North Atlantic
Energy Service Corporation

SEABROOK STATION UNIT 1

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

License Amendment Request No. 92-13
Manual Operation of Cooling Tower
Fans and Sprays

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
- Section IV - Safety Evaluation of Proposed Changes
- Section V - Determination of Significant Hazards for Proposed Changes
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Sworn and Subscribed
to before me this
30th day of September, 1992

Beverly E. Silloway
Notary Public

Ted C. Feigenbaum
Ted C. Feigenbaum
Senior Vice President and Chief Nuclear Officer

I. Introduction and Description of Proposed Changes

A. Introduction

The purpose of the proposed Technical Specification change is to revise Technical Specification 3/4.7.5 "Ultimate Heat Sink" to:

1. Revise the Limiting Condition for Operation by adding a note stating that a cooling tower fan may be considered OPERABLE if it is capable of being manually started from the main control board. This change will allow cooling tower spray and fan operation to be manually initiated by the operator as opposed to automatically occurring during a cooling tower actuation. As described below this is necessary to prevent ice build up on cooling tower components during cooling tower operation when ambient air temperature is below freezing.

2. Delete the requirement to verify that the cooling tower fans automatically start on a Tower Actuation (TA) signal and add a requirement to verify that automatic valves actuate to their correct positions on a TA signal.

3. Increase the maximum allowed cooling tower basin temperature from the current 67.3°F to 70.0°F. This change will minimize the potential for requiring cooling tower operation, with spray, to reduce basin temperature during the summer months.

The original cooling tower design allowed for automatic initiation of sprays and fans upon receipt of a TA signal. In certain environmental conditions, however, this could result in icing of the tower fill tile. Ice has the potential to prevent cooling by impeding the flow of water through the fill tile. In order to address this concern, a design change was implemented to install spray bypass valves 1-SW-V-139, and 1-SW-V-140, such that upon receipt of a TA signal, hot service water bypasses the spray header and is recirculated back to the tower basin. These valves were included in the Inservice Test program and are periodically surveilled pursuant to Technical Specification Surveillance Requirement 4.0.5. In addition, the fan control switches were placed in the "pull-to-lock" position since operation with ice buildup on the fan blades is not recommended by the fan manufacturer. Automatic initiation of both the sprays and fans was replaced by proceduralized manual initiation. Upon receipt of a TA signal, the operator would manually initiate spray and fan operation based on the combination of primary component cooling water heat exchanger outlet temperature and ambient wet bulb temperature (see Figure 2 of Section VIII). Manual operation ensures adequate cooling of the service water and also ensures tile icing will not occur. Manual initiation of cooling tower sprays and fans is addressed in Seabrook Station abnormal operating procedure OS1216.01, "Degraded Ultimate Heat Sink" and emergency operating procedure E-0, "Reactor Trip or Safety Injection". Control of the bypass valves and fans is performed from the main control board. The aforementioned operation of the cooling tower is documented in the Seabrook Station Updated Final Safety Analysis Report (UFSAR), section 9.2.5.2. This section states, in part, that cooling tower spray and fan operation is manually initiated following a TA signal.

On August 7, 1992, in response to an NRC concern, it was identified that placing the cooling tower fan control switches in the "pull-to-lock" position precluded demonstration of operability of the cooling tower in accordance with Technical Specification Surveillance Requirement 4.7.5.d.1). This surveillance requirement requires that operability of the cooling

tower be demonstrated every 18 months by testing automatic actuation of each cooling tower fan on a TA test signal. This surveillance was performed by taking the fan control switches out of the "pull-to-lock" position. Since the fans were not tested in their normal configuration (i.e., pull-to-lock), this aspect of the Technical Specifications was not satisfied. Therefore, the cooling tower was not verified to be OPERABLE pursuant to Surveillance Requirement 4.7.5.d.1). This condition is documented in Seabrook Station Licensee Event Report (LER) 92-11, entitled "Inoperable Cooling Tower Fans", which was transmitted to the NRC on September 4, 1992, via NYN-92121.

LER 92-11 also identified that the design change that installed the spray bypass valves also circumvented the intent of Surveillance Requirement 4.7.5.d.1). Specifically, this surveillance requirement was designed to test automatic actuation of the cooling tower in response to a TA signal. Since this design change prevents automatic actuation of the tower sprays, it also does not meet the intent of Technical Specification Surveillance Requirement 4.7.5.d.1).

To correct the situation pending the NRC review of the proposed Technical Specification change, the cooling tower fan control switches have been placed in the automatic position and the spray bypass valves have been closed whenever the cooling tower is required to be OPERABLE per Technical Specifications. This action will allow the fans to start automatically and the cooling tower return water to be directed to the spray header following the receipt of a TA signal. This action satisfies the requirements of Surveillance Requirement 4.7.5.d.1), and is acceptable prior to the onset of winter conditions.

Technical Description of Service Water System and Cooling Towers

The function of the Service Water (SW) system is to transfer the heat loads from various sources in both the primary and secondary portions of the plant to the ultimate heat sink. The SW system has two sources of cooling water: the service water pumphouse (normal) and the service water cooling tower (alternative)(See Figure 1 in Section VIII).

