VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

10 CFR 50.54(f)

May 16, 2002

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

Serial No.: 02-168A
NL&OS/ETS Rev 1
Docket Nos.: 50-338
50-339
50-280
50-281
License Nos.: NPF-4
NPF-7
DPR-32
DPR-37

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION)
NORTH ANNA POWER STATION UNITS 1 AND 2
SURRY POWER STATION UNITS 1 AND 2
SIXTY DAY RESPONSE TO NRC BULLETIN 2002-01
REACTOR PRESSURE VESSEL HEAD DEGRADATION AND REACTOR COOLANT PRESSURE BOUNDARY INTEGRITY

On March 18, 2002 the NRC issued NRC Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity." The bulletin requires licensees to provide information related to 1) the integrity of the reactor coolant pressure boundary including the reactor vessel head, and the extent to which inspections have been undertaken to satisfy applicable regulatory requirements, and 2) the basis for concluding that plants satisfy applicable regulatory requirements related to the structural integrity of the Reactor Coolant System (RCS) pressure boundary and that future inspections will ensure continued compliance with the applicable regulatory requirements. Information that related to reactor vessel head integrity was provided in a fifteen-day response dated April 1, 2002 (Serial No. 02-168). The focus of the sixty-day response required by the bulletin is the integrity of the remainder of the reactor coolant pressure boundary.

The boric acid inspection programs implemented at North Anna and Surry Power Stations, as described in the attachment to this letter, have been and continue to be effective at detecting boric acid that could cause wastage or degradation of the remainder of the RCS pressure boundary. These programs ensure compliance with the

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applicable regulatory requirements. In light of the recent reactor vessel head corrosion identified at Davis-Besse, Dominion is reviewing the boric acid inspection programs to ensure that the lessons learned and operating experiences will be appropriately addressed in our inspection program.

If you have any further questions or require additional information, please contact us.

Very truly yours,

Leslie N. Hartz
Vice President – Nuclear Engineering

Attachment

Commitment made in this letter: None

cc: U.S. Nuclear Regulatory Commission
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SN: 02-168A
Docket Nos.: 50-338/339
50-280/281
Subject: 60 Day Response to NRC Bulletin 02-01

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Leslie N. Hartz, who is Vice President - Nuclear Engineering, of Virginia Electric and Power Company. She has affirmed before me that she is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of her knowledge and belief.

Acknowledged before me this 16th day of May, 2002.

My Commission Expires: March 31, 2004.

Maggie McClure
Notary Public

(SEAL)

ATTACHMENT

Sixty Day Response to NRC Bulletin 2002-01
Reactor Pressure Vessel Head Degradation and
Reactor Coolant Pressure Boundary Integrity

North Anna Power Station Units 1 and 2
Surry Power Station Units 1 and 2

Virginia Electric and Power Company
(Dominion)

North Anna and Surry Power Stations Units 1 and 2
Sixty Day Response to NRC Bulletin 2002-01
Reactor Pressure Vessel Head Degradation and
Reactor Coolant Pressure Boundary Integrity

On March 18, 2002 the NRC issued Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity." The bulletin requires licensees to provide information related to 1) the integrity of the reactor coolant pressure boundary including the reactor vessel head, and the extent to which inspections have been undertaken to satisfy applicable regulatory requirements, and 2) the basis for concluding that plants satisfy applicable regulatory requirements related to the structural integrity of the Reactor Coolant System (RCS) pressure boundary and that future inspections will ensure continued compliance with the applicable regulatory requirements.

NRC required information

3. *Within 60 days of the date of this Bulletin, all PWR addressees are required to submit to the NRC the following related to the remainder of the reactor coolant pressure boundary:*

   A. *the basis for concluding that your boric acid inspection program is providing reasonable assurance of compliance with the applicable regulatory requirements discussed in Generic Letter 88-05 and this bulletin. If a documented basis does not exist, provide your plans, if any, for a review of your programs.*

Response:

Background

Generic Letter (GL) 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants," requested licensees to provide assurance that a program was implemented at their facility to ensure that boric acid corrosion due to leakage will not lead to degradation of the Reactor Coolant System (RCS) pressure boundary. The program was to include the following attributes:

- Determination of the principal locations where leaks may occur and cause significant boric acid corrosion of the primary pressure boundary.
- Procedures for the location of small coolant leaks (i.e., leakage rates at less than technical specification limits).
- Methods for conducting examinations and performing engineering evaluations to establish the impacts on the RCS pressure boundary when leakage is located.
- Corrective actions to prevent recurrence of this type of corrosion.

