

AEOD TECHNICAL REVIEW REPORT\*

UNIT: Oconee 1, 2, and 3  
DOCKET NO.: 269, 270, 287  
LICENSEE: Duke Power Co.  
NSSS/AE: Babcock & Wilcox/Duke-Bechtel

TR REPORT NO. AEOD/NT304  
DATE: November 4, 1983  
EVALUATOR/CONTACT: K. Black

SUBJECT: HUMAN FACTORS INVOLVEMENT IN EVENTS AT OCONEE 1, 2, AND 3

EVENT DATES: 821213 (manual containment valves on Oconee 3 left open on all units)  
830303 (manual sample valve left open on all units by Oconee procedure)  
830316 (double isolation criterion for Safe Shutdown Facility not met)  
830317 (test valve on Oconee 3 emergency air lock left open)  
830317-23 (inner hatch door on emergency air lock on Oconee 1 left open)

SUMMARY

Between December 1982 and March 1983, Oconee reported a series of five events related to containment integrity. Human factors were important contributors to these five events. The last two events, both of which occurred on March 17, 1983, were the subject of escalated enforcement action.

The AEOD Nonreactor Assessment Staff (NAS) undertook a review of the events because a number of events associated with the same system occurred over a short period of time.

The review showed that corrective actions were taken for each of the events. In addition, Oconee personnel undertook an extensive review of directives and procedures related to independent verification of performance of operational activities affecting safety-related equipment. A management audit team was also established to review operational activities to assure that they were conducted in a quality manner.

AEOD believes the response to the event represents a comprehensive effort to reduce the contribution of human error to these and other types of future events.

DISCUSSION

AEOD Reactor Operations Analysis Branch recognized a series of reportable events that involved human errors by Oconee personnel and informed the Nonreactor Assessment Staff of the fact. The NAS undertook a review of LERs

\* This document supports ongoing AEOD and NRC activities and does not represent the position or requirements of the responsible NRC program office.

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submitted by Oconee, Inspection Reports, and Duke Power correspondence to determine whether a generic problem existed. Table I presents a chronology of the events and management initiatives to review activities associated with containment integrity.

In December 1982, the first of the series of events was reported in which human factors contributed to degradation of containment isolation.<sup>1</sup> With Unit 3 in cold shutdown, two (instrument air) Manual Containment Isolation Valves were found open. It was determined that the valves had been open between December 6 and December 8, 1982 with the reactor coolant pressure and temperature greater than 300 psig and 200°F respectively. Technical Specification 3.61 was violated. The LER for the event was classified as requiring no additional review by AEOD.

Some time after the above report was made to NRC, the Oconee Operations Superintendent requested an investigation of activities related to containment integrity within the operations group.<sup>2</sup> This investigation resulted in discovery of two incidents: a manual sample valve was specified to be left in the open position by Oconee procedure, even though technical specifications required it to be closed (it is a containment isolation valve);<sup>3</sup> and, the tie-in of the Standby Shutdown Facility (SSF) to the fuel transfer tubes failed to meet containment isolation criteria.<sup>4</sup> The LER for the valve misposition was classified by AEOD as requiring no additional review; the disposition of the LER on the SSF was not found in WAMS. (The SSF is not operational.)

During the required quarterly surveillance tests of containment, two other events were discovered. In one, a pressurization connection valve on the Unit 3 Emergency Access Air Lock Hatch had been left open and was found to be leaking air. The valve is classified as a containment isolation valve. The valve is known to have been closed on December 17, 1982, and was discovered to be open on March 17, 1983.<sup>5</sup> In the other event on March 17, 1982, the inner Emergency Hatch door on Oconee 1 was inadvertently opened after the outer door was closed. The door remained open for four days, even though the Emergency Hatch inner/outer door open statalarm in the control room was actuated.<sup>6</sup> Both events were classified as requiring no additional review by AEOD. The two events were the subject of escalated enforcement action by IE.

