U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-255/84-18

Docket No. 50-255 License No. DPR-20

Licensee: Consumers Power Company
212 West Michigan Avenue
Jackson, MI 49201

Facility Name: Palisades Nuclear Generating Plant

Inspection At: Palisades Site, Covert, Michigan

Inspection Conducted: August 20-22, 1984

Inspectors: J. P. Patterson (Team Leader) — Date: Sept. 6, 1984

T. J. Ploski — Date: 9/6/84

W. B. Gloersen — Date: 9/6/84

Approved By: M. P. Phillips, Chief
Emergency Preparedness Section — Date: 9/6/84

Inspection Summary:

Inspection on August 20-22, 1984 (Report No. 50-255/84-14))
Areas Inspected: Routine, announced inspection of the following areas: Palisades Nuclear Generating Plant emergency preparedness exercise involving observations of key functions and locations during the exercise by seven NRC representatives. The inspection involved 144 inspector-hours onsite by three NRC inspectors and four consultants.
Results: No items of noncompliance or deviations were identified.

DETAILS

1. Persons Contacted

NRC Observers and Areas Observed

F. McManus, Control Room
T. Ploski, Technical Support Center, (TSC)
T. Essig, TSC and Emergency Operations Facility (EOF)
W. Gloersen, Operational Support Center (OSC) and Inplant Health Physics Teams
J. Martin, OSC and Inplant Health Physics Teams
M. Parkhurst, Offsite Radiological Monitoring Teams
J. Patterson, Control Room, TSC and EOF

Consumers Power Company (CPCo) and Areas Assigned

R. DeWitt, Emergency Officer, EOF
T. Elward, EOF Director, EOF
D. Fugere, Lead Controller, EOF
*R. English, Health Physics Team Leader, EOF
*J. Schepers, Plant Support Team Leader, EOF
*P. Bruce, Reactor Engineering Team Leader, EOF & TSC
R. Montross, Site Emergency Director, (SED), TSC
W. Mullins, TSC and Onsite Lead Controller
R. DeLong, TSC Controller
L. Kenaga, Health Physics Team Leader, TSC
*K. Osborne, Plant Support Team Leader, TSC
*N. Campbell, OSC Director
J. Brunet, Lead Controller, OSC
*T. Kanicki, Shift Supervisor, Control Room
*B. Bauer, Shift Engineer (SED), Control Room
*D. Rogers, Duty and Call Superintendent, Control Room (SED)
*+T. Bordine, Staff Licensing Engineer
R. Marusich, Lead Controller, Control Room
*J. Duquette, Controller, Offsite Radiological Monitoring Teams
*R. Henry, Controller, Offsite Radiological Monitoring Teams
K. Farr, Joint Public Information Center (JPIC)
*B. Heffner, JPIC
+G. Slade, General Office Control Center (GOCC) Director
A. Katarsky, GOCC Lead Controller
R. Sinderman, GOCC Health Physics Team Leader
+P. Loomis, Palisades Exercise Coordinator (CPCo)
+D. VandeWalle, Director, Nuclear Licensing

*Denotes those not attending the exit meeting on August 22, 1984.
+Denotes those attending management meeting on August 17, 1984.

2. General

An exercise of the Palisades Plant Site Emergency Plan and General Office Control Center (GOCC) and Emergency Operations Faciltiy (EOF) Emergency Implementing Procedures was conducted on August 21, 1984. State and

local governmental organizations did not participate in this exercise. The exercise tested the licensee's capability to respond to a hypothetical accident scenario resulting in a release of radioactive material to the environment. The enclosed attachment describes the scenario.

