Nuclear Operating Company

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

November 5, 2012
NOC-AE-12002925
File No.: G25
10 CFR 50.55a

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Response to Request for Additional Information Regarding Relief Request RR-ENG-3-10 for Reactor Pressure Vessel Head Flange O-Ring Leakoff Lines Non-Destructive Examination
(TAC Nos. ME9863 and ME9864)

References: 1. Letter, D. W. Rencurrel to NRC Document Control Desk, "Request for Relief from ASME Section XI Code Requirements for Reactor Pressure Vessel Head Flange O-Ring Leakoff Lines Non-Destructive Examination (Relief Request RR-ENG-3-10)," dated November 1, 2012 (NOC-AE-12002922)

2. E-Mail, "South Texas Project Units 1 and 2 – Request for Additional Information Email, Relief Request RR-ENG-3-10 for Reactor Pressure Vessel Head Flange O-Ring Leakoff Lines NDE, Third 10-Year Inservice Inspection Interval," dated November 2, 2012 (TAC Nos. ME9863 and ME9864) (ML12307A264)

By Reference 1, STP Nuclear Operating Company (STPNOC) submitted a request for relief from ASME Section XI code requirements for reactor pressure vessel (RPV) head flange O-ring leakoff lines non-destructive examination (Relief Request RR-ENG-3-10). By Reference 2, the NRC staff requested additional information regarding the review of RR-ENG-3-10. STPNOC's response to Reference 2 is provided in the attachment to this letter.

There are no commitments in this letter.

If there are any questions, please contact Coley Chappell at 361-972-4745, or me at 361-972-7867.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on Nov. 5, 2012

D. W. Rencurrel
Senior Vice President

ccc

Attachment: Response to Request for Additional Information Regarding Relief Request RR-ENG-3-10

A047
NRR

STI: 33620919

cc: (paper copy)

Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
1600 East Lamar Boulevard
Arlington, TX 76011-4511

Balwant K. Singal
Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North (MS 8 B1)
11555 Rockville Pike
Rockville, MD 20852

NRC Resident Inspector
U. S. Nuclear Regulatory Commission
P. O. Box 289, Mail Code: MN116
Wadsworth, TX 77483

C. M. Canady
City of Austin
Electric Utility Department
721 Barton Springs Road
Austin, TX 78704

Carl F. Lyon
Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North (MS 8 B1A)
11555 Rockville Pike
Rockville, MD 20852

Brian Benney
Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North (MS 8 B1)
11555 Rockville Pike
Rockville, MD 20852

(electronic copy)

A. H. Gutterman, Esquire
Morgan, Lewis & Bockius LLP

Michael Markley
Balwant K. Singal
Carl F. Lyon
Brian Benney
U. S. Nuclear Regulatory Commission

John Ragan
Chris O-Hara
Jim von Suskil
NRG South Texas LP

Kevin Pollo
Richard Peña
City Public Service

Peter Nemeth
Crain Caton & James, P.C.

C. Mele
City of Austin

Richard A. Ratliff
Texas Department of State Health Services

Alice Rogers
Texas Department of State Health Services

Response to Request for Additional Information Regarding Relief Request RR-ENG-3-10 (TAC Nos. ME9863 and ME9864)

REQUEST:

1. Section D of Relief Request RR-ENG-3-10 discusses the alternative examination of the O-ring leakoff lines. Please provide more details regarding the VT-2 visual examination of the leakoff lines when the reactor cavity is filled. For example:

   a. Describe exactly how an operator would visually examine the leakoff line (where and how).

   b. Confirm that each leakoff line as shown in Figures 1 and 2 consists of a monitor tube of 1-inch in diameter coming off the O-ring area and is connected to a smaller piping of 3/4 inch in diameter.

   c. Discuss which portion of the piping and monitor tubes the operator will be examining to determine the potential leakage (i.e., discuss which portion of the leakoff line is accessible for visual inspection).

   d. Discuss which portion of the monitor tube and piping is required to be examined in accordance with the ASME Code, Section XI, IWC-5000 and which portion of the line the alternative examination will be able to visually examined.

   e. If the length of the leakoff pipe examined per the Relief Request is less than the required examination length per IWC-5000, demonstrate the structural and leakage integrity of the unexamined portion of the leakoff line.

