



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

December 24, 2009

Mr. Benjamin Waldrep, Vice President
Brunswick Steam Electric Plant
Carolina Power & Light Company
Post Office Box 10429
Southport, North Carolina 28461

**SUBJECT: BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2 – PROPOSED
CHANGES TO THE EMERGENCY PLANNING ZONES OF THE EMERGENCY
RESPONSE PLAN (TAC NOS. ME1640 AND M1641)**

Dear Mr. Waldrep:

By letter dated June 22, 2009, and as supplemented by letters dated September 29 and November 11, 2009, Carolina Power & Light Company (the licensee) submitted proposed changes to the Brunswick Steam Electric Plant (BSEP), Units 1 and 2 Emergency Response Plan (ERP). The licensee submitted the proposed changes for Nuclear Regulatory Commission (NRC) approval prior to implementation, in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.54(q).

The proposed changes would modify the Emergency Planning Zones of the BSEP, Units 1 and 2 ERP to compensate for changes in population growth and location. These proposed changes have been reviewed and approved by the North Carolina Division of Emergency Management and the Federal Emergency Management Agency.

The NRC staff has completed a technical and regulatory review of the licensee's submittals and finds that the changes do not alter the population's planned evacuation routes or shelters, and it could minimize the potential risks to health from a potentially unnecessary protective action. Incorporation of the proposed changes would not decrease the effectiveness of the BSEP, Units 1 and 2 ERP, and the plan, as changed, continues to meet the standards in 10 CFR 50.47(b) and the requirements of Appendix E of 10 CFR Part 50. Therefore, the NRC staff concludes there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency, and that the proposed changes are acceptable. The basis for our conclusion is contained in the enclosed safety evaluation.

B. Waldrep

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If you have any questions concerning this matter, please contact the BSEP Project Manager, Ms. Farideh Saba, at (301) 415-1447.

Sincerely,

A handwritten signature in black ink, appearing to read "Eric J. Leeds". The signature is fluid and cursive, with a large initial "E" and "J" and a distinct "L" and "S" at the end.

Eric J. Leeds, Director
Office of Nuclear Reactor Regulation

Docket Nos. 50-325 and 50-324

Enclosure: Safety Evaluation

cc: ListServ



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

PROPOSED CHANGES TO THE EMERGENCY PLANNING ZONES OF THE

EMERGENCY RESPONSE PLAN FOR

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2

DOCKET NOS. 50-325 AND 50-324

1.0 INTRODUCTION

By letter dated June 22, 2009 (Agencywide Document Access Management System (ADAMS) Accession No. ML091870827), and as supplemented by letters dated September 29 and November 11, 2009 (ADAMS Accession Nos. ML092870367 and ML093220067, respectively), Carolina Power & Light Company (CP&L, the licensee), submitted proposed changes to the Brunswick Steam Electric Plant (BSEP), Units 1 and 2 Emergency Response Plan (ERP) for Nuclear Regulatory Commission (Commission, NRC) approval prior to implementation. The proposed changes would modify the Emergency Planning Zones (EPZ) to compensate for changes in population growth and location. The proposed changes were submitted for NRC review and approval pursuant to Section 54(q) of Part 50 to Title 10 of the *Code of Federal Regulations* (10 CFR).

2.0 REGULATORY EVALUATION

The regulatory requirements and guidance on which the NRC staff based its acceptance are as follows:

2.1 Regulatory Requirements

Section 47(b)(10) of 10 CFR 50 states, "A range of protective actions has been developed for the plume exposure pathway EPZ for emergency workers and the public. In developing this range of actions, consideration has been given to evacuation, sheltering, and, as a supplement to these, the prophylactic use of potassium iodide (KI), as appropriate. Guidelines for the choice of protective actions during an emergency, consistent with Federal guidance, are developed and in place, and protective actions for the ingestion exposure pathway EPZ appropriate to the locale have been developed."

Section 47(c)(2) of 10 CFR 50 states in part, "Generally, the plume exposure pathway EPZ for nuclear power reactors shall consist of an area about 10 miles (16 km) in radius The exact size and configuration of the EPZs surrounding a particular nuclear power reactor shall be determined in relation to the local emergency response needs and capabilities as they are affected by such conditions as demography, topography, land characteristics, access routes, and jurisdictional boundaries."

