational Support Center's emergency response performance was good. Good planning was displayed in repair team development and deployment. Effective command and control was demonstrated by the OSC Coordinator. Several examples of poor radiological control work practices were identified.

b.3 Emergency Operations Facility

Observations and Findings

The announcement to staff the EOF was made at 8:07 a.m., and sufficient site personnel had arrived and were in their assigned positions within approximately 75 minutes to activate the facility, if necessary. Several equipment problems were identified by the inspectors and the licensee that hampered a more timely activation capability. Specifically, it took security 28 minutes to locate the keys and unlock the EOF, personnel had to manually log into the EOF because the access computer was out of service, malfunctions occurred with some fax machines in the EOF and dose assessment area, and the meteorologist had difficulty accessing weather data on the laptop computer.

Activation of the EOF was not made until approximately 10:50 a.m. because the EC in the TSC did not conduct a turnover. This decision centered on the rapidly changing conditions being managed by the EC and the difficulty in providing timely offsite notifications with equipment that was not functioning properly (i.e., the facsimile machine programmed to send to all offsite locations simultaneously was not working, requiring sequential transmission which required more time).

When the turnover was made, the EOF Director assumed the responsibilities for emergency classification, offsite notifications, and making protective action recommendations. Shortly after the EOF activated, the conditions for the General Emergency declaration, as envisioned by the scenario development team, had occurred, i.e. "After reviewing the Emergency Classification procedure, the EOF Director declares a General Emergency at 1110 based on Prolonged Loss of All Offsite Power and Onsite AC Power (OR Other Conditions Warrant Declaration of General Emergency-EOF Director Judgment Indicates Actual/Imminent Substantial Core Degradation With Potential For Loss of Containment)."

As the scenario developed during the exercise, by 11:00 a.m., the plant had experienced:

- an Anticipated Transient Without Scram,

- high activity in the Reactor Coolant System,

- radiation monitors were in alarm in the high pressure injection pump room and containment,

-a station blackout had occurred,

- Auxiliary Feedwater was lost,

- and the Safe Shutdown Facility was unavailable.

By 11:21 a.m., a Reactor Coolant Pump seal leak occurred which resulted in a leak greater than 600 gpm, and an explosion had occurred in the Unit 1, West Penetration Room. By 11:29 a.m., a release of radioactivity from containment was in progress. Based on existing plant conditions between 11:00 and 11:30 a.m., the ED should have made a more timely GE declaration based upon the EALs, "Other condition warrant declaration of GE" or the "loss of two fission barriers with the potential loss of the third barrier." Because the EOF had responsibility for the emergency classification, and did not declare it until 11:50 a.m., this delayed classification was identified as an exercise weakness. IFI 50-269, 50-270,50-287/98-13-02 Failure to provide a timely classification of the General Emergency.

The inspector observed several communications between the TSC and the EOF were incomplete or untimely:

a. The EOF was fully staffed and declared "Operational" at 9:21 a.m. A medical emergency occurred at 9:15 a.m., but the EOF was not made aware of the emergency until 9:55 a.m.

b. An ATWS occurred at 9:36 a.m., but there was no information transmitted to the EOF concerning the status of the fuel until 10:47 a.m., when EOF was informed of the reactor coolant sample result.

c. At 12:00 noon, the ED learned that the containment had been breached through communications with the State instead of from his staff.

d. At 12:55 p.m. the EOF was informed of the 11:25 a.m., simulated acetylene bottle explosion in the West Penetration Room.

Other activities accomplished by the EOF were adequate. The PARs provided with the General Emergency declaration were correct and were communicated to the offsite agencies in a timely manner once the decision was made to declare a GE.

