UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 6, 2010

Mr. Charles G. Pardee
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: DRESDEN NUCLEAR POWER STATION, UNITS 2 – REVIEW AND APPROVAL OF A FLAW EVALUATION (TAC NO. ME2604)

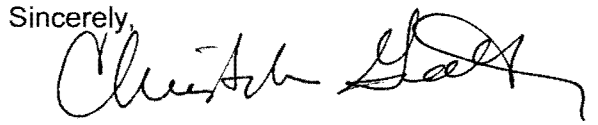
Dear Mr. Pardee:

By letter dated November 16, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML093210142), as supplemented by letter dated November 24, 2009 (ADAMS Accession No. ML093290088), Exelon Generation Company, LLC (EGC or the licensee), submitted for Nuclear Regulatory Commission (NRC) staff review, a flaw evaluation report for Dresden Nuclear Power Station (DNPS), Unit 2, regarding a circumferential flaw indication in Weld PD1A-D14, which is located on the downstream side of a 28-in. recirculation pump A discharge elbow-to-pipe weld. The examination of the flaw indicated that, although the flaw length remained unchanged at 1 in., the flaw depth has increased from its previous examination from 0.25 in. (November 2007) to 0.32 in. (November 2009). The flaw indication does not meet the acceptance standards of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Section XI, 1995 Edition with 1996 Addenda, which is the DNPS Unit 2 Section XI code of record for the current 4th inspection interval for continued operation without repair or replacement, or flaw evaluation. The licensee requested NRC staff approval of the pipe flaw evaluation for Weld PD1A-D14 to support the start up and operation of Unit 2 following refueling outage D2R21. The licensee proposed to leave the weld as-is without repair for the following cycle.

The NRC staff has completed its review of the submittal and supplemental information and found that the licensee's flaw evaluation meets the rules in the 1995 Edition through 1996 Addenda of Section XI of the ASME Code. On November 25, 2009, the NRC staff verbally

accepted the licensee's flaw evaluation, authorizing the license to operate DNPS Unit 2 for an additional cycle. The enclosed safety evaluation is a written confirmation of the verbal authorization.

Sincerely,



Christopher Gratton, Senior Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-237

Enclosure:
Safety Evaluation

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
DRESDEN NUCLEAR POWER STATION, UNIT 2
RECIRCULATION PIPE WELD PD1A-D14 FLAW EVALUATION
EXELON GENERATION COMPANY, LLC
DOCKET NO. 50-237

1.0 INTRODUCTION

By letter dated November 16, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML093210142), as supplemented by letter dated November 24, 2009, (ADAMS Accession No. ML093290088), Exelon Generation Company, LLC (EGC or the licensee) submitted a flaw evaluation report to the Nuclear Regulatory Commission (NRC) staff for Dresden Nuclear Power Station (DNPS), Unit 2, regarding a circumferential flaw indication in Weld PD1A-D14, which is located on the downstream side of a 28-inch (in.) recirculation pump A discharge elbow-to-pipe weld. The flaw indication was originally detected in 1986, and was last reexamined by ultrasonic testing (UT) on November 8, 2009, during the refueling outage D2R21 in accordance with Boiling-Water Reactor Vessel and Internals Project (BWRVIP) Report 75-A, "Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules." This reexamination indicated that, although the flaw length remained unchanged at 1 in., the flaw depth has increased from 0.25 in. (November 2007) to 0.32 in. (November 2009).

The licensee, subject to Generic Letter (GL) 88-01, "NRC Position on IGSCC [intergranular stress corrosion cracking] in BWR [Boiling-Water Reactor] Austenitic Stainless Steel Piping," sought NRC approval of the flaw evaluation prior to the resumption of operation of DNPS, Unit 2. The NRC staff reviewed the licensee's application, and verbally approved the flaw evaluation on November 25, 2009, allowing the restart and operation of DNPS, Unit 2, for an additional operating cycle without repair of the subject Recirculation Pump A Weld PD1A-D14.

This safety evaluation provides the written documentation of the NRC staff's verbal approval of the licensee's flaw evaluation for Weld PD1A-D14.

2.0 REGULATORY EVALUATION

The inservice inspection of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Class 1, Class 2, and Class 3 components shall be performed in accordance with Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the ASME Code and applicable editions and addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i).

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in Section XI of the ASME Code to the extent practical within the limitations of design, geometry, and materials of construction of the components.

For BWR coolant pressure boundary piping, additional inspection guidance was documented in GL 88-01. The technical bases for these NRC positions can be found in NUREG-0313, Revision 2, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping." The BWRVIP Report 75-A, which contained revised inspection schedules that could be used as an alternative to the GL 88-01 schedule, represents the industry's effort up to now in controlling IGSCC in BWR piping.

