POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-266 AND 50-301

LICENSE AMENDMENT REQUEST (LAR-261) - EXTENDED POWER UPRATE (EPU)

(TAC NOS. ME1044 AND ME1045)

Introduction

By letter to the Nuclear Regulatory Commission (NRC) dated April 2, 2009 (Agencywide Document and Management System Accession No. ML091250564), the licensee of the Point Beach Nuclear Plant (PBNP), Units 1 and 2, NextEra Energy Point Beach, LLC, submitted a license amendment request (LAR), pursuant to the requirements of Title 10 of the Code of Federal Regulations Section 50.90, "Application for Amendment of License or Construction Permit." The LAR proposes to increase the power level of the current Renewed Operating License (OL) to 1,800 megawatts thermal (MWt), approximately 17% above the current licensed thermal power (CLTP) of 1,540 MWt and approximately 18.5% above the Original Licensed Thermal Power (OLTP) of 1,518.5 MWt.

The Mechanical & Civil Engineering Branch staff has reviewed the LAR licensing report (LR) for power uprate. The staff has identified that additional information is needed to complete the review. The staff's request for additional information (RAI) is attached. This request does not include items related to safety-related valves and pumps since review of these components is performed by the Component Integrity, Performance and Testing Branch. Please note that EMCB RAIs related to LR Section 2.2.1, "Pipe Rupture Locations and Associated Dynamic Effects" and Section 2.2.5, "Seismic and Dynamic Qualification of Mechanical and Electrical Equipment", if required, will be submitted via a separate memorandum.

Requests for Additional Information

EMCB RAI 1

It is noted that the PBNP EPU licensing report (LR) specifies that the plant design basis code of record for BOP piping analysis is the USAS B31.1 Power Piping Code, 1967 Edition. Please verify and/or identify the code utilized in qualifying nuclear steam supply systems (NSSS) and balance of plant (BOP) piping and pipe supports for EPU conditions. If different from the plant design basis code of record, provide justification and confirm that the calculated values for piping and supports utilized the original code of construction allowable values.

EMCB RAI 2

Confirm that the reactor coolant system (RCS) piping and supports, components, primary equipment nozzles and supports, associated reactor coolant loop (RCL) branch piping and supports, did not experience an increase in stresses due to the EPU because the existing analysis contains loads which envelop the loads at EPU conditions.

EMCB RAI 3

Confirm that the current licensing basis at PBNP does not contain any requirements for fatigue evaluation of the above-mentioned systems, structures, and components (SSCs).

EMCB RAI 4

Tables 1-1 and 1-2 provide the RCS operating temperatures and pressures for EPU and current licensed thermal power (CLTP). Table 2.5.5.1-1 provides main steam (MS) operating and design temperature and pressure. Table 2.5.5.4-1 provides feedwater (FW) operating temperature and pressure. For the CLTP and EPU, please provide both the FW and RCS design temperatures and pressures.

EMCB RAI 5

Section 2.2.2.2.2.2 states that, "The two piping systems of most concern with respect to flow rate increases are main steam and feedwater systems."

a) Identify all piping systems that would experience higher flow rates due to the EPU implementation.

b) Section 2.2.2.2.2.3 also states that "Additionally, the implementation of the EPU will result in higher flow rates for several piping systems. Piping systems experiencing these higher flow rates require review for potential flow induced vibration issues." Please discuss how these reviews were conducted and provide a summary of their results.

c) Provide a clear description of the planned activities to address flow-induced vibration (FIV) on susceptible systems.

d) Describe the methodology and provide the acceptance criteria for the evaluation of FIV for these piping systems.

EMCB RAI 6

This RAI is in reference to EPU-LR Section 2.12.1.2.3.4, Vibration Monitoring.
This section, in part, states that:

> A Piping and Equipment Vibration Monitoring Program, including plant walkdowns and monitoring of plant equipment, will be established to ensure that steady state flow induced piping vibrations following EPU implementation are not detrimental to the plant, piping, pipe supports or connected equipment.

a) Has the development of this program been completed? If not, provide the schedule for completion.

In the same section, it is also stated that:

> The program scope will also include any lines or equipment within the monitored systems that have been modified or otherwise identified through the PBNP action report system as having already experienced vibration issues.

b) Has this work been performed yet? If not, provide the schedule for completion.

