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

June 11, 2010

Mr. Paul Freeman
Site Vice President
c/o Mr. Michael O'Keefe
NextEra Energy Seabrook, LLC
P.O. Box 300
Seabrook, NH 03874

SUBJECT: SEABROOK STATION, UNIT NO. 1 - RELIEF REQUEST FOR CONTAINMENT BUILDING SPRAY PUMP TESTING ON RECIRCULATION FLOW PATH, THIRD 10-YEAR INTERVAL (TAC NO. ME2412)

Dear Mr. Freeman:

By letter dated October 13, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML092890326), NextEra Energy Seabrook, LLC (the licensee), submitted a proposed alternative to the requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code) for Seabrook Station, Unit No. 1 (Seabrook). These requirements pertain to the inservice testing requirements. The proposed alternative would allow flow testing outside of the required range of ± 20% of pump design flow rate.

The Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's analysis in support of the proposed alternative. The NRC staff concludes that the proposed alternative provides an acceptable level of quality and safety. The request is authorized for Seabrook pursuant to Title 10 of the *Code of Federal* Regulations 10 CFR 50.55a(a)(3)(i) for the remainder of the third 10-year interval.

The NRC staffs' evaluation and conclusions are contained in the enclosed safety evaluation. If you have any questions, please contact the Seabrook Project Manager, Mr. G. Edward Miller, at 301-415-2481.

Sincerely,

Harold K. Chernoff, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-443

Enclosure:
As stated

cc w/encl: Distribution via Listserv

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST ASSOCIATED WITH

CONTAINMENT BUILDING SPRAY PUMP FLOW TESTING

NEXTERA ENERGY SEABROOK, LLC

SEABROOK STATION, UNIT NO. 1

DOCKET NO. 50-443

1.0 INTRODUCTION

By letter dated October 13, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML092890326, NextEra Energy Seabrook, LLC, the licensee, submitted alternative request PR-1 for the third 10-year inservice testing (IST) program interval. The licensee requested an alternative test plan in lieu of certain IST requirements of the 2004 Edition of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code). Specifically, the proposed alternative would allow flow testing outside of the required range of +/-20% of pump design flow rate. The NextEra Energy Seabrook, LLC third 10-year IST interval commences on August 18, 2010, and ends on August 17, 2020.

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal* Regulations (10 CFR) 50.55a(f), "Inservice testing requirements," requires, in part, that ASME Class 1, 2, and 3 components must meet the requirements of the ASME OM Code and applicable addenda, except where alternatives have been authorized pursuant to paragraphs (a)(3)(i) and (a)(3)(ii) of 10 CFR 50.55a.

In proposing alternatives, the licensee must demonstrate that the proposed alternatives provide an acceptable level of quality and safety or compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Section 50.55a authorizes the NRC to approve alternatives to ASME OM Code requirements upon making necessary findings. NRC guidance contained in NUREG-1482 Revision 1, "Guidance for Inservice Testing at Nuclear Power Plants," provides alternatives to ASME Boiler Pressure and Vessel Code (ASME Code) requirements which are acceptable.

3.0 TECHNICAL EVALUATION

3.1 ASME Code Components Affected

Containment Building Spray (CBS)
CBS-P9A – Containment Building Spray Pump A
CBS-P9B – Containment Building Spray Pump B

3.2 ASME OM Code Requirements

ISTB-3300 Reference Values

(e) Reference values shall be established in a region(s) of relatively stable pump flow.

(1) Reference values shall be established within [± 20%] of pump design flow rate for the Comprehensive test.

(2) Reference values shall be established within [± 20%] of pump design flow rate for Group A and Group B tests, if practicable. If not practicable, the reference point flow rate shall be established at the highest practical flow rate.

3.3 Proposed Alternative

The licensee stated that performance of the test at full flow would require significant temporary modifications within containment to provide adequate piping pathways for the flow. Instead, the licensee is proposing to perform the testing at 68 percent of pump design flow through a 4-inch recirculation line currently incorporated in the CBS system.

