September 13, 2002

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 -BORIC ACID CORROSION EXTENT OF CONDITION - REPORT NO. 50-346/02-09(DRS)

Dear Mr. Myers:

On July 26, 2002, the NRC completed a special inspection at your Davis-Besse Nuclear Power Station. This inspection reviewed your actions to resolve Restart Checklist Item No. 2c, associated with the adequacy of safety significant structures, systems and components located inside of containment. Specifically, this inspection focused on review of activities as described in the Containment Boric Acid Extent of Condition Plan. This plan described your activities to identify, evaluate and disposition the extent of condition throughout the reactor coolant system and containment structures systems and components relative to the nozzle cracking and boric acid corrosion mechanisms that occurred on the reactor pressure vessel head (reference NRC IR 50-346/02-03(DRS)). Our review of this plan, included evaluation of your staff's inspection methods (lighting, visual aides, access), control of walkdown boundaries, resolution of obstructed examinations, and control of data sheets/video records. The enclosed report presents the results of our review.

The inspectors identified two findings of very low safety significance (Green) that were determined to involve violations of NRC requirements. The first finding is associated with lack of acceptance criteria and requirements to follow inspection plans. The second finding is associated with inadequate training and certification of inspection personnel used to perform containment area inspections. Additionally, inspectors identified weaknesses in your staff's inspection efforts such as, inconsistent methods to track completion of inspected components, lack of demonstrated visual inspection quality requirements and components with corrosion/boric acid that were not identified during your inspections. These findings and observations indicate that your Containment Boric Acid Extent of Condition Plan was not effectively implemented in all respects. Therefore, Restart Checklist Item No. 2.c will remain open, pending additional NRC inspections of your activities to address this item. In response to these findings and observations, your staff revised your inspection plans and procedures, re-trained and re-certified inspection personnel and implemented corrective actions to repeat these inspections.

Because of the very low safety significance of the findings and because these issues have been entered into your corrective action program, the NRC is treating these issues as Non-Cited Violations in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny these Non-Cited Violations, you should provide a response with a basis for your denial, within 30 days of the date of this inspection report, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, Region III; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Davis-Besse Nuclear Power Station.

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. 50-346/02-09(DRS)

cc w/encl: 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
President, Ottawa County Board of Commissioners
D. Lochbaum, Union of Concerned Scientists

Because of the very low safety significance of the findings and because these issues have been entered into your corrective action program, the NRC is treating these issues as Non-Cited Violations in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny these Non-Cited Violations, you should provide a response with a basis for your denial, within 30 days of the date of this inspection report, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, Region III; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Davis-Besse Nuclear Power Station.

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Sincerely,

John A. Grobe, Chairman
Davis-Besse Oversight Panel

Docket No. 50-346
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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50-346
License No:	NPF-3
Report No:	50-346/02-09(DRS)
Licensee:	FirstEnergy Nuclear Operating Company
Facility:	Davis-Besse Nuclear Power Station
Location:	5501 North State Route 2 Oak Harbor, OH 43449
Dates:	June 10 through 21, 2002 July 22 through 26, 2002
Inspectors:	M. Holmberg, Reactor Inspector, Division of Reactor Safety J. Larizza, Resident Inspector, Division of Reactor Projects
Approved by:	John A. Grobe, Chairman Davis-Besse Oversight Panel

TABLE OF CONTENTS

SUMMARY OF FINDINGS

IR 05000346-02-09, on 06/10-08/01/2002, FirstEnergy Nuclear Operating Company, Davis-Besse Nuclear Power Station. Special Inspection.

This report covers a 3-week special inspection of licensee activities associated with identifying and evaluating the effects of reactor coolant leakage and boric acid corrosion of components and systems within containment. This inspection was conducted by a Resident Inspector and an inspector based in the NRC Region III Office. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609, "Significance Determination Process" (SDP). The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at http://www.nrc.gov/NRR/OVERSIGHT/index.html.

A. Inspector Identified Findings

Cornerstone: Barrier Integrity

Green. Inspectors identified a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," in that, the licensee failed to provide acceptance criteria or requirements to follow the inspection plans used for the extent of condition inspections of systems in containment.

This finding was considered to be more than minor because it had the potential to affect the barrier integrity cornerstone (procedure quality attribute). This finding, if left uncorrected, could have become a more significant safety concern in that, lack of acceptance criteria and plan adherence criteria could have resulted in the failure to detect degraded systems, structures and components within containment. Subsequently, the licensee implemented actions to revise inspection plans and procedures, incorporate acceptance criteria, and reperform the containment inspections. This finding was determined to be of very low risk significance (Section 4OA3.1).

Green. Inspectors identified a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," in that, the licensee failed to adequately train personnel for VT-2 certification to perform containment area extent of condition walkdowns.

This finding was considered to be more than minor because, if left uncorrected, it could have become a more significant safety concern in that, use of improperly trained personnel could have resulted in the failure to detect degraded systems, structures, and components within containment. Subsequently, the licensee implemented actions to repeat these inspections using personnel trained and certified to a newly developed boric acid and corrosion control inspector training standard. This finding was determined to be of very low risk significance (Section 4OA3.2).

