Progress Energy

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United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23

SUBMITTAL OF 90-DAY RESPONSE TO NRC
BULLETIN 2003-02, "LEAKAGE FROM REACTOR
PRESSURE VESSEL LOWER HEAD PENETRATIONS AND
REACTOR COOLANT PRESSURE BOUNDARY INTEGRITY"

Ladies and Gentlemen:

Pursuant to 10 CFR 50.54(f), Progress Energy Carolinas, Inc. (PEC) hereby submits the H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2, 90-day response to NRC Bulletin 2003-02, "Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity."

Attachment I to this letter provides an Affirmation in accordance with 10 CFR 50.54(f) and Attachment II to this letter provides the information request by the Bulletin.

If you have any questions regarding this submittal, please contact Mr. C. T. Baucom.

Sincerely,

J. F. Lucas
Manager – Support Services – Nuclear

Progress Energy Carolinas, Inc.
Robinson Nuclear Plant
3581 West Entrance Road
Hartsville, SC 29550

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JFL/cac

Attachments:

I. Affirmation

II. 90-Day Response to NRC Bulletin 2003-02, "Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity"

c: Mr. L. A. Reyes, NRC, Region II
Mr. C. P. Patel, NRC, NRR
NRC Resident Inspector

AFFIRMATION

The information contained in letter RNP-RA/03-0139 is true and correct to the best of my information, knowledge, and belief; and the sources of my information are officers, employees, contractors, and agents of Progress Energy Carolinas, Inc. I declare under penalty of perjury that the foregoing is true and correct.

Executed On: 13, November 2003

J. W. Moyer
Vice President, HBRSEP, Unit No. 2

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

90-DAY RESPONSE TO NRC BULLETIN 2003-02, "LEAKAGE FROM REACTOR PRESSURE VESSEL LOWER HEAD PENETRATIONS AND REACTOR COOLANT PRESSURE BOUNDARY INTEGRITY"

NRC Bulletin 2003-02, "Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity," (the "Bulletin") requires that within 90 days of the issuance of the Bulletin all Pressurized Water Reactor (PWR) addressees submit to the NRC the following information:

(a) A description of the Reactor Pressure Vessel (RPV) lower head penetration inspection program that has been implemented at your plant. The description should include when the inspections were performed, the extent of the inspections with respect to the areas and penetrations inspected, inspection methods used, the process used to resolve the source of findings of any boric acid deposits, the quality of the documentation of the inspections (e.g., written report, video record, photographs), and the basis for concluding that your plant satisfies applicable regulatory requirements related to the integrity of the RPV lower head penetrations.

(b) A description of the RPV lower head penetration inspection program that will be implemented at your plant during the next and subsequent refueling outages. The description should include the extent of the inspections which will be conducted with respect to the areas and penetrations to be inspected, inspection methods to be used, qualification standards for the inspection methods, the process used to resolve the source of findings of boric acid deposits or corrosion, the inspection documentation to be generated, and the basis for concluding that your plant will satisfy applicable regulatory requirements related to the structural and leakage integrity of the RPV lower head penetrations.

(c) If you are unable to perform a bare-metal visual inspection of each penetration during the next refueling outage because of the inability to perform the necessary planning, engineering, procurement of materials, and implementation, are you planning to perform bare-metal visual inspections during subsequent refueling outages? If so, provide a description of the actions that are planned to enable a bare-metal visual inspection of each penetration during subsequent refueling outages. Also, provide a description of any penetration inspections you plan to perform during the next refueling outage. The description should address the applicable items in paragraph (b).

(d) If you do not plan to perform either a bare-metal visual inspection or non-visual (e.g., volumetric or surface) examination of the RPV lower head penetrations at the next or

subsequent refueling outages, provide the basis for concluding that the inspections performed will assure applicable regulatory requirements are and will continue to be met.

The following information is provided in response to items (a) through (d) for H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2.

Description of Previous RPV Lower Head Penetration Inspections

The current normal RPV lower head penetration inspection is conducted as part of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, system leakage test for the Reactor Coolant System (RCS), with RCS pressure greater than or equal to 2235 psig. This examination is normally conducted at approximately 18-month intervals at the conclusion of each refueling outage. The examination is conducted in accordance with an Engineering Surveillance Test (EST)-083, "Inservice Inspection Pressure Testing of Reactor Coolant System (Refueling Shutdown Interval)." This EST requires visual examination (VT-2) of the RCS pressure boundary, including the RPV lower head and penetrations. The lower RPV head portion of the examination is conducted by accessing the area under the RPV and visually inspecting for leakage at the bottom of the vessel and penetration tubes with artificial lighting. This examination is conducted without insulation removal in accordance with ASME Code, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components.