Enclosure

2.2 Guidance

Regulatory Guide 1.101 (RG 1.101), "Emergency Response Planning and Preparedness for Nuclear Power Reactors," provides guidance on methods acceptable to the NRC staff for implementing specific parts of the NRC's regulations, in this case, 10-CFR-50.47(b) and Appendix E to Part 50. RG 1.101 endorses Revision 1 of NUREG-0654/FEMA-REP-1 (NUREG-0654), "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," which provides a planning basis and specific acceptance criteria, including those addressing the plume exposure pathway EPZ, for complying with 10 CFR 50.47(b).

Section I, "Planning Basis" of NUREG-0654, states in part, "EPZs are defined as the areas for which planning is needed to assure that prompt and effective corrective actions can be taken to protect the public in the event of an accident The choice of the size of the Emergency Planning Zones represents a judgment on the extent of detailed planning which must be performed to assure an adequate response base Although the radius for the EPZ implies a circular area, the actual shape should depend upon the characteristics of a particular site"

Section III, "Recommended Planning Basis," of NUREG-0396, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear power Plants," states, "It is expected that judgment of the planner will be used in determining the precise size and shape of the EPZs considering local conditions such as demography, topography and land use characteristics, access routes, jurisdictional boundaries, and arrangements with the nuclear facility operator for notification and response assistance." In addition, NUREG-0396 provided the following criteria for an EPZ:

- 1) The choice of the size of the EPZ represents a judgment on the extent of detailed planning which must be performed to assure an adequate response base.
- 2) The task force selected a radius of about 10 miles for the plume exposure pathway and a radius of 50 miles for the ingestion exposure pathway.
- 3) Although the radius implies a circular area, the actual shape would depend upon the characteristics of the particular site.
- 4) Detailed planning within the 10 miles would provide a substantial base for expansion of response efforts in the event that this proved necessary.

In July 1996, the NRC and the Federal Emergency Management Agency (FEMA) published Supplement 3 to NUREG-0654, which updated the previous guidance for protective action recommendation decision-making contained in Appendix 1 to NUREG-0654. Supplement 3 to NUREG-0654 makes evacuation of a 2-mile radius and 5 miles downwind the preferred initial protective action for a severe reactor accident involving actual or projected severe core damage or loss of control of facility. Affected individuals in the remainder of the EPZ would be advised to remain indoors and to monitor the Emergency Broadcast System for further instructions.

The U.S. Environmental Protection Agency's (EPA's) guidance document, entitled EPA-400-R-92-001, "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," provides radiation protection guidance to public officials in establishing emergency

response plans and for making decisions during a nuclear incident. This guidance provides, in part:

“The decision to advise members of the public to take an action to protect themselves from radiation from a nuclear incident involves a complex judgment in which the risk avoided by the protective action must be weighed in the context of the risks involved in taking the action During the planning process it is possible to make some value judgments and to determine which responses are not required, which decisions can be made on the basis of prior judgments, and which judgments must be made during an actual emergency ... it is then possible to devise operational plans which can be used to respond to the spectrum of hazardous situations which may develop.”

Regulatory Issue Summary 2005-02, “Clarifying the Process for Making Emergency Plan Changes,” was issued by the NRC to clarify the meaning of “decrease in effectiveness,” to clarify the process for making changes to emergency plans, and to provide some examples of changes that are considered to be a decrease in effectiveness.

3.0 TECHNICAL EVALUATION

The NRC staff has reviewed the licensee’s regulatory and technical analyses in support of the proposed BSEP ERP change. The NRC staff’s technical evaluation is detailed below.

3.1 Background

The licensee states that the overall objective of the BSEP ERP is to provide for early detection, warning, and protective action response and recommendations for emergency conditions at BSEP that may affect the site proper and/or offsite areas. The basis for this plan is NUREG 0654 and 10 CFR Part 50.

The licensee discusses that the principle exposure sources of the plume exposure pathway are: (a) whole body external exposure to gamma radiation from the plume and from deposited material, and (b) inhalation exposure from the passing radioactive plume. For the plume exposure pathway, shelter and/or evacuation would likely be the principal immediate protective actions to be recommended for the general public. The size (i.e., approximately a 10-mile radius) for the BSEP EPZ was primarily based on the following considerations:

- 1) Projected doses from the traditional design basis accidents would not exceed Protective Action Guide levels outside the zone;
- 2) Projected doses from most core melt sequences would not exceed Protective Action Guide levels outside the zone;
- 3) For the worst core melt sequences, immediate life threatening doses would not generally occur outside the zone; and
- 4) Detailed planning within 10 miles would provide a substantial base for expansion of response efforts in the event that this proved necessary.

