

October 4, 2001

Mr. J. S. Keenan
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 - ISSUANCE OF
AMENDMENT REGARDING SURVEILLANCE TESTING OF EXCESS FLOW
CHECK VALVES (TAC NOS. MB1048 AND MB1049)

Dear Mr. Keenan:

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 215 to Facility Operating License No. DPR-71 and Amendment No. 242 to Facility Operating License No. DPR-62 for Brunswick Steam Electric Plant, Units 1 and 2. The amendments change the Technical Specifications in response to your submittal dated January 17, 2001, as supplemented by letters dated March 23 and August 31, 2001.

The amendments change the Technical Specifications to relax the 24-month surveillance frequency of excess flow check valves (EFCVs) by limiting the number of tests to a representative sample every 24 months such that each EFCV will be tested at least once every 10 years.

A copy of the related Safety Evaluation is also enclosed. A Notice of Issuance will be included in the Commission's bi-weekly Federal Register Notice.

Sincerely,

/RA/

Donnie J. Ashley, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-325
and 50-324

Enclosures:

1. Amendment No. 215 to
License No. DPR-71
2. Amendment No. 242 to
License No. DPR-62
3. Safety Evaluation

cc w/enclosures:
See next page

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CAROLINA POWER & LIGHT COMPANY, et al.

DOCKET NO. 50-325

BRUNSWICK STEAM ELECTRIC PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 215
License No. DPR-71

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment filed by Carolina Power & Light Company (the licensee), dated January 17, 2001, as supplemented March 23 and August 31, 2001, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications, as indicated in the attachment to this license amendment; and paragraph 2.C.(2) of Facility Operating License No. DPR-71 is hereby amended to read as follows:

Date of Publication: October 1, 2011

3.

This order shall become effective on the date of publication.

the Commission shall have jurisdiction over the matter.

Office of the Director, Nuclear Regulatory Commission

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ATTACHMENT TO L
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DOCKET NO. 50-325

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licensee), dated January 17, 2001.
The application for amendment

The Nuclear Regulatory Commission

License No. DPR-62
Amendment No. 242

AMENDMENT TO FACILITY OPERATING LICENSE

BRUNSWICK STEAM ELECTRIC PLANT

DOCKET NO. 50-324

CAROLINA POWER & LIGHT COMPANY

Insert Page

DOCKET NO. 50-324

FACILITY OPERATING LICENSE NO. DPR-62
ATTACHMENT TO LICENSE AMENDMENT NO. 242

Revised page 10. The purpose of the Appendix is to identify any Specifications with the contained marginal

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 215 TO FACILITY OPERATING LICENSE NO. DPR-71
AND AMENDMENT NO. 242 TO FACILITY OPERATING LICENSE NO. DPR-62
CAROLINA POWER & LIGHT COMPANY
BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
DOCKET NOS. 50-325 AND 50-324

1.0 INTRODUCTION

By letter dated January 17, 2001, as supplemented by letters dated March 23 and August 31, 2001, the Carolina Power & Light Company (the licensee) submitted a request for changes to the Brunswick Steam Electric Plant, Units 1 and 2 (BSEP), Technical Specifications (TS). The requested changes would revise the surveillance test requirements for excess flow check valves (EFCVs). The March 23 and August 31, 2001, letters provided clarifying information that did not change the initial no significant hazards consideration determination, or expand the scope of the initial application.

2.0 BACKGROUND

Excess flow check valves (EFCVs) are installed in boiling water reactor (BWR) instrument lines penetrating the primary containment boundary, to limit the release of fluid in the event of an instrument line break. Regulatory Guide (RG) 1.11, "Instrument Lines Penetrating Primary Reactor Containment," provides guidance on the implementation of General Design Criteria (GDC) 55 and 56 for instrumentation lines that penetrate primary reactor containment and are part of the reactor coolant pressure boundary. As stated by RG 1.11, EFCVs in combination with flow restricting features (line size or orifice) satisfy the requirements of GDC 55 and 56 for automatic isolation capability, maintain the reliability of the connected instrumentation, and ensure the functional performance of secondary containment in the event of an instrumentation line rupture. Examples of EFCV installations include reactor pressure vessel (RPV) level and pressure instrumentation, main steam line flow instrumentation, recirculation pump suction pressure, and reactor core isolation cooling steam line flow instrumentation. EFCVs are not required to close in response to a containment isolation signal and are not required to operate under post loss-of-coolant accident (LOCA) conditions.