The EST-083 examination was last conducted prior to start-up from the most recently completed refueling outage (RO-21), on November 12, 2002. The examination was performed by qualified VT-2 examination personnel following a four hour hold time. There was no leakage or evidence of leakage reported from the RPV lower head and penetrations. The examination was documented by the completed written procedure and associated evaluation documentation. No specific action was required for the RPV lower head, because no leakage or evidence of leakage was identified in this area.

In response to NRC Generic Letter 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants," dated March 17, 1988, HBRSEP, Unit No. 2, implemented a systematic program to monitor locations where boric acid leakage could occur and implemented measures to prevent the degradation of the RCS pressure boundary by borated water corrosion. This program is documented and maintained within the HBRSEP, Unit No. 2, Plant Operating Manual as Plant Program Procedure (PLP)-040, "Program for Prevention of Boric Acid Corrosion of RCS Carbon Steel Bolting (Generic Letter 88-05)." The intent of this procedure is to detail the program for identification, evaluation, repair, and prevention of boric acid corrosion of carbon steel components forming the reactor coolant primary pressure boundary.

PLP-040 outlines specific activities and inspection boundaries, and supplements the requirements of other surveillances for the inspection and disposition of borated system leakage and any resultant corrosion of primary pressure boundary "targets," including other safety-related components. These surveillances include:

- Operations Surveillance Test (OST)-053, "Inspection for Reactor Coolant System Leakage (Prior To and Following Cooldown) (Refueling Interval)"

- EST-083, "Inservice Inspection Pressure Testing of Reactor Coolant System (Refueling Shutdown Interval)"

- OST-052, "RCS Leakage Test and Examination Prior to Startup Following an Opening of the Primary System (Refueling and/or Startup Interval)"

Additional pertinent details of PLP-040 are summarized as follows:

- Visual examinations may be conducted without removal of insulation. However, for leakage examinations of components with external insulation surfaces and joints not accessible for direct visual examination, the surrounding area (including the floor, equipment surfaces underneath the inaccessible component, and other areas where leakage may be channeled) shall be examined for evidence of component leakage.

- Discoloration, staining, boric acid residue, and other evidence of leakage on insulation surfaces and the surrounding area shall be given particular consideration as evidence of component leakage. If evidence of leakage is found, the exact source is determined.

- When leakage is discovered, the leak/spray path shall be investigated, removing insulation as necessary, to determine the extent of any component degradation.

- Borated system leakage from the sources of any other borated system in the vicinity of the primary pressure boundary "targets" which could leak/spray on these "targets" is not acceptable. These leaks must be repaired or evaluated (and documented) to assure continued reactor coolant pressure boundary integrity.

- Boric acid corrosion of the "targets" shall be evaluated in accordance with the provisions of the ASME Code, Section XI, IWA-5000 and IWB-3000, with regard to structural integrity.

PLP-040, Section 7.7, "Corrective Measures," prescribes the actions to be taken in response to the identification of boric acid leakage or residue on carbon steel components associated with the RCS pressure boundary. Paragraph 7.7.3 of this section states, "If carbon and low-alloy steel components are exposed to boric acid, the component shall be cleaned of all boric acid and corrosion product and visually inspected (VT-3). For severe damage, ultrasonic and dye penetrant inspections of the affected components may be necessary."

Inservice pressure testing of code class pressure retaining components of the RCS is performed on a refueling interval frequency in accordance with plant procedure EST-083, "Inservice Inspection

Pressure Testing of Reactor Coolant System (Refueling Shutdown Interval)," which satisfies ASME Code requirements. This surveillance test is performed at the conclusion of each refueling outage and includes two examinations:

1. While the RCS is less than 200 degrees F, with insulation removed as directed by the Inservice Inspection (ISI) Specialist, an examination is performed for evidence of leakage at the pressure retaining boundary bolted connections identified by EST-083.

2. With the RCS pressurized and in a normal alignment, an examination for leakage is performed within the boundaries established by EST-083.

