

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos: 50-456, 50-457  
License Nos: NPF-72, NPF-77

Report No: 50-456/99015(DRS); 50-457/99015(DRS)

Licensee: Commonwealth Edison Company

Facility: Braidwood Nuclear Plant, Units 1 and 2

Location: 35100 S. Route 53, Suite 84  
Braceville, IL 60407

Dates: September 27 through October 4, 1999

Inspectors: D. Muller, Operations Branch Inspector  
D. Pelton, Resident Inspector

Approved by: David E. Hills, Chief, Operations Branch  
Division of Reactor Safety

## EXECUTIVE SUMMARY

### Braidwood Nuclear Plant, Units 1 and 2 NRC Inspection Report 50-456/99015(DRS); 50-457/99015(DRS)

This inspection report contains the findings and conclusions regarding the licensed operator requalification training program. The inspection included a review of training and operations procedures; operating examination material; observation and evaluation of licensed operators and licensee evaluators during a requalification operating examination; an assessment of simulator fidelity; and a review of requalification training records. Additionally, observations of control room activities were conducted. The inspectors used the guidance in inspection procedures (IPs) 71001 and 71707.

#### Operations

- Control room operators performed appropriately during the inspectors' observation period in the control room. The inspectors noted appropriate control room staffing levels, appropriate shift turnover activities, adequate crew communications, and adequate operator knowledge of plant status. (Section O1.1)

#### Training

- The inspectors noted that the licensee performed appropriate operator training in response to human performance problems identified in 1998 and 1999. (Section O5.1)
- Overall, the licensee-developed requalification exam materials were satisfactory. However, the inspectors identified two opportunities for improvement associated with the exam materials: the licensee's use of "verify" actions as part of job performance measure (JPM) critical steps that were not critical to the tasks and the absence of specific test items associated with the training conducted on station-observed human performance problems. (Section O5.2)
- The licensee's overall administration of the requalification operating tests was satisfactory. In general, licensee personnel properly administered the examinations, properly evaluated the crews and individuals, and maintained adequate examination security. However, the inspectors identified that the licensee had not established clear expectations or grading policies associated with student response to annunciator alarms during simulator JPMs. (Section O5.3)
- The licensee's remedial training program was satisfactory. The licensee properly removed operators with performance deficiencies from licensed duties, effectively remediated these operators, and properly reevaluated these operators prior to the operators' resumption of licensed duties. (Section O5.5)
- The inspectors concluded that facility operators were in conformance with the medical, watch standing proficiency hours, and training attendance requirements of 10 CFR 55.53. (Section O5.6)

## Report Details

### I. Operations

#### **O1 Conduct of Operations**

##### **O1.1 Main Control Room Observations**

###### **a. Inspection Scope (71707)**

The inspectors observed routine control room operations, performed panel walk-downs and questioned the control room operators on plant status.

###### **b. Observations and Findings**

The inspectors observed the communications and awareness of plant status of control room operators during a two-hour observation period. Both units were at or near full power. Activities observed during the two-hour period included routine maintenance and a shift turnover.

During the observation period, the inspectors noted the following:

- The control room staffing level was appropriate for both units at power. Each unit was staffed by two reactor operators and one senior reactor operator.
- The control room crew's communications were adequate. On one occasion, the inspectors observed an inappropriate three way communication:

The Unit 1 Assistant Nuclear Station Operator (NSO) informed the Unit 1 NSO that a radiation monitor had been placed in bypass. The Unit 1 NSO responded "OK".

This communication was contrary to station communications expectations, which directed the Unit NSO to repeat back that the radiation monitor was in bypass, and directed the Assistant NSO to acknowledge this repeat back.

- The operators were generally aware of plant status. However, when questioned about off-normal conditions, the Unit 1 NSO on two occasions had to review out-of-service records to verify the reasons for current plant alarms.
  - Shift turnover activities were appropriately performed. On-coming plant operators were appropriately informed of plant status, upcoming work activities, and their assignment to the fire brigade.
- ###### **c. Conclusions**

Control room operators performed appropriately during the inspectors' observation period. The inspectors noted appropriate control room staffing levels, appropriate shift

turnover activities, adequate crew communications, and adequate operator knowledge of plant status.

