March 23, 2005

EA-03-214

Mr. Mark B. Bezilla
Vice President-Nuclear, Davis-Besse
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
MID-CYCLE OUTAGE, NRC SPECIAL INSPECTION 05000346/2005003(DRS)

Dear Mr. Bezilla:

On January 28, 2005, the U.S. Nuclear Regulatory Commission (NRC) completed a special inspection at your Davis-Besse Nuclear Power Station. The enclosed report documents the inspection results, which were discussed on January 28, 2005, with you and other members of your staff, and on February 15, 2005, via teleconference with Mr. Clark Price.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel. Specifically, we reviewed activities related to your examinations of the Inconel piping components in the pressurizer in accordance with the NRC Temporary Instruction (TI) 2515/160, "Pressurizer Penetration Nozzles and Steam Piping Connections in U.S. Pressurized Water Reactors." Additionally, we reviewed your activities related to inservice inspection of the steam generators in accordance with the NRC baseline procedure 71111.08, "Inservice Inspection Activities." Lastly, we reviewed your activities related to the visual examination of the upper and lower reactor vessel head and head penetration nozzles and reactor coolant system to evaluate your boric acid corrosion controls and to confirm that the requirements of NRC Confirmatory Order EA-03-214 were met. Also included, is a review of your correspondence dated February 3, 2005, regarding your evaluation of the Order-required examinations. Based on the results of this inspection no findings of significance were identified.

For the entire inspection period, the Davis-Besse Nuclear Power Station was under the Inspection Manual Chapter 0350 Process. The Davis-Besse Oversight Panel assessed inspection findings and other performance data to determine the required level and focus of followup inspection activities and any other appropriate regulatory actions. Even though the Reactor Oversight Process had been suspended at the Davis-Besse Nuclear Power Station, it was used as guidance for evaluation of inspection activities and to assess potential findings.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publically 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/

Steven A. Reynolds, Chairman
Davis-Besse Oversight Panel

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

Enclosure: Inspection Report 0500346/2005003(DRS)
w/Attachment: Supplemental Information

cc w/encl: The Honorable Dennis Kucinich
G. Leidich, President - FENOC
J. Hagan, Senior Vice President
Engineering and Services, FENOC
L. Myers, Chief Operating Officer, FENOC
Plant Manager
Manager - Regulatory Compliance
M. O'Reilly, Attorney, FirstEnergy
Ohio State Liaison Officer
R. Owen, Administrator, Ohio Department of Health
Public Utilities Commission of Ohio
President, Board of County Commissioners
of Lucas County
J. Papcun, President, Ottawa County Board of Commissioners
D. Lochbaum, Union Of Concerned Scientists
J. Riccio, Greenpeace
P. Gunter, N.I.R.S.

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50-346
License No:	NPF-3
Report No:	05000346/2005003(DRS)
Licensee:	FirstEnergy Nuclear Operating Company (FENOC)
Facility:	Davis-Besse Nuclear Power Station
Location:	5501 North State Route 2 Oak Harbor, OH 43449-9760
Dates:	January 18 through February 15, 2005
Inspectors:	M. Holmberg, Reactor Inspector, Team Lead T. Bilik, Reactor Engineer J. Jacobson, Senior Inspector
Approved by:	S. Reynolds, Chairman Davis-Besse Oversight Panel

Enclosure

SUMMARY OF FINDINGS

IR 05000346/2005003(DRS); 01/18/2005 - 02/15/2005; Davis-Besse Nuclear Power Station; Inservice Inspection, Special Inspection, and Pressurizer Penetration Nozzles and Steam Space Piping Connections in U.S. Pressurized Water Reactors.

This report covers a two-week period of announced baseline inservice inspection, temporary instruction and special inspection. The inspection was conducted by Region III inspectors and no findings or violations were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be "Green" or be assigned a severity level after NRC management review. 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. <u>Inspector-Identified and Self-Revealed Findings</u>

No findings of significance were identified.

B. <u>Licensee-Identified Violations</u>

No findings of significance were identified.

REPORT DETAILS

Summary of Plant Status

Davis-Besse remained shutdown in a mid-cycle outage throughout the inspection period.

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, and Barrier Integrity

1R08 Inservice Inspection (ISI) Activities (IP 71111.08)

Steam Generator (SG) Tube ISI

a. Inspection Scope

From January 18, 2005, through January 28, 2005, the inspectors performed an on-site review of SG tube examination activities conducted pursuant to Technical Specification (TS) and the American Society of Mechanical Engineers (ASME) Code Section XI requirements.

The NRC inspectors observed acquisition of eddy current (ET) data, interviewed ET data analysts, and reviewed documents related to the SG ISI program to determine if:

- in-situ SG tube pressure testing screening criteria and the methodologies used to derive these criteria were consistent with the Electric Power Research Institute (EPRI) TR-107620, “Steam Generator In-Situ Pressure Test Guidelines;”
- the in-situ SG tube pressure testing screening criteria were properly applied in terms of SG tube selection based upon evaluation of the list of tubes with measured/sized flaws (e.g., tubes with I-Code type ET calls);
- the numbers and sizes of SG tube flaws/degradation identified were bounded by the licensee’s previous outage Operational Assessment predictions;
- the SG tube ET examination scope and expansion criteria was sufficient to identify tube degradation based on site and industry operating experience by confirming that the ET scope completed was consistent with the licensee’s procedures, plant TS requirements, and EPRI 1003138, “Pressurized Water Reactor Steam Generator Examination Guidelines, Revision 6," (with justified exceptions);
- the licensee identified new tube degradation mechanisms;
- the planned SG tube repair processes were allowed by the plant TS requirements;

- the licensee primary-to-secondary leakage (e.g., SG tube leakage) was below the detection threshold during the previous operating cycle;

- the licensee identified loose parts indications during ET;

- the ET probes and equipment configurations used to acquire data from the SG tubes were qualified to detect the known/expected types of SG tube degradation in accordance with Appendix H, “Performance Demonstration for Eddy Current Examination,” of EPRI 1003138, “Pressurized Water Reactor Steam Generator Examination Guidelines, Revision 6."