Following the two events of March 17, Oconee personnel began a review of directives and procedures related to independent verification of operational activities affecting safety-related equipment. Duke provided a description of its activities in a letter to Region II dated April 29, 1983. (The letter follows meetings with Region II on March 23, 1983 and April 19, 1983.)

Table 2 gives a brief description of the event, plant status, and cause of the above events.

## FINDINGS

Duke Power has reported a series of five events in which human error contributed to degradation of containment integrity. After the first event, Oconee instituted an investigation of activities related to containment integrity and discovered and reported two other events. The final two events occurred during a required test of personnel emergency air locks. Following these two incidents, Oconee

instituted a review of directives and procedures related to independent verification of performance of operations activities affecting safety-related equipment, not limited to containment. In addition to these reviews, Oconee instituted specific corrective actions for each event designed to prevent the recurrence of the event.

Table 3 lists actions undertaken by Oconee as a result of the first, fourth, and fifth events.<sup>8</sup>

### CONCLUSIONS

Although none of the events contributing to degradation of containment integrity at Oconee that were reviewed by AEOD were judged to be significant, the number that occurred over a short period of time (four months) caused us to review the events. The fact that two of the events were the subject of escalated enforcement may have resulted in greater responsiveness by the licensee than would otherwise have occurred. Oconee has instituted corrective actions for each event and committed itself to establishing a containment integrity procedure that includes two component check lists--isolation and verification. A similar system check procedure was instituted in the summer of 1979 on certain systems; since implementation, none of the systems subject to the check has been found in a degraded mode.<sup>9</sup>

A management audit team has also been established to review: the process of review and determination of compliance with regulatory requirements; the station modification process; procedural development; the overall audit process; and personnel qualification.<sup>10</sup>

AEOD believes the Oconee response to the events represents a comprehensive effort to reduce the contribution of human error to these and other types of future occurrences. No further action appears necessary at this time.

References

1. LER 287/82-15/01T
2. Letter to James P. O'Reilly, NRC from Hal B. Tucker, Vice President, Duke Power Company, April 29, 1983, p. 1 of documentation.
3. LER 269/83-07/01T
4. LER 269/83-05/03L
5. LER 287/83-04/01T
6. LER 269/83-10/01T
7. Ref. 2, p. 8 of documentation
8. Letter to Director, I.E. from Hal B. Tucker, Vice President, Duke Power Company, July 1, 1983 p. 4 of Attachment 2.
9. Ref. 2, p. 9 of documentation
10. Ref. 2 p. 10 of documentation

Table 1

Chronology of Events at Oconee Involving Compromise of Containment Integrity and Management Initiatives

<u>Date</u>	<u>Event</u>
821213	Region II was notified that 2 manual isolation valves were open LER 287/82-15 submitted 821230. Valves were open from 821206-821212 with unit above 300 psig and 200°F with fuel in core.
821231 or later*	Management Initiative 1 - Oconee operations superintendent asked for investigation related to containment integrity activities within Operations Group.
830303	As a result of Management Initiative 1, a manual sample valve was discovered being left in open position even though tech specs required valve to be closed. Oconee procedures change required valve to be open (LER 269/83-07, submitted 830322).
830316	An engineering evaluation was conducted on March 16, 1983 as part of followup actions to Management Initiative 1. LER 269/83-05 submitted 830415; the double isolation criterion for SSF RC Makeup System was not met.
830317	Test valve on Oconee 3 RB emergency airlock was left open (LER 287/83-04).
830317/21	At 100% power, inner hatch door on Oconee 1 was inadvertently opened and remained open for four days. Task force formed. (LER 269/83-10)
830321 or later	Management Initiative 2 - Oconee personnel undertook an extensive review of directives and procedures related to independent verification of performance of operational activities affecting safety-related equipment. (The review was not limited to systems important to containment integrity.)