EST-083 is performed to satisfy ASME Code requirements for inservice pressure testing of the code class pressure retaining components of the RCS. The Acceptance Criteria for performance of this test are summarized as follows:

- All observed leakage identified during performance of the test must be documented and categorized.

- All test exceptions must be reviewed by the test engineer and evaluated in accordance with PLP-040.

- No through-wall leakage exists on any piping system examined during the performance of the test. If through-wall leakage has been detected, the through-wall leakage has been addressed by a corrective maintenance work order, an engineering evaluation, or both.

Description of Planned RPV Lower Head Penetration Inspections

A bare-metal visual (BMV) examination of the RPV lower head penetrations is planned for the next refueling outage, which is scheduled to occur during April 2004. The examination will require removal of portions of the RPV bottom insulation as necessary to allow visual examination of the RPV bottom penetrations. If unforeseen circumstances prevent completion of the bare-metal visual exam, appropriate changes will be implemented, as necessary based on the lessons learned during this inspection, to facilitate a complete visual examination during the next scheduled refueling outage.

The examination procedure to be used for the BMV examination of the RPV lower head penetrations will be developed based on guidance contained in Electric Power Research Institute (EPRI) Report 1007842, "Visual Examination for Leakage of PWR Reactor Head Penetrations: Revision 2 of 1006296, Includes 2002 Inspection Results and MRP Inspection Guidance," and any additional relevant guidance that becomes available prior to the examination, as deemed appropriate. It is expected that documentation of the inspection will be collected and maintained consistent with ASME Code, Section XI, requirements. Inspection findings will be resolved consistent with the requirements of ASME Code, Section XI, and the HBRSEP, Unit No. 2, Boric Acid Corrosion Control Program and Technical Specifications.

The periodicity and scope of future inspections will be based on the results of this inspection and relevant regulatory and industry guidance.

Compliance with Applicable Regulatory Requirements

NRC Bulletin 2002-01, Item 3.A, required that a basis be provided for concluding the HBRSEP, Unit No. 2, boric acid inspection program provides reasonable assurance of compliance with the applicable regulatory requirements discussed in Generic Letter 88-05 and NRC Bulletin 2002-01. Information describing compliance with the applicable regulatory requirements was provided in response to NRC Bulletin 2002-01, by letter dated May 17, 2002. The applicable regulatory requirements continue to be satisfied as described in the May 17, 2002 letter.

These applicable regulatory requirements are identified as follows:

- 10 CFR 50, Appendix A, "General Design Criteria for Nuclear Power Plants," including the following:

  Criteria 14, "Reactor Coolant Pressure Boundary"
  Criteria 30, "Quality of Reactor Coolant Pressure Boundary"
  Criteria 31, "Fracture Prevention of Reactor Coolant Pressure Boundary"
  Criteria 32, "Inspection of Reactor Pressure Coolant Pressure Boundary"

- 10 CFR 50.55a, "Codes and Standards"

- 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," Criteria V, IX, and XVI

- Technical Specifications

General Design Criteria

The General Design Criteria (GDC) in existence at the time HBRSEP, Unit No. 2, was licensed for operation (July 1970) were contained in the proposed Appendix A to 10 CFR 50, "General Design Criteria for Nuclear Power Plants," published in the Federal Register on July 11, 1967. HBRSEP, Unit No. 2, conformance with the Proposed GDC is described within Updated Final Safety Analysis Report (UFSAR) Section 3.1, "Conformance With General Design Criteria." Applicability of these Proposed GDCs to the HBRSEP, Unit No. 2, boric acid inspection program is discussed in the following paragraphs.

Proposed GDC 9 provides the HBRSEP, Unit No. 2, design criteria that is comparable to the current GDC 14 and certain portions of the current GDC 30. Proposed GDC 9 states:

> "The reactor coolant pressure boundary (RCPB) shall be designed, fabricated, and constructed so as to have an exceedingly low probability of gross rupture or significant uncontrolled leakage throughout its design lifetime."

A discussion of HBRSEP, Unit No. 2, compliance with Proposed GDC 9 is provided within UFSAR Section 3.1.2.9.

Previous visual examinations of the HBRSEP, Unit No. 2, reactor coolant pressure boundary have not identified pressure boundary leakage or degradation. Based on the preceding information and industry experience regarding the low levels of primary system leakage resulting from reactor coolant pressure boundary leakage, HBRSEP, Unit No. 2, remains in compliance with the reactor coolant pressure boundary design criteria as set forth within Proposed GDC 9.

