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U. S. Nuclear Regulatory Commission
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BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
REQUEST FOR LICENSE AMENDMENTS
ENHANCED OPTION I-A STABILITY TE ,CAL SPECIFICATIONS

Gentlemen:

In accordance with the Code of Federal Regulations, Title 10, Parts 50.90 and 2.101, Carolina Power & Light Company hereby requests a revision to the Technical Specifications for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2. The proposed revision would allow full implementation of the Boiling Water Reactor Owners Group (BWROG) Enhanced Option I-A (E1A) Reactor Stability Long Term Solution. These revisions are being submitted in the format of the Improved Standard Technical Specifications (ISTS) to allow implementation concurrent with implementation of the BNP Improved Technical Specifications (ITS) in the fourth quarter of 1997.

The basis for these proposed amendments is provided in Supplement 4 to NEDO-32339, "Reactor Stability Long Term Solution: Enhanced Option I-A Generic Technical Specifications." Supplement 4 to NEDO-32339 has been found by the NRC to be an acceptable basis for the Technical Specifications to implement the E1A long term solution. The NRC review is documented in a Safety Evaluation Report, "Reactor Stability Long-Term Solution, Enhanced Option 1-A Generic Technical Specifications, NEDO-32339, Supplement 4," dated June 21, 1996.

Implementation of these proposed amendments concurrent with the Brunswick conversion to the Improved Standard Technical Specifications provides for the most efficient use of CP&L and NRC staff resources. Substantial benefits can be gained in consolidating procedure revision efforts, training development, and training by concurrent implementation of these amendments with the Brunswick ITS conversion effort. CP&L's implementation schedule for long-term resolution of the thermal hydraulic instability concerns is documented in a Supplemental Response to Generic Letter 94-02, "Long-Term Solution and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in BWRs," (reference CP&L letter BSEP 96-0072, dated March 13, 1996).

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The BNP ITS submittal (TSC 96TSB02) also includes the typed Technical Specifications and Bases related to the E1A long term solution proposed in this request for license amendments. In order to facilitate NRC technical branch review, this amendment request provides the plant-specific basis for the changes related to the E1A long term solution and is being submitted in parallel with the BNP ITS submittal.

Certain changes which appear on the BNP ITS pages of this submittal differ from existing Technical Specifications and are not addressed in this submittal. Those changes are addressed within the BNP ITS submittal. In addition, the marked-up current Technical Specification pages in this submittal (Enclosures 4 and 5) have been marked in a similar manner as the current Technical Specification markups in the BNP ITS submittal since the Technical Specifications changes related to thermal hydraulic instability and the BNP ITS are being proposed concurrently.

In order to allow time for completion of procedure revisions and training, CP&L requests that the proposed amendments, once approved by the NRC, be issued with the BNP Units 1 and 2 ITS with an implementation date no later than the ITS implementation.

Carolina Power & Light Company is providing, in accordance with 10 CFR 50.91(b), Mr. Dayne H. Brown of the State of North Carolina with a copy of the proposed license amendments.

Please refer any questions regarding this submittal to Mr. Mark Turkal at (910) 457-3066.

Sincerely,

William R. Campbell

William R. Campbell

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Enclosures:

1. Basis for Change Request
2. 10 CFR 50.92 Evaluation
3. Environmental Considerations
4. Marked-up Technical Specifications and Bases Pages - Unit 1
5. Marked-up Technical Specifications and Bases Pages - Unit 2
6. Typed Technical Specifications and Bases Pages - Unit 1
7. Typed Technical Specifications and Bases Pages - Unit 2

William R. Campbell, having been first duly sworn, did depose and say that the information contained herein is true and correct to the best of his information, knowledge and belief; and the sources of his information are officers, employees, and agents of Carolina Power & Light Company.

Gwendolyn R. Midgette
Notary (Seal)

My commission expires: August 12, 2001

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ENCLOSURE 1

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
NRC DOCKET NOS. 50-325 AND 50-324
OPERATING LICENSE NOS. DPR-71 AND DPR-62
REQUEST FOR LICENSE AMENDMENTS
ENHANCED OPTION I-A STABILITY TECHNICAL SPECIFICATIONS

BASIS FOR CHANGES

Current Requirements

Current Technical Specification 3/4.4.1.1 limits the allowed power and flow conditions during operation with two reactor coolant recirculation loops in operation. The immediate actions required, when the power and flow conditions of current Technical Specification Figure 3.4.1.1-1 are not met with any number of operating recirculation loops operating, are consistent with the recommendations of General Electric (GE) Service Information Letter (SIL) #380, "BWR Core Thermal Hydraulic Stability," Revision 1, dated February 10, 1984. With no recirculation loops in operation, power must be immediately reduced to comply with the power limits, (with no recirculation loops operating, increasing flow would not be possible). With one recirculation loop operating, power must be immediately reduced or flow increased to comply with the limits.

With two recirculation loops operating, the operator may either take immediate action to comply with the power and flow limits or monitor neutron flux noise levels within two hours. When the operator chooses to monitor neutron flux noise levels, the observed levels are compared with baseline noise levels established during testing following a refueling outage. Furthermore if neutron flux noise levels exceed three times the established baseline, the operator must take immediate action to reduce the noise levels and meet the power and flow limits presented in current Technical Specification Figure 3.4.1.1-1.

