August 5, 2003

Mr. Lew Myers
Chief Operating Officer
FirstEnergy Nuclear Operating Company
Davis-Besse Nuclear Power Station
5501 North State Route 2
Oak Harbor, OH 43449-9760

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION
NRC SPECIAL INSPECTION - CONTAINMENT INTEGRATED LEAK RATE TEST - REPORT NO. 50-346/03-05(DRS)

Dear Mr. Myers:

On July 18, 2003, the NRC completed a special inspection at your Davis-Besse Nuclear Power Station. This inspection reviewed your actions to resolve Restart Checklist Item No. 2.b, associated with ensuring containment integrity following replacement of the reactor head. Specifically, the inspection reviewed preparation for and execution of a Containment Integrated Leak Rate Test, and a review of the results of the completed test. The results of our inspection were discussed with your staff at an exit meeting on July 18, 2003, and are contained in the enclosed report.

Based on the results of this inspection, no findings of significance were identified. As such, based on the review of the results by the Davis-Besse Oversight Panel, Restart Checklist Item No. 2.b. regarding the containment integrity after replacement of the reactor head is considered closed, as documented in the attached report.

In accordance with 10 CFR Part 2.790 of the NRC's "Rules of Practice, a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

John A. Grobe, Chairman
Davis-Besse Oversight Panel

Docket No. 50-346
License No. NPF-3

Enclosure: NRC Special Inspection Report
No. 50-346/03-05(DRS)

cc w/encl: The Honorable Dennis Kucinich
B. Saunders, President - FENOC
Plant Manager
Manager - Regulatory Affairs
M. O'Reilly, FirstEnergy
Ohio State Liaison Officer
R. Owen, Ohio Department of Health
Public Utilities Commission of Ohio
President, Board of County Commissioners
Of Lucas County
Steve Arndt, President, Ottawa County Board of Commissioners
D. Lochbaum, Union Of Concerned Scientists

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50-346
License No:	NPF-3
Report No:	50-346/03-05
Licensee:	FirstEnergy Nuclear Operating Company
Facility:	Davis-Besse Nuclear Power Station
Location:	5501 North State Route 2 Oak Harbor, OH 43449
Dates:	March 28 - July 18, 2003
Inspectors:	M. Farber, Senior Reactor Inspector P. Lougheed, Senior Reactor Inspector S. Thomas, Senior Resident Inspector D. Simpkins, Senior Resident Inspector, Hatch
Approved by:	Julio Lara, Chief Electrical Engineering Branch Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000346/2003-005, FirstEnergy Nuclear Operating Company, on 03/28/03 - 07/18/03; Davis-Besse Nuclear Power Station; Containment Integrated Leak Rate Test Inspection

The report covers a special inspection, by two regional and two resident inspectors, of the Davis-Besse Nuclear Power Station Containment Integrated Leak Rate Test. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3; dated July 2000.

A. Inspector-Identified Findings

None

B. Licensee-Identified Findings

None

REPORT DETAILS

4. OTHER ACTIVITIES (OA)

4OA3 Event Follow-Up (93812)

Background

On March 6, 2002, Davis-Besse personnel notified the NRC of degradation (corrosion) of the reactor vessel head material adjacent to a control rod drive mechanism (CRDM) nozzle. This condition was caused by coolant leakage and boric acid corrosion of the head material resulting from an undetected crack in the adjacent CRDM nozzle. The degraded area covered in excess of 20 square inches where the low-alloy structural steel was corroded away, leaving the thin stainless steel cladding layer.

As a result of this degradation, the licensee purchased a replacement reactor vessel head. To remove the old head and bring in the replacement, it was necessary to cut a hole in the containment vessel. To verify proper repair of the hole and that containment integrity had been restored, the licensee conducted a containment integrated leak rate test.

a. Inspection Scope

The inspectors reviewed a calculation for containment volume, reviewed the test procedure, monitored prerequisite activities such as valve lineups, containment walkdowns, and local leak rate tests, witnessed the performance of the test, monitored system restoration activities, and reviewed the results of the test after they were approved by licensee management.

b. Observations and Findings

b.1 ILRT Procedure Review

In the Fall of 2002, as the licensee began to prepare for the ILRT, the inspectors began similar long-range planning. Included in this activity were meetings with the licensee's ILRT staff and an initial review of the test procedure. Based on that review, the inspectors questioned the basis for the containment volume fractions used in the data analysis. Because no documented basis could be identified, Condition Report 02-08432, "Containment Design Basis Calculation," was issued on October 21, 2002, to recalculate the volume fractions. No other problems with the procedure were noted.