The SW system normally uses the Atlantic Ocean as the ultimate heat sink to dissipate primary and secondary heat loads. In this mode, seawater is drawn through the Circulating Water system intake tunnel, to the service water pumphouse and distributed to the primary and secondary heat exchangers. The service water return flow is from the heat exchangers, through the discharge tunnel, to the Atlantic Ocean. In the unlikely event that seawater flow to the service water pumphouse is restricted (greater than 95% blockage) due to seismically induced damage to the intake and discharge tunnels, a seismically qualified mechanical draft evaporative cooling tower is provided to dissipate shutdown and accident heat loads.

The cooling tower is divided into three separate bays; two outboard bays, one serving Unit I train A distribution loop and one serving the Unit II train A distribution loop, and the center (common) bay, utilized by Units I and II B train loop. The spray area of the cooling tower bays are filled with ceramic material which provides a tortuous path for the water cascading down to the cooling tower basin. This provides even water distribution and an increased surface area, which enhances the evaporative cooling process. Fans are installed over the cooling tower bays to provide additional cooling. The cooling tower is constructed over a common storage basin that contains approximately four million gallons of fresh water.

If the cooling tower is in use, the atmosphere is the ultimate heat sink and the service water system operates as essentially a closed loop. The service water pumphouse is isolated from

the distribution system and redundant cooling tower pumps route water from the cooling tower storage basin through the SW system. Heated water from the heat exchangers is returned to the cooling tower.

The cooling tower itself has two modes of operation. The spray header bypass mode is used when wet bulb temperature is low or when the water returning to the cooling tower does not require cooling. In this mode the water returning to the cooling tower bypasses the spray header and returns directly to the basin. The spray mode is used when ambient air temperature is above freezing or the water returning to the cooling tower requires cooling. In this mode the water returning to the cooling tower is directed to the spray header. It then flows downward over the ceramic fill in the cooling tower. If additional cooling is required large fans in the top of the cooling tower are started and the upward air flow provided by the fans provides the added cooling. As the heated service water passes downward through the fill, an induced flow of cooling air passes upward. The upward air flow increases the evaporative cooling process. The cooled service water falls into the storage basin and is ready to begin the cycle again.

Switching the system supply from the normal (service water pumphouse) to the alternate (cooling tower) supply source is accomplished manually or, automatically upon failure of the service water pumphouse to supply sufficient service water pressure. Manual switching is accomplished by control switches on the main control board (MCB). Automatic transfer is accomplished by a TA signal generated manually from MCB controls or automatically upon a low service water header pressure.

The cooling tower was originally designed to support the operation of two units at the Seabrook site. The design basis for the cooling tower included the post-Loss Of Coolant Accident (LOCA) heat loads from one unit and the cooldown loads from the second unit. With the cancellation of Seabrook Station Unit II, the cooling tower now only serves one unit. Therefore, significant performance margin exists in the design of the cooling tower with respect to its current duty requirements.

Cooling Tower Manual Operation

The design basis for the cooling tower assumes that the seismic event which disables the intake and discharge tunnels also initiates a LOCA and a Loss of Offsite Power (LOP). Thus, the design basis heat load for the cooling tower consists of the Residual Heat Removal (RHR) system heat rejection, Containment Building Spray (CBS) system heat rejection, Diesel Generator Cooling system heat rejection, the cooling tower pumps, and other small heat loads imposed on the Primary Component Cooling Water (PCCW) system during the accident.

During the initial stage of the LOCA the Emergency Core Cooling System (ECCS) operates in the injection phase. In this phase, the water supply for the ECCS pumps is the Refueling Water Storage Tank (RWST) and the heat loads imposed on the cooling tower by the ECCS equipment is minimal. The majority of the heat load on the cooling tower occurs following switchover from the ECCS injection phase to the recirculation phase. During the recirculation phase, valves are aligned to draw water from the containment recirculation sump to be re-injected into the reactor vessel and containment building. This water, which had previously been cool water from the RWST, now must be cooled in the RHR and CBS heat exchangers, prior to re-injection. This heat is ultimately rejected to the cooling tower and when this occurs, a significant heat load is imposed on the cooling tower.

The bulk temperature of the cooling tower basin water is currently limited to an initial temperature of 67.3°F by Technical Specification 3.7.5. This limit was chosen to ensure that the cooling tower basin temperature would be limited during the design basis event to ensure that the design limitations of the primary component water cooling system are not exceeded. An analysis has been performed by, North Atlantic Energy Service Corporation (North Atlantic), which demonstrates that the cooling tower basin average temperature could be allowed to increase to 80°F during a single train post-LOCA cooldown, or to 87°F during a two train cooldown, prior to initiating sprays and fans without exceeding equipment limitations. North Atlantic has proposed, on the basis of this analysis, that the cooling tower Technical Specification basin temperature limit be increased to 70°F. The analysis which demonstrates this is available for NRC review at Seabrook Station. This proposed change will alleviate a significant operational burden by minimizing the potential for requiring cooling tower operation, with spray, to reduce basin temperature below the current Technical Specification value (67.3°F), during the summer months. The proposed increase in basin temperature will maintain an adequate amount of time for operator action to initiate spray and fan operation and will not adversely affect the ability to remove the LOCA heat load.