3. General Observations

a. Procedures

This exercise was conducted in accordance with 10 CFR Part 50, Appendix E requirements using the Palisades Plant Site Emergency Plan, Implementation Procedures, and the GOCC and EOF Emergency Implementing Procedures.

b. Coordination

The licensee's response was coordinated, orderly, and timely. If the event had been real, the actions taken by the licensee would have been sufficient to permit the State and local authorities to take appropriate actions.

c. Observers

Licensee observers monitored and critiqued this exercise along with seven NRC observers.

d. Critique

The licensee held a critique at the nearsite EOF on August 22, 1984. The NRC critique immediately followed the licensee's critique. The NRC and licensee identified weaknesses in their respective critiques as detailed in this report.

4. Specific Observations

a. Control Room

With few exceptions, the Shift Supervisors (SS) office was used for the entire exercise rather than the Control Room. This created an artificial stage for the participants and detracted from the realism of the event. Future exercises should utilize the Control Room provided that plant safety is not jeopardized. It took 18 minutes to complete the initial notifications to offsite governmental agencies for reporting the Notification of Unusual Event (NUE). The licensee communicator mistakenly used an outdated notification form during his first phone call to offsite agencies. This error was detected and subsequent calls were placed using the appropriate forms. There was no Public Address (PA) announcement of the NUE. Procedure No. EI-3, Revision 7 does not specify that PA announcement shall be made for the NUE. However, the NRC team recommended that this announcement should be made to inform all personnel outside the Control Room that operating conditions exist which constitute this first level of emergency. Offsite notifications for the Alert emergency classification were completed within 15 minutes from the Control Room.

Control Room participants displayed team work throughout the exercise. Communications appeared to be very good between the Control Room, TSC, and OSC. Transfer of command from the Shift Engineer as acting Site Emergency Director (SED) to the Duty and Call Superintendent was well done. The Controllers did a good job in keeping the exercise moving and on schedule.

Neither Control Room Controller was aware that activities would be discovered in the "A" steam generator. This aspect may be due to lack of coordination between the scenario development groups. The checklist for containment isolation was not filled out as would normally be expected. It was available, however, and used as a reference. This resulted in the Controller not promptly notifying the participants of the failed open containment valves, thus delaying identification of the offsite release path. Neither reactor operator maintained an official log of events or actions taken. The Shift Supervisor did maintain a general log in a spiral notebook which helped to give on overall view of events.

Based on the above findings, the following item should be considered for improvement:

- The Shift Supervisor should ensure that a comprehensive log of activities and notifications be made including a detailed chronology of events.

b. Technical Support Center (TSC)

Good command and control was exhibited by the SED upon activation of the TSC at the Alert level. A rollcall was immediately taken for all participants, controllers, and observers present in the TSC. This tally was soon forwarded to Security as part of the overall accountability. The assembly/accountability drill commenced following the Alert siren. This drill was completed in about 41 minutes, with all but five individuals accounted for in 30 minutes. Status boards, in general, were updated in a timely manner and used effectively except for the "Vital Equipment Out of Service" status board which was never used during the exercise. The location of this status board, which was at the end of the hallway just before entering the main TSC conference room, made it difficult to observe. This board should be repositioned to a more suitable location for future drills and exercises.

Promptly after the Site Area Emergency declaration, the SED initiated the evacuation of non-essential personnel from the plant. He correctly assigned the Chemistry/Health Physics (C/HP) Group Leader the task of determining the optimum evacuation route to minimize the radiation dose to those evacuated and also to ensure that Security was given several minutes to prepare for this evacuation. Support groups were kept informed of scenario events and key decisions by the SED's briefings and plant status reports. Tasks were assigned to the various support groups and feedback was requested by the SED on a periodic basis.

Plotting of current information on the status boards was generally timely except for data on the "Plant Parameter Status Board." Timeliness of plotting data on this status board including the addition of trend indicators was improved through action of the SED as the exercise progressed. Trending of plotted data in the Primary Coolant System and Containment Pressure, and for the Cold Leg and Core Exit Temperatures was done well by the Technical Group in the TSC. The SED's communicator ensured that information was updated prior to transmittal to the GOCC and the EOF. TSC communicators promptly transmitted these updates to their GOCC and EOF counterparts. Communications and information flow was handled well and used effectively from the TSC.

