

APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Inspection Report: 50-285/92-17

Operating License: DPR-40

Licensee: Omaha Public Power District  
444 South 16th Street Mall  
Omaha, Nebraska 68102-2247

Facility Name: Fort Calhoun Station (FCS)

Inspection At: FCS Site, Fort Calhoun, Nebraska


Inspection Conducted: August 10-14, 1992

Inspectors: T. O. McKernon, Reactor Inspector, Operational  
Programs Section, Division of Reactor Safety

D. R. Hunter, Senior Reactor Inspector, Operational  
Programs Section, Division of Reactor Safety

L. Ostrom, Human Factors Specialist, Consultant

Approved:

  
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T. F. Stetka, Chief, Operational Programs  
Section, Division of Reactor Safety,

9/1/92  
Date

Inspection Summary

Areas Inspected: Routine, announced followup inspection of the FCS emergency operating procedures (EOPs) upgrade program and procedures. The inspection also included the review of corrective actions taken by the licensee for previously identified inspection findings.

Results:

- The inspectors observed a significant improvement in the FCS EOPs that included the abnormal operating procedures (AOPs). The procedures were well organized, logical, and provided effective transitions to other procedures and attachments (paragraph 1.1).

- While some minor discrepancies were noted, the EOPs and AOPs, the operators knowledge and skills, and the labeling of plant equipment were considered strengths (paragraphs 1.1-1.3).
- The licensee has established good measures for EOP/AOP configuration control, maintenance of the procedures, and training on the procedures (paragraph 1.4).
- The plant housekeeping and cleanliness were well maintained (paragraph 1.5).

Summary of Inspection Findings:

Inspection Followup Items 285/9014-02, 285/9020-02, 285/9027-01, 285/9036-04, and 285/9036-05 and Violation 285/9020-01 were closed (paragraph 2).

Attachments:

- Attachment 1 - Persons Contacted and Exit Meeting
- Attachment 2 - Documents Reviewed

## DETAILS

### 1 EMERGENCY OPERATING PROCEDURES (EOPs) (IP 42001)

#### 1.1 Review of EOPs and Supporting Procedures

The inspectors conducted a human factors review of the EOPs to ascertain whether needed corrective actions to the prior procedures had been accomplished. In order to perform this evaluation, the inspectors reviewed the EOPs and Abnormal Operating Procedures (AOPs), the EOP/AOP Writer's Guide, the EOP/AOP User's Guide, and the technical basis documents (TBDs). The procedures were reviewed to ascertain conformance with the Combustion Engineering Operating Procedures Guidelines, CEN-152, Revision 03, and NUREGs 0899 and 1358.

The EOP/AOP Writer's Guide provided guidance on the EOPs and AOPs structure, style and general appearance, content and format, and the preparation of flowcharts. Within these topic areas further guidance was given for writing instruction and contingency action statements, the accepted use of logic syntax, cautions and notes, and the evaluation of action item prioritizing. Further, the procedure addressed the use of exit conditions, safety function status checks, resource assessment trees as well as floating steps and diagnostic actions.

During the review of the writer's guide, a minor discrepancy was noted in that no guidance on how to draw the symbols used in the resource assessment trees was provided. However, the assessment trees were clear, concise, and consistent with engineering drawings. The lack of such guidance and the use of a mechanism to ensure consistency in future resource assessment trees was discussed with the licensee. Some other minor discrepancies noted were: the acronym "EFPY" was not included in the acronym and abbreviation list; the word "lost" was not on the adjective list, and the words "jeopardy" and "pursued" were not defined in the writer's guide. These minor discrepancies were also discussed with the licensee. Discussions with the operators verified that they understood the meaning of these terms. Overall, the writer's guide appeared to provide sufficient direction to enable the EOP and AOP writers to write procedures that were complete in content and consistent in format to assure the procedures were readable, understandable, and usable by control room and in-plant operators.