Conclusion

The EOF Director and his staff did not provide a timely classification of the General Emergency. Command and control of EOF operations was generally adequate. Important information available in the TSC as not always effectively communicated to the EOF. Early equipment problems hampered initial staffing.

b.4 Licensee Facility Critiques

Following the exercise, the licensee conducted facility critiques in which the players provided their own assessment of their performance and identified areas that needed improvement. The post-exercise critiques in the TSC, OSC, and EOF were observed to be thorough, open, and self-critical. The licensee controller/evaluator organization then conducted detailed discussions, reviewed documentation, and conducted interviews as required to develop their critique results. The licensee's controller/evaluator organization was proactive in identifying the significant performance deficiencies that were consistent with NRC observations. On August 20, 1998, the presentation made to the management staff of the critique results presented an accurate assessment of the exercise performance.

Conclusion

The licensee's controller/evaluator organization was proactive in identifying the significant performance deficiencies, consistent with NRC observations.

V. Management Meetings

X1 Exit Meeting

The Team Leader presented the inspection summary to licensee management on August 20, 1998. The summary indicated the exercise was satisfactory, but there were two exercise weaknesses. Licensee management committed to another exercise in the near future in order to demonstrate the higher level of emergency response proficiency expected by management.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

D. Berkshire, Senior Scientist
C. Boyd, Work Control Manager
P. Brandt, Emergency Planning Specialist
E. Brown, Scientist
R. Brown, Emergency Planning Specialist
E. Burchfield, Regulatory Compliance Manager
J. Collier, Shift Work Manager
S. Constance, Environmental Management Scientist
C. Hamlin, Nuclear Support Section Manager
G. Hamrick, Chemistry Manager
B. Jones, Manager Nuclear Training
D. Kelly, Administrative Specialist
E. Lampe, Operations Engineering Scientist
J. Long, ALARA Specialist
M. Nazar, Engineering Manager
T. Pettit, Site Community Relations Manager
G. Sanders, Nuclear Engineer
M. Thorne, Emergency Planning Manager
C. Todd, Environmental Management Manager
J. Twiggs, Radiation Protection Manager
O. White, Training Instructor
L. Wilkie, Engineering Manager
T. Worley, Senior Communications Specialist

INSPECTION PROCEDURES USED

IP 82301: Evaluation of Exercises for Power Reactors
IP 82302: Review of Exercise Objectives and Scenarios for Power Reactors

ITEMS OPENED

50-269,270,287/98-013-01	IFI	Exercise Weakness--Failure to follow up on the damage report from Security that delayed critical damage assessment.
50-269,270,287/98-013-02	IFI	Exercise Weakness--Failure to provide a timely classification of the General Emergency.

Attachment (15 pages):
Exercise Scope, Objectives,
Narrative, Sequence of Events
and Time Line

A. SCOPE

The 1998 Oconee exercise scheduled to be conducted on August 18th is designed to meet the exercise requirements of 10CFR50, Appendix E, Section IV.F. The 1998 exercise will involve full participation by Oconee and Pickens Counties and partial participation by the State of South Carolina. This participation will also include activation of the Alert and Notification System for Oconee (EAS and Sirens).

The 1998 Oconee exercise will involve full participation of Oconee Nuclear Site's emergency response organization and will require activation of the Technical Support Center, Operational Support Center, and Emergency Operations Facility. In addition, the EOF and Field Monitoring Teams will demonstrate identified Ingestion Pathway objectives. This portion of the exercise will involve partial participation by the State of South Carolina (limited to receipt of communications from the EOF). ERDS will be activated and used to provide data to SC State during this exercise.

A critique involving exercise participants and controllers will be conducted prior to the formal critique involving Oconee Nuclear Site Management and the NRC. These critiques will be held at Oconee Nuclear Site.

A public critique will be held at the Duke Power Operations Center on August 19, 1998 at 1400.

ATTACHMENT

A. EMERGENCY CLASSIFICATION

1. Demonstrate the ability to properly classify emergency situations in accordance with plant procedures.

B. NOTIFICATION TO OFFSITE AGENCIES (STATE/COUNTY/FEDERAL)

1. Demonstrate the ability to notify counties and state within 15 minutes after declaring an emergency or after changing classification.

