

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-331/82-12(DEPOS)

Docket No. 50-331

License No. DPR-49

Licensee: Iowa Electric Light and Power Company
Post Office Box 351
Cedar Rapids, IA 52406

Facility Name: Duane Arnold Energy Center

Inspection At: Duane Arnold Site, Palo, IA

Inspection Conducted: July 27-29, 1982

Inspectors: *M. P. Phillips*
M. P. Phillips

8/13/82

J. P. Patterson
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8/13/82

Approved By: *W. L. Axelson*, Chief
Emergency Preparedness
Section

8/13/82

Inspection Summary

Inspection on July 27-29, 1982 (Report No. 50-331/82-12(DEPOS))

Areas Inspected: Routine, announced inspection of the Duane Arnold Energy Center emergency preparedness exercise involving observations by nine NRC representatives of key functions and locations during the exercise. The inspection involved 119 inspector-hours onsite by four NRC inspectors and five consultants.

Results: No items of noncompliance or deviations were identified.

DETAILS

1. Persons Contacted

NRC Observers and Areas Observed

M. Phillips, Control Room and Technical Support Center (TSC)
J. Patterson, Emergency Operations Facility (EOF)
J. Matthis, EOF
P. Robinson, Operational Support Center (OSC) and Radiation Environmental Monitoring Teams
G. Stoetzel, OSC and Radiation Environmental Monitoring Teams
A. Robinson, OSC and Inplant/Onsite Health Physics Teams
R. Poeton, OSC and Inplant/Onsite Health Physics Teams
G. Bethke, TSC
P. Bolton, Emergency News Center and EOF

Iowa Electric and Areas Observed

L. Root, Assistant Vice President-Nuclear Generation
H. Webb, Emergency News Center Director, EOF and Emergency News Center
R. McGaughy, Emergency Response and Recovery Director, EOF
D. Mineck, Emergency Coordinator, TSC
K. Meyer, EOF Manager, EOF
W. Razlaff, Lead Controller, TSC
D. Reeves, Controller, EOF
A. Cruz, Controller, EOF
A. Bonino, Controller, Control Room
D. Allred, Controller, OSC
B. Thorsen, Controller, OSC
B. Wadman, Controller, Inplant Health Physics Team
B. Ayres, Controller, Radiation Environmental Monitoring Team
D. Miller, Controller, Radiation Environmental Monitoring Team
D. Peacor, Controller, Inplant Health Physics Team
B. Stokes, Controller, Emergency News Center

All of the above personnel attended the exit interview on July 28, 1982.

2. Licensee Action on Previously Identified Items Related to Emergency Preparedness

(Closed) Confirmation of Action Letter (CAL) Item 331/81-03-04: Obtain sufficient silver zeolite cartridges for post-accident radioiodine sampling. The inspectors observed that several boxes of silver zeolite cartridges had been obtained and were stored in the emergency lockers located in the OSC. This item is considered closed.

(Closed) CAL Item 331/81-03-06: Develop procedures and/or checklists for onsite and corporate emergency response personnel with major functional roles. Specific emergency plan implementing procedures have

been developed for the Emergency Coordinator (EPIP 2.3), Emergency Response and Recovery Director (CPIP 5.1), Radiological and EOF Manager (CPIP 5.2), and Radiological Assessment Coordinator (CPIP 5.3). In addition, checklists have been developed for the above personnel and the OSC Supervisor, Security Shift Supervisor, TSC Supervisor, and Site Radiation Protection Coordinator. These checklists are designed to ensure accomplishment of each individuals necessary emergency actions. Both the Emergency Response and Recovery Director and the Emergency Coordinator procedures specify that protective action recommendations are to be based on an analysis of current trends in degrading reactor conditions as well as potential or actual radiological release conditions. This item is considered closed.