Report Details

BACKGROUND AND EVENT OVERVIEW

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 nozzle. This condition was caused by coolant leakage and boric acid corrosion of the head material induced by an undetected crack in the adjacent control rod drive 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. This condition represented a loss of the reactor vessel's pressure retaining design function, since the cladding was not considered as pressure boundary material in the structural design of the reactor pressure vessel. While the cladding did provide a pressure retaining capability during reactor operations, the identified degradation represented an unacceptable reduction in the margin of safety of one of the three principal fission product barriers at the Davis-Besse Nuclear Power Station (reference NRC IR 50-346/02-03(DRS)).

As a corrective action for the vessel head degradation, the licensee implemented the "Containment Boric Acid Extent of Condition Plan." This plan described activities to evaluate and disposition the extent of condition throughout the reactor coolant system and containment structures systems and components relative to the degradation mechanisms that occurred on the reactor pressure vessel head. The NRC inspectors reviewed the activities as described in the "Containment Boric Acid Extent of Condition Plan." For this inspection, the NRC inspectors focused on the identification of issues under the "Boric Acid Extent of Condition Plan." The NRC intends to review the resolution of a sample of degraded structures, systems and components (SSCs) identified during this licensee effort during a subsequent NRC inspection for Davis Besse (50-346/2002-012(DRS)). Given the high public interest in this subject area at Davis Besse and therefore need to clearly communicate the rationale for NRC staff conclusions regarding the effectiveness of licensee extent of condition inspections, this report documents several observations in addition to the inspection findings.

4.0 OTHER ACTIVITIES [OA]

4OA3 Event Followup (93812 "Special Inspections")

.1 Containment Boric Acid Extent of Condition Plan

a. Inspection Scope

The NRC inspectors reviewed the licensee's "Containment Boric Acid Extent of Condition Plan" to evaluate the adequacy of the procedures and plans and the scope of SSCs included under the licensee's plan.

b. Observations and Findings

b.1 Licensee Inspection Plan Scope

The charter for the “Containment Boric Acid Extent of Condition Plan,” Revision 2, encompassed actions to evaluate and disposition the extent of condition throughout the reactor coolant system (RCS) and containment SSCs relative to the degradation mechanisms that occurred on the reactor pressure vessel head. The licensee defined three specific terms relative to the scope of SSCs walkdowns in this plan:

> Sources: Components containing borated water that were considered likely leak locations - sources were further subdivided into three groups; mechanical joints (e.g., valve packing, bolted flanged connections), alloy 600 components/welds, and instrument tubing. The licensee conducted inspection of sources to assure that evidence of RCS leakage from any source was properly identified and evaluated.
>
> Targets: Components within the RCS that utilize materials susceptible to boric acid corrosion (carbon and low alloy steels) as part of the pressure boundary. The licensee conducted inspection of targets to assure that no undetected degradation of the RCS pressure boundary existed.
>
> Miscellaneous: Non-RCS pressure boundary SSCs, utilizing materials susceptible to boric acid corrosion, but are not part of the RCS. The licensee conducted inspection of miscellaneous SSCs to verify that boric acid corrosion had not adversely impacted component functions.

The NRC inspectors considered the scope of the licensee’s “Containment Boric Acid Extent of Condition Plan” sufficiently comprehensive to identify the potentially degraded components affected by boric acid corrosion within containment. However, to assess the need for direct inspection of borated systems outside containment, the NRC inspectors initiated a walkdown of one such system (the decay heat removal (DHR) system).

The NRC inspectors performed a walkdown of the DHR system (contains borated water) outside containment to identify any boric acid deposits or corrosion. Inspectors observed minor boric acid leakage indications at a few valve packing locations and at the mechanical seal for both the "A" and "B" DHR Pumps. Dry, white boric acid residue was also observed on the bonnet and yoke arm set screw for Valve DH1518 (12 inch diameter RCS suction valve to DHR Pump "B"). The licensee subsequently identified in condition report (CR) 02-02600, a need to revise the Boric Acid Control Program to include systems with boric acid outside containment. The licensee later issued procedure NOP-ER-2001, “Boric Acid Corrosion Control Program,” which prescribed actions for boric acid leaks inside and outside containment for Davis-Besse and Beaver Valley Stations.

b.2 Lack of Acceptance Criteria and Requirements to Follow Inspection Plans

Introduction

Green. The NRC inspectors identified a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” in that, the licensee failed to provide acceptance criteria and failed to require inspectors to follow the inspection plans that were used for the extent of condition inspections of systems in containment. If left uncorrected, this finding could have become a more significant safety concern in that, lack of acceptance criteria and plan adherence requirements could have resulted in the failure to detect degraded SSCs within containment.

Description

The “Containment Boric Acid Extent of Condition Plan” was subdivided into three individual inspection plans; IP-M-028, “Alloy 600, Threaded/Bolted Class 1 Joints and Connections RCS Extent of Condition Inspection,” IP-M-029, “Containment Area Inspections,” and IP-M-30, “Reactor Vessel and Incore Tunnel Area Extent of Condition Inspection Plan.” The licensee used these plans to control field inspection activities which affected quality (e.g., activities to identify degraded SSCs in containment). However, these plans did not meet the same quality assurance program requirements/standards that applied to safety-related procedures. Specifically, no requirement existed to adhere to an inspection plan, nor were acceptance criteria defined in plans IP-M-028 and IP-M-030. Additionally, the level of use (e.g., general reference or continuous) that was expected of personnel following these plans was not defined. Therefore, the NRC inspectors considered the use of these plans inadequate to direct field activities associated with identification of degraded SSCs in containment.

