UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

Report No.: 50-261/95-28

Licensee: Carolina Power and Light Company
P. O. Box 1551
Raleigh, NC 27602

Docket No.: 50-261 License No.: DPR-23

Facility Name: H. B. Robinson Steam Electric Plant, Unit 2

Inspection Conducted: October 30 - November 3, 1995

Inspector: _____ 12/6/95
W. M. Sartor, Jr., Team Leader Date Signed

Accompanying Personnel: K. Clark, NRC Region II
F. Kantor, NRC Headquarters
J. Kreh, NRC Region II

Approved by: _____ 12/14/95
T. R. Decker, Acting Chief Date Signed
Plant Support Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine, announced inspection involved the observation and evaluation of the annual emergency preparedness exercise, conducted from 7:00 a.m. to 1:50 p.m. on November 2, 1995. Correlative offsite activities involving State and local emergency response organizations during this partial-participation exercise were evaluated by the Federal Emergency Management Agency. The onsite inspection focused on the overall adequacy of the licensee's emergency response program, the implementation of the Emergency Plan and associated procedures in response to the simulated emergency conditions, and the effectiveness of the emergency response training program as reflected by the players' performance during the exercise.

Enclosure

Results:

In the areas inspected, no violations or deviations were identified. The exercise demonstrated that the onsite emergency response plans were adequate and that the licensee was capable of implementing them. The licensee's emergency response organization was judged to have performed very well, with significantly improved performance relative to that observed in the 1993 exercise.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

D. Baur, Senior Analyst - Emergency Preparedness
G. Bowen, Senior Analyst - Technical Training
B. Clark, Manager - Maintenance
M. Gann, Senior Analyst - Emergency Preparedness
M. Herrell, Manager - Training
P. Jenny, Supervisor - Emergency Preparedness
G. Johnson, Supervisor-designate - Emergency Preparedness
J. Keenan, Director - Site Operations
R. Krich, Manager - Regulatory Affairs
J. Lucas, Supervisor - Technical Training
T. Lucas, Analyst - Emergency Preparedness
B. Meyer, Manager - Operations
R. Moore, Manager - Outage Management
J. Moyer, Manager - Nuclear Assessment Section
P. Musser, Superintendent - Operations Support
W. Randlett, Superintendent - Security
W. Stover, Shift Technical Advisor - Operations
R. Warden, Manager - Plant Services/Nuclear Assessment Section
D. Whitehead, Manager - Site Support Services
T. Wilkerson, Manager - Environmental and Radiation Control
D. Young, Plant General Manager

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

Nuclear Regulatory Commission

J. Zeiler, Resident Inspector

All individuals whose names are listed in Paragraph 1 attended the exit interview with the inspection team on November 3, 1995.

Abbreviations used throughout this report are defined in the last paragraph.

2. Exercise Scenario (82302)

The scenario for the emergency exercise was reviewed to determine whether provisions had been made to test the integrated capability and a major portion of the basic elements existing within the licensee, State, and local emergency plans and organizations as required by 10 CFR 50.47(b)(14); 10 CFR Part 50, Appendix E, Paragraph IV.F; and specific criteria in NUREG-0654, Section II.N.

The scenario was reviewed in advance of the exercise and was discussed with licensee representatives. The scenario was judged by the inspector to be challenging, particularly for the Accident Assessment Team, and

was fully satisfactory for exercising the onsite and offsite emergency response organizations of the licensee. The scenario also prompted a range of response activities sufficient for local government agencies and the State of South Carolina to test the various facets of their respective emergency response plans during this partial-participation exercise. The inspector observed that the exercise controllers were knowledgeable, and managed, with minor exceptions, to maintain the established timeline of scenario events.

No violations or deviations were identified.

3. Assignment of Responsibility (82301)

This area was observed to determine whether primary responsibilities for emergency response by the licensee had been specifically established and whether adequate staff was available to respond to an emergency as required by 10 CFR 50.47(b)(1) and 10 CFR Part 50, Appendix E, Paragraph IV.A.

The inspectors observed that specific assignments had been made for the licensee's ERO and that there was adequate staff available to respond to the simulated emergency. The initial response organization was augmented by designated licensee representatives. The capability for long-term or continuous staffing of the ERO was discussed by the exercise players, and planning for relief was initiated at each of the ERFs (viz., TSC, OSC, and EOF).

