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

July 16, 2010

Christopher L. Burton, Vice President
Shearon Harris Nuclear Power Plant
Carolina Power & Light Company
Post Office Box 165, Mail Zone 1
New Hill, North Carolina 27562-0165

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1 – ISSUANCE OF AMENDMENT TO INCORPORATE AN EXPANDED RANGE OF EDUCTOR FLOW RATES (TAC NO. ME3281)

Dear Mr. Burton:

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 134 to Renewed Facility Operating License No. NPF-63 for the Shearon Harris Nuclear Power Plant, Unit 1 (HNP), in response to your application dated January 27, 2010, as supplemented by letter dated March 22, 2010.

The proposed amendment revises Technical Specification Limiting Condition for Operation Section 3.6.2.2.a to incorporate an expanded range of eductor flow rates for the HNP Containment Spray Additive System as a result of the use of a new chemical model and new boric acid equilibrium data, revised sump pH limits, and changes to the Containment Spray Additive Tank concentration and volume limits.

A copy of the related NRC staff safety evaluation is also enclosed. The Notice of Issuance will be included in the Commission's regular biweekly *Federal Register* notice.

Sincerely,

Marlayna Vaaler, Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-400

Enclosures:
1. Amendment No.134 to NPF-63
2. Safety Evaluation

cc w/enclosures: Distribution via Listserv

CAROLINA POWER & LIGHT COMPANY, et al.

DOCKET NO. 50-400

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 134
Renewed License No. NPF-63

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Carolina Power & Light Company (the licensee), dated January 27, 2010, as supplemented by letter dated March 22, 2010, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications, as indicated in the attachment to this license amendment; paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-63 is hereby amended to read as follows:

   (2) <u>Technical Specifications and Environmental Protection Plan</u>

   The Technical Specifications contained in Appendix A, and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, as revised through Amendment No. 134, are hereby incorporated into this license. Carolina Power & Light Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Douglas A. Broaddus, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to Renewed Facility
Operating License No. NPF-63
and the Technical Specifications

Date of Issuance: July 16, 2010

ATTACHMENT TO LICENSE AMENDMENT NO. 134

RENEWED FACILITY OPERATING LICENSE NO. NPF-63

DOCKET NO. 50-400

Replace Page 4 of Renewed Operating License No. NPF-63 with the attached Page 4.

Replace the following page of Appendix A, "Technical Specifications," to Renewed Facility Operating License No. NPF-63 with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

Remove Page	Insert Page
3/4 6-12	3/4 6-12

C. This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect, and is subject to the additional conditions specified or incorporated below.

(1) Maximum Power Level

Carolina Power & Light Company is authorized to operate the facility at reactor core power levels not in excess of 2900 megawatts thermal (100 percent rated core power) in accordance with the conditions specified herein.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, as revised through Amendment No. 134, are hereby incorporated into this license. Carolina Power & Light Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) Antitrust Conditions

Carolina Power & Light Company shall comply with the antitrust conditions delineated in Appendix C to this license.

(4) Initial Startup Test Program (Section 14)[1]

Any changes to the Initial Test Program described in Section 14 of the FSAR made in accordance with the provisions of 10 CFR 50.59 shall be reported in accordance with 50.59(b) within one month of such change.

(5) Steam Generator Tube Rupture (Section 15.6.3)

Prior to startup following the first refueling outage, Carolina Power & Light Company shall submit for NRC review and receive approval if a steam generator tube rupture analysis, including the assumed operator actions, which demonstrates that the consequences of the design basis steam generator tube rupture event for the Shearon Harris Nuclear Power Plant are less than the acceptance criteria specified in the Standard Review Plan, NUREG-0800, at §15.6.3 Subparts II(1) and (2) for calculated doses from radiological releases. In preparing their analysis Carolina Power & Light Company will not assume that operators will complete corrective actions within the first thirty minutes after a steam generator tube rupture.

[1]The parenthetical notation following the title of many license conditions denotes the section of the Safety Evaluation Report and/or its supplements wherein the license condition is discussed.