3.4 Licensee Basis for the Alternative

The licensee provided the following description of the hardship associated with performing the test within ± 20% of pump design flow rate:

> The Containment Building Spray system is designed to remove the energy discharged to the containment following a loss-of-coolant accident (LOCA) or main steam line break (MSLB) to prevent the containment pressure from exceeding design pressure and to reduce and maintain containment temperature and pressure within acceptable limits. The CBS pumps are motor-driven, horizontal, centrifugal pumps. The subject pumps are designed to take suction from either the Refueling Water Storage Tank (RWST) in the Emergency Core Cooling System (ECCS) injection mode or the containment recirculation sump in the ECCS recirculation mode. The CBS pump discharges the flow back into the containment through the containment spray nozzles. Each train of the CBS system includes one 100% capacity pump.
>
> As such, the CBS pumps are required to be inservice tested in accordance with Subsection ISTB of the 2004 Edition, of American Society of Mechanical Engineers (ASME) Code for the Operation and Maintenance of Nuclear Power

Plants (OM Code). ISTB-3300(e)(1) of the OM Code requires that comprehensive tests reference values be established within ± 20% of pump design flow.

The flow path used to perform both the biennial comprehensive pump test and the quarterly Group A test are the same. The CBS pumps take suction from the Refueling Water Storage Tank (RWST) through a series of manual valves and a suction check valve and discharge water back to the RWST. The pump discharge flow path contains a piping run to a heat exchanger (CBS-E-16A or CBS-E-16B) and then continues to the containment spray ring header penetration(s) (X- 14 and X- 15). Upstream of this penetration is the return line to the RWST. In the return line, there is an air-operated valve (AOV) (open/close type) specific to each train (CBS-V31 and CBS-V32) with no remote throttling capability. The return lines for each train tie together into a common line that utilizes a similar type AOV (CBS-V33). This common line then connects to the RWST, which is located downstream. The Safety Injection pumps also utilize this common return line to the RWST. CBS pump flow is measured utilizing a flow indicator (FI-2340) located in the common return line to the RWST. Due to the design of the valves, there is no practical method to vary the resistance of the test path to adjust flow. IST testing is performed at this fixed reference condition.

During the pre-operational test period, a test (PT 1-12.1) was performed to verify CBS system performance. PT [1]-12.1 was performed utilizing a temporary manual throttle valve installed in a spool piece (for a temporary strainer) in the common RWST return line. This spool piece still exists as a bolted joint but the manual valves and strainer have been removed. Installation of a similar temporary throttle valve with the plant on-line to achieve additional flow points for the subject pumps is impractical due to the use of this line by other pumps such as the Safety Injection pumps. Installation of a temporary manual throttle valve during shutdown periods would require extensive and intrusive modifications.

Alternative means to vary system resistance in order to provide additional test data were evaluated. The local manual throttling of either CBS-V31, CBS-V32 or CBS-V33 was eliminated as an option due to the potential for valve damage since these valves incorporate a soft seat type design. Additionally, local manipulation of these valves at power would over ride the automatic signals that these valves receive to close to protect the containment spray flow path to containment.

The potential to vary system resistance utilizing a manual valve located in the pump suction lines was also evaluated. This option was eliminated due to the potential to cavitate the pumps and reduce net positive suction head (NPSH) margin for the pumps. As a result, the Containment Building Spray Pumps (CBS-P9A, CBS-P9B) can only be tested on a recirculation flow path which is sized for approximately 63% (1900 gallons per minute (GPM) of the Best Efficiency Point (BEP) Flow of 3000 GPM and approximately 68% of the required design flow of 2808 GPM.

Full flow testing would require system alignment to the containment spray headers and subsequent discharge to the containment. In order to perform full flow testing without alignment to the spray headers, temporary piping would be required to recirculate water to/from the ECCS Containment Sumps. This was performed one time previously, to verify CBS pump curve data (pre-operational test 1-PT-11, Containment Recirculation Sump Operability Demonstration). 1-PT-11 required modification of the sump by means of building a 2 to 3 foot high steel dyke around the top of the sump (at -26 [foot] elev. floor level) in order to hold the volume of water required to achieve the necessary pump NPSH [net positive suction head] without flooding the containment. The spray header piping would also require modification by means of removing the spool pieces downstream of valves CBS-V13 and CBS-V19 and connecting temporary pipe (minimum 8 [inch] diameter) from the 25 [foot] elevation in containment to the ECCS Sumps at -26 [foot] elevation. Recent (OR12) installation of the sump modifications under DCR 06-002, Debris Interceptors, has installed flow interceptors, further reducing the available volume of the sump for testing. Performing these temporary modifications to the CBS system or enlarging the recirculation piping and components to achieve 80% design flow is not warranted since there will be no improvement in our ability to detect pump degradation.