The C/HP Support Group did a good job in updating information on habitability levels for onsite areas where personnel were still present. Offsite field monitoring team reports, current and forecast meteorological data, and status of post-accident sampling activities were examples of areas where information was updated and utilized in the TSC. Radiation exposure control was well demonstrated for those personnel dispatched to close Valves No. 1064 and No. 1065.

The C/HP Support Group performed frequent and timely dose assessment calculations. However, all environmental dose calculations throughout the exercise appeared to be based on a stack monitor response. Stack sample analyses should have been used later in the exercise to supplement the stack monitor data-based dose estimates. A stack sample was requested, but there was no evidence that sample results were ever obtained or utilized. Had these samples been taken, the iodine/noble gas ratio of 0.001, which was used in the calculations, could have been examined to determine its accuracy, thus potentially impacting on thyroid dose calculations.

Initial Protective Action Recommendations (PARs) were made by the C/HP Support Group in the TSC. Although it was conservatively decided to add sectors B and C to the two to five mile PAR based on a forecast wind direction shift, no recommendations for either sheltering or evacuation were considered for any sectors beyond 5 miles.

The TSC staff promptly recognized that a LOCA had taken place about 0800, but they were slow to estimate the leak rate. This resulted in a contingency message being issued stating that the LOCA was greater than the charging pump capacity. This EAL was then promptly recognized by the SED as warranting a Site Area Emergency classification. It took about an hour from the time that the SED was informed (0815) that a stack release was in progress, despite supposed containment isolation, before the release path was determined. This should have been determined sooner.

The use of the Covert Fire Department pumper truck to expedite removal of water from the auxiliary feed water pump room, though innovative, was not feasible. It was proposed to have the truck approach the site from the North and then drive into the main access road. The truck would have had to traverse the plume and also

travel roughly along the plume centerline once reaching the main access road. It is doubtful that the truck could get onsite by travelling either the North or South plant evacuation routes. There did not seem to be much concern from the TSC about reducing exposures to security personnel on duty at the gatehouse or the fire department personnel arriving onsite, although information on the plume's trajectory and dose rates at the gatehouse were available to the SED and the C/HP Support Group.

Once the release had been terminated, TSC staff began appropriate reentry/recovery actions to determine the extent of onsite and near-site contamination, to continue core damage assessment, to estimate the location and source of the LOCA, and to determine how to best reduce containment pressure as well as maintain core coverage. Overall, the TSC functioned well. It was fully activated in less than 30 minutes and demonstrated good coordination throughout the exercise.

c. Operational Support Center (OSC)

The OSC was activated, reconfigured, and fully functional within approximately 30 minutes after the Alert declaration. The OSC staff demonstrated good team work in activating the OSC. The Chemistry/Health Physics (C/HP) personnel reported to Area 1 while the maintenance personnel reported to Area 2. Good command and control was demonstrated by the OSC Director who gave periodic briefings on plant status. Offsite and onsite conditions, and meteorological conditions were reported in a timely and meaningful manner. Habitability levels were checked frequently. Status boards which listed OSC area habitability, emergency response personnel, plant status, and a 10 mile Emergency Planning Zone (EPZ) map for dispatching offsite monitoring teams were utilized effectively. A useful addition would have been a power block survey map with an overlay to record inplant dose rates instead of listing them separately.

Maintenance teams, C/HP teams, and corrective action repair teams were briefed adequately on radiation conditions before being dispatched. Inplant radiological surveys were done in accordance with emergency implementing procedures. The Radiation Protection Technicians (RPT) demonstrated proficiency in the use of survey instruments. The RPT who reported habitability surveys via radio did not include the statement, "This is a drill." PA announcements were made in a frequent and meaningful manner. Tne PA reception in the main OSC was sometimes inaudible. One participant claimed that he did not hear the announcement for evacuation of nonessential personnel. The high noise level in the area may have been responsible for this.

