North Atlantic
Energy Service Corporation

SEABROOK STATION UNIT 1

Facility Operating License NPF-86
Docket No. 50-443

License Amendment Request No. 93-18
Wide Band Operation and Core Design Enhancements

This License Amendment Request is submitted by North Atlantic Energy Service Corporation pursuant to 10CFR50.90. The following information is enclosed in support of this License Amendment Request:

- Section I - Introduction and Description of Proposed Changes
- Section II - Markup of Proposed Changes
- Section III - Retype of Proposed Changes
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Sworn and Subscribed
to before me this
23 day of November, 1993

Beverly E Sellaway
Notary Public

Bruce L. Drawbridge
Executive Director of Nuclear Production

I. Introduction and Description of Proposed Changes

A. Introduction

The purpose of License Amendment Request (LAR) 93-18 is to propose changes to the Seabrook Station Technical Specifications to allow North Atlantic to operate the core within an axial flux difference (AFD) band which is expanded from the current band in the Technical Specifications. The proposed changes will also allow improved fuel cycle management through the implementation of core design enhancements. The methodology used, for expanding the AFD band, includes consideration for the use of the Fixed Incore Detectors (FIDS) to continuously monitor compliance of the core power distribution with the Technical Specification limits imposed by the Loss of Coolant Accident (LOCA) analysis assumptions. Compliance with the LOCA limits is currently assured by operation within an Axial Flux Difference (AFD) band known as Constant Axial Offset Control (CAOC). In the CAOC monitoring scheme, the excore detector axial flux difference indications are used to infer worst case core power distributions. Core operation is limited to an AFD envelope based on worst case power distributions pre-determined by conservative off-line physics analysis.

Use of the FIDS eliminates much of the uncertainty in quantifying available margin to the LOCA limits associated with off-line inference of worst case power distributions from the excore signals. This allows the AFD Limiting Condition for Operation (LCO) to be expanded beyond that specified by CAOC methodology. The AFD LCO band becomes defined by power distribution restraints required to ensure adequate initial margin to fuel thermal design limits on departure from nucleate boiling (DNB) and fuel centerline melt for anticipated transients.

For operation with the FIDS alarm inoperable, the cycle dependent normalized axial peaking factor, K(Z), specified in the COLR, accounts for possible xenon redistribution following power changes in addition to axial power shape sensitivity in the LOCA analysis. This ensures that the consequences of a LOCA would be within the specified acceptance criteria.

The proposed expanded AFD band and core design enhancements include modification to several safety analysis input parameters and assumptions. These are:

- Incorporation of the Westinghouse WRB-1 Departure from Nucleate Boiling (DNB) Correlation and Revised Thermal Design Procedure (RTDP)
- Increase in the core power distribution peaking factors
- Allowance for positive moderator temperature coefficient
- Allowance for thimble plug deletion
- Allowance for increase in steam generator tube plugging
- Flexibility to implement certain new fuel design features in the future. e.g., low pressure drop Zircalloy grids and Zirlo cladding
- Modification of analysis assumptions related to certain surveillance parameters, e.g., low pressurizer pressure safety injection actuation setpoint and time delay

- Expansion of the AFD Limiting Condition for Operation (LCO) band

A safety analysis in support of operation with an expanded axial flux difference Limiting Condition for Operation (LCO) band and enhanced core and system design features is provided in Yankee Atomic Electric Company (YAEC) report YAEC-1871, "Safety Analysis In Support Wide Band Operation and Core Design Enhancements for Seabrook Station" (Enclosure 1).

Justification for the expanded axial flux difference LCO band and the enhanced core parameters is provided through a complete re-analysis of the Seabrook Station Updated Final Safety Analysis Report (UFSAR) Chapter 15 Accidents and Transients. The large and small break Loss of Coolant Accident (LOCA) analysis was performed for North Atlantic by Westinghouse Electric Corporation (Enclosure 2). The remaining Accidents and Transients of the UFSAR Chapter 15 were evaluated for North Atlantic by YAEC.

The results of the safety analysis demonstrate that Seabrook Station can be safely operated within the Technical Specifications including the proposed changes.

