U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-331/OL-93-02

Docket No. 50-331 License No. DPR-49

Licensee: Iowa Electric Light and Power Company
IE Towers
P. O. Box 351
Cedar Rapids, IA 52406

Facility Name: Duane Arnold Energy Center

Examination Administered At: Duane Arnold Energy Center

Examination Conducted: Week of December 6, 1993

Examiners: Douglas Shepard, NRC, Region III
John Hanek, Idaho National Engineering Laboratory (INEL)

Chief Examiner: R. L. Doornbos Date: Jan 7, 1994

Approved By: M. J. Jordan, Chief Date: Jan 7, 1994
Operator Licensing Section 1

Examination Summary

Examination administered during the week of December 6, 1993 (Report No. 50-331/OL-93-02(DRS))
Written and operating requalification examinations were administered to six Senior Reactor Operators (SROs), and three Reactor Operators (ROs). Two operating crews and one staff crew were evaluated on the simulator portion of the NRC examination. Two SROs and four ROs who had been evaluated during previous examinations participated during the dynamic simulator scenarios to complete the crew compositions.

Requal Examination Results:

There was one individual failure on the written examination, and no individual or crew failures on the JPM or dynamic simulator portions of the NRC requalification examination. Based on the results of the examination and in accordance with the criteria of NUREG-1021, Revision 7, Operator Licensing Examiner Standards, ES-601, D.2.a, the Duane Arnold Requalification Training Program has been assigned an overall program rating of satisfactory.

The following is a summary of the strengths and weaknesses noted during the performance of the examination and is provided for evaluation via your SAT based training program. No response is required.

STRENGTHS/WEAKNESSES

Strengths

- Crew communications during dynamic simulator scenarios w r good. (Section 3.f.1)
- Reactor operator knowledge of EOP entry conditions was good. (Section 3.f.1)
- Operator knowledge of plant equipment locations was good. (Section 3.d.1)
- Licensee evaluations were more restrictive than established standards and were conducted in a professional manner. (Section 3.a)
- Simulator support personnel were knowledgeable about the simulator's performance capabilities. (Section 3.a)
- Shift Technical Advisor (STA) system knowledge was good. (Section 4.a)

Weaknesses

- Operators' understanding of the HVAC system was deficient. (Section 3.f.2)
- Operators' ability to determine tne operating status of the Standby Gas Treatment (SBGT) system was deficient. (Section 3.f.2)
- Operators' performance of single to two loop recirculation pump startup was impaired. (Section 3.d.2)
- Trainers' ability to develop crew critical tasks (CTs) was flawed. (Section 3.b)
- Length of time used by evaluators between scenarios was excessive. (Section 3.b)

REPORT DETAILS

1. Examiners

*R. L. Doornbos, Chief Examiner, NRC, Region III
D. Shepard, Examiner, NRC, Region III
J. Hanek, INEL

2. Persons Contacted

Facility

*J. Franz, VP Nuclear
*R. Anderson, Operations Supervisor
*J. Christensen, Assistant Operations Supervisor
*G. VanMiddlesworth, Assistant Plant Supt. O&M
*S. Swails, Manager, Nuclear Training
*K. Young, Manager, Nuclear Licensing
*P. Bessette, ReaComm Supervisor
*P. Meek, Simulator Supervisor
*J. Bashore, Senior Instructor
*T. Evans, Senior Instructor
*M. Fisher, Senior Instructor
*R. Fisher, Senior Instructor
*R. Hunt, Simulator Specialist
*D. Musel, Ops Instructor
*M. Pettengill, Senior Instructor
*W. Render, Senior Instructor
*S. Tait, Senior Simulator Specialist
*E. Vann, Senior Ops Instructor
*T. Van Wyen, Senior Instructor

U. S. Nuclear Regulatory Commission (NRC)

*J. A. Hopkins, Senior Resident Inspector, Duane Arnold

*Denotes those present at the exit meeting on December 10, 1993.