OSC personnel monitored their self-reading dosimeters periodically. These dosimeters were read as persons exited and entered the OSC area to control exposure and prevent possible overexposure of personnel. Communications were maintained well with the TSC and with the OSC personnel in the Maintenance Support Center (Main Locker Room) by maintaining open telephone lines.

Radio interference was a problem which may have been caused by both onsite and offsite teams communicating on the same frequency. It was particularly difficult for some inplant teams to communicate back to the OSC by radio. No RPTs were dispatched for monitoring non-essential personnel prior to their evacuation following the 0823 PA announcement of site evacuation for non-essential personnel. Although simulation was called for in the scenario, action should still have included the simulated dispatching of RPTs to the monitoring stations.

Several corrective action repair teams were delayed on their missions because of lack of controllers, especially radiological information controllers who could handle the data interpretation. More controllers were needed, especially those trained in interpreting the inplant/onsite radiological data.

At 0909, the OSC received a request for a post-accident sample. The Chemistry Supervisor then initiated planning and preparation for post-accident sampling. Initial survey of the Post-Accident Sample Monitoring (PASM) area was conducted at 0916. It was 0955 before the PASM team was dispatched from the OSC, 46 minutes after the initial request was received. Initial surveys and preparations should have been started sooner so that important post-accident samples could be obtained in a more timely manner. Initial instructions from the Chemistry Supervisor to the PASM could have been more specific. The type of samples to be taken were not defined clearly until 23 minutes later. Procedure EI-7.1, Section 3.12 specifies that two Chemistry/Radiation Safety Technicians shall conduct initial radiation and air sample surveys. The initial survey was done by one technician. Also, no air samples were taken, nor was continuous air sampling maintained for the sampling area as specified in this procedure. Respirators for the PASM team were obtained at the Access Control point which was potentially contaminated. The PASM team should have obtained their respirators at the OSC and put them on before entering the Access Control area.

One PASM team member, while wearing potentially contaminated gloves, opened up the anti-contamination suit of the other team member in order to read his pocket dosimeter. Sampling techniques were demonstrated to collect primary coolant. These techniques resulted in potentially contaminated liquid on top of the inner cask. This cask was never surveyed or cleaned up and could have been a source of serious contamination. Diluted and undiluted samples were collected for boron and gamma analyses. A contaminated air sample was also taken and transferred to the "Hot" Lab.

Based on the above findings, the following item should be considered for improvement:

- Additional drills and training for the PASM teams with emphasis on initial response functions and presampling requirements and surveying of sampling equipment should be implemented. (255/84-18-01)

d. Emergency Operations Facility (EOF)

The nearsite EOF at the South Haven Conference Center was staffed by Palisades Plant emergency support personnel after the Site Area Emergency was declared (0818). This was done to provide emergency support until decisionmaking corporate management representatives could arrive from the GOCC at Jackson, Michigan. The Emergency Director, EOF Officer, and the Exercise Coordinator arrived at the EOF at approximately 0845. At approximately 0930, the Emergency Director (ED) called the support team leaders to his desk to brief them on current plant status conditions. At 0942 the EOF was officially activated. Command and control functions by the Emergency Director (ED) were effective. Frequent and concise briefings were given to the staff regarding both onsite and offsite activities.

Status boards, in general, were updated in a timely manner and used effectively. Key parameters were plotted and trended when needed. The Plant Support Engineering Group did an excellent job of trouble-shooting. They worked well together in continuing to attempt to locate the primary system leak. At about 1142, the SED from the TSC called the EOF to suggest downgrading the emergency to a Site Area Emergency. The Emergency Officer insisted that he could not recommend downgrading from the General Emergency Classification until the following three main concerns were resolved: (1) determine the source of the primary leak path; (2) seal the containment; and (3) get results on boron concentration from post-accident samples taken from the primary coolant system. This was a good example of objective decisionmaking by the Emergency Officer.

