August 15, 2002

MEMORANDUM TO: William Ruland, Director
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

FROM: Drew Holland, Project Manager, Section 2
Project Directorate IV ***/RA/***
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF MEETING BETWEEN THE NUCLEAR REGULATORY COMMISSION STAFF AND THE BABCOCK AND WILCOX OWNERS GROUP ON ALTERNATIVE INITIAL RT_{NDT} OF LINDE 80 WELDS, MAY 16, 2002 (TAC NO. MB4968)

The Babcock and Wilcox Owners Group (B&WOG) met with the Nuclear Regulatory Commission (NRC) staff to discuss use of alternative initial reference nil ductility transition temperature (IRT_{NDT}) values for Linde 80 welds in reactor pressure vessels (RPVs). The background for the consideration of this matter was provided. It was explained that the current generic IRT_{NDT} values for Linde 80 welds are highly conservative. All of that data is controlled by Charpy transition temperature and not drop-weight testing determinations. Other RPV weld IRT_{NDT} values are typically much lower and are controlled by drop weight testing. Some background information on WF-70 welds using the 1993 Zion alternative fracture toughness based approach safety evaluation (SE) and the Kewaunee Master Curve SE of May 2001 was given.

Benefits to be gained by licensees in using the alternative values were then described. It was explained that a reduction in IRT_{NDT} values would support license renewals in terms of relaxing pressurized thermal shock constraints, providing increased operating bands for heatups and cooldowns, and in supporting power uprates. The B&WOG then explained that licensees need to know that the lower alternative IRT_{NDT} values are implementable in order to plan for license renewals, power uprates, higher capacity factors and lengthening operating/fuel cycles. It was explained that approval of BAW-2308, "Initial IRT_{NDT} of Linde 80 Weld Material," would bring certainty for the affected RPVs. BAW-2308 will be submitted for NRC review in the near future. BAW-2308 will reflect the capsule surveillance data presented in BAW-2412 "Analysis of the B&W Owners Group Capsule A3, April 2002."

The discussion then moved on to an outline of the proposed topical report. This document describes a background of unirradiated reference temperature (RT) Linde 80 data. In addition it will cover fracture toughness test procedures using the Master Curve method in accordance with American Society of Testing Materials (ASTM) E1921, "Standard Test Method for the Determination of Reference Temperature, T_o, For Ferritic Steels in the Transition Range." The report will also discuss irradiation induced shift in fracture toughness and the alternative IRT_{NDT} values of Linde 80 welds.

Background information was then provided on the basis of BAW-2308. It was explained that the reactor vessel working group (RVWG) RPVs all have high copper welds as the limiting materials. The process for forming the welds was automatic submerged arc welding with manganese molybdenum steel (Mn-Mo-Ni) filler wire and Linde 80 flux. The Linde 80 characteristics are low upper shelf toughness and relatively high IRT_{NDT} values. Fifteen different wire heats were used in the RVWG RPVs.

The presentation went on to describe the role of American Society of Mechanical Engineers (ASME) Code Section III, NB-2331, "Test Requirements and Acceptance Standards, Fracture Toughness Requirements for Materials," in determining IRT_{NDT} values. It was explained that the higher of the nil ductility transition temperatures based on the drop-weight method (T_{NDT}) or the transition temperature at 50 ft-lbs Charpy impact energy (TT_{50}) minus 60°F becomes the IRT_{NDT} value for the material. The Linde 80 generic IRT_{NDT} is -5°F. Other US RPV welds are typically -50°F and are controlled by T_{NDT}.

With regard to the topical report, it was stressed that alternative IRT_{NDT} values for each Linde 80 heat in the RVWG data base consider over 300 transition range fracture toughness test data points. The connection with ASME Code Case N-629, "Use of Fracture Toughness Test Data to Establish Reference Temperatures for Pressure Retaining Materials," Section XI, Division I was made. It was also explained that the initial margin incorporates uncertainty due to the number of specimens used in the T_0 determination using ASTM Standard Test Method E1921 and uncertainties determined using Monte Carlo simulation.

The presentation went on to describe methodology and data acquisition in more detail and to describe the effects of stress relief on the welds. The current licensing basis for IRT_{NDT} values were discussed. Material sources for testing were also described.

The alternative IRT_{NDT} values are intended to be used with the shift prediction specified in Regulatory Guide (RG) 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials." The B&WOG concluded that the RG 1.99, Revision 2 shift prediction was demonstrated to be conservative for the Linde 80 class welds using over 110 irradiated fracture toughness tests.

This meeting was informational. No regulatory decisions were made.

Project No. 693

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Dated: August 15, 2002

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MEETING WITH THE BABCOCK & WILCOX OWNERS GROUP

ON ALTERNATIVE INITIAL RT_{NDT} OF LINDE 80 WELDS

MAY 16, 2002

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