No violations or deviations were identified.

4. Onsite Emergency Organization (82301)

The licensee's onsite emergency organization was observed to determine whether the responsibilities for emergency response were defined, whether adequate staffing was provided to insure initial facility accident response in key functional areas at all times, and whether the interfaces were specified as required by 10 CFR 50.47(b)(2) and 10 CFR Part 50, Appendix E, Paragraph IV.A.

The inspectors determined that the licensee's onsite emergency organization was well defined and was generally effective in managing the simulated emergency. Adequate staffing of the ERFs was provided for the initial accident response, and the interfaces between the onsite organization and offsite support agencies were adequate to ensure prompt notification and support from offsite agencies as required.

The licensee had implemented the "team" concept (the teams were designated A, B, C, D, and a relief team) in which "on-call" status for ERO duty rotated among the teams on a weekly basis. Although Team A was on-call during the weekly rotational period ending November 3, the exercise players were from Team D, which had also participated in two

practice exercises in September and October. An area for further consideration by the licensee was the issue of whether all teams were equivalently trained so that each would be fully prepared at any time to respond to an emergency.

No violations or deviations were identified.

5. Emergency Response Support and Resources (82301)

This area was observed to determine whether arrangements for requesting and effectively using assistance resources were made, whether arrangements to accommodate State and local personnel in the EOF were adequate, and whether other organizations capable of augmenting the planned response were identified as required by 10 CFR 50.47(b)(2) and 10 CFR Part 50, Appendix E, Paragraph IV.A.

The Emergency Plan provided information regarding additional support and resources that may be called upon to assist in an emergency. The inspector observed that representatives of the State of South Carolina were readily accommodated at the EOF, and that arrangements for requesting offsite assistance resources were in place and were demonstrated. During the exercise, the ERM and his staff were proactive in providing information and support to the State DHEC and EPD representatives in the EOF. Projected doses and field monitoring information were closely coordinated with the DHEC staff in the EOF. In the postexercise critique, State representatives expressed appreciation of the licensee's support and noted that coordination was greatly enhanced by the face-to-face contact. The licensee should continue to encourage the State to send representatives to the EOF in future drills and exercises.

No violations or deviations were identified.

6. Emergency Classification System (82301)

This area was observed to verify that a standard emergency classification and action level scheme was in use by the licensee as required by 10 CFR 50.47(b)(4) and Paragraph IV.C of Appendix E to 10 CFR Part 50.

Emergency Plan implementing procedure PEP-101, "Initial Emergency Actions", provided an EAL flowchart for the categorization of an off-normal event as one of the four standard emergency classifications (if the applicable criteria were met). The licensee's staff made emergency classifications during the exercise as follows (the listed times are from the SCR and ERF clocks, which were synchronized internally but were 4 minutes fast relative to Eastern time):

- At 7:55 a.m., unidentified RCS leakage was determined to be occurring at a rate exceeding 10 gpm (the calculated rate was 12.5 gpm). This condition met the criteria for a NOUE, which was declared at 8:05 a.m.

- At 8:51 a.m., a flow-balance calculation indicated that RCS leakage exceeded 50 gpm. The reactor was tripped manually at 8:58 a.m., and an Alert was declared at 9:00 a.m. based on RCS leakage exceeding 50 gpm.

- At 9:57 a.m., a SAE was declared based upon RCS leakage exceeding charging pump capacity.

- At 12:17 p.m., a GE was declared based upon the jeopardizing of the fuel cladding, with the other two fission-product barriers already breached.

The above conditions were all evaluated and classified in accordance with PEP-101.

No violations or deviations were identified.

7. Notification Methods and Procedures (82301)

This area was observed to determine whether procedures had been established for notification by the licensee of State and local response organizations and emergency personnel; whether the content of initial and follow-up messages to response organizations had been established; and whether means to provide early notification to the populace within the plume exposure pathway EPZ had been established as required by 10 CFR 50.47(b)(5) and 10 CFR Part 50, Appendix E, Paragraph IV.D.

