Palo Verde Nuclear Generating Station

Gregg R. Overbeck
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10 CFR 50.54(f)
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102-04702-GRO/SAB/RJR
May 17, 2002

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Reference Letter 102-04681-GRO/SAB/RJR, "Response to Bulletin 2002-01: Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity," dated April 03, 2002, from Gregg R. Overbeck, APS to USNRC.

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Docket Nos. STN 50-528/529/530
APS' Response to the Information Requested by NRC Bulletin 2002-01, Item 3.A.

In accordance with 10 CFR 50.54(f), the attached enclosure contains the Arizona Public Service Company (APS) 60-day response to U.S. Nuclear Regulatory Commission (NRC) Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity," dated March 18, 2002.

The enclosure provides the information requested by Bulletin 2002-01 Item 3.A.

There are no commitments being made to the NRC by this letter. Should you have any questions, please contact Thomas N. Weber at (623) 393-5764.

Sincerely,

GRO/SAB/RJR/kg

Enclosure: APS' Response to the Information Requested by NRC Bulletin 2002-01, Item 3.A.

cc:
E. W. Merschoff
J. N. Donohew
J. H. Moorman

A095

Enclosure: APS' Response to the Information Requested by NRC Bulletin 2002-01, Item 3.A.

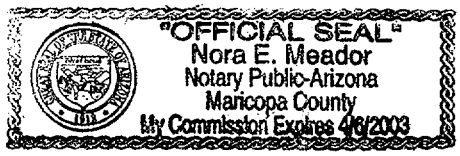
cc:
E. W. Merschoff (NRC Region IV)
J. N. Donohew (NRR Project Manager)
J. H. Moorman (NRC Resident Inspector)

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

I, William E. Ide, represent that I am Vice President Nuclear Production, Arizona Public Service Company (APS), that the foregoing document has been signed by me on behalf of APS with full authority to do so, and that to the best of my knowledge and belief, the statements made therein are true and correct.

William E. Ide

Sworn To Before Me This 17th Day Of May, 2002.



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ENCLOSURE

APS' Response to the Information Requested by NRC Bulletin 2002-01, Item 3.A.

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This is the Arizona Public Service Company (APS) response to information requested by Nuclear Regulatory Commission (NRC) Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity," dated March 18, 2002, Item 3.A.

NRC Required Information

Bulletin 2002-01 requires all PWR addressees to provide within 60 days of the date of this bulletin the following information related to the remainder of the reactor coolant pressure boundary:

3.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.

APS Response

Generic Letter 88-05 concluded that without a program to identify and correct reactor coolant system pressure boundary (RCSPB) leakage, compliance with General Design Criteria (GDC) 14, 30, and 31 could not be ensured.

GDC 14, 30, and 31 state the following:

Criterion 14 Reactor coolant pressure boundary. The reactor coolant pressure boundary shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture.

Criterion 30 Quality of reactor coolant pressure boundary. Components which are part of the reactor coolant pressure boundary shall be designed, fabricated, erected, and tested to the highest quality standards practical. Means shall be provided for detecting and, to the extent practical, identifying the location of the source of reactor coolant leakage.

Criterion 31 Fracture prevention of reactor coolant pressure boundary. The reactor coolant pressure boundary shall be designed with sufficient margin to assure that when stressed under operating, maintenance, testing, and postulated accident conditions (1) the boundary behaves in a nonbrittle manner and (2) the probability of rapidly propagating fracture is minimized. The design shall reflect consideration of service temperatures and other conditions of the boundary material under operating,

maintenance, testing, and postulated accident conditions and the uncertainties in determining (1) material properties, (2) the effects of irradiation on material properties, (3) residual, steady state and transient stresses, and (4) size of flaws.

In addition to the above GDCs, Bulletin 2002-01 also identified the applicability of GDC 32, which applies to the inspectability of RCSPB components. GDC 32 states the following:

Criterion 32 Inspection of reactor coolant pressure boundary. Components which are part of the reactor coolant pressure boundary shall be designed to permit (1) periodic inspection and testing of important areas and features to assess their structural and leaktight integrity, and (2) an appropriate material surveillance program for the reactor pressure vessel.