3. Training Program Observations

NUREG 1021 provides guidance for NRC administered requalification examination development, including exam security guidance. ES-602 Section C.1.c of NUREG 1021 states, "If the facility licensee submits a proposed (requalification) examination, those individuals involved in its development become subject to the security restrictions of ES-601 once examination development commences. These restrictions remain in effect until the NRC examination is given." ES-601, Section C.4.b, specifically states, "those individuals with knowledge of the examination content shall not participate in any facility requalification training programs (e.g., instruction, examination, or tutoring) involving the licensees selected for the examination."

Examination development began on August 10, 1993. DAEC training representatives delivered the facility developed requalification exam to the NRC on October 21, 1993. The security agreement provided at that time was signed by three individuals; two signed on October 19, 1993, and one on October 21, 1993.

When asked if any instruction had been given to the proposed exam candidates between the time development had begun and the date on the security agreement, the developer and supervisor answered, "yes." The developer had conducted instruction in the areas of Curves and Limits and EOP C (EOP Flowchart Support Procedures).

All sections of the examination provided for review to the NRC were modified. To prevent a potential compromise of the exam integrity that occurred during examination development the NRC deleted three scenarios and replaced them with one scenario written by the NRC. One additional job performance measure was replaced by the NRC.

Additional investigation revealed that there was no examination security procedure in place that would prevent compromising the integrity of examinations under development. This issue is considered an unresolved item and will be addressed in resident inspector Report No. 50-331/93023.

a. Trainer/Evaluator Strengths

The evaluators were knowledgeable and courteous throughout the examination process. Extra time was expanded as necessary and a professional attitude was maintained throughout the examination.

NUREG 1021, ES-601 D.2.b states in part that, "....for all facility failures, the facility is expected to differentiate among those failures where the operator performed at an unsafe level, from those failures where the operator failed for other than safety reasons (i.e., not meeting higher facility-established standards). In these cases, those licensees identified as failing for safety reasons would also be considered NRC failures." During individual evaluations required by ES-604 E.2, facility evaluators held the operators to a higher performance standard than that required by NUREG 1021. This resulted in competency failures of three Senior Reactor Operators for other than safety reasons. None of the competencies evaluated were connected to a crew critical task, therefore, further evaluation by the NRC is not needed.

During the examination week the simulator failed to properly initialize. The simulator specialist demonstrated his proficiency operating the simulator by quickly recovering the simulator. The quick recovery prevented postponement of scenario evaluations and the written examination.

b. Weaknesses

The evaluators used an excessive amount of time between scenarios. Activities necessary to evaluate crew and individual operator performance were not performed efficiently. The lead evaluator would read each crew competency including all three options for each, then all the evaluators voted to determine the competency rating to be assigned. All these actions were completed before any resetting of the simulator was performed. After the simulator was completely reset, an evaluator would then describe the next scenario to the evaluators prior to giving the crew brief and allowing the crew to walkdown the panels. This practice averaged approximately two hours between scenarios. The NRC has found that this significant exam delay can increase exam candidate stress. A reduction in unnecessary exam stress is beneficial to botn the examiners and examinees.

Crew critical tasks associated with the scenarios initially presented to the NRC for review were faulty in that they did not always meet the guidance of NUREG 1021 for critical tasks. Several critical tasks provided did not have safety significance to the plant or public. New critical tasks were developed under NRC guidance prior to exam administration.

c. Written Examination

Category A and B portions of the written examination were given in the simulator. The RO and SRO examinations each had 20 questions. Two questions on the Category A portion of the exam were replaced prior to exam administration. All operators completed the examination within the allowed 3 hours.

1. Strengths

The overall knowledge level tested by the static (Category A) examination questions was good. The static examination questions that required operators to analyze conditions and evaluate results were directly related to the simulator setup. Although meeting the guidelines in NUREG 1021, seven questions were not related to the simulator setup.