Table 2  
Outline of Five Events at Oconee

Events	Unit	Plant Status	Cause
Two Manual Containment Isolation Valves Open for 4 days between Dec. 8 and Dec. 12, 1982	Oconee 3	Cold Shutdown	<ul style="list-style-type: none"> <li>Inadequate review of outstanding items by shift personnel.</li> <li>Deficiency in procedure (deletion of audit from pre-criticality check).</li> </ul>
Manual Containment Isolation Valve Open by Procedure	Oconee 1, 2, 3	All 100% power	<ul style="list-style-type: none"> <li>Personnel error; tech spec requirements were overlooked during review of procedure for approval.</li> </ul>
Standby Shutdown Facility Valve Lineup did not meet Double Isolation Criterion	Oconee 1, 2, 3	All 100% power	<ul style="list-style-type: none"> <li>Design deficiency resulting from inadequate review. (SSF not operational.)</li> </ul>
Emergency Personnel Air Lock Hatch Leaking Air (Valve Open)	Oconee 3	All 100% power	<ul style="list-style-type: none"> <li>Operating procedure did not explicitly call for valve closure.</li> </ul>
Emergency Personnel Air Lock Hatch Inner Door Open for 4 days from March 17 to March 21, 1983	Oconee 1	All 100% power	<ul style="list-style-type: none"> <li>Inner door inadvertently opened; statalarm ignored; Duke never considered the requirement for independent verification for hatch procedures.</li> </ul>

Table 3

Duke Power Company  
 Oconee Nuclear Station  
 April 29, 1983 Submittal  
 Status of Actions  
 -July 1, 1983-

<u>Action</u>	<u>Status</u>
1. Air Lock Door Open Incident - close door, check other units, notify NRC, file LER	Complete
2. Air Lock Valve Open Incident - close valve, check other units, notify NRC, file LER	Complete
3. Establish Containment Integrity Task Force	Complete
• Compile master list of CI components	Complete
• Visual check of all accessible penetrations	Complete
• Label all CI components	Complete
• Control Room drawings updated	Complete
• Controlled drawings revised	Complete
4. Establish controlling procedure for containment integrity	Complete
5. Establish quarterly and prior to S/U surveillance of containment integrity	Complete
6. Establish procedure to require effective/timely follow-through to alarm conditions	Complete
7. Revise SD 4.4.4 to expand modification process review to all affected sections	Complete
8. Initial review of station procedures	Complete
9. Revise three Operations Procedures as a result of initial review	Complete
10. Revise six Performance Procedures found as a result of initial review	Complete
11. Review incidents of past three years for incidents related to personnel error	Complete
12. Review of past modifications to assure procedures have been appropriately updated	Complete

Table 3 (continued)

<u>Action</u>	<u>Status</u>
13. Revise/implement SD 4.2.5 to reflect results of past/recent incidents	Complete
14. Revise/implement SD 4.2.1 on procedures	Complete
15. Revise/implement other SDs as required as a result of these changes	As needed
16. Review procedures, again, based on new SDs	Complete
17. Establish interim programs	Complete
18. Conduct an independent management audit	Complete
19. Incorporate Lessons Learned into operational activities at McGuire and Catawba	Schedule to be established



CONTROL BLOCK: (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

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EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)
On July 5, 1983, at ~1448, while trying to determine the source of water influx to certain waterboxes, valve 1CCW-1 was fully opened, thus causing CCW-8 to open, thus losing the prime on the Emergency CCW System discharge line and rendering this system inoperable. During inoperability, the CCW pumps had power and provided cooling flow through the condensers. If all station power was lost, the main steam relief valves were available. Thus, the health and safety of the public were not affected by this incident.

09 | C | F | A | V | A | L | V | E | X | B | A | 8 | 3 | 0 | 1 | 4 | 0 | 1 | T | 0 | E | X | Z | Z | 0 | 0 | 0 | 0 | N | Y | L | L | 2 | 0 | 0

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)
10 | Unit 1 - refueling shutdown, Units 2 and 3 - 100%. The cause of this incident was
11 | personnel error in that the connection between the two valves was not considered.
12 | The valves were closed and the CCW emergency discharge piping was reprimed. The
13 | responsible person was counseled, and appropriate personnel will review the
14 | station report.