In response to GL 88-05, North Anna and Surry reviewed and enhanced existing programs for identifying and correcting boric acid leakage and corrosion of the RCS pressure boundary. In determining the principal locations where leaks may occur, these programs focused on components and connections susceptible to aging or fatigue, as well as other forms of degradation due to boric acid corrosion. The program focused on finding and repairing leaking components to prevent boric acid corrosion and wastage of low alloy steel components in the RCS pressure boundary.

The NRC Bulletin 2002-01 fifteen-day response focused on the activities (design and inspection) that have been completed and are ongoing to ensure compliance with the applicable regulatory requirements for the reactor vessel head and penetrations. This sixty-day response focuses on the inspection activities that are being implemented to ensure compliance with the applicable regulatory requirements for the remainder of the RCS.

Program Description

The current boric acid inspection programs at both Surry and North Anna Power Stations include the following attributes to ensure that leakage from systems containing boric acid will not result in corrosion that will challenge structural integrity of the RCS pressure boundary during the operating cycle. As required by Generic Letter 88-05, the following attributes were previously incorporated into the program.

1. Determination of the principal locations where reactor coolant leakage can initiate degradation of the primary pressure boundary by boric acid corrosion. Particular consideration was given to identifying those locations where conditions exist that could cause high concentrations of boric acid on pressure boundary surfaces, including boric acid from external sources.

2. Procedures for locating small leaks (i.e., leakage rates at less then Technical Specifications limits).

3. Methods for conducting examinations and performing engineering evaluations to establish the impact on the reactor coolant pressure boundary when boric acid is found on an external surface of the RCS. This includes procedures to gather the necessary information for an engineering evaluation before the removal of boric acid deposits or corrosion.

4. Corrective actions to prevent recurrences of this type of corrosion. This includes any modifications to be introduced in the present design or operating procedures of the plant that (a) reduce the probability of primary coolant leaks at the locations where they may cause corrosion damage and (b) entail the use of suitable corrosion resistant materials or the application of protective coatings/claddings.

The boric acid inspection program is delineated in the Augmented ISI Program and station procedures. These documents establish the inspection scope, frequency, and responsibilities for inspection and evaluation.

Inspection Scope and Frequency

Plant Operations

During plant operations Technical Specifications require operable leakage detection systems, which include radiation monitors, a sump level detection system, and a periodic inventory balance surveillance that are capable of providing indication of primary system leakage prior to a loss of RCS structural integrity.

Periodic test procedures require the performance of an RCS pressure boundary leakage calculation daily and once every 72 hours at Surry and North Anna, respectively. The purpose of these procedures is to verify that any RCS leakage is within Technical Specifications limits. However, if the leakage rate increases by a predetermined amount, a walkdown (similar to the Cold Shutdown inspection noted below) of the RCS inside containment is performed to identify the source of the increased leakage. The change in leakage rate that prompts an RCS walkdown is a small fraction of the Technical Specification limit for pressure boundary leakage (a few tenths of a gallon per minute).

Plant Shutdown

At Surry and North Anna, bolting inspections are conducted in accordance with the Inservice Inspection (ISI) Plan for each unit. The North Anna Unit 1 and Surry Units 1 and 2 ISI plans are written to comply with ASME Section XI 1989 edition, and the North Anna Unit 2 ISI plan is written to comply with ASME Section XI 1995 Edition with 1996 Addenda.

North Anna performs an inspection of the RCS at nominal operating pressure and temperature prior to placing the plant in Cold Shutdown. Surry and North Anna perform inspections for RCS leakage during each Cold Shutdown prior to cleaning activities in the containment. During each Surry and North Anna unit startup from Cold Shutdown an inspection of the RCS is performed to verify RCS integrity with the plant at nominal operating pressure and temperature (2235 psig and 547°F).

The reactor coolant pressure boundary bolted connections are inspected each refueling outage for reactor coolant leakage. Specific areas inspected include: steam generator manway bolting, loop stop valves, loop stop bypass valves, pressurizer manway bolting, reactor coolant pump seal housings, residual heat removal system isolation valves, and safety injection check valves to the loops. Insulation is removed from these components and the bolted connections are visually examined for evidence of reactor coolant leakage. The inspections are performed prior to cleaning the areas where the components are located to prevent removing any evidence of leakage (i.e., accumulated boric acid deposits).