The EOP/AOP User's Guide provided instructions to the operators on the use of the new procedures. The guide discussed the principles of the EOPs and AOPs, their organization, format, and usage. Further, the guide provided instructions on placekeeping, logic term usage, branching and referencing techniques, exit conditions, and others. The user's guide also included a list of acronyms and abbreviations used in the EOPs and AOPs as well as a preferred verb list. The guide appeared to provide the users a good reference tool.

The FCS EOP and AOP verification and validation (V&V) guidelines were incorporated into the EOP/AOP Generation Program Procedure SO-G-74, Revision 5. It included the V&V criteria to be met to ensure that procedure generation, review, and revision was in accordance with the guidelines established in NUREG-0800, "Standard Review Plan," and NUREG-0899, "Guidelines for the Preparation of Emergency Operating Procedures." This procedure applied to the V&V program of the EOPs and AOPs as well as the TBDs. It was noted that the V&V process included checklists for the verification of the EOPs and AOPs against the writer's guide, the source documents, and plant hardware. Additionally, the validation checklists covered table-top reviews, plant walkthroughs, and simulator usage. The checklists also incorporated human factors criteria and attributes.

The inspectors also reviewed a sample of EOPs and AOPs for technical adequacy and operational correctness. The sampled procedures were reviewed against the licensee's TBD, which consisted of the FCS-specific technical guidelines, the incorporated setpoints, and the applicable deviation documentation. The TBD compared the FCS EOPs with the vendor's CEN-152 emergency procedures guidelines (EPGs) and provided justifications where deviations were warranted. The review included EOPs-00, -01, -04, -07; the functional recovery guidelines (FRGs); and a limited number of AOPs. The review verified that the procedures were technically adequate and could be performed by the operators. The procedures accurately incorporated the vendor's generic guidelines and provided adequate justification for deviations taken from the guidelines as a result of the plant-specific design. All discrepancies identified during this review appeared to be minor and were quickly resolved by the licensee.

## 1.2 Use of EOPs and Supporting Procedures

The inspectors walked down EOPs-00, -04, -07 (Attachments 6 and 12), -20 (HR-3 and HR-4), AOPs-06, -07, -30 with licensed or non-licensed operators as appropriate.

The walkdowns were performed to verify that the EOPs and AOPs could be physically and correctly performed inside and outside the control room. In all instances, the procedures appeared satisfactory in structure, accuracy, and in the incorporation of human factors attributes. Only a few minor discrepancies were observed. For example, AOP-30 did not address local operator actions required to fill the emergency feedwater storage tank. This could be accomplished using the diesel driven auxiliary feedwater pump (FW-54). It was noted that under control room evacuation conditions the procedure did not specify local operation of FW-54. Interviews with operators indicated that the operators were knowledgeable about the local operation of FW-54 under the contingency conditions. Further, the operators indicated that instruction for the local operation of FW-54 was included in Operating Instruction OI-AFW-4, "Auxiliary Feedwater Startup and System Normal Operations." When informed of this omission, the licensee took prompt action by issuing a procedure change request and an internal memorandum to immediately bring the matter to the attention of the operators.



Another discrepancy noted during the walkdowns included mislabeling of plant components. During a walkdown of AOP-06, Attachment II and the EOP-20, MVA-DC section, it was noted that the procedures called for use of Battery 2 in Battery Room 2. However, the door to this battery room was labeled as Room 55, West Battery Room. Similarly, Battery Room 1 was labeled as Room 54, East Battery Room. It was also noted that the only labeling indicating the battery room number was on the demineralized water lines inside each of the battery rooms. It was observed that the operators did not have any problems in locating the equipment.

A third discrepancy involved Section 5, Step 26, of EOP-04. This procedure ensured that adequate shutdown margin existed and required that the shift chemist sample the reactor coolant system (RCS) periodically for boron dilution. This step was considered important since the maximum allowed pressure difference between the RCS and the most affected steam generator was 50 psi. The term "periodically" did not provide a definitive time period. However, it was noted that the shift technical adviser was required to perform safety function checks every 10 minutes and that a check of reactivity control would reflect whether adequate shutdown margin existed.

