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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Quad Cities Nuclear Power Station, Unit 1
Facility Operating License No. DPR-29
NRC Docket No. 50-254

Subject: Change of Commitment to Inspect and/or Weld Overlay Repair Welds 02BS-F4, 02AS-S4 and 02AD-F12.

References:

(1) Letter from T. J. Tulon (Exelon/ComEd, SVP-01-009) to USNRC, "Quad Cities Nuclear Power Station Plans to Inspect and/or Weld Overlay Repair Welds 02BS-F4, 02AS-S4 and 02AD-F12," dated January 31, 2001.

(2) Letter from S. N. Bailey (USNRC) to O. D. Kingsley (ComEd), "Quad Cities, Unit 1 - Approval of Weld Overlay Repair Deferrals (TAC No. MB0312)," dated November 7, 2000.

(3) Letter from W. H. Bateman (NRR) to C. Terry (BWRVIP), "Final Safety Evaluation of the 'BWRVIP Vessel and Internals Project, BWR Vessel and Internals Project, Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules (BWRVIP-75),' EPRI Report TR-113932, October 1999 (TAC No. MA5012)," dated May 14, 2002.

The purpose of this letter is to describe a change of commitment regarding our previously communicated plans in Reference 1 to (1) complete the weld overlay repair of the 02BS-F4 weld, and (2) re-inspect welds 02AS-S4 and 02AD-F12 with automated techniques during the next Unit 1 refueling outage (Q1R17) scheduled for November 2002. The inspection plan for welds 02BS-F4, 02AS-S4, and 02AD-F12 was previously reviewed by the NRC and found acceptable (in Reference 2).

The change of commitment is due to (1) anticipated high dose rates during Q1R17, and (2) results of a review of the recently approved BWRVIP-75 "BWR Vessel and Internals Project, Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules" (Reference 3).

Exelon Generation Company, LLC (EGC) has reviewed the work scope to complete the weld overlay at weld 02BS-F4 and concluded that 84 person-Rem would be required to complete the welding and surface finishing to meet full structural overlay requirements in accordance with American Society of Mechanical Engineers (ASME) Code Case

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N-504-2 during Q1R17. In lieu of repair, EGC plans on performing a Performance Demonstration Initiative (PDI) qualified Ultrasonic Testing (UT) of the partial weld overlay repair to demonstrate the weld overlay and outer 50% of the original base metal is free from Intergranular Stress Corrosion Cracking (IGSCC) defects. This varies from the past practice where only the outer 25% of the original pipe base metal is examined when a full structural weld overlay is in place. Provided that the examination results are consistent to the previous exam, a fracture mechanics evaluation to demonstrate continued structural integrity through at least the next cycle of operation will be submitted to the NRC for approval.

EGC has reviewed the recent NRC SER issued in Reference 3 that approved BWRVIP-75 and has reclassified welds 02AS-S4 and 02AD-F12 from Category F (cracked weld with inadequate or no repair) welds to Category E (cracked mitigated by stress improvement) welds. Therefore, these two welds will not be re-examined using automated UT techniques during Q1R17, but will be re-examined during Q1R18 in accordance with the GL 88-01 Program to meet BWRVIP-75 requirements.

Plans to mitigate the radiation exposure accumulation by means of a chemical decontamination process of the Reactor Recirculation System piping were evaluated for (Q1R17). However, several potentially significant detrimental side effects were identified which supports postponing chemical decontamination at this time. Chemical decontamination would result in the removal of the Noble Metals Chemical Application (NMCA) coating. Re-application of NMCA to the Recirculation System piping during, or just after, Q1R17, is not desirable due to the potential effects of double exposure of fuel to the NMCA process. Without a planned re-application, the affected piping would have an increased vulnerability to IGSCC and potential flaw creation/growth in the affected piping. This could potentially result in additional repair activities. Given these two deleterious effects, the optimum time for source term reduction would be during the next scheduled outage in January 2005 (Q1R18) concurrent with the next application of NMCA, thereby, permitting repair activities to be performed in a lower dose environment. In addition, this will allow the Station to implement plans to reduce overall radiation exposure by reducing cobalt concentrations in the primary reactor water systems.