The EOF Health Physics Support Team performed frequent and timely dose assessment calculations. Comparisons between measured and calculated radiation levels identified a temporary mismatch which caused the EOF HP staff to question whether another effluent leakage path existed. Wind forecast data were obtained and effectively used in dose assessments and PARs. Meteorological data was updated every 15 minutes and posted on a status board. This data included forecast information. Dose projections were often quoted as a dose rate rather than a projected integrated dose for the release duration. Although a default value of two hours for the projected release duration was used in dose projection estimates, the HP Support Team did not appear to aggressively seek out a better estimate of the release duration. Had this been done, a more meaningful comparison could have been made between the licensee's dose projections (i.e, integrated doses) and the EPA Protective Action Guides.

All support groups were observed following their EOF implementing procedures. The Communications Support Group functioned smoothly and with efficiency to support the overall effort. There was good management communications throughout. Logistics and administrative functions were well provided including distribution of messages to all groups and the EOF management staff. The use of telephone head sets by communicators was helpful. The inspectors noted that offsite

monitoring teams were not requested by their EOF dispatcher to perform window-open (beta) radiation measurements to confirm that the team was actually in the plume, as opposed to being beneath it. This should be done routinely.

Overall, the EOF participants functioned well and their actions demonstrated good coordination. Good training was evident. A good positive attitude persisted throughout the EOF's activation.

e. Offsite Radiological Monitoring Teams (RMTs)

Two offsite RMTs had already assembled at the OSC following the Alert declaration. Each radiation instrument had a recent calibration sticker on it. Aside from temporary vehicle failure, the monitoring teams proceeded in accordance with instructions from the OSC and later from the EOF. The teams kept careful track of exposure rates in each of the vans and of personnel exposures. They stayed in the plume briefly to take readings then moved outside its boundaries for sample counting and personnel dose reduction purposes. Air samples were taken and analyzed periodically as requested. One team member was assumed to have contamination of about 500 counts per minute (cpm) from plume fallout. The EOF then requested a team member to put on a respirator and "particulate protection clothing" and take vegetation and soil samples at the centerline of the plume. As observed, these samples were properly taken, marked and doublebagged. Both iodine content and particulate activity in the plume were determined. The EOF advised the team at 1140 that the contaminated team member had been decontaminated to less than 150 cpm. Both vans were later decontaminated by a Covert fire truck at an access road.

Radiation readings and sample data information were transmitted by radio to the EOF as soon as they were available. In a few instances the response of the EOF Communicator indicated a misunderstanding of the teams' location with regard to the plume. No information on plant status was provided to the two field teams throughout their activities despite their own requests. No announcement was made to the field teams that a General Emergency had been declared.

Controllers had some difficulty providing data to the team members. Some inaccurate readings were issued. The data should have been presented in a better format for easier interpretation. Emergency Implementation Procedure EI-9 does not include steps for determining exposure rates while traversing the plume. Both teams had portable ion chambers (PIC-6), which were not specified on the equipment list in Attachment 1 to EI-9. This attachment did not specifically identify instrumentation by model, but rather refers to equipment by phrases such as "high range survey instrument." One team had a teletector probe which was used constantly during these surveys. The other team did not have a teletector. One team had their PRM-6 survey meter available and had the audible counts on. The other team did not have their PRM-6 in evidence prior to analyzing their samples. Neither team had an RO-2 ion chamber model instrument or any other instrument to monitor anything but gross differences in the window open/window

closed readings. The teleletector instrument should not be used for plume detection nor for traversing the plume as it is an ineffective instrument for detecting beta radiation fields, responding predominately to gamma radiation fields.

The van that developed a dead battery did have a separate back-up radio to contact the EOF. The other van had no backup independently powered radio. Two way, battery-powered radios should be provided in each emergency van used for offsite monitoring teams.

The offsite monitoring team aptly demonstrated their capabilities with few exceptions during the exercise. Lack of requests by the EOF dispatcher for open window/closed window readings were previously addressed in Section 4.a.