The scope of the inspection was expanded in accordance with the procedure, because the licensee staff and NRC inspectors identified deviations from EPRI 1003138, “Pressurized Water Reactor Steam Generator Examination Guidelines, Revision 6.” The NRC inspectors performed reviews of SG tube ET data to confirm the licensee’s basis for concluding that no tube integrity concerns existed. Specifically, the NRC inspectors interviewed the lead resolution data analyst and performed reviews of ET data for the following SG tube locations affected by these deviations or other NRC questions:

- SG A tube (row/column) Nos. 74/120, 63/120 (repetitive ET signals (tube noise) on the bobbin probe along the entire tube length caused by original manufacturing - buffing/polishing);

- SG B tube(row/column) No. 56/49 (+ Point™ probe in the lower tubesheet sludge pile region to evaluate noise);

- SG B tube(row/column) No. 81/98 (+ Point™ probe in the lower tubesheet role transition to evaluate noise);

- SG A tube (row/column) Nos. 27/65, 63/1,142/65,151/10 (+ Point™ probe identified tube-end cracks);

- SG B tubes (row/column) Nos. 27/63, 27/64 (+ Point™ probe identified tube-end cracks); and

- SG B tubes (row/column) Nos. 61/109, 141/51 (tube dent signals reinspected with +Point™ probe to evaluate flaw discrimination capability).

The NRC inspectors performed a review of SG inservice inspection related problems that were identified by the licensee and entered into the corrective action program. The NRC inspectors reviewed these corrective action program documents to confirm that the licensee had appropriately described the scope of the problems. Additionally, the NRC inspectors’ review was conducted to confirm that the licensee had an appropriate threshold for identifying issues and had implemented effective corrective actions. The inspectors evaluated the threshold for identifying issues through interviews with licensee staff and reviewed licensee actions to incorporate lessons learned from industry issues related to the ISI program. The NRC inspectors performed these reviews to ensure compliance with 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requirements. The corrective action documents reviewed by the inspectors are listed in the attachment to this report.

The NRC inspectors concluded that the reviews discussed above did not count as a completed inspection sample as described in Section 71111.08-5 of the inspection procedure, but the sample was completed to the extent practical.

The specific activities which were not available for the NRC inspectors' review to complete the procedure sample and the basis for their unavailability are identified below:

- Procedure 71111.08, Steps 02.04.a.3 and 02.04.a.4 associated with review of in-situ pressure testing and tube performance criteria were not available for review because none of the degraded SG tubes met the screening requirements for pressure testing;

- Procedure 71111.08, Step 02.04.d associated with review of licensee activities for new SG tube degradation mechanisms was not available for review because no new tube degradation mechanisms were identified; and

- Procedure 71111.08, Step 02.04.h associated with review of corrective actions for primary-to-secondary leakage greater than 3 gallons per day was not available for review because primary-to-secondary leakage was below the 5 gallons per day measurement threshold during the previous operating cycle.

b. <u>Findings</u>

No findings of significance were identified.

4OA5 <u>Other Activities</u>

.1 <u>Pressurizer Penetration Nozzles and Steam Space Piping Connections in U.S. Pressurized Water Reactors (PWRs)</u> (TI 2515/160)

a. <u>Inspection Scope</u>

On May 28, 2004, the NRC issued Bulletin 2004-01, "Inspection of Alloy 82/182/600 Materials Used in the Fabrication of Pressurizer Penetrations and Steam Space Piping Connections at Pressurized-Water Reactors." The purpose of this Bulletin was to: (1) advise PWR licensees that current methods of inspecting Alloy 82/182/600 materials used in the fabrication of pressurizer penetrations and steam space piping connections may need to be supplemented with additional measures to detect and adequately characterize flaws due to primary water stress corrosion cracking (PWSCC); (2) request PWR addressees to provide the NRC with the information related to the materials from which the pressurizer penetrations and steam space piping connections at their facilities were fabricated; and (3) request PWR licensees to provide the NRC with the information related to the inspections that have been and those that will be performed to ensure that degradation of Alloy 82/182/600 materials used in the fabrication of pressurizer penetrations and steam space piping connections will be identified, adequately characterized, and repair.

The objective of TI 2515/160, "Pressurizer Penetration Nozzles and Steam Space Piping Connections in U.S. Pressurized Water Reactors," was to support the NRC review of licensees' activities for inspecting pressurizer penetrations and steam space piping connections made from Alloy 82/182/600 materials and to determine whether the inspections of these components are implemented in accordance with the licensee responses to Bulletin 2004-01 (ADAMS Accession Number ML041480034). In response to Bulletin 2004-01, the licensee committed to perform a bare metal visual inspection at Inconel Alloy 600 pressurizer penetrations during the mid-cycle outage, in a manner that permits visual access to the bare metal 360 degrees around each penetration. Because this commitment did not explicitly include Alloy 82/182 weld metal junctions for stainless steel safe ends, the inspectors confirmed that the licensee performed a visual examination at all 13 Inconel Alloy 82/182 or Alloy 600 locations. The NRC inspectors performed a review, in accordance with TI 2515/160, of the licensee's procedures, equipment, and personnel used for pressurizer penetration nozzles and steam space piping connections examinations to confirm that the licensee met commitments associated with Bulletin 2004-01. The results of the NRC inspectors' review included documenting observations and conclusions in response to the questions identified in TI 2515/160.

b. Observations

Summary: Based upon a bare metal visual examination of the pressurizer, the licensee did not identify any indications of boric acid leaks from pressure retaining components in the pressurizer system.