RESPONSE:

1. a. After completing the system lineup to pressurize the ASME Class 2 portion of the line and achieving the 4-hour hold time, the operator would perform a visual test (VT-2) inspection of the leakoff line. VT-2 examination does not require removal of insulation. For segments of the line that are inaccessible for direct VT-2 visual inspection, examination would include inspection of the surrounding areas below the line for evidence of leakage as permitted by ASME Section XI Code, 2004 edition, IWA-5241(b). The flex hose and monitor tube segments that are inaccessible for direct VT-2 visual inspection are shown below on Figure RAI-1.

   b. As depicted below in Figure RAI-2, Piping and Instrumentation Diagram, each leakoff line consists of a 1-inch monitor tube connected to a flexible hose, then to 3/4-inch piping to isolation valves, then to 3/8-inch tubing to the Reactor Coolant Drain Tank (RCDT). The monitor tubes connect to the reactor vessel flange, which contains 3/8-inch passages downstream of each O-ring to collect leakage (refer to Figure RAI-3 below).

c. All accessible portions from the flex hose downstream pipe-tube adapter (see Figure RAI-2) will be directly examined in accordance with IWC-5000. For portions upstream of the flex hose downstream pipe-tube adapter, the surrounding areas below the line will be examined for evidence of leakage as permitted by IWA-5241(b).

d. The Class 2 portions from the reactor vessel flange to the Class 2 boundaries (see Figure RAI-2) are required to be examined. For segments of the line that are inaccessible for direct VT-2 visual inspection, examination will be of the surrounding area below the line for evidence of leakage as permitted by IWA-5241(b).

e. Not applicable, the inspected sections of the leakoff line per the Relief Request and as required by IWC-5000 are identical. Only the system conditions are different.

