UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 4, 2014

Mr. Rafael Flores
Senior Vice President and
Chief Nuclear Officer
Attention: Regulatory Affairs
Luminant Generation Company LLC
P.O. Box 1002
Glen Rose, TX 76043

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT, UNIT 2 - REQUEST FOR RELIEF FROM PRESSURE TEST REQUIREMENTS ON REACTOR PRESSURE VESSEL FLANGE LEAK-OFF PIPING FOR THE SECOND 10-YEAR INSERVICE INSPECTION INTERVAL (TAC NO. MF2997)

Dear Mr. Flores:

By letter dated October 31, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML ML13312A121), as supplemented by letters dated January 23 and February 11, 2014 (ADAMS Accession Nos. ML 14038A256 and ML14055A318, respectively), Luminant Generation Company LLC (the licensee) submitted Relief Request No. C-3 for Comanche Peak Nuclear Power Plant (CPNPP), Unit 2, for relief from certain pressure test requirements for the reactor pressure vessel (RPV) flange leak-off piping. The request is for the second 10-year inservice inspection (ISI) interval, which began on August 3, 2004, and ends on August 2, 2014.

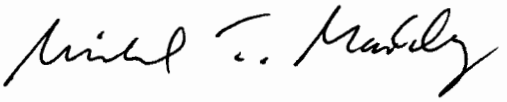
The licensee has proposed to perform a VT-2 visual examination of the accessible areas each period on the piping subjected to the static pressure head when the reactor cavity is flooded during refueling outage, in lieu of the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, Paragraph IWC-5221 for the pressure test, which requires that system leakage test be performed with lines pressurized prior to performing VT-2 visual examination.

As set forth in the enclosed safety evaluation, the U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the request and concluded that the proposed alternative provides reasonable assurance of structural integrity and leak tightness of the RPV flange leak-off piping and that complying with the specified ASME Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed the regulatory requirements set forth in Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 50.55a(a)(3)(ii). Therefore, the NRC authorizes the use of the proposed alternative at CPNPP, Unit 2, for the remainder of the second 10-year ISI interval.

All other ASME Code, Section XI, requirements for which relief has not been specifically requested and approved remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact Mr. Balwant Singal at 301-415-3016 or via e-mail at Balwant.Singal@nrc.gov.

Sincerely,



Michael T. Markley, Chief
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-446

Enclosure:
Safety Evaluation

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UNITED STATES
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# SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

# REQUEST FOR RELIEF NO. C-3

# SECOND 10-YEAR INSERVICE INSPECTION INTERVAL PROGRAM

# LUMINANT GENERATION COMPANY LLC

# COMANCHE PEAK NUCLEAR POWER PLANT, UNIT 2

# DOCKET NO. 50-446

## 1.0 INTRODUCTION

By letter dated October 31, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13312A121), as supplemented by letters dated January 23 and February 11, 2014 (ADAMS Accession Nos. ML14038A256 and ML14055A318, respectively), Luminant Generation Company LLC (the licensee), submitted Relief Request (RR) No. C-3 for Comanche Peak Nuclear Power Plant (CPNPP), Unit 2, for U.S. Nuclear Regulatory Commission (NRC) review and authorization. Specifically, the licensee requests relief from the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI system leakage test requirements for the reactor pressure vessel (RPV) flange leak-off piping. The licensee has proposed to perform a VT-2 visual examination of the accessible areas each period on the piping subjected to the static pressure head when the reactor cavity is flooded during refueling outage, in lieu of the requirements of ASME Code, Section XI, Paragraph IWC-5200 for the pressure test. However, in its letter dated February 11, 2014, the licensee clarified that the request for relief is from the requirements of IWC-5221, which requires that system leakage test be performed with lines pressurized prior to performing VT-2 visual examination.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii), the licensee proposed an alternative system leakage test on the basis that complying with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

## 2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), the ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The inservice examination of components and system pressure tests conducted during the first 10-year

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interval and subsequent intervals must comply with the requirements in the latest edition and addenda of Section XI of the ASME Code, incorporated by reference in 10 CFR 50.55a(b), 12 months prior to the start of the 120-month interval, subject to the conditions listed therein.

Pursuant to 10 CFR 50.55a(a)(3), alternatives to the requirements of paragraph (g) of 10 CFR 50.55a may be used, when authorized by the NRC, if the licensee demonstrates (i) the proposed alternatives would provide an acceptable level of quality and safety; or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Based on analysis of the regulatory requirements, the NRC has the regulatory authority to authorize the proposed alternative under 10 CFR 50.55a(a)(3)(ii) and the NRC staff has reviewed and evaluated the licensee's request accordingly.