Current Technical Specification Table 4.3.1-1 includes Note (f) which is applicable to Reactor Protection System (RPS) Function 2.b, "Average Power Range Monitor (APRM) Flow-Biased Simulated Thermal Power - High". This note indicates that the weekly Channel Calibration applicable to Function 2.b includes adjustment of the APRM flow biased simulated thermal power channel to conform to a calibrated flow signal.

The allowable value for RPS Function 2.b in current Technical Specification Table 2.2.1-1 is expressed as a function of the variable W which is defined in Note © to be the fraction of rated recirculation loop flow (W) in percent. Note © of Table 2.2.1-1 also refers to current Technical Specification Figure 2.2.1-1, "APRM Flow Bias Scram Relationship to Normal Operating

Conditions" and Note (d) indicates the APRM flow biased simulated thermal power signal is fed through a time constant circuit of approximately 6 seconds.

Current Technical Specification 6.9.3.1 lists the specifications for which limits are included in the Core Operating Limits Report.

Proposed Changes

The proposed change will enable the full implementation of the Enhanced Option I-A (E1A) long term solution to the neutronic/thermal hydraulic instability issue. Specifically, the proposed change deletes the limits on power and flow conditions associated with the implementation of the guidance in SIL 380, Revision 1 (current Technical Specification 3/4.4.1.1 and Figure 3.4.1.1-1), adds two new specifications (BNP ITS 3.2.3 and 3.3.1.3), and modifies an existing specification (Function 2.b of current Technical Specification 3.3.1 (BNP ITS 3.3.1.1)) and the description of the contents of the Core Operating Limits Report (COLR) in current Technical Specification 6.9.3.1 (BNP ITS 5.6.5). The two new specifications require maintaining a stability control and the availability of a stability detection system during operation in defined regions of the power and flow operating domain. In a general sense, the actions required when the power and flow limits of current Technical Specification 3/4.4.1.1 are not met are replaced by requirements to maintain the stability control and the availability of the stability detection system over a similar region of the power and flow operating domain. The additions and modifications of the proposed change are consistent with the description of the E1A solution as described in NEDO-32339, "Reactor Stability Long-Term Solution: Enhanced Option I-A" and Supplements 1-4. NEDO-32339 and Supplements 1, 2, 3 and 4 have been reviewed and found acceptable by the NRC Staff when appearing as a reference in license applications.

The requirements of 10 CFR 50 Appendix A, General Design Criterion 12 (GDC-12) specify that neutronic/thermal hydraulic instability is to be prevented by design or be readily and reliably detected and suppressed. After neutronic/thermal hydraulic instability events occurred in the early 1980's at Boiling Water Reactors (BWRs) outside the United States it was recognized that some BWR designs did not prevent neutronic/thermal hydraulic instability. To improve the ability of the operator to detect and suppress potential neutronic/thermal hydraulic instability, General Electric prepared Service Information Letter (SIL) #380, Revision 1. The recommendations of SIL #380, Revision 1, were developed based on the limited event and test data available. When cycle specific analytical projections of decay ratios approached and then exceeded a threshold value specified by the NRC for the then current accepted licensing methodology, requirements consistent with the recommendations of SIL #380, Revision 1, were incorporated in the Brunswick Nuclear Plant Units 1 and 2 Technical Specifications as required by the NRC.

Following the neutronic/thermal hydraulic instability event at LaSalle Unit 2 in early 1988, the NRC issued IE Bulletin 88-07. The Boiling Water Reactor Owners Group (BWROG) responded to concerns raised by the NRC pertaining to the neutronic/thermal hydraulic instability issue by performing studies utilizing newer and more detailed models originally developed for the analysis of other BWR neutronic/thermal hydraulic transients. The results of these BWROG studies indicated the potential for neutronic/thermal hydraulic instability to exceed specified acceptable fuel design limits established for anticipated operational occurrences routinely evaluated to demonstrate compliance with 10 CFR 50 Appendix A, General Design Criterion 10. Specifically, it was concluded that neutronic/thermal hydraulic instability can result in power oscillations which could result in exceeding the Minimum Critical Power Ratio (MCPR) Safety Limit (SL) prior to automatic actuation of the Reactor Protection System.

Based on these results the BWROG developed Interim Corrective Actions (ICAs) which identified operator actions to be taken based on Neutron Monitoring System (NMS) response, recirculation loop operation and power and flow conditions within the licensed operating domain. The ICAs caused a region of the power and flow operating domain to be excluded from normal operation that was larger than that specified by the power and flow limits of current Technical Specification Figure 3.4.1.1-1. The ICAs were administratively implemented at Brunswick Nuclear Plant Units 1 and 2 in late 1988 and have remained in continuous use.

Concurrent with the development of the ICAs, the BWROG also initiated efforts to develop generic long term solutions to the neutronic/thermal hydraulic instability issue for the industry. As described in IE Bulletin 88-07, Supplement 1, the ICAs were accepted by the NRC as adequate compensatory measures pending final development and implementation of the long term solutions being developed by the BWROG. One of the solutions initially developed by the BWROG was designated Option I-A. The original Option I-A solution is described in NEDO-31960 and was later enhanced through the efforts of a smaller number of BWROG participants resulting in the Enhanced Option I-A solution described in NEDO-32339.