2. Demonstrate proper use of message format and authentication methodology for messages transmitted to state and counties.

3. Demonstrate the ability to notify the NRC not later than 1 hour after declaring one of the emergency classes.

C. EMERGENCY RESPONSE ORGANIZATION

1. Demonstrate the ability to mobilize staff (TSC, OSC, EOF) and activate facilities as required by Figure B-8 in the ONS Emergency Plan after declaring an Alert or higher emergency classification.

2. Demonstrate the ability to fully staff facilities and maintain staffing around the clock.

3. Demonstrate precise and clear transfer of responsibility from the Operations Shift Manager in the Control Room/TSC to the Emergency Coordinator in the TSC.

4. Demonstrate precise and clear transfer of responsibility from the Emergency Coordinator in the TSC to the EOF Director in the EOF.

D. COMMUNICATIONS

1. Test onsite and offsite communications equipment:

   a. Selective Signaling

   b. SC State Decision Line

   c. Duke Offsite Radio System (FMTs and TSC/EOF)

D. COMMUNICATIONS (continued)

d. Duke Onsite Radio System (OSC/OSC Teams)

e. FTS 2000 System - ENS

f. AT&T

g. Intercom Systems (TSC/OSC/EOF/Plant)

h. ONS Plant Phone System

2. Demonstrate the ability to communicate with all appropriate locations, organizations, and field personnel.

3. Demonstrate the ability to provide current plant data to appropriate locations, organizations, and field personnel.

E. SITE ASSEMBLY/ACCESS CONTROL

1. Demonstrate the ability to account for onsite personnel within 30 minutes.

2. Demonstrate the ability to locate unaccounted personnel determined by site assembly.

3. Demonstrate the ability to provide controlled access to the plant and EOF.

F. SITE EVACUATION

1. Demonstrate the ability to effect an orderly evacuation of non-essential personnel (planning process will occur and will be demonstrated, offsite agency support requested; evacuation of personnel will be simulated).

G. EMERGENCY EQUIPMENT AND SUPPLIES

1. Test adequacy and operability of emergency equipment and supplies.

H. RADIOLOGICAL MONITORING AND EXPOSURE CONTROL

1. Demonstrate appropriate equipment and procedures for determining ambient radiation levels.

2. Demonstrate appropriate equipment and procedures for measurement of airborne radioiodine concentrations.

H. RADIOLOGICAL MONITORING AND EXPOSURE CONTROL (continued)

3. Demonstrate the ability to continuously monitor and control emergency worker exposure.

4. Semi-annually, demonstrate the response to simulated elevated airborne and liquid samples.

5. Semi-annually, demonstrate the analysis of simulated elevated airborne and liquid samples.

6. Semi-annually, demonstrate the ability to obtain direct radiation measurements in the environment.

7. Demonstrate the ability to make the decision (based on predetermined criteria) whether to issue KI to emergency workers and then to issue same.

I. FIELD MONITORING/PLUME TRACKING/OFFSITE DOSE CALCULATIONS

1. Demonstrate the ability to mobilize teams in the 10 mile EPZ to locate and track the plume for noble gases and radioiodine concentrations in a timely manner.

2. Demonstrate the ability to transmit field measurement data to the TSC/EOF.

3. Demonstrate the ability to develop and provide offsite dose projections in accordance with site procedures.

4. Demonstrate the ability to project dosage to the public via ingestion pathway exposure.

5. Demonstrate the ability to project damage to the public based on plant and field data for public via ingestion pathway exposure.

J. PROTECTIVE ACTION RECOMMENDATIONS

1. Demonstrate the ability to provide timely and appropriate protective action recommendations in accordance with site procedures.

