STATUS REPORT

RE: UNRESOLVED RESPONSES TO THE BULLETIN 2001-01 FOR HIGH SUSCEPTIBILITY PLANTS AND THOSE PLANTS THAT HAVE EXPERIENCED VHP NOZZLE CRACKING

NOVEMBER 30, 2001

4:00 P.M.

❑ Davis-Besse

The staff hosted a public meeting on November 28, 2001, with FENOC (licensee) representatives as part of its ongoing efforts associated with review of the licensee's Bulletin 2001-01, "Reactor Pressure Vessel Head Penetration Nozzle Cracking," responses. The licensee provided additional information including its revised probabilistic safety assessment. To address the potential safety concerns and to justify operation beyond December 31, 2001, the licensee also committed to (1) shut down Davis-Besse on February, 16, 2002, for the commencement of the refueling outage, (2) perform the vessel head penetration (VHP) nozzle inspections as recommended in the Bulletin, (3) characterize any cracks that are identified in VHP nozzles (as required by the ASME Code), (4) operate the plant at a lower reactor coolant system hot leg temperature to reduce the vessel head temperature effects on crack initiation and growth, (5) maximize the availability of the plant's redundant critical safety systems until shutdown, and (6) ensure more reliable operator response to the potential consequences of an event by providing enhanced operator training related to SBLOCA.

As the basis for evaluating the licensee's probabilistic safety assessment, the staff utilized the guidance contained in Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," and RG 1.182, "Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants." In the November 28, 2001, meeting, the licensee presented a range of possible initiating event frequencies and associated changes in core damage frequencies (ΔCDF) and incremental core damage probabilities (ICDP) for a loss-of-coolant accident (LOCA) resulting from outside diameter-initiated primary water stress corrosion cracking of a VHP nozzle based on assumptions regarding the efficacy of previously conducted inspections as well as the VHP nozzle material susceptibility to this cracking mechanism. The resultant ΔCDFs and ICDPs (for the approximately 75 days that the facility would operate), including credit for conservative configuration risk management, ranged from values that risk-informed decisionmaking guidance considers acceptable with increased management attention to a value that would not normally be permitted. The corresponding values for the changes in large early release frequencies (ΔLERF) and incremental large early release probabilities (ILERP) were generally below the guideline thresholds due to the relatively large, dry containment at Davis-Besse.

The staff recognizes the uncertainties associated with this issue including those associated with the crack initiation and growth models. Based on the available information, the staff believes that the actual initiating event frequency and resultant ΔCDF, ICDP, ΔLERF, and ILERP of a LOCA resulting from a failure of a VHP nozzle due to this cracking mechanism is between the bounding values.

E-43

After considerable deliberation and increased management attention, it is the staff's judgment that sufficient information is available to justify operation of the Davis-Besse facility until February 16, 2002. Although operation in this condition could result in ΔCDF and ICDP values that are above the normally acceptable guidelines of RG 1.174 and RG 1.182, the analyses also indicate that the consequences of such an event would not constitute undue risk to the health and safety of the public.

On November 30, 2001, telephone calls were held with Davis-Besse and FirstEnergy management regarding the commitments discussed at the November 28, 2001, meeting. The staff anticipates additional information regarding this issue to clarify the licensee's position of these commitments. FirstEnergy management committed to provide this information in writing by COB Monday, December 3, 2001.

❑ D. C. Cook, Unit 2

Licensee Plans/Commitments: The licensee plans to shutdown and perform inspections on January 19, 2002. The shutdown date of January 19, 2002, was docketed in a letter dated November 30, 2001.

A telephone call was held on November 30, 2001, to discuss the scope of inspections to be conducted in January 2002. The licensee plans to perform the inspections that are recommended in the Bulletin.

NRC Staff Position: Based on its review of information provided by the licensee and results of inspections conducted at other facilities, the staff has concluded that deferral of the inspections at D.C Cook 2 until the next outage, which begins on January 19, 2002, is acceptable.

Next Regulatory Action: Based on its review of information provided by the licensee and results of inspections conducted at other facilities, the staff has concluded that deferral of the inspections at D.C Cook, Unit 2, until the next outage, which begins on January 19, 2002, is acceptable. Therefore, no Order is proposed for D.C Cook, Unit 2.

Meetings & Conf. Call Summaries: A public meeting was held with the licensee today, 11/20/01, to discuss information regarding this issue.

❑ North Anna, Units 1 and 2

Licensee Plans/Commitments: The NRC received a supplemental response on November 19, 2001, regarding information to qualify the fall inspections for North Anna and Surry Units.

NRC Staff Position: During an inspection in October 2001, the licensee identified several nozzles with cracking on the inside diameter of the nozzle and penetrant testing (PT) indications on the J-groove welds. The licensee determined that the nozzle cracking did not require repair. A staff review of the PT records concurred with the licensee's conclusions that the indications appeared to be surface indications and not relevant to a cracking mechanism.