Proposed GDC 16 provides the HBRSEP, Unit No. 2, design criteria that is comparable to the portions of GDC 30 that are not encompassed by the Proposed GDC 9. Proposed GDC 16 states:

> "Means shall be provided to detect significant uncontrolled leakage from the reactor coolant pressure boundary."

A discussion of HBRSEP, Unit No. 2, compliance with Proposed GDC 16 is provided within UFSAR Section 3.1.2.16. Positive indications are provided in the Control Room for the detection of leakage from the RCS to the containment. This includes the capability for continuous monitoring of containment air activity and the needed indications for monitoring of liquid inventory in process systems and the containment sump. Additionally, containment humidity and runoff from the condensate collecting pans under the cooling coils of the containment air recirculation units are displayed at the Waste Disposal Panel. Routine operational leakage monitoring is performed in accordance with Technical Specifications Surveillance Requirement 3.4.13.1, which requires verification that RCS operational leakage is within limits (1 gpm unidentified leakage and 10 gpm identified leakage) once within 12 hours after reaching steady state operating conditions and every 72 hours thereafter during steady state operation. Therefore, HBRSEP, Unit No. 2, remains in compliance with the reactor coolant pressure boundary leakage detection requirements as set forth within Proposed GDC 16.

Proposed GDC 34 provides the HBRSEP, Unit No. 2, design criteria that is comparable to the current GDC 31. This Proposed GDC states:

> "The RCPB shall be designed and operated to reduce to an acceptable level the probability of rapidly propagating type failure. Consideration is given:
>
> a) To the provisions for control over service temperature and irradiation effects which may require operational restrictions.
>
> b) To the design and construction of the reactor pressure vessel (RPV) in accordance with applicable codes, including those which establish requirements for absorption of

energy within the elastic strain energy range, and for absorption of energy by plastic deformation.

c) To the design and construction of RCPB piping and equipment in accordance with applicable codes."

A discussion of HBRSEP, Unit No. 2, compliance with Proposed GDC 34 is provided within UFSAR Section 3.1.2.34. As noted previously, visual examinations of the HBRSEP, Unit No. 2, reactor coolant pressure boundary have not identified reactor coolant pressure boundary leakage or degradation. Based on the above information and industry experience to-date regarding flaw development and propagation, HBRSEP, Unit No. 2, remains in compliance with Proposed GDC 34 regarding rapidly propagating type failures of the reactor coolant pressure boundary.

Proposed GDC 36 provides the HBRSEP, Unit No. 2, design criteria that is comparable to the current GDC 32. This Proposed GDC states:

"RCPB components shall have provisions for inspection, testing, and surveillance of criteria areas by appropriate means to assess the structural and leak-tight integrity of the boundary components during their service lifetime. For the reactor vessel, a material surveillance program conforming with the current applicable codes shall be provided."

A discussion of HBRSEP, Unit No. 2, compliance with Proposed GDC 36 is provided within UFSAR Section 3.1.2.36. This UFSAR section states that the design of the reactor vessel and its arrangement in the system permits access to the entire internal surfaces of the vessel and to the following external zones of the vessel:

- the flange seal surface
- the flange outside diameter down to the cavity seal ring
- the closure head except around the drive mechanism adaptors, and
- the nozzle to reactor coolant piping welds

This UFSAR section further states that the reactor arrangement within the containment provides sufficient space for inspection of the external surfaces of the reactor coolant piping, except for the area of pipe within the primary shielding concrete. In addition, Technical Specifications and ASME Code requirements prohibit RCS pressure boundary leakage. The inspection programs and surveillance tests described previously within this submittal are considered sufficient and appropriate for the detection and correction of reactor coolant pressure boundary leakage and any associated boric acid deposition. Therefore, HBRSEP, Unit No. 2, remains in compliance with Proposed GDC 36 regarding the capability for RCPB inspection and surveillance.

10 CFR 50.55a, Codes and Standards

10 CFR 50.55a, "Codes and Standards," requires that inservice inspection and testing be performed in accordance with the requirements of the ASME 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.