(Closed) CAL Item 331/81-03-11: Procedure for field monitoring teams use. EPIP 3.2, Offsite Radiological Monitoring, Revision 3, was issued by the licensee and describes the method for determining whether the team is in or near the plume, how to collect an air sample, how monitoring teams are to document their results, and the precautions to be taken while performing the procedure. This procedure also describes how to evaluate the silver zeolite cartridge to determine radioiodine air activity using an E-140 survey instrument. This item is considered closed.

(Closed) CAL Item 331/81-03-15: Revise EPIPs 5.1 and 5.2 to indicate means for downgrading an emergency classification. Both procedures have been revised to indicate the stable conditions necessary to declare an emergency "under control." In addition, EPIP 5.1 describes the plant parameters that should be monitored to ensure and confirm a de-escalating condition. This item is considered closed.

(Closed) CAL Item 331/81-03-17: Provide documentation on prompt public notification system. By letter dated December 14, 1981, the licensee provided a description of the existing siren system, the newly installed siren system, mobile system, and supplemental systems. Also included was a map indicating siren locations and sizes for all the sirens in the system. The system has been tested and is operational (see Inspection Report No. 50-331/82-09). This item is considered closed.

(Closed) Open Item 331/82-XX-01: Receipt of NRC Region III Incident Response Supplement. By letter dated July 1, 1982, NRC Region III transmitted a copy of their Incident Response Supplement to the licensee. The inspectors verified that the licensee had received a copy of this supplement. This item is considered closed.

3. General

An exercise of the licensee's "Duane Arnold Energy Center" and "Iowa Electric Light and Power Corporate" Emergency Plans was conducted at the Duane Arnold Energy Center on July 28, 1982, testing the integrated responses of the licensee, local, State, and NRC organizations

to a simulated emergency. The exercise tested the licensee's response to a major release of noble gas with some iodine. Attachment 1 describes the scenario. The exercise was integrated with a test of the State of Iowa, Linn County, Benton County, and NRC Emergency Plans.

4. General Observations

a. Procedures

This exercise was conducted in accordance with 10 CFR 50, Appendix E, requirements using the licensee's Emergency Plans and the Emergency Plan Implementing Procedures used by the Site (EPIP) and Corporate (CPIP) personnel.

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 for the protection of the public.

c. Observers

Licensee observers monitored and critiqued this exercise along with nine NRC observers and approximately fourteen Federal Emergency Management Agency (FEMA) observers. FEMA observed and will report on the responses of the State and local governments.

d. Critique

The licensee held a critique immediately following the exercise the afternoon of July 28, 1982. The NRC critique was held after the licensee's critique. Areas requiring additional attention are discussed in Paragraph 5.

5. Areas Requiring Additional Attention

Problems identified by the NRC observers and discussed during the exit interview included: (1) poor effluent sampling capability; (2) inefficient utilization of TSC personnel; and (3) poor documentation of survey results by onsite teams. In addition, confusion was apparent in the utilization of the two different maps when describing how protective action recommendations were being implemented.

6. Specific Observations

a. Control Room (CR)

The operators responded well to cues, and made proper and timely notifications. When major changes in plant status occurred, appropriate procedures and Piping and Instrument

Diagrams were consulted. Control Room personnel appeared to be well versed in the Technical Specifications, plant systems, and emergency action levels and their corresponding emergency classifications. On one occasion, the Control Room Coordinator was simultaneously trying to communicate on two phones. One call was from the Chairman of the NRC and the other was from the TSC. Some other individual in the Control Room, such as the Shift Supervising Engineer, should have taken over communications on one of the phones. The Control Room personnel had an excellent grasp of appropriate plant operational actions, and on several occasions developed possible solutions to problems prior to the TSC. Based on the actions taken during the exercise, it appeared that more technical expertise was available in the Control Room than in the TSC, although this appearance could also be caused by the lack of efficiency in the utilization of TSC personnel.

b. Technical Support Center (TSC)