Evaluation of Inspection Requirements

In accordance with requirements of TI 2515/160, the inspectors evaluated and answered the following questions:

For each of the examination methods used during the outage, was the examination:

1. Performed by qualified and knowledgeable personnel? (Briefly describe the personnel training/qualification process used by the licensee for this activity.)

   Yes. The NRC inspectors verified that the examination was performed by an individual who was a qualified and certified as a Level III VT-2 examiner, as well as boric acid corrosion control (BACC) and boric acid (BA) inspection qualified.

   The licensee's visual inspector was certified in accordance with Davis-Besse Procedure NA-QC-07004, which met the American Society of Non-destructive Testing document CP-189, as modified by the ASME Section XI, 1995 Edition, 1996 Addenda. The examiner was BACC and BA inspection qualified as required by the licensee's Alloy 600 inspection procedure EN-DP-01501.

2. Performed in accordance with demonstrated procedures?

Yes. The licensee performed visual examinations of the pressurizer Alloy 600 components during this mid-cycle outage. The NRC inspectors confirmed that the examination personnel performed the examination in accordance with Davis-Besse Procedures EN-DP-01501, "Inspection of RCS Alloy 600 Components/Welds, Threaded/Bolted Connections and Targets Inside Containment," and NOP-ER-2001, "Boric Acid Corrosion Control Program." The NRC inspectors observed that the licensee demonstrated the visual acuity of this examination in a manner consistent with the Code. Specifically, the licensee examiner verified the adequacy of illumination in the examination areas by resolving the lower case alpha-numeric letters (with dimensions consistent with the Code VT-2 requirements), at distance of six feet. For this check, the licensee's examiner used a flashlight to supplement the existing light source.

3. Able to identify, disposition, and resolve deficiencies?

Yes. The NRC inspectors observed licensee staff conducting direct observation of the pressurizer penetrations/welds and confirmed that they received an unobstructed 360 degree bare metal examination. The licensee staff took photographs at these locations to establish an as-found condition. The licensee also sampled a small white piece of debris identified at the top of the pressurizer. The licensee's analysis of this substance could not conclusively identify its origin due to the small sample size available. Because the debris was basic in pH rather than acidic, the licensee concluded that the deposit was not boric acid and the licensee speculated that this deposit was indicative of hard water scale from previously performed power washing (reference condition report (CR) 03-04131).

The NRC inspectors noted that the licensee's procedures included acceptance criteria/recordable conditions and evaluation and corrective measures. Therefore, the NRC inspectors concluded that adherence to these procedure requirements, in conjunction with the overall boric acid control program, enabled the licensee to adequately identify, disposition and resolve deficiencies.

4. Capable of identifying the leakage in pressurizer penetration nozzle or steam space piping components, as discussed in NRC Bulletin 2004-01?

Yes. The NRC inspectors determined through direct observation of the licensee's efforts that the licensee's examiner was capable of observing and identifying leakage in penetration nozzle or stream space piping components if any had been present.

5. What was the physical condition of the penetration nozzle and steam space piping components in the pressurizer system (e.g., debris, insulation, dirt, boron from other sources, physical layout, viewing obstructions)?

The penetration nozzles and steam space piping components were generally free of debris and dirt, and no boric acid deposits were identified. The NRC inspectors observed some minor dirt and debris that existed on the pressurizer vessel and insulation which did not mask or impede inspection efforts (discussed in question 3 above).

6. How was the visual inspection conducted (e.g., with video camera or direct visual by the examination personnel)?

   The licensee conducted a direct visual examination with a qualified examiner as discussed in question No. 1.

7. How complete was the coverage (e.g., 360 degrees around the circumference of all the nozzles)?

   The licensee removed the insulation from around the vent line, three pressure relief nozzles, and the spray nozzle, such that the physical layout permitted complete access (360 degrees) to each of these penetrations. Similarly, a sufficient gap existed between the insulation and the thermowell, six level-sensing nozzles, and the sampling nozzle, after removal of the convection seals, to permit the licensee examiner a full 360 degree access for the bare metal visual examination of these penetrations and the adjacent pressurizer vessel surface.

8. Could small boron deposits, as described in the Bulletin 2004-01, be identified and characterized?

   Yes. The NRC inspectors determined through direct observation of the licensee's efforts that the licensee personnel were capable of identifying and characterizing small boron deposits.

9. What material deficiencies (i.e., cracks, corrosion, etc.) were identified that required repair?

   Not applicable. The licensee did not identify any material deficiencies that required repair.

10. What, if any, impediments to effective examinations, for each of the applied methods, were identified (e.g., centering rings, insulation, thermal sleeves, instrumentation, nozzle distortion)?

    The NRC inspectors did not identify any impediments to the licensee's visual examination. The licensee had removed all normally installed reflective metal insulation at the Inconel penetrations to allow complete access for the visual examination.

11. If volumetric or surface examination techniques were used for the augmented inspection examinations, what process did the licensee use to evaluate and dispose any indications that may have been detected as a result of the examinations?

Not applicable. The licensee only performed visual examinations.

12. Did the licensee perform appropriate follow-on examinations for indications of boric acid leaks from pressure-retaining components in the pressurizer system?

    Not applicable. The licensee did not identify any indications of boric acid leaks from pressure-retaining components in the pressurizer.

c. Findings

No findings of significance were identified.