APS' initial responses to Bulletins 2001-01 and 2002-01 (References 1 and 2) provide the basis for APS' conclusion that the PVNGS Boric Acid Inspection Program is providing reasonable assurance of compliance with the applicable regulatory requirements discussed in Generic Letter 88-05 and Bulletin 2002-01 for the remainder of the RCSPB. This basis is summarized below.

General Design Criteria (GDC):

The requirements established for design, fracture toughness, and inspectability in GDC 14, 30, 31, and 32, respectively, were satisfied during the initial design and licensing. As part of the original design and licensing of PVNGS, APS demonstrated that the design of the RCPB met the requirements of these GDCs. PVNGS complied with these criteria in part by:

1. selecting Alloy 600 and other austenitic materials with excellent corrosion resistance and extremely high fracture toughness for reactor coolant pressure boundary materials; and

2. following ASME Codes and Standards and other applicable requirements for fabrication, erection, and testing of the pressure boundary parts.

The aspects of GDC 14, 30, 31, and 32 that address and require the RCSPB to be inspected in order to validate the ability of the RCSPB to maintain its structural integrity continue to be satisfied during operation. The structural integrity of the RCSPB is validated by the implementation of PVNGS' Inservice Inspection Program[1] and supported by performance of the PVNGS Boric Acid Corrosion Prevention Program.

1. A discussion of PVNGS' Visual Examination for Leakage Procedure is included at the end of this enclosure.

Boric Acid Corrosion Prevention Program

The intent of the Boric Acid Corrosion Prevention Program is to provide the boric acid walkdown (BAW) leak detection and documentation guidelines utilized to prevent boric acid corrosion of RCSPB components. The program is defined by procedure and implements the intent of the requirements contained in Generic Letter No. 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants." The implementing procedure defines responsibilities for Operations, Mechanical Maintenance Engineering, Radiation Protection, Maintenance, Outage Management and Planning, and System Engineering. This program provides a multifaceted approach to leakage detection which is applied while the units are operating and during outages.

During operating cycles, the potential for small-unidentified primary leaks is determined by evaluation of five sampling methods[2]. These methods are:

- Containment atmosphere particulate radioactivity monitors
- Containment atmosphere gaseous radioactivity monitors
- Containment relative humidity readings
- Containment sump level rate of change and discharges
- RCS water inventory balance measurements

During plant shutdowns the following applies:

- A complete BAW inspection is required to be performed at each refueling outage. These inspections include observations of the components identified in the Boric Acid Corrosion Prevention procedure.
- A complete BAW inspection is required to be performed any time the unit will be in Mode 3 or below for more than approximately 14 days and the unit has been in power operation for more than three months or 90 Effective Full Power Days (EFPD) since the last inspection.
- A determination to perform a limited BAW inspection is required after each reactor trip or controlled shutdown if less than three months or 90 EFPD have elapsed since the last inspection.

In response to Generic Letter 88-05, PVNGS established a program to inspect for boric acid leaks in the containment building and to evaluate the impact of those leaks on carbon steel or low alloy steel components. Issues, such as the following, are considered in the inspection and evaluation:

2. RCS leakage limits are defined by the PVNGS Technical Specifications. Leakage at PVNGS is limited to 1 gpm Unidentified leakage, 10 gpm Identified Leakage, and no RCS Pressure Boundary leakage.

- Evidence of corrosion or metal degradation
- Effect the leak may have on the pressure boundary
- Possibility of boric acid traveling along the inside of insulation on piping and/or components
- Possibility of dripping or spraying on other components

Inspections are guided by a listing of significant potential leak locations based on the experience gained from years of developing, performing and evaluating BAWs at PVNGS. The intent of the listing is to provide the field engineering personnel with guidelines for locating leak sites where leaks smaller than the allowable TS limits could cause degradation of the RCS pressure boundary by boric acid corrosion. Potential leak locations are grouped together by Zones within the Containment Building. The components listed in each Zone have been organized in the order the field personnel should encounter them as they walk through the Zone as outlined in the Radiation Protection (RP) Valve Locator Maps. These walkdowns can also be, (but are not required to be) conducted along with the ASME Section XI, Class 1 Inservice Leak Test.