The inspector observed that notification methods and procedures had been established and were used to provide information concerning the simulated emergency to affected counties and the State of South Carolina. The licensee utilized a computerized Emergency Notification Form which greatly facilitated the development and transmission of accident information to offsite authorities. Notification messages contained the appropriate information and were timely, although minor discrepancies on some of the Emergency Notification Forms were detected by the inspectors and licensee evaluators.

No violations or deviations were identified.

8. Emergency Communications (82301)

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

The inspector observed that adequate communications capability existed with offsite authorities, as well as between and among the licensee's emergency organizations and personnel. No significant communications-related problems were identified by the inspectors during this exercise.

No violations or deviations were identified.

9. Public Education and Information (82301)

This area was observed to determine whether information concerning the simulated emergency was made available for dissemination to the public as required by 10 CFR Part 50, Appendix E, Paragraph IV.D, and specific criteria in NUREG-0654, Section II.G.

Information was provided to the media and the public in advance of the exercise. That information included details of how members of the public would be notified and what initial actions they should take in an emergency. During the exercise, a JIC was established at the licensee's District Office in Florence, SC. Following the activation of the JIC, the licensee issued press releases at timely intervals and conducted joint news briefings with State and county representatives. Information provided to the public by licensee personnel, both during news briefings and in news releases, was understandable and not excessively technical. Licensee personnel in the JIC were observed to be in possession of an understanding of their responsibilities and to have the ability to perform their functions.

No violations or deviations were identified.

10. Emergency Facilities and Equipment (82301)

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

The inspectors observed the activation, staffing, and operation of selected ERFs and evaluated equipment provided for emergency use during the exercise.

a. Simulator Control Room - An inspector observed that SCR personnel acted promptly to initiate emergency response to the simulated emergency. The Superintendent - Shift Operations assumed the responsibilities of SEC on an interim basis and directed the site's response to the simulated emergency until relieved. Emergency procedures were readily available and used effectively. No equipment problems were observed.

b. Technical Support Center - Staffing and activation of the TSC commenced soon after the announcement of the Alert classification, and the TSC was declared activated/operational at 9:44 a.m. The interim SEC in the SCR provided an appropriate turnover briefing to the SEC in the TSC prior to activation. The SEC demonstrated very good command and control of TSC operations. Using a "hands-on" management approach, he fostered good communications among TSC personnel. Briefings were technically detailed yet concise. The benefits of the "team" concept of ERO staffing (see Paragraph 4) were evident, with TSC personnel being clearly familiar, through

previous training and drills, with the SEC's management style and expectations. The facility and equipment in the TSC were effectively used by the SEC and his staff throughout the exercise.

c. Operations Support Center - The OSC was sufficiently staffed and was adequately equipped to perform assigned functions. No significant problems were identified by the licensee's evaluators. The NRC inspection team did not include a full-time evaluator for the OSC.

d. Emergency Operations Facility - The EOF, located in the TSC/EOF/ Training Building, provided adequate space and facilities for evaluating, coordinating, and directing the designated activities involved in coping with the radiological emergency. The EOF was activated and fully operational at 9:45 a.m., approximately 45 minutes following the declaration of the Alert. The ERM maintained effective command and control over the operation of the EOF. The Assistant to the ERM contributed significantly to this effort. Personnel in the EOF worked well together, and appeared knowledgeable and fully capable of performing their assigned duties. The EOF staff was periodically briefed on plant status and events. The briefings were coordinated with the TSC and were considerably enhanced by use of a closed-circuit camera and speaker to monitor the TSC briefings.

The inspector noted that the licensee did not have an Emergency Plan implementing procedure(s) addressing the activation and operation of the EOF and the TSC. Although some of the information normally found in such a procedure is included in various sections of the Emergency Plan, the inspector discussed with the licensee the development of a consolidated activation and staffing procedure as an area for improvement. Typical information in such a procedure includes a schematic diagram of the facility, a detailed organization chart, the functions and responsibilities of each position, the procedural steps for activating the facility, assessment and communication equipment, and the minimum number of personnel required to consider the facility activated.

No violations or deviations were identified.

11. Accident Assessment (82301)

This area was observed to determine whether adequate 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 Part 50, Appendix E, Paragraph IV.B; and specific criteria in NUREG-0654, Section II.I.

