UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 40 TO FACILITY OPERATING LICENSE NO. NPF-86

NORTH ATLANTIC ENERGY SERVICE CORPORATION

SEABROOK STATION, UNIT NO. 1

DOCKET NO. 50-443

1.0 INTRODUCTION

By application dated April 16 1995, North Atlantic Energy Service Corporation (North Atlantic) proposed an amendment to the Appendix A Technical Specifications (TS) for the Seabrook Station, Unit 1 (Seabrook). The proposed changes would modify certain requirements of TS 3.9.4 relating to containment building penetrations during refueling operations. One change would allow both doors of one containment building personnel airlock (PAL) to be open during core alterations or movement of irradiated fuel within the containment building provided certain conditions are satisfied. Other changes proposed would allow the use of closure methods equivalent to closed valves or blind flanges and would add an alternate containment building penetration closure method during refueling operations. Additionally, Surveillance Requirement (SR) 4.9.4.a would be modified to be consistent with these changes.

2.0 DISCUSSION

TS 3.9.4 currently requires that a minimum of one door in each containment building PAL be closed and each penetration providing direct access from the containment building atmosphere to the outside atmosphere be isolated or capable of being isolated by an automatic isolation valve. Acceptable isolation devices are closed isolation valves, blind flanges, closed manual valves, or operable automatic isolation valves. These requirements are applicable during refueling operations (Mode 6) whenever core alterations are being performed or there is movement of irradiated fuel within the containment building.

North Atlantic has proposed several changes to TS 3.9.4 as follows:

- TS 3.9.4.b - The requirement that a minimum of one door in each PAL be closed would be changed to allow both doors of one PAL to be open provided one PAL door is capable of being closed and a designated individual is available outside the PAL to close the door,

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- TS 3.9.4.c.1 - The requirement would be reworded to provide for the use of closure methods *equivalent* to closed manual or automatic [isolation] valves or blind flanges,

- TS 3.9.4.c.3 - An alternate containment building penetration closure method would be allowed consisting of a designated individual available at the penetration to manually close the penetration, and

- SR 4.9.4.a - The SR would be modified to require verification that the penetrations are in the *required* condition vice *closed/isolated* condition to be consistent with proposed equivalent and alternate closure methods described.

The containment building and associated systems are provided to establish a nearly leaktight barrier against the uncontrolled release of radioactivity to the environment. During operation in Modes 1, 2, 3, or 4, this is accomplished by maintaining Containment Integrity. Containment Integrity assures that all penetrations required to be closed in the event of an accident are closed or are capable of being closed automatically and that containment leakage rates are within specified limits.

Containment Integrity is necessary for operation in Modes 1 through 4 because, in the event of an accident with the reactor coolant system (RCS) above 200°F, the containment building could become pressurized. However, during refueling operations (Mode 6), containment pressurization as a result of an accident is not likely; therefore, the requirements to isolate the containment from the outside atmosphere are less stringent. Thus, in Mode 6 only those penetrations providing direct access from the containment atmosphere to the outside atmosphere are required to be closed or be capable of being closed, and only one door on each PAL is required to be closed. In this condition, all potential direct escape paths are closed or capable of being closed. The closure requirements are sufficient to restrict fission product radioactivity release from containment due to a fuel handling accident.

The PALs provide a means for personnel access without violating containment integrity. Each PAL has doors at both ends. The doors on each PAL normally are interlocked to prevent simultaneous opening when containment closure is required. During periods of unit shutdown when containment closure is not required, the door interlock mechanism may be disabled, allowing both doors of the PAL to remain open for extended periods when frequent containment entry is necessary.

During a refueling outage, work in the containment building continues even during core alterations or movement of irradiated fuel when the current technical specification requires one PAL door to be closed. Thus, personnel entering or leaving the containment building when TS 3.9.4 is applicable must enter the PAL through one door with the other door closed, shut the door just passed, then open the other door. During a refueling outage, North Atlantic estimates that the PAL doors are operated up to several hundred times per day when containment closure is required. This heavy use of the PAL doors has resulted in failures of door components and seals reducing PAL closure reliability.