O5.1 Operating History and Operator Training

a. Inspection Scope (71001)

The inspectors reviewed the plant's operating history from January 1998 through September 1999, to determine the nature of human performance problems at the station. The inspectors discussed recent human performance with the NRC resident inspectors and licensee personnel, and reviewed the following documents:

- Licensee Event Reports for 1998 and 1999.
- The current plant issues matrix.
- Selected NRC inspection reports, including reports written by resident inspectors and operator licensing examiners.

b. Observations and Findings

Operating History

Based on a review of the above documents and discussions with NRC and licensee personnel, the inspectors noted four general areas of operator performance problems during 1998 and 1999:

- Main control room formality. The inspectors noted problems in this area based on the observations and findings of the NRC resident inspectors. Examples of resident inspector observations included the use of slang, inappropriate three leg communications, and other instances of a lack of main control room formality.
- Configuration control. The inspectors noted problems in this area based on multiple incorrect switch positions, incorrect valve positions, errors with placing or removing out of service cards, and a January 1998 Unit 2 trip during maintenance on the electro-hydraulic control (EHC) system.
- Operator awareness of plant status. The inspectors noted problems in this area during the January 1998 Unit 2 trip during EHC maintenance, and during a February 1998 event, where the Unit 2 boron dilution prevention system (BDPS) inadvertently remained in the "blocked" position.
- Supervisory oversight of plant activities. The inspectors noted problems in this area during the January 1998 Unit 2 trip during EHC maintenance, the February 1998 BDPS event, a July 1998 event, where a senior reactor operator was not present in the control room, and a May 1998 event, where plant supervisors did not identify low battery specific gravity.

### Operator Training

The licensee conducted training on station events throughout 1998 and 1999, as a part of the station's ongoing efforts to reduce human performance errors. The licensee typically trained on station and industry events as a part of each six-week training cycle, during operating experience and lessons learned training sessions. In addition, the licensee responded to human performance problems with appropriate "focus areas" during the training cycles.

#### c. Conclusions

The inspectors noted that the licensee performed appropriate operator training in response to human performance problems identified in 1998 and 1999.

### O5.2 Regualification Examination Materials

#### a. Inspection Scope (71001)

Using NRC inspection procedure (IP) 71001, the inspectors reviewed a sampling of the following 1999 requalification exam materials for repetition, quality and content:

- Examination sample plan,
- Training topical schedules,
- Job Performance Measures (JPMs),
- Dynamic simulator scenarios, and
- Written examinations.

#### b. Observations and Findings

The licensee administered the 1999 requalification exam over a roughly twelve week period (two training cycles). During each week, a different crew of operators received a portion of their overall exam. During the first six week cycle the licensee administered the written portion of the exam, and during the second six week cycle the licensee administered the JPMs and simulator scenarios.

### Overall Examination Content

The inspectors determined that, for the most part, the examination sample plan and the associated examination materials accurately reflected the content of the requalification training received. However, the inspectors determined that although the sample plan properly included training items related to the four previously discussed operator performance problems (see section O5.1), the associated exam materials contained no exam items specifically targeted to these performance problems. In particular, the

inspectors determined that the licensee missed an opportunity to develop test items associated with configuration control.

The inspectors determined that the repetition between exam weeks was low. Only three written questions, six JPMs, and three simulator scenarios were used during more than one exam week.

#### Job Performance Measures (JPMs)

The inspectors determined that the licensee-developed JPM guides satisfied the quality assurance checklist items of IP 71001. In particular, each JPM guide that the inspectors reviewed contained the following: a reference to the facility's task analysis, initial conditions, cues, procedure references, specific performance standards, indications of critical steps, validated performance times, and success criteria. However, the inspectors identified the following problems with the JPM guides reviewed:

- JPM guide N-33, "Local Shutdown of the B Auxiliary Feedwater (AFW) Pump," contained two erroneous performance standards. Steps 2 and 3 of the JPM guide incorrectly stated that the operator was expected to place local control switches to start, when in fact these switches were already in the start position as a part of the initial conditions. This appeared to be an isolated problem.
- Four of the thirteen JPM guides reviewed contained checking for proper response actions ("verify" actions) as part of a critical step (JPMs N-11, N-19, N-02, and N-35). The inspectors noted that if these "verify" actions were not performed (and the system responded correctly), the JPM tasks could still be successfully completed, and therefore these portions of the actions were not critical to the tasks.