The BAW is a physical walkdown and inspection of the Containment for the purpose of identifying small coolant leaks from the RCS. Procedural guidance is given to quantifying the extent of the leakage and accumulation of boric acid. These are defined as slight, moderate, or heavy residue as well as active or inactive leakage. If carbon and low-alloy steel components are exposed to boric acid leakage, procedures require carefully cleaning the components and evaluating the extent that the carbon steel has been affected. The procedure identifies that wall thickness, diameter measurements, localized corrosion depths, etc., of the affected area may be required to determine the extent of the wastage and its potential impact on component operability and structural integrity. For significant damage, additional examination of the affected components may be required to assess the impact. An Engineering evaluation of degraded or potentially damaged components is required to be completed and documented as part of the PVNGS Corrective Action Program.

Formal corrective actions are required for cases in which boric acid leakage has resulted in significant degradation of the carbon steel RCSPB components. In these cases, a CRDR is to be initiated to document and trend the condition. The CRDR process will ensure that an Equipment Root Cause Failure Analysis (ERCFA) will be performed for the condition as appropriate. As part of the ERCFA program, corrective actions are identified to prevent recurrence of the condition.

BAWs are required to be performed by qualified personnel. The qualification requirements are detailed in the Boric Acid Walkdown Qualification Card.

Visual Examination for Leakage Program

The PVNGS Inservice Inspection (ISI) Examination Program provides the instructions for performing pressure testing and associated visual examinations of pressure retaining components and satisfies the applicable requirements identified in the PVNGS Technical Requirements Manual, 10 CFR 50.55a, and Section XI of the ASME Code (1992 Edition, 1992 Addenda). Part of this program includes the performance of visual examinations for RCSPB leakage prior to returning the unit to service thus ensuring entry into power operation with no known visual leaks.

ASME Class 1 components receive a VT-2 visual examination as part of this program. VT-2 examinations are conducted when the unit is in Mode 3 (hot standby) on all portions of the RCS pressure boundary that are accessible. Class 1 components are examined for leakage once every refueling outage where Class 2 and 3 are examined once every period (1/3 of a 10-year cycle). The procedure also provides guidance for performing this examination on both accessible and inaccessible components, which includes buried components. Acceptance criteria are provided for both leakage and corrosion.

Visual examinations are directed to the detection of any abnormal condition such as evidence of leakage from the pressure retaining components, evidence of abnormal leakage from components that have leakage collection systems, and the presence of boric acid residues.

Personnel performing examinations governed by this procedure are required to be qualified and certified to at least Level II in the VT-2 method.

Summary

APS inspects the RCSPB and takes corrective action in accordance with the PVNGS programs and procedures identified in this response. These programs and procedures have been developed to implement the regulatory requirements identified in this response and validate the ability of the RCSPB to maintain its structural integrity during operation. Therefore, in view of the inspection programs and activities described above, APS' has reasonable assurance that these regulatory requirements are being met.

References

1. APS Letter No. 102-04603-CDM/SAB/RJR, "Response to NRC Bulletin 2001-01: Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," Dated September 4, 2001, from Gregg R. Overbeck, APS to USNRC.
2. APS Letter No. 102-04681-GRO/SAB/RJR, "Response to NRC Bulletin 2002-01, Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity," Dated April 03, 2002, from Gregg R. Overbeck to USNRC.
3. PWR Materials Reliability Program Response to NRC Bulletin 2001-01 (MRP-48),

dated August 2001
4. FirstEnergy letter RAS02-00132, Probable Cause Summary Report for CR2002-0891, Significant Degradation of the Reactor Vessel Head Pressure Boundary, from S. A. Loehlein, Root Cause Team Leader, FirstEnergy to H. W. Bergendahl, V.P.-Nuclear, FirstEnergy, dated March 22, 2002.