.2 Inspection of Control Rod Drive Mechanism (CRDM) Flanges (IP 93812)

a. Inspection Scope

The CRDM assemblies at Davis-Besse are mounted to the head penetrations with a flanged, double gasket connection located above the insulation. This connection has historically been the source of numerous reactor coolant system leaks.

From January 20, 2005, through January 24, 2005, the NRC inspectors observed the licensee performing visual examinations of the CRDM assemblies, and reviewed the licensee's visual examination procedure, certification records of the licensee contractor inspection personnel and the completed visual examination records.

b. Observations

The licensee performed examination of the CRDM flanges using remote cameras operated from above the service structure. These remote cameras were mounted to a pole and positioned manually from above the CRDMs to obtain views of all four quadrants at each flange location. The licensee inspectors positioned the cameras and lighting such that both the flange and the nut ring below the flange could be viewed. The NRC inspectors concluded that the AREVA Procedure 6029296A, "Reactor Head Nozzle Flange to CRDM Motor Tube Flange and Split Ring Remote Visual Inspection Plan for Davis Besse Unit 1," used for this inspection provided adequate guidance to the licensee's inspection staff.

The NRC inspectors observed approximately 70 percent of the CRDM flange examinations. The licensee performed these examinations using a VT-2 qualified contract inspector and a boric acid control qualified inspector from the Davis-Besse staff. The licensee contractor procedure required the camera system to be able to resolve Code VT-1 sized alpha numeric characters; however, the procedure was subsequently revised to require VT-2 resolution because the licensee could not meet the VT-1 acuity criteria. Confirmation of the correct CRDM flange location was verified by both the NRC inspectors and the licensee's remote camera operator. The licensee's inspectors verified that the visual acuity and lighting were adequate, at the beginning, and the end of each shift. The licensee's contractor inspection staff performed this visual acuity check by resolving Code VT-2 sized alpha numeric characters. The licensee recorded this visual examination on video tape. Overall, the NRC inspectors considered the examination to be acceptable and adequate to identify active reactor coolant system leakage if any had been present. The NRC inspectors noted that several of the 69 flange locations exhibited one or more of the following conditions:

- Apparent rusty leak trails from the flange joint;
- Thin white water spots on some of the flanges;
- Light rust on several nut rings; and
- Small white deposits around several CRDM flange nameplates and test port covers.

The NRC inspectors noted that these conditions appeared unchanged from those identified during the examination conducted prior to restart from the extended outage (October 2003). The previous inspection and evaluation of these conditions are documented in NRC Inspection Report 05000346/2003023.

c. Findings

No findings of significance were identified.

.3 Reactor Vessel Closure Head CRDM Penetration Inspection (IP 93812)

a. Inspection Scope

From January 22, 2005 through January 24, 2005, the NRC inspectors observed the licensee performing remote camera aided visual examinations of the reactor vessel closure head CRDM penetrations, reviewed the visual examination procedure, certification records of the licensee inspection personnel, and reviewed the completed visual examination records. The NRC inspectors utilized TI 2515/150, "Reactor Pressure Vessel Head and Vessel Head Penetration Nozzles (NRC Order EA-03-009)," for guidance in conducting this inspection. The NRC inspectors could not complete all attributes of TI 2515/150, because the licensee's mid-cycle outage vessel head inspection was a commitment to NRC Order EA 03-214 and not to NRC Order EA-03-009. Specifically, the NRC inspectors could not complete a review of the vessel head susceptibility ranking calculation because none was required to be completed by NRC Order EA 03-214 for this mid-cycle outage.

b. Observations

Summary: The licensee conducted this visual examination using a remotely operated crawler mounted with a color camera that traversed the bare metal head below the insulation package. The licensee positioned the camera such that all four quadrants for each of the 69 head penetrations were examined. The licensee did not identify any evidence of reactor coolant system leakage. However, the NRC inspectors questioned the existence of a black substance located at the head to penetration interface on several of the penetrations. The inspector requested a comparison of the digital photos for penetration No. 21 taken during the previous examination in October 2003, with the current examination. This comparison appeared to show more of this substance present than was previously recorded. The licensee issued CR 05-00666 on January 22, 2005, to document this condition. The NRC inspectors judged that the very small volume of this black deposit would not hinder identification of boric acid deposits indicative of leakage.

By letter dated February 3, 2005, the licensee notified the NRC that the Order (EA-03-214) required examinations of the CRDM flanged connections, reactor vessel bare metal upper head, and lower head were completed. No evidence of reactor coolant leakage was identified. The letter also stated that upon further review of the inspection video tapes, the deposits located at the head to penetration interface (discussed above) are believed to be Iron Oxide, which was likely formed during initial heat up and pressurization of the replacement head in the Fall, 2003. The licensee stated that the next examination of the head is scheduled to be performed in Spring, 2006 at which time, the results will be reviewed to determine if there are indications of changing material conditions.

The NRC inspectors reviewed the licensee's investigation of the deposits documented in CR 05-00666. The investigation noted that upon reviewing portions of past inspection records, the deposits were found to exist prior to the current examination and that careful review of the current photographs and videotape found the material to be tightly adhering and orange/brown in color, with no indications of RCS leakage or material wastage. The licensee's review of videotape from an inspection of the head conducted prior to installation, noted that many of the nozzles had staining or oxide buildup in the annular region, several of which required cleaning with a wire brush prior to completing the examination. Of the six nozzles found to have the most prominent deposits in the current inspection, three were amongst those that were cleaned, while the other three had shown staining prior to installation.

