North Atlantic

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The Northeast Utilities System

September 11, 2000

Docket No. 50-443

NYN-00082

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Seabrook Station
Response to NRC Request For Additional Information (RAI) Regarding Proposed
Technical Specification Change To Surveillance Requirement 4.2.5.3

Please find enclosed (Enclosure 1) North Atlantic Energy Service Corporation's (North Atlantic) response to the Nuclear Regulatory Commission's (NRC) Request For Additional Information Regarding Proposed Technical Specification Change To Surveillance Requirement 4.2.5.3 (TAC No. MA9301) dated August 11, 2000.

The Request For Additional Information (RAI) is associated with License Amendment Request (LAR) 00-04, Reactor Coolant System Flow Measurement, that was submitted on June 20, 2000, pursuant to the requirements of 10CFR50.90 and 10CFR50.4.

LAR 00-04 proposed changes to the Seabrook Station Technical Specifications (TS) related to Reactor Coolant System (RCS) flow measurement surveillance requirement (SR) 4.2.5.3 contained in TS 3/4.2.5, "DNB Parameters, and the associated reactor trip function for Reactor Coolant Flow – Low, contained in TS Table 2.2-1, "Reactor Trip System Instrumentation Trip Setpoints."

Should you have any questions regarding this letter, please contact Mr. James M. Peschel, Manager - Regulatory Programs, at (603) 773-7194.

Very truly yours,

NORTH ATLANTIC ENERGY SERVICE CORP.

William A. DiProfio
Station Director

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cc: H. J. Miller, NRC Regional Administrator
R. M. Pulsifer, NRC Project Manager, Project Directorate 1-2
R. K. Lorson, NRC Senior Resident Inspector

Mr. Woodbury P. Fogg, P.E., Director
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State Office Park South
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Oath and Affirmation

I, William A. DiProfio, Station Director of North Atlantic Energy Service Corporation hereby affirm that the information and statements contained within Enclosure 1 are based on facts and circumstances which are true and accurate to the best of my knowledge and belief.

Sworn and Subscribed
before me this
11th day of September, 2000

Judith L St Laurent
Notary Public

William A. DiProfio
Station Director

# ENCLOSURE 1

## RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING PROPOSEDTECHNICAL SPECIFICATION CHANGE TO SURVEILLANCE REQUIREMENT 4.2.5.3

**Response to NRC Request for Additional Information Regarding Proposed Technical Specification Change to Surveillance Requirement 4.2.5.3**

**Question 1** - Section 6.3 of WCAP-15404 describes the removal of RTD bypass system prior to Cycle 3, and its effect on the elbow tap flow measurements for MOC 4 and later cycles. Section I, "Introduction and Safety Assessment for Proposed Change," of the June 20, 2000, letter states that the calculated flow uncertainty is based in part on the inclusion of the effects of RTD bypass manifold elimination.

a) Explain why the RTD bypass manifold elimination does not affect Cycle 3 elbow tap flow measurement.

**Response:** The RTD bypass manifold elimination affected the elbow tap flow measurements for Cycle 3 and all subsequent cycles. As stated in Section 6.3 paragraph 1 of WCAP-15404, the elbow tap measurements for Cycle 3 and BOC 4 were not used in the analysis, so the first application in the analysis of the 0.15% flow correction was in MOC 4.

b) - Describe how the RTD bypass manifold elimination affects the flow measurement uncertainty, and how this is accounted for in the uncertainty analysis.

**Response**: The effect of RTD bypass manifold elimination on the elbow tap measurement is a correction of 0.15% in the measured flow after Cycle 2, as described in Section 6.3. The magnitude of the correction (0.15%) is considered to be conservative relative to the ratio of the actual RTD bypass manifold flow to the measured RCS loop flow. Since the magnitude of an uncertainty on this conservative flow ratio would be negligible, no uncertainty has been applied in the setpoint analysis for this correction.

**Question 2** - Section 6.5 of WCAP-15404 attributes the significantly lower values of the calorimetric measured RCS flows relative to the best estimate flow trend after Cycle 2 to a bias in the hot leg temperature resulting from the implementation of low leakage loading pattern and one RTD in each hot leg being installed in a non-optimum location. It states that an allowance for this streaming bias is included in the setpoint analysis described in Reference 3.

Explain how the effect of this streaming bias is accounted for in the setpoint analysis.

**Response:** The hot leg streaming bias is explicitly accounted for (random and systematic terms) in the RCS flow uncertainty calculations performed for Seabrook Station. The magnitudes of the streaming terms are dependent on the point in time the calculation is performed for, i.e., pre-RTD bypass manifold elimination or post-RTD bypass manifold elimination. Table 3.1-4 of WCAP-13181 provides the post-RTD bypass manifold elimination condition. Westinghouse has informed North Atlantic that they intend to revise WCAP-15404 to reflect WCAP-13181 as a reference. Table A-3 of WCAP-15404 provides the pre-RTD bypass manifold elimination condition (Cycles 1 and 2). A comparison of the Hot Leg Enthalpy – Temperature – Streaming terms (both random and systematic) will note the differences between the two conditions. Table 3.1-4 of WCAP-13181 reflects the non-optimum RTD location effect.

