From:	Kalyanam, Kaly
To:	CLARK, ROBERT W
Subject:	RAI for the Request to use of Alternate ASME Code Case N-770-1 Baseline Examination, Request for Alternative ANO2-ISI-007. (TAC No. ME7646)
Date:	Tuesday, August 28, 2012 11:55:00 AM
Attachments:	RAI fro EPNB_RAII_08-21-12.pdf

Bob,

By letter dated November 30, 2011, Entergy Operations, Inc. (Entergy) made a request to NRC for approval to "Use of Alternate ASME Code Case N-770-1 Baseline Examination, Request for Alternative ANO2-ISI-007."

The TAC No. for this request is ME7646.

The NRC Staff has reviewed the and determined that we require additional information to complete our review. A request for additional information is attached.

The staff requests you to provide a response to the RAI on or before September 14, 2012. This date was discussed with you. Please let me know if this date cannot be met.

Thanks

Kaly

OFFICE OF NUCLEAR REACTOR REGULATION
REQUEST FOR ADDITIONAL INFORMATION
USE OF ALTERNATE ASME CODE CASE N-770-1 BASELINE EXAMINATION
ENTERGY OPERATIONS, INC
ARKANSAS NUCLEAR ONE, UNIT 2
DOCKET NUMBER 50-368

By letter dated November 30, 2011, as supplemented by letters dated April 13, 2012 and May 21, 2012, (Agencywide Documents Access and Management System (ADAMS) Accession Numbers ML113340158, ML12104A066 and ML12142A319, respectively) Entergy Operations, Inc. (the licensee) submitted Request for Alternative ANO2-ISI-007, "Use of Alternate ASME Code Case N-770-1 Baseline Examination," for U. S. Nuclear Regulatory Commission review and authorization. The staff requests additional information to complete the review.

1. For welds 09-008 and 10-014, please provide an analysis of the time necessary for the largest potential semicircular (thumbnail) inside diameter connected axial flaw contained in the unexamined region of the susceptible weld material to grow by primary water stress corrosion cracking (PWSCC) to:

    a. Extend far enough into the examined region to be detected
        i. Describe the criteria for determining the PWSCC flaw size that can be detected using the ultrasonic examination (UT) techniques employed
    b. Exceed American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) allowable size
    c. Become through-wall

2. In order for the NRC staff to have the ability to verify the above analyses, for the two subject welds please provide:

    a. Scale drawings showing the dimensions of the Alloy 82 weld root, Alloy 182 fill and butter, and the dimensions of the unexamined region at the weld root. Indicate the position of the PWSCC flaw when it can be detected
    b. Diameter, wall thickness and material on each side of the dissimilar metal weld
    c. Length of the cast austenitic stainless steel safe end
    d. Information on any post-weld machining, including back chipping and rewelding on the inside diameter, and documented weld repairs
    e. Stress field description at the weld
    f. Operating temperature and pressure

3. The staff requests information concerning the subject UT examinations

    a. From statements in the licensee's submittals, it appears that the ultrasonic procedure, equipment and personnel employed were qualified through the industry's Performance Demonstration Initiative (PDI). Confirm that all aspects of the subject qualifications have been through blind qualification in accordance with ASME Appendix VIII requirements. This includes probes and ultrasonic instrumentation, procedure variables, and personnel.

ENCLOSURE

b. Describe the manner in which these examinations have been performed, such as by a single examiner or by teaming (master/slave, etc.).
c. State whether a site-specific demonstration was performed as part of the qualification process for the subject examinations. If so, submit the Technical Justification for this site-specific demonstration.
d. The drawings submitted by the licensee are quite useful and show graphical estimates for volumetric coverage. The reduced coverage appears to be primarily associated with circumferential scans (for axially oriented flaws), and indicates that the inner one-third region, where PWSCC would be initially manifested, lacks sufficient volumetric coverage. The licensee's RAI responses dated April 13, 2012, and May 21, 2012, indicate that weld crown concavity (Weld 09-008) and outside diameter weld taper (Weld 10-014) are the specific geometrical causes for limited coverage of these welds. The licensee further suggests that + and −10 degree probe skewing performed increases volumetric coverage, but is not quantified, nor included in the cumulative volumetric coverage obtained. Confirm that the + and −10 degree skew was the result of manually orienting the phased array search unit at these angles, not electronic skews via focal law control.

4. In order to evaluate the ultrasonic techniques applied and assess whether the examinations performed would be expected to adequately detect PWSCC, the staff is modeling these examinations. In order to make these models accurate, information is needed concerning the as-built geometries of the subject welds and variables associated with the phased array method. Please provide the following information:

   a. Phased array probe
      i. Center frequency, bandwidth, pulse excitation type and duration
      ii. Operating mode
         1. Transmit-receive (TR), pulse / echo, etc.
         2. Longitudinal (L) and/or shear (S) wave
      iii. Array configuration (matrix)
         1. Whether identical or different transmit-receive arrays, if used
         2. Physical separation between arrays (if TRL/TRS configuration). Identify distance between first element of one array and first element of second array (array separation – see Figure 1)
         3. If TRL or TRS mode is used, identify transmit and receive arrays (relative to weld geometry)
      iv. Total number of elements per array
         1. Number of elements along the primary axis
         2. Number of elements along the secondary axis
      v. Element dimensions along primary and secondary axes, spacing between elements, and center-to-center distance (pitch – see Figure 2)
         1. Element shape if not rectangular
      vi. Element wiring configuration and element firing/receiving ordering sequence for each array
      vii. Probe manufacturer and/or part number (if available)
   b. Wedge (see Figure 3)
      i. Material type – Rexolite, other, etc.