The accident assessment program included an engineering assessment of plant status and an assessment of radiological hazards to both onsite and offsite personnel resulting from the simulated accident. During the exercise, the Technical Analysis Director and his staff (at the TSC) functioned effectively in analyzing plant status so as to provide

recommendations to the SEC concerning mitigating actions to reduce damage to plant equipment, to prevent release of radioactive materials, and to terminate the emergency condition.

Radiological assessment activities were centered in the EOF once that facility was operational. The EOF staff demonstrated the capability to perform timely and accurate dose assessments during the exercise. Dose projections were developed in accordance with procedures using both default values and actual plant data. Field monitoring teams were controlled by the EOF staff, and the results were used to verify and adjust the calculated dose assessments. The calculated dose projections and offsite measurements were coordinated with DHEC representatives in the EOF.

No violations or deviations were identified.

12. Protective Responses (82301)

This area was observed to determine whether 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 specific criteria in NUREG-0654, Section II.J.

The ERM and key staff in the EOF coordinated closely with the TSC as the plant conditions deteriorated during the postulated event. Following the declaration of the GE, the EOF staff developed and issued a PAR in a timely manner. The licensee's initial PAR, in accordance with implementing procedure PEP-105, was for an evacuation in a 2-mile radius and 5 miles downwind. Meteorological information, dose projections, and plant conditions were used to assess the need to adjust the initial PAR. The recommendation for evacuation was expanded to 10 miles in the downwind direction as the accident scenario progressed.

No violations or deviations were identified.

13. Radiological Exposure Control (82301)

This area was observed to determine whether means for controlling radiological exposures during an emergency were established and implemented for emergency workers, and whether these means included exposure guidelines consistent with EPA recommendations as required by 10 CFR 50.47(b)(11) and specific criteria in NUREG-0654, Section II.K.

An inspector noted that radiological exposures were controlled throughout the exercise by issuing supplemental dosimeters to emergency workers and by periodic surveys in the ERFs. Exposure guidelines were in place for various categories of emergency actions.

No violations or deviations were identified.

14. Exercise Critique (82301)

The licensee's critique of the emergency exercise was observed to determine whether deficiencies or weaknesses identified in the performance of the licensee's emergency response organization were formally presented to licensee management for corrective actions as required by 10 CFR 50.47(b)(14), Paragraph IV.F of Appendix E to 10 CFR Part 50, and specific criteria in NUREG-0654, Section II.N.

The licensee conducted player critiques immediately after the exercise, followed by a detailed controller/evaluator critique. A formal presentation of the licensee's critique conclusions was made on November 3, 1995, with exercise players, controllers, licensee management, and NRC personnel attending. The licensee reviewed the exercise objectives and evaluated the performance of the emergency organization in meeting the objectives. The final critique identified ten "strengths", three "deficiencies", and numerous minor "areas for improvement". The licensee's critique process was considered by the inspectors to be thorough and effective.

No violations or deviations were identified.

15. Exit Interview

The inspection scope and results were summarized on November 3, 1995, with the persons whose names are listed in Paragraph 1. The Team Leader described the areas inspected and discussed observations derived from the inspection. Licensee management was informed that the NRC considered the exercise to have been very successful. Proprietary information was reviewed during the inspection but none is contained in this report.

16. Federal Evaluation Team Report

The report by the Federal Evaluation Team (Regional Assistance Committee and Federal Emergency Management Agency, Region IV staff) concerning the activities of offsite agencies during the exercise will be forwarded by separate correspondence.

17. Index of Abbreviations Used in This Report

CFR	Code of Federal Regulations
DHEC	Department of Health and Environmental Control (State of South Carolina)
EAL	Emergency Action Level
EOF	Emergency Operations Facility
EPD	Emergency Planning Division (State of South Carolina)
EPZ	Emergency Planning Zone
ERF	Emergency Response Facility
ERM	Emergency Response Manager
ERO	Emergency Response Organization
GE	General Emergency
gpm	gallons per minute

JIC	Joint Information Center
NOUE	Notification of Unusual Event
NRC	Nuclear Regulatory Commission
OSC	Operations Support Center
PAR	Protective Action Recommendation
PEP	Plant Emergency Procedure
RCS	Reactor Coolant System
SAE	Site Area Emergency
SCR	Simulator Control Room
SEC	Site Emergency Coordinator
TSC	Technical Support Center