The licensee corrected the inspector identified problem with JPM guide N-33, and the licensee planned to review their JPM bank for the appropriate selection of critical steps.

#### Dynamic Simulator Scenarios

The inspectors determined that the licensee-developed simulator scenario guides satisfied the quality assurance checklist items of IP 71001. In particular, each scenario guide that the inspectors reviewed contained the following: the point in the scenario when malfunctions were initiated, symptoms and cues that were visible to the students, expected operator actions, and references to facility task numbers and to 10 CFR 55.45 operating test items. In addition, the inspectors determined that the scenarios contained an adequate number of malfunctions, typically consisted of related events, and appeared to be an effective tool for evaluating crew and individual operator performance.

## Written Examinations

The licensee developed two-part written exams to evaluate licensed operators. One part of each exam was a 20-question classroom-oriented exam, and the other part of each exam was a 20-question simulator static exam. Both parts of the exams were open reference. The inspectors determined that the written exams reviewed contained an appropriate number of higher knowledge level questions and that the exams appeared to be challenging. The inspectors determined that questions on both the classroom-oriented exam and the simulator static exam satisfied the quality assurance checklist items of IP 71001. In particular, the inspectors noted the following regarding the sample of written exam questions reviewed: the questions were linked to job performance, the questions were operationally oriented, the questions appeared to be able to discriminate between safe and unsafe operators, the questions were clear and easy to understand, the simulator static questions took advantage of the simulator setup, and the questions were appropriate to an open reference exam.

### c. Conclusions

Overall, the licensee-developed requalification exam materials were satisfactory. However, the inspectors identified two opportunities for improvement associated with the exam materials: the licensee's use of "verify" actions as part of JPM critical steps that were not critical to the tasks and the absence of specific test items associated with the training conducted on station-observed human performance problems

## O5.3 Requalification Examination Administration Practices

### a. Inspection Scope (71001)

The inspectors observed the licensee's administration of JPMs and simulator scenarios during a portion of the 1999 requalification examination. In addition, during the 1999 requalification examination, the inspectors observed the licensee's examination security practices and simulator fidelity.

### b. Observations and Findings

#### JPM Administration

During the administration of the JPMs, the inspectors observed that the licensee JPM evaluators properly read the initial conditions and cues, followed the JPM guides, closely observed student performance, and noted student actions. In general, the inspectors agreed with the administration practices and the pass/fail determinations of the licensee JPM evaluators.

However, the inspectors identified a lack of consistency associated with how the students were expected to respond to annunciator alarms during the simulator JPMs. During one simulator JPM, a student was observed announcing expected alarms and expected alarm resets. However, during two other simulator JPMs, with two different JPM evaluators, the students did not communicate expected alarms and resets. The

fact the students did not announce alarms and resets was not documented by the JPM evaluators on the student evaluation forms. Discussions with licensee management indicated that the licensee did not have clear expectations or grading policies associated with student annunciator response during simulator JPMs.

#### Dynamic Simulator Scenario Administration

The inspectors observed five simulator scenarios conducted by the licensee. One crew of licensed operators performed two scenarios, and a second crew of operators performed three scenarios. Each crew consisted of a shift manager, unit supervisor, two NSOs and a shift technical advisor. Operators were assigned different crew positions during different scenarios. The licensee utilized a three-person crew evaluation team, which consisted of senior operations personnel and training personnel.

During the administration of the simulator scenarios, the inspectors noted that the crew evaluation team closely monitored and recorded student actions, and properly implemented the performance standards contained in the simulator guides and plant operating procedures. When the evaluation team needed more information concerning students' actions, the evaluation team asked follow up questions to the students, reviewed simulator data, and attempted to recreate the student actions utilizing the simulator's backtrack function. During one scenario, a crew prematurely tripped the reactor, such that the crew was not evaluated on certain planned malfunctions. The licensee's crew evaluation team conservatively decided to have this crew perform a third scenario, such that the crew could be evaluated on additional malfunctions.

