October 22, 2003

MEMORANDUM TO: James W. Clifford, Chief, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

FROM: Richard B. Ennis, Senior Project Manager, Section 2 ***/RA by VNerses for/***
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: MILLSTONE POWER STATION, UNIT NO. 2,
FACSIMILE TRANSMISSION, ISSUES TO BE DISCUSSED IN AN
UPCOMING CONFERENCE CALL (TAC NO. MC0942)

The attached information was transmitted by facsimile on October 22, 2003, to Mr. David Dodson of Dominion Nuclear Connecticut, Inc. (the licensee). This information was transmitted to facilitate a upcoming conference call in order to clarify the licensee’s relief request RR-89-48 for Millstone Power Station, Unit No. 2 (MP2) dated October 3, 2003, as supplemented on October 10, 2003. The licensee's submittal requests relaxation from the certain requirements of NRC Order EA-03-009 pertaining to inspection of the MP2 reactor pressure vessel control element drive mechanism penetration nozzles.

This memorandum and the attachment do not convey a formal request for information or represent an NRC staff position.

Docket No. 50-336

Attachment: Issues for Discussion in Upcoming Telephone Conference

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ACCESSION NO.: ML032970004

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DATE	10/22/03	10/22/03

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ISSUES FOR DISCUSSION IN UPCOMING TELEPHONE CONFERENCE

RELATED TO RELIEF REQUEST RR-89-48

RELAXATION OF THE REQUIREMENTS OF ORDER EA-03-009 REGARDING

REACTOR PRESSURE VESSEL HEAD INSPECTIONS AT

MILLSTONE POWER STATION, UNIT NO. 2

DOCKET NO. 50-336

On February 11, 2003, the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-03-009 requiring specific inspections of the reactor pressure vessel (RPV) head and associated penetration nozzles at pressurized water reactors. The NRC issued an errata to the Order on March 14, 2003, to correct an administrative part of the Order related to requests for relaxation of the Order requirements. Section IV.F of the Order states that requests for relaxation associated with specific penetration nozzles will be evaluated by the NRC staff using its procedure for evaluating proposed alternatives to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) in accordance with Section 50.55a(a)(3) of Title 10 of the *Code of Federal Regulations* (10 CFR 50.55a(a)(3)).

Sections IV.A and IV.B of the Order provide criteria to categorize each plant's RPV head with respect to its susceptibility to primary water stress corrosion cracking (PWSCC). For plants such as Millstone Power Station, Unit No. 2 (MP2), with RPV heads that are categorized as being highly susceptible to PWSCC, Section IV.C(1)(b) of the Order requires that the RPV head penetration nozzles be inspected each refueling outage using either of the following techniques: (1) ultrasonic testing (UT) from two inches above the J-groove weld to the bottom of the nozzle and an assessment to determine if leakage has occurred in the interference fit zone, or (2) eddy current testing or dye penetrant testing (PT) of the wetted surface of each J-groove weld and nozzle base material to at least two inches above the J-groove weld.

By letter dated October 3, 2003, as supplemented on October 10, 2003, Dominion Nuclear Connecticut, Inc. (DNC or the licensee) requested relaxation from the requirements in Section IV.C(1)(b) of the Order for MP2. The relaxation request was made pursuant to the procedure specified in Section IV.F of the Order. Specifically, for inspection of the RPV control element drive mechanism (CEDM) penetration nozzles, DNC requested authorization to use a combination of UT and PT on the nozzle base material, and reduced examination coverage below the weld in the non-pressure boundary portion of the nozzle.

The NRC staff has reviewed the information the licensee provided that supports the proposed relief request and would like to discuss the following issues to clarify the submittal:

RAI Regarding Relaxation Request No. RR-89-48

1-1. Provide and justify the use of the assumed initial crack geometries (length, depth, surface, through-wall, etc.) for the four CEDM nozzle cases. Also, provide the

identification numbers of the WCAP figures on which your calculated years of operating time for the four CEDM nozzle cases were based.

1-2. Provide the total length of the blind zone at the location where your flaw evaluation for the four CEDM nozzle cases is conducted. The blind zone is defined as an area where UT inspection cannot be performed.

RAI Regarding Report WCAP-15813-P

2-1. Provide the stress-strain curves for penetration tube, J-groove weld, and vessel head used in your finite element method (FEM) stress analysis; justify the applicability of these stress-strain curves to your CEDM nozzle assembly. Test data should be provided to justify the use of either an elastic-perfectly plastic model or a strain hardening model for the Alloy 600 nozzle material in your FEM analysis.

2-2. You mentioned in Section 3.2 that for the crack growth calculation, a best estimate is needed and no additional margins are necessary. Your statement is true for fatigue crack growth calculations because the crack growth time (e.g., 30 years and beyond) is long enough to balance out slower and faster growths at various periods of the component's life. For PWSCC, a typical crack growth time of concern is 1.5 year, and a crack may grow much faster than the best-estimate rate during the entire short period. How do you justify that no additional margins are necessary when using best-estimate PWSCC rate?

2-3. You mentioned in Section 5.2 that the vessel to penetration nozzle weld was simulated with two weld passes. Please provide the actual number of weld passes for fabricating the vessel to penetration nozzle weld and justify quantitatively that using two weld passes in your FEM modeling would adequately represent actual residual stresses.

2-4. You mentioned in Section 6.2 that the stress intensity factor expression of Raju and Newman was used for surface flaws. The staff has two concerns:

(A) The specific Raju and Newman expression cited by you is good for cylinders with R/t ratio greater than 4. In the present application, the R/t ratios are 2.4, 4.93, and 2.41 for CEDM, ICI, and the head vent nozzles. Applying the Raju and Newman expression to CEDM and the head vent nozzles will produce non-conservative stress intensity factors. Provide an error analysis.

(B) The Raju and Newman expression considers stress variation in the thickness direction only. In the current application, the surface crack tip is of the primary concern, and, therefore, stress variation in the length direction should be considered. Provide an error analysis.

2-5. Provide an error analysis on using the expression for a through-wall crack in a plate (infinite medium?) in this application for an axial through-wall flaw in the penetrations.

2-6. Confirm that in addition to the hoop stresses, you have also considered hydrostatic pressure on flaw faces in your fracture mechanics analysis.

2-7. In the discussion of the circumferential crack propagation for ICI nozzles under Section 6.4, you mentioned that the time period for a surface flaw to become a through-wall flaw was conservatively ignored. Does this approach also apply to CEDM nozzles?