May 8, 2008

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 - RELIEF REQUESTS FOR THE BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2 FOURTH 10-YEAR PUMP AND VALVE INSERVICE TESTING PROGRAM (TAC NOS. MD7425, MD7426, MD7427, MD7428, MD7429, MD7430, MD7431, MD7432, MD7433, MD7434, MD7435, MD7436, MD7437, MD7438, MD7440, AND MD7441)

Dear Mr. Waldrep:

By letter dated November 13, 2007, Carolina Power & Light Company (the licensee) submitted Relief Requests PRR-01, PRR-02, PRR-03, VRR-01, VRR-02, VRR-03, VRR-04, and VRR-05 for the fourth 10-year interval inservice testing (IST) program at Brunswick Steam Electric Plant, Units 1 and 2. The licensee requested Nuclear Regulatory Commission (NRC) approval for relief from certain IST requirements of the American Society of Mechanical Engineers Code for Operation and Maintenance of Nuclear Power Plants. By letter dated April 23, 2008, the licensee submitted its response to the NRC staff's request for additional information. In its letter, the licensee withdrew relief requests PRR-01 and PRR-02 and revised relief requests PRR-03, VRR-01, and VRR-02.

The NRC staff has reviewed the relief requests and concluded that Relief Requests VRR-01, VRR-02 (Part A), VRR-03, VRR-04, VRR-05, and PRR-03 are authorized pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(i) for the fourth 10-year IST interval, and that the proposed alternatives would provide an acceptable level of quality and safety.

For Relief Request VRR-02 (Part B), relief is granted pursuant to 10 CFR 50.55a(f)(6)(i) and based on the determination that it is impractical for the licensee to comply with the specified requirement. Granting relief is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The licensee's proposed alternative provides reasonable assurance of the operational readiness of the components.

The bases for the NRC staff's conclusion are contained in the enclosed Safety Evaluation. If you have any questions regarding this issue, please contact Farideh E. Saba at (301) 415-1447 or farideh.saba@nrc.gov.

Sincerely,

***/RA/***

Thomas H. Boyce, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-325 and 50-324

Enclosure: Safety Evaluation

cc w/encl: See next page

The bases for the NRC staff's conclusion are contained in the enclosed Safety Evaluation. If you have any questions regarding this issue, please contact Farideh E. Saba at (301) 415-1447 or farideh.saba@nrc.gov.

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* By memorandum

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST RELATED TO THE INSERVICE TESTING PROGRAM

FOURTH 10-YEAR INTERVAL

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2

DOCKET NUMBERS 50-325 AND 50-324

## 1.0 INTRODUCTION

By letter dated November 13, 2007, Carolina Power and Lighting Company (CP&L, the licensee) submitted relief requests for the fourth 10-year interval inservice testing (IST) program at Brunswick Steam Electric Plant (BSEP), Units 1 and 2. The licensee requested relief from certain IST requirements of the 2001 Edition through 2003 Addenda of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code). The BSEP fourth 10-year IST interval commences on May 11, 2008. In response to the staff's request for additional information (RAI), the licensee submitted additional information to the Nuclear Regulatory Commission (NRC) in a letter dated April 23, 2008. Also, the licensee withdrew Relief Requests PRR-01 and PRR-02 and revised Relief Requests PRR-03, VRR-01, and VRR-02.

## 2.0 REGULATORY EVALUATION

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(f)(4)(ii), licensees are required to comply with the requirements of the latest edition and addenda of the ASME Code incorporated by reference in the regulations 12 months prior to the start of each 120-month IST program interval. In accordance with 10 CFR 50.55a(f)(4)(iv), IST of pumps and valves may meet the requirements set forth in subsequent editions and addenda that are incorporated by reference in 10 CFR 50.55a(b), subject to NRC approval. Portions of editions or addenda may be used provided that all related requirements of the respective editions and addenda are met.

