



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

December 28, 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 SECTION 5.7.3, “SEISMIC MONITORING” OF THE
RADIOLOGICAL EMERGENCY RESPONSE PLAN (TAC NOS. MD9258
AND MD9259)

Dear Mr. Waldrep:

By letter dated July 16, 2008, and as supplemented by letter dated February 3, 2009 Carolina Power & Light Company (the licensee) submitted proposed changes to the Brunswick Steam Electric Plant (BSEP), Units 1 and 2 Emergency Plan. The licensee submitted the proposed changes for Nuclear Regulatory Commission (NRC) review and approval prior to implementation, in accordance with paragraph 50.54(q) of Title 10 of *Code Federal Regulations* (10 CFR).

The proposed changes would remove the Unit 1 seismic monitoring system as presented in Section 5.7.3, “Seismic Monitoring” of the BSEP, Units 1 and 2 Radiological Emergency Response Plan (ERP) after the plant modification to install a new highly reliable, computer-based seismic monitoring system on Unit 2.

The NRC staff has completed a technical and regulatory review of the licensee's submittals and finds that the installation of a highly reliable, computer-based seismic monitoring system improves the overall effectiveness of the ERP. Incorporation of the proposed changes would not decrease the effectiveness of the BSEP, Units 1 and 2 Radiological 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 that 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 this 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', with a long horizontal flourish extending to the right.

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
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

PROPOSED SEISMIC MONITORING CHANGES TO THE RADIOLOGICAL

EMERGENCY RESPONSE PLAN FOR

BRUNSWICK STEAM ELECTRIC PLANT UNIT NOS. 1 AND 2

DOCKET NOS. 50-325 AND 50-324

1.0 INTRODUCTION

By application dated July 16, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML082050399), and as supplemented by letter dated February 3, 2009 (ADAMS Accession No. ML090560539), Carolina Power & Light Company (CP&L, the licensee), submitted changes to the Radiological Emergency Response Plan (ERP) for Brunswick Steam Electric Plant (BSEP) for Nuclear Regulatory Commission (NRC) approval prior to implementation. The proposed changes would remove the Unit 1 seismic monitoring system as presented in Section 5.7.3, "Seismic Monitoring" of the BSEP Units 1 and 2 Radiological Emergency Response Plan after the plant modification to install a new computer-based seismic monitoring system on Unit 2. The proposed changes were submitted for NRC review and approval pursuant to Sections 50.54(q) of 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 50.47(b)(4) of 10 CFR states, in part, that "A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters"

Part B, "Assessment Actions," of 10 CFR 50, Appendix E, Section IV states, in part, that "The emergency action levels shall be based on in-plant conditions and instrumentation"

Part C, "Activation of Emergency Organization," of 10 CFR 50, Appendix E, Section IV, states, in part, that "Emergency action levels based not only on onsite and offsite radiation monitoring information but also on readings from a number of sensors that indicate a potential emergency"

Section IV(a)(4), "Required Seismic Instrumentation," of 10 CFR 50, Appendix S states that "Suitable instrumentation must be provided so that the seismic response of nuclear power plant feature important to safety can be evaluated promptly after an earthquake."

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 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 specific acceptance criteria, including those addressing emergency action levels (EALs), for complying with 10 CFR 50.47(b).

In Section II of NUREG-0654, Evaluation Criterion II.D.2 references Appendix 1, "Basis for Emergency Action Levels for Nuclear Power Facilities" to NUREG-0654. Criterion II.H.5 specifies onsite monitoring systems which would be used to initiate the emergency measures identified in Appendix 1. Included are: "... geophysical phenomena monitors (e.g., meteorological, hydrological, seismic)" Criterion II.H.6 specifies each licensee shall make provisions to acquire data from or for emergency access to offsite monitoring and analysis equipment. Included are: "... geophysical phenomena monitors (e.g., meteorological, hydrological, seismic)" Criterion II.I.1 requires the licensee to identify plant system and effluent parameter values characteristic of a spectrum of off-normal conditions and identify the plant parameter values or other information which corresponds to the example initiating conditions in Appendix 1.