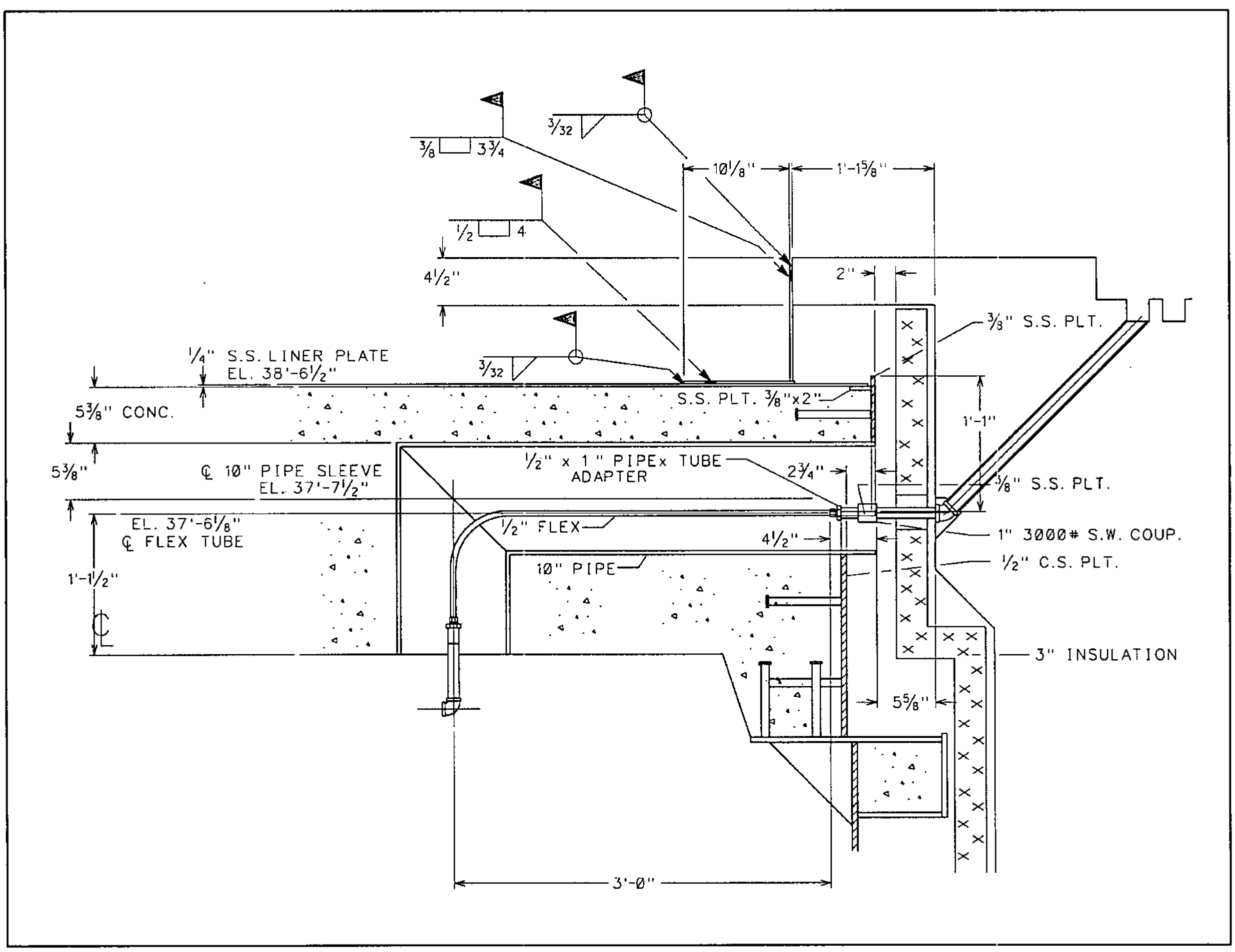

Figure RAI-1: Simplified Sketch of O-Ring Leakoff Line off Reactor Vessel Flange

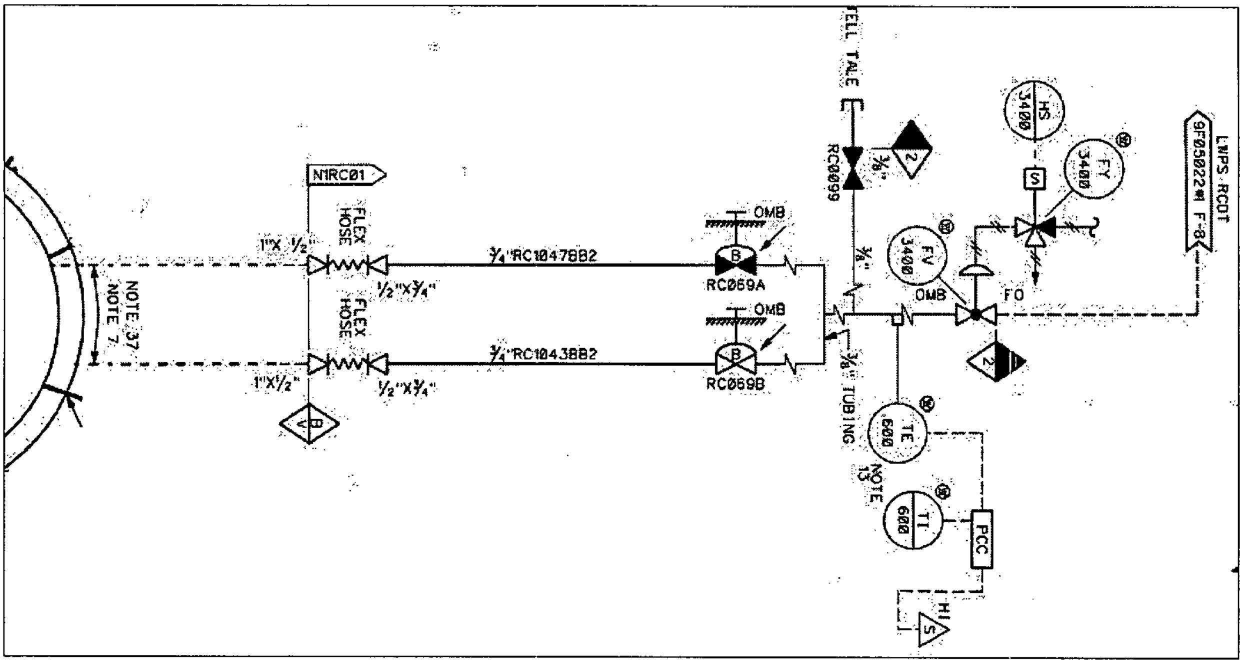

Figure RAI-2: Piping and Instrumentation Diagram

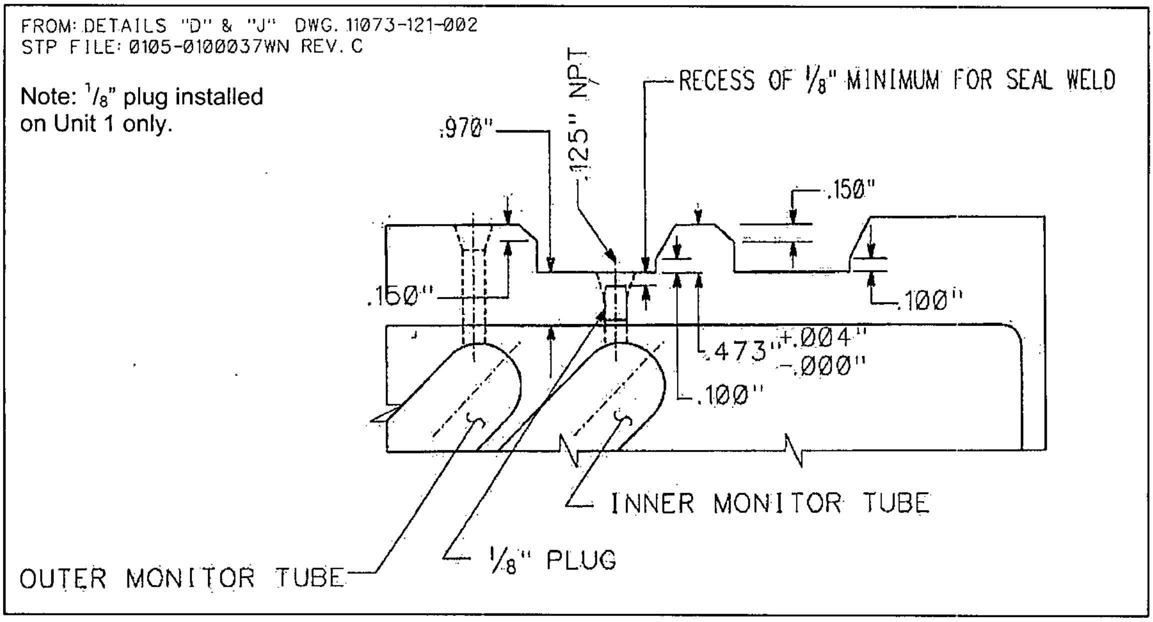

Figure RAI-3: Upper Vessel Machine of O-Ring Grooves and Leakoff Lines

REQUEST:

2. Section E of the relief request discusses that for Unit 1, a threaded plug has been installed and seal welded in the reactor vessel flange drain hole for the inner O-ring leakoff line as shown in Figure 1. Please discuss:

    a. Why the plug is installed.

    b. If this reduces the capability of O-ring leakoff when the inner leakoff line is removed from service.

    c. Confirm that with plugged inner leakoff line the O-ring leakoff will be drained through the outer leakoff line and that the outer leakoff line has the capacity to handle all leakoff.

RESPONSE:

2. a. A leak was discovered in the inner O-ring leakoff line upstream of the isolation valve, during 1RE14 on 04/11/2008. Due to the location of the leak inside an embedded sleeve in the reactor cavity concrete floor near the reactor, repair would have been exceptionally difficult. A decision was made to plug the inner leakoff line instead. This eliminated the leak path.

    b. The inner and outer leakoff lines join together downstream of the isolation valves. The intent of the original design is to isolate the inner leakoff line after leakage past the first seal is detected and then rely only on the outer leakoff line. The intent of the original design was to have only one leakoff line active at a time. Therefore, removal of the inner leakoff line from service does not reduce the capability of O-ring leakoff. The current configuration is equivalent to the original design with the inner leakoff line isolation valve closed.

    c. With the inner leakoff line plugged, any leakage past the inner O-ring seal will be confined between the inner and outer O-ring seals as long as the outer seal holds. Leakage that goes past the outer seal will drain through the outer leakoff line, with no reduction in capacity from that provided by the original design with the isolation valve closed on the inner leakoff line.

    While the outer O-ring will function as it did before the design change, its configuration as a leakage indication line allows for a limited amount of leakage flow. In the case of more than limited leakage, primary coolant may flow past the reactor vessel flange to the cavity drainage system. Such leakage would be detected by containment leakage detection systems.

REQUEST:

3. Section E, first paragraph, states that "...STP tests the RPV flange O-ring leakoff lines every outage at normal operating temperature and pressure with the RPV flange O-rings installed..."

   a. Please clarify and describe exactly how the test was performed as discussed in the aforementioned statement,

   b. Since the licensee has tested the RPV flange O-ring leakoff lines every outage at normal operating temperature and pressure with the RPV flange O-rings installed, discuss the hardship for performing such test besides the hardship that is already discussed in the relief request.