K. ACCIDENT ASSESSMENT/MITIGATION

1. Demonstrate the ability to assess the incident and determine/implement mitigation strategies.

L. OFFSITE AGENCY ASSISTANCE

1. Demonstrate county and state participation in exercises/drills.

   a. Full (Counties)

   b. Partial (State)

2. Demonstrate participation in an Ingestion Pathway Exercise.

   b. Partial (State - receipt of information)

M. JOINT INFORMATION CENTER/PUBLIC INFORMATION

1. Demonstrate the ability to brief the media in a clear, accurate, and timely manner.

2. Demonstrate the ability to provide advance coordination of information released.

3. Demonstrate the ability to establish and operate rumor control in a coordinated fashion.

N. RECOVERY AND REENTRY

2. Demonstrate the ability to estimate total population exposure.

3. Demonstrate adequate equipment and procedures for decontamination of workers, equipment, etc.

P. FIRE PROTECTION

1. Demonstrate proper response by the on-site fire brigade to a simulated fire in accordance with station procedures.

Q. EXERCISE/DRILL MANAGEMENT

2. The Biennial Exercise will be scheduled during different seasons of the year.

4. Drills will be under the control of a Drill/Exercise Director. Controllers/Evaluators will be utilized to keep the scenario on track and to allow for "free play".

6. Critiques will be held after all drills/exercises to determine any corrective actions that may need to be made.

Q. EXERCISE/DRILL MANAGEMENT (continued)

7. Demonstrate resolution of previous exercise findings (weaknesses/deficiencies) identified by NRC or QV, as applicable.

   a. Demonstrate the ability to provide updates to offsite agencies as conditions change.

Oconee Nuclear Site
1998 Emergency Response Exercise
August 18, 1998

Narrative

The exercise begins with Oconee Unit 1 operating at 100% power, Unit 2 shutdown for a refueling outage, and Unit 3 shutdown to repair tube leaks in 3A1 and 3B1 feedwater heaters. The site's Standby Shutdown Facility (SSF) is out of service for piping modifications, diesel generator maintenance, and breaker maintenance. Keowee Hydro Unit 1 is out of service due to unscheduled maintenance on the governor.

The weather forecast for Tuesday, August 18th, calls for winds from the East (≈ 85-95°) with a wind speed of 4-6 mph. A low temperature of 75 °F is expected with a high temperature of 98 °F. A 75% chance of late evening thunderstorms is expected.

At 0730 Unit 1 is operating at 100% power with no major problems. A seven day *Technical Specification Limiting Condition For Operation* is in effect due to the SSF being out of service for maintenance, with the SSF due back in service by 8/24/98. The unit entered a three day *Technical Specification Limiting Condition For Operation* this morning whenever Keowee Hydro Unit 1 experienced a fault with it's governor. Keowee Hydro Unit 1 is due back in service by 8/21/98.

At 0740 a call is received by the Switchboard Operator indicating that an explosive device is located in the plant near 4160 volt switchgear 1TD. The Switchboard Operator immediately notifies the Security Supervisor. The Security Supervisor notifies the Operations Shift Manager and initiates a search for the device. At 0750, Security Officers locate a suspicious looking device between 1TD Switchgear and Unit 1's Standby Power Batter Charger. This information is provided to the Operations Shift Manager and authorization is provided to Security to notify and request assistance from the Anderson City Bomb Squad.

After notification from Security that the explosive device has been located, the Operations Shift Manager reviews the Emergency Classification Procedure and declares an **Alert** at approximately 0800 based on a *Security Event In A Plant Protected Area - Bomb discovered in an area containing Safety Related Equipment*. Procedure actions are initiated to notify offsite agencies (SC State, Oconee County, Pickens County, and NRC) and activate the site's emergency response organization. Site Assembly is initiated and site personnel are warned of the potential hazard near 1TD. The SC State Warning Point, Oconee County LEC, and Pickens County LEC are notified of the Alert at 0815 (or within 15 minutes after the declaration).

While leaving Unit 1's West Penetration Room to report for Site Assembly, welders installing and cutting hangars for cable tray modifications inadvertently leave their Acetylene and Oxygen cylinders on and the lines charged.