Evaluation of hot leg temperature measurements after RTD bypass manifold elimination (starting in Cycle 3) indicated that the non-optimum hot leg RTD location would cause the hot leg temperature indication to be higher than the actual temperature, thus introducing an additional conservative bias in the RCS calorimetric flow measurement. This bias, evaluated to be 0.5% flow as stated in Section 6.5, was considered to be one factor resulting in the low calorimetric flow measurement in Cycle 3, adding to the bias imposed by LLLP.

Hot leg temperature in Cycle 3 and subsequent cycles is not used as an input for an elbow tap flow measurement, so the non-optimum hot leg RTD location (or any other hot leg temperature streaming uncertainty term) has no impact on the elbow tap flow measurement uncertainty defined in WCAP-15404.

**Question 3** - Section 7.2 of WCAP-15404 states that the uncertainty calculations are essentially the same as those performed previously for Seabrook (documented in WCAP-13181) with the differences lying in the assumption of normalization of the elbow taps to previously performed RCS flow calorimetric measurements (BOC 1 and BOC 2) which requires inclusion of additional uncertainties in the determination of the indicated RCS flow uncertainty.

Describe how the additional uncertainty values to account for the absence of current normalization of elbow taps are derived and accounted for in the uncertainty analysis in Tables A-4 and A-5.

**Response:** The normalization of the elbow tap transmitters on a cycle by cycle basis is provided in Tables 3.1-5 and 3.1-6 of WCAP-13181. The normalization of the elbow tap transmitters to a cycle 1 calorimetric is provided in Tables A-4 and A-5. The differences in magnitude noted for the transmitter terms, SCA, SPE, STE, etc., reflect the differences in the frequency of normalization, i.e., each cycle vs. one cycle.

**Question 4** - The proposed technical specification (TS) changes on SR 4.2.5.3 would (1) delete the prescriptive "precision heat balance measurement" without mentioning the elbow tap measurement method, and (2) require RCS flow measurement within 72 hours of exceeding 90% rated thermal power (RTP).

a) The proposed TS change should be more specific in stating that only an approved method of RCS measurement, such as the elbow tap measurement method of WCAP-15404, may be used for the surveillance.

**Response:** North Atlantic will provide a supplement to LAR 00-04 to address this issue. The revised proposed TS change is currently in North Atlantic's review and approval process and will be submitted in a separate letter.

b) Provide the basis for the 72-hour window of exceeding 90% RTP for completion of RCS flow surveillance.

**Response:** The time limit associated with SR 4.2.5.3 could have been based on reaching 100 % RTP, where calorimetric flow measurements are most accurate, but elbow tap measurements are relatively insensitive to RTP between 90 and 100% RTP. Since the plant could operate for an extended period of time at power levels between 90 to 100% RTP, the flow measurement could be performed at any power level between 90 and 100% RTP. Considering the need to verify flow soon after startup, while assuring that stable plant operation has been achieved, it was determined that a reasonable period for performing the total RCS flow rate verification would be between 24 and 72 hours after power reached 90% RTP.

Additionally, typical plant power escalation results in achieving full power approximately five hours after completing testing at 90 % RTP. This presumes no hold points. Once full power is reached, several protection functions should be normalized (NIS Power Range – High, Overtemperature $\Delta T$ and Overpower $\Delta T$ reactor trips), a flux map performed to verify peaking factors and control setpoints

verified. These normalizations and verifications should have a higher priority over the RCS Flow verification because:

1. the reactor trips are major functions (Overtemperature $\Delta T$ is the most utilized protection function in the safety analyses),

2. RCS flow can be qualitatively verified at any previous hold point with small changes in actual flow expected due to the power escalation,

3. real reductions in RCS Flow from one cycle to the next require mechanistic causes, i.e., something has to change in the RCS, e.g., Steam Generator tube plugging,

4. the RCS Flow – Low reactor trip can be set at 90 % of indicated flow, per Westinghouse recommendations, which results in less sensitivity to the absolute magnitude of flow indicated in a loop (results in a faster trip response for loops with indicated flows greater than Minimum Measured Flow and equivalent trip response for loops with indicated flows less than Minimum Measured Flow when compared to the trip response of the same loops with setpoints equal to 90 % of Minimum Measured Flow).

The recommended 72 hour limit provides an endpoint, which currently does not exist in all plant technical specifications, i.e., some plant technical specifications require the performance of a measurement but do not specify a time limit.

c) Will BASES 3/4.2.5 be revised to reflect the proposed changes of SR 4.2.5.2[3]?

A TS Bases change will be provided in the forthcoming supplement to LAR 00-04 which will address the time limit and measurement methodologies to be used for verifying RCS total flow rate.

**Question 5** - On page 5 of Section I of the June 20, 2000, letter it is stated that the final normalized values for the elbow tap coefficients will be based on the average of BOC 1 and BOC 2 precision flow calorimetrics and that the elbow tap coefficients will no longer be adjusted to future calorimetrics. This statement appears to be inconsistent with the method described in WCAP-15404. In WCAP-15404 elbow tap measurement method, the elbow tap total flow coefficients are based on the average elbow tap $\Delta p$ (Equations 2 and 6), and the current cycle flow is based on the elbow tap flow coefficients and the baseline calorimetric flow (Equation 4).

Clarify the above statement.

**Response:** The statement on page 5 of Section I of the June 20, 2000, letter is incomplete and should have stated the following:

"The final normalized, baseline values for the elbow tap coefficients will be based on the average of BOC 1 and BOC 2 precision flow calorimetrics and the BOC 1 elbow tap measurements. The baseline elbow tap coefficients will not be adjusted to future calorimetrics."