RESPONSE:

3. a. IWC-5221 requires that "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...." The lines were tested (VT-2) performing their normal function after the O-rings were reinstalled and the primary had achieved normal operating pressure. Generally some leakage has been experienced during pressure/temperature ascension prior to the O-rings being fully "energized." However, if minimal or no leakage occurred, then the line would not have been subjected to a pressure higher than the RCDT pressure of 2-6 psig.

   The line was tested every outage coincident with the ASME Class 1 pressure test. The new exam will be performed once per period as is required by table IWC-2500-1 examination category C-H.

   b. With the RPV head flange O-rings installed and performing their intended function, the leakoff lines are not expected to be pressurized during the system pressure test following a refueling outage. Applying system pressure to the leakoff lines is not practical with the RPV head installed after refueling, since it would require either intentionally failing the O-rings or pressurizing the line with a hydrostatic test pump in the direction opposite to the intended design function of the O-rings, which could damage O-ring sealing material with debris. Performing such a test during shutdown would delay the shutdown, requiring the plant to be maintained in Mode 3 at normal operating temperature and pressure at higher decay heat loads, resulting in an incremental increase in core damage frequency, and reverse the results of site efforts to reduce the outage sequence to cold shutdown in order to minimize shutdown risk. Performing such a test also may potentially introduce damaging debris to the flange surfaces that would result in the additional radiation exposure if subsequent repairs are required. For additional discussion refer to the response to RAI 5 on page 7.

   Testing prior to O-ring placement would require the installation and removal of the plugs that would result in significant radiation exposure, estimated at 1000-2000 mrem per test.

REQUEST:

4. If during the performance of the alternative VT-2 examination per the relief request, a small through wall flaw is not detect during the refueling outage inspection (and during the normal operation the O-ring degraded and the reactor coolant leaked through the O-ring and flowed into the leakoff line) and subsequently, the reactor coolant in the leakoff line leaks out of the pipe or monitor tube wall. Then please discuss:

   a. How the leakage from the leakoff pipe/tube wall would be detected,

   b. How soon the operator will be notified, and,

   c. Discuss the safety significance of this scenario.

RESPONSE:

4. a. Leakage to the leakage-detection line in service would be indicated by an audible alarm in the control room when the line temperature setpoint of 20°F above ambient is reached [Annunciator Procedure 0POP09-AN-05M2]. Control room operators would respond by observing leakoff temperature, and taking other actions as directed by procedure.

   Leakage upstream of leakoff line isolation valves [through pipe/tube wall] would be detected by containment leakage detection systems and daily performance of Reactor Coolant System inventory.

   b. The operator would be alerted by an audible alarm when the line temperature reaches about 20°F above ambient. For very low leakage rates below that which brings in alarm, leakage may be detected by rising RCDT levels.

   Through pipe/tube wall leakage upstream of leakoff line isolation valves would be detected by containment leakage detection systems and daily performance of Reactor Coolant System inventory. The minimum detection sensitivity of these means is about 0.02 gallons/minute.

   c. The technical specification limit for leakage past the O-rings through a fault in the line is 1 gallon/minute, the limits for RCS unidentified leakage. Leakage would not be considered PRESSURE BOUNDARY LEAKAGE as the O-ring/flange interface is a mechanical joint, not leakage through a pressure-retaining body. Leakage reaching 1 gallon/minute would necessitate placing the plant in COLD SHUTDOWN in accordance with Technical Specification 3/4.4.6, Reactor Coolant System Leakage. Following shutdown, the leaking pipe/tube would be identified and corrected. (Note: the portions of the leakoff lines upstream of the manual isolation valves are inside the biological shield wall, generally inaccessible at power for inspection.)

REQUEST:

5. Please discuss the possibility of performing the pressure test of the leakoff line using the normal Reactor Coolant System pressure and temperature after a scheduled plant shutdown, but before removing the reactor vessel head per IWC-5000. In this case, the old O-ring may be damaged but it will be discarded as part of the normal maintenance activity. Discuss the hardship, if any, associated with this test evolution.

RESPONSE:

5. Performing the test by applying system pressure to the leakoff lines with a hydrostatic test pump with the RPV head installed during shutdown would delay the shutdown, may introduce damaging debris to the flange surfaces and would result in the additional radiation exposure of an estimated 100 mrem per test. Applying backpressure to the lines in HOT STANDBY may affect the sealing capability of the O-rings as debris in the leakoff lines is introduced back to the O-rings, inducing leakage, which may potentially accelerate erosion of the flange surfaces as the plant is brought to a COLD SHUTDOWN condition. Subsequent repair of flange damage would require additional personnel exposure.