## 3.0 TECHNICAL EVALUATION

### 3.1 Licensee's Request for Alternative

#### 3.1.1 Components Affected

The component affected by this request is ASME Code Class 2, IWC-2500, Table IWC-2500-1, Examination Category C-H, Item Number C7.10, pressure-retaining components. The licensee proposed alternative examination in lieu of the requirements of IWC-5220 for the leak-off piping (Line Numbers RC-2-080, RC-2-081, and RC-2-082) of the RPV head flange seal leak detection and collection system. The ¾ inch RPV flange seal leak-off piping is SA-376 Type 304 or 316 stainless steel.

#### 3.1.2 Code Requirements

The Code of record for the second 10-year ISI interval at CPNPP, Unit 2, is the 1998 Edition through 2000 Addenda of the ASME Code.

The ASME Code, Section XI, IWC-2500, Table IWC-2500-1, Examination Category C-H, establishes requirements to conduct the system leakage testing according to IWC-5220 and the VT-2 visual examinations according to IWA-5240, for each inspection period. As required by IWC-5221, the system leakage test shall be conducted at the system pressure obtained while the system, or portion of the system, is in service performing its normal operating function or at the system pressure developed during a test conducted to verify system operability.

The licensee proposed an alternative to IWC-5221. The proposed alternative is to perform the VT-2 visual examination of the accessible areas of the RPV flange leak-off piping subject to a static pressure head when the vessel cavity is flooded during the refueling outage. This examination will be performed during each inspection period. The licensee estimated that the pressure head developed at the opening of the flange leak-off line from the elevation (24 feet and 5.5 inches) of water above the flange when cavity is flooded, will be 10.6 pounds per square inch gauge (psig).

3.1.3 Licensee's Reason for Request

In its letter dated October 31, 2013, the licensee stated, in part, that

> The Reactor Pressure Vessel (RPV) head flange seal leak detection piping is separated from the reactor coolant pressure boundary by one passive membrane, which is an O-ring located on the inner vessel flange as shown in Attachment 2 to [the licensee's letter dated October 31, 2013]. A second O-ring is located on the outside of the tap in the vessel flange.
>
> If the inner O-ring leak during the operating cycle[,] it will be identified by an increase in temperature of the leak-off line above ambient temperature. This high temperature would actuate an alarm in the Control Room, which would be closely monitored by procedurally controlled operator actions allowing identification of any further compensatory actions required.

Failure of the inner O-ring is the only condition under which this line is pressurized. In its letter dated February 11, 2014, the licensee stated, in part, that

> The procedure also addresses notifying chemistry department to increase monitoring of containment atmosphere to detect possible outer O-ring failure; perform an operations test to determine leakage rate as applicable; and initiating corrective action documents to identify the condition and correct the condition as applicable.

In its letter dated October 31, 2013, the licensee stated, in part, that

> The configuration of this piping precludes system pressure testing while the vessel head is removed because the time required by personnel for the installation and removal of a threaded [1/8-inch] plug in the flange face to act as a pressure boundary would incur significant dose (estimated 20 - 40 mRem/min [milli roentgen equivalent man per minute], which would be an ALARA [as low as reasonable achievable] concern. This activity would also present Foreign Material Exclusion issue for the 1/8" plug that would be required to be installed to complete a leakage test at pressure.
>
> The configuration [of the RPV flange leak-off piping] also precludes pressurizing the line externally with the head installed. The top head of the vessel contains two grooves that hold the O-rings. The O-rings are held in place by a series of retainer clips that are housed in recessed cavities in the flange face. If a pressure test were to be performed with the head on, the inner O-ring would be pressurized in a direction opposite to its design function. This test pressure would result in a net inward force on the inner O-ring that would tend to push it into the recessed cavity that houses the retainer clips. The thin O-ring would likely be damaged by the inward force.

In its letter dated January 23, 2014, the licensee stated that its response to Question 6 of the NRC staff's request for additional information (RAI) for CPNPP, Unit 1 (letter dated January 9,

2013, available in ADAMS at Accession No. ML130250339), applied to CPNPP, Unit 2. The licensee stated that pressurizing the leak-off lines with the head on would cause damage and failure of the inner O-ring. This inner O-ring failure would prevent pressure build-up by allowing water to pass by and enter the reactor vessel. To ensure that it was in fact an O-ring failure and not a leak in the leak-off line piping, the portion of piping in the reactor vessel nozzle inspection areas ("sandboxes") would have to be inspected. In its letter dated January 9, 2013, the licensee stated that the conditions inside the "sandboxes" at the beginning of the outage prior to removing the head would be considered unsafe with extremely high temperatures and dose rates ranging from 150 to 250 mrem per hour (mrem/hr). The leak-off piping travels through three of the eight "sandboxes."

The licensee stated that there has been no known evidence of corrosion, stress-corrosion cracking, or fatigue in the subject flange leak-off piping at CPNPP, Units 1 and 2.