SPRAY ADDITIVE SYSTEM

LIMITING CONDITION FOR OPERATION

3.6.2.2 The Spray Additive System shall be OPERABLE with:

a. A Spray Additive Tank containing a volume of between 3268 and 3768 gallons of between 27 and 29 weight % NaOH solution, and

b. Two spray additive eductors each capable of adding NaOH solution from the chemical additive tank to a Containment Spray System pump flow.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With the Spray Additive System inoperable, restore the system to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours; restore the Spray Additive System to OPERABLE status within the next 48 hours or be in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.6.2.2 The Spray Additive System shall be demonstrated OPERABLE:

a. At least once per 31 days by verifying that each valve (manual, power-operated, or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position;

b. At least once per 6 months by:

   1. Verifying the contained solution volume in the tank, and
   2. Verifying the concentration of the NaOH solution by chemical analysis.

c. At least once per 18 months by verifying that each automatic valve in the flow path actuates to its correct position on a containment spray or containment isolation phase A test signal as applicable; and

d. At least once per 5 years by verifying each eductor flow rate is between 17.2 and 22.2 gpm, using the RWST as the test source containing at least 436,000 gallons of water.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 134 TO

RENEWED FACILITY OPERATING LICENSE NO. NPF-63

CAROLINA POWER & LIGHT COMPANY

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1

DOCKET NO. 50-400

1.0 INTRODUCTION

By application dated January 27, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML100340310), as supplemented by letter dated March 22, 2010 (ADAMS Accession No. ML100890425), Carolina Power & Light Company (the licensee), now doing business as Progress Energy Carolinas, Inc., submitted a proposed amendment for the Shearon Harris Nuclear Power Plant, Unit 1 (HNP).

The proposed amendment would revise Technical Specification (TS) Limiting Condition for Operation (LCO) Section 3.6.2.2.a, as well as the associated Surveillance Requirement (SR), to incorporate an expanded range of eductor flow rates for the HNP Containment Spray Additive System as a result of the use of a new chemical model and new boric acid equilibrium data, revised sump pH limits, and changes to the Containment Spray Additive Tank concentration and volume limits.

The supplement dated March 22, 2010, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on March 23, 2010 (75 FR 13788).

2.0 REGULATORY EVALUATION

The purpose of the Containment Spray System (CSS) is to remove heat and fission products from a post-accident containment atmosphere by spraying borated sodium hydroxide (NaOH) solution into containment. The presence of a system capable of removing heat from the reactor containment is required by Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Appendix A, General Design Criterion 38, "Containment Heat Removal."

Section 50.46 of 10 CFR, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," requires that the Emergency Core Cooling System (ECCS)

Enclosure

have the capability to provide long-term cooling of the reactor core following a loss-of-coolant accident (LOCA). The ECCS must be able to remove decay heat so that the core temperature is maintained at an acceptably low value for the extended period of time required by the long-lived radioactivity remaining in the core. HNP credits, in part, the CSS with performing safety functions to satisfy the above requirements. Additionally, the CSS is also credited by HNP for reducing the accident source term to meet the limits of 10 CFR Part 100, "Reactor Site Criteria," and/or 10 CFR 50.67, "Accident Source Term."

Section 6.5.2.3.3 of the HNP Final Safety Analysis Report (FSAR), states that the CSS is designed to deliver spray during injection and initial recirculation phases with a pH of approximately 8.2 to enhance iodine absorption. To assure long-term retention of iodine, a minimum pH of 7.0 in the sump at the onset of recirculation and a minimum spray pH of 8.5 at the completion of NaOH addition from the Containment Spray Additive Tank (CSAT) is maintained. A maximum pH of 11.0 is also required.

The HNP FSAR goes on to state that the CSS will provide adequate capability for scrubbing of the containment atmosphere in order to ensure that 10 CFR 50.67 dose limits are not exceeded while assuming Regulatory Guide (RG) 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," release characteristics (see FSAR Section 6.5.2.1.1). FSAR Section 6.5.2.1.2 states that a pH of 8.2 to 11.0 is maintained during the recirculation period to enhance absorption and retention of iodine by chemical reaction. The iodine removed from the containment atmosphere remains in the spray solution.