If the cooling tower is manually operated, assuming maximum ECCS flows and the minimum allowable RWST volume (i.e. minimizing the time to recirculation), and with the increased initial basin temperature, a minimum of 74 minutes will be available for operator action to initiate cooling tower sprays and fans prior to reaching either basin limiting temperature (80°F or 87°F); the time available between switchover to recirculation and spray activation is at least 51 minutes. This 74 minutes exceeds the 20 minutes stated in NUREG-0800, Section 6.3 as the basis for requiring automatic rather than manual actuation.

Although the post-LOCA cooldown is the design basis case for the cooling tower, a normal cooldown has also been evaluated with respect to the increased basin initial temperature and manual cooling tower spray and fan operation. The normal cooldown differs from the post-LOCA cooldown in that the initial heat load to the cooling tower is higher in the normal cooldown case. This higher load results from normal plant heat loads, which would be isolated in the post-LOCA cooldown case remaining in service and therefore requiring cooling.

Initially in the normal cooldown, RCS decay heat is removed by the steam generators. The actual cooldown heat load is not provided to the cooling tower until the RHR system is placed into service after the Reactor Coolant System (RCS) temperature has been reduced to less than 350°F. The time from normal operating temperature until the RHR system is placed into operation requires about four hours. Therefore, the cooling tower heat load is constant during this initial four hour period, increasing at that time due to the decay heat being removed, and then gradually decreasing.

As in the post-LOCA cooldown case, the cooling tower basin is assumed to be at its maximum initial temperature and minimum volume. The tower basin temperature is again limited to a maximum temperature of 80°F prior to initiating cooling tower spray and fan operation. This 80°F limit is conservative for this case as it is based on the larger heat loads experienced in the post-LOCA cooldown case. With the maximum normal cooldown heat load, and assuming a loss of offsite power which adds the heat rejection from both diesel generators, greater than 106 minutes is available for operator action to start the

cooling tower sprays and fans prior to reaching a cooling tower basin average temperature of 80°F.

If the cooling tower design basis scenario were to occur, operators would begin to monitor ultimate heat sink performance at step 10 of Seabrook Station emergency operating procedure E-0, "Reactor Trip or Safety Injection". This step directs operators to verify ultimate heat sink operation. If the cooling tower is the ultimate heat sink operators are directed to initiate cooling tower spray and fan operation based on the combination of ambient wet bulb temperature and PCCW heat exchanger outlet temperature. If there is no need to initiate cooling tower spray and fan operation when step 10 of procedure E-0 is reached, operators will periodically monitor cooling tower operation to ascertain the need for spray and fan operation. In addition, there are PCCW high temperature alarms, located in the main control room, which will alert operators to the need to initiate cooling tower spray and fan operation.

If a Tower Actuation were to occur without an accompanying entry into the emergency operating procedures, abnormal operating procedure OS1216.01, "Degraded Ultimate Heat Sink" provides guidance on cooling tower fan and spray operation.

Operator training is conducted using abnormal and emergency simulator scenarios which emphasize monitoring ultimate heat sink performance. These training scenarios verify that appropriate operator action is taken during a cooling tower actuation occurring both with and without entry into E-0, "Reactor Trip or Safety Injection".

There is sufficient time available, even with the increased basin temperature, for manual operator action to initiate cooling tower spray and fan operation following the cooling tower design basis event. Therefore, operation of the cooling tower with the sprays and fans manually controlled does not require immediate operator action to mitigate the effects of an accident and therefore the proposed Technical Specification change is not detrimental to safe operation.

B. Description of Proposed Changes

The following changes are proposed to Technical Specification 3/4.7.5 and its Bases:

1. Limiting Condition for Operation 3.7.5.b is being revised to add ** following the word OPERABLE in two locations. A note is to be added to the bottom of page 3/4 7-14 stating that a fan may be considered OPERABLE if it is capable of being manually started from the main control board. These changes will permit the cooling tower fans to be considered OPERABLE when their control switches are in the "pull-to-lock" position.

2. Limiting Condition for Operation 3.7.5.b and Surveillance Requirement 4.7.5.b are being revised to increase the maximum allowable basin temperature from 67.3°F to 70°F. Increasing the temperature will minimize the potential for requiring cooling tower operation with spray, to reduce basin temperature, during summer months.

3. Existing Surveillance Requirement 4.7.5 d.1), which verifies that the cooling tower fans automatically start on a tower actuation test signal, is replaced with a requirement to verify that each automatic valve in the flowpath actuates to its correct position on

a tower actuation test signal. This change will allow cooling tower spray and fan operation to be manually initiated. The current surveillance requirement will be enhanced by requiring verification that automatic valves align to the correct position on a tower actuation test signal.

4. The Bases for Technical Specification 3/4.7.5 are revised by adding a paragraph discussing manual operation of the cooling tower sprays and fans.

II. Markup of Proposed Changes

See attached markup of proposed changes to Technical Specifications.