The attachments to this letter provide the basis for this commitment change. Should you have any questions regarding this letter, please contact Mr. Wally Beck at (309) 227-2800.

Respectfully,

Timothy J. Tulon
Site Vice President
Quad Cities Generating Station

Attachment 1: Basis for Change in Commitment
Attachment 2: Limited Use Overlay Examination Qualification

cc: Regional Administrator-NRC Region III
NRC Senior Resident Inspector, Quad Cities Generating Station

ATTACHMENT 1
BASIS FOR CHANGE IN COMMITMENT

History

Weld 02BS-F4

Weld 02BS-F4 is a 28" diameter pipe to pipe weld located on the suction side of the B loop of the Reactor Recirculation system. An IGSCC flaw indication was identified in 1998 (Q1R15) by ultrasonic inspection and resulted in re-classification of this weld to Category F (cracked weld with inadequate or no repair) under Generic Letter 88-01 / Boiling Water Reactor Vessel and Internals Project (BWRVIP) -75. The original flaw was an IGSCC indication 0.25 inches deep (approximately 20% thru-wall) and 27 inches long (approximately 30% of the circumference) in the weld region. A flaw evaluation was conducted and approved by NRC to allow continued operation without weld repair until the next refueling outage. Plans were made to weld overlay repair this component during Q1R16 (October 2000). After Q1R16 began and the overlay welding activities proceeded, work progress and dose rates were reviewed and concluded that the overlay completion would result in unacceptable dose accumulation to complete as a full structural weld overlay.

The feasibility of completing the overlay versus deferring the repair was evaluated and presented to the NRC Staff. It was determined to stop the welding process after three layers (two layers of overlay plus a finish layer approximately 0.25 inches total as-built thickness) due to unacceptably high personnel radiation exposure. Following surface finishing, nondestructive examinations utilizing PDI techniques were conducted to evidence the soundness of the overlay prior to operation. The examinations conducted included a surface examination along with manual and automated PDI ultrasonic (UT) examinations. The UT examinations interrogated the entire overlay thickness for welding generated defects and the originally identified flaw indication.

The surface and volumetric examinations were completed with satisfactory results. The UT examinations did not locate the previously recorded circumferential flaw.

The overlay was applied with water-backed welding, providing a desirable heat sink benefit placing the inner surface of the pipe into compression, which tends to close the crack and make detection by UT means difficult. Also, the weld shrinkage measurements taken in the axial direction showed weld shrinkage at 0.074 inches over the width of the weld overlay, indicating a compressive strain and confirming compressive stresses.

The NRC agreed in Reference 2 that Unit 1 could be safely operated with the partially completed weld overlay and concluded deferral of the completion of this repair to the next unit outage (next refueling outage or other extended outage of sufficient duration) was acceptable (see Reference 2).

Welds 02AS-S4 and 02AD-F12

Weld 02AS-S4 is a 28" diameter elbow to pipe weld located on the suction side of the A loop of the Reactor Recirculation system. Weld 02AD-F12 is a 28" diameter pump to pipe weld located on the discharge side of the A loop of the Reactor Recirculation system. IGSCC flaws were identified in 1996 (Q1R14) by ultrasonic inspection and resulted in re-classification of these welds to Category F (cracked weld with inadequate or no repair) under Generic Letter 88-01.

The original flaws were short and shallow IGSCC (see Table 1 and Table 2 for details). Flaw evaluations were performed and approved by NRC in Reference 2 for at least one additional cycle of operation. Ultrasonic examinations were repeated in 1998 (Q1R15) and determined no growth had occurred during the previous 18-month fuel cycle. Additionally, the flaw evaluations

were determined to remain valid for continued operation through the next refueling outage scheduled for October 2000, Q1R16.

Plans were made to weld overlay repair both welds during Q1R16 until the initial drywell entry surveys revealed unacceptably high radiation fields at the weld locations. The welds were subsequently re-examined. The UT examinations, manual and automated, found indications in the same circumferential locations as previously observed and were determined to be either root geometry with no measurable depth, or shallow flaws. No growth of these indications had occurred over the time period between these examinations. The indications were conservatively categorized as IGSCC and the previous flaw evaluations were determined to remain valid for continued operation through the next refueling outage scheduled for November 2002, Q1R17.