Appendix 1 to NUREG-0654 provides a listing of example initiating conditions for each of the four emergency classifications which are to form the basis for establishing the specific plant instrumentation readings (as applicable) which, if exceeded, will initiate the emergency class. For three of the four emergency classifications, Appendix 1 identifies example initiating conditions associated with seismic events. In developing this guidance, the staff placed (and continues to place) emphasis on directly observable plant instrumentation, including seismic monitors.

Regulatory Guide 1.12 (RG 1.12), "Nuclear Power Plant Instrumentation for Earthquakes," provides "Instrumentation in addition to that installed for a single unit will not be required if essentially the same seismic response is expected at the other units based on the seismic analysis used in the seismic design of the plant. However, if there are separate control rooms, annunciation should be provided to both control rooms as specified in Regulatory Position 7."

Generic Letter 95-10 (GL 95-10), "Relocation of Selected Technical Specifications Requirements Related to Instrumentations," was issued to advise licensees that they could request a license amendment to relocate selected instrumentation requirements from their Technical Specifications. The selected instrumentation included seismic monitoring instrumentation.

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 its proposed ERP changes, as described in the application dated July 16, 2008, and as supplemented by the letter dated February 3, 2009. The staff's technical evaluation is detailed below.

3.1 Background

BSEP installed the Kinometrics SMA-3/SMP Seismic Monitoring Systems on each unit during original construction. The licensee, in July 16, 2008 letter, states that the currently installed system is based on technology that is over three decades old and is no longer supported by the manufacturer. In addition, the licensee anticipates that some point in the near future, the equipment will reach its end-of-life service and will become non-serviceable. CP&L is planning a plant modification to replace the existing Unit 2 Kinometrics SMA-3/SMP Seismic Monitoring System with the new Kinometrics Condor Seismic Monitoring System, and remove the Unit 1 Kinometrics SMA-3/SMP Seismic Monitoring System, including the Unit 1 active sensors. The single monitoring system will be located in the Unit 2 Control Room back-panels and will feed the existing two Seismic Event annunciators, one for each unit's control board. The active sensors in the Unit 2 Reactor Building will remain in their existing locations. The peak shock recording system, installed only on Unit 2, is not affected by this change. The licensee states that the requirements related to the seismic monitoring instrumentation are contained in Section 3.9, "Seismic Monitoring Instrumentation," of each unit's Technical Requirements Manual. The licensee further states it has determined that installing the new, highly reliable, computer-based seismic monitoring system on Unit 2, while decommissioning the existing seismic monitoring system on Unit 1, meets these requirements and can be completed in accordance with 10 CFR 50.59, without prior NRC approval.

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 to perform the planning standard functions of 10 CFR 50.47(b)(4), emergency classification and 10 CFR 50.47(b)(9), assessment. The staff evaluated the proposed change against the capability to perform the functions and the associated time requirement of performing the function to determine whether the capability or timeliness to perform a function is lost and/or degraded.

Section VI(a)(3) of Appendix A to 10 CFR Part 100 requires that seismic monitoring instrumentation be provided to promptly determine the response of those nuclear power plant features important to safety in the event of an earthquake. This capability is required to allow for a comparison of the measured response to that used in the design basis for the plant, Comparison of such data is needed to (1) determine whether the plant can continue to be operated safely and (2) permit the timely action as may be appropriate. However, seismic instrumentation does not actuate any protective equipment or serve any direct role in the mitigation of an accident.

The capability of the plant to withstand a seismic event or other design basis accident is determined by the initial design and construction of systems, structures and components. The instrumentation is used to alert operators to the seismic event and evaluate the plant response.

GL 95-10 discusses that seismic monitoring instrumentation is not included in the criterion of instrumentation used to detect precursors to reactor coolant pressure boundary leakage and does not serve as a protective design feature or part of a primary success path for events that challenge fission product barriers.

The licensee discussed in its letter dated July 16, 2008, that the BSEP's ERP contains three EALs related to seismic activity.

EAL 14.01.01, "Alarm on seismic monitor AND confirmation of earthquake," which constitutes an Unusual Event (UE).

EAL 14.02.01, "Earthquake registering greater than 0.08 g on seismic instrumentation," which constitutes an Alert.

EAL 14.03.01, "Earthquake registering greater than 0.16 g on seismic instrumentation with plant not in cold shutdown," which constitutes a Site Area Emergency (SAE).