BSEP TS Surveillance Requirement (SR) 3.6.1.3.7 currently requires verification of the actuation capability of each reactor instrumentation line EFCV every 24 months. The SR demonstrates that each reactor instrumentation line EFCV is operable by verifying that the valve actuates to the isolation position on an actual or simulated instrument line break. The proposed change revises TS SR 3.6.1.3.7 to relax the 24-month EFCV surveillance frequency by limiting the number of tests to a "representative sample," consisting of an approximately

equal number of EFCV's being tested every 24 months such that each EFCV is tested at least once every 10 years.

The basis for the request is the high degree of reliability shown by the EFCVs and the low consequences of an EFCV failure. The supporting analysis for the licensee's conclusion is based on General Electric Nuclear Energy (GENE) Topical Report NEDO-32977-A, "Excess Flow Check Valve Testing Relaxation" dated June 2000. The topical report provided: (1) an estimate of steam release frequency (into the reactor building) due to a break in an instrument line concurrent with an EFCV failure to close, and (2) an assessment of the radiological consequences of such a release. The Boiling Water Reactor Owners Group (BWROG) concluded that the EFCV testing interval could be extended up to 10 years based on the topical report reliability and consequence analysis without significantly affecting plant risk. The BWROG suggested a staggered test interval based on actual valve performance with each valve being tested at least once every 10 years. The staff accepted the generic applicability of the topical report by a Safety Evaluation Report (SER) dated March 14, 2000, and agreed that the EFCV test interval could be extended to as much as 10 years. The staff also noted that licensees adopting the topical report must have a failure feedback mechanism and corrective action program to ensure that EFCV performance continues to be bounded by the topical report results. Additionally, each licensee is required to perform a plant-specific radiological dose assessment and EFCV failure rate and release frequency analysis to confirm that their facility is bounded by the generic analysis of the topical report.

The proposed change adopts the industry-recommended Technical Specification Task Force (TSTF) Traveler TSTF-334, Revision 2, "Relaxed Surveillance Frequency for Excess Flow Check Valves Testing," which was accepted by the staff on October 31, 2000, by letter from W. D. Beckner to A. R. Pietrangelo, Nuclear Energy Institute. The TSTF proposed specific changes to the Standard Technical Specifications (STS) with guidance for licensees implementing the extended EFCV surveillance test intervals proposed in the GENE topical report. Furthermore, the adoption of TSTF-334 is applicable only for those plants for which NEDO-32977-A is found applicable and are subject to EFCV performance and corrective action criteria to be developed by the licensee.

3.0 EVALUATION

The staff reviewed the licensee's submittal for conformance to the March 14, 2000, staff SER to Topical Report NEDO-32977-A and the recommended guidance in TSTF-334, Revision 2. The staff evaluation addresses the following areas: (1) EFCV failure rate and release frequency; (2) the licensee's failure feedback mechanism and corrective action program; (3) radiological dose assessment; and (4) conformance of the proposed TS to recommended generic guidance of the TSTF.

3.1 EFCV failure rate and release frequency

In the GENE topical report, EFCV reliability was evaluated based on testing experience provided by 12 different BWR plants. The composite data indicated that EFCVs are very reliable. The data represented 12,424.5 valve years of operation with a total of 11 failures noted. The EFCV composite failure rate was 1.67E-07/hour and was referenced as the "upper limit" failure rate in the topical report.

During the review of the GENE topical report, the staff noted that the BWROG assumed the EFCV failure rate as constant over time and that the owner groups did not account for potential age-related degradation in the EFCV failure rate. Additionally, the staff questioned the use of an instrument line break frequency based on WASH-1400 and not on more current industry data. In response to this staff concern, the BWROG response to a Request for Additional Information (RAI) provided an updated instrument line failure frequency of $3.52E-05$ failures/year based on the Electric Power Research Institute's Technical Report No. 100380, "Pipe Failures in U.S. Commercial Nuclear Power Plants," July 1992. The staff finds that this value is 6.6 times greater than the value calculated in the topical report using WASH-1400 data, and that the observed EFCV failures assumed in the BWROG response were five times the actual observed number (55 vs. 11) listed in the GENE topical report. The additional impact of an increase in instrument line failure frequency and a fivefold increase in EFCV failures assumed in the BWROG response demonstrated that release frequencies remained low with limited impact on the release frequency.