Implementation of long term solutions to the Boiling Water Reactor (BWR) neutronic/thermal hydraulic instability issue has been an industry and regulatory objective since issuance of Supplement 1 of IE Bulletin 88-07. The E1A solution option was identified as the solution proposed to be implemented at the Brunswick Nuclear Plant (BNP) Units 1 and 2 in response to Generic Letter 94-02, "Long-Term Solution and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in BWRs." Upon full implementation of the E1A long term stability solution, the administrative controls established to comply with the guidance of the BWROG ICAs will no longer be formally enforced at Brunswick Units 1 and 2.

Elimination of the limits on power and flow conditions of current Technical Specification 3/4.4.1.1 and Figure 3.4.1.1-1 and the guidance of the BWROG ICAs is justified based on the following attributes of the E1A long term solution:

- Operation in the region of the power and flow operating domain most susceptible to neutronic/thermal hydraulic instability is excluded from the licensed operating domain and

- Operation in the region of the power and flow operating domain potentially susceptible to neutronic/thermal hydraulic instability in the absence of stability control requires implementation of a stability control prior to entry.

These regions are established using the NRC accepted E1A methodology and reflect plant specific design and operating data of each Brunswick Nuclear Plant unit.

The characteristics of a reactor system most important in determining stability performance are power, core flow and power distribution. Recirculation system design can impact the calculated stability performance through the coupling of the fluid in the recirculation system piping with the reactor core. For a given power, core flow and power distribution, differences in the calculated stability performance can be of some significance when large differences in the physical dimensions of the recirculation piping (i.e., jet pump configuration, recirculation pipe length and diameter and pump inertia) are assumed. However, the E1A methodology requires modeling the plant specific characteristics of the recirculation system design important in evaluating the stability performance of the reactor system and determining the E1A regions. Operation with a different number of operating recirculation loops at the same power, core flow and power distribution, will have only minor impact on these characteristic values. Furthermore, for a given power and core flow, adherence to the stability control adopted for implementation with the E1A solution has been demonstrated, as described in Section 9 of NEDO-32339, to greatly reduce the sensitivity of stability performance to all other parameters. Therefore, elimination of the power and flow limits of current Technical Specification 3/4.4.1.1 and Figure 3.4.1.1-1 is appropriate for operation with any number of recirculation loops.

Elimination of the operator actions (in current Technical Specification 3/4.4.1.1) to monitor neutron flux noise levels prior to and during operation within the power and flow limits of current Technical Specification Figure 3.4.1.1-1, elimination of requirements to establish baseline neutron flux noise levels, and elimination of requirements to monitor individual LPRM signals from different areas of the core for the presence of oscillations with characteristics consistent with neutronic/thermal hydraulic instability based on the BWROG ICAs is justified based on the following attribute of the E1A long term solution:

- The required operation of a stability detection system that monitors individual LPRM signals for evidence of neutronic/thermal hydraulic instability during operation in a region of the power and flow operating domain significantly larger than the region that is potentially susceptible to neutronic/thermal hydraulic instability in the absence of stability control.

The E1A solution prevents reactor instability through a combination of features. Implementation of some of these features require changes to the Technical Specifications. The BWROG E1A Committee prepared Supplement 4 to NEDO-32339, "Reactor Stability Long-Term Solution: Enhanced Option I-A: Generic Technical Specifications" to describe the changes to the Improved Standard Technical Specifications (ISTS) of NUREG-1433. NEDO-32339, Supplement 4, provides the basis for the changes in these license amendment requests. The features of the E1A solution prevent neutronic/thermal hydraulic instability by limiting reactor operation, including conditions resulting from unexpected transients, to prescribed power and flow conditions.

The portion of the reactor power and flow operating domain that must be excluded from the licensed operating domain due to the potential for neutronic/hydraulic instability is designated the Exclusion Region. A portion of the licensed operating domain, immediately adjacent to the Exclusion Region is defined as the Restricted Region. Planned operation in the Restricted Region requires implementation of a stability control prior to entry. The APRM flow biased control rod block setpoint is adjusted to coincide with the lower boundary of the Restricted Region and thereby provides an operator aid in identifying entry into the Restricted Region. The APRM flow biased control rod block function does not meet the NRC criteria in 10 CFR 50.36(c)(2)(ii) for inclusion in the Technical Specifications and only serves as an operator aid. Therefore, it is not retained in the Technical Specifications. As described in Supplement 4, NEDO-32339, gross violation of the licensed operating domain is prevented by the APRM flow biased scram function and is not used directly to protect the MCPR SL. Therefore, the APRM flow biased scram function does not meet the NRC criteria in 10 CFR 50.36(c)(2)(ii) for inclusion in Technical Specifications. However, since the APRM flow biased scram function is a feature of the E1A stability solution necessary to ensure compliance with 10 CFR 50 Appendix A, General Design Criterion 12, it is retained in the Technical Specifications.

The APRM flow biased scram function as modified by the E1A solution prevents gross violation of the licensed power and flow operating domain which provides a pre-emptive automatic reactor scram upon entry into regions of the operating domain most susceptible to neutronic/thermal hydraulic instability. This feature of the E1A solution will increase the occurrence of automatic reactor scram since the APRM flow biased scram function will cause automatic reactor scram upon entry into this region of the operating domain. However, the region of the operating domain most susceptible to neutronic/thermal hydraulic instability and

the region requiring immediate manual reactor scram upon entry by the recommendations of the BWROG ICAs are similar. Therefore, the overall incidence of reactor scram will not significantly change due to the E1A modification of the APRM flow biased scram function.