Section 50.55a of 10 CFR requires that IST of ASME Code Class 1, 2, and 3 pumps and valves be performed at 120-month (10-year) IST program intervals in accordance with the specified ASME Code and applicable addenda incorporated by reference in the regulations, except where alternatives have been authorized pursuant to 10 CFR 50.55a(a)(3)(i), 10 CFR 50.55a(a)(3)(ii), or relief has been requested by the licensee and granted by the NRC pursuant to paragraph (f)(6)(i) of 10 CFR 50.55a.

Enclosure

In proposing alternatives or requesting reliefs, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety; (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance is impractical for the facility. Section 50.55a authorizes the NRC to approve alternatives and to grant relief from ASME OM Code requirements upon making necessary findings. NRC guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provides alternatives to ASME Code requirements which are acceptable. Further guidance is given in GL 89-04, Supplement 1, and NUREG (NRC technical report designation)-1482, Revision 1, "Guidelines for Inservice Testing at Nuclear Power Plants."

## 3.0 TECHNICAL EVALUATION

### 3.1 Valve Relief Request VRR-01

#### 3.1.1 Code Requirements

The ASME OM Code, paragraph ISTC-5113(c) requires that the stroke time of all valves shall be measured to at least the nearest second.

#### 3.1.2 Component Identification

The components affected by this relief request are automatic depressurization system (ADS) safety/relief valves (S/RVs) 1-B21-F013A through 1-B21-F013L and 2-B21-F013A through 2-B21-F013L for BSEP, Units 1 and 2.

#### 3.1.3 Licensee's Basis for Requesting Relief

The functions of the primary steam line S/RVs are to: (1) open upon receipt of an ADS signal to blow down the reactor vessel (i.e. for the ADS valves only), (2) act as primary system safety valves actuating on high system pressure or by manual actuation from the control room, and (3) to close to maintain the primary system pressure boundary and prevent uncontrolled depressurization of the reactor (i.e., stuck open relief valve). The function of the solenoid valves is to energize upon receipt of a manual or ADS actuation signal and, in so doing, vent the associated poppet valve assembly causing the associated main valve to open.

The valves are sent to a vendor (i.e., Wyle Laboratories) and as-found tested, which includes visual inspection, leakage testing, stroke time testing and set pressure testing; maintenance is performed as well. The stroke time is measured by using accelerometers. The acceptance criteria are set at less than 100 milliseconds. The valves test consistently between 25 and 50 milliseconds. This verifies that the valves will perform their desired function. The valves are full-stroke exercised and remote position verified, in accordance with the ASME OM Code and the technical specifications (TSs) at the BSEP. There are no remote position indicators related to the position of these valves that signal full-open positioning of the valves. Therefore, temperature sensors and acoustic monitors downstream of the valves' discharge nozzles are used to provide a positive valve position indication. To perform the stroke time testing at the plant would require installation of test equipment. Within the drywell, the installation of this test equipment would be required during plant start-up operations, involve personnel working in high radiation field, and involve subsequent removal of this test equipment when drywell is inaccessible.

The proposed alternate testing above, together with the extensive preventative maintenance requirements for these valves, gives adequate assurance that these valves will perform satisfactorily and reliably. This position and alternate testing conforms to the recommendations presented in NUREG-1482, Revision 1, paragraph 4.3.2.1.

3.1.4 Licensee's Proposed Alternative Testing

Each of these valves will be exercised open and closed, and proper operation will be ascertained, by observing the response and changes in main steam parameters within a specified time period and observation of the outputs of the downstream temperature sensors and acoustic monitors. Specific as-found stroke times, visual inspections, set pressure and leakage testing will be measured by the vendor.

3.1.5 Evaluation of Relief Request VRR-01

The licensee requests relief from the measurement requirements of ASME OM Code, paragraph ISTC-5113(c) for the S/RVs 1/2-B21-F013A through 1/2-B21-F013L for BSEP, Units 1 and 2. Paragraph ISTC-5113(c) requires that the stroke time measurement of all the power-operated valves shall be measured to at least the nearest second.