Attachment (12 pages):
Objectives and Scenario Précis
for 1995 H. B. Robinson Exercise

	DEMO ?	OBJECTIVE	ACCEPTANCE CRITERIA
1		Provide 24 hour per day on shift emergency response personnel as required by the Emergency Plan including the capability of 24 hour per day manning of communications.	This objective is met as long as the staffing requirements of Technical Specifications, Emergency Plan Table 5.3.2-1 "Minimum Shift Size" column are satisfied.
5		Demonstrate the ability to contact Contractors and private organizations for technical assistance.	This objective is met when the ability to contact has been demonstrated. (Actual contact may be simulated.)
6		Demonstrate the ability to obtain assistance from law enforcement, medical, and fire-fighting organizations including assistance for contaminated personnel.	This objective is met when the ability to contact has been demonstrated. (Actual contact may be simulated.)
8	★	Demonstrate the ability to coordinate radiological monitoring and analysis.	This objective is met when appropriate monitoring and analysis data are received. (May be simulated)

ATTACHMENT

ATTACHMENT

	EMO ?	OBJECTIVE	ACCEPTANCE CRITERIA
9	★	Demonstrate the ability to identify and properly classify events using appropriate procedures, plant system parameter values, and the EALs.	This objective is met when events are correctly classified in a timely manner.
10	★	Demonstrate the ability to alert, notify, and mobilize ERO personnel.	This objective is met when the ERFs are activated.
11	★	Demonstrate the ability to make initial emergency notification to State and Chesterfield, Darlington, and Lee County Warning Points or EOCs within 15 minutes following declaration of each emergency classification.	This objective is met when initial notifications are accomplished within the required 15 minutes. Time starts at emergency declaration and ends at first contact.

	EMO ?	OBJECTIVE	ACCEPTANCE CRITERIA
12	★	Demonstrate the ability to make followup notifications to State and Chesterfield, Darlington, and Lee County Warning Points or EOCs within 60 minutes following initial and change of classification notifications.	This objective is met when follow-up notifications are accomplished within the required 60 minutes. Time starts at completion of the previous notification and ends at first contact.
13	★	Demonstrate the ability to formulate protective action recommendations and transmit to State and County personnel.	This objective is met when protective action recommendations are transmitted to the State and Counties within 15 minutes following the declaration of a General Emergency.
14	★	Demonstrate the ability to communicate with State and County personnel using primary and backup communication systems.	This objective is met when communications have been established using the Selective Signaling system and one of the backup systems.
15		Demonstrate the provisions to communicate with Federal emergency response organizations.	This objective is met by agreement letters.

	DEMO ?	OBJECTIVE	ACCEPTANCE CRITERIA
16	★	Demonstrate the ability to communicate between the CR, TSC, EOF, OSC, and Enmon teams.	This objective is met when none of the other Objectives fail due to communications.
17	★	Demonstrate the ability to communicate with the NRC within 60 minutes following each emergency classification declaration.	This objective is met when communications are established within the required time. Time starts at emergency declaration and ends at first contact.
21	★	Demonstrate the ability to obtain data from meteorological, hydrologic, seismic, radiological monitors, and sampling devices.	This objective is met when data has been obtained and provided to appropriate personnel.
22	★	Demonstrate the ability to obtain samples and analyze data from the PASS and other post accident monitoring equipment.	This objective is met when samples have been obtained and accurately analyzed. (May be simulated based on equipment availability and plant status)
23	★	Demonstrate the ability to determine the source term and magnitude of releases.	This objective is met when source term and release magnitude/dose protection have been accurately determined.

	DEMO ?	OBJECTIVE	ACCEPTANCE CRITERIA
24	*	Demonstrate the ability to project dosage to the public, from the Plume exposure pathway, based on plant and field data.	This objective is met when Dose Projection information is included in the General Emergency declaration notification or as a followup to the General Emergency notification.
25		Demonstrate the ability to alert and advise individuals who are visitors, contractors, and members of the public onsite.	This objective is met when individuals receive, understand, and respond as required to notifications provided by alarms and PA.
26		Demonstrate the ability to evacuate non-essential personnel from site to be monitored and decontaminated at an offsite location.	This objective is met when personnel are sent to an offsite location for decontamination. (May be simulated.)
27		Demonstrate the ability to monitor, decontaminate and evacuate non-essential personnel from site.	This objective is met when personnel are able to discuss decontamination procedures.