At 0830 the Anderson City Bomb Squad arrives on site and initiates efforts to retrieve the explosive device. Security establishes a perimeter around the switchgear to keep personnel from entering the area. A follow-up notification should be provided to SC State, Oconee County, and Pickens County (this notification is contingent upon the Operations Shift Manager being notified of the Bomb Squad's arrival by the Security Shift Supervisor).

Narrative

Staffing of the site's Emergency Response Facilities is in progress. The onsite Technical Support Center (TSC) and Operational Support Center (OSC) are staffed and operational by 0830. Staffing of the offsite Emergency Operations Facility (EOF), located in Clemson, is in progress. At approximately 0845, after the Emergency Coordinator has completed a turnover with the Operations Shift Manager, the TSC is activated. The TSC is now responsible for Emergency Classification, Offsite Communications, and Protective Action Recommendations. Site personnel are monitoring plant conditions and implementing appropriate response actions.

If not provided earlier, Follow-up Notifications are provided to the SC State EOC, Oconee County EOC, and Pickens County EOC at approximately 0915 (or at least 1 hour after the initial notification). The site remains in an **Alert** classification.

At 0915, the OSC receives a call on the site's emergency line concerning an individual experiencing chest pains at their Site Assembly location at the Oconee Complex. Due to the ongoing Security Event, Security officers on MERT are unable to respond and Offsite Agency support from Oconee Memorial Hospital is requested.

The EOF completes turnover with the TSC and is activated at approximately 0920. The EOF is now responsible for Emergency Classification, Offsite Communications, and Protective Action Recommendations. The EOF Director notifies the State Emergency Preparedness Director, Oconee County Emergency Preparedness Director, and Pickens County Emergency Preparedness Director that the EOF is activated and provides additional information concerning current plant conditions.

At 0930, a fault on 6900 Volt Switchgear 1TA occurs resulting in a Lockout of the switchgear and a loss of 1A1 and 1B1 Reactor Coolant Pumps. The Main Turbine trips as required. The Reactor Protective System (RPS) initiates a reactor trip signal; however, the Control Rod Drive breakers fail to actuate and the reactor does not trip resulting in an ATWS (Anticipated Transient Without Scram). Operations personnel are dispatched from the OSC to manually open the Control Rod Drive breakers. Access to the 4160 Volt Switchgear breakers may be delayed due to the security event related to the explosive device at 1TD. Control Rod Drive breakers in the Cable Room and Equipment Room are accessible and the reactor is tripped at approximately 0935. The ATWS results in < 1% Fuel Clad damage. Conditions exist for a **Site Area Emergency** classification due to the ATWS.

At 0940, the EOF Director (or TSC Emergency Coordinator if turnover has not occurred) declares a **Site Area Emergency** based on *Failure Of RPS To Complete Or Initiate A Rx (Reactor) Scram.* Notification of the **Site Area Emergency** classification is provided to the SC State EOC, Oconee County EOC, and Pickens County EOC by 0955 (or within 15 minutes after the event is classified). Oconee County and Pickens County coordinate activation of the Alert and Notification System (EAS and Sirens) with SC State. EAS and the Sirens are activated at 1010 (or within 15 minutes of the decision by State and County Emergency Preparedness Directors to activate the Alert and Notification System).

Narrative

From 0935 to 1045, plant operations personnel initiate actions to establish Hot Shutdown conditions on Unit 1 prior to going to Cold Shutdown. The site remains in a **Site Area Emergency** classification. Due to plant conditions, the TSC Emergency Coordinator may evacuate non-essential personnel. Given current plant conditions - no radiological release in progress, personnel should be evacuated to their personal residence. TSC Offsite Communicator should notify Oconee and Pickens Counties and request support for the evacuation (traffic control).