Following the completion of each scenario, the evaluation team discussed crew performance, including critical task completion and other performance observations. These discussions were then documented on crew and individual performance grade sheets. Following the completion of each crews' simulator dynamic exam, the evaluation team debriefed the crews on their performance. During these debriefs, the crews were informed of individual and crew pass/fail decisions, critical task completion, and any other performance comments. In general, the inspectors agreed with the performance observations and pass/fail decisions of the evaluation team. Additionally, the inspectors determined that the crew debriefs were effective at communicating the crews' performance.

#### Examination Security Practices

The inspectors determined that examination integrity was enhanced due to the low repetition of exam items from week to week. During the administration of the JPMs and simulator scenarios, the inspectors observed no incidents of exam compromise.

#### Simulator Fidelity

During the simulator scenario portion of the examination, the inspectors observed two incidents of apparent improper simulator performance. The first incident was that "C" steam generator pressure did not drop to zero, even though there was an unisolable



steam leak on the steam generator, the steam generator had boiled dry, and there was no feed flow to the steam generator. The second incident was that the "A" auxiliary feedwater pump failed to start, although it appeared that the pump had been given a valid manual start signal. These two incidents were also identified by the licensee, who initiated simulator work requests. These two incidents are also discussed on the attached simulator fidelity report.

c. Conclusions

The licensee's overall administration of the requalification operating tests was satisfactory. In general, licensee personnel properly administered the examinations, properly evaluated the crews and individuals, and maintained adequate examination security. However, the inspectors identified that the licensee had not established clear expectations or grading policies associated with student response to annunciator alarms during simulator JPMs.

O5.4 Requalification Training Program Feedback

a. Inspection Scope (71001)

The inspectors discussed the requalification training feedback process with licensee training personnel, and reviewed the following documents:

- Procedure CWPI-NSP-TQ-1-6, "Licensed Operator Requalification Training Program," issued June 21, 1999.
- Procedure NSP-TQ-1000, "Systematic Training Process Description," issued December 18, 1997.
- Student and Manager evaluations of training sessions.
- Licensee self-assessments of the training program.

b. Observations and Findings

As previously discussed in Section O5.1, "Operating History and Operator Training," the inspectors determined that the licensee performed appropriate operator training in response to human performance problems.

The inspectors observed the following regarding the licensee's processes for other sources of training feedback:

- The content of the training evaluation forms was good. The forms contained ample space for written comments, and the forms contained a sufficiently detailed list of training evaluation criteria.
- Although the content of the forms was good, the students did not consistently fill out the forms completely. Numerous forms filled out by the students did not

indicate the names of the instructors, and many forms did not indicate the area evaluation scores.

- In general, the licensee appropriately reviewed, summarized, and evaluated for further action student and manager training evaluation comments.
- The licensee-conducted training self assessments were performed in a rigorous and critical manner. The licensee properly incorporated the findings from the self assessments into the training program.

c. Conclusions

The licensee's use of training feedback was appropriate. The licensee properly incorporated into the training program insights from station events, findings from training self assessments, and the training comments from students and station managers. However, the inspectors identified that the students did not consistently fill out the training critique forms completely for the licensee's training feedback system.

O5.5 Remedial Training Program

a. Inspection Scope (71001)

The inspectors performed the following to assess the licensee's remedial training program effectiveness:

- Reviewed five individual operator and three crew performance evaluations that documented failures or the need for improvement along with the associated remediation packages.
- Interviewed licensee personnel (licensed operators, instructors/evaluators, and supervisors).
- Reviewed procedure CWPI-NSP-TQ-1-6, "Licensed Operator Requalification Training Program," issued June 21, 1999.

b. Observations and Findings

The inspectors determined that the licensee's licensed operator requalification training procedure, CWPI-NSP-TQ-1-6, appropriately contained the requirements for the remediation program. Based on a review of individual and crew performance weaknesses, the inspectors determined that the licensee had identified the root causes and developed appropriate remedial training plans. The inspectors determined that the licensee had required successful completion of the remedial training, which included a reevaluation, prior to affected individuals or crews resuming licensed duties.

c. Conclusions

The licensee's remedial training program was satisfactory. The licensee properly removed operators with performance deficiencies from licensed duties, effectively remediated these operators, and properly reevaluated these operators prior to the operators' resumption of licensed duties.