Based on the above findings, the following items should be considered for improvement:

- Use of teletectors for plume monitoring should be discontinued. An ion chamber instrument capable of detecting beta radiation should be substituted. (255/84-18-02)

- Emergency Implementation Procedure EI-9 should be revised to include guidance on radiation surveying for exposure rates for the teams passing through the plume. Attachment 1, Monitoring Team Outfitting Requirements, should be more specific in identifying radiation monitoring instruments and other items listed as under 2.and 3.of Attachment 1. (255/84-18-03)

5. Management Meetings

a. Meeting in Region III Office on August 17, 1984

NRC representatives met with licensee personnel denoted in Paragraph 1 on August 17, 1984, to discuss the licensee's concept of operation for the General Office Control Center (GOCC), the transfer of responsibilities from the TSC, and the subsequent activation of the EOF. Licensee representatives stated that the functions of the EOF will be transferred to the GOCC from the TSC upon activation of the GOCC. The GOCC is activated at the Alert level. In addition, some plant personnel will be dispatched to the EOF to maintain the status boards and to provide distribution of hardcopy data to the various director tables so that this information would be available upon their arrival. Licensee representatives stated that the EOF could be activated in approximately one hour, if the GOCC was activated. The licensee committed to activate the EOF if the NRC sent a site team or at the Alert level based upon the GOCC Director's discretion. NRC representatives stated that Commission policy had been consistent in requiring the EOF to be functional within approximately one hour, and that the staffing levels specified for the EOF in Table 2 of Supplement 1 of NUREG-0737 only specified three positions. The NRC staff also stated that the term "functional" requires that all decisions be approved by the person at the EOF. Whether his staff was completely located in

that facility or not was not a requirement. Licensee representatives agreed that they would have the senior management representative present in the EOF within approximately one hour of the decision to activate this facility. However, all of his staff may not be present at the EOF within that time frame. The licensee representatives committed to modify the Palisades Emergency Plan to indicate clearly that this would be done.

b. Exit Meeting on August 24, 1984

The inspectors held an exit interview after the licensee's critique on August 17, 1984, with licensee representatives denoted in Section 1 to discuss the scope and findings of the inspection. The licensee agreed to examine the concerns of the inspector.

Attachment: Exercise Scenario

PALEX-84 Narrative Summary

The exercise starts at 6:00 AM. The important initial conditions are:

1. Leakage test is in progress.

2. SIT(C) at zero pressure (at 5:20).

3. Auxiliary Feedwater Pump P8-C out for maintenance due to thrust bearing problem which galled the shaft.

4. Auxiliary Feedwater Pump P8-B is running to wear in the packing.

At 6:15 the leak rate test results come in showing 1.2 gpm unidentified leakage. An Unusual Event should be called due to Depressurized Safety Injection Tank and/or Primary Coolant Leakage greater than 1 gpm unidentified.

At 6:30 Operations commences shutdown.

At 6:45 the Condensate Storage Tank supply line to Auxiliary Feedwater Pumps P8-A and P8-B ruptures. The rupture is inside of the Auxiliary Feedwater Pump Room and the flow rate out is 1,000 gpm into the room. The break will flood the room and both auxiliary feedwater pumps.

At 6:50 the Auxiliary Feedwater Pump P8-B trips on low suction pressure and then the shaft siezes due to improper packing gland adjustment.

At 7:00 the Auxiliary Feedwater Pump Room is flooded to a level of four feet above the floor. This covers the pumps and comes up on the door to such an extent that the door cannot be opened.

The card reader on the door is also broken such that the insertion of a card does not open the door. The only accessible auxiliary feedwater pump is the one in the ESF room.

At 7:20 (or sooner) the AO reports strong suspicion of flooding in the Auxiliary Feedwater Pump Room. He is either sent from Control Room to see what happened or is on rounds and hears it. In either case, it is called in at 7:20 and the card reader doesn't work and the door cannot be opened.