NEDO-32339, Supplement 4, as accepted by the NRC, relocates the Allowable Value of the APRM flow biased scram function to the COLR. This relocation facilitates the revision of these values as it becomes necessary to update them due to changes in core or fuel designs. The proposed change also relocates the Function 2.b (APRM flow biased scram) Allowable Value (expressed as a function of the parameter (W)) from current Technical Specification Table 2.2.1-1 (BNP ITS Table 3.3.1.1-1) to the COLR. Current Technical Specification Figure 2.2.1-1 which describes the APRM flow biased scram Allowable Value (Note © to current Technical Specification Table 2.2.1-1) is also relocated to the COLR. The Function 2.b Allowable Value is replaced with footnote (b) to BNP ITS Table 3.3.1.1-1, which states that the Allowable Values are specified in the COLR. Changes to the relocated APRM flow biased scram Allowable Value information in the COLR will be controlled using 10 CFR 50.59. The function of the APRM flow biased scram in the E1A long term solution is to prevent gross violation of the licensed operating domain and is not used to directly protect the MCPR SL. In addition, the APRM flow biased scram is not credited in the mitigation of design basis accidents or transients. As a result, the APRM flow biased scram Allowable Values are not necessary to be included in the Technical Specifications to ensure the Function remains capable of mitigating design basis accidents or transients. A commensurate change is also proposed to current Technical Specification 6.9.3.1 (BNP ITS 5.6.5) to indicate that the COLR contains the Allowable Values of the APRM flow biased scram and provides the methodology for development and revision of these limitations. The methodology for development and revision of these limitations is provided in NRC approved Licensing Topical Report NEDO-32339 and NEDC-32339 Supplement 1 and NEDO-32339 Supplement 3. NEDC-32339 Supplement 1 and NEDO-32339 Supplement 3 were approved in NRC Safety Evaluations dated January 4, 1996 and May 28, 1996, respectively.

To facilitate intentional entry into the Restricted Region once the stability control is in place, the APRM flow biased control rod block setpoint is "Setup". With the "Setup" setpoint value selected, the setpoint is elevated above the normal "non-Setup" value and entry into the Restricted Region does not result in an APRM flow biased control rod block. Operation with the stability control implemented reduces the susceptibility to neutronic/thermal hydraulic instability while operating in the Restricted Region. The APRM flow biased scram setpoint is also elevated to preserve the margin between the rod block and scram setpoints.

The stability control used in the E1A solution is the Fraction of Core Boiling Boundary (FCBB). The FCBB is the ratio of the power generated in the lower 4 feet of the active reactor core to the power required to produce bulk saturated boiling of the coolant entering the fuel channels. The value of 4 feet above the bottom of the active fuel is set as the boiling boundary limit based on analysis described in Section 9 of NEDO-32339. The boiling boundary limit is established to

ensure that the core will remain stable during normal reactor operations in the Restricted Region of the power and flow operating domain which may otherwise be susceptible to neutronic/thermal hydraulic instability. This core average boiling boundary is manipulated by operator actions that affect power distribution. The associated operating limit, FCBB, is required to be met during operation in the Restricted Region and meets Criterion 2 of 10 CFR 50.36(c)(2)(ii). Therefore, a new specification (BNP ITS 3.2.3) is appropriately added to the Power Distribution Limits section of the Technical Specifications.

The design of the hardware required for implementation of the E1A solution provides the capability for the APRM flow biased control rod block and scram function setpoint values to be "Setup" prior to and during operation in the Restricted Region. In order to provide this feature the original Flow Control Trip Reference (FCTR) card of the RPS is replaced with a card of a new design specifically developed and manufactured for implementation of the E1A solution. The design of the E1A FCTR card includes both analog and digital components as described in NEDO-32339, Supplement 2, "Reactor Stability Long-Term Solution: Enhanced Option I-A: Solution Design". The digital design of some of the components provides the capability to perform all the features required by the flow mapping methodology including the mapping of the boundaries of the Exclusion Region and Restricted Region, established as a function of power versus core flow to setpoint versus drive flow.

The drive flow to core flow mapping methodology described in NEDO-32339, Supplement 3, uses plant specific historical operating data to improve the derivation of core flow from drive flow. After an initial alignment process that accommodates potential actual variations in the drive flow to core flow relationship from that assumed in the plant specific application of the flow mapping methodology, no other adjustment to the digital components of the FCTR is required. The use of digital components in the E1A FCTR card also allows the incorporation of self-test features which allows more frequent internal checks. Also, digital components, such as those used in the E1A FCTR card, are highly reliable, and therefore in combination with the self test capability, less frequent external checks are necessary. For these reasons, Note (f) to current Technical Specification Table 4.3.1-1 for the weekly Channel Calibration frequency of Reactor Protection System Function 2.b (APRM flow biased scram) is modified. The proposed change provides a new Surveillance Requirement (BNP ITS SR 3.3.1.1.18) that is applicable only to Reactor Protection System Function 2.b and requires the adjustment of the channel to conform to core flow once within 7 days after reaching equilibrium conditions following each refueling outage. In addition, a commensurate change is made to add a note (Note 3 to BNP ITS SR 3.3.1.1.11) to the Channel Calibration Surveillance Requirement for Reactor Protection System Function 2.b which states the digital components of the FCTR card are excluded from the quarterly Channel Calibration.