EPU-LR Section 2.12.1.2.3.4 also states that:

> Subsequent observations will take place at each EPU Test Plateau, as described in Section 2.12.1.2.3.1 above. By comparing the observed pipe vibrations/displacements at various power levels with previously established acceptance Criteria, potentially adverse pipe vibrations will be identified, evaluated and resolved prior to failure.

c) Please list the acceptance criteria and supporting basis to be utilized for evaluating observed pipe vibrations and displacements at various EPU ascension power levels.

d) Have base line data at CLTP been gathered and have they been analyzed and projected to the EPU level to determine that at EPU power the allowable limits will not be exceeded? If yes, provide evaluation summaries which show that established acceptance criteria can be met for EPU conditions. If not, provide a justification why this work has not been performed yet.

EMCB RAI 7

Section 2.2.2.2.2 states that, "BOP piping and support systems were evaluated to assess the impact of operating temperature, pressure and flow rate changes that will result due to the implementation of EPU" and contains a list of "BOP piping and support systems that were evaluated for EPU conditions." The list follows this quoted statement. From this list, Table 2.2.2.2-1 of the LR indicates that only portions of the MS, FW, condensate, extraction steam and FW heater drains have been evaluated.

a) Identify all systems (inside and outside containment) that experience increase in temperature, increase in pressure and an increase in flow rate.

b) For systems that experience increases in the above parameters, provide the method of your evaluation. Provide a quantitative summary of the maximum stresses and fatigue usage factors (if applicable) for original and EPU conditions with a comparison to the original code of construction allowable stress values. Include only maximum stresses and data at critical locations (i.e., nozzles, penetrations, etc). List all piping modifications (for pipe supports see (d) below) required due to EPU and the associated schedule for completion. For affected nozzles and containment penetrations, provide a summary of loads compared to specific allowable values for the nozzles and penetrations (include containment penetrations, steam generator (SG) and FW pump nozzles).

c) For the systems with a thermal change factor greater than 1.00, provide a description of pre-operational measures taken to identify locations that could potentially be subject to unacceptable thermal expansion interaction resulting in an unanalyzed plant condition that could potentially overstress piping and supports. In addition, confirm that a program will be in place for monitoring thermal expansion at the startup of the EPU. The EPU power ascension program (see LR page 2.12-4) does not appear to contain such a provision. In addition, page 2.12-14 of the LR states that the "EPU power ascension program will be developed." Please verify that this program has been developed.

d) For the systems in (b), state the method used for evaluating pipe supports when considering EPU conditions and confirm that the supports on the affected piping systems have been evaluated and shown to remain structurally adequate to perform their intended design function. Provide detail descriptions of all pipe support modifications needed to meet design basis at EPU conditions. In addition, list also type, size, loading (current and EPU) and location of supports that need to be modified and/or added due to the EPU.

e) Provide the schedule for completion of all piping and pipe support modifications and additions.

EMCB RAI 8

Section 2.2.2.2.2 states that "… main steam and feedwater pipe support modifications are required to mitigate the larger flow induced fluid transient loads that resulted due to EPU conditions." Please identify all piping systems that require modifications for EPU. Provide a detailed description of piping and pipe support modifications (including new supports) that are required for EPU. Include pipe line name, size, type and identification name of pipe support and the reason for the revision/addition.

EMCB RAI 9

EMCB RAI 9 refers to pipe stress summaries of the EPU LR Table 2.2.2.2-1.

a) Confirm whether stress summaries of Table 2.2.2.2-1 include stresses due to fluid transient loads associated with the EPU; such as turbine stop valve (TSV), main steam isolation valve (MSIV) and main feedwater isolation valve (MFIV) closure transients. If not, provide stress summaries of the feedwater and main steam piping evaluations that contain stresses due to EPU higher fluid transient loads. In addition, for main steam and feedwater nozzles and containment penetrations, provide a summary of loads compared to specific allowable values for the nozzles and penetrations.

b) The stress summaries of Table 2.2.2.2-1 are not based on the current plant piping configurations. Please update this table to show pipe stress summaries of EPU piping configuration and conditions.

c) Table 2.2.2.2-1 does not contain stress summaries for the sustained loads equation. Verify that pressure in piping systems (BOP and inside containment) is not affected by the proposed EPU.

EMCB RAI 10

At the time of the EPU LAR submittal, some EPU required piping and pipe support analyses had not been performed or completed. On page 2.2.2-18 of the EPU LR, states that "…the piping and support evaluations will be performed as part of the overall design change package…" This is not acceptable to the staff. Please provide assurance that all piping and pipe support evaluations, including new and modified supports, have been completed and the evaluations have found that these SSCs are capable of maintaining their designed structural integrity for EPU conditions in accordance with the current plant design basis. Also, please provide the schedule for the required installations.