	DEMO ?	OBJECTIVE	ACCEPTANCE CRITERIA
30		Demonstrate the ability to establish onsite exposure guidelines consistent with EPA emergency worker and lifesaving activities.	This objective is met when emergency worker and lifesaving exposure guidelines are implemented.
31		Demonstrate the ability to provide onsite first aid capability.	This objective is met when First Responders have provided initial treatment and the victims have been delivered to the rescue squad. (Portions may be simulated.)
36		Perform medical emergency drills which demonstrate the ability to deal with a medical emergency involving a simulated contaminated individual including participation of offsite medical treatment agencies.	This objective is met when first responders arrive at the scene and offsite assistance is coordinated. (Portions may be simulated.)
37		Perform Health Physics Drills which involve response to, and analysis of, simulated elevated airborne and liquid samples and direct radiation measurements in the environment.	This objective is met when environmental measurement and analysis of water, vegetation, soil, and air sample media have been completed.

	EMO ?	OBJECTIVE	ACCEPTANCE CRITERIA
38		Perform an offsite hazards drill which will involve response to and analysis of simulated offsite hazards (example chlorine, propane, hydrogen, gasoline or some other offsite hazard either natural or man made). Samples, measurements as well as protective measures should be taken.	This objective is met when an offsite hazard is included in a drill or exercise and protective measures are taken and the hazard is measured for the protective measures.
39		Perform a critique at the conclusion of an exercise to evaluate the ability of organizations to respond as required.	This objective is met when the critique report has been issued.

1995 Annual Exercise
Narrative Summary and Timeline

Note

- This drill is a partial participation exercise with the State and County Agencies.

- The drill will be conducted with the simulator in the interactive mode. Times given are for planning purposes only actual times may vary (except start of release) due to dynamic response of the operators on the simulator.

Narrative Summary

The scenario begins at 07:00 with the Reactor at 100% power on day 125 (middle of core life) of a continuous run. Reactor coolant activity begins to increase due to an inadvertent addition of sodium hydroxide versus lithium hydroxide (see discussion following narrative). A containment purge is in progress in preparation for routine CV entry. An initial condition impacting the ability to cool the core in an accident exists. During post maintenance VOTES testing (several weeks ago) the disc separated from the stem on a Refueling Water Storage Tank outlet valve, SI-864A. This effectively **blocks all emergency core cooling flow from the Refueling Water Storage Tank.**

At 07:20 an HVH Condensate Measuring Alarm is received due to a 15 gpm Reactor Coolant System (RCS) leak on the sensing line nozzle for pressurizer level indication PI-459. Operators will estimate leakage and determine that leakage is in excess of Technical Specifications and the threshold for declaration of an UNUSUAL EVENT. At the first sign of leakage the operations staff will likely stop the containment purge and consider shutdown of the unit. A Penetration Pressurization System (PPS) alarm will give indication that the containment purge isolation valves are

closed.

At approximately 07:30 an **UNUSUAL EVENT** should be declared based on greater than 15 gpm leakage. An instrument and control technician should be dispatched to investigate LI-459 problems and determine the fault is either mechanical or actual system response. An Auxiliary Operator(AO) dispatched to perform the condensate measuring test (OST-901) will report that HVH-2 (closest to the leakage) has a higher condensate flow than the other HVH units in containment. Search of the Technical Support Center (TSC) will be requested at this time.

A shutdown at a rate of 2%/min. should begin about 07:50. If operations chooses a shutdown rate of less than 2% a message from Operations manager will redirect them back to the appropriate shut down rate.

The RCS filter becomes plugged with debris at a time determined by the lead scenario controller, as a result of the inadvertent addition of sodium hydroxide. The filter will have to be bypassed to maintain letdown flow and replace the filter.

At 08:00 there will be a rod control urgent failure. A circuit card failure is the reason for the alarm on the 2BD power cabinet. The RCS leakage increases to 25 gpm at 08:15

At 08:40 the failure on the pressure transmitter propagates, RCS leak rate increases to 100 gpm. The increased leakage will be identified by a flow balance conducted by the Control Operator. The Shift Supervisor should have sufficient information to declare an **ALERT** at 08:45. Activation of the on site Emergency Facilities is required at the declaration of the Alert.