O5.6 Conformance With Operator License Conditions

a. Inspection Scope (71001)

To assess the licensee's conformance with the operator license conditions contained in 10 CFR 55.53, the inspectors reviewed the past two years of records associated with the following documents:

- A sampling of licensed operator medical records.
- Operator proficiency log records, which indicated the watch standing hours for licensed operators at the facility.
- Requalification training attendance records.

b. Observations and Findings

Based on a review of the above documents and discussions with licensee personnel, the inspectors determined the following:

- The medical records reviewed satisfied the requirements of 10 CFR 55.53. Specifically, medical examinations for the operators sampled were conducted at no greater than two year intervals, and license restrictions (e.g., corrective lenses) corresponded with the operators' medical conditions (e.g, uncorrected 20/60 vision).
- Operator watch standing hours satisfied the requirements of 10 CFR 55.53. The inspectors determined that active licensed operators properly maintained their licenses active, and inactive licensed operators performed the proper under-instruction watch standing prior to performing active licensed duties.
- Licensed operator requalification training attendance satisfied the requirements of 10 CFR 55.53. The inspectors determined that when scheduled training was missed, operators attended appropriate make-up training in a timely fashion.

c. Conclusions

The inspectors concluded that facility operators were in conformance with the medical, watch standing hours, and training attendance requirements of 10 CFR 55.53.

## **O8 Miscellaneous Operations Issues**

### **O8.1 Timeliness of Operator Actions in Regard to Mitigating a Steam Generator Tube Rupture (SGTR)**

#### **a. Inspection Scope (92700)**

The inspectors reviewed actions taken by the licensee in regard to problems noted at Byron Station related to untimely operator actions in mitigating a SGTR during simulator training scenarios. The inspectors also reviewed the Braidwood/Byron Updated Final Safety Analysis Report (UFSAR), Chapter 15. The inspectors observed the performance of two simulator scenarios which required operators to respond to a SGTR. The inspectors discussed actions taken by the licensee in regard to a SGTR with training department and operations department personnel.

#### **b. Observations and Findings**

The Braidwood/Byron UFSAR, Chapter 15.6.3, discussed critical operator actions for which timely completion is necessary to prevent ruptured steam generator (SG) overfill during a SGTR. These actions and times were 11 minutes to isolate the ruptured SG and 31 minutes to complete all other mitigation actions. During a training simulator scenario, operators at Byron Station had not met these time requirements.

The inspectors determined that the licensee reviewed the circumstances surrounding the above issue in a timely manner and provided classroom training to all licensed operators concerning SGTR mitigation including problems noted with operator action timeliness. The inspectors also determined that as of the date of this inspection, the licensee provided approximately 80 percent of their licensed operators with simulator training involving a SGTR. The inspectors determined that the remaining 20 percent of licensed operators were scheduled to receive the simulator training in the near future.

The licensee timed operator actions during SGTR simulator scenarios and determined that operators could respond within the times specified in the UFSAR, Chapter 15. The inspectors reviewed the documented operator response times and observed two simulator scenarios which required operators to respond to a SGTR. The inspectors confirmed that operators took actions to mitigate the SGTR within the times specified in the UFSAR. The licensee planned to check operator proficiency and operator response times for SGTR scenarios about once every two years.

#### **c. Conclusions**

The licensee took timely action and provided necessary training to licensed operators in regard to a Byron Station identified issue involving untimely operator actions during a training scenario involving a steam generator tube rupture. The inspectors determined that Braidwood station operators could respond in a timely fashion to a steam generator tube rupture, and that the licensee had plans in place to ensure that in the future, operators could respond in a timely fashion.