NUREG-0800, "Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," which is also referred to as the Standard Review Plan (SRP), Section 6.5.2, "Containment Spray as a Fission Product Cleanup System," Revisions 0 and 1, required a pH of 8.5 in the containment sump at the onset of recirculation mode to ensure adequate fission product removal. However, in all subsequent revisions of SRP Section 6.5.2, a pH of 7.0 or greater in the containment sump is considered acceptable for iodine retention.

The NRC staff's technical review consisted of comparing the licensee's proposed changes against the applicable regulatory criteria cited above, as well as reviewing the information provided by the licensee as it relates to the methodology for concluding that existing regulatory criteria will continue to be satisfied after the proposed changes are implemented.

3.0 TECHNICAL EVALUATION

3.1 System Description

The purpose of the CSS at HNP is to remove heat and fission products (primarily iodine) from a post-accident containment atmosphere by spraying borated NaOH solution into the containment. The CSS consists of two independent and redundant loops, each containing a spray pump, piping, valves, spray headers, and spray valves. The operation of the CSS is automatically initiated by the Containment Spray Actuation Signal (CSAS), which occurs when a containment high-pressure signal is reached. Upon receipt of a CSAS, the containment spray pumps begin operation and the containment spray isolation valves open.

Each redundant train of the CSS contains a pump that draws borated water from the refueling water storage tank (RWST). A small recirculation line across each pump passes water through an eductor. Under accident conditions, NaOH drawn from the CSAT by the eductor is then blended into the spray stream that is pumped to the spray headers at the top of the containment dome. Under test conditions, the eductor draws water from the RWST and the pump recirculates back to the RWST. The test and post-accident eductor flow paths are different. The CSAT supplies NaOH under accident conditions, while borated water from the RWST is substituted for NaOH during surveillance testing. The test flow path and the post-accident flow path for each train share a common throttle valve.

3.2 Applicable TS and SR Requirements

HNP TS LCO Section 3.6.2.2, "Containment Spray Additive System," provides the operability requirements, allowed conditions, required actions, completion times and SRs associated with HNP's CSS. Per LCO 3.6.2.2, the Spray Additive System (SAS) is considered operable when the CSAT contains the proper mixture and amount of NaOH and the two spray additive eductors are each capable of adding NaOH solution from the chemical additive tank to a CSS pump flow in Modes 1, 2, 3, and 4.

HNP SR 4.6.2.2 contains the associated surveillance requirements that must be performed to demonstrate the operability of the SAS. In accordance with SR 4.6.2.2.d, the flow rate of each eductor is currently verified to be between 19.5 and 20.5 gallons per minute (gpm), using the RWST as the test source, at least once per 5 years. HNP has had difficulty maintaining repeatable test results within this flow band due to the system design. Specifically, when the eductor surveillance test is performed, the as-found flow rate is discovered to have drifted from the previous as-left flow rate and is outside the allowable SR 4.6.2.2.d limits despite no manipulation of the associated throttle valve between tests.

For this reason, the licensee is seeking to expand the range of allowable eductor flow rates from the original values to between 17.2 and 22.2 gpm. Changes in the allowable eductor flow rate will change the rate of NaOH addition through the CSS, and in turn impact the post-LOCA pH calculations and the ability to retain radioactive iodine.

Because the proposed changes to the flow eductors do not impact the overall containment spray flow rate, only the composition of the fluid, the existing temperature and pressure analyses for the HNP containment remain unchanged. As such, the licensee stated that with the proposed changes, the CSS will continue to provide containment atmosphere cooling to limit post-accident pressure and temperature in containment to less than the design values. In addition, in the event of a design basis accident (DBA), the reduction of containment pressure and the iodine removal capability of the spray both maintain the release of fission product radioactivity from containment to the environment to within specified limits.