Inspections of the partial penetration welds at the bottom of the Reactor Vessel are also conducted each refueling outage in accordance with the approved ISI programs. Specifically, approved ISI program relief requests define the inspection requirements. A VT-2 inspection is performed each refueling outage when the containment is at atmospheric conditions.

Response to Leakage

RCS leakage and the affected components are logged and tracked. The boric acid inspection program requires that for each identified leak, the source of the leakage, potential leakage pathways and affected components are determined and recorded. An engineering evaluation to assess the effects of the leakage is performed. For bolting, the evaluation is conducted in accordance with approved ISI Program relief requests. The relief requests require the evaluation to consider as a minimum the following:

1. Bolt and component material
2. Leakage location and system function
3. Corrosiveness of process fluid
4. Leakage history at the connection or system component
5. Visual evidence of corrosion at the assembled connection

When evidence of reactor coolant leakage is found, the path of the leakage is determined to locate the source of the leak, as well as, to identify any additional components/piping that may have boric acid deposits. These additional components received a detailed inspection of the affected area. The inspection is performed to identify any degradation or wastage that could impact component integrity or strength and to determine if any additional inspections or corrective actions are required.

The additional inspections and assessments of components impacted by boric acid deposits along the reactor coolant leakage path are performed by engineering personnel using the evaluation requirements for bolting evaluations as guidance. The importance of identifying each boric acid leakage path and the affected components is stressed during the pre-job briefs associated with the inspection walkdowns.

Training

The personnel performing the inspections are VT-2 qualified. The inspection teams normally consist of ISI and/or Component engineers and Operations personnel. The inspectors examining the components are qualified to ANSI/ASNT CP-189 (1991). If evidence of boric acid leakage is found, the bolts and affected components are inspected and evaluated by a VT-3 qualified engineer. Although formal training is not provided for RCS inspections, pre-job briefs provide additional guidance for performing the inspections, which would include recent industry operating experience as well as expected leakage due to plant operating conditions.

Compliance with Regulatory Requirements

Design Requirements: 10 CFR 50, Appendix A – General Design Criteria

The applicable GDC include GDC 14 (Reactor Coolant Pressure Boundary), GDC 31 (Fracture Prevention of Reactor Coolant Pressure Boundary), and GDC 32 (Inspection of Reactor Coolant Pressure Boundary). GDC 14 specifies that the reactor coolant pressure boundary (RCPB) has an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture. GDC 31 specifies that the probability of rapidly propagating fracture of the RCPB be minimized. GDC 32 specifies that components, which are part of the RCPB, have the capability of being periodically inspected to assess their structural and leaktight integrity. Inspection practices that do not permit reliable detection of degradation are not consistent with this GDC.

Compliance Basis

Recent events at the Davis-Besse plant have demonstrated that the design of the reactor vessel head is very robust and that it can tolerate significant degradation without rapidly propagating failure or gross rupture. The requirements established for design, fracture toughness, and inspectability in GDC 14, 31, and 32, respectively, were satisfied during each plant's initial licensing review, and continue to be satisfied during operation. The inspection programs that have been implemented at North Anna Units 1 and 2 and Surry Units 1 and 2 are effective at detecting leakage prior to unacceptable degradation/wastage of the remainder of the reactor coolant pressure boundary.

ASME Code Regulatory Requirement

NRC regulations in 10 CFR 50.55a state that American Society of Mechanical Engineers (ASME) Class 1 components (which includes the reactor coolant pressure boundary) must meet the requirements of Section XI of the ASME Boiler and Pressure Vessel Code. IWB-3522.1(c) and (d) specify that conditions requiring correction include the detection of leakage from insulated components and

discoloration or accumulated residues on the surfaces of components, insulation, or floor areas which may reveal evidence of borated water leakage, with leakage defined as "the through-wall leakage that penetrates the pressure retaining membrane." Therefore, 10 CFR 50.55a, through its reference to the ASME Code, does not permit through-wall degradation of the RCS pressure boundary.

For through-wall leakage identified by visual examinations in accordance with the ASME Code, acceptance standards for the identified degradation are provided in IWB-3142. Specifically, supplemental examination (by surface or volumetric examination), corrective measures or repairs, analytical evaluation, and replacement provide methods for determining the acceptability of degraded components.