EMCB RAI 11

Please explain why the reactor pressure vessel (RPV) stress summary does not contain primary plus secondary stress intensity values compared to $3S_m$ for the RPV inlet and outlet nozzle support pads. If these values were not calculated for EPU, provide a justification.

EMCB RAI 12

Please clarify whether the fatigue derived cumulative usage factors (CUFs) shown in tables of EPU LR Section 2.2, "Mechanical and Civil Engineering", are for the 60 year renewed plant life.

EMCB RAI 13

Were the stress analyses rerun or were scaling factors used with the CLTP or the original stress reports to determine EPU stress intensities and fatigue CUFs shown in LR Table 2.2.2.3-3? Provide your methodology which shows how the scaling factors were derived and how they were used to determine EPU stress intensities and fatigue CUFs from baseline stress reports. Also explain the "standard engineering approaches" used to evaluate changes in the thermal and pressure stresses, due to adverse changes in temperature and/or pressure variations from the baseline transients. Provide an example which shows the methodology used.

EMCB RAI 14

For the vessel support, LR Table 2.2.2.3-3 shows fatigue CUF of 0.995 for CLTP to 60 year plant renewed life and [0.842] for post-EPU.

a) Clarify whether the EPU CUF value of 0.842 is applicable for the 60 year plant renewed life?

Note 2 of Table 2.2.2.3-3 states that: "Number 0.842 was calculated using a stress concentration factor (SCF) of 1.5 applied to thermal stresses, as determined from a finite element analysis. The pre-EPU cumulative fatigue usage factor 0.995 applied on overly conservative SCF of 3.27 to the thermal stresses."

b) Please provide a description which clearly shows how these stress concentration factors have been developed and the geometry that they apply to.

EMCB RAI 15

Please verify whether or not the fatigue CUF values shown on Table 2.2.2.3-3 reflect effects from environmentally assisted fatigue? If not provide a justification.

EMCB RAI 16

LR Table 2.2.2.3-6 contains the EPU revised "RPV support loads (per Support)."

a) Please explain whether these RPV loads were applied to each shoe of its support structure and discuss why the CLTP RPV support loads would change for EPU?

b) Please also provide the corresponding allowable loads for the EPU revised RPV support loads, as shown in Table 2.2.2.3-6.

EMCB RAI 17

PBNP EPU LR Section 2.2.2.5.7 discusses the evaluation performed to address the effects of flow induced vibration (FIV) on the SG tubes due to the increased EPU flow. Please discuss the bases for your assumptions, acceptance criteria and the methodology used for calculating tube wear, vibration forces and stresses.

EMCB RAI 18

PBNP EPU LAR Section 2.2.2.5.7 predicts a pre-uprate and post-uprate tube wear values for the PBNP Unit 2 SG tubes for 40 years design life and states that: "This amount of wear will not significantly affect tube integrity and is judged to be acceptable." Please indicate the amount of tube wear beyond which the tube structural integrity is considered to be affected and your technical basis for this judgment. In addition, provide the EPU evaluated tube wear for the PBNP Unit 1 SG tubes and the method of evaluation.

EMCB RAI 19

SG tubes have been known to fail and rupture due to high cycle fatigue caused by vibration due to fluid-elastic instability. Discuss the applicability of the NRC Bulletin 88-02, "Rapidly Propagating Fatigue Cracks in Steam Generator Tubes," to the PBNP SGs.

EMCB RAI 20

PBNP EPU LR Tables 2.5.5.1-1 and 2.5.5.4-1 show that, at EPU power levels main steam and FW flow rates will increase by over 20%, while velocities in the main steam from SGs to TCSVs could increase by approximately 27% and condensate and feedwater system flow velocities are expected to increase by approximately 25% at EPU power level.

a) Please provide for both units analysis summaries for the steam dryer, dryer supports, flow-reflectors (if applicable) and for other SG internals due to flow-induced loadings associated with fluid-elastic instability, vortex shedding or acoustic type loadings due to the EPU higher FW and steam flow. If these types of analyses for the SG internals have not been performed or flow-induced loads are not thought to be a concern for these components, provide a justification which supports your position.

b) Discuss whether any acoustic resonance could be generated at EPU flow or during power ascension to EPU power in the feedwater and main steam lines and describe how the acoustics-driven dynamic pressure loading acting on the components inside the steam generator under EPU conditions will be estimated. The discussion of the results presented in EPU LR Section 2.2.2.5 of the comparative assessment between geometries of BWR and PWR steam dryers does not demonstrate and is inconclusive as to why an acoustic type pressure wave cannot be generated and create a pressure loading on the dryer and its components.

c) Discuss procedures in place for preparation, response and preventive actions designed to detect and remove loose parts that could potentially occur due to component degradation as a result of the EPU increased main steam and FW flow. Also, please discuss the potential for damage that these loose parts could have to the safety-related SSCs.

