1. On page 8, question no. 10, of the licensee's letter of response to the staff RAI dated April 12, 2010, the licensee stated in part, "These nine penetrations consist of seven penetrations that are one-inch (nominal pipe size) nozzles that are attached to the pressurizer with a partial penetration weld located at the inside surface of the pressurizer. The other two penetrations consist of a 1.5-inch diameter thermowell that is attached to the pressurizer with a partial penetration weld located at the inside surface of the pressurizer, and **a smaller thermowell that was installed through a spare penetration that was originally a one-inch nozzle similar to the other seven discussed above.**"

   Please clarify the sentence underlined/bold. Is this the 10th nozzle? Please explain.

   RESPONSE

   In reviewing our submittal I can see the confusion concerning the total the number of penetrations. The write-up was not the clearest. Let me try to clarify this below.

   As noted in the April 12, 2010, submittal there was nine (9) unmitigated Alloy 600/82/182 instrument penetrations to the ANO-1 pressurizer at the beginning of the last refueling outage. All nine penetrations were modified during that outage.

   - The 1.5" thermowell nozzle was attached to the pressurizer by a partial penetration weld on the inside surface of the pressurizer.
   - Six (6) 1" nozzles (level taps, spares, vent and sample tap, sample tap) were attached to the pressurizer by a partial penetration weld on the inside surface of the pressurizer.
   - Two (2) – previously repaired nozzles (1" thermowell [TE-1002A/B] and 1" level tap [RC-1001A/B]) had outside diameter pads replaced with resistant material and the nozzles were also replaced using resistant material. It should be noted that TE-1002A/B is one nozzle and RC-1001A/B is one separate nozzle.

   There is no 10th nozzle, just the nine described above.

2. Flaw evaluation document ANO-34Q-326, pages 4, 5, and .. talk about "**Self Similar Crack Growth**" assumption and indicates that "this assumption is a conservative approach."

   Please describe underlying nature of "**Self Similar Growth**" and state why this assumption is considered conservative approach.

   RESPONSE

   Self-similar crack growth means that the crack aspect ratio (depth-to-length) remains constant as the crack propagates. The crack front retains its shape as it grows into the base metal, thus, the term 'self-similar' crack growth. For the small bore nozzle in calculation ANO-34Q-326, an initial flaw is postulated in the pressurizer J-groove weld. The initial postulated crack front is assumed to take the shape of the boundary of the J-groove weld at its interface with the pressurizer base metal. Assuming self-similar

growth, two larger flaws are postulated, retaining the shape of the initial flaw, as illustrated in Figure 1 of calculation ANO-34Q-326.

The self-similar crack growth assumption is conservative because the stress intensity factor (K) is not uniform along the crack front. Because of the non-uniform distribution of K along the crack front, the crack is unlikely to propagate in a self-similar manner, but rather would tend to show more growth at the location of maximum K. By assuming that it grows self-similarly, the crack growth calculated based on the maximum K along the crack front is essentially being conservatively applied to the entire crack front to determine the next crack size.

3. Was buttering applied/used between the J-groove attachment weld and the pressurizer carbon steel shell at the nozzle location?

   RESPONSE

   A review of a Nuclear Steam Supply System vendor's documentation and plant drawings noted that a weld butter was not used between the J-groove attachment weld and the pressurizer carbon steel shell at the nozzle location in the construction of the welds.