The location of the EOPs and AOPs in the control room was clearly defined, accessible, and the current revision of the procedures was in place. The procedures were also in excellent shape with no missing pages, and were contained in distinctive binders. Placekeeping ribbons were attached to the binders and placekeeping sheets were placed in the front of the procedures. Labeling of control board components was consistent with the procedures.

The inspectors concluded from the walkdowns that the EOPs and AOPs could be performed by the operators. The procedures were structured so that the operators did not have to travel long distances to accomplish the procedure steps and the steps could be performed in a timely manner. The minor discrepancies noted did not pose any obstacles to the operators performing the steps.

### 1.3 Knowledge and Performance of Duties

The inspectors assessed the operators' knowledge and performance in the execution of the EOPs to verify that the licensed and non-licensed operating staff were aware of and understood all significant changes to the EOPs.

One part of the assessment involved the evaluation of the operators during simulator scenarios. The first simulator scenario included malfunctions to simulate a station blackout with a concurrent loss of all feedwater and an intersystem loss of coolant accident. The second scenario simulated a loss of main feedwater with a steam generator tube leak. In both cases, the operators demonstrated good knowledge of the new EOPs, the procedures appeared to be useable, and the operators demonstrated good communication skills. The simulator scenarios also demonstrated that the placekeepers were effective. During the scenarios when multiple failures compounded the event, the crew effectively branched to the functional recovery group procedures and mitigated the events expediently. The operating crew

consistently displayed a questioning attitude, correctly diagnosed events or conditions, and entered the correct procedures.

During the EOP walkdowns, licensed operators were able to quickly locate controls and affected indications. They demonstrated a good ability to explain the proper manipulation of controls and the expected instrumentation response. The operators were also familiar with local action steps used by the EOPs and AOPs and were able to explain local instrumentation and alternate success paths if needed.

Based on the walkdowns and simulator evaluations, the inspectors determined that the EOPs and AOPs could be physically and correctly performed. The operators appeared knowledgeable of the new EOPs and communicated well.

#### 1.4 Review of Licensee EOP Programmatic Controls

This portion of the inspection involved the assessment of the licensee's administrative procedures to ascertain whether changes to the EOPs were adequately controlled and to assess the licensee's self-assessment and maintenance of the EOPs.

The inspectors reviewed Standing Order Procedure SO-G-74, "FCS EOP/AOP Generation Program." The procedure addressed the development of the EOPs, their V&V, and the EOP training and maintenance program. It was noted that the procedure provided for an ongoing revision process whereby operators could submit proposed changes to the EOP coordinator. The EOP coordinator in conjunction with other affected departments reviewed the proposed change and rejected or accepted the item for incorporation. The EOP coordinator would ensure the proposed changes were entered into a data base and tracked. The proposed changes were then dispositioned based upon priority (i.e., whether or not the change should be implemented immediately or not). The EOP and AOP plant review subcommittee would then review the proposed revisions and make recommendations for revision approval to the plant review committee. The EOP and AOP revisions would then be approved and implemented in accordance with Standing Order G-30, "Setpoint/Procedure Change and Generation." To ensure that the revisions to the procedure were captured in all other applicable procedures and consistency was maintained, a computer-based word search would be made.

In addition to the EOP revision process discussed above, SO-G-74 provided guidance on training requirements for new and revised EOPs and AOPs. Training on new EOPs included classroom presentations and discussions, simulator instruction and walkthroughs, and examinations, if appropriate. Training on revisions to EOPs and AOPs depended upon whether the change affected the intent of the procedure. If the change affected the procedure intent, an accelerated training schedule was implemented. Otherwise, training on revisions was scheduled into the next requalification training class.