To estimate the release frequency initiated by an instrument line break, two factors are considered: (1) the instrument line break frequency downstream of the EFCV, and (2) the probability of the EFCV failing to close. The staff reviewed BSEP EFCV data and finds them to be consistent both in time sampled and EFCV reliability (0 EFCV failures, 89 valves installed per unit and no failures observed (1990 through 2001)) when compared to the topical report data. Using a surveillance interval of 24 months (current plant practice), an instrument line break frequency of $3.13E-03$ /year for BSEP, and an industry composite EFCV failure frequency of $5.53E-03$ (topical report value), the EFCV release frequency is estimated to be $1.73E-05$ /year. For a surveillance interval of 10 years, the release frequency is estimated to be $8.65E-05$ /year. The 10-year release frequency shows an increase of $6.92E-05$ /year over the 24-month value. This represents the increase in the total plant release frequency for a random break of any of the 89 BSEP instrument lines with a concurrent failure of the EFCV to isolate the break. These values are consistent with the staff topical report SER results that concluded an increase in release frequency of $7.3E-05$ /year was not significant. Based on the above, the staff considers the estimated EFCV failure rate and increase in estimated EFCV release frequency for a 10-year EFCV surveillance interval to be sufficiently low and is bounded by the staff topical report SER results.

3.2 The licensee's failure feedback mechanism and corrective action program

The staff noted that the GENE topical report does not provide a specific failure feedback mechanism, but does state that a plant's corrective action program must evaluate equipment failures and establish appropriate corrective actions. The BWROG responded to the staff RAI question concerning failure feedback by stating that each licensee that adopts the relaxed surveillance intervals recommended by the topical report should ensure that an appropriate feedback mechanism responsive to EFCV failure trends is in place.

To ensure EFCV performance remains consistent with the proposed extended test interval, the licensee stated in their submittal that they have established minimum performance criteria for conformance with the staff topical report SER. Any EFCV testing failure will be documented in the BSEP Corrective Action Program. The licensee stated that, in the event of a failure of one EFCV in a testing group, testing of an additional group will be performed on EFCVs subject to similar conditions. If two or more EFCVs were to fail, the sample would expand to 100 percent of the EFCVs for the unit being tested. The above performance criteria will be incorporated into the BSEP EFCV test procedures and inservice testing program documents upon implementation

of the proposed changes. The staff considers the licensee's committed program to account for potential changes in EFCV failure rates acceptable and it satisfies the recommended guidance in TSTF-334's performance and corrective action criteria.

3.3 Radiological dose assessment

The operational impact of an EFCV failing to close during the rupture of an instrument line connected to the RPV boundary is based on environmental effects of a steam release in the vicinity of the instrument racks inside the reactor building. Thus, the environmental impact of the failure of instrument lines connected to the RPV pressure boundary is the released steam into the reactor building. The GENE topical report stated that the magnitude of release through an instrument line would be within the pressure control capacity of reactor building ventilation systems and that the integrity and functional performance of secondary containment and Stand By Gas Treatment system following an instrument line break would continue to be met. The licensee stated, in their submittal, that their analysis has confirmed that an instrument line rupture outside primary containment will not result in overpressurizing secondary containment, and that the integrity and functional performance of the secondary containment are not impaired by the proposed change. Furthermore, the separation of instrument lines and equipment in the reactor building is expected to minimize the operational impact of an instrument line break on other equipment due to jet impingement.

In the licensee analysis, radiological consequences for an instrument line break was evaluated without taking credit for the EFCVs isolating the break, and the licensee analysis also assumed a discharge of reactor water through an instrument line with a 1/4-inch restricting orifice. The calculated potential offsite exposures are substantially below the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 100. As a result, a failure of an EFCV is bounded by the licensee's previous analysis. Based on the above review, the staff finds that radiation dose consequences for an instrument line break are not impacted by the proposed change, and thus the changes are acceptable.

3.4 Conformance of the proposed TS to recommended generic guidance of the TSTF

The BSEP TS SR 3.6.1.3.7 currently requires verification that each reactor instrumentation line EFCV be demonstrated OPERABLE at least once every 24 months by verifying the valve actuates to the isolation position on an actual or simulated instrument line break. The sentence in TS SR 3.6.1.3.7 will be revised to read, "Verify a representative sample of reactor instrumentation line EFCVs actuate to the isolation position on an actual or simulated line break signal."