At 1055, with Unit 1 in Hot Shutdown, an insulator failure on top of the Main Start-Up Transformer (CT-1) results in a loss of power to the unit. Emergency Power Switching Logic initiates an emergency start of Keowee Hydro Unit 2. Within seconds of providing emergency power, Keowee Hydro Unit 2 fails due to an emergency lockout. Emergency power is transferred to the 100 kV Transformer (CT-5) which is powered from gas turbines at Lee Steam Station. Shortly after transferring power to Lee, a protective relay for the transformer actuates and de-energizes the transformer. A Station Black Out exists, with no AC power available to Unit 1 from onsite or offsite sources.

The loss of power results in a loss of the Main Feedwater Pumps for Unit 1. The Turbine Driven Emergency Feedwater Pump starts; however, it fails approximately 10 seconds later due to turbine blade damage caused by water in the turbine casing. At this time, no feedwater flow is available to the secondary side. Without cooling and high pressure seal injection flow, the Reactor Coolant Pump (RCP) Seals fail and a *Loss Of Coolant Accident* (LOCA) of approximately 600 gallons per minute (gpm) occurs. With a Seal LOCA of this magnitude, core uncovery will occur in approximately 1 hour and 45 minutes. Conditions for a **General Emergency** classification exist at this time.

After reviewing the Emergency Classification procedure, the EOF Director declares a **General Emergency** at 1110 based on *Prolonged Loss Of All Offsite Power And Onsite AC Power* (OR *Other Conditions Warrant Declaration Of General Emergency - EOF Director Judgment Indicates Actual/Imminent Substantial Core Degradation With Potential For Loss Of Containment)*. A Protective Action Recommendation to evacuate a two mile radius, five miles downwind, and shelter the remaining sectors is provided to SC State by the EOF Director. The SC State EOC, Oconee County EOC, and Pickens County EOC are notified of the **General Emergency** classification and Protective Action Recommendations at 1125 (or within 15 minutes after the event declaration). After reviewing the site's Protective Action Recommendations and current plant conditions, SC State along with Oconee and Pickens Counties determine the Protective Action Recommendations that will be issued. Within 15 minutes of this determination state and county personnel begin to implement the agreed on Protective Action Recommendations. The Alert and Notification System is activated (simulated at this time; however, actual activation may occur if required due to system problems during the Site Area Emergency).

Narrative

At 1125, an explosion, due to ignition of the charged acetylene and oxygen lines (left by welders reporting for Site Assembly) occurs in the West Penetration Room. Shrapnel damages the ductwork for the Rx Building Purge System between Containment Isolation Valves PR-5 and PR-6. The concussion of the blast jars PR-6 (Rx Building Purge Inlet Containment Isolation Valve located inside the reactor building) open - bumped off of it's seat. With PR-6 open and damage to the ductwork, a release path for radiological material from the reactor building exists. The explosion also damages the side of the West Penetration Room. A security officer near the SSF reports smoke coming from and damage to the West Penetration Room. Fire Brigade personnel are dispatched; however, radiation levels prevent action. The fire quickly burns itself out without causing any further damage.

Site Evacuation of non-essential personnel is initiated by 1130 if it was not performed earlier. With a radioactive release in progress, vehicles located in the parking lots West of the plant would be unavailable for use. The OSC would arrange transportation and affected personnel should be evacuated to Daniel High School for surveying and decontamination. The TSC Offsite Communicator (or EOF State/County Communicator) should request Oconee and Pickens County to provide assistance as needed.

After 1230, efforts to repair the governor on Keowee Hydro Unit 1 are completed - Keowee Hydro Unit 1 is now available as an emergency power supply. Power is restored to Unit 1 from Keowee between 1245 and 1300.

At 1255, PR-6 re-seats and the release is secured. Field Monitoring personnel locate and track the plume as it heads west. OSC personnel initiate efforts to patch the damaged siding of the West Pentration Room.

The Plume Exposure portion of the exercise is completed after 1300 once the state and counties complete demonstration of applicable objectives. The EOF continues with the Ingestion Pathway portion of the exercise to demonstrate applicable objectives. SC State participation in this portion of the exercise is limited to the receipt and discussion of information from the EOF.