Calculation C-NSA-000.00-019, "GOTHIC Model Inputs for DB Primary Containment," Revision 0, was issued on February 4, 2003. In addition to the volume fractions needed for the ILRT, this calculation derived heat transfer coefficients and other parameters needed for containment thermohydraulic analyses. The inspectors only examined the portion of the calculation related to the volume fractions, and on resolution of some mathematical questions, concluded that the calculation was satisfactory.

Following issuance of C-NSA-000.00-019, the new volume fractions were incorporated into the ILRT procedure. The inspectors reviewed the procedure, including all attachments, in detail. Following resolution of some questions regarding requirements to vent and drain the piping associated with several penetrations, the inspectors concluded that the procedure was adequate.

c.1 Observations and Findings

No findings of significance were identified.

b.2 Pre-ILRT Activities

The inspectors verified the licensee's planned lineups through procedural and drawing review, actual plant walkdowns and discussion with the licensee. The inspectors confirmed that all sources of pressurized air were isolated and vented from containment to prevent any inleakage that could mask containment leaks. The inspectors performed a number of containment walkdowns to assess the status of the licensee's readiness to perform the ILRT. The containment walkdowns covered all levels and areas of the containment, including inside the concrete shielding surrounding the reactor vessel, steam generators, reactor coolant pumps, and the pressurizer.

The inspectors witnessed local leak rate tests on penetrations associated with the containment vent and purge system, the make-up system, and on the personnel, emergency, and equipment hatches. The tests were performed in accordance with an established procedure and results were acceptable for all penetrations except the containment purge exhaust. The initial leak rate was unacceptable, requiring maintenance and a subsequent retest. While the retest was acceptable, the leak rate was higher than desired. Because the licensee intended to reopen the containment, and consequently the containment purge exhaust, for additional work, it was decided to rework the containment purge exhaust valves after the ILRT, reperform the local leak rate test, and add the results to the ILRT. The inspectors considered this an acceptable approach.

The licensee had performed an extensive retagging effort on containment components during the outage. Therefore, the inspectors verified that equipment labels were securely attached with approved fasteners to ensure that, during the pressurization phase or an actual event, the labels would remain in place. The inspectors evaluated the placement and fastening of temporary plastic sheeting to ensure that it would not block air flow during the test and that it could not make its way to the containment sump if torn. The inspectors evaluated the location and coverings for temporary and permanent lighting to ensure that, should the glass break due to increased pressure, it would not be transported to the sump.

c.2 Observations and Findings

No findings of significance were identified.

b.3 ILRT Main and Verification Test Performance

On Monday, April 7, 2003, the licensee began pressurization of the containment for the ILRT. The pressurization was uneventful, with all compressors working as designed. At 3:45 a.m. on Tuesday, April 8, 2003, the containment was pressurized to 39.3 psig and the compressors were secured. The inspectors confirmed that the compressors were isolated from the building.

The stabilization phase of the test lasted for 10.2 hours, and at 2:00 p.m. on Tuesday, the licensee began the data collection phase of the ILRT. The inspectors verified through review of the data collected that the stabilization criteria were met prior to the test start being declared. The licensee used the BN-TOP-1 methodology for data computation and at 8:10 p.m., after a minimum test duration of six hours, had met the test acceptance criteria within the 95 percent upper confidence band. The inspectors witnessed completion of the necessary procedural steps to terminate the main test and verified that the acceptance criteria were met.

At 8:31 p.m., the licensee established a leak of 35 cubic feet per minute by opening a temporary valve attached to penetration P59. The licensee stationed two individuals to monitor and adjust the leak rate through the valve in order to maintain the desired leak rate. After a one hour stabilization period, the verification test began. The test quickly stabilized within the required acceptance band and after the minimum three hour period, the verification test was successfully concluded at 12:45 a.m., on Wednesday, April 9, 2003.

Depressurization began at 3:58 a.m. and was completed at 10:27 a.m. Following depressurization, the inspectors accompanied the licensee on the initial post-test walkdown of the containment to observe the effects of the test on the containment structure. The licensee noted a number of areas where grating adjacent to the containment wall had buckled. The licensee attributed this to the expansion and contraction of the containment during the pressurization period. Additionally, one snubber was leaking hydraulic fluid, an oil gun cylinder, which had not been removed, leaked and a number of the containment lights appeared to have failed. Otherwise, little to no damage was observed.

c.3 Observations and Findings

No findings of significance were identified.

b.4 ILRT Results Reviews

The inspectors reviewed the preliminary test summary report. The final report cannot be issued until the containment is closed and final type B and C LLRTs have been completed prior to Mode 4. The preliminary report noted the following:

> "Based on the preliminary minimum path leakage rate (MNPLR) results tabulated at the start of the ILRT, the size of the additions is not anticipated to be significant, however are required for completeness to allow closure. Even if the outcome of the remaining LLRTs are at their maximum allowable rates, when

factored into the overall ILRT, the results would still be well within the acceptance criteria for final as-left Type A ILRT (<75%L_a). The final Type B and C tests will be completed prior to Mode 4. The results will be factored into the overall ILRT leakage rate to derive a final as-left ILRT leakage rate value, and the final ILRT report and test will be processed for test completion per DB-PF-00203, "Acceptance Test Program."