Further, a review of training records indicated that all licensed operators had received training on the new EOPs and the majority of prioritized AOPs.

This training was completed as of July 1, 1992, and involved simulator training on various simulator scenarios to include minimum shift complement conditions. The licensee also conducted human factors training for those personnel involved in the EOP and AOP upgrade. The personnel selected for the training were from multi-disciplined backgrounds so that each could lend their expertise to writing and reviewing the procedures.

The SO-G-74 procedure provided guidance for the V&V process. The procedure provided for the V&V of the EOPs and AOPs by a multi-disciplinary evaluation team appointed based upon their operating expertise, knowledge of plant hardware, the EPGs, TBDs, and the writer's guide. The verification process was further divided into an assessment phase, resolution, and documentation phase. The tracking of discrepancies found during the verification process was accomplished on a number of different forms dependent upon the discrepancy classification (e.g., Form FC-1221 was used for verification of written correctness and technical accuracy). The inspectors noted that all V&V forms for the new EOPs had been retained as quality assurance records. The verification program also included the upgraded TBDs. The inspectors reviewed a sampling of forms, which documented differences between the vendor's EPG and the EOPs and provided justification for significant deviations. The forms appeared to accurately evaluate the technical differences between the FCS EOPs and the EPGs establishing the background information for the TBDs.

The validation program's objective was to determine if the control operators could manage emergency conditions in the plant using the EOPs and AOPs. The validation process evaluated whether the EOPs and AOPs were compatible with plant responses, hardware, and shift manning levels. The process also evaluated whether the procedures could be followed with a minimum amount of delay, confusion, and error; whether a direct correspondence between controls and instrumentation existed; and whether the procedure successfully guided the operators to mitigate the transient. This validation process was accomplished through use of the plant specific simulator, walkthroughs of the procedures, and table-top reviews. Similar to the verification process, discrepancies identified during the validation process were documented, reviewed, assessed, and resolved. A review of a sampling of the validation discrepancy forms verified that a systematic approach to validation was implemented. The licensee's validation process also included task analyses and information control characteristics reviews. This area of validation ensured that operators could perform post-accident local area actions.

In the review of the licensee's V&V of the new EOPs, the inspectors observed that in some instances the EOPs were validated using a limited number of simulator scenarios. For example, Procedures HR-3 and HR-4 of EOP-20 (functional recovery guidelines) had been validated using only scenarios of a steam generator tube rupture (SGTR) and a loss of coolant accident concurrent with the loss of one vital electrical bus. However, the STGR event, with a duration of 30 minutes concurrent with the assumed loss of one vital electrical bus and the total loss of instrument air, had not been specifically validated. Since the purpose of the functional recovery guidelines was to mitigate multiple failure type events, the inspectors



considered the use of only a few scenarios in validating these procedures as limiting. The use of varied and numerous types of scenarios in the licensee's ongoing EOP and AOP evaluation process and licensed operator training was discussed with the licensee. The licensee acknowledged the inspectors' observations and stated that additional multiple failure type scenarios were being considered during future training and validation exercises.

The inspectors concluded that the licensee's program for revising EOPs and AOPs provided satisfactory controls to ensure changes were made in a systematic manner, implemented expeditiously when required, and provided for required training.

## 1.5 Conclusions

The licensee's staff appeared knowledgeable of the EOPs and AOPs and how to implement them correctly. The inspectors considered the overall EOPs and AOPs and their development process to be a strength. The procedures were well organized, logical, and contained clear transitions to attachments and other procedures. Plant equipment labeling, plant housekeeping and cleanliness were also considered strengths.

## 2 FOLLOWUP

### 2.1 FOLLOWUP TO PREVIOUSLY IDENTIFIED INSPECTION FINDINGS (IP 92701)

#### 2.1.1 (Closed) Inspection Followup Item 285/9014-02: Quality Assurance (QA) Involvement in the EOP and AOP Program

This item related to a concern of limited involvement by the QA group in the EOP and AOP procedure upgrade program.