The licensee concluded that the current deposits were most likely Iron Oxide formed at elevated temperatures upon placing the head in service. Iron Oxide requires iron, moisture, and oxygen, all of which were present during initial heatup of the head. The licensee believes the source of the moisture was most likely atmospheric condensation trapped in the nozzle annular region caused by storage conditions prior to its arrival at Davis-Besse. The investigation stated that because the moisture that was required for the formation of these oxide deposits has likely been exhausted and that there were no indications of material wastage, no further actions are recommended beyond careful monitoring during the next scheduled examination to identify any changes.

The NRC inspectors found the above investigation to support the licensee's conclusions and actions going forward to be acceptable. While the NRC inspector observed some apparent increase in the volume of the deposits at penetration No. 21, the increase was not judged to be significant.

<u>Evaluation of Inspection Requirements</u>

In accordance with requirements of TI 2515/150, Revision 2, the NRC inspectors evaluated and answered the following questions:

For each of the examination methods used during the outage, was the examination:

1. Performed by qualified and knowledgeable personnel?

   Yes. The NRC inspectors verified that the examinations were performed by licensee contractors qualified and certified as ASME Code Level II VT-2 examiners. Additionally, the licensee's contract examiners received training on industry vessel head penetration leakage experiences documented in EPRI/ MRP 1006296, "Visual Exam for Leakage of PWR Reactor Head Penetrations on Top of RPV [Reactor Pressure Vessel] Head."

2. Performed in accordance with demonstrated procedures?

   Yes. The NRC inspectors verified that the bare metal visual examination was conducted in accordance with procedures which required qualified examination personnel with knowledge of identifying CRDM leakage along with resolution and lighting in accordance with the ASME Code VT-2 requirements. The NRC inspectors concluded that the AREVA Procedure 54-ISI-367, "Visual Examination for Leakage of Reactor Head Penetrations," Revision 7, and Procedure 6027636A, "Reactor Head Nozzle Penetration Remote Visual Inspection Plan," Revision 2, used to conduct this examination contained adequate guidance for the licensee's contractor inspection staff.

3. Able to identify, disposition, and resolve deficiencies?

   Yes. The NRC inspectors concluded from observing approximately 60 percent of the remote visual examination process that the licensee had sufficient access to complete 100 percent coverage of the bare metal of the reactor head as well as 360 degree coverage at each vessel head penetration. The licensee staff confirmed visual acuity and lighting at least once per shift and the NRC inspectors considered the visual examination resolution to be adequate to resolve indications of boric acid leakage (boron deposits) if any had been present. Therefore, the NRC inspectors concluded that the examination was capable of identification and resolution of deficiencies.

4. Capable of identifying the PWSCC and/or reactor vessel head corrosion phenomena described in Order EA-03-009?

   Yes. The NRC inspectors determined through direct observation of the remote visual examination process that the licensee's efforts were capable of detecting and characterizing vessel head nozzle penetration leakage, PWSCC and/or reactor vessel head corrosion if any had been present.

5. What was the condition of the reactor head (debris, insulation, dirt, boron from other sources, physical layout, viewing obstructions)?

   The reactor vessel head insulation package was located several inches above the center of the head which allowed access for the low profile manipulator and crawler mounted camera through an opening in the service structure. The licensee was able to position the camera such that all four quadrants for each of the 69 head penetrations were examined without obstruction. During the examination, the NRC inspectors noted that dust, debris (e.g., pieces of duct tape), some light surface rust, and thin milky stains were present on the head and/or penetration surfaces. While these debris/dirt did not interfere with the examination, the NRC inspector noted that more debris was found on the head surface than during previous examinations conducted in October 2003.

The NRC inspectors questioned the existence of a black substance located at the head to penetration interface on several of the penetrations. The inspector requested a comparison of the digital photos for penetration No. 21 taken during the previous examination in October 2003, with the current examination. This comparison appeared to show more of this substance present than was previously recorded. The licensee issued CR 05-00666 on January 22, 2005, to document this condition. The NRC inspectors judged that the very small volume of this black deposit would not hinder identification of boric acid deposits indicative of leakage.

6. Could small boron deposits, as described in Bulletin 01-01, be identified and characterized?

   Yes. The NRC inspectors determined through direct observation of the inspection process, a review of the visual inspection procedure, and a review of the qualifications and training of the VT-2 examiners, that small boron deposits, as described in the Bulletin 01-01, could be identified and characterized.

7. What material deficiencies (i.e., cracks, corrosion, etc.) were identified that required repair?

   Not applicable. The licensee did not identify any material deficiencies associated with the head visual examination that required repair.

8. What, if any, impediments to effective examinations, for each of the applied methods, were identified (e.g., centering rings, insulation, thermal sleeves, instrumentation, nozzle distortion)?

   None. The licensee had sufficient access to perform a remote visual examination with 360 degree coverage of each penetration.

9. What was the basis for the temperatures used in the susceptibility ranking calculation, were they plant-specific measurements, generic calculations (e.g., thermal hydraulic modeling, instrument uncertainties), etc.?

   Not applicable. The Davis-Besse reactor vessel head was replaced during the extended outage which ended in early 2004 and a susceptibility ranking calculation was not required for this mid-cycle outage.

10. During non-visual examinations, was the disposition of indications consistent with the guidance provided in Appendix D of this TI? If not, was a more restrictive flaw evaluation guidance used?

    Not applicable. Non-visual examinations were not performed.

11. Did procedures exist to identify potential boric acid leaks from pressure-retaining components above the vessel head?

    Yes. The NRC inspectors verified that visual examinations to detect potential boric acid leaks from pressure-retaining components above the vessel head were conducted in accordance with AREVA Procedure 6029296A, "Reactor Head Nozzle Flange to CRDM Motor Tube Flange and Split Ring Remote Visual Inspection Plan for Davis Besse Unit 1."