The inspectors were aware of the need for additional work on valves associated with several containment penetrations and the need for confirmatory type C testing. The inspectors were also aware that the containment would be reopened following the ILRT, necessitating final type B testing of the equipment and personnel hatches. This circumstance is not unusual and is acceptable.

Acceptance criteria are specified in percent by weight of containment air in a 24-hour period (% wt./day) at the peak calculated accident pressure. ILRTs are typically performed over a six to eight-hour period and the results are extrapolated over a 24-hour period. The test report showed that all test acceptance criteria were met with a 95% upper confidence limit as follows:

- "as found" actual leakage was 0.16844% wt./day compared to an acceptance limit of 0.5% wt./day
- "as left" actual leakage was 0.16772% wt./day compared to an acceptance limit of 0.75% wt./day

The test package contained a preliminary test summary report, the General Physics preliminary test report, the completed test procedure, completed test attachments, chronological test log, and computer data printouts from the different modes of the test. The inspectors reviewed the test report in detail including duplicating hand calculations and performing hand calculations of the computerized data reductions for parameters such as average containment temperature, pressure, and relative humidity, containment air mass, and the test and verification leak rates. The inspectors also carefully reviewed the data to ensure that test criteria for pressurization, stabilization, and test termination were satisfactorily met. No deficiencies were identified.

c.4 Observations and Findings

Based on the above, no findings of significance were identified. The inspectors concluded that containment integrity had been restored where the containment had been opened for replacement of the reactor head. This conclusion also reflects on Restart Checklist Item 2.b., "Containment Vessel Restoration Following Reactor Pressure Vessel Head Replacement," which was discussed with the Davis-Besse Oversight Panel and is considered closed.

4OA6 Management Meetings

.1 Exit Meeting Summary

The inspectors presented the inspection results to Mr. L. Myers and other members of licensee management and staff at the conclusion of the inspection on July 18, 2003. The licensee acknowledged the information presented.

KEY POINTS OF CONTACT

Licensee
J. Baldwin, Operations
M. Beier, Plant Engineering
R. Carey, Plant Engineering Contractor
R. Fast, Plant Manager
E. Grindahl, Nuclear Quality
D. Hartnett, Operations
R. Lakis, Operations
A. Lewis, Operations
G. Mellsen, Plant Engineering
W. Marini, Regulatory Services
R. Mende, Plant Engineering Manager
D. Millinger, Site Manager
L. Myers, Chief Operating Officer
L. Pearce, VP Oversight
A. Stallard, Operations
G. Van Wert, Plant Engineering Contractor

Nuclear Regulatory Commission
J. Grobe, Director, Division of Reactor Safety
C. Lipa, Chief, Reactor Projects Branch 4
S. Thomas, Senior Resident Inspector
D. Simpkins, Senior Resident Inspector, Hatch

LIST OF DOCUMENTS REVIEWED

The following is a list of licensee documents reviewed during the inspection, including documents prepared by others for the licensee. Inclusion on this list does not imply that NRC inspectors reviewed the documents in their entirety, but that selected sections or portions of the documents were evaluated as part of the overall inspection effort. Inclusion on this list does not imply NRC acceptance of the document, unless specifically stated in the inspection report.

Procedures

DB-PF-03008	Containment Local Leakage Rate Tests, Revision 05; March 15, 2003
DB-PF-10310	Containment Integrated Leak Rate Test, Revision 01; February 26, 2003
DB-OP-04004	Locked Valve Verification, Revision 03; November 2, 2001
DB-OP-04005	Capped Valve Verification, Revision 03; February 22, 2002

Preventive Maintenance

PM-5316	CV-5005 and All Associated Assets Clean and Inspect Valve Seats; April 1, 2003
01-000743-00	Repetitive Work Order for Containment Purge Inlet Isolation Butterfly Valves, Revision 0

Condition Reports (CR)

02-04751	Commitments in 50.59 Evaluation 02-00157; August 22, 2002
03-02264	Request for Assistance - Capture Technical and Regulatory Issues with Integrated Leak Rate Test without Containment Air Cooler Service Water Intact; March 21, 2003

Drawings

A-3	Containment & Auxiliary Buildings General Floor Plan El. 545’-0", Revision 29
A-4	Shield, Auxiliary, & Turbine Buildings General Floor Plan El. 565’-0", Revision 39
A-5	Shield, Turbine, Auxiliary, Off. Buildings General Floor Plan El. 585’-0", Revision 52
A-6	Shield, Turbine, Auxiliary, Off. Buildings General Floor Plan El. 603’-0", Revision 49
A-7	Shield, Turbine, Auxiliary, Off. Buildings General Floor Plan El. 623’-0", Revision 26