Document reviews and personnel interviews revealed that the licensee QA group completed specific activities associated with the EOP and AOP program including two audits, July 1990 and April through June 1991. Additionally, five surveillances were conducted between January 1991 and July 1992. The inspectors reviewed the audit and surveillance reports for scope, content, findings, and corrective actions. The inspectors had no further concerns regarding this item.

#### 2.1.2 (Closed) Inspection Followup Item 285/9027-01: Verification of Flexible Hose Replacement and Relocation of the Sample Collection Point to the Bottom of the Fuel Oil Day Tank

This item involved an observation that the licensee had not established a program for periodically inspecting the hoses for degradation. The observation also noted that the sample connection was at the sight glass in lieu of the bottom of the day tank so that detection of moisture in the fuel could be made.



During this inspection, it was verified that the licensee had established a program for periodic inspection of the flexible hoses under preventive maintenance order PMO No. WPOC5636 for both diesel generators. In addition, it was noted that the licensee revised the Chemistry Manual Procedure CMP-2.7, Revision 3, "Fuel Oil Storage Vessel Sampling," to require sampling from a lower point below the auxiliary day tank (i.e., from valves on the diesel generator base tanks, FO-127 and FO-114). This action would allow for detecting potential moisture in the fuel oil.

2.1.3 (Closed) Inspection Followup Item 285/9036-04: Licensee's Evaluation of Standing Order Procedure O-25 and Plant Walkdown Findings

This item involved the concern regarding control of equipment drain hoses as temporary modifications.

The licensee's review and evaluation of this issue concluded that equipment drain hoses are not modifications. The licensee had included temporary hoses into the temporary modification procedure by stating that temporary hoses connected from system drains to floor drains did not require documentation under temporary modification procedure SO-0-25. It was further noted that the licensee's plant walkdown verified that existing equipment drain hoses/tubing did not adversely impact safety systems or interfere with operations.

2.1.4 (Closed) Inspection Followup Item 285/9036-05: Plant Systems Response During a Reactor Trip on November 19, 1990

This item involved the review of the response of plant systems by the licensee during the November 19, 1990, reactor trip resulting from a loss of instrument air pressure.

Document reviews and interviews revealed that the event was reviewed by the licensee in accordance with procedure Standing Order No. O-46, Revision 0, "Post Trip Reviews." The post-trip review information addressed the items such as main feedwater controls and erratic letdown system flow rates. The licensee determined that the problems which occurred during the transient were directly attributable to the loss of instrument air pressure and no abnormalities were identified. The post-trip review and evaluation were reviewed by the plant review committee and the plant manager prior to the next plant startup. The review of this item by the inspector revealed no deficiencies.

2.1.5 (Closed) Inspection Followup Item 285/9020-02: Formalization of the Basis/Deviation Document into a controlled and current document

This item involved the formalization of the TBD into a controlled document upgraded to the current vendor EPGs.

During the inspection, the inspectors verified that the licensee had formalized the TBD into a controlled and current procedure. The TBD was

issued April 30, 1992, and consisted of TBDs for the seven major accidents and associated EOPs, which were implemented after the standard post trip actions were performed and the event appropriately diagnosed. The TBDs also covered the functional recovery group procedures. The inspectors also reviewed associated V&V documents related to the TBDs and found them to be technically accurate and comprehensive.

## 2.2 Followup to Violations (IP 92702)

### 2.2.1 (Closed) Violation 285/9020-01: Failure to Establish and Maintain Appropriate Plant Procedures

This violation involved the licensee's failure to establish and maintain appropriate EOPs and AOPs. The violation was characterized by such examples as V&Vs to EOPs and AOPs did not include adequate walkdowns outside the control room and were not effectively verified against the writer's guide. Further, the EOPs and AOPs contained multiple examples of incorrectly used logic statements and no system of configuration management existed such that changes made to a procedure were adequately reflected in all other applicable procedures.