1. Longitudinal and shear wave velocity
2. Attenuation (if known)
3. Density (if known)

ii. Geometry
1. Wedge angle
2. Roof angle (if used)
3. All physical dimensions necessary to create 3-D solid model, such as height at front of wedge, height at back of wedge, width of wedge, and length of wedge
4. Placement of each probe on each wedge; i.e., what is the height of the middle of the first element?
5. Is wedge contact geometry contoured to the specimen? If not, what contour does it have, if any?

c. Beam focusing

i. Please state the type of focusing used and include associated details, as listed below. The four types of focusing techniques are listed below and shown graphically in Figure 4.
1. *Projection* – focusing in a specific vertical plane
   a. Parameters: distance from probe reference point, sweep angles (start, stop, interval), skew angle(s)
2. *True depth* – focusing at specific constant depth with all angles focused at this depth
   a. Parameters: focusing depth, sweep angles (start, stop, interval), skew angle(s)
3. *Half-path* – sound path held constant as beam is swept
   a. Parameters: sound path length, sweep angles (start, stop, interval), skew angle(s)
4. *Focal plane* – arbitrary user-defined plane of focus
   a. Low angle path length, high angle path length, sweep angles (start, stop, interval), skew angle(s)

ii. Number and configuration of elements used in data acquisition (active aperture), if different than total number of elements within each probe (e.g., if a linear array probe physically contains 64 elements but only the first 32 were active – this needs to be defined)

iii. If possible, please provide a set of transmit and receive delay law values for each element at a particular angle and focus to validate model

d. As-built weld geometry

i. Provide dimensioned drawings of the welds to be modeled. Are the sketches provided for welds 09-008 and 10-014 (referenced as Figures 2 and 3 in the latest submittal) scaled drawings? Provide angle of OD taper of weld 10-014.

ii. Estimate and provide depth of geometrical anomalies (e.g., concavity or waviness) on the OD surface of the welds that impact volumetric inspection.