Sequence of Events:

0730	Unit 1 at 100% Power
0740	Call received at Switchboard - Bomb Threat (caller indicates that an explosive device has been placed near 1TD)
0750	Security locates an explosive device near Breaker 1TD-0 (1A MDEFWP Breaker - between 1TD Switchgear and 1PS Standby Battery Charger) Security officer reports discovery to OSM Security notifies Anderson City and requests support Anderson City Bomb Squad is dispatched to respond Conditions exist for Alert Classification
0800	OSM declares an Alert based on ***Security Event In A Plant Protected Area - Bomb discovered in an area containing Safety Related Equipment*** ERO Activation Initiated Site Assembly Initiated - Announcement requests site personnel to avoid the 3rd Floor of the Turbine Building Workers inside Unit 1 West Penetration Room installing and cutting hangers for cable tray modifications inadvertently leave their Acetylene and Oxygen bottles on and the lines charged whenever they report for Site Assembly.
0815	Offsite Agencies (Pickens/Oconee/SC State) notified of Alert Classification
0820	Anderson City Bomb Squad arrives on site - initiates process to remove explosive device
0830	TSC/OSC/EOF staffing in progress

0900	Turnover completed between TSC Emergency Coordinator and Control Room Emergency Coordinator TSC/OSC activated
0915	OSC receives 4911 call - Individual experiencing chest pains at Site Assembly location at the Complex. Due to Security Event, Security officers cannot respond - Offsite agency support is requested (tests objective for offsite agency support).
0920	EOF and TSC complete Turnover - EOF is activated
0930	1TA Relay Lockout occurs - 1A1 and 1B1 RCPs trip Main Turbine trips; auxiliaries transfer to CT-1 RPS initiates Rx Trip; however, CRD Breakers fail to trip DSS failed to actuate at 2450 psig RCS Pressure; Reg rods fail to drop - ATWS in progress - Operators can not trip Rx from the Control Room or insert Control Rods. NLO's are dispatched to trip Control Rod Breakers in Cable Room, Equipment Room, and at the 4160v Switchgear (Security may delay response to the Equipment Room/ 4160v Switchgear due to explosive device being located near 1TD) < 1% Failed Fuel results from ATWS Conditions exist for Site Area Emergency Classification
0935	Rx Tripped
0940	TSC Emergency Coordinator/EOF Director declares Site Area Emergency based on ***Failure Of RPS To Complete Or Initiate A Rx Scram - Valid Rx Trip Signal Received Or Required <u>Without</u> Automatic Scram <u>And</u> DSS Has <u>NOT</u> Inserted Control Rod Groups 5-7 <u>AND</u> Manual Trip From The Control Room Was <u>NOT</u> Successful In Reducing Reactor Power To Less Than 5% And Decreasing***
0955	Offsite Agencies notified of Emergency Classification
1010	Sirens and EAS activated (actual activation)

1020-1045	U1 Stable at Hot S/D
	TSC Emergency Coordinator identifies need to evacuate Site Personnel
1045	Offsite Agencies notified of evacuation - requested to provide support (traffic control in support of evacuation - personnel are being sent to personal residences)
1055	Unit 1 @ Hot S/D
	Main FDW/EFDW supplying OTSGs; 1A2 and 1B2 RCPs providing forced flow circulation through Rx
	Insulator on top of CT-1 fails - Explosive Noise is heard near CT-1
	E1& E2 Trip Open: PCB-17 and 18 Trip Open to isolate fault
	After 20 seconds MFBMP initiates Keowee Emergency Start; within 30 seconds, CT-4 is energized from KWH-2 and Standby Bus is energized; within seconds, KWH-2 trips (86 E-2 Trip - Emergency Lockout - as indicated by 87-G2 Relay)
	CT-5 is energized and emergency power is transferred to CT-5 87 TX (Differential Relay) operates and de-energizes CT-5
	Unit is now in a Station Black Out
	Unit 1 TDEFWP starts, then fails/trips ≈10 seconds later due to water in the turbine casing - turbine blades are cracked
	Operations attempts to align Unit 3 EFDW to supply Unit 1. Cross-connect is unavailable (valves are tagged on Unit 1 & 3 for maintenance on 2FDW-313 and 2FDW-314)
	Seal LOCA occurs (≈ 600 GPM)
	Time to core uncovery ≈ 1.75 Hrs
	Containment radiation levels begin to increase; however, no indication is available to Control Room or Emergency Response Facilities due to the loss of power. RP obtains an approximation of Containment radiation levels based on survey of RxB Wall
	Conditions exist for General Emergency Classification