Compliance Basis

Title 10 of the Code of Federal Regulations, Part 50.55a requires that inservice inspection and testing be performed per the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, "Inservice Inspection of Nuclear Plant Components." Section XI contains applicable rules for examination, evaluation and repair of code class components, including the reactor coolant pressure boundary.

Paragraph IWA-5250 requires repair or replacement of the affected part if a through-wall leak is found and requires an assessment of damage, if any, associated with corrosion of steel components by boric acid. Plants may not return to service after finding a leak from the RCS pressure boundary (i.e., component body, pipe well, vessel wall, or pipe weld) until the appropriate Code repairs are completed.

Therefore, our implementation of the ASME Section XI inspection program and the augmented inspection program, which includes the GL 88-05 inspection program, ensures that the RCS is operated and maintained in accordance with the Technical Specification and ASME Code requirements with no pressure boundary leakage and/or non-pressure boundary identified or unidentified leakage less than a predetermined value.

Quality Assurance Regulatory Requirements

- Criterion V (Instructions, Procedures, and Drawings) of Appendix B to 10 CFR Part 50 states 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, procedures, or drawings. Criterion V further states that instructions, procedures, or drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished. Visual and volumetric examinations of the reactor coolant pressure boundary are activities that should be documented in accordance with these requirements.

Compliance Basis

Any of the work undertaken to inspect, evaluate, and/or repair the North Anna and Surry RCS is conducted and documented in accordance with existing or new procedures which comply with the Company's Quality Assurance (QA) Topical Report, the QA program, and Criterion V of Appendix B to 10 CFR Part 50.

- Criterion IX (Control of Special Processes) of Appendix B to 10 CFR Part 50 states that special processes, including nondestructive testing, shall be controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements.

  Compliance Basis

  Personnel involved with the inspections are VT-2 qualified. The engineering personnel that evaluate and disposition identified leakage are VT-3 qualified and are familiar with the type of deterioration or wastage expected from boric acid corrosion.

- Criterion XVI (Corrective Action) of Appendix B to 10 CFR Part 50 states that measures shall be established to assure that conditions adverse to quality are promptly identified and corrected. For significant conditions adverse to quality, the measures taken shall include root cause determination and corrective action to preclude repetition of the adverse conditions. For degradation of the reactor coolant pressure boundary, the root cause determination is important for understanding the nature of the degradation present and the required actions to mitigate future degradation.

  Compliance Basis

  Station programs require identification, documentation, correction, and prevention of reoccurrence of conditions adverse to quality. The ASME Code design and inspection requirements, and the augmented inspection program, which includes the GL 88-05 inspections, provide assurance that conditions adverse to quality identified in the RCS are adequately identified, documented and corrected.

  In summary, Dominion's approach to inspection, monitoring, cause determination, and resolution of identified leakage ensures compliance with the performance-based objectives of Appendix B.

Technical Specifications Requirements

Plant Technical Specifications pertain to this issue insofar as they do not allow operation with known through-wall RCS pressure boundary leakage (i.e., component body, pipe well, vessel wall, or pipe weld).

Compliance Basis

The reactor coolant pressure boundary is one of the three physical barriers to the release of radioactivity to the environment. Therefore, our plant's Technical Specifications (TS) include requirements and associated action statements addressing RCS pressure boundary leakage. The limits for reactor coolant pressure boundary leakage at North Anna and Surry are 1 gallon per minute (gpm) for unidentified leakage, 10 gpm for identified leakage, and no leakage from a non-isolable fault in the RCS pressure boundary (i.e., component body, pipe well, vessel wall, or pipe weld).

If through-wall leakage or unacceptable indications are found, then the defect must be repaired before the plant returns to power operations. During plant operation, if a through-wall pressure boundary leak develops and increases to the point that the leakage is detected by the on-line leak detection systems, the leak must be evaluated per the specified TS acceptance criteria, and the plant shut down if the leak is determined to be non-isolable RCS pressure boundary leakage (i.e., component body, pipe well, vessel wall, or pipe weld). Plant Technical Specifications requirements continue to be met.

Conclusion

The boric acid inspection programs implemented at North Anna and Surry Power Stations have been and continue to be effective at detecting boric acid that could cause wastage or degradation of the remainder of the RCS pressure boundary. Therefore, these programs provide assurance of compliance with the applicable regulatory requirements. In light of the recent reactor vessel head corrosion identified at Davis-Besse, Dominion is reviewing its boric acid inspection programs to ensure that the lessons learned and operating experiences will be appropriately addressed in our inspection program.