Activation and staffing of the permanent TSC was orderly and timely, and the transfer of responsibility for offsite notification was made smoothly. Command and Control functions performed at the TSC were adequate. The TSC was continuously monitored for radiological habitability, and dosimetry control was adequate. The General Electric technical team in Vallecitos was well utilized, and provided excellent expertise in the determination of the percent of fuel damage. The Emergency Coordinator made very few status reports to personnel in the TSC. Individuals had to gather their own information rather than rely on status reports. This probably contributed to the inefficient utilization of TSC personnel. Both the Technical Supervisor and Emergency Coordinator did not effectively use the personnel available in the TSC. It appeared that personnel at the TSC were never really aware of the cause of the reactor scram, the cause of the fuel damage, or the general area where the primary containment was leaking to the secondary containment. Although an individual was asked to trend data, the individual was not advised of which parameters should be trended. Even more serious was the complete lack of any offsite dose assessment regarding the consequences of using the faulty RHR Service Water System heat exchanger which had already resulted in an offsite liquid release. Although this heat exchanger was being considered to reduce containment pressure, the tube leak would result in an additional release of noble gases and unfiltered iodines at ground level. This release pathway is not normally monitored, therefore a good calculational analysis would be necessary to assess the potential offsite consequences of utilizing this system, and this assessment should then be factored into the protective action decision making process. Such an assessment was never performed. Although available, plant area and power bloc survey maps were not as effectively utilized as they could have been. Some confusion was evident at the TSC when the "Alert" declaration was made over the paging

system using the phrase "Site Alert." Some personnel thought a Site Emergency had been declared. This was identified by the TSC and clarified in a very timely manner. Problems were encountered (and resolved by the Site Radiation Protection Coordinator) in the transmission and recording of containment radiation data, which was converted to mR/hr and then documented as if this reading was R/hr. Two examples were the $10 \text{ E}+10 \text{ R/hr}$ and $10 \text{ E}+9 \text{ R/hr}$ readings, both beyond the scale of the instrument.

During the course of the exercise, which NRC personnel also participated in, the Emergency Coordinator left his normal location and conducted a briefing for the NRC personnel who arrived onsite. During this briefing it was not apparent who was left in charge. In addition, due to the locations of the phones available for NRC use, it was difficult for NRC personnel to communicate and interface with licensee personnel (see Paragraph 6.g).

c. Emergency Operations Facility (EOF)

The permanent EOF, which is located in the fourteenth floor of the IE Towers, was activated in accordance with the Emergency Plan in a timely manner. Command and Control functions at the EOF were good, and it was clear who was in charge. Security at the EOF was excellent. Administrative support flowed smoothly even though walkways, desk areas, and the Radiation Assessment room were constantly crowded. Adequate briefings of personnel regarding updated plant conditions were held, and all information regarding the event was logged and available to all personnel. Utilization of industry support groups, such as the Pool Inventory Management, was excellent. Communications between the EOF and the TSC, State of Iowa Office of Disaster Services, and Benton and Linn County EOCs was excellent. The Radiological and EOF Manager provided frequent briefings to the State and county representatives present in the EOF.

Coordination between the Radiological Assessment Coordinator and State radiological assessment personnel was adequate. Protective Action assessments were made utilizing both plant release data and offsite monitoring data. Some minor delays were observed regarding the dispatching and moving of the field teams for plume tracking and proper positioning of them to avoid overexposures. Offsite monitoring results were recorded both in the Radiation Assessment room and the main EOF area. Radio and telephone communications regarding offsite measurements were good; however, verification of communicated numbers was never observed.

The NRC dedicated Health Physics Network (HPN) phone was not available, and the phones provided for NRC use, including the Emergency Notification System (ENS) phone, were not located near the EOF managers (see Paragraph 6.g). As a result, NRC

communications was hampered. Both the ENS and HPN phones are under the direction of the NRC, and will be relocated in the EOF in the near future.