At 7:30 an Alert is called due to the loss of all auxiliary feedwater. P8-A (the electric pump) is flooded, P8-B (the turbine pump) is flooded but won't work due to shaft seizure and P8-C (the HPSI pump) is out for maintenance. The TSC is activiated, as is the GOCC.

At 0800 the LOCA occurs. It is a $0.2 ft^2$ breaker (data taken from CE small break LOCA analysis). Reactor trip occurs but one rod is stuck out of the core. HPSI Pump P66-B fails to start.

At 8:05, or sooner, the containment stack monitors alarm. This is because the isolation valves on the clean waste receiver tanks vents have failed to close. It is assumed that one of the clean waste receiver tank rupture disks has been removed. (This has been the case for years.) When the isolation valves fail to close a release path is established. The release path is from the hole in the primary coolant system into containment, into the Clean Waste Receiver Tank with the rupture disk removed, out the vent line, through the waste gas collection header and out the stack.

At 8:10 a Site Area Emergency is called due to the LOCA which exceeds charging pump capacity.

At 8:15 core damage occurs due to the uncovering of the core (from the LOCA coupled with one HPSI pump failure to start) and iodine spike (noble gases and particulates also spike). The release is about equivalent to a gas release.

At 8:25 the Condensate Storage Tank empties filling the Auxiliary Feedwater Pump Room, unless someone enters the valve pit and isolates the tank.

At 8:30 the stuck CEA is put back into the core.

At 8:58 the SIRW tank is empty and recirculation is established. The release continues and the plant conditions are relatively stable.

At 10:30 Auxiliary Feedwater Pump P8-C is repaired and is used to cool down the steam generators. Cooldown proceeds via this route because HPSI flow from one pump is not sufficient to refill the system and LPSI pumps cannot be hooked in.

At 11:00 the Clean Waste Receiver Tank vent valves have been repaired and closed. This terminates the release.

At 12:45 the steam generator level is normal and the primary system is depressurizing. Reentry and recovery operations begin.

PALEX-84

Emergency Maintenance Activities

1. Auxiliary Feedwater Pump P8-C is out for service at the beginning of the exercise due to a thrust bearing problem which galled the shaft. The pump is torn apart. The pump will be repaired by 10:30.

2. Auxiliary Feedwater Pump P8-B is running at the start of the exercise. It has just had maintenance performed on it and is undergoing a test run. When the Condensate Storage Tank supply line breaks this pump will trip. We are presently reviewing past failures to find one which will render the pump inoperative for the duration of the exercise (most likely a governor failure).

3. Auxiliary Feedwater Pump P8-A will be flooded by CST line break. To get it running again it must be completely dried out.

4. Condensate Storage Tank supply line to the Auxiliary Feedwater Pumps breaks. To stop the flooding the isolation valves in the valve pit must be closed.

5. The flooded Auxiliary Feedwater Pump Room must be pumped out so that the auxiliary feedwater pump may be repaired (except for P8-C which is in the Engineered Safeguards Room). Portable pumps must be used and the suction must be snaked through the ventilation duct as the door to the room (which opens inward) cannot be opened.

6. Card reader to the auxiliary feedwater pump room fails such that the door cannot be opened. Use of a special key will unlatch the lock. The door cannot be opened because of the above.

7. One scram rod fails to insert. The failure is due to sticky contacts. The operator must recognize that this is the problem and then go to the cable spreading room (below the control room) and manually unlatch the break and manually drive the rods.

8. One HPSI pump won't start. (This is due to a failure in the break such that the piece which connects to the hot side to power the pump breaks off the breaker and wedges in the hot side. This causes the motor to trip. To repair, they must remove the breaker, pull the connection out of the hot side with the bus line and replace the breaker.

9. The Clean Waste Receiver Tank isolation valves (containment isolation) fail to close on containment isolation signal. The failure is dirt under the seat. To fix, they must enter the El 602 pipeway (which will be >10R/hr through most of the exercise) and manually remove air from the valve.