B. Description of Proposed Changes

The proposed changes are grouped into a series of functionally related changes. The functional groups and the affected Technical Specification pages are described below:

1) The definition of Core Operating Limits Report is modified by adding the acronym COLR.

Affects: Technical Specification definition 1.10 (page 1-2)

2) The Cycle Independent Thermal Limit Lines of Technical Specification 2.1.1, Figure 2.1-1 are revised to reflect use of the WRB-1 DNB correlation, the Revised Thermal Design Procedure, a design heat flux hot channel factor of 2.5, a design enthalpy rise hot channel factor of 1.65, and a power dependent multiplier of 0.3.

Affects: Technical Specification 2.1.1, Figure 2.1-1 (Page 2-2); Page B 2-1.

3) The cycle dependent Overtemperature Delta-T and Overpower Delta-T trip setpoint parameters and function modifiers are removed from Technical Specification Table 2.2-1, Reactor Trip System Instrumentation Trip Setpoints, revised, and placed in the Core Operating Limits Report (COLR).

Affects: Technical Specification 2.2.1, Table 2.2-1 (Page 2-4, 2-7, 2-8, 2-9, and 2-10); Page B 2-5; COLR.

4) Clarify the basis for the Reactor Coolant System Low Flow Trip Setpoint to be the measured loop flow consistent with current plant procedures and the revised safety analysis.

Affects: Technical Specification 2.2.1, Table 2.2-1 (Page 2-5).

5) Implement a Positive Moderator Temperature Coefficient

Affects: Technical Specification 3.1.1.3, Moderator Temperature Coefficient (Page 3/4 1-4); COLR.

6) The rod drop time specified in Technical Specification 3.1.3.4, Rod Drop Time, is increased from 2.2 seconds to 2.4 seconds. This will permit the future use of fuel fabricated with low pressure drop Zircaloy grids.

Affects: Technical Specification 3.1.3.4, Rod Drop Time (Page 3/4 1-20).

7) Technical Specification 3.2.1, Axial Flux Difference is replaced with a dual Technical Specification incorporating the use of the Fixed Incore Detectors (FIDS). A FIDS alarm will be generated prior to exceeding the $F_Q(Z)$ Technical Specification limit. The current Technical Specification is based on Constant Axial Offset Control (CAOC) methodology. The proposed Technical Specification includes two AFD control bands for operation with and without the FIDS alarm. Operation with the FIDS alarm will be permitted within a proposed Wide Band Delta-I control area. When the FIDS alarm is inoperable operation will be restricted within a control area similar to Relaxed Axial Offset Control (RAOC) methodology. The two AFD Figures are placed in the COLR. The applicability of the AFD instrumentation Surveillance Requirements are revised to be consistent with the revised applicability of Technical Specification 3.2.1 and consistent with the frequency contained in NUREG 1431, "Standard Technical Specifications Westinghouse Plants".

Affects: Technical Specification 3.2.1, Axial Flux Difference (Pages 3/4 2-1, 3/4 2-2, B 3/4 2-1, B 3/4 2-2); Technical Specification Table 4.3-1, Reactor Trip System Instrumentation Surveillance Requirements, Table Notations (3) and (6), (page 3/4 3-12).

8) The F_{xy} Surveillance Requirements in Technical Specification 3.2.2, Heat Flux Hot Channel Factor are replaced by Surveillance Requirements which monitor $F_Q(Z)$. Two Normalized $F_Q(Z)$, [K(Z)] Figures are placed in the COLR.

Affects: Technical Specification 3.2.2, Heat Flux Hot Channel Factor (Pages 3/4 2-6, 3/4 2-7); Technical Specification 3.2.4, Quadrant Power Tilt Ratio (Page 3/4 2-9); Technical Specification 3.3.3.2, Incore Detector System (Page 3/4 3-40); Pages B 3/4 2-1, B 3/4 2-3.

9) The Enthalpy Rise Hot Channel Factor Limits of Technical Specification 3.2.3, Nuclear Enthalpy Rise Hot Channel Factor are removed from the Technical Specifications and placed in the COLR consistent with the safety analysis methodology used in YAEC-1871,"Safety Analysis in Support of Wide-Band Operation and Core Design Enhancements for Seabrook Station" (YAEC 1871).