3.3 Proposed Change

The HNP post-accident pH calculation has been revised to evaluate and justify an expanded range of eductor flow rates using a new chemical model and new boric acid equilibrium data, revised sump pH limits, and changes to CSAT concentration and volume limits. The calculation estimating post-accident chemical precipitate formation has also been revised based on output from the post-accident pH calculation to show that the new spray pH boundaries do not affect the input assumptions used during recirculation sump screen testing.

As a result of the updated analyses, the proposed change to HNP's TS includes revisions to the weight-percent NaOH, the contained volume, the indicated level of the CSAT, and the eductor flow limits related to the CSS and the SAS, as follows:

- The allowable concentration of NaOH in the CSAT in HNP TS LCO 3.6.2.2.a is changed from 28-30 percent to 27-29 percent.
- The upper CSAT volume limit in TS LCO 3.6.2.2.a is changed from 3964 gallons to 3768 gallons. The lower CSAT volume limit of 3268 gallons remains unchanged.
- The indicated percent level range for the CSAT in TS LCO 3.6.2.2.a will change from 92-96 percent to 90.7-93.9 percent. The percent level range for the CSAT, however, will be removed from HNP's TS in favor of the volume limits alone. This is to avoid confusion between the two sets of numbers, which do not directly correspond. The volume and percent level values do not correspond directly with each other due to the inclusion of instrument uncertainty into the percent level limits.
- The eductor flow limits in SR 4.6.2.2.d are changed from 19.5-20.5 gpm to 17.2-22.2 gpm as measured using the RWST as the test source.

The licensee established all of the above limits through iterations to the pH analysis and the containment sump precipitate analysis performed by Numerical Applications, Inc. under a quality assurance program that complies with 10 CFR Part 50, Appendix B. As previously noted, the revised pH analysis incorporates a new chemistry model that more accurately predicts the equilibrium pH of the containment sump and spray. The revised methodology is a significant reason for the wider range of allowable eductor flow rates.

The current HNP licensing basis requires that the post-accident containment sump reach a pH of at least 8.5 at the completion of NaOH addition. This limit will be eliminated and the existing requirement for sump pH to meet or exceed 7.0 at the onset of ECCS recirculation will be retained. Since post-accident sump pH and eductor flow are directly related, a wider pH band (7.0 to 11.0 versus 8.5 to 11.0) will allow for a wider range of NaOH/RWST flow.

Although the minimum allowable CSAT volume remains unchanged at 3268 gallons, the low level alarm set point on the CSAT will be reduced from 48.00 inches above the bottom of the tank (IABT) to 47.10 IABT. This was established by eliminating some of the margin conservatively added to the level set points in the uncertainty calculations.

The results of the incorporation of the above changes into the post-accident pH calculation and the post-accident chemical precipitate calculation indicate that containment sump and spray pH values, as well as the predicted mass of chemical precipitates, will remain within analyzed limits.

3.4 Changes to the Containment Sump pH Requirements

The current TS SR 4.6.2.2.d for the SAS requires that the eductor flow rate using the RWST as a test source be between 19.5 gpm and 20.5 gpm. The currently applicable pH requirements for HNP are based on prevention of iodine re-evolution, corrosion considerations and precipitate formation. These requirements specify that the equilibrium containment sump pH be greater than 7.0 at the onset of the spray recirculation mode and that the maximum containment spray and sump pH profiles do not cause an increase in the mass of precipitates previously evaluated for HNP. As stated by the licensee, the proposed eductor flow rate range (with the RWST as a test source), along with the other proposed changes, assure these requirements are met.

The NaOH solution, which is injected into the CSS lines just upstream of the containment spray pump suction, enhances absorption and retention of iodine through chemical reaction. Maintaining the pH value within the specified range during the long-term recirculation period minimizes the effect of chloride and caustic stress corrosion on mechanical systems and components. Industry operating experience with this type of flow eductor/pump combination indicates that turbulence in the fluid passing through the pump is sufficient to assure complete and uniform mixing. The fission product iodine removed from the containment atmosphere remains in the spray solution and will not evolve back into the containment atmosphere.