2. Weaknesses

The RO knowledge level tested by the written exam was, at times, indistinguishable from that required of the SRO. It was understood that the knowledge level expected of the RO by the facility Job Task Analysis was the same for both the RO and SRO. However, the method by which this knowledge is tested should be job specific. For example, the RO would not be expected to determine SRO actions necessary to provide Alternate Level Control during a LOCA.

d. Job Performance Measures (JPM)

Operator JPM scores ranged from 80% to 100% with each operator performing five JPMs during their requalification examination. The following strengths and weaknesses were identified.

1. Strengths

Operator knowledge of plant equipment locations was good. This was demonstrated while performing one JPM that required the operator to locate switches in the control room, cooling tower breaker rooms, and pump house, and to identify the location of valves located under gratings at the cooling towers.

2. Weaknesses

Several operators had difficulty in performing the single to two loop recirculation pump startup procedure. Although most successfully completed the JPM, there was considerable confusion about the procedure's terminology requiring them to determine or record temperatures necessary to prevent technical specification violations of recirculation loop and reactor vessel temperatures required for startup.

3. JPMs performed in the control room/simulator were:

Substitute rod position using NUMAC Rod Worth Minimizer.

Perform required actions for transferring from single recirculation loop operation to dual loop operation.

Manually shutdown High Pressure Coolant Injection (HPCI) with an automatic initiation signal present.

Determine required Emergency Action Level and perform notification of off-site agencies.

4. JPMs performed in the plant were:

Perform Reactor Pressure Vessel (RPV) injection with well water.

Restore torus water level manually using the Core Spray system.

e. Simulator Scenarios

Two scenarios were used during the simulator portion of the operating test. Strengths of the scenarios are provided below, followed by a brief description.

1. Strengths

Scenario complexity and the depth to which they took the operators into the Emergency Operating Procedures was good.

2. Descriptions

Scenario #1: Dropped Fuel Bundle/LOCA: While assuming the watch, the Refuel Floor SRO will contact the control room and inform them that they have evacuated the Refuel Floor IAW F&RCHP #5 because of a dropped dummy fuel bundle into the spent fuel pool. The dropped bundle dislodged a fuel bundle in the pool. Fuel Pool Exhaust Rad Monitors will increase to greater than 9 mr/hr, causing EOP-3 to be entered. The "A" train of Standby Gas Treatment (SBGT) will trip on the Group 3 isolation signal. Additionally, Reactor Building Heating Ventilation and Air Conditioning (HVAC) will fail to isolate on a Group 3 isolation signal. Further, all Refuel Floor Area Radiation Monitors (ARMs) will increase to greater than their maximum normal operating limits. Additionally, the crew will enter EOP-4 (Radioactivity Release Control) on a fuel handling accident that results in fuel damage with the release of radioactivity to the Reactor Building.

A leak in the "A" Reactor Recirculation Loop will require that the crew establish an increasing vessel level using EOP-1, Table 1 equipment.

Scenario #2: Turbine HI Vibration, SRV Tailpipe Break with Failure of SRV Handswitches: A fault in the HPCI invertor will necessitate the crew backing out of the surveillance procedure (STP), declare the HPCI system inoperable, and enter a 14 day Limiting Condition for Operation (LCO). While backing out of the STP, a pipe break in the discharge line of the "A" Residual Heat Removal (RHR) loop will require the crew to enter EOP-3, "Secondary Containment Control" and isolate the RHR leak. The RHR isolation will render the RHR system inoperable, thereby requiring the declaration of a shutdown LCO. Additionally, because of the RHR leak, the crew will enter EOP-2, "Primary Containment Control" as a result of low torus water level, and attempt to raise torus level in accordance with (IAW) EOP-2.

As a result of the shutdown LCO, the crew will commence a reactor shutdown by reducing power IAW IPOI-3 guidelines. During this power reduction, a main turbine high vibration leads to a manual reactor scram, turbine trip, and manual Group 1 isolation. PSV 4407 opens on Low Low Set (LLS), but a break in the tailpipe results in drywell pressure and temperature dramatically increasing. Torus Spray valves fail, requiring Emergency Depressurization IAW EOP-2.

