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July 29, 2005
LIC-05-0092

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

References:
1. Docket No. 50-285
2. Letter from NRC (R. William Borchardt) to OPPD (R. T. Ridenoure) dated February 20, 2004, Issuance of First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors (NRC-04-0022) (ML040220181)
3. Letter from NRC (H. N. Berkow) to OPPD (R. T. Ridenoure) dated May 24, 2005, Fort Calhoun Station, Unit No. 1 – Relaxation Request from U.S. Nuclear Regulatory Commission (NRC) Order EA-03-009 for the Control Element Drive Mechanism Nozzles (TAC No. MC6726)

SUBJECT: 60 Days After Plant Restart Report – First Revised NRC Order EA-03-009, Interim Inspection Requirement For Reactor Pressure Vessel Heads At Pressurized Water Reactors

In accordance with Section IV(E) of the First Revised NRC Order EA-03-009 (Reference 2), as modified by Reference 3, attached is the report required 60 days after plant restart. On June 1, 2005, Fort Calhoun Station, Unit No. 1 returned to operation following the 2005 refueling outage.

If you have any questions or require additional information, please contact T. C. Matthews at (402) 533-6938.

Sincerely,

D. J. Bannister
Manager – Fort Calhoun Station

DJB/mle

Attachment 60 Days After Plant Restart Report - Revised NRC Order EA-03-009, Interim Inspection Requirement For Reactor Pressure Vessel Heads At Pressurized Water Reactors

60 DAYS AFTER PLANT RESTART REPORT – FIRST REVISED NRC ORDER EA-03-009, INTERIM INSPECTION REQUIREMENT FOR REACTOR PRESSURE VESSEL HEADS AT PRESSURIZED WATER REACTORS

During the 2005 Refueling Outage (RFO), the Omaha Public Power District (OPPD) completed the inspection of the Fort Calhoun Station, Unit No. 1 (FCS) reactor pressure vessel (RPV) head and RPV head penetrations as required by the First Revised NRC Order EA-03-009 (Reference 1), as modified by Reference 6. FCS returned to operation on June 1, 2005. In Reference 2, OPPD requested relaxation to implement an alternative to the requirements of Section IV paragraph C.(5)(b)(ii) of the Order for twenty-five (25) control element drive mechanism (CEDM) penetration nozzles in the FCS RPV head. References 3, 4, and 5 provided supplemental information supporting the relaxation request of Reference 2. In Reference 6, the NRC approved OPPD's relaxation request.

The FCS RPV head is in the highest susceptibility category as a result of having accumulated greater than 12 Effective Degradation Years, which was calculated in accordance with the methodology provided in the Order. For those plants in the high susceptibility category, RPV head and head penetration nozzle inspections must be performed using the following techniques every refueling outage (the following information is extracted from the First Revised NRC Order EA-03-009):

(a) *Bare metal visual examination of 100 percent of the RPV head surface (including 360° around each RPV head penetration nozzle). For RPV heads with the surface obscured by support structure interferences which are located at RPV head elevations downslope from the outermost RPV head penetration, a bare metal visual inspection of no less than 95 percent of the RPV head surface may be performed provided that the examination shall include those areas of the RPV head upslope and downslope from the support structure interference to identify any evidence of boron or corrosive product. Should any evidence of boron or corrosive product be identified, the licensee shall examine the RPV head surface under the support structure to ensure that the RPV head is not degraded.*

(b) *For each penetration, perform a nonvisual NDE [nondestructive examination] in accordance with either (i), (ii), or (iii):*

  (i) *Ultrasonic testing of the RPV head penetration nozzle volume (i.e., nozzle base material) from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or bottom of the nozzle if less than 2 inches); OR from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0-inch below the lowest point at the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPV head penetration nozzle surfaces below the J-groove weld that have an operating stress level (including all residual and normal operation stresses) of 20 ksi tension and greater. In addition, an assessment shall be made to determine if leakage has occurred into the annulus between the RPV head penetration nozzle and the RPV head low-alloy steel.*

(ii) Eddy current testing or dye penetrant testing of the entire wetted surface of the J-groove weld and the wetted surface of the RPV head penetration nozzle base material from at least 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or the bottom of the nozzle if less than 2 inches); OR from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0-inch below the lowest point at the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPV head penetration nozzle surfaces below the J-groove weld that have an operating stress level (including all residual and normal operation stresses) of 20 ksi tension and greater.