The licensee provided the following justification for the proposed alternative:

Testing of the subject pumps utilizing the recirculation flow path provides for substantial flow testing in a stable region of the pump curve, well above the minimum continuous flowrate specified by the pump manufacturer. Testing the CBS pumps at reference values established in this region of the pump curve will not cause damage to the pumps and will provide meaningful data to assess pump operational readiness.

In order to compensate for testing the subject pumps at a reduced flow rate during the comprehensive pump test, as required by ISTB-3300(e)(1), the CBS pumps are included in the Predictive Maintenance Monitored Equipment Program. This program includes thermography, enhanced vibration monitoring and analysis of the pump and periodic sampling and analysis of the lube oil. Station personnel will also perform Static Motor Testing using the Baker Advanced Winding Analyzer Series IV (AWAIV) equipment and Dynamic Motor Monitoring utilizing the Baker EXP3000 equipment. On-line testing using the EXP3000 utilizes a multitude of tests to determine the power quality, motor operating conditions, motor performance, and load originated issues.

If measured parameters are found outside of the normal operating range or were determined to be trending toward an unacceptably degraded condition, corrective actions are required. These corrective actions include monitoring additional pump parameters, review of relevant data to determine the cause of the deviation, and potential removal from service.

Reference values for testing the Containment Building Spray pumps will be established and pump testing will be performed while operating on the installed

recirculation loop. This program contains testing and analysis requirements beyond those required by the 2004 Edition of the ASME OM Code.

3.5 NRC Staff Evaluation

The licensee is preparing to enter its third 10-year IST program interval set to commence on August 18, 2010, and end on August 17, 2020. The licensee has proposed an alternative test in lieu of the requirements found in ISTB-3300 for CBS pumps CBS-P9A and CBS-P9B. Specifically, the current configuration of CBS pumps CBS-P9A and CBS-P9B cannot meet the test requirements of ISTB-3300(e)(1) which states:

> Reference values shall be established within ±20% of pump design flow rate for the comprehensive test.

As stated in Section 3.1.2 of this Safety Evaluation, the CBS Pumps (CBS-P9A, CBS-P9B) are not designed and configured to perform full flow testing without a modification. They can only be tested on a recirculation flow path which is sized for approximately 1900 gpm, which is 63 percent of the BEP Flow of 3000 gpm and approximately 68 percent of the required design flow of 2808 gpm.

The comprehensive pump test (CPT) was developed by the ASME Code to ensure a more accurate evaluation of pump performance at a reduced frequency. The test is intended to be conducted at, or near, the pump's design flow rate. The CPT was developed with the knowledge that some pumps, such as containment spray pumps, cannot easily be tested at the required high flow rates because of system design limitations. NUREG-1482 Revision 1 "Guidelines for Inservice Testing at Nuclear Power Plants" Section 5.10, acknowledges this fact and accepts the use of alternative test methods provided that the licensee can demonstrate that the proposed alternative method will detect hydraulic degradation and that the acceptance criteria for determining pump operability is equivalent to the CPT Code requirements in ISTB-3300.

The licensee stated in its alternative request that testing the CBS pumps at the required flow as specified by the Code would require the building of a temporary dike system around the top of the containment sump. A dike system is required to hold the needed volume of water for maintaining the NPSH on the pump without flooding the containment. In addition, intrusive temporary piping would need to be installed for completion of the full flow test loop. A pre-operational test using this configuration verified the manufacturer's pump curve data and confirmed the ability of the pumps to deliver design flow. However, duplication of this test, by the standards today, would be more difficult to accomplish due to recent plant modifications to the sump and the temporary modification installation impact on other systems.