The proposed change also modifies the value for the simulated thermal time constant specified in Note (d) of current Technical Specification Table 2.2.1-1. The simulated thermal power time constant is intended to diminish the random fluctuations of the APRM signal, characteristic of

the neutron flux detectors, to more dependably represent the actual thermal power generated in the core. As the value of the time constant is increased, the simulated thermal power signal becomes less responsive to the instantaneous neutron flux. The current value of the time constant is specified as "approximately 6 seconds". The proposed change modifies the specification to less than or equal to 7 seconds (in BNP ITS SR 3.3.1.1.14). This change removes the ambiguity of "approximately" and replaces it with a definite limit which sets a minimum sensitivity of Reactor Protection System Function 2.b to ensure thermal power is adequately simulated. This change is consistent with ISTS objectives and is administrative in nature since, as discussed above, Reactor Protection System Function 2.b is an operator aid to the identification of gross violation of the licensed operating domain and is not credited in the safety analysis.

The Period Based Detection System (PBDS) is a required feature of the E1A solution. The PBDS uses the Period Based Algorithm (PBA) described in NEDO-31960, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology" and applied to the E1A solution reported in NEDO-32339. The PBDS has no safety function and is not credited during any design basis accident or transient analysis. However, during operation in regions of the operating domain potentially susceptible to instability, the PBDS provides an indication that conditions consistent with a significant degradation in the stability performance of the reactor has occurred and the potential for imminent onset of neutronic/thermal hydraulic instability may exist. Therefore, a new PBDS Specification (BNP ITS 3.3.1.3) is appropriately added to the Instrumentation section of the Technical Specifications.

The requirements of the E1A solution PBDS Specification requires immediate manual reactor scram upon receipt of any Operable PBDS channel High-High alarm while operating in regions of the operating domain postulated, even under extreme conditions exceeding the licensing basis, to be susceptible to neutronic/thermal hydraulic instability. This feature of the E1A solution results in a potential increase in the incidence of manual reactor scram since there is no specific requirement in current Technical Specification 3/4.4.1.1 to respond to increased neutron flux noise levels (a characteristic of power oscillations induced by neutronic/thermal hydraulic instability) by performing a manual reactor scram. However, guidance consistent with the recommendations of the BWROG ICAs has been implemented at BNP Units 1 and 2 which specifies immediate manual reactor scram is appropriate upon confirmation of power oscillations. Therefore, it is concluded that implementation of the requirement to insert a manual reactor scram upon receipt of a High-High alarm from any Operable PBDS channel will not significantly increase the incidence of reactor scram.

In addition, Required Actions A.1 and B.2 of the new PBDS Specification do not conform exactly to NEDO-32339, Supplement 4, as accepted by the NRC. Required Actions A.1 and B.2 of Specification 3.3.1.3 of NEDO-32339, Supplement 4, require immediately placing the reactor mode switch in the shutdown position when any Operable PBDS channel is indicating High-High alarm or when the required PBDS channel is inoperable while in Restricted Region

and the APRM flow biased scram Allowable Value is not "Setup." With the BNP Unit 2 design, placing the mode switch in the shutdown position results in a reactor scram and a Group I isolation (MSIV closure) when main steam line flow is greater than 40%. In this condition, a Group I isolation is not desirable. Therefore, BNP Unit 2 ITS 3.3.1.3 Required Actions A.1 and B.2 are revised to immediately manually scram the reactor which results in an equivalent action as that intended by NEDO-32339, Supplement 4, Required Actions A.1 and B.2 of Specification 3.3.1.3. BNP Unit 1 ITS 3.3.1.3 Required Actions A.1 and B.2 are also revised to immediately manually scram the reactor for consistency with the BNP Unit 2 ITS.

Corresponding changes are also proposed to the BNP Technical Specification Bases consistent with the format and level of detail of the Technical Specification Bases provided in Appendix B of NEDO-32339, Supplement 4. These changes include minor editorial changes and changes to reflect the plant specific design of Brunswick Nuclear Plant Units 1 and 2.
Values of parameters which are dependent upon plant specific design are enclosed in brackets in the ISTS. Consistent with this convention the minimum number of Operable Level A, B or C LPRMs required for a PBDS channel to be considered Operable appears in brackets in Appendix B of NEDO-32339, Supplement 4. The design of the PBDS hardware, as described in NEDO-32339, Supplement 2, includes a dip switch which allows the operator to select either six or eight as the number of LPRMs required for the PBDS to display its status as Operable. The plant specific design of the Brunswick Nuclear Plant Units 1 and 2 Neutron Monitoring System (NMS) results in a maximum of 13 and 11 available LPRMs at Levels A, B, or C for PBDS channels A and B, respectfully. For PBDS channel B, the probability that random LPRM detector failure could result in fewer than eight Operable LPRMs being available is not negligible. For this reason, the Bases of the BNP ITS PBDS Specification are modified from the Bases presented in NEDO-32339, Supplement 4, for the PBDS Specification and specify conditions under which the operator may select six as the minimum number of LPRMs required for the PBDS to be considered Operable. The BNP ITS Bases for the PBDS Specification state that a PBDS channel may be considered Operable with only six Operable LPRMs when the distribution of the Operable LPRMs provides: a) at least one Operable LPRM in each core quadrant or b) at least two Operable LPRMs in the core quadrant opposite any core quadrant with no Operable LPRMs. This distribution ensures that, for all postulated orientations and modes of oscillation, there are least two Operable LPRMs in the core quadrants in which the local neutron flux will oscillate with a frequency within the range monitored by the PBDS. These conditions for allowing a PBDS channel to be considered Operable with as few as six Operable LPRMs appropriately consider the plant design and the characteristics of neutronic/thermal hydraulic instability.

