WOLF CREEK
NUCLEAR OPERATING CORPORATION

Richard A. Muench
Vice President Technical Services

AUG 2 9 2001

ET 01-0025

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Subject: Docket No. 50-482: Response to NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles"

Gentlemen:

Attached is the Wolf Creek Nuclear Operating Corporation (WCNOC) response to U.S. Nuclear Regulatory Commission (NRC) Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," dated August 3, 2001. NRC Bulletin 2001-01 requested information relative to the Reactor Pressure Vessel (RPV) head penetration nozzle configuration, previous RPV head inspections, and plans for future RPV head inspections. WCNOC is participating in the Electric Power Research Institute, Inc., Materials Reliability Program associated with the issue. Wolf Creek Generating Station is in the category of plants with low susceptibility to circumferential cracking of the reactor pressure vessel head penetration nozzles. WCNOC also coordinated preparation of this response with the other participants in the Strategic Teaming and Resource Sharing (STARS) group.

If you should have any questions regarding this submittal, please contact me at (620) 364-4034, or Mr. Tony Harris at (620) 364-4038.

Very truly yours,

Richard A. Muench

RAM/rlr

Attachments:
I - Affidavit
II - Response to NRC Bulletin 2001-01
III - List of Commitments

A088

cc: J. N. Donohew (NRC), w/a
W. D. Johnson (NRC), w/a
E. W. Merschoff (NRC), w/a
Senior Resident Inspector (NRC), w/a

**STATE OF KANSAS )**
**) SS**
**COUNTY OF COFFEY )**

Richard A. Muench, of lawful age, being first duly sworn upon oath says that he is Vice President Technical Services of Wolf Creek Nuclear Operating Corporation; that he has read the foregoing document and knows the contents thereof; that he has executed the same for and on behalf of said Corporation with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By RAMuench
Richard A. Muench
Vice President Technical Services

SUBSCRIBED and sworn to before me this 29 day of August, 2001.

NOTARY PUBLIC STATE OF KANSAS
RHONDA L. RODGERS
My Appt. Exp. 5-11-2002

Rhonda L. Rodgers
Notary Public

Expiration Date May 11, 2002

**Response to NRC Bulletin 2001-01**
**Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles**

Below is the Wolf Creek Nuclear Operating Corporation (WCNOC) response to Nuclear Regulatory Commission (NRC) Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," dated August 3, 2001 (Reference 1). The Bulletin's "Requested Information" is shown in bold.

WCNOC is participating in the Electric Power Research Institute, Inc. (EPRI) Materials Reliability Program (MRP) associated with this issue. Information associated with the MRP efforts are compiled in "PWR Materials Reliability Program Response to NRC Bulletin 2001-01 (MRP-48), EPRI, Palo Alto, CA: 2001: TP-1006284," (Reference 2). This report was transmitted to the NRC by Nuclear Energy Institute (NEI) letter, "Generic Information for Use by Licensees in Response to NRC Bulletin 2001-01," dated August 21, 2001 (Reference 3). Reference to the MRP report is made, where appropriate.

**Requested Information**

1. **All addressees are requested to provide the following information:**

   a. **the plant-specific susceptibility ranking for your plant(s) (including all data used to determine each ranking) using the PWSCC [Primary Water Stress Corrosion Cracking] susceptibility model described in Appendix B to the MRP-44, Part 2, report;**

**Response**

As shown in Table 2-1 of Reference 2, Wolf Creek Generating Station (WCGS) has been evaluated for relative susceptibility to PWSCC of the Reactor Pressure Vessel (RPV) head penetration nozzles. The evaluation indicates it would take approximately 114 Effective Full Power Years (EFPYs) of additional operation to reach the same time-at-temperature as Oconee Nuclear Station Unit 3 (ONS3). The 114 EFPY is based from March 1, 2001. March 2001 is when leaking nozzles were discovered at ONS3. As described in Reference 2, the evaluation used the same time-at-temperature model as described in Appendix B to MRP-44, Part 2 (Reference 4).

Using the criteria stated in NRC Bulletin 2001-01, WCGS can be considered as having a low susceptibility to circumferential cracking of the reactor pressure vessel head penetration nozzles.

**Requested Information**

1. **All addressees are requested to provide the following information:**

   b. **a description of the VHP [vessel head penetration] nozzles in your plant(s), including the number, type, inside and outside diameter, materials of construction, and the minimum distance between VHP nozzles;**

**Response**

Reference 2, Table 2-3, provides the requested nozzle information.