A-8	Shield, Turbine, Auxiliary, Off. Buildings General Floor Plan El. 643’-0", Revision 19
M-003A	Main Steam and Reheat System Piping and Instrumentation Diagram, Sheet 1, Revision 36
M-003C	Main Steam and Reheat System Piping and Instrumentation Diagram, Sheet 3, Revision 53
M-007A	Steam Generator Secondary Side Piping and Instrumentation Diagram, Sheet 1, Revision 42
M-007B	Steam Generator Secondary Side Piping and Instrumentation Diagram, Sheet 2, Revision 48
M-010C	Makeup Water Treatment System Piping and Instrumentation Diagram, Sheet 3, Revision 38
M-010D	Makeup Water Treatment System Piping and Instrumentation Diagram, Sheet 4, Revision 39
M-900A	Instrument Air System Piping Schematic, Revision 1
M-015A	Instrument Air System Piping and Instrumentation Diagram, Sheet 1, Revision 51
M-015C	Station Air System Piping and Instrumentation Diagram, Sheet 1, Revision 18
M-015D	Station Air System Piping and Instrumentation Diagram, Sheet 2, Revision 21
M-015F	Station Air System Piping and Instrumentation Diagram, Sheet 4, Revision 4
M-019	Nitrogen Supply System Piping and Instrumentation Diagram, Revision 70
M-023	Containment Leak Rate Test Piping and Instrumentation Diagram, Revision 43
M-029B	Containment and Penetration Rooms Piping and Instrumentation Diagram, Sheet 1, Revision 55
M-029C	Containment and Penetration Rooms Piping and Instrumentation Diagram, Sheet 2, Revision 37
M-029D	Containment and Penetration Rooms Piping and Instrumentation Diagram, Sheet 3, Revision 17
M-029E	Containment and Penetration Rooms Piping and Instrumentation Diagram, Sheet 4, Revision 17
M-030A	Reactor Coolant System Piping and Instrumentation Diagram, Sheet 1, Revision 53

M-031A	Makeup and Purification System Piping and Instrumentation Diagram, Sheet 1, Revision 42
M-031B	Makeup and Purification System Piping and Instrumentation Diagram, Sheet 2, Revision 25
M-031C	Makeup and Purification System Piping and Instrumentation Diagram, Sheet 3, Revision 35
M-033A	High Pressure Injection Piping and Instrumentation Diagram, Revision 30
M-033B	Decay Heat Train 1 Piping and Instrumentation Diagram, Revision 39
M-033C	Decay Heat Train 2 Piping and Instrumentation Diagram, Revision 16
M-034	Emergency Core Cooling System Containment Spray and Core Flooding Systems Piping and Instrumentation Diagram, Revision 55
M-035	Spent Fuel Pool Cooling System Piping and Instrumentation Diagram, Revision 49
M-036C	Component Cooling Water System Piping and Instrumentation Diagram, Sheet 3, Revision 25
M-038C	Gaseous Radioactive Waste System Piping and Instrumentation Diagram, Sheet 3, Revision 12
M-040A	Reactor Coolant System Details Piping and Instrumentation Diagram, Sheet 1, Revision 73
M-040C	Reactor Coolant Pump and Motor Piping and Instrumentation Diagram, Sheet 3, Revision 11
M-040D	Reactor Coolant Pump and Motor Piping and Instrumentation Diagram, Sheet 4, Revision 12
M-041C	Service Water System for Containment Air Coolers Piping and Instrumentation Diagram, Sheet 3, Revision 25
M-042C	Sampling System Piping and Instrumentation Diagram, Sheet 3, Revision 32
M-046	Station Drainage Systems Piping and Instrumentation Diagram, Revision 85

Calculations

C-NSA-000.00-019	GOTHIC Model Inputs for DB Primary Containment, Revision 0, February 4, 2003

Other Documents

NPE-03-00040	Memo - Contingency Position Paper for Performance of the ILRT before CAC Service Water Piping Completed; March 25, 2003
RG 1.163	Regulatory Guide, Performance-Based Containment Leak-Test Program, Preliminary Test Summary Report Containment Integrated Leak Rate, Test 13 RFO (April 2003); June 18, 2003

LIST OF ACRONYMS USED

AIT	Augmented Inspection Team
CR	Condition Report
ILRT	Integrated Leak Rate Test
LIR	Latent Issues Review
LLRT	Local Leak Rate Test
NRC	Nuclear Regulatory Commission
PDR	Public Document Room