(iii) A combination of (i) and (ii) to cover equivalent volumes, surfaces, and leak paths of the RPV head penetration nozzle base material and J-groove weld as described in (i) and (ii). Substitution of a portion of a volumetric exam on a nozzle with a surface examination may be performed with the following requirements:

1. *On nozzle material below the J-groove weld, both the outside diameter and inside diameter surfaces of the nozzle must be examined.*
2. *On nozzle material above the J-groove weld, surface examination of the inside diameter surface of the nozzle is permitted provided a surface examination of the J-groove weld is also performed.*

Fort Calhoun Station, Unit No. 1 Inspection Results

In order to satisfy the requirements of the NRC Order, OPPD performed the following types of examinations on the FCS RPV head during the 2005 RFO.

(1) Bare Metal Visual Examination

A bare metal visual examination on the top of the RPV head was performed. This was the third and final visual examination performed on the existing RPV head.

The bare metal visual examination did not find any indication of boric acid leakage or boric acid deposits. Every penetration annulus was examined 360° around. The examination found that the RPV head was clean with no evidence of degradation of any kind. The condition of the RPV head has not changed from the examinations conducted during the 2002 and 2003 RFOs.

Based on the visual examination requirements of the NRC Order, the FCS RPV head was determined to be acceptable for continued service.

(2) CEDM and In-core Instrumentation (ICI) Nozzle, J-Groove Weld and Reactor Head Vent Wetted Surface Examination Using Eddy Current Testing (ECT)

(i) CEDM Nozzles

Table 1 gives a description of the examinations performed on all forty-one (41) CEDM nozzles. The j-groove welds and outside diameter (OD) examinations were completed as planned, and in full compliance with the NRC Order.

The CEDM nozzle internal diameter (ID) examinations could not be completed in compliance with the NRC Order. Therefore, for those nozzles, OPPD requested (Reference 2) and was granted (Reference 6) relaxation from the requirements to examine the nozzle ID to a minimum of 2.00 inches above the highest point of the j-groove root weld (on a horizontal plane perpendicular to the nozzle axis) and 360° around each nozzle ID surface. Travel of the ECT probe was constrained by lack of mechanical clearance between the thermal sleeves and nozzles, hard deposits from boric acid or crud buildup in the nozzle to thermal sleeve gaps, thermal sleeve centering tab interferences, and mechanical limits of ECT probe travel. Details of the nozzle ID examinations are in Table 1 along with the percentage of area coverage achieved; these details are the same as those noted in the Reference 6 approved relaxation.

In summary, the CEDM nozzle ID examinations posed significant technical challenges, and several nozzles were not examined in full compliance with the NRC Order. However, in the non-fully scanned nozzles, the missing scans were in areas of low residual stress and therefore highly unlikely to be the locations of stress corrosion cracking initiation (Reference 2). For all nozzle penetrations with less than 99.5% area scan coverage, OPPD was granted relaxation from the NRC Order. OPPD is confident that the CEDM nozzle ID examinations verified that the CEDM nozzle ID surfaces do not contain any flaws and are structurally sound.

(ii) In-core Instrumentation (ICI) Nozzles

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The ECT examinations of the ID, OD, and j-groove welds on all 6 ICI nozzles were completed as planned, and in full compliance with the NRC Order. See Table 1 for details.

(iii) RPV Head Vent

The ECT examinations of ID and j-groove weld on the RPV head vent were completed as planned, and in full compliance with the NRC Order. See Table 1 for details.

Conclusion

The wetted surface ECT of the nozzles and j-groove welds on the FCS RPV head and the bare metal visual inspection on the top of the FCS RPV head were completed satisfactorily. The inspections did not identify any indication of degradation, cracking or leakage, and no flaws were found. The FCS CEDM nozzles and RPV head are structurally sound, the RCS pressure boundary is intact, and both the nozzles and head are acceptable for continued service based on the requirements of the First Revised NRC Order EA-03-009. The FCS RPV head is scheduled for replacement during the 2006 RFO.