EMCB RAI 21

EPU LR Section 2.2.2.5 states that: "With the increased flow conditions within the steam drum expected from EPU conditions, material loss in the carbon steel steam drum components may be initiated or accelerated. Periodic steam generator inspections will detect degradation that may occur." Please provide the frequency of the scheduled inspections for the steam drum components and the supporting basis that drives these inspections.

EMCB RAI 22

EPU LR Section 2.2.2.5, with respect to the structural adequacy of the steam drum components states that: "flow-induced vibration of these components during uprated conditions is considered to be enveloped by the original design basis evaluations due to the limited change in flow parameters within the steam drum under EPU conditions." Please describe the original design basis evaluations and provide references of these evaluations which have been performed for the steam drum components that include flow-induced loads. Also, please describe how the flow parameters in the original design basis evaluations envelop the EPU increased flow conditions.

EMCB RAI 23

Please confirm that EPU LR Section 2.2.2.1 indicates that for the NSSS piping and supports the current analyses on record contain load and transient input data that bound those of the EPU conditions.

EMCB RAI 24

Please clarify whether the ratio values in Tables 2.2.2.7-2 and 2.2.2.7-3 are for EPU or CLTP and update these tables to show calculated and allowable values from both CLTP and EPU. Note 1 of Table 2.2.2.7-2 indicates that the pressurizer spray nozzle has failed to meet the ASME Section III NB-3222.2 primary plus secondary stress intensity requirement of 3Sm and has been qualified by the alternate rules of the simplified elastic-plastic analysis of sub-paragraph NB-3228.3. If this condition is for stress intensity calculated at EPU conditions, please provide a quantitative summary of the evaluation which shows that the special rules for exceeding 3Sm, as provided by (a) through (f) of sub-paragraph NB-3228.3 have been met. In the requested summary, please show calculated and allowable values and not just ratios, as currently included in the above-mentioned tables.

EMCB RAI 25

a) For EPU LR Section 2.2, "Mechanical and Civil Engineering," please verify that, where a different code or code edition than the original code of construction has been utilized, a documented code reconciliation exists that allows such use and that the allowable values from the original code of construction have been utilized with the reconciled (later) year code. As an example, LR Section 2.2.2.7 concludes that: "[The] pressurizer components meet the stress intensity/fatigue requirements of the ASME Code Section III, 1965 Edition with Addenda through Summer 1966 for all proposed EPU operation." However, the same section indicates that the stress and fatigue evaluations have been performed in accordance with a later ASME Code edition. The code edition year is not mentioned.

b) For sub-sections in LR Section 2.2 where the acceptance criteria and evaluation does not mention either the code, code section and/or code year, please provide that information. For instance, in the case of the reactor coolant pumps and supports, Section 2.2.2.6 indicates that the acceptance criteria at EPU conditions for stress limits and fatigue usage requirements are in accordance with the American Society of Mechanical Engineers (ASME) Code, Section III. However, it does not mention the code year.

EMCB RAI 26

For the RPV internals, as shown in LR Table 2.2.3-3, that exceed the NB-3222.2 primary plus secondary stress intensity requirement of 3Sm at EPU conditions, please provide a quantitative summary of the evaluation which shows that the 3Sm code limit is met when excluding thermal bending stresses and that the remainder of NB-3228.3 requirements (b) through (f) have also been satisfied.

EMCB RAI 27

For LR Table 2.2.3-3, please provide an explanation which demonstrates why, at EPU conditions, the primary plus secondary stress intensity range of some vessel internal components has been greatly reduced. Also, please explain, quantitatively, how the baffle-former bolts have been evaluated and qualified since the table does not contain a stress and fatigue usage summary for these components.

EMCB RAI 28

Table 2.2.3-2 of the LR for the guide tubes provides a value of 266.0×10^{-6} in/in strain from measured strain data as an acceptable (or allowable) mean strain and 65.0×10^{-6} in/in for alternating dynamic strain. Please explain where the data that established these values originated from and why these values are applicable to the PBNP guide tubes.

EMCB RAI 29

In Tables 2.2.3-1 and 2.2.3-2 of the LR, the current analyses of record (AOR) values originated from Ginna. Please explain where the “After EPU” column values originate from. Also, please provide an explanation of why, from all of the vessel internals components, only the guide tubes and the thermal shield top support bolts and flexures have been evaluated for flow induced vibration.