Analysis

This issue represented a licensee performance deficiency, because activities affecting quality were not adequately controlled in that the plans used for containment inspection activities lacked acceptance criteria or requirements to follow them. This finding had the potential to affect the barrier integrity cornerstone (procedure quality attribute) and was greater than minor because, if left uncorrected, it could have become a more significant safety concern. Specifically, lack of acceptance criteria and plan adherence requirements, could have resulted in the failure to detect degraded SSCs within containment. In fact, the NRC inspectors and licensee quality assurance personnel identified corrosion of components which had been missed during this licensee inspection activity (Section 4OA3.2.b.1.3). This finding has greater significance than a similar issue described in NRC Manual Chapter 0612, Appendix E, Section 4.c. Subsequently, the licensee implemented actions to revise the plans and procedures, incorporate acceptance criteria, and re-perform the containment inspections. This finding was determined to be of very low risk significance (Green).

Enforcement

10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," requires in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions. Instructions, procedures, and drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

Contrary to the requirements above, on June 21, 2002, NRC inspectors identified that IP-M-028, Revision 0, and IP-M-030, Revision 1, lacked acceptance criteria and requirements appropriate to the circumstances (e.g., requirement to follow these plans). Failure to include acceptance criteria or requirements to follow the inspection plans is a violation of 10 CFR Part 50, Appendix B, Criterion V. Because of the very low safety significance, this violation is being treated as a Non-Cited Violation (NCV 50-346/02-09-01) consistent with Section VI.A.1 of the NRC Enforcement Policy. The issues identified in this violation are documented in the corrective action program in CR 02-02544 and CR 02-02541.

b.3 Plans Lacked Demonstrated Visual Inspection Quality Requirements

The American Society of Mechanical Engineers Code Section XI, invokes quality requirements for visual inspection of Code components. For VT-2 inspections, this standard requires being able to discern characters 0.158 inches in height from a distance of six feet under a minimum of 15 foot-candles of illumination. Typically, lower case characters are printed on a laminated "visual acuity card" and used by the field inspection staff to confirm the fidelity of the visual examination. However, NRC inspectors identified that the licensee had not invoked these requirements, or any other requirements to confirm the quality of the visual inspections described in their inspection plans.

The NRC inspectors noted that IP-M-30, "Reactor Vessel and Incore Tunnel Area Extent of Condition Inspection Plan," lacked a requirement for a demonstrated check of visual quality for the remote camera used in this inspection. The licensee subsequently issued Revision 2 to this plan that added a requirement to demonstrate that the VT-2 sized lettering on a visual acuity card could be read from eight feet.

The NRC inspectors noted that IP-M-28, "Alloy 600, Threaded/Bolted Class 1 Joints and Connections RCS Extent of Condition Inspection," lacked a requirement for a demonstrated check of visual quality for this inspection. The licensee subsequently issued Revision 1 to this plan that added a requirement to demonstrate that the VT-2 sized lettering on a visual acuity card could be read from six feet.

The NRC inspectors noted that IP-M-029, "Containment Area Inspections," Revision 0, lacked a requirement for a demonstrated check of visual quality for this inspection. The licensee subsequently issued procedure EN-DP-1502, "Containment Area Inspections," that added a requirement to demonstrate that the VT-2 sized lettering on an acuity card could be read from six feet.

.2 Implementation of the Containment Boric Acid Extent of Condition Plan

a. Inspection Scope

To evaluate the implementation of the "Containment Boric Acid Extent of Condition Plan," the NRC inspectors reviewed inspection methods (lighting, visual aides, access), boundaries of walkdowns, turnover of partial walkdowns, resolution of obstructions to complete examinations, and control of data sheets and video records generated. Further, NRC inspectors performed direct visual examinations, review of video records,

and/or review of exam data sheets for a sample of components identified in each category defined in the plan (e.g., source, target and miscellaneous). The NRC inspectors focused this review effort on the following list of components/ areas:

Source components (Dissimilar metal welds)
- 10 inch diameter pressurizer surge line nozzle safe end weld PZR-01
- 2.5 inch and 3 inch diameter welds adjacent to pressurizer relief valves RC 2A, RC 13A and RC13B

Targets
- Reactor vessel surfaces under the insulation layer
- Containment liner focused on areas near interface with containment floor

Miscellaneous
- Control rod drive mechanism ventilation fans/duct-work on service structure
- Service water piping systems

The NRC inspectors reviewed VT-2 personnel certifications and training records. The inspectors also interviewed VT-2 inspection personnel to determine their level of knowledge and experience.

b. Observations and Findings

b.1 General Observations

b.1.1 Vessel Inspections

The licensee performed inspections of the reactor vessel under the insulation in accordance with IP-M-30, "Reactor Vessel and Incore Tunnel Area Extent of Condition Inspection Plan." For this examination, the licensee used a remote camera system mounted to a robotic crawler that provided an effective approach to minimize dose. The licensee videotaped this inspection and documented the inspection results on data sheets in IP-M-30 and on CRs. Based on review of this tape, the camera optics and lighting provided excellent visual resolution and adequate color contrast for this inspection, such that potentially corroded areas of the vessel were clearly identifiable. Camera access was limited in areas near the cold leg nozzle piping and vessel 0-ring seal ring leak-off piping due to the installed mirror insulation. The licensee planned to remove this insulation and complete the inspection.