Currently, the BSEP EPZ consists of nine zones (i.e., Zones A, B, C, D, E, F, G, H, and K), which include portions of Brunswick and New Hanover counties in the State of North Carolina. As a result of population increases in these counties, the proposed change increases the number of zones from nine to thirteen (i.e., Zones A, B, C, D, E, F, G, H, J, K, L, M, and N).

The licensee provides that these changes better define evacuation areas within the 10-mile EPZ. The most significant changes consist of: (1) removing Bald Head Island from the BSEP 2-mile evacuation zone by splitting existing Zone C into proposed Zones M and N (Note: Bald Island will now be included in Zone N) and expanding existing Zone B (i.e., proposed Zone A), and (2) subdividing existing zones to account for population growth within those areas (i.e., splitting existing Zone D into proposed Zones C, D, and E and splitting existing Zone K into proposed Zones K and L). Other changes include slight alterations of zone boundaries to better coincide with easily determined landmarks and re-designation of assigned zone designators to account for the addition of the four new zones. The licensee states in their application that these changes are supported by State and local government agencies and are being made at their request.

3.2 Evaluation

In considering whether the proposed change would reduce the effectiveness of the BSEP, Units 1 and 2 ERP, the staff considered the impact on the ability of the licensee to perform the protective actions functions required by 10 CFR 50.47(b)(10). The staff evaluated the proposed change against the capability to perform the protective action functions to determine whether the capability to perform these functions is lost and/or degraded.

Evaluation of Changes

Change 1 Remove Bald Head Island from the BSEP 2-mile evacuation zone by splitting existing Zone C into proposed Zones M and N, and expanding existing Zone B (i.e., proposed Zone A)

Bald Head Island is located in excess of 5 miles from BSEP; however the original EPZs incorporated Bald Head Island into existing Zone C, which is partially located within BSEP's 2-mile radius. The approved ERP requires BSEP to recommend the evacuation of the population located within a 2-mile radius of the plant (i.e., existing Zones A, B, and C) upon declaration of a General Emergency associated with a radiological event. Bald Head Island is accessible only by boat and, as such, the State of North Carolina will only initiate evacuation activities if called for by the circumstances of an ongoing event. Given the present EPZ, the licensee would automatically recommend evacuation of Bald Head Island in the event of a General Emergency, causing the State to analyze the current conditions and potentially counter the licensee's recommendation if conditions did not warrant evacuation.

Change 1 relocates Bald Head Island into a new Zone N, which is entirely outside of BSEP's 2-mile radius. This change will allow the licensee to make more appropriate recommendations with respect to protective actions for Bald Head Island to the State of North Carolina. The proposed change does not alter the ability to evacuate the Bald Head Island population nor does it change the population's planned evacuation shelter.

Existing Zone B (i.e., proposed Zone A) has been expanded to include the mainland portion of existing Zone C. Residents in this area are not affected by the change. Their evacuation route and shelter remain the same.

Proposed Zone M consists of non-residential/non-developed areas and, as such, there are no potential impacts resulting from this change.

The proposed changes are consistent with current guidance that states that the decision to implement a protective action should be based on the projected radiation dose that would be incurred by the public if the protective action were not implemented, that is, the dose that would be avoided by taking the action. Radiation doses that occurred prior to implementing the protective action are not considered. Another key principle is that the risk to health from a protective action should not exceed the risk to health from the dose that would be avoided.

In addition, the proposed changes are consistent with the EPA-400-R-92-001, which recognizes that it is possible during the planning process to make value judgments as to which decisions are not required, which can be made based on prior judgments, and which must be made during an actual emergency. Such preplanning can reduce, to a manageable level, the complexity of decisions required to effectively protect the public at the time of an incident. Nonetheless, the key principle of protective actions, namely that the risk to health from a protective action should not exceed the risk to health from the dose that would be avoided, must be satisfied.

The guidance provided in Supplement 3 to NUREG-0654 makes evacuation of a 2-mile radius and 5 miles downwind the preferred initial protective action for a severe reactor accident involving actual or projected severe core damage or loss of control of facility. Based on Bald Head Island's distance from the BSEP (in excess of 5 miles), its method of evacuation by boat, and the potential risks to health from a potentially unnecessary protective action, the staff finds the removal of Bald Head Island from the BSEP 2-mile evacuation zone is acceptable.