15 | X | X | X | X | Varied status | A | Operator observation

16 | Z | Z | NA | NA

17 | 0 | 0 | 0 | Z | NA

18 | 0 | 0 | 0 | NA

19 | Z | NA | NA | PDR ADDOCK 05000269 S PDR

20 | N | NA

DUKE POWER COMPANY  
P.O. BOX 33189  
CHARLOTTE, N.C. 28242

HAL B. TUCKER  
VICE PRESIDENT  
NUCLEAR PRODUCTION

July 19, 1983

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(704) 373-4531

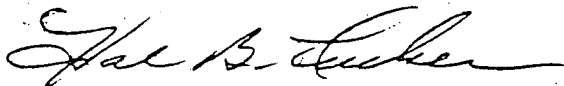
Mr. James P. O'Reilly, Regional Administrator  
U. S. Nuclear Regulatory Commission  
Region II  
101 Marietta Street, NW, Suite 2900  
Atlanta, Georgia 30303

Subject: Oconee Nuclear Station  
Docket No. 50-269

Dear Mr. O'Reilly:

Please find attached Reportable Occurrence Report RO-269/83-14. This report is submitted pursuant to Oconee Nuclear Station Technical Specification 6.6.2.1.a(2) which concerns an operation subject to a limiting condition for operation which was less conservative than the least conservative aspect of the limiting condition for operation established in the Technical Specifications, and describes an incident which is considered to be of no significance with respect to its effect on the health and safety of the public.

Very truly yours,



Hal B. Tucker

JCP/php  
Attachment

cc: Document Control Desk  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

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Duke Power Company  
Oconee Nuclear Station

Report Number: RO-269/83-14

Report Date: July 19, 1983

Occurrence Date: July 5, 1983

Facility: Oconee Units 1, 2, and 3, Seneca, South Carolina

Identification of Occurrence: Loss of prime on the condenser circulating water (CCW) emergency discharge line due to CCW-8 being opened.

Conditions Prior to Occurrence: Oconee 1 - Refueling shutdown  
Oconee 2 - 100%  
Oconee 3 - 100%

Description of Occurrence: On July 5, 1983, at about 1448, in an effort to try to determine the source of influx of water to the 1A1, 1B2, and 1C2 water-boxes, the Condenser A1 Emergency Outlet Valve, 1CCW-1 was opened. When this valve was fully opened, this caused the Emergency Discharge Valve to the tailrace, CCW-8, to open. This resulted in a loss of prime on the Emergency Condenser Circulating Water (CCW) System discharge line and rendered this system inoperable per Technical Specification 3.4.5.

Apparent Cause of Occurrence: The cause of this occurrence was personnel error. The responsible person failed to consider the interlock between 1CCW-1 and CCW-8 in his decision to open 1CCW-1. A contributing cause to this occurrence was the component failure of valve 1CCW-1 in not isolating the discharge system from the condenser.

Analysis of Occurrence: During the period the Emergency CCW System was inoperable, the CCW pumps had power and were providing cooling flow through the condensers and thus removing heat. Additionally, the probability of a loss of all station power during the short time (88 minutes) the Emergency CCW System was inoperable is extremely low. In the event of a loss of power during this 88 minutes the main steam relief valves were available to steam the OTSGs to the atmosphere. The health and safety of the public were not affected by this incident.

Corrective Action: Valves 1CCW-1 and CCW-8 were shut and the CCW emergency discharge piping was reprimed. At 1620, the CCW Emergency Discharge System was declared operable. The responsible person has been counseled on his error and the importance of quality job planning. Operations personnel will review this report with emphasis on the interlock between CCW-8 and the condenser outlet valves.