The HBRSEP, Unit No. 2, Third Ten-Year Inservice Inspection (ISI) Interval, which commenced on February 19, 1992, was implemented in accordance with the ASME Code, 1986 Edition with no Addenda. The Fourth Ten-Year ISI Interval for HBRSEP, Unit No. 2, commenced on February 19, 2002, and was developed in accordance with the ASME Code, 1995 Edition with 1996 Addenda.

ASME Code pressure boundary inspection requirements are implemented through the performance of surveillance test procedures. These procedures prescribe corrective measures that satisfy the ASME Code requirements for the resolution of reactor coolant pressure boundary leakage and boric acid deposition.

The acceptance standards provided within both the 1986 and 1995 Editions of the ASME Code for the VT-2 visual examinations of the pressure retaining boundary are identified as IWB-3522, which requires correction of pressure boundary leakage prior to continued service. Additionally, both the 1986 and 1995 Editions of the ASME Code contain within IWB-3140 acceptance standards for visual examinations required by IWB-2500. Specifically, IWB-3142 prescribes acceptance standards regarding the acceptability for continued service of components whose visual examination detects relevant conditions.

As previously stated, HBRSEP, Unit No. 2, maintains procedures and programs to implement ASME Code requirements relative to the reactor coolant pressure boundary. The acceptance criterion for these procedures is that no through-wall leakage exists. Therefore, HBRSEP, Unit No. 2, remains in compliance with 10 CFR 50.55a regarding ASME Code requirements.

10 CFR 50, Appendix B

NRC Bulletin 2002-01 identified the following Criteria of 10 CFR 50, Appendix B, as being applicable to reactor coolant pressure boundary degradation and leakage:

- Criterion V, "Instructions, Procedures, and Drawings"
- Criterion IX, "Control of Special Processes"
- Criterion XVI, "Corrective Action"

HBRSEP, Unit No. 2, has and maintains the required instructions, procedures, and drawings for special processes and activities affecting quality to satisfy the requirements of 10 CFR 50, Appendix B, Criterion V and IX. The requirements of NRC Generic Letter 88-05 and the ASME Code are prescribed within HBRSEP, Unit No. 2, instructions and procedures.

10 CFR 50, Appendix B, Criterion XVI, requires that measures be established to assure that conditions adverse to quality are promptly identified and corrected. Additionally, significant conditions adverse to quality will have the cause determined and corrective actions taken to preclude repetition. HBRSEP, Unit No. 2, maintains programs and procedures to satisfy the requirements of Criterion XVI.

Based on the above, there is reasonable assurance that HBRSEP, Unit No. 2, has met and will continue to meet the regulatory requirements provided within 10 CFR 50, Appendix B, Criterion V, IX, and XVI.

Technical Specifications

10 CFR 50.36, "Technical Specifications," provides requirements for Technical Specifications (TS) for licenses associated with production and utilization facilities.
10 CFR 50.36(c)(2) provides requirements specific to "Limiting Conditions for Operation," and 10 CFR 50.36(c)(3) provides requirements relative to "Surveillance Requirements." The HBRSEP, Unit No. 2, Operating Licensing and TS were developed and approved in accordance with these requirements and provide Limiting Conditions for Operation (LCO), Action Statements, and Surveillance Requirements (SR) regarding the reactor coolant pressure boundary.

HBRSEP, Unit No. 2, TS 3.4.13, "RCS Operational Leakage," provides criteria and limits regarding primary system leakage, including LCO 3.4.13, which prohibits RCS pressure boundary leakage. Should pressure boundary leakage exist, Condition B would be entered which requires the unit to enter MODE 3 in six hours and MODE 5 in 36 hours. Verification that RCS operational leakage is within limits by performance of an RCS water inventory balance is performed every 72 hours during steady-state operation in accordance with SR 3.4.13.1.

As noted above under the General Design Criteria discussion, and as indicated within the HBRSEP, Unit No. 2, TS Bases for LCO 3.4.13, the RCS leakage detection systems provide the means to detect RCS leakage to the extent practical. Industry experience from reactor coolant pressure boundary leakage has shown that the associated primary system leakage can be well below TS limits and the sensitivity of on-line leakage detection systems. An RCS leak of sufficient magnitude to be detected by on-line leak detection systems would be evaluated in accordance with TS requirements and the appropriate actions taken. The current HBRSEP, Unit No. 2, TS requirements, e.g., LCOs and SRs, are consistent with the requirements of 10 CFR 50.36 and specify actions to maintain plant operations within analysis and design limits.