The licensee further states that:

Currently, EAL 14.01.01 is entered upon confirmation of an earthquake. This confirmation is essentially immediate via verification that the opposite unit's annunciator is lit. After the proposed change, the single active monitoring system will feed both units' annunciator. As such, confirmation of an earthquake will be accomplished by accessing the monitoring system in the Unit 2 back-panel area. While this slightly increases the time to enter EAL 14.01.01, it remains well within the less than 15[-]minute criterion for making the determination. Additionally, if the proposed single monitoring system is inoperable, recognition of a seismic event by the control room personnel may be dependent upon notification by other onsite personnel or other anomalous plant indications (e.g., fluctuating water levels in the spent fuel pool), which may increase the time taken to classify EAL 14.01.01.

EALs 14.02.01 and 14.03.01 both require the magnitude of the seismic event to be known. Currently, this is accomplished by accessing data stored on magnetic tape cassettes, which takes approximately 12 minutes to complete. ERP assumes that at least one of the two seismic monitoring systems is operating at all times.

With the new system, this data will be immediately available, via direct readout, upon accessing the monitoring system in the Unit 2 back-panel area (i.e., it is estimated that this would take only a few minutes to complete). However, if the proposed single monitoring system is out-of-service due to inoperability or scheduled maintenance, this information will have to be relayed from off-site entities such as the United States Geological Survey (USGS) National Earthquake Center. The USGS National Earthquake Center indicated that once they have been contacted, the specific magnitude readings for the BSEP site may take 15 to 30 minutes to calculate.

Both the Unit 1 and Unit 2 reactor buildings are designed to be the same seismic input and the same in-structure response spectra are used for both buildings, therefore, the installation of only one set of accelerometers is acceptable. Although BSEP has a shared control room, annunciation of an event is being maintained for both units. The new seismic monitoring system meets the design requirements contained in Revision 2 of Regulatory Guide 1.12.

CP&L will ensure that adequate preplanned measures are in place for the accurate and timely classification of EALs during periods when seismic monitoring instrumentation is inoperable. The TRM [Technical Requirements Manual] requires surveillance intervals of once every 31 days for a channel check, once every 184 days for a channel functional test, and once every 24 months for a channel calibration. Based on the above surveillance requirements, the expected monitoring availability of the system is 99.4% [percent] over 12 months.

During the time that the seismic monitoring system may be unavailable for testing or repair, recognition of a minor seismic event by control room personnel may be dependent upon notification by other onsite personnel or other anomalous plant indications (e.g., fluctuating water levels in the spent fuel pool), which may increase the time taken to classify EAL 14.01.01. Once identified, procedural requirements will dictate backup calls to the USGS National Earthquake Center, if required, to obtain seismic event magnitude data. This is consistent with NUREG-0654, Revision 1, 'Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants,' Planning Standard H.6.a which requires licensees to make provision to acquire data from offsite monitoring of geophysical phenomena (e.g., seismic). This data will then be used to determine if entry into EAL 14.02.01 (i.e., Alert) or 14.03.01 (i.e., Site Area Emergency) is required. As previously discussed, the USGS National Earthquake Center indicated that once they have been contacted, the specific magnitude readings for the BSEP site may take 15 to 30 minutes to calculate. With the current system, this data is available in approximately 12 minutes by accessing data stored on magnetic tape cassettes. CP&L believes that obtaining seismic event magnitude data from the USGS National Earthquake Center continues to ensure accurate and timely classification of EALs during periods when seismic monitoring instrumentation is inoperable.

Emergency Classification

Classification is expected to be made promptly following indication that the conditions have reached an emergency threshold in accordance with the licensee's EAL scheme. With respect to classification of emergencies, the 15-minute goal is a reasonable period of time for assessing and classifying an emergency once indications are available to control room operators that an EAL has been exceeded. Allowing a delay in classifying an emergency up to 15 minutes will have minimal impact upon the overall emergency response to protect the public health and safety.

The current seismic monitoring system provides the capability of having continuous site seismic monitoring capability even when one unit's system is out of service, it effectively ensured an immediate (i.e., less than 15 minutes) readout of the occurrence of a seismic event. It should be noted that the Technical Requirements Manual Specification (TRMS) 3.9.B does allow one or

more seismic monitoring instruments inoperable for 31 days. However, the TRM does not specify that one seismic monitoring system be in-service at all times.