NRC approval was obtained in Reference 2 to defer the planned weld overlays in Q1R16 and thus eliminate the significant personnel radiation exposure.

Change of Commitment

During a recent maintenance outage on Unit 1 in August 2002, high radioactive dose rates similar to those in Q1R16 were observed and are expected to be present for Q1R17, which is scheduled for November 2002. Therefore, to allow dose reduction efforts to be applied and affect the overall concentration of cobalt in the primary system, station management has decided to defer the completion of the weld overlay repair on 02BS-F4 to a future outage. This will require a re-inspection and flaw evaluation to demonstrate structural integrity is maintained until the following refueling outage, Q1R18 currently scheduled for 2005.

In addition, applying the requirements provided in BWRVIP-75 which was recently approved by NRC SER dated May 14, 2002, welds 02AS-S4 and 02AD-F12 are being re-categorized to Category E (cracked mitigated by stress improvement) and as such, being rescheduled to Q1R18.

Revised Plan for Weld 02BS-F4

The completion of overlay welding of this component with the current Unit 1 radioactive dose estimates represents a significant hardship. The radioactive dose savings alone for deferring the overlay completion until a future outage with source term reduction will constitute savings of 66.6 person-Rem (approximately 17.4 person-Rem will be expended following dose reduction initiatives).

Completion of overlay welding for weld 02BS-F4 will be conducted after dose reduction initiatives have been effective in reducing the overall cobalt concentration in the primary system, at the earliest, during the Q1R18 refuel outage currently scheduled for January 2005. Nondestructive examination will be performed during Q1R17 to verify that the existing partial overlay material is sound and that the original flaw has not propagated into the outer 50% of the base metal. Thereby, resulting in a basis for continued operation until Q1R18 by applying fracture mechanics evaluation to demonstrate continued structural integrity is maintained. Weld 02BS-F4 will continue to be categorized and examined as Category F, cracked with inadequate repair, until the completion of the overlay welding to meet the full structural weld overlay criteria.

In accordance with GL 88-01/BWRVIP-75 guidelines, an overlay welded component is initially examined ultrasonically through interrogation of the overlay weldment, the interface between the weldment and base metal and the outer 25% of the original pipe wall thickness of base metal for the full width of the overlay. Thereafter, during the overlay's service lifetime, the volume

examined is the same through-wall, but restricted to the width of the original underlying butt-weld and one-half inch of base metal on each side.

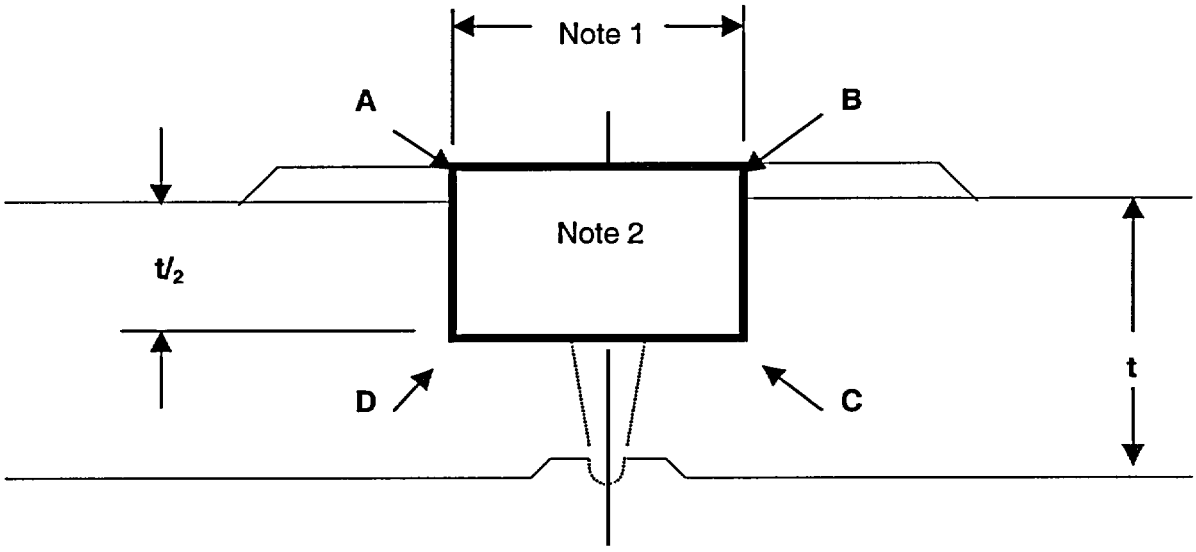
Weld 02BS-F4, with its unique design, was examined initially during Q1R16, following the GL 88-01 guidelines. The upcoming examination during Q1R17 will be the same as a full structural overlay as addressed in GL 88-01/BWRVIP-75, with the exception of the outer 25% through-wall of the original pipe wall thickness of base metal.