The licensee has proposed to perform the CPT at reduced flow conditions. To compensate for the reduced flow testing, the licensee has proposed obtaining additional pump health data via their Predictive Maintenance Monitored Equipment Program. Predictive technologies such as: thermography, vibration analysis, oil analysis, and static/dynamic motor monitoring/analysis will be incorporated into the CPT. Measured parameters will be analyzed and trended. Should a predictive technology measured parameter be found outside its normal range and/or is trending to an unfavorable condition, corrective actions would be required.

The licensee proposes to test the CBS pumps utilizing the recirculation flow path. This fixed path provides flow testing in a stable region of the pump curve well above the minimum continuous flow rate specified by the manufacturer. The required ASME OM Code pump parameters such as differential pressure, discharge pressure, flow rate and vibration will be captured, trended, analyzed and measured against established reference values. In addition, predictive technologies will be used to enhance the monitoring of component health of the pumps. Thermography is an effective tool for identifying faulty bearings, misaligned couplings, electrical faults and abnormal temperature increases. Vibration analysis can be used to detect bearing faults, motor/pump imbalances, impeller faults, motor faults, resonance problems, and system anomalies. Lube oil analysis can detect bearing wear and abnormal system operation such as water intrusion. Static motor testing and dynamic motor monitoring can detect power quality and motor performance issues. The performance of thermography and lube oil sampling and analysis exceed the requirements of the 2004 Edition of the ASME OM Code. Additionally, the proposed alternatives meet the recommendations of NUREG-1482, Revision 1, Section 5.10 and provide an acceptable level of quality and safety.

4.0 CONCLUSION

As set forth above, the NRC staff determines that the proposed alternative, PR-1, for CBS Pumps CBS-P9A and CBS-P9B, provides reasonable assurance that pumps CBS-P9A and CBS-P9B are operationally ready. Accordingly, the staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii), and is in compliance with the ASME OM Code's requirements. All other ASME OM Code requirements for which relief was not specifically requested and approved, remain applicable. These proposed alternatives are authorized for the third 10-year IST interval, which commences on August 18, 2010, and ends on August 17, 2020.

Principal Contributor: R. Lake

Date: June 11, 2010

June 11, 2010

Mr. Paul Freeman
Site Vice President
c/o Mr. Michael O'Keefe
NextEra Energy Seabrook, LLC
P.O. Box 300
Seabrook, NH 03874

SUBJECT: SEABROOK STATION, UNIT NO. 1 - RELIEF REQUEST FOR CONTAINMENT BUILDING SPRAY PUMP TESTING ON RECIRCULATION FLOW PATH, THIRD 10-YEAR INTERVAL (TAC NO. ME2412)

Dear Mr. Freeman:

By letter dated October 13, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML092890326), NextEra Energy Seabrook, LLC (the licensee), submitted a proposed alternative to the requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code) for Seabrook Station, Unit No. 1 (Seabrook). These requirements pertain to the inservice testing requirements. The proposed alternative would allow flow testing outside of the required range of ±20% of pump design flow rate.

The Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's analysis in support of the proposed alternative. The NRC staff concludes that the proposed alternative provides an acceptable level of quality and safety. The request is authorized for Seabrook pursuant to Title 10 of the *Code of Federal* Regulations 10 CFR 50.55a(a)(3)(i) for the remainder of the third 10-year interval.

The NRC staffs' evaluation and conclusions are contained in the enclosed safety evaluation. If you have any questions, please contact the Seabrook Project Manager, Mr. G. Edward Miller, at 301-415-2481.

Sincerely,
/ra/
Harold K. Chernoff, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-443

Enclosure:
As stated

cc w/encl: Distribution via Listserv

DISTRIBUTION:

PUBLIC	LPLI-2 R/F	RidsRgnIMailCenter Resource
RidsOgcRp Resource	RidsAcrsAcnw_MailCTR Resource	RidsNrrLpl-2 Resource
RidsNrrPMGMiller	RidsNrrLAABaxter	LTrocine, EDO, RI
RidsNrrDciCvibResource		

ADAMS Accession No.: ML101380192 *SE dated **not required per ML092220406

OFFICE	LPL1-2/PM	LPL1-2/LA	CPTB/BC	OGC	LPL1-2/BC
NAME	GEMiller	ABaxter	AMcMurtray*	**	HChernoff
DATE	6/11/10	6/7/10	4/22/10		6/19/10

OFFICIAL RECORD COPY