The NRC inspectors noted large areas of the vessel with scattered patches of peeling paint. The licensee stated that the coating was a corrosion inhibitor applied by the vessel fabricator. Some of the areas with peeled paint left unprotected metal which appeared to have a layer of surface corrosion. Each of the vessel nozzles typically had a thin coating of corrosion products. In particular the west side hot leg and lower head were coated with a thin layer of corrosion products and boric acid residue. The licensee engineering staff believed that these residues were primarily from washdown of the deposits on the head which occurred during Refueling Outages 12 and 13. The corrosion products appeared to have run down the sides of the vessel and converged at the bottom center in-core guide tube penetration. The presence of the corrosion

products and boric acid deposits prevented a complete examination of the 52 in-core guide tubes at the interface with the bottom of the vessel head. The licensee documented this potential masking affect (to completing the dissimilar metal weld examinations) in their corrective action program. Additionally, the licensee believed that this washdown or leakage around the cavity seal was the cause for source term accumulation in the horizontal insulation panels under the vessel, which were found to have elevated radiation levels. The licensee planned to remove peeling paint and take samples of corrosion products to investigate the areas of the vessel with corrosion deposits.

The licensee thoroughly documented the conditions found on the vessel. However, the NRC inspectors identified that a potential existed for water or moisture intrusion into two non-environmentally qualified boxes attached to in-core guide tubes below the vessel. These boxes housed transducer assemblies which provided inputs into the loose parts monitoring system. If moisture or boric acid deposits accumulated inside these boxes it could adversely affect the electrical connectors to the transducer assembly. The routine maintenance performed on this system included a channel check, which would not necessarily identify a degraded transducer assembly. Therefore, the licensee initiated CR 02-2727 and was planning actions to open and inspect these boxes.

Overall, the NRC inspectors considered the scope and quality of reactor vessel inspections adequate to identify and characterize potential degradation. Further, the use of a remote camera mounted to a crawler minimized the radiation dose for personnel performing this inspection.

b.1.2 Dissimilar Metal Weld and Threaded/Bolted Class 1 Joint Inspections

The licensee performed inspections of dissimilar metal welds (alloy 600 to steel or stainless steel) in accordance with IP-M-028, “Alloy 600, Threaded/Bolted Class 1 Joints and Connections RCS Extent of Condition Inspection.” For the dissimilar metal weld examinations, documentation included pictures, examination reports and condition reports. This documentation appeared comprehensive and thorough.

The NRC inspectors observed very light white streaked stains (possibly indicative of minor coolant leakage and boric acid residue from some location higher on the pressurizer) on the pressurizer 10 inch surge line nozzle safe end weld PZR-01. This streaking had been identified by the licensee during the dissimilar metal weld inspection indicating that licensee staff had a low threshold for identifying boric acid residue on dissimilar metal welds. However, the NRC inspectors identified couplant gel, used in ultrasonic inspections of welds left on the pressurizer relief nozzle weld at RC 13A which had not been identified during dissimilar metal weld examinations. This indicated that the licensee inspection personnel were focused on potential boric acid deposits and corrosion, vice other material condition issues. The licensee entered this into their corrective action systems as CR 02-02127.

No indications of active leakage were identified at the dissimilar metal welds inspected by the licensee staff. In general, the NRC inspectors considered the scope and quality of the dissimilar metal weld and threaded/bolted Class 1 joints inspections adequate to identify and characterize potential degradation. However, the NRC inspectors noted

that detection of leakage from dissimilar metal welds that attached the in-core guide tubes to the lower vessel head area would be potentially masked by the corrosion deposits discussed in Section 4OA3.2.b.1.1. The licensee had captured this issue in the Corrective Action Program.

b.1.3 Containment Area Inspections

The licensee performed inspections of containment in accordance with IP-M-029, "Containment Area Inspections," with one exception. Personnel that performed these walkdowns were not properly trained and certified to VT-2 inspection requirements as required by this plan (See Section 4OA3.2.b.2). Further, two areas of containment (585-5S and 636-1S) were inspected by licensee staff that had not yet been certified as VT-2 qualified examiners (CR 02-02569). For the containment area inspections, the licensee used multi-discipline teams of engineering staff in each of the containment areas. This appeared to provide a technically sound approach for identifying issues. Further, the areas in containment were well defined and clearly understood by the personnel performing these inspections.

The NRC Inspectors identified a potential weaknesses in implementation of the containment walkdown inspections for areas which required inspections that extended for several shifts or several days. During these inspections personnel did not use consistent method to track completion of components within the examination areas assigned. Some personnel tracked the status of components inspected on drawings and some relied on memory when returning to continue inspection of components in the assigned area.