Although the time to classify the EAL 14.01.01 (UE) could be slightly increased with the proposed new system as confirmation of an earthquake can be accomplished in a few minutes by accessing the monitoring system in the Unit 2 back-panel area for the data immediately available by direct readout, it is well within the 15-minute goal. The data to assess the magnitude for classification of the EALs 14.02.01 (Alert) and 14.03.01 (SAE) is available in a few minutes by accessing the back panel area for the data immediately available by direct readout vice the approximately 12 minutes required to access the data on the old system's magnetic tapes. This provides the information needed to promptly determine the seismic response of the nuclear plant features important to safety to permit comparison of such response with that used as the design basis.

The use of a single system could have minimal impact on the ability to timely classify seismic events due to inoperability or unavailability, however, the installation of a new, highly reliable, computer-based seismic monitoring system does improve the overall effectiveness of the ERP due to the expected minimal unavailability (99.4 percent over 12 months) and the immediate readout capability of data for classification of an Alert or SAE vice approximately 12 minutes. The use of a single system, with provisions in place for unavailability, to obtain information necessary for assessment and classification meets the guidance provided in RG 1.12 and NUREG-0654, and therefore is acceptable.

Assessment

Methods of detection can be based on instrumentation, validated by a reliable source, or operator assessment. As defined in the Electric Power Research Institute (EPRI) sponsored "Guidelines for Nuclear Plant Response to an Earthquake", dated October 1989, a "felt earthquake" is:

An earthquake of sufficient intensity such that: (a) the vibratory ground motion is felt at the nuclear plant site and recognized as an earthquake based on a consensus of control room operators on duty at the time, and (b) for plants with operable seismic instrumentation, the seismic switches of the plant are activated. For most plants with seismic instrumentation, the seismic switches are set at an acceleration of about 0.01g.

Although the time to assess the conditions for classification of the EAL 14.01.01 (UE) could be slightly increased with the proposed new system as confirmation of an earthquake can be accomplished in a few minutes by accessing the monitoring system in the Unit 2 back-panel area for the data immediately available by direct readout, it is well within the 15 minute goal. The data to assess the magnitude for classification of the EALs 14.02.01 (Alert) and 14.03.01 (SAE) is available in a few minutes by accessing the back panel area for the data immediately available by direct readout vice the approximately 12 minutes required to access the data on the old system's magnetic tapes. This provides the information needed to promptly determine the seismic response of the nuclear plant features important to safety to permit comparison of such response with that used as the design basis.

The use of a single system could have minimal impact on the ability to timely assess the magnitude of seismic events due to inoperability or unavailability, however, the installation of a

new, highly reliable, computer-based seismic monitoring system does improve the overall effectiveness of the ERP due to the expected minimal unavailability (99.4 percent over 12 months) and the immediate readout capability of data for assessment of the magnitude for a classification of an Alert or SAE. The use of a single system, with provisions in place for unavailability, to obtain information necessary for assessment and classification meets the guidance provided in RG 1.12 and NUREG-0654, and therefore is acceptable.

4.0 CONCLUSION

The NRC staff finds that the proposed emergency plan changes meet the standards in 10 CFR 50.47(b) and the requirements in Appendix E of 10 CFR Part 50, 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 July 16, 2008, and as supplemented by the letter dated February 3, 2009, are acceptable.

5.0 REFERENCES

1. CP&L Letter, "Request for Emergency Plan Change," dated July 16, 2008 (ADAMS Accession No. ML082050399).
2. CP&L Letter, "Response to Request for Additional Information Regarding Request for Emergency Plan Change," dated February 3, 2009 (ADAMS Accession No. ML090560539).
3. 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).
4. Regulatory Guide 1.12, Revision 2, "Nuclear Power Plant Instrumentation for Earthquakes," dated March 1997 (ADAMS Accession No. ML003739944).
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 FBrown for/

Eric J. Leeds, Director
Office of Nuclear Reactor Regulation

Docket Nos. 50-325 and 50-324

Enclosure: Safety Evaluation

cc: ListServ

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