In addition, the staff finds the splitting of the existing Zone C into proposed Zones M and N, and expanding existing Zone B (i.e., proposed Zone A) acceptable since the change does not alter the population's evacuation routes nor does it change the population's planned evacuation shelters, and it could minimize the potential risks to health from a potentially unnecessary protective action.

Change 2 Subdivide existing zones to account for population growth within those areas (i.e., splitting existing Zone D into proposed Zones C, D and E, and splitting existing Zone K into proposed Zones K and L).

Change 2 subdivides two existing zones into a total of five zones to account for population growth within the areas. This change can facilitate evacuation by better defining the number of citizens which could be affected. For example, under the current EPZs, Zone K includes the municipalities of Kure Beach, Wilmington Beach and Carolina Beach, and an evacuation of Zone K would affect all three municipalities. By splitting existing Zone K into proposed Zones K and L, an evacuation may only be prudent for one of the zones, thereby limiting the number of citizens required to be relocated. A similar discussion can be made for the proposed subdivision of existing Zone D.

Subdividing existing zones to account for population growth within those areas potentially limits the number of citizens required to be relocated in the event of an emergency, thereby facilitating evacuation of truly impacted citizens. Therefore, these changes do not adversely affect the ability to provide for early detection, warning and protective action response, and recommendations for emergency conditions at BSEP. Since the change does not alter the population's evacuation routes nor does it change the population's planned evacuation shelters, and it could minimize the potential risks to health from a potentially unnecessary protective action, the staff finds this change acceptable.

Other changes

There were additional changes to the EPZ, including the slight alterations of zone boundaries to better coincide with easily determined landmarks and the re-designation of assigned zone designators to account for the addition of the four new zones.

These changes are consistent with the guidance provided in NUREG-396, whereby the planner should consider the local conditions such as demography, topography and land use characteristics, access routes and jurisdictional boundaries in determining the precise size and shape of the EPZs. Since the changes do not alter the population's evacuation routes nor does it change the population's planned evacuation shelters, and the changes could minimize the potential risks to health from a potentially unnecessary protective action, the staff finds these changes acceptable.

4.0 STATE CONSULTATION

The proposed changes to the BSEP EPZ are supported by the North Carolina Division of Emergency Management as well as Brunswick and New Hanover counties as documented in a letter dated October 12, 2009. In addition, FEMA, Region IV, has reviewed and approved the proposed EPZ modification as documented in a letter dated October 30, 2009. Both letters were included as enclosures to the licensee's letter dated November 11, 2009.

5.0 CONCLUSION

The NRC staff finds that the proposed emergency plan changes meet the applicable standards in 10 CFR 50.47(b) and provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. Therefore, the NRC staff concludes that the licensee's proposed changes to the BSEP ERP in its application dated June 22, 2009, and as supplemented by the letters dated September 29 and November 11, 2009, are acceptable.

6.0 REFERENCES

1. CP&L Letter, "Emergency Response Plan Revision – Modification of the Emergency Planning Zones," dated June 22, 2009 Agencywide Documents Access and Management System (ADAMS) Accession No. ML091870827).
2. CP&L Letter, "Response to Request for Additional Information Regarding Emergency Response Plan Revision – Modification of the Emergency Planning Zones," dated September 29, 2009 (ADAMS Accession No. ML092870367).

3. CP&L Letter, "Response to Request for Additional Information Regarding Emergency Response Plan Revision – Modification of the Emergency Planning Zones," dated November 11, 2009 (ADAMS Accession No. ML093220067).
4. NUREG-0654/FEMA REP-1, Revision 1, Supplement 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," dated November, 1980 (ADAMS Accession No. ML040420012).
5. NRC Regulatory Issue Summary 2005-02, "Clarifying the Process for Making Emergency Plan Changes," dated February 14, 2005 (ADAMS Accession No. ML042580404).

Principal Contributor: Michael Norris

B. Waldrep

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If you have any questions concerning this matter, please contact the BSEP Project Manager, Ms. Farideh Saba, at (301) 415-1447.

Sincerely,

/RA/

Eric J. Leeds, Director
Office of Nuclear Reactor Regulation

Docket Nos. 50-325 and 50-324

Enclosure: Safety Evaluation

cc w/enclosure: ListServ

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