12. Did the licensee perform appropriate follow-on examinations for indications of boric acid leaks from pressure-retaining components above the vessel head?

    Not applicable. The licensee did not identify any evidence of leakage during the visual examination.

c. Findings

No findings of significance were identified.

4. Reactor Pressure Vessel Lower Head Penetration Nozzles (IP 93812)

a. Inspection Scope

From January 21, 2005, through January 24, 2005, the NRC inspectors observed the licensee performing remote camera aided visual examinations of the reactor vessel lower head penetrations, reviewed the visual examination procedure, certification records of the licensee inspection personnel, and reviewed the completed visual examination records. The NRC inspectors utilized TI 2515/152, "Reactor Pressure Vessel Head and Vessel Head Penetration Nozzles (NRC Bulletin 2003-02)," for guidance in conducting this inspection. The licensee performed the mid-cycle outage lower head inspection as a commitment to NRC Order EA 03-214 and not NRC Bulletin 2003-02. Because TI 2515/152 has been completed for Davis-Besse (reference NRC Inspection Report 05000346/2003023), the NRC inspectors did not completely review all attributes specified by this TI. Specifically, the NRC inspectors did not complete another review of the licensee's previous investigations into the origin of deposits present on the lower vessel head.

b. Observations

Summary: The licensee used a remotely operated crawler mounted with a color camera that traversed the inside of the lower insulation package to view the lower bare metal head and penetration nozzles above the insulation package. The licensee positioned the remote camera such that all four quadrants for each of the 52 lower head penetrations were examined. In May of 2003, the licensee had completed a power wash of the bottom head surface and the previous condition of the lower head has been documented in NRC Inspection Report 05000346/2003023. Evidence of some staining, light boric acid residues, rust/corrosion, and tape/mastic remained unchanged from the previous inspection. The NRC inspectors considered the general condition of the lower head to be acceptable in that, it would not interfere with identification of deposits caused by leakage from the penetration nozzles and no such deposits were identified.

Evaluation of Inspection Requirements

In accordance with requirements of TI 2515/152, Revision 1, the NRC inspectors evaluated and answered the following questions:

For each of the examination methods used during the outage, was the examination:

1. Performed by qualified and knowledgeable personnel?

   Yes. The NRC inspectors verified that the examinations were performed by licensee and contractor inspectors qualified and certified as ASME Code Level II VT-2 examiners.

2. Performed in accordance with demonstrated procedures?

   Yes. The NRC inspectors verified that the bare metal visual examination was conducted in accordance with procedures which required qualified examination personnel along with resolution and lighting in accordance with the ASME Code VT-2 requirements. The NRC inspectors concluded that the AREVA Procedure 6025716A, "Under Vessel ICI Nozzle Penetration Remote Visual Inspection Plan," used to conduct this examination contained adequate guidance for the licensee's inspection staff.

3. Able to identify, disposition, and resolve deficiencies?

   Yes. The NRC inspectors concluded from observing approximately 75 percent of the remote visual examination process that the licensee had sufficient access to complete 100 percent coverage of the bare metal of the reactor head as well as 360 degree coverage at each vessel head penetration. The licensee's inspectors compared each view of the nozzles with the previous inspection conducted in October 2003. The licensee also verified the visual exam acuity and lighting at the beginning and at the end of the examination. Therefore, the NRC inspectors concluded that the examination was capable of identifying and resolving deficiencies.

4. Capable of identifying pressure boundary leakage as described in the bulletin and/or vessel lower head corrosion?

Yes. The NRC inspectors concluded from observing approximately 75 percent of the remote visual examination process that the licensee had sufficient access to complete 100 percent coverage of the bare metal of the reactor head as well as 360 degree coverage at each vessel head penetration. The licensee inspectors compared each view of the nozzles with the previous inspection conducted in October 2003. A VT-2 qualified contract inspector and a boric acid control qualified inspector from the Davis-Besse staff performed the visual examinations. The licensee inspectors also verified the visual exam acuity and lighting at the beginning and at the end of the examination. Therefore, the NRC inspectors concluded that the remote visual examination was capable of detecting and characterizing nozzle leakage and/or lower vessel head corrosion if any had been present.

5. Could small boric acid deposits representing reactor coolant system leakage, as described in the Bulletin 2003-02, be identified and characterized, if present, by the visual examination method used?

   Yes. Because of the unobstructed access to each penetration annulus area, adequate visual resolution, and use of ASME Code VT-2 qualified examiners, the NRC inspectors concluded that reactor coolant leakage as described in Bulletin 2003-02 would have been identified if present.

6. How was the visual inspection conducted (e.g., with video camera or direct visual by the examination personnel)?

   The licensee conducted the visual examination using a high resolution camera mounted on a remotely operated crawler. The images acquired were processed directly to electronic media.

7. How complete was the coverage (e.g., 360 degrees around the circumference of all the nozzles)?

   The licensee positioned the remote camera such that all four quadrants (e.g., 360 degree coverage) were viewed for each of the 52 lower head penetrations.

8. What was the physical condition of the vessel lower head (e.g., debris, insulation, dirt, deposits from any source, physical layout, viewing obstructions)? Did it appear that there are any boric acid deposits at the interface between the vessel and the penetrations?