Handswitches for PSV 4406, and PSV 4400 fail requiring the opening of non-ADS safety relief valves, or alternate methods to Emergency Depressurize. The crew will vent the torus and/or drywell using EOP Defeat #10.

f. Crew Performance

All operators were graded as satisfactory in their performance during the dynamic simulator scenarios. Strengths and weaknesses of the crews are discussed below.

1. Strengths

Crew communications during dynamic scenarios were good. In most cases the operators used and required others to use repeatbacks in their communications.

Reactor Operator knowledge of EOP entry conditions was good. The reactor operators were quick to identify EOP entry conditions. They also anticipated entry conditions early and ensured the SRO was informed.

2. Weaknesses

The operators' understanding of the HVAC system was lacking. Operators on two of three crews failed to identify that certain valves in the HVAC system had failed to isolate as required on a Group 3 isolation signal. Additionally, SROs on these crews failed to relate the failure of HVAC to isolate as a breach of secondary containment.

The operators had difficulty in recognizing that SBGT was not operating. All three crews initially stated that the SBGT system was operating, even though the SBGT exhaust fan had failed and the remaining flow (caused by reactor building fans) through the system was reduced to approximately 2600 scfm. Minimum flow of SBGT is 4000 scfm.

It is the NRC's expectation that operators would quickly determine a course of action and pursue it when reactor vessel level is decreasing at a rate of approximately ten inches per minute. However, in a scenario with a slowly developing LOCA during refuel operation, two of the three crews were slow to take positive actions to restore reactor water level and allowed level to drop from 250 inches to the low level trip setpoint (170 inches) before positive actions were attempted.

Two of three crews had difficulty in implementing EOP-3 when determining whether a primary system was discharging into secondary containment. These two crews determined that the RHR system was a primary system and followed the incorrect

path in EOP-3. However, during followup questions they stated RHR was not a primary system. This indicates their knowledge in this area was correct but their ability to apply that knowledge was incorrect.

4. Operations, Security, Rad Protection, Other

Overall interaction between the examiners and each of these organizations was good. Specific strengths associated with particular organizations are identified below.

a. Strengths

Shift Technical Advisors (STAs) used during the scenarios were good. The STAs provided all available options to the SRO in charge while maintaining an appropriate big picture view of the plant's conditions.

The security and radiation protection groups presented a professional demeanor while providing plant access to the examiners.

5. Simulator Observations

No simulator discrepancies were identified.

6. Exit Meeting

The exit meeting was held at the Duane Arnold Energy Center training offices on December 10, 1993. Those who attended are listed in Section 2 of this report. The following items were discussed:

- Strengths and weaknesses noted in this report.
- The general modifications made to the examination as a result of the potential for compromising the integrity of the originally proposed examination.

ENCLOSURE 2

REQUALIFICATION PROGRAM EVALUATION REPORT

Facility: Duane Arnold Energy Center

Examiners: R. Doornbos, Chief Examiner, NRC, Region III
D. Shepard, Examiner, NRC, Region III
J. Hanek, Examiner, INEL

Dates of Evaluation: December 6-10, 1993

Areas Evaluated: X Written X Oral X Simulator

Examination Results:

	RO Pass/Fail	SRO Pass/Fail	Total Pass/Fail	Evaluation (S or U)
Written Examination	3/0	5/1	8/1	S
Operating Examination JPMs	3/0	6/0	9/0	S
Simulator	7/0	8/0	15/0	S

Evaluation of facility written examination grading S

Crew Examination Results:

	Crew 1 Pass/Fail	Crew 2 Pass/Fail	Crew 3 Pass/Fail	Evaluation (S or U)
Operating Examination	PASS	PASS	PASS	S

Overall Program Evaluation

Satisfactory

Submitted:
R. Doornbos
Examiner
01/ 7/94

Forwarded:
M. Jordan
Section Chief
01/07/94

Approved:
for M. Ring
Branch Chief
01/ /94