1110 EOF Director declares a General Emergency based on ***Prolonged Loss Of All Offsite Power And Onsite AC Power - MFB 1 and 2 De-energized AND SSF Fails To Maintain Hot Shutdown AND Restoration Of Power To At Least One MFB Within 4 Hours Is NOT Likely***

OR

Other Conditions Warrant Declaration Of General Emergency - EOF Director Judgment Indicates Actual/Imminent Substantial Core Degradation With Potential For Loss Of Containment

PARs provided to Offsite Agencies (Evacuate two miles around, five miles downwind, and shelter all remaining sectors).

1125 Explosion occurs in West Penetration Room, between PR-5 and PR-6, results in damage to RxB Purge Ductwork; PR-6 is jarred open (bumped off it's seat by the concussion) allowing slight leakage to enter ductwork (loss of containment exists at this time)

Damage occurs to the West Peneteration Room as a result of the explosion. Security Officer located near the SSF observes damage and smoke and reports information to the OSC. Fire Brigade is activated; however, response is limited due to radiation levels. Fire burns itself out without causing any further damage.

1255 PR-6 re-seats, leakage is stopped

1200 - 1300 Efforts are made to restore power to CT-4 (Governor work on Keowee Unit 1 is completed)

1300 - 1330 Exercise with Counties/State Completed

EOF continues with Ingestion Pathway portion to demonstrate applicable objectives - Information is provided to SC DHEC

1400 Exercise TERMINATED

Oconee Nuclear Site
1998 Emergency Response Exercise
Drill 98-03 08/18/98 *TIME LINE*

07:30 (00:00)	Unit @ 100% Power
07:40 (00:10)	Bomb Threat Call
07:50 (00:20)	Security locates explosive device, notifies: Ops Shift Manager Anderson City Bomb Squad
08:00 (00:30)	**Alert** declared Site Assembly initiated ERO activated
08:20 (00:50)	Anderson City Bomb Squad arrives on site
08:30 (01:00)	Site Assembly completed TSC/OSC Staffed EOF staffing in progress
09:00 (01:30)	TSC activated
09:15 (01:45)	4911 Call into OSC - Medical Emergency Offsite Agency Support required
≈09:10 (01:40)	EOF operational
09:20 (01:50)	EOF activated
09:30 (02:00)	1TA Relay Lockout occurs 1A1 and 1B1 RCPs trip ATWS occurs - unable to s/d from Control Room Conditions exist for **Site Area Emergency**
09:35 (02:05)	Rx Tripped
09:40 (02:10)	**Site Area Emergency** declared
10:10 (02:40)	Sirens and EAS activated
10:45 (03:15)	Unit 1 stable and in Hot Shutdown TSC Emergency Coordinator may initiate Site Evacuation - Offsite Agency Support req'd
10:55 (03:25)	Loss Of Onsite and Offsite Power Seal LOCA Conditions exist for a **General Emergency**
≈11:10 (03:40)	**General Emergency** declared/ PAR s determined
11:25 (03:55)	Explosion occurs in West Pen Room damaging vent header between PR-5 and PR-6; PR-6 fails off seat - Offsite Release begins
12:55 (05:25)	PR-6 re-seats; Release stopped
1200-1330 (04:30-05:30)	Power Restored
14:00 (07:00)	Exercise Terminated