Sequence of Events

Scenario Time	Approx. Time	Sequence of Events
Initial	0600	Initial
T + 15 min	0615	Leak Rate Calculation Shows: Unidentified Leakage: 1.2 gpm Identified Leakage : .2 gpm Total : 1.4 gpm
T + 20 min	0620	Unusual Event declared due to a shutdown required by T.S. LCO. a) Safety Injection Tank Depressurized. b) > 1 gpm Unidentified Leakage.
T + 30 min	0630	Operations commence shutdown at 2-3% 5 min.
T + 35 min	0635	Shutdown rate is decreased to 1% 5 min.
T + 45 min	0645	Condensate Storage Tank (T-2) supply line to the Auxiliary Feedwater Pumps (P8-A & B) ruptures in the Auxiliary Feedwater Pump Room. NOTE: CST level decrease assumes no makeup.
T + 50 min	0650	P8-B Auxiliary Feedwater Pump trips on low suction pressure and seizes due to improper packing gland adjustment.
1 hr	0700	Auxiliary Feedwater Pumps are flooded and operators are unable to enter the auxiliary feedwater pump room due to: a) Broken Card Reader. b) Flooding Water Pressure Holding Door Shut.
1 hr 20 min	0720	Auxiliary operator reports strong suspicion of flooding in the Auxiliary Feedwater Pump Room.
1 hr 23 min	0723	CST low level alarm is received.
1 hr 30 min	0730	An alert is declared due to the loss of all auxiliary feedwater.
1 hr 45 min	0745	The Technical Support Center and Operations Support Center are activated. GOCC staffing begins.
2 hrs	0800	Primary coolant leakage is greater than 150 gpm (ie, a 0.2 ft^2 LOCA is occurring). Reactor trip occurs. One rod is stuck out of the core.

Sequence of Events

Scenario Time	Approx. Time	Sequence of Events
2 hrs 5 min	0805	Containment stack monitors alarm (release path out stack). Offsite authorities are notified. Repairs teams are dispatched. One of the two HPSI pumps fail to start.
2 hrs 10 min	0810	A site area emergency is declared due to a loss of coolant accident which exceeds the combined charging pump capacity.
2 hrs 20 min	0820	Security controls access to the site and assists in evacuation of nonessential personnel.
2 hrs 25 min	0825	The Condensate Storage Tank is empty.
2 hrs 30 min	0830	The charging pumps suction is manually switched from the boric acid storage tanks to the safety injection refueling water tank.
2 hrs 40 min	0840	The Emergency Operations Facility is staffed.
2 hrs 45 min	0845	A general emergency is declared due to offsite radiation levels.
2 hrs 58 min	0858:50	The Safety Injection Refueling Water Tank reaches its low level set point and primary coolant system makeup is established through containment recirculation flow.
3 hrs	0900	Operations turn off charging pumps. Increased dose assessment activities occur, field monitoring teams are directed to locate and follow the plume.
4 hrs	1000	Operators isolate the safety injection tanks.
4 hrs 15 min	1015	The release continues, however, the recirculation cooling mode works satisfactorily to maintain core cooling.
4 hrs 30 min	1030	P8-C Auxiliary Feedwater Pump is repaired and filling of the steam generators commenced. Plant conditions stabilize; however, the release is still in progress.
4 hrs 45 min	1045	Area radiation levels in the vicinity of the CWRT vent header control valves has decreased sufficiently to allow maintenance teams into the area to effect repairs.

Sequence of Events

Scenario Time	Approx. Time	Sequence of Events
5 hrs	1100	Repair teams succeed in closing the clean waste receiver tank vent valves, terminating the release.
6 hrs	1200	Offsite radiation levels begin decreasing.
6 hrs 10 min	1210	Plant conditions are stable with all safety systems operating. Offsite radiation readings are approaching background. Reentry and recovery begins.
8 hrs	1400	Exercise is terminated.