The containment spray radioactivity removal rate and the retention of radioactivity in the containment sump are inputs to the offsite dose analysis. The spray removal coefficients for elemental iodine and particulate iodine are presented in HNP FSAR Section 6.5.2.3.2. No credit is taken for spray removal/retention of organic iodine compounds. The dose calculations are dependent on the spray not becoming a source of airborne radioactivity once recirculation begins. This is accomplished by having a sump and spray pH greater than 7.0 after spray recirculation begins. As outlined in NUREG/CR-5950, "Iodine Evolution and pH Control," referenced in the alternative source term summary report, retention of iodine in the recirculation pool is dependent on pool pH. The tendency for retained iodine to convert back to elemental (gaseous) iodine becomes extremely small for pH values above 6.0.

After a LOCA, a variety of different chemical species are released from the damaged core, one of which is radioactive iodine. Iodine, when released to the environment, contributes significantly to radiation doses. It is therefore essential to keep iodine confined within the plant's containment. According to NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants," iodine is released from the core in three different chemical forms. At least 95 percent is released in ionic form as cesium iodide, and the remaining 5 percent as elemental iodine and hydriodic acid (HI).

Cesium iodide and hydriodic acid are ionized in water, and are therefore soluble. However, elemental iodine is scarcely soluble. Accordingly, in order to sequester the iodine in water, it is desirable to maintain as much as possible of the released iodine in ionic form. In the radiation environments existing within containment, some of the ionic iodine dissolved in water is converted into the elemental form. The degree of conversion varies significantly with the pH of the water present within containment. At a higher pH, conversion to the elemental form is lower and at pH greater than 7.0 it becomes negligibly small. The relationship between the rate of iodine conversion and pH is shown in Figure 3.1 of NUREG/CR-5950.

In order to show that the proposed change in eductor flow rates would not adversely impact the dose calculations associated with iodine evolution, the licensee provided a revised sump pH calculation that included a new chemical model and new boric acid equilibrium data, revised sump pH limits, and changes to the CSAT concentration and volume limits.

The licensee provided information regarding the assumptions and calculations used to verify that the sump pH would remain greater than 7.0 following a LOCA. The licensee's analysis considered minimum and maximum boron concentrations and volumes for the refueling water storage tank, accumulators, pressurizer, and reactor coolant system. Additional inputs included the impact of strong acids generated by radiation of cable insulation and sump water. The licensee used conservative values for the quantity of cable material inside containment and considered the maximum water volume when determining the amount of sump fluid present. The NRC staff finds the licensee's calculations for strong acid generation acceptable based on the conservative assumptions used to create the calculation inputs.

The licensee's minimum pH evaluation used the maximum borated water source volumes and concentrations, as well as the contribution of acid from the radiolysis of cables and sump fluid, to determine the minimum sodium hydroxide concentration and CSAT volume necessary to ensure an equilibrium sump pH greater than 7.0. The calculation determined that a CSAT volume of 3268 gallons with a 27 weight-percent NaOH solution would be sufficient to maintain the overall pH greater than 7.0. Any quantity of NaOH greater than this will ensure that the sump pool pH will remain in an alkaline regime under the worst case boron concentrations, sump fluid volumes, and quantities of strong acid generated.

The maximum pH case was also analyzed based on the proposed TS limit of a CSAT volume of 3768 gallons containing a 29 weight-percent NaOH solution. The maximum pH case remains consistent with the previous maximum pH of 11.0.

The HNP TS SRs ensure that at least once every 6 months the licensee verifies the concentration and volume of the NaOH solution in the spray additive tank. In addition, the TS limit on minimum sodium tetraborate mass will ensure that there is sufficient NaOH available to maintain the post-LOCA sump pH above 7.0.