Many areas of containment were identified with boric acid deposits or corrosion during this walkdown. Some of the more notable areas included corrosion products at the containment area coolers and discharge plenums, thermowell locations on hot leg RCS piping, and service water piping. During past plant operation, the service water piping had condensed the boric acid from the containment atmosphere. This resulted in deposits of boric acid or corrosion on components under the service water piping runs, such as cable trays, electrical conduits and electrical junction boxes.

The NRC inspectors identified areas of corrosion and/or boric acid deposits that licensee staff had missed during the containment area walkdown inspections. For example, corrosion was not initially identified at the containment liner to floor interface gap (CR 02-02528) and a service structure ventilation system fan motor and shaft (CR 02-02671). Subsequent inspections by licensee quality assurance personnel also identified corrosion/boric acid deposits at two manual valves (CR 02-02648) that had not been identified during the original containment walkdowns. Based on these observations, the NRC inspectors concluded that the containment walkdowns were not completely effective at identifying the more subtle areas in containment where corrosion or boric acid deposits existed.

The failure to properly certify personnel, use of inconsistent methods to track completion of inspected components, and examples of components with corrosion/boric acid missed during inspections indicated that this effort was not effectively implemented. Therefore, the licensee implemented actions to repeat these inspections using

personnel trained and certified to a newly developed boric acid and corrosion control inspector training standard.

b.2 Inadequate Training and Certification of Inspection Personnel

Introduction

Green. The NRC inspectors identified a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," in that, the licensee failed to adequately train personnel for VT-2 certification to perform containment area extent of condition inspections. If left uncorrected, this finding could have become a more significant safety concern in that, using improperly trained personnel could have resulted in the failure to detect degraded SSCs within containment.

Description

The NRC inspectors interviewed five licensee staff that had been certified to VT-2 qualification standards to meet requirement 3.1 of plan IP-M-029, "Containment Area Inspections." The personnel were required to be qualified in accordance with NA-QC-07004. This document required a minimum of six hours of training to be certified as a Level II VT-2 inspector. For the five licensee staff interviewed, each had typically less than four hours of training, which was less than the minimum hours of training to be certified. Additionally, one student did poorly on the color vision test, but was certified.

The NRC inspectors also identified a lack of applicable work experience for five VT-2 personnel certified as Level II VT-2 examination personnel in April of 2002. The procedure NA-QC-07004, "Certification of Nondestructive Examination Personnel," Revision 1, required 60 hours of experience in the VT method for applicable work experience. For the inspection personnel interviewed, none had applicable experience in the VT-2 inspection method.

The NRC inspectors were also concerned that the practical examination administered was not sufficiently challenging. For example, piping used for this test was typically not insulated making identification of leaks less challenging and the pipe configuration used was easily accessible and did not require use of ladders or mirrors to identify leaks. Further, students taking this examination were given piping plans vice having to request or locate them. The quality check for lighting adequacy was done based on student estimation of appropriate distance and ability to read the VT-2 acuity card using a flashlight. No actual light-meter check for illumination (15 foot-candles minimum) was performed to confirm minimum American Society of Mechanical Engineers Code, Section XI lighting requirements for a VT-2 examination.

Of the 23 licensee personnel that were certified for the first time as VT-2 examiners to support the containment area inspections, no student failed either the written or practical examinations. The lack of training and requisite experience identified for the five licensee staff discussed above, appeared to apply to all of these 23 licensee personnel certified for the first time as level II VT-2 inspectors and used for the containment area walkdowns. The licensee subsequently identified that the VT-2 training program specified by NA-QC-07004 did not comply with station requirements for a systematic approach to training. These issues were documented by the licensee in CR 02-02696.

Analysis

This issue represented a licensee performance deficiency because the minimum acceptable procedural standards for training personnel had not been met, consequently it is considered a finding. This finding had the potential to affect the barrier integrity cornerstone (human performance attribute) and was greater than minor because, if left uncorrected, it could have become a more significant safety concern. Specifically, the use of improperly trained personnel could have resulted in the failure to detect degraded SSCs within containment. In fact, NRC inspectors and licensee quality assurance personnel identified corrosion of components which had been missed during this inspection activity (Section 4OA3.2.b.1.3). This finding has greater significance than a similar issue described in NRC Manual Chapter 0612, Appendix E, Section 4.i. Subsequently, the licensee implemented actions to repeat these inspections using contract personnel certified to a newly developed boric acid and corrosion control inspector training standard. This finding was determined to be of very low risk significance (Green).

Enforcement

10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," requires in part, that activities affecting quality shall be prescribed by documented instructions, procedures or drawings and shall be accomplished in accordance with these instructions. Attachment 1 of NA-QC-07004, "Certification of Nondestructive Examination Personnel," Revision 1, Step 2 states, "A person may be qualified directly to NDE [nondestructive examination] Level II with no time as a certified NDE Level I, providing the required experience/training consists of the sum of the hours required for Level I and Level II," six total hours (combined four hours for Level I and two hours for Level II), was specified in the "Training (Hours)" Table in Attachment 1. This Table also required 60 hours of experience "in method" (e.g., accompany a certified VT-2 examiner) for work experience.