Other licensees have experienced similar difficulties with PALs during refueling outages. Florida Power and Light Company (FPL), the licensee for Turkey Point Unit 3 and 4, proposed an amendment on October 20, 1994, which would, in part, allow the PAL doors to remain open during core alterations. The amendment was issued on May 11, 1995, on the basis primarily that calculated offsite dose and control room operator doses were within acceptable limits with the PAL doors open following a fuel handling accident. In support of that proposal, FPL estimated that when the PAL doors were closed during core alterations during the 1994 Turkey Point Unit 3 refueling outage, the PAL doors were cycled over 300 times a day. FPL also asserted that the crowding of personnel in the PAL during shift changes might cause an increase in personnel contaminations. The excessive cycling of the PAL doors required frequent maintenance of the door hinge pin, the door seals, the packing of the equalizing valve, and other components.

The purpose of the current requirement to have at least one PAL door closed is to restrict the escape of radioactive material in the event of a fuel handling accident. In support of the proposed change to TS 3.9.4.b, North Atlantic notes that the current requirement will not prevent all radioactive releases from the containment following a fuel handling accident because there are many workers inside containment during a refueling outage even during fuel movement or core alterations. To evacuate these personnel from containment in the event of a fuel handling accident, the PAL doors would be cycled a number of times. Such cycling would release some radioactive material to the environment. In support of its proposed change to TS 3.9.4.b, North Atlantic provided a fuel handling accident analysis which assumes that the doors of one PAL are not closed at the time of or following the accident. This analysis is discussed further in Section 3.0.

North Atlantic's proposal to revise TS 3.9.4.c.1 to allow the use of closure methods *equivalent* to closed manual or automatic [isolation] valves or blind flanges would be consistent with the requirements of Section 3.9.4 of the Westinghouse Standard Technical Specifications, NUREG-1431 which would allow containment isolation to be achieved by an operable automatic isolation valve, or by a manual isolation valve, blind flange, or equivalent. Equivalent isolation methods must be approved and supported by an engineering evaluation and may include use of a material that can provide an atmospheric pressure and ventilation barrier to restrict release of radioactive material to the environment from the penetration. North Atlantic asserts that this change would improve schedular flexibility for refueling outage activities during periods when containment closure is required.

North Atlantic notes that during a typical refueling outage, there are only short periods of time when the current technical specifications would allow the containment to be open to the environment. Thus, the current TS requirements also limit the times when certain other refueling outage activities can be performed. North Atlantic provided steam generator sludge lancing as an example of one refueling outage activity that is so limited.

Sludge lancing requires the routing of hoses from equipment located outside containment to a special fixture attached to a spare containment penetration. The fixture provides manual isolation valves and connection points for the sludge lance hoses inside containment. At times when TS 3.9.4 is applicable, sludge lancing must be stopped and the manual isolation valves in the penetration fixture closed. With the proposed change to TS 3.9.4.c.3, sludge lancing could continue. North Atlantic asserts the alternate closure method, consisting of a designated individual available to close the penetration, would ensure that the penetration would be capable of restricting the release of radioactive material to the environment. In support of its proposed change to TS 3.9.4.c.3, North Atlantic provided a fuel handling accident analysis which assumes that the penetration remains open for as long as 2-hours. This analysis is discussed further in Section 3.0.

3.0 EVALUATION

During refueling operations, the most severe radiological consequences result from a fuel handling accident. The fuel handling accident is a postulated event that involves damage to irradiated fuel. Fuel handling accidents include dropping a single irradiated fuel assembly and handling tool or dropping a heavy object onto other irradiated fuel assemblies. The TS requirements associated with refueling are intended to ensure that the release of fission product radioactivity subsequent to a fuel handling accident results in doses that are *well within* the guideline values specified in 10 CFR Part 100. Standard Review Plan (SRP), Section 15.7.4, Rev. 1, defines *well within* 10 CFR Part 100 to be 25% or less of the 10 CFR 100 Part values, i.e., ≤75 rem to the thyroid and ≤6 rem to the whole body.