The general layout of desks, charts, and administrative support equipment was enlarged from the last exercise. Due to the excessive amount of traffic the charts in front of the EOF were difficult to read. This could be solved by reversing the current layout, and utilizing the opposite area for posting charts, graphs, large visuals, etc.

d. Emergency News Center (ENC)

The ENC was established on the 6th floor of the IE Towers after declaration of the Site Area Emergency. Prior to that time, press contacts were made by the Emergency News Center Director's staff at the Unusual Event and Alert levels. The ENC was well prepared, and security was excellent. The ENC Director received briefings directly from the Emergency Response and Recovery Manager in the EOF, which resulted in excellent information transfer from the EOF to the ENC. Coordination of all public affairs personnel - licensee, NRC, State, and counties - was adequate and considerably improved over last years performance. Although the ENC gave plant status updates, the lack of visual aids was a hinderance in making these updates understandable to the press and the public. Some confusion was generated during press briefings when the licensee and State representatives referred to two different maps with similar indications when describing protective actions which were being taken. The State used the sixteen sector offsite monitoring map and referred to Sectors R, A, and B. The licensee used the map from the public information brochure which is labeled A, B, C, D, E, and F. Although the letters are the same, the areas designated on each map are significantly different. The public information brochure should be redesigned using numbers to avoid future confusion.

e. Operational Support Center (OSC)

The OSC is also the primary onsite assembly area. The OSC was manned in a timely manner with the sounding of the plant assembly/evacuation siren. Personnel reported to this assembly area, and accountability of all personnel was accomplished in a timely manner. Health Physics and maintenance teams are assembled at the OSC through the use of a tag board system which worked very well. Teams were well briefed on actions to be taken prior to undertaking their assignments, and the OSC Supervisor did a good job in ensuring that instruments were checked and operational. In general the OSC was kept well informed of events occurring in the plant. Access control was very good, as was security. Exposure control at the OSC was good. Habitability checks were performed throughout the OSC with a frequency based on increasing dose rates. Documentation of onsite survey results was deficient, in that

information was recorded on the back of team members hands rather than on the log. Documentation of survey results should be better formalized. The onsite team involved with the collection of the stack effluent sample displayed a basic lack of training on sample collection. The team did not have appropriate sample handling equipment, and failed to demonstrate contamination control when they failed to frisk upon return to the OSC. It was also apparent that they were not familiar with the proper means for sample collection. The licensee is completing installation of a post-accident effluent monitoring system for the stack. This system is designed to meet the requirements of NUREG-0737 Task Item II.F.1, which provides for a sampling system capable of analyzing noble gas, radioiodine, and particulates. Upon completion of installation of this system, personnel must be trained in proper procedures for sample collection and analysis. This was identified as an open item in NRC Inspection Report No. 50-331/81-03, and will be examined upon system completion.

f. Environmental Monitoring Teams

The environmental monitoring teams were assembled in a timely manner and dispatched. The use of the predesignated survey maps worked fairly well. Field monitoring teams maintained adequate radiation exposure controls; however, the wearing of protective clothing long before any release occurred should be reconsidered. Except in extremely high winds, there would be ample time to don protective clothing while in the field when a release began. Communications between the teams and the EOF were adequate; however, after the release began the teams were not kept informed of the status of the release. Although radioiodine analysis was conducted, more samples should have been collected and analyzed. When it was determined that the sample collected would be analyzed by the NRC Van, a different vehicle should have been used to transport the sample to the van. Utilizing the offsite teams vehicle resulted in them being unavailable for offsite monitoring for a considerable length of time. A minor problem was encountered in the way sample results were given in the scenario. In order to prevent over prompting of the teams, scenario results had to be converted by the controller to a number useable by the team. This resulted in some delay. Generally, offsite teams did a very good job.

g. NRC/Licensee Interface

During this exercise, NRC concerns were identified relevant to direct NRC/licensee interface in the EOF and TSC. The NRC working space is located in the far corner of the EOF, a considerable distance from the licensee's working space. This caused a severe communications problem for the NRC. We recommend that a larger working space be provided for the NRC in the same vicinity as the licensee's emergency response organization. In addition, an HPN line will be located in this working space. The existing NRC room located in the EOF

should be retained but this area will only be utilized for NRC private meetings. The same problem noted at the EOF was observed at the TSC. Both the ENS and HPN telephones should be relocated to the same working area as the licensee's Emergency Coordinator. Further, a larger NRC working space should be provided in the TSC directly adjacent to the TSC Supervisor's working area.