This component will be examined ultrasonically with manual PDI techniques through interrogation of the overlay weldment, the interface between the weldment and base metal and the outer 50% of the original pipe wall thickness of base metal for the width of the original underlying butt-weld and one-half inch of base metal on each side, as depicted in Figure 1.

EPRI/PDI has reviewed the applicable PDI procedure and basis for its qualification and determined that this procedure can effectively interrogate the 02BS-F4 weld overlay material and at least the outer 50% of the original base metal (i.e., a total of 0.85 in. of examination volume depth, including the weld overlay thickness of 0.25 in.) since the PDI procedure was originally qualified for a full structural weld overlay for a 1.42" maximum depth of the examination volume from the OD surface, which includes a typical 0.45" thick weld overlay material and the outer 25% of the typical 28" diameter original pipe wall (see Attachment 2). Therefore, we have concluded that the PDI qualified UT procedure can reliably detect flaws in the weld overlay and outer 50% of the base metal. Following the examination in Q1R17, a fracture mechanics evaluation will be performed and provided to NRC for review and approval prior to Unit restart.

Figure 1

Inspection Volume for Weld Overlay 02BS-F4



Note 1: The width of the required inspection volume shall include the original pipe weld crown plus a minimum 0.50" from each weld toe.

2: The Inservice Examination Volume is bounded by points A, B, C, and D.

Revised Plans for Welds 02AS-S4 and 02AD-F12

The re-examination of these welds has been rescheduled for Q1R18 in 2005. These components have been reclassified from Category F to Category E in accordance with GL 88-01/BWRVIP-75 requirements.

These welds are classified as Category E welds, cracked mitigated by stress improvement, under GL 88-01/BWRVIP-75. These two welds have received an effective IHSI application. Review of IHSI records show that they are within parameters delineated in BWRVIP-61. In addition, the "flaws" identified in these two welds are within the Stress Improvement Crack Mitigation Criteria of NUREG-0313/GL 88-01/BWRVIP-75. The criteria are crack depth of 30% or less and cumulative crack length of 10% or less. These flaws are shallow and very short in length (see Table 2 for details). The service stresses for these welds are lower than 1.0 Sm.

In accordance with BWRVIP-75 Final SER (dated May 14, 2002), a Category E weld, mitigated by stress improvement, must be followed by two successive inservice examinations (a repeat inspection after two cycles and another repeat inspection after two more cycles). Flaws were first detected in 02AS-S4 and 02AD-F12 in 1996. The first successive examination was in 2000; the second successive inservice examination will be required in 2005.

Therefore, an examination will not be performed during Q1R17 in 2002 but will be rescheduled for Q1R18 in 2005. No growth of these indications has occurred over the time period of 1996 through 2000. These welds have been examined using industry, NRC, Electric Power Research Institute (EPRI) and Performance Demonstration Initiative (PDI) approved ultrasonic techniques in several examinations spanning at least a 16-year period (see Table 1 and Table 2).