Regulatory Guide (RG) 1.25 provides acceptable assumptions that may be used in evaluating the radiological consequences of a fuel handling accident. North Atlantic provided the results of a fuel handling accident assuming several scenarios with respect to the changes proposed to TS 3.9.4.b and 3.9.4.c.3. The limiting scenario is that corresponding to the proposal to permit both doors of one PAL to be open during movement of irradiated fuel or core alterations. For this limiting scenario, North Atlantic's analysis calculated the doses for the 0-2 hour period at the exclusion area boundary to be 62.7 rem to the thyroid and 2.0 rem to the whole body. Control room habitability following a fuel handling accident must also be considered using the dose criteria in Appendix A to 10 CFR Part 50, Criterion 19. North Atlantic analysis results show the 30-day control room doses to be 6.7 rem to the thyroid and 0.29 rem to the whole body. Thus, North Atlantic's calculated doses are within the acceptance criteria of the SRP and Criterion 19.

The staff has completed its evaluation of the potential radiological consequences of a fuel handling accident at Seabrook, based upon the conditions of the proposed TS changes. The staff reviewed North Atlantic's analysis for the limiting scenario; however, it was not relied upon for determining acceptability of the proposed changes. Instead, the staff performed an independent analysis to determine conformance with the acceptance criteria of 10 CFR Part 100 and Criterion 19 of Appendix A to 10 CFR Part 50. The staff's analysis utilized the accident source term given in RG 1.4, the assumptions contained in RG 1.25, and the review procedures specified in SRP Sections 15.7.4 and 6.4. The staff assumed an instantaneous puff release of noble gases and radioiodines from the gap and plenum of the broken fuel rods. These gas bubbles will pass through at least 23 feet of water covering the fuel prior to reaching the containment atmosphere. All airborne activity reaching the containment atmosphere is assumed to exhaust to the environment within 2 hours. As stipulated in the proposed TS change, the gap activity is assumed to have decayed for a period of 100 hours.

The staff computed the offsite doses for Seabrook using the above assumptions and NRC computer code ACTICODE. Control room operator doses were determined using the methodology in SRP Section 6.4. The computed offsite doses and control room operator doses are within the acceptance criteria given in SRP Section 15.7.4 and Criterion 19. The assumptions used in calculating those doses and the resulting calculated values are shown in Tables 1 and 2.

Based upon this independent analysis, the staff concludes that the radiological consequences associated with the limiting fuel handling accident scenario are within the acceptance criteria set forth in 10 CFR Part 100 and the control room operator dose criteria specified in Criterion 19 of Appendix A to 10 CFR Part 50 and are acceptable. Further, the staff finds the proposed changes to the TS acceptable, since the radiological consequences of a fuel handling accident meet the dose acceptance criteria with the proposed changes.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the New Hampshire and Massachusetts State officials were notified of the proposed issuance of the amendment. The State officials had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes a surveillance requirement. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (60 FR 32369). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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TABLE 1

CALCULATED RADIOLOGICAL CONSEQUENCES
(rem)

Exclusion Area Boundary	Dose	SRP 15.7.4 Guidelines
Whole Body	0.28	6
Thyroid	56.9	75

Control Room Operator	Dose	GDC-19 Guidelines
Whole Body	0.18	5
Thyroid	15.2	Equivalent to 5 rem whole body*

* Guideline doses provided in Standard Review Plan Section 6.4 define the dose-equivalent as 30 rem to the thyroid.

TABLE 2

ASSUMPTIONS USED FOR CALCULATING RADIOLOGICAL CONSEQUENCES

Parameters	Quantity
Power Level, Mwt	3,654
Number of Fuel Rods Damaged (1 assembly plus 32 rods)	264
Total Number of Rods	50,952
Shutdown time, hours*	100
Power Peaking Factor*	1.65
Fission Product Release Duration*	2 hours
Core Fission Product Inventories per TID-14844	
Receptor Point Variables**	
Exclusion Area Boundary	
Atmospheric Relative Concentration, X/Q (sec/m^3)	
0-2 hours	2.7×10^{-4}
Control Room	
Atmospheric Relative Concentration, X/Q (sec/m^3)	3.18×10^{-3}
Control Room Volume, cubic feet	2.46×10^{5}
Maximum Infiltration Rate, ft^3/min	1200
Geometry Factor	17.5
Iodine Protection Factor	44
Recirculation Air Flow	
Flow Rate, ft^3/min	800
ESF Filter Efficiency	
Elemental Iodine	95%
Organic Iodine	95%
Particulate Iodine	99%

Note: Dose conversion factors from ICRP-30 were utilized for all calculations

* Regulatory Guide 1.25
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