Table 1: Results of Fort Calhoun ECT of RPV Head Penetrations and Scope of Relaxation Obtained

Penetrations		Examinations and Relaxation Obtained					
Type	**Numbers**	**J-Groove Weld ECT**	**OD ECT**	**ID ECT**	**ID ECT Circumferential Coverage Achieved**	**Relaxation from Order Obtained**	**Flaw Detected**
CEDM	1	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
CEDM	2	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
CEDM	3	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
CEDM	4	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
CEDM	5	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
CEDM	6	Examination Per Order	Examination Per Order	99.01% coverage	360°	Yes	No
CEDM	7	Examination Per Order	Examination Per Order	98.62% coverage	360°	Yes	No
CEDM	8	Examination Per	Examination Per	99.38% coverage	360°	Yes	No

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Penetrations		Examinations and Relaxation Obtained					
Type	**Numbers**	**J-Groove Weld ECT**	**OD ECT**	**ID ECT**	**ID ECT Circumferential Coverage Achieved**	**Relaxation from Order Obtained**	**Flaw Detected**
CEDM	14	Examination Per Order	Examination Per Order	99.27% coverage	360°	Yes	No
CEDM	15	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
CEDM	16	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
CEDM	17	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
CEDM	18	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
CEDM	19	Examination Per Order	Examination Per Order	99.22% coverage	360°	Yes	No
CEDM	20	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
CEDM	21	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No

Table 1: Results of Fort Calhoun ECT of RPV Head Penetrations and Scope of Relaxation Obtained

Penetrations		Examinations and Relaxation Obtained					
Type	**Numbers**	**J-Groove Weld ECT**	**OD ECT**	**ID ECT**	**ID ECT Circumferential Coverage Achieved**	**Relaxation from Order Obtained**	**Flaw Detected**
CEDM	27	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
CEDM	28	Examination Per Order	Examination Per Order	99.18% coverage	360°	Yes	No
CEDM	29	Examination Per Order	Examination Per Order	99.77% coverage	360°	Yes	No
CEDM	30	Examination Per Order	Examination Per Order	97.34% coverage	360°	Yes	No
CEDM	31	Examination Per Order	Examination Per Order	99.53% coverage	360°	Yes	No
CEDM	32	Examination Per Order	Examination Per Order	97.76% coverage	360°	Yes	No
CEDM	33	Examination Per Order	Examination Per Order	96.99% coverage	360°	Yes	No
CEDM	34	Examination Per Order	Examination Per Order	99.12% coverage	360°	Yes	No

Table 1: Results of Fort Calhoun ECT of RPV Head Penetrations and Scope of Relaxation Obtained

Penetrations		Examinations and Relaxation Obtained					
Type	**Numbers**	**J-Groove Weld ECT**	**OD ECT**	**ID ECT**	**ID ECT Circumferential Coverage Achieved**	**Relaxation from Order Obtained**	**Flaw Detected**
CEDM	40	Examination Per Order	Examination Per Order	93.61% coverage	360°	Yes	No
CEDM	41	Examination Per Order	Examination Per Order	93.20% coverage	360°	Yes	No
ICI	42	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
ICI	43	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
ICI	44	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
ICI	45	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
ICI	46	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
ICI	47	Examination Per Order	Examination Per Order	Examination Per Order	360°	No	No
Vent	48	Examination Per	Not Applicable	Examination Per	360°	No	No

References

1. Letter from NRC (R. William Borchardt) to OPPD (R. T. Ridenoure) dated February 20, 2004, Issuance of First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors (NRC-04-0022) (ML040220181)
2. Letter from OPPD (Ralph L. Phelps) to NRC (Document Control Desk) dated May 14, 2005, Fort Calhoun Station Unit No. 1, Revised Relaxation Request for First Revised Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors (LIC-05-0057)
3. Letter from OPPD (Ralph L. Phelps) to NRC (Document Control Desk) dated May 17, 2005, Fort Calhoun Station Unit No. 1, Response to Request for Additional Information on the Revised Relaxation Request for First Revised Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors (LIC-05-0062)
4. Letter from OPPD (Ralph L. Phelps) to NRC (Document Control Desk) dated May 18, 2005, Fort Calhoun Station Unit No. 1, Supplemental Response to Request for Additional Information on the Revised Relaxation Request for First Revised Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors (LIC-05-0064)
5. Letter from OPPD (Ralph L. Phelps) to NRC (Document Control Desk) dated May 19, 2005, Fort Calhoun Station Unit No. 1, Supplemental Response to Request for Additional Information on the Revised Relaxation Request for First Revised Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors (LIC-05-0065)
6. Letter from NRC (H. N. Berkow) to OPPD (R. T. Ridenoure) dated May 24, 2005, Fort Calhoun Station, Unit No. 1 – Relaxation Request from U.S. Nuclear Regulatory Commission (NRC) Order EA-03-009 for the Control Element Drive Mechanism Nozzles (TAC No. MC6726)