Furthermore, Quad Cities Nuclear Power Station has implemented significant IGSCC mitigation strategies. Hydrogen water chemistry was implemented in 1992 and system availability has been greater than 94% over the past four years, with Electro-Chemical Potential (ECP) values consistently less than negative 230 millivolts – Standard Hydrogen Electrode (SHE). Noble metal chemical application was performed in April 1999. Both welds have been effectively treated with Induction Heating Stress Improvement (IHSI) that met or exceeded the minimum requirements for through-wall temperature differential and other parameters in accordance with the industry guidelines in Boiling Water Reactor Vessel and Internals Project (BWRVIP) Report-61, "BWR Vessel and Internals Project Induction Heating Stress Improvement Effectiveness on Crack Growth in Operating Plants."

ATTACHMENT 1
BASIS FOR CHANGE IN COMMITMENT

Table 1

02AS-S4 UT Examination History

Year	Examination Procedure	Personnel Qualification	Result
1984 pre-IHSI	3-Party Agreement	3-Party Agreement	ID Geometry
1984 IHSI conducted.			
1984 post-IHSI	3-Party Agreement	3-Party Agreement	Counterbore @ 11"-12"
1986	3-Party Agreement	3-Party Agreement	Sharp Signal @ 12.2"-13.2" RT Film Review = Hand Ground Counterbore
1987	3-Party Agreement	3-Party Agreement	Counterbore
1989	3-Party Agreement	3-Party Agreement	Counterbore
1992	3-Party Agreement	3-Party Agreement	Root @ 11.2"-12.7"
1996	3-Party Agreement	3-Party Agreement	IGSCC, 0.2" deep x 1.25" long @ 11.7"-13.0"
1998	3-Party Agreement	PDI	IGSCC, 0.2" deep x 1.25" long @ 11.7"-13.0"
2000	PDI	PDI	ID Geometry @ 10.5"-11.7" RT Film Review = Ground or Excavated Area

Table 2

02AD-F12 UT Examination History

Year	Examination Procedure	Personnel Qualification	Result
1984 pre-IHSI examination not conducted			
1984 IHSI conducted.			
1984 post-IHSI	3-Party Agreement	3-Party Agreement	Root @ 75"-76.8"
1987	3-Party Agreement	3-Party Agreement	Root @ 85"-89"
1989	3-Party Agreement	3-Party Agreement	Crack like @ 75.5"-76.2" @ 86.3"-89.1" No Thru-wall sized = Root
1996	3-Party Agreement	3-Party Agreement	IGSCC, 0.16" deep x 2.5" long @ 74.5"-77" IGSCC, 0.14" deep x 2" long @ 86.7"-88.7"
1998	3-Party Agreement	PDI	IGSCC, 0.18" deep x 2.5" long @ 74.5"-77" IGSCC, <0.14" deep x 2" long @ 86.7"-88.7"
2000	PDI	PDI	Root Geometry @ 74.5"-77" Root Geometry @ 86.7"-88.7" RT Film Review = Slag Inclusions In Same Areas

ATTACHMENT 2

LIMITED USE OVERLAY EXAMINATION QUALIFICATION

The Electric Power Research Institute (EPRI) and the Performance Demonstration Initiative (PDI) groups provided the following limited use overlay examination qualification information.

CODE REFERENCE/REQUIREMENT

The American Society of Mechanical Engineers (ASME) Code requires ultrasonic examination procedures, equipment and personnel be qualified by performance demonstration in accordance with Appendix VIII.

The ultrasonic examination procedures, equipment and personnel are in accordance with ASME Section XI, Appendix VIII, 1995 Edition, 1996 Addenda, Supplement 11, "Qualification Requirements for Full Structural Overlaid Wrought Austenitic Piping Welds," as modified by the PDI Program.

Note: The Scope of Appendix VIII is limited to full structural overlaid piping welds.

Alternative Examinations

Quad Cites Nuclear Power Station proposes to use procedures, personnel and equipment qualified in accordance with the Performance Demonstration Initiative (PDI) Program, for inservice examination of overlay 02BS-F4 to the extent that the essential parameters used are within the Scope of the qualified procedures. The essential parameters in this case are the maximum overlay thicknesses, maximum metal path distance to the flaw of interest, scanning surface roughness, and the demonstrated inspection volume or depth. The overlay to be examined is within the essential parameters of the qualified procedures:

GE-UT-232: Revision 2, Addenda 0, "Procedure for Automated Ultrasonic Examination and Tomoview Analysis of Weld Overlaid Austenitic Piping Welds in Accordance with PDI."
PDI UT-8, Revision B or equivalent latter procedures, Addenda 0, "PDI Generic Procedure for the Ultrasonic Examination of Weld Overlaid Austenitic Piping Welds."