   The horizontal insulation package formed a flat deck under the lower vessel head from which the licensee operated a crawler mounted with a color camera that traversed the inside of the lower insulation package to view the lower bare metal head and penetration nozzles above the insulation package. The licensee positioned the remote camera such that all four quadrants for each of the 52 lower head penetrations was examined and the annulus region of each penetrations was clear and unobstructed. In May of 2003, the licensee had completed a power wash of the bottom head surface and the previous condition of the lower head has been documented in NRC Inspection Report 05000346/2003023. Evidence of some staining, light boric acid residues, rust/corrosion, and tape/mastic remained unchanged from the previous inspection. The NRC inspectors considered the general condition of the lower head to be acceptable in that, it would not interfere with identification of deposits caused by leakage from the penetration nozzles and no such deposits were identified.

No. The licensee did not identify any boric acid deposits at the interface between the vessel and the penetrations (e.g., the annulus region).

9. What material deficiencies (i.e., cracks, corrosion, etc.) were identified that required repair?

   Not applicable. The licensee did not identify any material deficiencies associated with the lower head visual examination that required repair.

10. What, if any, impediments to effective examination, for each of the applied non-destructive examination methods, were identified (e.g., insulation, instrumentation, nozzle distortion)?

    None. The licensee had sufficient access to perform a remote visual examination with 360 degree coverage of each penetration.

11. Did the licensee perform appropriate follow-on examinations for indications of boric acid leaks from pressure-retaining components above the vessel lower head?

    Not applicable. The licensee did not identify any evidence of leakage during the visual examination.

12. Did the licensee take any chemical samples of the deposits? What type of chemical analysis was performed (e.g., Fourier Transform Infrared (FTIR)), what constituents were looked for (e.g., boron, lithium, specific isotopes), and what were the licensee's criteria for determining any boric acid deposits were not from R.C.S. leakage (e.g., Li-7, ratio of specific isotopes, etc.)?

    No. The licensee had previously sampled and tested deposits found on the lower vessel head as discussed in NRC Inspection Report 05000346/2003023.

13. Is the licensee planning to do any cleaning of the head?

    No. The licensee did not conduct further cleaning of the lower vessel head during the mid-cycle outage.

14. What are the licensee's conclusions regarding the origin of any deposits present and what is the licensee's rationale for the conclusions?

Not applicable. The NRC inspectors had previously discussed the results of chemical samples and conclusions regarding the origin of the lower head deposits in NRC Inspection Report 05000346/2003023.

c. Findings

No findings of significance were identified.

.5 Boric Acid Corrosion Control (IP 93812)

a. Inspection Scope

From January 18, 2005, through January 21, 2005, the NRC inspectors reviewed the BACC inspection activities conducted pursuant to licensee commitments made in response to NRC Generic Letter 88-05, “Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary.”

The NRC inspectors conducted an on-site observation of licensee staff performing BACC visual examinations to evaluate compliance with licensee’s BACC program requirements and 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action,” requirements. Specifically, the NRC inspectors accompanied licensee staff performing examinations of systems and components inside the East D-ring enclosure and at the 565 foot elevation inside containment. The NRC inspectors determined that the licensee’s visual examinations focused on locations where boric acid leaks could cause degradation of safety significant components and that degraded or non-conforming conditions were properly identified in the licensee’s corrective action system.

b. Observations

The NRC inspectors determined through direct observations that the licensee’s BACC walkdowns in containment were thorough and that the threshold for entering deficiencies into CRs was appropriately low. The licensee issued in excess of 100 CRs to document identification of boric acid residue during the mid-cycle system walkdown inspections. The CRs generated by the licensee were mostly associated with valve packing leakage. Of the 40 - 50 valves designated for corrective work, the licensee staff had planned 30 of them in advance of the walkdown. The licensee did not identify any evidence of pressure boundary leakage during these walkdowns.

During walkdown of the East D-ring enclosure, the NRC inspectors observed a small amount of boric acid deposit located on the Reactor Coolant Pump (RCP) 2-2 case-to-cover joint. The boric acid was dry, white, and tightly adhered to the joint. The boric acid deposits did not contact the RCP case-to-cover studs which are part of the pressure retaining boundary. Since these areas had already been inspected by the licensee, the NRC inspectors verified that this condition had been documented in a CR and that the deposits were accurately described. The NRC inspectors noted that another CR had been issued for RCP 2-1 and similarly, a small amount of boric acid deposit was present at the case-to-cover joint.

c. Findings

No findings of significance were identified.

4OA6 Meetings

.1 Exit Meeting

The NRC inspectors presented the inspection results to Mr. Bezilla and other members of licensee management on January 28, 2005. The NRC inspectors asked the licensee whether any materials discussed as potential report input should be considered proprietary. No proprietary information was identified.

.2 Supplemental Exit Teleconference

The NRC inspectors discussed the results of a review of the February 3, 2005, FENOC correspondence with Mr. Clark Price on February 15, 2005.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

M. Bezilla, Site Vice President
B. Allen, Plant Manager
D. Wuokko, Regulatory Compliance Supervisor
D. Gerren, Steam Generator Engineer
S. Franklin, Nuclear Engineer
G. Wolf, Regulatory Affairs

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened Closed or Discussed

None.

LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety but rather that selected sections of portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

1R08 Inservice Inspection Activities

Corrective Action Documents Generated During the Inspection

CR 05-00377; Areva Document 51-5051884-00 Reference Error; dated January 19, 2005

CR 05-00457; Tubing Thread Chaser Left on Floor at 565' Elevation in Containment; dated January 19, 2005

CR 05-00767; In-Situ Screening Voltage Not Supported by Documentation; dated January 26, 2005

CR 05-00769; Measurement of Tube Noise NRC Concern; dated January 26, 2005

CR-05-00774; Alloy 600 Insulation Inspection Concern; dated January 20, 2005

Corrective Action Documents Reviewed During Inspection

CR 02-01165; Eddy Current Identified Tubes in Need of Repair; dated March 11, 2002

CR 04-07333; EPRI Exceptions; dated November 30, 2004

CR 04-02454; Traces of Radioactive Fission Gases in Condenser Vacuum System Discharge; dated April 1, 2004

CR 05-00765; Reactor Vessel Closure Head; dated January 23, 2005

Miscellaneous Documents

AREVA Document 54-ISI-400-13; Multi-Frequency Eddy Current Examination of Tubing; dated July 19, 2004

AREVA Document 51-5001484-03; Qualified Eddy Current Examination Techniques for Davis-Besse; November 19, 2004

AREVA Document Examination Technique Specification Sheet (ETSS) No. 4; Sleeve +Point Probe Examination; Revision 0

AREVA Document ETSS No. 3; Rotating Probe for Obstructed Tubes; Revision 0

AREVA Document ETSS No. 2; Rotating Probe, Tube Expansion, Lane and Wedge, Lower Tubesheet Crevice and Special Interest; Revision 0

AREVA Document ETSS No. 1; Bobbin Standard ASME Code Examination for Unsleeved Parent Tubing; Revision 0

Babcock and Wilcox (B&W) Document 77-1258722-00; Probability of Detection of Defects in Once-Through Steam Generators; dated December of 1977

B&W Document 77-5002925-06; Probability of Detection of Defects in Once-Through Steam Generators; dated December 16, 2003

Davis Besse 13RFO OTSG Degradation Assessment; Revision 2

DB-PF-05058; Steam Generator Eddy Current Data Analysis Guidelines; Revision 4

Engineering Evaluation Response Sheet; 14 Mid-Cycle Steam Generator In-Situ Pressure Test Selection Document Following NEI 97-06; dated January 19, 2005

EPRI Document ETSS No. 96912.1; Revision 9

EPRI Document ETSS No. 96912.2; Revision 9

EPRI Document ETSS No. 96910.1; Revision 8

EPRI Document ETSS No. 20510.1; Revision 5

EPRI Document ETSS No. 20511.1; Revision 7

EPRI Document ETSS No. 96703.1; Revision 15

EPRI Document ETSS No. 21409.1; Revision 4

EPRI Document ETSS No. 21410.1; Revision 4

EPRI Document ETSS No. 96009.1; Revision 6

EPRI Document ETSS No. 96002.1; Revision 10

EPRI Document ETSS No. 96007.1; Revision 10

EPRI Document ETSS No. 96008.1; Revision 13

Framatome Advanced Nuclear Products (FANP) Document 51-5034564-02; Davis Besse Degradation Assessment for 14 Mid-Cycle January 2005; dated December 3, 2004

FANP Document 51-5051884-01; Procedure for Selection of In-Situ Pressure Testing Candidates; dated January 19, 2005

FANP Document 51-5000345-02; PWSCC and Primary Side IGA Sizing Performance of OTSG Rotating Coil Examinations; July 27, 2001

FANP Document 60101451; Field Procedure For In-Situ Tube Pressure Testing of OTSG tubes Using the Triplex Pump; Revision 4

Memorandum to S. Slosnevich (FENOC) from W. Boudreaux (FANP); Calibration Standards for 14MCO; dated January 19, 2005

4OA5 Other Activities

AREVA Document 6027636A; Reactor Head Nozzle Penetration Remote Visual Inspection Plan; Revision 2

AREVA Procedure 54-ISI-367; Visual Examination for Leakage of Reactor Head Penetrations; Revision 7

AREVA Procedure 6029296A; Reactor Head Nozzle Flange to CRDM Motor Tube Flange and Split Ring Remote Visual Inspection Plan for Davis Besse Unit 1; Revision 1

EN-DP-01501; Inspection of RCS Alloy 600 Components/Welds, Threaded/Bolted Connections and Targets Inside Containment; Revision 9

NOP-ER-2001; Boric Acid Corrosion Control Program; Revision 4

ISI-SK-020; Pressurizer Outline Containment Building; Revision 2

ISI-SK-022; Pressurizer Lower Head Nozzle Details Containment Building; Revision 1

Response to NRC Bulletin 2004-01; Inspection of Alloy 82/182/600 Materials Used I the Fabrication of Pressurizer Penetrations and Steam Space Piping Connections at Pressurized-Water Reactors; dated July 26, 2004

CR 03-04131; Pressurizer Heater Bundle Mirror Insulation Disrupted During Deconning; dated May 25, 2003

CR 05-00386; Boric Acid Found on RCP 2-1 Case to Cover Joint; dated January 18,2005

CR 05-00387; Boric Acid Found on RCP 2-2 Case to Cover Joint; dated January 18,2005

CR 05-00400; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00402; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00405; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00406; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00407; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00408; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00410; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00411; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00412; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00413; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00415; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00416; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00417; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00418; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00419; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00420; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00421; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00422; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00423; BACC: Mid-cycle 14 Outage CTMT Area Inspections; dated January 19, 2005

CR 05-00607; Rust Streaking on Pressurizer Vessel Wall; dated January 22, 2005

LIST OF ACRONYMS USED

ADAMS	Agency wide Documents Access and Management System
ASME	American Society of Mechanical Engineering
ASNT	American Society for Non-Destruction Testing
BA	Boric Acid
BACC	Boric Acid Corrosion Control
CR	Condition Report
CRDM	Control Rod Drive Mechanism
EPRI	Electric Power Research Institute
ET	Eddy Current
ISI	Inservice Inspection
NRC	Nuclear Regulatory Commission
PWR	Pressurized Water Reactor
RCS	Reactor Coolant System
SG	Steam Generator
TI	Temporary Instruction
TS	Technical Specification
VT	Visual Test