In response to Section 5.0 (Plant-Specific Actions) of the NRC SER for Supplement 2 of NEDC-32339P (which required that licensees referencing NEDC-32339P, Supplement 2, for implementation of the E1A long term solution provide certain information in their license amendment submittals), CP&L provides the following:

1. The BNP Units 1 and 2 E1A solution equipment design of the FCTR card and the PBDS does not deviate from the design specifications provided in NEDC-32339P, Supplement 2. As a result, Supplement 2 of NEDC-32339 is applicable to the BNP Units 1 and 2 E1A solution design.

2. The description of the functions of the FCTR card and the PBDS, in NEDO-32339 and NEDC-32339, Supplement 2, are applicable to BNP Units 1 and 2. Plant specific analysis performed for BNP Units 1 and 2 has demonstrated stability performance indicating potential susceptibility to neutronic/thermal hydraulic instability in regions of the power and flow operating domain. Therefore, the E1A solution is applicable to BNP Units 1 and 2. Additional plant specific analysis will establish appropriate setpoints for the FCTR card consistent with the margins described in NEDO-32339. There are no plant specific setpoints associated with the required features of the PBDS. Operational parameters for the PBDS will be established during initial installation and testing to provide margins consistent with the PBDS function as described in NEDO-32339.

3. The BNP Units 1 and 2 environmental conditions (temperature, humidity, pressure, seismic, and electromagnetic compatibility) for the areas in which the PBDS will be installed have been confirmed to be enveloped by the PBDS environmental qualification values. The BNP Units 1 and 2 environmental conditions (temperature, humidity, pressure, seismic, and electromagnetic compatibility) for the areas in which the FCTR card will be installed will be confirmed to be enveloped by the E1A FCTR card environmental qualification values prior to installation.

4. Administrative controls for manually bypassing APRM flow biased scram and control rod block functions are in place at BNP Units 1 and 2. Comparable administrative controls will be established for the PBDS channels prior to the full implementation of the E1A solution.

5. The only change to the BNP Units 1 and 2 plant operators' control panels associated with the E1A solution are those associated with the addition of alarms and indications for the PBDS instrumentation. The E1A long term solution modifications associated with changes to the plant operators' control panels have received human factors reviews.

References:

1. GE Service Information Letter # 380, Revision 1, "BWR Core Thermal Hydraulic Stability."
2. NEDO-32339, "Reactor Stability Long-Term Solution: Enhanced Option I-A."
3. NEDO-32339, Supplement 1, "Reactor Stability Long-Term Solution: Enhanced Option I-A."

4. NEDO-32339, Supplement 2, "Reactor Stability Long-Term Solution: Enhanced Option I-A: Solution Design."
5. NEDO-32339, Supplement 3, "Reactor Long Term Stability Solution E1A: Flow Mapping Methodology."
6. NEDO-32339, Supplement 4, "Reactor Stability Long Term Solution: Enhanced Option I-A Generic Technical Specifications."
7. NEDO-31960, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology."
8. 10 CFR 50, Appendix A, General Design Criterion (GDC) 12, "Suppression of Reactor Power Oscillations."
9. IE Bulletin 88-07, "Power Oscillations in Boiling Water Reactors (BWRs)."
10. 10 CFR 50, Appendix A, GDC 10, "Reactor Design."
11. IE Bulletin 88-07, Supplement 1, "Power Oscillations in Boiling Water Reactors (BWRs)."
12. Generic Letter 94-02, "Long-Term Solution and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in BWRs."
13. 10 CFR 50.36(c)(2)(ii).
14. NRC Safety Evaluation Report (SER), "Acceptance for Referencing of Topical Report NEDO-32339, Supplement 3, "Reactor Long Term Stability Solution E1A: Flow Mapping Methodology," (TAC No. M93649)."
15. NRC Safety Evaluation Report (SER), "Acceptance of Licensing Topical Report NEDC-32339P, Supplement 2, with Errata dated March 27, 1996, Reactor Long Term Stability Solution E1A: Enhanced Option I-A Solution Design (TAC No. M92373)."

ENCLOSURE 2

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
NRC DOCKET NOS. 50-325 AND 50-324
OPERATING LICENSE NOS. DPR-71 AND DPR-62
REQUEST FOR LICENSE AMENDMENTS
ENHANCED OPTION I-A STABILITY TECHNICAL SPECIFICATIONS

10 CFR 50.92 EVALUATION

The Commission has provided standards in 10 CFR 50.92 for determining whether a significant hazards consideration exists. A proposed amendment to an operating license for a facility involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated, (2) create the possibility of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in a margin of safety. Carolina Power & Light Company has reviewed these proposed license amendment requests and believes that their adoption would not involve a significant hazards consideration. The basis for this determination follows.

1. The proposed amendments do not involve a significant increase in the probability or consequences of an accident previously evaluated.