**Requested Information**

1. **All addressees are requested to provide the following information:**

   c. **a description of the RPV head insulation type and configuration;**

**Response**

The WCGS RPV head insulation type and configuration are briefly described in Reference 2, Table 2-1. The RPV head insulation is a reflective (mirror) insulation constructed to be permanent, yet removable and reusable. The main portion of the insulation is installed horizontally above the dome of the RPV with outer portions stepped down to accommodate the circular vessel configuration. The insulation is positioned between the top of the vessel and the head penetration flanges, which connect to the Control Rod Drive Mechanism (CRDM) housings. The insulation is provided in individual panels that fit together in a specific arrangement and are fastened by buckles.

**Requested Information**

1. **All addressees are requested to provide the following information:**

   d. **a description of the VHP nozzle and RPV head inspections (type, scope, qualification requirements, and acceptance criteria) that have been performed at your plant(s) in the past 4 years, and the findings. Include a description of any limitations (insulation or other impediments) to accessibility of the bare metal of the RPV head for visual examinations;**

**Response**

WCNOC has not performed RPV head and nozzle inspections within the past four years. In April 1999, based on non-inspection plant activities, a portion of the RPV head insulation was removed. While no specific inspections for nozzle leakage were performed, no leakage was reported. Accessibility limitations to the RPV head bare metal for visual examinations include the dose and time associated with removal of the insulation and CRDM cooling shroud.

**Requested Information**

1. **All addressees are requested to provide the following information:**

   e. **a description of the configuration of the missile shield, the CRDM housings and their support/restraint system, and all components, structures, and cabling from the top of the RPV head up to the missile shield. Include the elevations of these items relative to the bottom of the missile shield.**

**Response**

Table 1 provides relative elevation of various significant components to the missile shield. WCGS Updated Safety Analysis Report (USAR) Figure 1.2-15 shows an elevation view general arrangement of equipment, including the RPV and the missile shield.

| | |
|---|---|
| Reactor Missile Shield | The reactor missile shield is a reinforced concrete slab supported by the refueling pool walls and is located above the RPV to provide protection against postulated CRDM missiles. The slab is moveable to allow access to the RPV during refueling. During normal plant operation, the missile shield is restrained laterally for seismic loads. |
| Seismic Support Platform | The seismic support platform is located between the bottom of the missile shield and the top of the CRDMs and serves to provide support for the upper end of the CRDM rod travel housings. The platform is supported off the RPV head. Power and instrumentation cables traverse upward from the components above the top of the RPV head, through the seismic support platform and across to the cable trays, located at approximately the 2047 foot elevation. The seismic support platform also provides support for the reactor vessel head vents and associated piping. |
| CRDM Cooling Shroud | The CRDM cooling shroud is a generally cylindrical steel structure which directs forced air cooling flow over the CRDM coils to maintain them in a suitable operating environment. The CRDM cooling shroud encircles the RPV head insulation and impedes access to the insulation panels. |
| RPV Head Penetrations | Of the seventy-eight four-inch diameter RPV head penetrations, fifty-three are used for the CRDMs. Twenty penetrations are capped, four penetrations contain temperature monitoring instrumentation, and one penetration contains the Reactor Vessel Level Instrumentation System (RVLIS). There is an additional one-inch head penetration, which is used for venting the RPV head. |
| CRDMs | A CRDM consists of four separate subassemblies. They are the pressure vessel, coil stack assembly, latch assembly, and the drive rod assembly. The CRDM pressure vessel is connected by a seal-welded threaded connection to the CRDM RPV head penetration and restrained at the top by Rod Position Indicator (RPI) top plates, which are an integral part of the seismic support platform. The other CRDM subassemblies provide for withdrawal or insertion of the rod control cluster assemblies (RCCAs), and for RCCA position indication. The CRDM power and instrumentation cables are contained in conduit from the applicable subassemblies to the RPI top plates. |
| RPV Head Insulation | See response to 1.c. |

| | |
|---|---|
| CRDM RPV Head Penetrations | The CRDM RPV head penetrations provide a pressure boundary from the RPV to the seal-welded threaded connection for the CRDMs. The penetrations are designed to provide a uniform height transition from the round RPV dome to the CRDM housing. |

**Requested Information**

2. **If your plant has previously experienced either leakage from or cracking in VHP nozzles, addressees are requested to provide the following information:**

   a. **a description of the extent of VHP nozzle leakage and cracking detected at your plant, including the number, location, size, and nature of each crack detected;**

   b. **a description of the additional or supplemental inspections (type, scope, qualification requirements, and acceptance criteria), repairs, and other corrective actions you have taken in response to identified cracking to satisfy applicable regulatory requirements;**

   c. **your plans for future inspections (type, scope, qualification requirements, and acceptance criteria) and the schedule;**

   d. **your basis for concluding that the inspections identified in 2.c will assure that regulatory requirements are met (see Applicable Regulatory Requirements section). Include the following specific information in this discussion:**

      (1) **If your future inspection plans do not include performing inspections before December 31, 2001, provide your basis for concluding that the regulatory requirements discussed in the Applicable Regulatory Requirements section will continue to be met until the inspections are performed.**

      (2) **If your future inspection plans do not include volumetric examination of all VHP nozzles, provide your basis for concluding that the regulatory requirements discussed in the Applicable Regulatory Requirements section will be satisfied.**

**Response**

WCGS has not previously experienced either leakage from or cracking in VHP nozzles. Therefore, this section is not applicable.