A change in the post-LOCA pH profile for the containment spray and the sump pool also impacts the corrosion rate and solubility of materials that can contribute to chemical effects in the form of precipitates that may impact ECCS strainer performance. Accordingly, the licensee's calculation of post-accident chemical precipitate formation has been revised based on output from the post-accident pH calculation to show that the new spray pH histories do not affect the input assumptions used during recirculation sump screen testing.

In addition, the quantity of chemical precipitate generated under the proposed conditions for eductor flow rates and CSAT volume and concentration are less than or equal to the quantity used for the HNP ECCS strainer qualification testing. The NRC staff will review the licensee's ECCS strainer performance as part of the response to Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors"; however, it is noted that this proposed change will not adversely impact the licensee's current analysis and testing for Generic Safety Issue 191.

The NRC staff reviewed the licensee's analysis for maintaining suppression pool pH greater than or equal to 7.0 for 30 days following a LOCA, and concluded that the assumptions and analysis used conservative values for the key parameters of the calculation. The assumptions are appropriate and consistent with the methods accepted by the staff for the calculation of post-accident containment sump pH. The staff also verified that the proposed TS requirements for NaOH concentration and volume will ensure sufficient buffering of the sump pool such that the pH will not drop below 7.0. Finally, the staff determined that HNP's proposed changes are consistent with the guidance contained in RG 1.183, which states that maintaining the pH at or above 7.0 will minimize re-evolution of iodine from the suppression pool water. Accordingly, the NRC staff finds the proposed changes discussed above acceptable.

3.5 Hydrogen Generation Evaluation

The licensee stated that, in accordance with HNP FSAR Section 1.8, HNP is committed to RG 1.7, "Control of Combustible Gas Concentrations in Containment," which describes methods acceptable to the NRC staff for implementing 10 CFR 50.44 for reactors. Section 50.44 of 10 CFR requires that plants be able to limit and control the quantity of post-accident hydrogen gas in containment. Hydrogen generation in containment is strongly dependent on the rate of corrosion of the materials in containment during post-accident conditions, particularly aluminum and galvanized steel, which contains zinc.

According to RG 1.7, the corrosion rate of aluminum is dependent upon fluid pH, among other factors (particularly temperature). Because accurate corrosion rates are difficult to determine given the various post-accident influences, Table 1 of RG 1.7 provides a conservative aluminum corrosion rate for use in determining hydrogen generation. This value is to be adjusted for increased temperature but is not required to be adjusted for variable pH. This approach is also applied to calculation of the hydrogen generation rates as a result of zinc corrosion.

In the HNP hydrogen generation calculation, hydrogen generation rates are adjusted for temperature but not for pH (which is consistent with the guidance provided in RG 1.7). Accordingly, the licensee concluded that the calculated amount of hydrogen generated by aluminum and zinc corrosion is unaffected by retaining the existing sump pH limit of 7.0.

The NRC staff accepts the licensee's conclusion that retaining the sump pH limit will have no adverse impact on hydrogen production due to aluminum or zinc corrosion based on (1) the information provided in the application, (2) the guidance of RG 1.7, and (3) the general assumption that zinc and aluminum corrosion effects are minimal in a pH environment of 7.0.

3.6 Changes to CSAT Maximum Level and Sodium Hydroxide Concentration

The licensee stated that the maximum pH case in the revised analysis was found, through much iteration, to be optimized by decreases in CSAT maximum volume and concentration. Therefore, HNP TS 3.6.2.2.a is being revised to provide a new 3768-gallon upper limit on CSAT volume (the existing limit is 3964 gallons) and a new sodium hydroxide concentration range of 27-29 percent (the existing range is 28-30 percent). The new percent level limits used to verify the new volume limits are 90.7-93.9 percent (the existing limits are 92-96 percent). Note that although the percent level limits are being removed from the TS, percent level indication for the CSAT will remain available and may be used by the operators to verify system conditions.

The LO-LO (empty) and LO tank levels are alarmed on the main control board while the HI tank level is not. Although the minimum allowable CSAT volume remains unchanged at 3268 gallons, the associated LO level alarm set point for the reactor protection system will be reduced from 48.00 IABT to 47.10 IABT in order to provide as much separation between the LO and HI level limits as possible. This is done by eliminating some of the margin conservatively added to the level set points uncertainty calculation.