After replacing the failed circuit card in power cabinet 2BD, control rod H-8 will cease movement. Unit #2 will be removed from the grid at around 09:00. The turbine bearing oil lift pump

will fail shortly after turbine trip. This failure will not allow the turning gear to engage and thus create concerns about uneven cooling of the turbine rotor.

At 09:45, RCS leakage will ramp from 100 gpm to 400 gpm over 10 minutes. Operations will likely initiate a manual Safety Injection, but there will be no Safety Injection flow due to SI-864A stem separation. Charging pumps will not be sufficient to keep up with the increased leakage, thus pressurizer level begins to fall.

At 10:15 a "C" PPS header alarm is received due to high PPS flow. The outer Purge Valve fails open due to the shear of the pin which holds the disc to the shaft. If an Auxiliary Operator investigates, the purge valve will indicate closed by the observation of the external control hardware.

By 10:00 a **Site Area Emergency** will be declared due to the leakage exceeding makeup capability of the three Charging Pumps (3 Pumps = 225 gal/min capability). A reactor trip and manual safety injection (SI) are initiated as leakage exceeds make-up capability.

After the manual SI has been initiated the SI pumps, located in the SI pump room, will be cavitating due to the lack of water supply to the suction. These pumps will be hot to touch and loud when running. If operations does not stop the SI pumps they will trip on motor overload after 15 minutes.

At approximately 11:30 large break Loss of Coolant Accident (LOCA) begins due to a weld failure in the Reactor Coolant System. At the same time, the inner Purge Outlet valve fails. The failure mode is similar to the outer Purge valve. This begins a release through the plant stack. Since there is insufficient makeup flow core damage is initiated (see fuel failure synopsis following narrative for detail). Significant increases in plant and stack radiation monitors will be noted.

Atmospheric conditions cause off site areas to be affected by the release.

The Control Room and/or TSC should recognize the leakage pathway to environment and fuel failure at 11:45. A **GENERAL EMERGENCY** will be declared based on a loss of 3 fission product barriers at this time if not anticipated earlier. At 14:00, or earlier if offsite objectives are met, terminate the exercise.

Inadvertent addition of Sodium Hydroxide (NaOH)

One day ago, the cation bed was placed in service to lower the lithium concentration in the RCS. This bed was inadvertently left in service for too long causing the lithium inventory to be reduced to zero. Chemistry, in a hurry to restore the concentration to normal, inadvertently adds sodium hydroxide instead of lithium hydroxide last night. The resultant activation of sodium causes the RCS activity to increase (R-9 changes from 40 mRem/hr to 150 mrem/hr) at the beginning of the drill. Chemistry sample results should confirm the problem.

Fuel Failure Synopsis and Assumptions

At the time of the LOCA, the reactor has been shut down and been decaying for approximately 2.5 hours. Thus, energy and decay heat in the RCS and the reactor core are declining. Core uncovery occurs quickly due to size and location of the break. Accumulators discharge their contents during depressurization, cooling the core for a short period. Charging flow at the maximum rate continues but the core remains uncovered. For the first 15 minutes, no significant fuel failure occurs. From 11:30 - 12:30 fuel failure occurs until all clad integrity is lost. Nobel gasses and volatile isotopes are released into the reactor vessel and into the containment via the RCS break. In addition to isolating emergency core cooling flow, the failure of SI-864A isolates Containment Spray which would normally reduce iodides in containment.

At 12:00, core temperatures reach a point where fission products begin emerging from the fuel. The charging flow flashes to steam in the core and scavenges the volatile and elemental fission products into the containment atmosphere. Core geometry degrades gradually to a mass at the bottom of the vessel, but the vessel melt through does not occur until 14:30. The Containment Atmosphere contains 90% of the nobel gasses, 2.5% of the iodides, and 0.1% of the particulate (radionuclide mix available for release from the containment). Some condensation into the sump occurs due to Containment fan coolers and ambient losses. Sump condensate retains 10% of the nobel gasses, 75% of the iodides, and 99% of the particulate.