Contrary to the requirements above, five personnel certified as Level II VT-2 examiners in April of 2002, had received approximately four hours of VT-2 training and did not have any hours of applicable work experience in the VT-2 inspection method. Failure to provide six hours of training and have 60 hours of experience in the VT-2 inspection method as required by procedure NA-QC-07004 is a violation of 10 CFR Part 50, Appendix B, Criterion V. Because of the very low safety significance, this violation is being treated as a Non-Cited Violation (NCV 50-346/02-09-02) consistent with Section VI.A.1 of the NRC Enforcement Policy. The issues identified in this violation are documented in the corrective action program in CR 02-02693 and CR 02-03398.

.3 Conclusions on Containment Extent of Condition Inspections

The NRC inspectors identified two findings of very low safety significance (Green) that were determined to involve violations of NRC requirements. The first finding is associated with lack of acceptance criteria and requirements to follow inspection plans. The second finding is associated with inadequate training and certification of inspection personnel used to perform containment area inspections. These findings indicate that the licensee's Containment Boric Acid Extent of Condition Plan was not effectively implemented in all respects.

The NRC inspectors considered the scope of the licensee's "Containment Boric Acid Extent of Condition Plan" to be sufficiently comprehensive to identify the potentially degraded components affected by boric acid corrosion within containment. However, a need was identified by the NRC inspectors and licensee personnel to perform direct inspection of borated systems outside containment. The NRC inspectors also identified that the licensee had not invoked requirements to confirm the quality of the visual inspections described in their inspection plans.

The NRC inspectors considered scope and quality of the vessel inspections, dissimilar metal weld and threaded/bolted Class 1 joints inspections adequate to identify and characterize potential degradation. However, inspectors noted that detection of leakage from dissimilar metal welds at the in-core guide tube area could be masked by the corrosion deposits.

For the containment area walkdown inspections, the failure to properly certify personnel, use of inconsistent methods to track completion of inspected components and examples of components with corrosion/boric acid missed during inspections, indicated that this effort was not effectively implemented in all respects. Therefore, the licensee implemented actions to repeat these inspections.

4OA6 Meetings

Exit Meeting Summary

The NRC inspectors presented the results of this inspection during exit meetings with Mr. L. Meyers and other members of licensee management on June 21, 2002, and July 26, 2002. The licensee acknowledged the findings presented. Inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

KEY POINTS OF CONTACT

Davis-Besse

L. Myers, Chief Operating Officer
H. Bergendahl, Vice President - Nuclear
R. Fast, Plant Manager
T. Chambers, Work Week Manager
R. Cook, Compliance Engineer, Regulatory Affairs
D. Eshelman, Director, Support Services
D. Geisen, Manager, Design Engineering
D. Lockwood, Manager, Regulatory Affairs
M. McLaughlin, Containment Health Engineer
J. Messina, Director, Work Management
D. Miller, Supervisor, Compliance
S. Moffit, Director, Technical Services
J. Powers, Director, Engineering

Nuclear Regulatory Commission

S. Thomas, Senior Resident Inspector

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

50-346/02-09-01	NCV	Failure to provide acceptance criteria or requirements to follow the inspection plans
50-346/02-09-02	NCV	Failure to adequately train personnel that were VT-2 certified

Discussed

None

LIST OF ACRONYMS USED

CFR	Code of Federal Regulations
CR	Condition Report
DHR	Decay Heat Removal
NCV	Non-Cited Violation
NDE	Nondestructive Examination
RCS	Reactor Coolant System
SDP	Significance Determination Process
SSCs	Systems, Structures and Components

LIST OF DOCUMENTS REVIEWED

Certification of Qualification (VT-2)

J. Brennan	April 17, 2002
A. Migas	April 17, 2002
T. Dabrowiak	April 17, 2002
G. Michael	April 30, 2002
S. Jones	April 30, 2002
W. Mopus	April 23, 2002
P. Seniuk	August 11, 2000

Condition Reports

02-02600	Recommended Expansion of Containment Extent of Condition Inspection
02-02108	Containment Air Cooler Piping
02-02120	Containment Air Cooler Piping
02-01819	Control Rod Drive Mechanism Ventilation Fans/Ductwork
02-02209	Containment Recirculation System Ventilation
02-01964	System Pressurizer
02-02625	DH Pump 1-1 Suction from RCS Valve
02-02580	QA Walkdowns of Containment 653 and 636 Elevations
02-02648	QA Walkdowns of Containment 585 and 603 Elevations
02-01631	Insulation for SG-2 Hot Leg Vent and RCS Flow Transmitter FERC 1A
02-01658	Insulation for SG-2 Hot Leg Vent and RCS Flow Transmitter FERC 1A
02-02127	RCS Loop 2 Hot Leg Inspections
02-02103	RCS Loop 2 Hot Leg

Drawings

7749-M-197-3-3	Bottom Head Support Steel	Revision T1
7749-M-197-4-2	Top Head Support Steel	Revision T1
7749-M-197-5-4	Bottom Head Horizontal Insulation	Revision T2
7749-M-197-6-1	Shell Insulation Development	Revision 0