When flaws are detected by volumetric examinations, acceptance of them by supplemental examination, repairs, replacement, or analytical evaluation shall be in accordance with ASME Code, Section XI, IWB-3130, "Inservice Volumetric and Surface Examinations." In this application, IWB-3600, "Analytical Evaluation of Flaws," specified in IWB-3132.3, "Acceptance by Analytical Evaluation," was applied by the licensee to demonstrate that the unit can be operated for an additional operating cycle without repair of the subject weld. These IWB subarticles are from the 1995 Edition through 1996 Addenda of the ASME Code, Section XI, which is the applicable ASME Code Edition for the current, fourth ISI interval at DNPS, Unit 2.

3.0 TECHNICAL EVALUATION

As stated previously, the circumferential flaw indication was originally detected in 1986. The flaw indication was last reexamined during the refueling outage D2R21 in 2009 by UT examination in accordance with BWRVIP Report 75-A. This reexamination indicated that although the flaw length remained unchanged at 1 in., the flaw depth has increased from 0.25 in. to 0.32 in. since 2007. The licensee's flaw sizing in 2007 and 2009, was appropriate considering that the UT results for both years were obtained using Performance Demonstration Initiative qualified personnel, equipment, and procedures.

The licensee's flaw evaluation considers both fatigue crack growth (FCG) and IGSCC and is based on the following conservative assumptions, adequate inputs, and acceptable criteria:

1. the flaw is conservatively assumed to extend 360-degrees circumferentially
2. the loads are from the revised 2004 recirculation piping stress analysis
3. residual stress is assumed to be 30 kilo-pounds per square inch, consistent with Section XI of the ASME Code
4. the cycles for the FCG calculation are conservatively assumed to be 1000
5. an acceptable noble metal chemical addition program is demonstrated to support use of the IGSCC growth rate of 1.1×10^{-5} inch per hour (in/hr)
6. use of the ASME Code acceptance criteria

As stated above, a 360-degree circumferential flaw is assumed to bound the subject flaw with a crack shape of 1 in. x 0.32 in. This assumption is conservative on the material resistance side considering that the allowable flaw depth in IWB-3600 for the subject flaw is 75 percent of the

pipe thickness while the allowable flaw depth for the 360-degree circumferential flaw is only 60 percent. The flaw shape assumption is also conservative on the driving force side because the 360-degree circumferential flaw will overestimate the maximum applied stress intensity factor (K_{max}) in the FCG calculation.

The licensee calculated the K_{max} considering pressure, thermal, deadweight, and the residual stress and the minimum applied stress intensity factor (K_{min}) considering only residual stresses. The licensee then obtained a FCG of 0.0059 in. for the assumed 360-degree circumferential flaw for 1000 stress cycles using the crack growth law for austenitic material in the ASME Code. The assumed 1000 cycles more than double the total number of startup and shutdown cycles that DNPS, Unit 2, will likely experience over its lifetime and, hence, are conservative. Treating pressure and deadweight as cyclic loads contributes additional conservatism in the FCG calculation. For IGSCC, the licensee used a growth rate of 1.1×10^{-5} in/hr and obtained an IGSCC growth of 0.193 inches in 2 years. Adding these two degradation mechanisms would give a final crack depth of 0.519 in., or 37.7 percent of the pipe wall thickness, significantly less than the allowable flaw depth of 60 percent of the pipe wall thickness for a 360-degree circumferential flaw.

Although the examination coverage for the weld is not 100 percent (the actual coverage is 87.75 percent), the conservatism in the flaw evaluation regarding the flaw shape and the FCG calculation and the margin between the predicted flaw depth and the allowable flaw depth are sufficient to account for the low probability of having a very deep flaw in the uncovered area of 12.25 percent. Hence, the subject flaw will meet the ASME Code, Section XI, IWB-3640 requirements at the end of an additional operating cycle.

4.0 CONCLUSIONS

The NRC staff finds that the licensee's flaw evaluation meets the requirements in the 1995 Edition through 1996 Addenda of Section XI of the ASME Code. Since the projected flaw depth, considering two years of crack growth, is bounded by the allowable flaw depth, the DNPS, Unit 2, can be restarted and operated without repair of the Recirculation Pump A Weld PD1A-D14 for an additional operating cycle.

The NRC staff conclusions were verbally communicated to the licensee during a conference call on November 25, 2009, prior to resumption of operations.

Principal Contributor: S. Sheng, NRR

Date: May 6, 2010

accepted the licensee's flaw evaluation, authorizing the license to operate DNPS Unit 2 for an additional cycle. The enclosed safety evaluation is a written confirmation of the verbal authorization.

Sincerely,

/RA/

Christopher Gratton, Senior Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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Safety Evaluation

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