Ensuring that the NRC and licensee's working spaces are integrated will ensure direct face-to-face communication and will ensure that NRC and licensee emergency organizations will directly interface with each other.

7. Exit Interview

The inspectors held an exit interview with licensee representatives denoted in Paragraph 1 at the conclusion of the licensee's critique. The licensee agreed to address the inspectors' concerns identified in Paragraph 5.

Attachment: Exercise Scenario

B. SCENARIO EVENT SCHEDULE

<u>Time</u>	<u>Initiating Message Number</u>	<u>Event Summary</u>
Prior to T + 00:00 (08:00)	Initial Conditions	<p>The unit is operating at 98% power and at full load. The core is 3/4 through end of cycle.</p> <p>RHR SW pump 1P-22C is out of service. The pump did not meet minimum flow requirements during routine quarterly surveillance testing. A repair team is investigating the pump wear rings. The daily surveillance requirement for the remaining pumps is in effect. RHR SW pump 1P-22A is scheduled next. Proof of operability testing will continue on this shift.</p> <p>During a recent spurious reactor scram, RCIC tripped on overspeed following automatic initiation. The ramp generator signal converter and the model EG-M control box were found to be out of calibration. RCIC is tagged out for maintenance. A 7 day LCO is in effect. HPCI operability testing is in progress with suppression pool cooling running in parallel to avoid exceeding suppression pool maximum temperature limits. RHR pump 1P-229D, Heat Exchanger IE-201B and RHR SW pumps 1P-22B and 1P-22D are being used at this time.</p> <p>Cedar River water temperature has been increasing over the past two weeks and is now 87.5°F. Cedar River flow is 210 cfs and decreasing.</p> <p>The weekly analysis of the reactor coolant has shown a slow increase over normal values and is now 0.6 uci/gm dose equivalent of I-131. An additional sample was drawn 4 hours earlier and is currently being analyzed.</p>

Time	Initiating Message Number	Event Summary
		<p>SIGNIFICANT INOPERABLE EQUIPMENT: A SRM Neutron Monitor E IRM Neutron Monitor 1P-205A RWCU Pump 1P-91B Stator Cooling Pump 1P-22C RHR SW Pump RCIC Turbine PSV-8012B Cl Sys IV-AC-17B MS Tunnel Fan</p>
T + 00:00	1	<p>The security patrol reports that a strong chlorine odor is present in the vicinity of the pump house. He has ordered the repair team working on RHR pump 1P-22C to evacuate the pump house.</p>
T + 00:20+	2	<p>A Health Physics Technician has been dispatched by the SSE to investigate a potential gas leak at the pump house. Upon arrival at the chlorine room he hears the sound of escaping gas by the on-service chlorine gas cylinder. Tests for chlorine gas in the area are positive. The Draeger tube indicates 1.25 ppm chlorine.</p>
T + 00:35+	2C-1	<p>An UNUSUAL EVENT should be declared for an on-site release of toxic or flammable gases.</p>
T + 00:40+	3	<p>The chlorine gas leak has been secured by shutting the valve isolating the on-service gas cylinder and tightening the downstream joint.</p>
T + 00:45	4	<p>The pump house and the adjacent chlorine room have been tested for the continued presence of chlorine and there is no further evidence of the gas. The pump house is declared clear and ready for use.</p>
T + 00:50	5	<p>The repair team foreman at the pump house reports that he is continuing work on the RHR SW pump 1P-22C.</p>