## II. Engineering

### **E8 Miscellaneous Engineering Issues (92902)**

- E8.1 (Closed) Inspection Follow-up Item (IFI) 50-456/98201-22:** "Licensee Identified Inconsistencies Between a Braidwood Emergency Operating Procedure (EOP) Setpoint Basis Document and Braidwood EOPs." In March and April of 1998, a design inspection was performed at Braidwood Station by personnel from the NRC Office of Nuclear Reactor Regulation. In preparation for this inspection, the licensee performed a self-assessment and identified that an appropriate calculation did not exist to provide a basis for the containment water level value necessary to switch the suction source for the emergency core cooling system from the refueling water storage tank to the containment sump during a large break loss of cooling accident (LOCA). The licensee also identified that the checking of the containment sump level lights in step 10 b. of Braidwood Contingency Action Procedure BwCA-1.1, "Loss of Emergency Coolant Recirculation," would not provide reliable indication of post-LOCA containment water level, because the associated instrumentation was not environmentally qualified. The inspectors determined that the licensee entered the above issues into their corrective action program and tracked the issues via action tracking number 15316. The inspectors determined that the licensee developed calculation NED-I-EIC-0082 which provided a basis for post-LOCA containment floor water level. The licensee also developed calculation BRW-99-0017-I which documented the basis for all EOP setpoints. The inspectors determined that the affected EOPs were updated consistent with this calculation. Finally, the inspectors determined that the licensee established a tie between BRW-99-0017-I and the associated EOPs, such that revisions made to one would be evaluated for impact on the other. This item is closed.

## III. Management Meetings

### **X1 Exit Meeting Summary**

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on October 4, 1999. The licensee acknowledged the findings presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

## PARTIAL LIST OF PERSONS CONTACTED

### Licensee

M. Cassidy, Regulatory Assurance - NRC Coordinator  
F. Cerovac, Operations Training Superintendent  
R. Coon, Training Manager  
C. Dunn, Operations Manager  
D. Myers, Requalification Training Lead Instructor  
M. Riegel, Braidwood Nuclear Oversight Manager  
K. Schwartz, Station Manager  
T. Simpkin, Regulatory Assurance Manager

### NRC

D. Hills, Chief, Operations Branch  
C. Phillips, Senior Resident Inspector

## INSPECTION PROCEDURES USED

IP 71707: Plant Operations  
IP 71001: Licensed Operator Requalification Program Evaluation  
IP 92902: Followup - Engineering

## ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened

None

### Closed

50-456/98201-22      IFI      Containment Water Level Calculations and EOP Setpoints

### Discussed

None

## LIST OF ACRONYMS USED

AFW	Auxiliary Feedwater
BDPS	Boron Dilution Prevention System
BwCA	Braidwood Contingency Action
CFR	Code of Federal Regulations
CWPI	Common Work Practice Instruction
DRS	Division of Reactor Safety
EHC	Electro-Hydraulic Control
EOP	Emergency Operating Procedure
IFI	Inspection Followup Item
IP	Inspection Procedure
JPM	Job Performance Measure
LER	Licensee Event Report
LOCA	Loss of Coolant Accident
NSO	Nuclear Station Operator
NSP	Nuclear Station Procedure
NRC	Nuclear Regulatory Commission
SG	Steam Generator
SGTR	Steam Generator Tube Rupture
UFSAR	Updated Final Safety Analysis Report

## SIMULATION FACILITY REPORT

Facility Licensee: Braidwood Station

Facility Licensee Docket No.: 50-456; 50-457

Operating Tests Observed: September 29 - October 1, 1999

This form is to be used only to report observations. These observations do not constitute audit or inspection findings and are not, without further verification and review, indicative of noncompliance with 10 CFR 55.45(b). These observations do not affect NRC certification or approval of the simulation facility other than to provide information that may be used in future evaluations. No licensee action is required in response to these observations.

While conducting the simulator portion of the operating tests, the following item was observed:

ITEM	DESCRIPTION
1.	"C" steam generator pressure did not drop to zero, even though there was an unisolable steam leak on the steam generator, the steam generator had boiled dry, and there was no feed flow to the steam generator.
2.	"A" auxiliary feedwater pump failed to start, although it appeared that the operator had performed a valid manual start with the start switch.