7749-M-197-3-3	Bottom Head Support Steel	Revision T1
7749-M-197-7-2	Upper Shell Development	Revision T1
7749-M-197-8-1	Inlet Nozzle Cover	Revision 0
7749-M-197-9-2	Outlet Nozzle Cover	Revision T1
7749-M-197-10-4	Top Head Panel	Revision T2
7749-M-197-11-1	Core Flood Nozzle Covers	Revision 0
7749-M-241E	Service Water System	Revision 8
7749-M-241F	Service Water System	Revision 6
Inspection Plans		
	Davis Besse Extent of Condition Plan	Revision 2
IP-A-006	Inspection Plan A-006, UT Thickness Readings and Pit Depth Micrometer Readings of the Containment Vessel in Select Areas.	Revision 0
IP-M-028	Alloy 600, Threaded/Bolted Class 1 Joints and Connections RCS Extent of Condition Inspection	Revisions 0 &1
IP-M-029	Containment Area Inspections,	Revisions 0
IP-M-30	Reactor Vessel and Incore Tunnel Area Extent of Condition Inspection Plan	Revision 0,1,& 2
Other Documents		
M-410Q-156-1	Buffalo Forge Service Manual Centrifugal Fans	Revision 0
Attachment 1 Data Sheet for IP-M-028 #HL2-1	Decay Heat Nozzle Weld on Hot Leg	May 6, 2002
Attachment 1 Data Sheet for IP-M-028 #HL2-3	Insulation HL Flow Meter	April 23, 2002
Attachment 1 Data Sheet for IP-M-028 #HL2-3	Weld RC Loop 2 HL Flowmeter Nozzle	May 15, 2002

M-410Q-156-1	Buffalo Forge Service Manual Centrifugal Fans	Revision 0
Attachment 1 Data Sheet for IP-M-028 #HL2-4	Insulation HL Flowmeter	April 23, 2002
Attachment 1 Data Sheet for IP-M-028 #HL2-5	HL Pressure Tap Nozzle PTA1	April 19, 2002
Attachment 1 Data Sheet for IP-M-028 #HL2-5	Weld RC Loop 2 HL Pressure Tap Nozzle PTA1	April 15, 2002
Attachment 1 Data Sheet for IP-M-028 #HL2-6	Weld RC Loop 2 HL Temperature Connection	April 15, 2002
Attachment 1 Data Sheet for IP-M-028 #HL2-7	Weld RC Loop 2 HL Pressure Tap PTA2	April 15, 2002
Attachment 1 Data Sheet for IP-M-028 #HL2-8	Weld RC Loop 2 HL RTE Mounting Boss	April 15, 2002
Attachment 1 Data Sheet for IP-M-028 #RCP 1-1 CSC	Cover Studs Bolting	April 14, 2002
Attachment 1 Data Sheet for IP-M-028 #RCP 1-1 IN-2	RC Piping Loop, 2.5 inch Drain Nozzle Weld CL1-1	April 16, 2002
Attachment 1 Data Sheet for IP-M-028 #RCP 1-1 INI-1	RCP 1-1 Inlet Pipe	April 16, 2002

Procedures

NG-EN-00324	Boric Acid Corrosion Control	Revision 3
EN-DP-1500	Reactor Vessel Inspection Procedure	Revision 1
EN-DP-1501	Inspection of RCS Alloy 600 Components/Welds, Threaded/Bolted Connections and Targets	Revision 0
EN-DP-1502	Containment Area Inspections	Revision 0
NOP-ER-2001	Boric Acid Corrosion Control Program	Revision 0
NA-QC-07004	Certification of Nondestructive Examination Personnel	Revision 1

DOCUMENTS REQUESTED

Part1 Please provide the following information to Melvin S. Holmberg at the Region III NRC office located at 801 Warrenville Rd, Lisle IL 60532, no later than June 3, 2002. This information is needed to support the upcoming NRC Inspection (IP 93812) of the Davis-Besse Nuclear Power Station scheduled to begin on June 10, 2002.

A. Information needed at the Region III office by June 3, 2002. With regard to the "Containment Boric Acid Extent of Condition Plan," hereinafter it is referred to as the "Plan."

Provide a copy of:
1) Schedule describing activities and dates that containment inspections began and ended for each type of inspection described in the Plan.

2) Each revision of the inspection procedures used to conduct examinations described in the Plan.

3) List identifying the inspectors used to complete the inspections as described in the Plan with current job titles and phone numbers. Identify the number of years and months that each inspector has been certified to perform VT-2 examinations. Also identify the components/system and/or areas examined by each inspector.

4) The lesson plan used for training the VT-2 inspectors used for the containment inspections.

5) List of CRs generated (with a short description) as a result of containment inspections required by the Plan.

6) Condition reports which document applicable causes for head degradation and assigned corrective actions that implement the Plan and/or the associated inspection procedures.

7) Procedure NA-QC-07004 and documents referenced by this procedure for qualification of VT-2 personnel.

8) Engineering evaluation of containment ventilation system fans and active ventilation system components, which demonstrates that equipment service life or reliability has not been adversely affected by past operation with airborne boric acid and corrosion products.

9) Provide briefing notes/outline and attendance records for the briefings held with the boric acid control coordinator for each type of inspection (Paragraph 4.1 of IP-M-028, 29 & 30).