Via letter dated November 19, 2001, the licensee provided the documentation to support a "qualified visual" analysis to demonstrate acceptability of using "design" dimensions of the VHP penetrations and nozzles. The staff is reviewing this information.

North Anna, Unit 2, has a special outage for nozzle inspections in progress. Results from the visual examination indicated several nozzles that appeared to have boric acid deposits consistent with the findings at the Oconee plants and Crystal River, Unit 3. Thus far the licensee has identified one of these nozzles with a through-wall crack in the J-groove weld (event report #38498). This crack was identified by the licensee due to staff insistence that the licensee destructively confirm the benign nature of PT indications on the J-groove welds dispositioned by the licensee as surface only and not relevant to a cracking mechanism. Repairs are being conducted on this nozzle and additional examinations are underway on two other suspect nozzles. Ultrasonic examination of the inside diameter of these three nozzles identified no cracking in the nozzle base metal.

With the findings at Unit 2, the staff will address with the licensee the PT findings at Unit 1.

Next Regulatory Action: None planned at this time.

Meetings & Conf. Call Summaries:
October 5, 2001 - Conference call held to discuss the number of VHP penetrations to be inspected at North Anna, Unit 1.

October 24, 2001 - Conference call held to discuss the qualification of the visual exams to be conducted at North Anna, Units 1 and 2.

Drop-in visits were held by the licensee with the Commissioners and the EDO on November 19, 2001. A general status of the nozzle inspections at the North Anna and the Surry plants was provided by the licensee.

❑ Surry, Units 1 and 2

Licensee Plans/Commitments: The NRC received a supplemental response on November 19, 2001, regarding information to qualify the fall inspections for all North Anna and Surry Units.

Licensee shutdown Surry, Unit 2, on November 19, 2001, to perform the recommended inspections. Visual inspections to begin November 24, 2001.

NRC Staff Position: Surry, Unit 1, has an outage in progress. The licensee is nearing completion of repairs on six penetrations (this is a correction as the last DSR stated that only 5 repairs were ongoing) at Surry, Unit 1. As mentioned above, the licensee shutdown Surry, Unit 2, on November 19, 2001, to conduct the inspections.

Staff will review the licensee's supplemental response regarding qualification of visual inspections for these units.

Next Regulatory Action: None planned at this time.

Meetings & Conf. Call Summaries:
10/12/01- Surry agreed to provide a supplement to their Bulletin response addressing qualified visual inspection (supplement sent November 14, 2001). Still uncertain as to when Surry, Unit 2, would be inspected.

10/31/01 - NRC gave verbal relief for Surry, Unit 1, relief requests SR-27 and SR-28 so that repair of cracks could proceed. Relief was based on NRC questions and licensee responses in previous North Anna phone calls (Surry, Unit 1, relief and North Anna, Unit 1, reliefs previously submitted, reviewed and withdrawn) and previous similar reliefs granted for Duane Arnold, Fitzpatrick, and Nine Mile Point.

11/6/01 - Surry agreed to docket a commitment to provide evidence of weld procedure qualification for P43 to P3 with F43 filler. Also agreed to provide analyses for weld repair and flaw evaluation prior to restart. Also agreed to address crack triplepoint, and to state there will be a PT report documenting J weld crack.

VHP NOZZLE INSPECTIONS/RESULTS
NOVEMBER 30, 2001
4:00 P.M.

Crystal River, Unit 3

Inspections completed in October 2001. The licensee identified one leaking CRDM nozzle with a 90° circumferential crack which was subsequently repaired. The staff notes that the licensee did not perform any destructive examination to further characterize the flaw. This is the highest ranked moderate susceptibility plant.

North Anna, Unit 1

Inspections completed in September 2001. The licensee identified eight shallow axial cracks below the J-groove weld and penetrant testing (PT) indications on the J-groove welds. The licensee did not perform any repairs because these cracks were not part of the reactor coolant pressure boundary. A staff review of the PT records concurred with the licensee's conclusions that the indications appeared to be surface indications and not relevant to a cracking mechanism.

North Anna, Unit 2

North Anna, Unit 2, found a through-wall leak in a CRDM nozzle (event report issued). Repairs are being conducted on this nozzle and additional examinations are underway on two other suspect nozzles. Ultrasonic examination of the inside diameter of these three nozzles identified no cracking in the nozzle base metal.

As of November 30, 2001, the licensee has completed repairs of the leaking CRDM nozzle and is in the process of repairing 2 others. The reactor vessel head is scheduled to be re-installed on December 9, 2001.