   The proposed amendments allow the implementation of the Enhanced Option I-A (E1A) long term solution to the neutronic/thermal hydraulic instability issue. Current Technical Specification restrictions on power and flow conditions, number of operating recirculation loops and operator actions implemented to reduce the probability of neutronic/thermal hydraulic instability are eliminated and new stability control requirements consistent with NEDO-32339, Supplement 4, are imposed. These requirements include restrictions on power and flow conditions and actions associated with the modified APRM flow biased scram and control rod block functions. These actions include adherence to the boiling boundary limit stability control prior to entry and during operation in the region of the power and flow operating domain which is potentially susceptible to neutronic/thermal hydraulic instability in the absence of the stability control. In addition, the proposed amendments require operator actions based upon a new Period Based Detection System (PBDS). The PBDS is designed to provide alarm indication that conditions consistent with a significant degradation in the stability performance of the reactor has occurred and the potential for imminent onset of neutronic/thermal hydraulic instability may exist.

1. (continued)

The proposed amendments will permit operation in regions of the power and flow operating domain postulated to be susceptible to neutronic/thermal hydraulic instability (i.e., Restricted and Monitored Regions). Operation in these regions does not increase the probability of occurrence of initiators and precursors of previously analyzed accidents when neutronic/thermal hydraulic instability is not possible. The proposed amendments also permit the implementation of the features of the E1A solution which prevent neutronic/thermal hydraulic instability including pre-emptive reactor scram upon entry into the region of the power and flow operating domain most susceptible to neutronic/thermal hydraulic instability (i.e., Exclusion Region). Furthermore, the E1A solution requires implementation of stability control prior to entry into a region of the power and flow operating domain which is potentially susceptible, in the absence of stability control, to neutronic/thermal hydraulic instability (i.e., Restricted Region). The E1A solution prevents neutronic/thermal hydraulic instability during operation in regions of the power and flow operating domain previously excluded from operation and therefore does not significantly increase the probability of a previously analyzed accident.

Operation in the regions of the power and flow operating domain excluded by current Technical Specification 3/4.4.1.1 and Figure 3.4.1.1-1 can occur as a result of anticipated operational occurrences. The severity of these transients may increase in the absence of operator actions due to the potential occurrence of neutronic/thermal hydraulic instability as a result of operation in these regions. The proposed amendments will permit the implementation of the E1A long term solution to the stability issue. Required features of the E1A solution include adherence to a boiling boundary limit stability control prior to selection by the operator of APRM flow biased scram and control rod block function setpoints which allow operation in a region of the power and flow operating domain potentially susceptible, in the absence of the stability control, to neutronic/thermal hydraulic instability. Upon entry, as a result of an anticipated operational occurrence, into the region most susceptible to neutronic/thermal hydraulic instability during operation with the boiling boundary limit stability control met, the pre-emptive reactor scram prevents neutronic/thermal hydraulic instability. Therefore, the consequences of an accident do not significantly increase while operating with the stability control met. After exiting the region requiring the stability control to be met, the setpoints are automatically returned to the values applicable when anticipated operational occurrences can be initiated from conditions with the stability control not met. This automatic actuation of the more conservative setpoints ensures that the pre-emptive reactor scram will prevent operation as a result of an anticipated operational occurrence in the region most susceptible to neutronic/thermal hydraulic instability should the operator not select the more conservative setpoints appropriate for operation following exit from the region requiring stability control. These required features of the E1A solution prevent operation in the region of the power and flow operating domain most susceptible to postulated

1. (continued)

reactor scram regardless of how the region was entered. Therefore, the proposed amendments prevent the occurrence of neutronic/thermal hydraulic instability as a consequence of an anticipated operational occurrence and do not significantly increase the consequences of any previously analyzed accident.

2. The proposed amendments do not create the possibility of a new or different kind of accident from any accident previously evaluated.

The proposed amendments eliminate restrictions on power and flow conditions and impose alternative restrictions which permit the implementation of the E1A long term stability solution. The current restrictions on the power and flow conditions do not prevent the entry into regions of the power and flow operating domain most susceptible to neutronic/thermal hydraulic instability and therefore the possibility of neutronic/thermal hydraulic instability exists in the absence of operator action. The required features of the E1A solution implement a pre-emptive scram upon entry into the region most susceptible, without operator action, to neutronic/thermal hydraulic instability. The accessible operating domain allowed by the proposed amendments is a subset of the power and flow operating domain currently allowed. Current initiators and precursors of accidents and anticipated operational occurrences can not occur with new or different initial conditions. Therefore, the proposed amendments do not create the possibility of a new or different kind of accident from that previously evaluated.

Concurrent with the implementation of the proposed amendments, a modified Flow Control Trip Reference (FCTR) card and a new Period Based Detection System (PBDS) will be installed as required by the E1A solution. The function of the FCTR card is to aid the operator in the identification of entry into regions of the power and flow operating domain potentially susceptible to neutronic/thermal hydraulic instability and to initiate a pre-emptive scram upon entry into the regions most susceptible to neutronic/thermal hydraulic instability. This is accomplished by altering the values of setpoints of the APRM flow biased scram and the control rod block functions generated by the modified FCTR card, which are existing functions of the current FCTR card. The modified FCTR card design includes components which may be susceptible to electromagnetic interference or other environmental effects. The plant specific environmental conditions (temperature, humidity, pressure, seismic, and electromagnetic compatibility) have been confirmed to be enveloped by the PBDS environmental qualification values and will be confirmed to be enveloped by the E1A FCTR card environmental qualification values prior to installation. Therefore, the potential for spurious scrams or common mode failures induced by environmental effects (e.g., electromagnetic interference) is considered negligible. The

installation of the modified FCTR card will therefore not create the possibility of a new or different kind of accident from any accident previously