Part2 Questions/Information on Containment Inspection Procedures to be Provided to the Inspectors at the Entrance Meeting on June 10, 2002:

A. Procedure IP-M-028, Alloy 600, Threaded/Bolted Class 1 Joints and Connections RCS Extent of Condition Inspection, Revision 2.

1) Davis Besse has identified several examples where incorrect nuts/bolting material has been installed (RC-2 valve body-to-bonnet nuts). Was consideration given to confirming corrosion resistant bolt/nut materials for bolted connections found to have boric acid deposits?

2) Paragraph 1.4 - What amount of boric acid will constitute “evidence of boric acid residue and evidence of leakage”?

3) Paragraph 4.1 - How were the list of components verified to be complete in Attachments 2, 3 and 4?

5) Paragraph 6.5 - Identify the components for which remote viewing equipment was used and provide the data sheets which documented the inspections of these components.

6) Paragraph 6.6 - Components in Attachment 4 are typically covered with insulation, not required to be examined within 6 feet and a “best effort” viewing is all that is specified. Why is this an adequate examination to detect leakage?

7) Paragraph 6.6 - Are limitations documented when 100 percent examination of the external surfaces of the insulated component in Attachment 4 are not completed? If so, where is this required in the procedure? If not, why not?

8) Paragraph 8 - Provide documentation of any exempted examination areas.

9) Attachment 1 - Where is the definition of active and inactive leakage, insignificant, minor, mod, or major size as specified in this form? If provided in a training document, please provide a copy of the training document/lesson plan.

10) Attachment 1- What does “The inspection must be from within 6' or optical enhancement must be used” mean? Specifically, when is optical enhancement used and what quality standards apply when this option is selected and where is this guidance discussed?

B. Procedure IP-M-30, Reactor Vessel and Incore Tunnel Area Extent of Condition Inspection Plan, Revision 1.

1) Paragraph 1.2 & 6.2 - Where is the extent/scope of the reactor vessel bare metal examination under the insulation defined/described and where will the extent be recorded (e.g. what percentage of the vessel under the insulation will get inspected) ?

2) What quality standards will be applied to these inspections (e.g. what maximum exam distance, lighting conditions and resolution standards)? Where are the visual exam standards described?

3) What are the acceptance criteria for this procedure? (e.g. see Section 8 of IP-M-029)

C. Procedure IP-M-029, Containment Area Inspections, Revision 1.

1) What quality standards will be applied to these inspections (e.g. what maximum exam distance, lighting conditions and resolution standards)? Where are the visual exam standards described?

2) Paragraph 8 - Provide documentation of any exempted examination areas.

3) Attachment 1 - Why are the containment liner inspections limited to above the 653' elevation? (e.g. why isn't the liner interface with the containment floor examined.) How is the containment liner above the 653' elevation inspected? (e.g. what techniques are used to perform this examination and what checks are done to confirm the adequacy of this inspection)

4) Attachment 5 - What does "free of evidence of leakage" mean in the context of area type walkdowns? How is this different than "free of boric acid crystals"?

D. General Questions:

1) How will the amount of corrosion be measured or characterized (e.g. dental impressions feeler gauge)? How will the scale/size of degradation be assessed based on pictures?

2) Were personnel training and examination quality standards for Code VT-1 and VT-2 examinations considered for these containment examinations? Explain.

3) For components/systems/areas which are covered by more than one inspector, or are performed over several shifts/days, how is the examination turnover, status controlled to ensure that no coverage gaps exist?

E. Information Requested(by June 10, 2002):

1) Ready access to the non-destructive examination personnel certification records for personnel performing containment inspections for the Plan.

Provide a copy of:
2) Drawings of the pressurizer 10" surge line PZR01 weld and 2.5" and 3" RC2A, RC13A & RC 13B welds.

3) Drawings of the lower reactor vessel and insulation including insulation support structures.

4) Drawings of the control rod drive mechanism ventilation fans and ductwork on the service structure.

5) Drawings showing the configuration of the interface of the containment liner and floor. These drawings need to include the floor seal design and liner inside coating specifications that applied below the containment floor elevations.

6) Drawings (including isometric drawings) for the service water piping runs in containment.

7) Completed examination data sheets, condition reports generated, video records associated with the following components/systems:

Source components (IP-M-028)
- Pressurizer 10 surge line nozzle safe end weld PZR-01.
- Pressurizer 2.5" and 3" pressure relief welds RC2A, RC 13A & RC13B.

Targets (IP-M-30)
- Lower areas of the Reactor Vessel under the insulation
- Containment liner focused on areas near interface with containment floor (note that this component is not on the list of targets identified by the licensee).

Miscellaneous (IP-M-29)
- Control rod drive mechanism ventilation fans/ductwork on service structure.
- Service water piping system in containment.

6) Surveillance audit reports by the quality assurance department for the containment inspections conducted for the plan.

7) Procedures NOP-LP-2001 Condition Reporting Process and NG-EN-00324 “Boric Acid Corrosion Control.

8) Inservice Inspection Program Class 1 bolted component listing

9) Vendor Manual for service structure ventilation system fans.

10) Visual acuity card used by inspectors performing inspections in containment.