Surry, Unit 1

The licensee is nearing completion of repairs on six penetrations (this is a correction as the last DSR stated that only five repairs were ongoing).

Repairs are complete are the licensee is preparing to re-start Surry, Unit 1.

Surry, Unit 2

The licensee shutdown Unit 2 on November 19, 2001 to conduct the recommended inspections. The inspections are expected to commence on November 24, 2001.

A bare-head visual inspection was conducted on Surry, Unit 2, over the weekend of November 24, 2001. No indications of VHP nozzle cracking and leaking were evident. In addition, there were no indications that would lead the licensee to perform NDE of any VHP nozzles. The licensee is preparing to re-start Surry, Unit 2.

❑ TMI-1

Following shutdown for a scheduled refueling outage in October 2001, TMI-1 performed visual inspections of the reactor vessel CRDM nozzles as recommended in NRC Bulletin 2001-01. The inspections revealed axially-oriented flaw indications in eight CRDM nozzles, six nozzles were found to have cracks within the pressure boundary (five nozzles had through-wall cracks and one did not), the other two nozzles had cracks that were outside the pressure boundary. The licensee completed Code repairs on all six of the CRDM nozzles that had flaws within the pressure boundary. Additionally, the licensee performed visual inspections of the eight thermocouple (T/C) nozzles and found evidence of leakage on all of them. Two of the leaking T/C nozzles were replaced and the remaining six were plugged in accordance with Code requirements or as allowed by an NRC-approved relief request. These corrective actions are complete.

The staff is interested in information regarding the licensee's flaw evaluation with regard to the 2 axial (below-the-weld) flaw indications that were not repaired. Items of interest are the assumed crack growth rate and the subsequent time it takes the axial flaws to propagate into the weld. The staff will engage the licensee in the near future regarding this issue.

❑ Oconee, Unit 3

The licensee initially identified cracking in February of 2001 (nine leaking CRDMs, three circumferential cracks) during a maintenance outage. On November 12, 2001, after only seven months of operation following its previous inspection and during its regularly scheduled refueling outage Oconee, Unit 3, identified indications of leakage evidenced by boric acid buildup around four CRDM nozzles. Three additional nozzles were categorized as potential leaking nozzles and require further inspection. The licensee expects to conduct additional inspections during the weekend of November 17, 2001.

As of the morning of Monday, November 19, 2001, nine CRDM nozzles have been ultrasonically examined. These nozzles include the four nozzles that had visual indications of leakage, the three nozzles that were categorized as potential leakers based on visual examination results, and two additional nozzles. UT has verified that five nozzles have through-wall cracks. One nozzle (nozzle 2) has a circumferential indication which is not through-wall (approximately. 48 degrees in length).

A telecon was held with the licensee to discuss preliminary results of its inspections of 9 control rod drive mechanism (CRDM) nozzles (4 exhibited visual indications of leakage, 3 were suspected leakers, and 2 others that were accessible due to the removal of the CRDMs).

Summary of potentially significant results (preliminary results only):

(1) 1 nozzle indicated a circumferential crack above the J-groove weld (not through-wall) at about 48 degrees,

(2) other nozzles had indications of ID- and OD-intiated axial cracking (mostly OD-initiated and some through-wall), and

(3) based on the indications, the licensee is currently planning to repair 7 nozzles. Interestingly, one of the 7 nozzles to be repaired is a nozzle that had no visual indications of leakage.

The licensee anticipates finalizing its results and its decision regarding expansion of inspections in a few days.

During a conference call on November 26, 2001, the licensee presented results of the inspection and repair of the CRDM nozzles. The licensee is planning to volumetrically examine all of the VHP nozzles which have not yet been examined (a total of 43 additional nozzles) for possible circumferential cracking. These inspections are scheduled to begin on December 2, 2001. A conference call has been scheduled for Monday, December 3, 2001, to discuss the status of these activities (call is scheduled for 10:30 am in Room O-7B6, attendees external to NRC headquarters may participate by dialing 1 800 638-8081, and using passcode [redacted] followed by the (#) X Ex 2

MODERATE SUSCEPTIBILITY PLANT INSPECTION RESULTS
NOVEMBER 30, 2001
4:00 P.M.

The following plants have performed the recommended inspections as defined in Bulletin 2001-01 this fall and found no indications of leakage. All of these plants are ranked as moderately susceptible to primary water stress corrosion cracking. The licensee for these plants performed 100% bare metal visual inspections.

Beaver Valley, Unit 1
Farley, Unit 1
Kewaunee
Turkey Point, Unit 3

St. Lucie, Unit 2, shut down on November 26, 2001, for its refueling outage. The head was being removed on Friday, November 30, 2001, and the VHP inspections are scheduled to commence on Saturday, December 1, 2001.

No other moderate plants are scheduled for outages before 12/31/01.