Affects: Technical Specification 3.2.3, Nuclear Enthalpy Rise Hot Channel Factor (Page 3/4 2-8); Page B 3/4 2-3.

10) Technical Specification 3.2.5, DNB Parameters, is modified to include a requirement to meet the "minimum measured flow" used in the analysis of DNB related events with the Revised Thermal Design Procedure (RTDP) consistent with YAEC-1871. The uncertainty on pressurizer pressure is increased to 50 psi consistent with the analysis in YAEC-1871. The value of flow measurement uncertainty is deleted from the Technical Specification to allow use of the most appropriate flow measurement means.

Affects: Technical Specification 3.2.5, DNB Parameters (Page 3/4 2-10); Page B 3/4 2-4.

11) Technical Specification 3.3.2, Table 3.3-4 Functional Unit 1d, Pressurizer Pressure-Low Setpoint and Allowable Value are revised consistent with a revised safety analysis limit of 1665 psia. The range of the pressurizer pressure instrument is changed from 1700-2000 psig to 1600-2500 psig which changes the Allowable Value for the Low and High Pressurizer Pressure Reactor Trips (Technical Specification 2.2.1, Table 2.2-1 Functional Units 9 and 10 respectively) and Engineered Safety Feature Interlock P-11 (Technical Specification 3.3.2, Table 3.3-4, Functional Unit 10a). Values of Total Allowance (TA), Z, and Sensor Error (S) are deleted from the Technical Specifications consistent with the format used in NUREG 1431, Standard Technical Specifications Westinghouse Plants.

Affects: Technical Specification 3.3.2, Table 3.3-4, Functional Units 1d and 10a (Pages 3/4 3-24 and 3/4 3-28); Technical Specification 2.2.1, Table 2.2-1, Functional Units 9 and 10 (Page 2-4).

12) Technical Specification 3.5.2, ECCS Subsystems-T_{avg} Greater Than or Equal to 350°F; The ECCS performance criteria of Surveillance Requirements 4.5.2f.3), 4.5.2h.1)a) and b), and 4.5.2.h.2)a) and b) are modified to reflect the revised safety analysis in YAEC-1871.

Affects: Technical Specification Surveillance Requirement 4.5.2 (Page 3/4 5-6, 3/4 5-7).

13) The fuel assembly description is changed to allow the possibility of future implementation of Zirlo cladding. The thermal performance characteristics of Zirlo were considered in the revised LOCA analysis which accompanies YAEC-1871.

Affects: Technical Specification Design Feature 5.3.1, Fuel Assemblies (Page 5-9).

14) The list of analytical methods approved by the NRC used to develop the COLR parameters is modified to include all applicable YAEC and Westinghouse methods.

Affects: Technical Specification Administrative Control 6.8.1.6.a, Core Operating Limits Report (Pages 6-18, 6-18A, 6-18B, 6-18C).

15) The Core Operating Limits Report is modified to:

a) Insert cycle dependent Overpower Delta-T and Overtemperature Delta-T trip setpoint parameters and function modifiers. Values for TA, Z, and S are marked N.A. to be consistent with the Technical Specifications.

b) Insert Positive Moderator Temperature Coefficient limits.

c) Existing Figure 2, which utilizes CAOC methodology, is replaced with limits on AFD for operation with and without the FIDS Alarm. The change includes two new Figures 2.1 and 2.2.

d) Remove the F_{xy} surveillance limits and replace with two new K(Z) Figures 3 and 4 for operation with and without FIDS. When the FIDS alarm OPERABLE, continuous K(Z) monitoring occurs and a relaxed K(Z) limit is permitted. When the FIDS alarm is inoperable, K(Z) will include a penalty for possible xenon transients occurring in between surveillance intervals. The K(Z) limits are determined based upon the results of the Loss-of-Coolant Accident Analysis and includes an allowance for the sensitivity of results to skewed axial power profiles permitted within the LCO on AFD. F^{RTP}_{Q} remains at 2.32 for Cycle 4 and increases to 2.50 for cycle 5.

e) Replace the Enthalpy Rise Hot Channel Factor limits with new power and burnup dependent limits shown in COLR Figure 5 (two parts).

II. Markup of Proposed Changes

See attached markup of proposed changes to Technical Specifications.