2. (continued)

evaluated. The function of the PBDS is to provide the operator with an indication that conditions consistent with a significant degradation in the stability performance of the reactor has occurred and the potential for imminent onset of neutronic/thermal hydraulic instability may exist. This is accomplished by the installation of a new PBDS card in the Neutron Monitoring System. The PBDS card takes inputs from individual local power range monitors and provides displays indicating alarm and status conditions to the operator in the control room. These displays can not create the possibility of a new or different kind of accident from any accident previously evaluated. The PBDS card design includes components which may be susceptible to electromagnetic interference or other environmental effects. The plant specific environmental conditions (temperature, humidity, pressure, seismic, and electromagnetic compatibility) have been confirmed to be enveloped by the PBDS environmental qualification values and will be confirmed to be enveloped by the E1A FCTR card environmental qualification values prior to installation. Therefore, the installation of the PBDS card will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. The proposed amendments do not involve a significant reduction in a margin of safety. The proposed amendments permit the implementation of the E1A long term solution to the stability issue. Under certain conditions, existing BWR designs are susceptible to neutronic/thermal hydraulic instability. General Design Criterion (GDC) 12 of 10 CFR 50, Appendix A, requires thermal hydraulic instability to be prevented by design or be readily and reliably detected and suppressed. When the design of the reactor system does not prevent the occurrence of neutronic/thermal hydraulic instability, instability is an anticipated operational occurrence. GDC 10 of 10 CFR 50, Appendix A, requires that specified acceptable fuel design limits not be exceeded during anticipated operational occurrences.

Analyses performed by the BWROG indicate that neutronic/thermal hydraulic instability induced power oscillations could result in conditions exceeding the Minimum Critical Power Ratio (MCPR) Safety Limit (SL) prior to detection and suppression by the current design of the Neutron Monitoring System and Reactor Protection System. To ensure compliance with GDC 12, the BWROG developed Interim Corrective Actions (ICAs) to enhance the capability of the operator to readily and reliably detect and suppress neutronic/thermal hydraulic instability. The BWROG ICAs also provided additional guidance for monitoring local power range monitors beyond the requirements of current Technical Specification 3/4.4.1.1 to ensure adequate margin to the onset of neutronic/thermal hydraulic instability. Reliance on operator actions to comply with GDC

12 was accepted on an interim basis by the NRC pending final implementation of a long term solution to the stability issue.

3. (continued)

The modified design of the Reactor Protection System (APRM flow biased scram) implemented with the E1A solution prevents neutronic/thermal hydraulic instability. The E1A solution also requires implementation of the stability control prior to entry into a region of the power and flow operating domain which is potentially susceptible, in the absence of the stability control, to neutronic/thermal hydraulic instability. As a result, the margin to the onset of neutronic/thermal hydraulic instability provided by the existing Technical Specification requirements and BWROG ICAs recommendations is not significantly reduced by the implementation of the E1A solution. The E1A solution assures compliance with GDC 12 by the prevention of neutronic/thermal hydraulic instability and therefore precludes neutronic/thermal hydraulic instability from becoming a credible consequence of an anticipated operational occurrence. The consequences of anticipated operational occurrences and the margin to the MCPR SL will not change upon the implementation of the E1A solution. Therefore, the proposed amendments do not involve a significant reduction in a margin of safety.

References:

1. NEDO-32339, Supplement 4, "Reactor Stability Long Term Solution: Enhanced Option I-A Generic Technical Specifications."
2. 10 CFR 50, Appendix A, General Design Criterion (GDC) 12, "Suppression of Reactor Power Oscillations."
3. 10 CFR 50, Appendix A, GDC 10, "Reactor Design."

ENCLOSURE 3

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
NRC DOCKET NOS. 50-325 AND 50-324
OPERATING LICENSE NOS. DPR-71 AND DPR-62
REQUEST FOR LICENSE AMENDMENTS
ENHANCED OPTION I-A STABILITY TECHNICAL SPECIFICATIONS

ENVIRONMENTAL CONSIDERATIONS

10 CFR 51.22(c)(9) provides criterion for and identification of licensing and regulatory actions eligible for categorical exclusion from performing an environmental assessment. A proposed amendment to an operating license for a facility requires no environmental assessment if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant hazards consideration, (2) result in a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (3) result in an increase in individual or cumulative occupational radiation exposure. Carolina Power & Light Company has reviewed this request and believes that the proposed 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 needs to be prepared in connection with the issuance of the amendment. The basis for this determination follows.

1. These amendments do not involve a significant hazards consideration, as shown in Enclosure 2.

2. The proposed license amendments do not result in a significant change in the types or a significant increase in the amounts of any effluent that may be released offsite. The proposed license amendments do introduce new equipment. However, the new equipment has no impact on the types or the amounts of any effluents that may be released offsite. The proposed license amendments do not alter the function of existing equipment in such a manner that will impact the types or the amounts of any effluents that may be released offsite. In addition, the proposed license amendments will ensure that the consequences of any previously evaluated accident do not increase. Therefore, CP&L has concluded that there will not be a significant increase in the types or amounts of any effluent that may be released offsite and, as such, the proposed license amendments do not involve irreversible environmental consequences beyond those already associated with normal operation.

3. These amendments do not result in an increase in individual or cumulative occupational radiation exposure. The proposed modifications do not result in any increase in existing source terms for either normal or accident conditions.