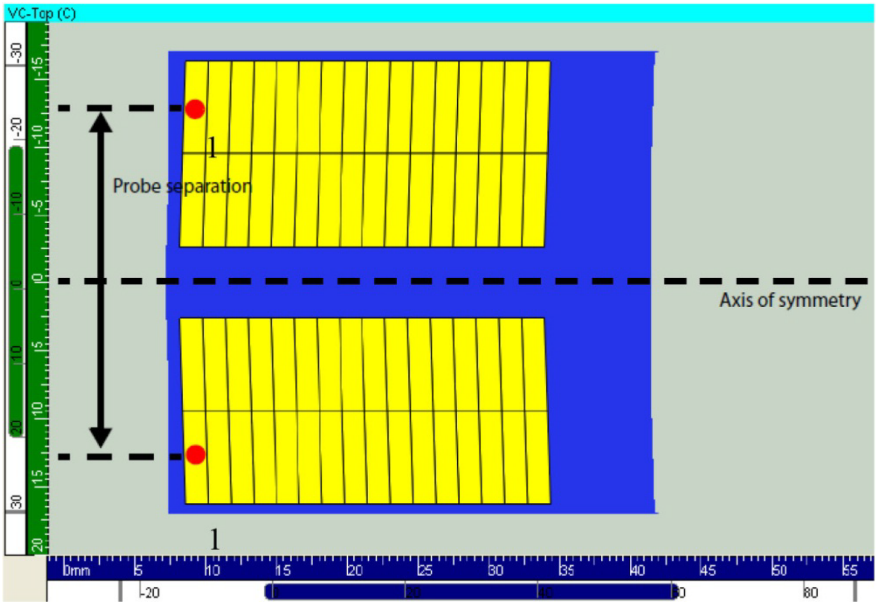

Figure 1 Top View of 2D Matrix Array Depicting Separation Dimension

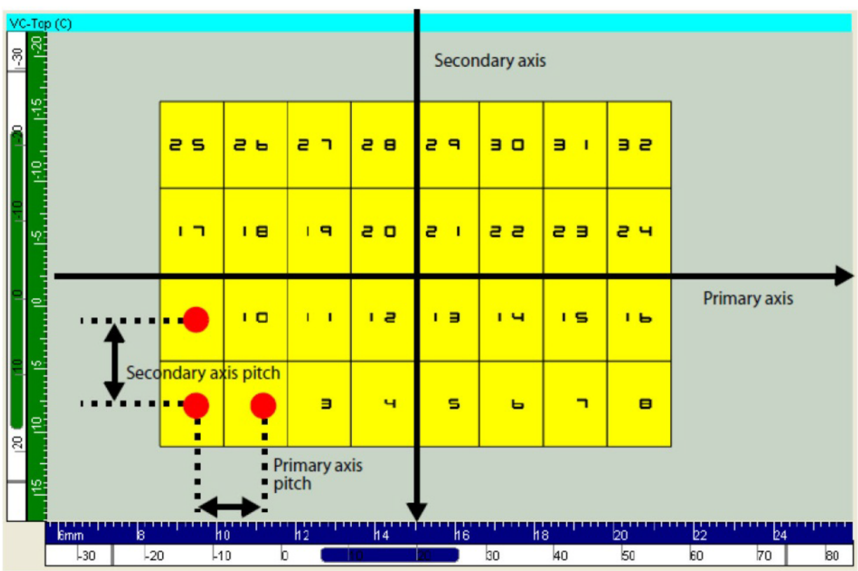

Figure 2 Top View of 2D Matrix Array Depicting Primary and Secondary Axis Pitch Dimensions

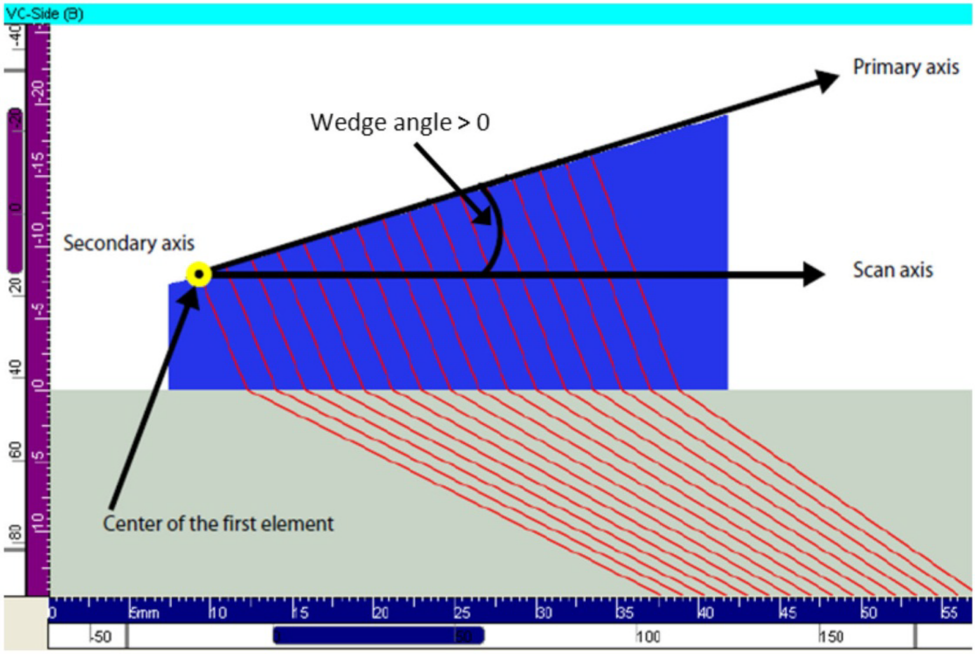

Figure 3 Definition of Wedge Angle

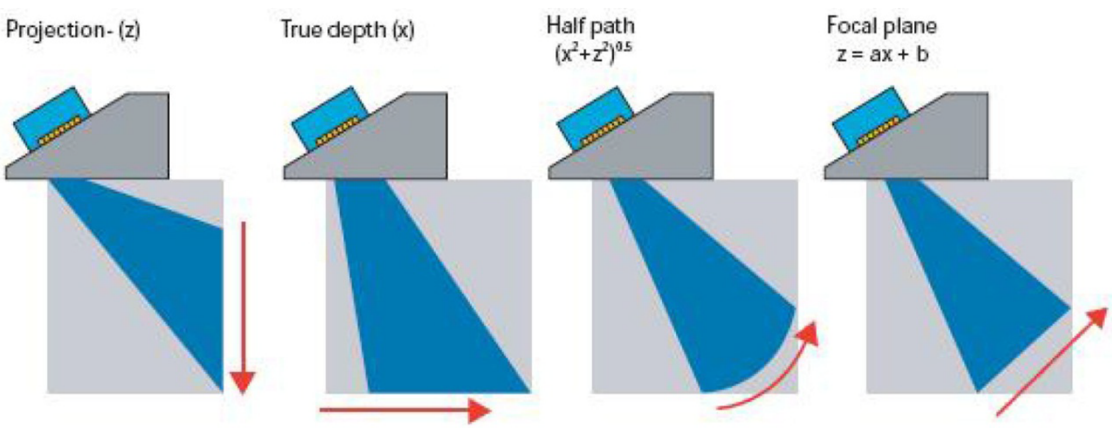

Figure 4 Beam Focusing Options for Phased Array Probes