Time	Initiating Message Number	Event Summary
T + 00:55	6	Analysis of the reactor coolant system sample is complete. The results are: 0.8 uci/gm dose equivalent of I-131.
T + 01:00	7	Initial indication is received in the control room of RHR HX IE-201B dp controller malfunction.
T + 01:05	8	A tube leak occurs in the RHR HX.
T + 01:10	9	Initial attempts to shut butterfly valve MO 1998B by operating HS 1998B were successful.
T + 01:15	10	The dp controller on RHR HX IE-201B was found to be cycling, resulting in the dp dropping to zero. The problem appears to be within the control system and will require an Instrument Technician to correct.
T + 01:20+	11	The dp controller problem on RHR HX IE-201B cannot be fixed at this time. The position modulator needs to be replaced. Valve MO-1947 is stuck open
T + 01:30+	12	The sample results on RHR SW, ESW, Cooling Tower, and Discharge Canal indicate contamination of these systems.
T + 01:45+	12C-1	An ALERT should be declared at this time for a liquid release 10 time greater than 10CFR20 limits based on the Chemistry sample analysis.
T + 02:10	13	Initial indication of a 1/2 Group I isolation signal is received in the control room.

Initiating

Time	Message Number	Event Summary
T + 02:15	14	A main steam tunnel high temperature signal closes the MSIVs. A partial reactor scram occurs. A pressure and power level excursion results. RPV level drops rapidly. Relief and Safety valves lift.
T + 02:30	14C-1	A Site Emergency should be declared at this time based on System/Equipment failure or malfunction-Reactor Protection System failure.
T + 02:20	15	The SDV vent and drain valves have failed shut. The manual scram function can not completely insert all the control rods.
T + 02:25	16	Attempts to reopen the SDV vent and drain valves from the control room fail.
T + 02:40	17	The reactor is shutdown by SBLC system.
T + 02:45	18	Drywell radiation monitors show increasing levels (first positive indications of fuel failure).
T + 03:10	19	Manual insertion of the control rods is complete.
T + 03:40	20	The Cedar Rapids City Water Department reports that the Cedar River Flow is less than 200 CFS. Cedar River temperature is now 92°F.
T + 03:50	21	An expansion joint on the discharge pipe of main circulating water pump 1P-4B has ruptured and is flooding the pump house.

Time	Initiating Message Number	Event Summary
T + 03:55	22	The RHR SW pump and the ESW pump in the compartment adjacent to the circulating pumps all trip. The repair team evacuates the pump house.
T + 04:00	23	A penetration leak occurs. Reactor Bldg. ARMs and off-gas stack monitors start increasing.
T + 04:15	23C-1	A General Emergency should be declared at this time for: System/Equipment Failure or Malfunction - loss of heat sink Environmental Release related to EPA PAGs - release of large amounts of reactivity in a short time.
T + 04:15	24	RHR temperature, suppression pool temperature, drywell temperature and pressure all show increases.
T + 05:00	25	The latest National Weather Service report predicts that wind direction will shift from S (180°) to W (270°) within the next two hours.
T + 05:30	26	RHR SW pump 1P-22C has been repaired.
T + 05:45	27	RHR SW flow to RHR HX has been restored. Cooling to Suppression Pool has been restored.
T + 06:00	28	Suppression Pool temperature has been significantly reduced resulting in the reduction of Drywell temperature and pressure. Offgas Stack Monitor and Reactor Building ARMs are showing reduced readings.

<u>Time</u>	<u>Initiating Message Number</u>	<u>Event Summary</u>
T + 06:30	29	The release is terminated. Containment pressure has decreased removing the driving force for the release.
T + 06:45	30	Based on wind conditions the plume will be outside the 10 mile EPZ in two hours. Discuss long term recovery efforts.
T + 07:00+	31	The exercise is terminated.