TECHNICAL BASIS

Component to be Examined

Weld Overlay 02BS-F4 is a 28-inch pipe-to-pipe weld located in the Reactor Coolant System (RCS). The nominal thickness of the pipe is 1.2 inch before overlay. The overlay is 8.4 inches wide and is centered about the original weld. The average overlay thickness is 0.25 inch. The short-range roughness of the scan surface is less than 250 Micro inch RMS and the long-range roughness is less than 1/32 inch over an area of 0.75 inch by 1.0 inch, which are required by the qualified examination procedures.

Full Structural Overlay

The words "Full Structural Overlay" were included in the title of Appendix VIII to preclude the use of this qualification for overlay repairs that did not meet the access and inspectability requirements of Code Case N-504-2 *(f), (i) and (j).* Paragraph (f) describes access requirements. Paragraphs (i) and (j) define the examination volume and inspection requirements. The subject weld meets these requirements.

ATTACHMENT 2

LIMITED USE OVERLAY EXAMINATION QUALIFICATION

Examination Qualifications

Procedures, personnel and equipment have been qualified for both the manual and automated procedures. The qualifications included the full extent of the ranges available through the PDI Program. This includes diameters from 4 to 28 inches and overlay thickness of 0.2 to 1.1 inch. Applicable overlay thickness range, for components to be examined, is from 0.1 inch to 1.35 inch. This allowance is provided by Appendix VIII, Supplement 11, 1.1 (b).

Qualified Ranges as Compared to Component to be Examined

Table 1 lists a comparison of the essential parameters of the qualified procedure to the component to be examined.

TABLE 1
COMPARISON OF QUALIFIED ESSENTIAL PARAMETERS

PARAMETER	QUALIFIED RANGE	OVERLAY O2BS-F4
Short term roughness	Up to 250 RMS	Less than 250 RMS
Long term roughness	Up to 1/32 inch over an area of 0.75 by 1.0 inch	Less than 1/32 inch
Overlay thickness	0.1 up to 1.35 inch	0.25 inch
Maximum depth of the examination volume from OD surface	1.42 from OD surface (includes overlay plus 25% of original pipe thickness)	0.85 inch (includes overlay thickness plus 50% of the original pipe wall thickness)
Maximum % of metal path made up of weld material	81% (Max depth / overlay thickness)	29%
Maximum diameter	28 inch	28 inch

As can be seen from Table 1, each of the parameters for 02BS-F4 is within the range of parameters qualified during the PDI Performance Demonstrations for the two applicable procedures. Due to the thinner overlay on the weld to be examined, a much smaller portion of the metal path is austenitic weld material. In the subject overlay 29% of the metal path is made up of weld metal whereas the demonstration was performed on a sample where 89% of the metal path consists of weld metal. Austenitic weld metal is much more attenuative than base metal. Examinations performed on overlay 02BS-F4 would provide a more conservative examination than was performed during the qualification demonstration. That is the signal-to-noise ratio and signal amplitude would be larger.

Conclusions

Both the Manual Generic and the automated procedures are qualified over a larger range of essential parameters than is required to perform the inservice examination of Overlay 02BS-F4. The need for this request is based on the fact that the title of Appendix VIII Supplement 11 includes the term "Full Structural Overlay" and the weld in question does not qualify as a full structural overlay and the qualifications are limited to the outer 25% of the original pipe wall thickness. The overlay does meet the accessibility and examination requirements of Code Case N-504-2 *(f), (i)* and *(g)*. The metal path required to extend the inspection volume to the outer 50% of the original pipe wall thickness is within the range qualified by both the automated and generic manual procedures. The proposed inservice inspection volume is shown in Figure 1.