HI tank level is calculated in terms of percent level; however, this input is used only in operating procedures for tank volume monitoring and adjustments. Accordingly, removal of the percent level limits from the HNP TS will not have an effect on the overall HI alarm set point of 48.70 IABT, which includes uncertainty and provides a 3.2 percent operating range for tank level between the upper limit and the low alarm set point.

HNP's uncertainty calculation, which adjusts the levels for instrument uncertainty as part of the determination of the final set points, as well as the scaling calculations, has been revised to accommodate the new 3768-gallon upper volume limit.

Minimum post-LOCA containment water level is a critical value for assuring adequate net positive suction head to the Residual Heat Removal and Containment Spray Pumps. It is also a factor in the determination of debris transport to the ECCS recirculation sump screens and the potential for vortex formation above the screens.

The HNP calculation for minimum post-LOCA containment water level considers a contribution of fluid from the CSAT to the volume of post-LOCA water on the containment floor. Because this calculation is concerned with minimum volume, it considers only the volume of fluid drawn from the CSAT in the time that it takes the containment atmosphere to reach peak temperature. Therefore, because of the time dependent (rather than volume dependent) nature of the associated calculation, the licensee stated that the decrease in CSAT maximum level has no effect on the calculated minimum post-LOCA containment water level.

In the licensee's maximum post-LOCA containment water level calculation, the full volume of the CSAT (currently 3964 gallons) is used to calculate a maximum level of 228.6 feet. Clearly, a reduction in the maximum tank volume adds margin to the analysis. Therefore, the licensee stated that the change in CSAT volume does not impact the calculated maximum post-LOCA containment water level.

Based on the above discussion, the NRC staff accepts that the proposed changes to the CSAT maximum level and NaOH concentration will not adversely impact the post-LOCA containment water analyses (both minimum and maximum).

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the State of North Carolina official was notified of the proposed issuance of the amendment on July 7, 2010. The North Carolina State official 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. 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 amendments involve no significant hazards consideration, and there has been no public comment on such finding, which was published in the *Federal Register* on March 23, 2010 (75 FR 13788). Accordingly, the amendments meet 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 amendments.

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.

Principal Contributor: Matthew Yoder

Date: July 16, 2010

July 16, 2010

Christopher L. Burton, Vice President
Shearon Harris Nuclear Power Plant
Carolina Power & Light Company
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New Hill, North Carolinax 27562-0165

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1 – ISSUANCE OF AMENDMENT TO INCORPORATE AN EXPANDED RANGE OF EDUCTOR FLOW RATES FOR THE CONTAINMENT SPRAY ADDITIVE SYSTEM (TAC NO. ME3281)

Dear Mr. Burton:

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 134 to Renewed Facility Operating License No. NPF-63 for the Shearon Harris Nuclear Power Plant, Unit 1 (HNP), in response to your application dated January 27, 2010, as supplemented by letter dated March 22, 2010.

The proposed amendment revises Technical Specification Limiting Condition for Operation Section 3.6.2.2.a to incorporate an expanded range of eductor flow rates for the HNP Containment Spray Additive System as a result of the use of a new chemical model and new boric acid equilibrium data, revised sump pH limits, and changes to the Containment Spray Additive Tank concentration and volume limits.

A copy of the related NRC staff safety evaluation is also enclosed. The Notice of Issuance will be included in the Commission's regular biweekly *Federal Register* notice.

Sincerely,

/RA/

Marlayna Vaaler, Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-400

Enclosures:
1. Amendment No.134 to NPF-63
2. Safety Evaluation

cc w/enclosures: Distribution via Listserv

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NAME	MVaaler	BClayton for CSola	RTaylor*	RElliott	CKanatas	DBroaddus
DATE	7/12/10	7/9/10	6/17/2010	7/13/10	07/16/10	07/16/10

*by memo

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