**Requested Information**

3. **If the susceptibility ranking for your plant is within 5 EFPY of ONS3, addressees are requested to provide the following information:**

   a. **your plans for future inspections (type, scope, qualification requirements, and acceptance criteria) and the schedule;**

**b. your basis for concluding that the inspections identified in 3.a. will assure that regulatory requirements are met (see Applicable Regulatory Requirements section). Include the following specific information in this discussion:**

**(1) If your future inspection plans do not include performing inspections before December 31, 2001, provide your basis for concluding that the regulatory requirements discussed in the Applicable Regulatory Requirements section will continue to be met until the inspections are performed.**

**(2) If your future inspection plans include only visual inspections, discuss the corrective actions that will be taken, including alternative inspection methods (for example, volumetric examination), if leakage is detected.**

**Response**

WCGS's susceptibility ranking is not within 5 EFPY of ONS3. Therefore, this section is not applicable.

**Requested Information**

**4. If the susceptibility ranking for your plant is greater than 5 EFPY and less than 30 EFPY of ONS3, addressees are requested to provide the following information:**

**a. your plans for future inspections (type, scope, qualification requirements, and acceptance criteria) and the schedule;**

**b. your basis for concluding that the inspections identified in 4.a will assure that regulatory requirements are met (see Applicable Regulatory Requirements section). Include the following specific information in this discussion:**

**(1) If your future inspection plans do not include a qualified visual examination at the next scheduled refueling outage, provide your basis for concluding that the regulatory requirements discussed in the Applicable Regulatory Requirements section will continue to be met until the inspections are performed.**

**(2) The corrective actions that will be taken, including alternative inspection methods (for example, volumetric examination), if leakage is detected.**

**Response**

WCGS's susceptibility ranking is not within the band of greater than 5 EFPY and less than 30 EFPY of ONS3. Therefore, this section is not applicable.

**Requested Information**

5. **Addressees are requested to provide the following information within 30 days after plant restart following the next refueling outage:**

   a. **a description of the extent of VHP nozzle leakage and cracking detected at your plant, including the number, location, size, and nature of each crack detected;**

   b. **if cracking is identified, a description of the inspections (type, scope, qualification requirements, and acceptance criteria), repairs, and other corrective actions you have taken to satisfy applicable regulatory requirements. This information is requested only if there are any changes from prior information submitted in accordance with this bulletin.**

**Response**

WCNOC will provide the requested information or will indicate that no leakage was identified within 30 days after plant restart following the next refueling outage.

**References**

1. NRC Bulletin 2001-01, Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles, dated August 3, 2001.

2. PWR Materials Reliability Program Response to NRC Bulletin 2001-01 (MRP-48), EPRI, Palo Alto, CA: 2001: TP-1006284.

3. NEI letter from Alexander Marion to Dr. Brian W. Sheron (NRC), Generic Information for Use by Licensees in Response to NRC Bulletin 2001-01, dated August 21, 2001.

4. PWR Materials Reliability Program, Interim Alloy 600 Safety Assessments for US PWR Plants (MRP-44): Part 2: Reactor Vessel Top Head Penetrations, EPRI, Palo Alto, CA: 2001.

**Table 1**

Wolf Creek Generating Station

Relative Elevation of Significant Components

| Elevation | Distance from Missile Shield | Component |
|---|---|---|
| 2051' | 0' | Bottom of Missile Shield |
| 2047' | 4' | Seismic Support Platform |
| 2047 | 4' | Top of CRDMs |
| 2030' 8" | 20' 4" | CRDM Penetration Flanges |
| 2029' 4" | 21' 8" | Head Insulation (Upper Horizontal Step) |
| 2029' 2" | 21' 10" | Top of RPV Head |
| 2028' 4" | 22' 8" | Center of Duct for CRDM Cooling Air |
| 2021' 8" | 29' 4" | RPV Flange |

## LIST OF COMMITMENTS

The following table identifies those actions committed to by Wolf Creek Nuclear Operating Corporation (WCNOC) in this document. Any other statements in this submittal are provided for information purposes and are not considered to be commitments. Please direct questions regarding these commitments to Mr. Tony Harris, Manager Regulatory Affairs at Wolf Creek Generating Station, (620) 364-4038.

| COMMITMENT | Due Date/Event |
|---|---|
| WCNOC will provide the requested information (NRC Bulletin 2001-01, Request 5) or indicate that no leakage was identified. | Within 30 days after plant restart following the next refueling outage. |