The licensee submitted this request for the remainder of the second 10-year ISI interval, which commenced on August 3, 2004, and will end on August 2, 2014.

3.2 NRC Staff Evaluation

The components and piping being addressed are associated with the RPV closure head flange leakage detection system. The RPV closure head flange is designed with two concentric O-rings that act as flange seals to enable the vessel to be pressurized during normal operation, with the inner O-ring acting as the primary pressure seal for the RPV. The area between the O-rings, the secondary outer O-ring, and subject piping segments downstream are designed to support leakage detection should the primary inner O-ring seal leak. These components are not pressurized by primary system water during normal reactor operation, and can only be tested using an external pressure source. The seal leak-off lines are essentially a leakage collection and detection system. Inner O-ring leakage during the operating cycle is identified by an increase in the line temperature above ambient, actuating an alarm in the Control Room, which would be monitored by procedurally controlled operator actions allowing identification of any further compensatory actions required.

The NRC staff recognizes three possible methods for external pressurization of the subject lines to perform the ASME Code-compliant examination: 1) pressurizing the leak-off lines upon entering the refueling outage prior to removing the RPV head; 2) pressurizing the leak-off lines at the end of the outage after installing new O-rings; and 3) installing a threaded plug in the flange face during the outage to act as a pressure boundary, and removing it after the examination.

In its letter dated January 23, 2014, the licensee stated that the response to CPNPP, Unit 1, RAI provided by letter dated January 9, 2013, is also applicable to CPNPP, Unit 2. Based on the information provided by the licensee in its letter dated January 9, 2013, the NRC staff concludes that performing the examination at the beginning of an outage would result in a relatively high radiation dose to personnel, which would constitute an ALARA concern and would present a hardship. Since O-rings cannot be reused, pressurizing the subject lines and performing the visual VT -2 examination at the end of an outage would require removal of the RPV head after the examination to replace the newly installed O-rings. The NRC staff concludes that ALARA

considerations and the heavy-lift evolution associated with replacing the O-rings would present a hardship.

The NRC staff concludes that the third method of performing an ASME Code-compliant examination, installing a 1/8" plug to complete a leakage test with externally supplied pressure, would also present an ALARA consideration, as well as a Foreign Material Exclusion issue, either of which would present a hardship.

In lieu of IWC-5221, the licensee proposes to use the static pressure head of 10.6 psig developed from the elevation of the water above the vessel flange during the cavity flood-up, to perform the system leakage test of the RPV leak-off piping. The NRC staff determines that the proposed test pressure for leak testing is acceptable because the licensee will use the highest achievable pressure without any major design modifications to the vessel flange and the pipes. If leakage originated from an existing flaw in the subject piping and its associated connections, the licensee will be able to detect it by the VT-2 visual examination performed according to IWA-5240, after maintaining the proposed test pressure. In addition, as stated by the licensee there has been no known evidence of corrosion, stress corrosion cracking, fatigue, etc. in the subject leak-off piping at CPNPP, Units 1 and 2.

The NRC staff determined that the licensee has sufficient reactor coolant system leakage detection capabilities (i.e., monitoring of containment atmosphere, sump, leakage rate, and increase in unidentified leakage) that notify the control room operator in an unlikely event of a through wall leak in the RPV flange seal leak-off line piping. The NRC staff concludes that even if the proposed alternative was not effective in identifying a through-wall leak, the existing reactor coolant leakage detection systems would be able to identify the leakage during normal operation and the licensee is required to take appropriate corrective actions in accordance with the plant technical specifications.

Therefore, the NRC staff concludes that the proposed system leakage testing with VT-2 visual inspection using low test pressure is adequate to provide a reasonable assurance of structural integrity and leak tightness of the RPV flange seal leak-off piping and demonstrates that leak-off lines can perform their intended function. The NRC staff also concludes that requiring compliance with the IWC-5200 system leakage test requirements would result in a hardship without a compensating increase in the level of quality and safety.

## 4.0 CONCLUSION

As set forth above, the NRC staff determines that the proposed alternative system leakage test provides reasonable assurance of structural integrity and leak tightness of the RPV head flange seal leak-off piping. The NRC staff concludes that complying with the specified ASME Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii). Therefore, the NRC staff authorizes the use of the proposed alternative at CPNPP, Unit 2 for the remainder of the second 10-year ISI interval, which commenced on August 3, 2004, and will end on August 2, 2014.

All other ASME Code, Section XI, requirements for which relief has not been specifically requested and approved remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: Ali Rezai, NRR/DE/ESGB

Date: April 4, 2014

If you have any questions, please contact Mr. Balwant Singal at 301-415-3016 or via e-mail at Balwant.Singal@nrc.gov.

Sincerely,

***/RA/***

Michael T. Markley, Chief
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-446

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Safety Evaluation

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