During the inspection, the inspectors verified that the licensee had taken those corrective actions delineated in OPPD letters LIC-90-0916, dated December 19, 1990; LIC-90-0737 dated October 1, 1990; and LIC-91-039R dated January 30, 1991. These corrective actions included: the appointment of an EOP and AOP coordinator under direct supervision of the operations supervisor and establishment of a configuration management program to ensure that changes in plant hardware and procedures that affect EOPs and AOPs were translated to all the affected procedures and procedure steps. Further, the corrective actions included an upgrade and control of the TBDs; an upgrade of the EOP writer's guide; an upgrade to the V&V process; the conduct of human factors training; a rewrite of the EOPs and AOPs to conform to the upgraded writer's guide and the vendor's guidelines; and corrective actions to address previous quality assurance and inspection findings. The inspectors considered the licensee's upgraded EOPs and AOPs, as well as the operators' knowledge of the procedures, as strengths.

## ATTACHMENT 1

### 1 PERSONS CONTACTED

#### Licensee Personnel

- \*S. Gambhir, Division Manager, Production Engineering
- \*J. Gasper, Acting Division Manager, Nuclear Operations
- \*R. Jaworski, Manager, Station Engineering
- \*W. Jones, Senior Vice President
- \*L. Kusek, Manager, Nuclear Safety Review
- \*R. Luikens, EOP Coordinator
- \*B. Matherson, Quality Assurance  
T. Nellenbach, Licensed Operator
- \*W. Orr, Manager Quality Assurance/Quality Control
- \*A. Richards, Acting Plant Manager
- \*R. Short, Nuclear Licensing Manager
- \*C. Simmons, Station Licensing Engineer  
J. Smith, Training Department
- \*J. Tills, Assistant Plant Manager

#### NRC

- \*T. Stetka, Chief, Operational Programs Section, Division of Reactor Safety

\*Denotes personnel that attended the exit meeting. In addition to the personnel listed above, the inspectors contacted other personnel during this inspection period.

### 2 EXIT MEETING

An exit meeting was conducted on August 14, 1992. During this meeting the inspectors reviewed the scope and findings of the inspection. The licensee did not identify as proprietary any of the materials provided to, or reviewed by the inspectors.

## ATTACHMENT 2

### Documents Reviewed

#### Emergency Operating Procedures

EOP-00, Revision 0, "Standard Post Trip Actions"  
EOP-01, Revision 0, "Reactor Trip Recovery"  
EOP-04, Revision 0, "Steam Generator Tube Rupture"  
EOP-07, Revision 0, "Station Blackout"  
EOP-20, Revision 0, "Functional Recovery Procedures"  
HR-3, "RCS and Core Heat Removal, Steam Generator Heat Sink  
with Safety Injection Operating"  
HR-4, "RCS and Core Heat Removal, Once-Through Cooling"  
MVA-AC "Maintenance of Vital Auxiliaries - AC"

#### Abnormal Operating Procedures

AOP-6, Revision 0, "Fire Emergency"  
AOP-7, Revision 0 "Evacuation of Control Room"  
AOP-24, Revision 0, "Steam Generator Tube Rupture (Reactor Shutdown)"  
AOP-30, Revision 0, "Emergency Fill of Emergency Feedwater Storage Tank"

#### Administrative Procedures

SO-G-74, Revision 5, "Fort Calhoun EOP/AOP Generation Program"  
EOP/AOP Writer's Guide, Revision 1  
EOP/AOP User's Guide, Revision 1  
Emergency Operating Procedures Technical Basis Document, Revision 1  
Annunciator Response Procedure A33c, Revision 1, Control Room Annunciator  
A33C Radiation Monitor Panel  
  
Operating Procedure OI-AFW-4, Revision 7, "Auxiliary Feedwater Startup and  
System Normal Operation"