The term "representative sample," as proposed by the topical report and TSTF-334 is not defined in the TS itself. However, the BWROG, in response to the staff RAI, stated that the term "representative sample," with an accompanying explanation in the TS Bases, is identical to the current usage in the STS, NUREG-1433, Revision 1. Specifically, NUREG-1433 uses the term "representative" in TS SR 3.8.6.3 in reference to battery cell testing, and "representative sample" in SR 3.1.4.2 for verification of control rod scram times. The criterion for "representative sample" and the basis for the nominal 10-year testing interval are provided in the licensee submittal, which is similar to Insert 1 and Insert 2 in TSTF-334, Revision 2. Therefore, the application of a "representative sample" for the EFCV testing SR, with an accompanying explanation in the TS Bases, is consistent with TSTF-334, Revision 2, to the STS usage and is, therefore, acceptable to the staff.

In addition, the licensee included in its submittal, for information, revised Bases for SR 3.6.1.3.7 that include a discussion of the EFCV test frequency and the term “representative sample.” The revised Bases for SR 3.6.1.3.7 include the following insert:

This SR requires a demonstration that a representative sample of reactor instrumentation line excess flow check valves (EFCVs) is OPERABLE by verifying that the valves actuate to the isolation position on an actual or simulated instrument line break signal. The representative sample consists of an approximately equal number of EFCVs, such that each EFCV is tested at least once every 10 years (nominal). In addition, the EFCVs in the samples are representative of the various plant configurations, models, sizes, and operating environments. This ensures that any potentially common problem with a specific type or application of EFCV is detected at the earliest possible time. This SR provides assurance that the instrumentation line EFCVs will perform so that predicted radiological consequences will not be exceeded during a postulated instrument line break event. The 24 month frequency is based on the need to perform this Surveillance under conditions that apply during plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has demonstrated that these components will pass this Surveillance when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. The nominal 10-year interval is based on performance testing as discussed in NEDO-32977-A (Ref. 12). Furthermore, any EFCV failures will be evaluated to determine if additional testing in that test interval is warranted to ensure overall reliability is maintained. Operating experience has demonstrated that these components are highly reliable and that failures to isolate are very infrequent. Therefore, testing of a representative sample was concluded to be acceptable from a reliability standpoint.

The staff reviewed the above proposed TS revisions and concludes that the revised SR 3.6.1.3.7 is consistent with the recommended generic guidance in TSTF-334, Revision 2.

As demonstrated in GENE Topical Report NEDO-32977-A, the impact of an increase in the EFCV surveillance test interval to 10 years results in an instrument line release frequency considered by the staff to be sufficiently low, especially since the consequences of an EFCV failure are bounded by previous licensee analysis and therefore are highly unlikely to lead to core damage. The staff concludes that the release frequency associated with the BSEP request for relaxation of EFCV surveillance testing is sufficiently low and therefore acceptable.

The consequences of steam release from the failure of the EFCVs is not significant, as shown by the topical report, and previous licensee analysis. Based on the acceptability of the methods applied to estimate the release frequency, the licensee’s relatively low release frequency estimate, and the negligible consequence of a release in the reactor building, in conjunction with a highly unlikely impact on core damage, the staff concludes that the impact on risk associated with the BSEP request for relaxation of EFCV surveillance testing is also sufficiently low and is acceptable.

The topical report established that each plant’s corrective action program must evaluate equipment failures and establish appropriate corrective actions. These programs ensure that meaningful feedback data is acquired so that appropriate corrective action may be taken with regard to EFCV performance. The licensee provided input on EFCV performance criteria and

the EFCV corrective action program. The licensee's program is in conformance with TSTF-334, Revision 2, and thus is acceptable to the staff.

Based on the above, the staff finds the change to relaxation of the BSEP reactor instrument line EFCV surveillance frequency by allowing a representative sample of EFCVs to be tested every 24 months, with all EFCVs being tested at least once every 10 years, to be acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the State of North Carolina official was notified of the proposed issuance of the amendments. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes a Surveillance Requirement. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (66 FR 11052). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: Clifford Douth

Date: October 4, 2001

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