The licensee states that it is not feasible to measure the stroke times of the ADS valves because of their design. The licensee proposed to exercise open and close of each of ADS, and ascertain proper operation by observing the response and changes in main steam parameter within the specified time period and observation of the outputs of the downstream temperature sensors and acoustic monitor. In addition to this, the licensee states that the proposed alternative testing will be performed with the extensive preventive maintenance requirements for these valves. The licensee's proposed alternative in consistent with the guidance as specified in NUREG-1482, Revision 1, paragraphs 4.2.3 and 4.3.2.1, therefore, the staff concludes that the licensee's alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the proposed alternative provides an acceptable level of quality and safety.

3.1.6 Conclusion

The proposed alternative to ASME OM Code, paragraph ISTC-5113(c) requirement related to the S/RV stroke time is authorized pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that compliance with specified requirements and that the proposed alternative provides an acceptable level of quality and safety.

3.2 Valve Relief Request VRR-02

3.2.1 Code Requirements

The ASME OM Code, paragraph ISTC-3510, "Exercising Test Frequency," requires that Active Category A, Category B, and Category C check valves shall be exercised nominally every 3 months, except as provided by paragraphs ISTC-3520, ISTC-3540, ISTC-3550, ISTC-3560, ISTC-5221, and ISTC-5222.

The ASME OM Code, paragraph ISTC-5224, "Corrective Action," requires that if a check valve fails to exhibit the required change of obturator position, it shall be declared inoperable. A retest showing acceptable performance shall be run following any required corrective action before the valve is returned to service.

3.2.2 Component Identification

The components affected by this relief request are feedwater (FW) check valves 1-B21-F010A, 1-B21-F010B, 2-B21-F010A, and 2-B21-F010B for BSEP, Units 1 and 2.

3.2.3 Licensee's Basis for Requesting Relief

These check valves open to provide flow paths for normal FW flow as well as high pressure coolant injection (HPCI) and reactor core isolation cooling (RCIC) flow into the reactor vessel. These are simple check valves, with no external means of exercising or external determination of disk position. Thus, the only practical method of exercising these valves to their open position and confirming full open operation per the guidance of NRC GL 89-04 and NUREG-1482, Revision 1, is with flow from the reactor FW system, or from the HPCI or RCIC systems themselves. The HPCI accident flow requirement is 4250 gallons per minute (gpm), and the RCIC accident flow requirement is 400 gpm. Injecting water directly from either the HPCI or RCIC systems to the reactor is impractical during plant operation due to the possibility of creating an unacceptable reactor vessel water level transient, thermal shock to reactor vessel nozzles, a reactivity excursion, or upsetting reactor water chemistry. Under normal shutdown conditions, steam is unavailable to operate the HPCI and RCIC turbines and there is a potential for over-pressurizing the reactor vessel. Thus, the only practical way of exercising these valves is with reactor FW flow during power operation.

During normal plant operation, the FW flow is approximately 12,500 gpm per loop. Normal plant operation exceeds 12,500 gpm, which is greater than the maximum accident flow of either HPCI or RCIC through these check valves. The reactor FW system arrangement is such that flow indication can be obtained for each of the individual FW loops. Thus, flow measurement through each check valve can be made to verify proper opening of the subject check valve. This method complies with NUREG-1482, Revision 1, paragraph 4.1.6, which allows extension of the test frequency for check valves to refueling outages to verify closed by leak testing and the performance of the open exercise test during the refueling outage or anytime during the fuel cycle interval. ASME OM Code, paragraph ISTC-3550, "Valves in Regular Use," also provides allowances that satisfy the exercising of requirements provided that observations otherwise required for testing are made and analyzed during operation, and recorded in the plant record at no greater than specified within the ASME OM Code. Monitoring of FW flow monthly and as required during the post-refueling startup test program, in accordance with plant procedures, complies with the above guidance.

3.2.4 Licensee's Proposed Alternative Testing

Exercising of these valves open will only be performed to the extent that adequate reactor FW flow is available. Full accident flow through each FW injection leg will be confirmed by monitoring A-loop and B-loop flow through FW flow venturis 1/2-C32-FE-N001A/B during power operation. FW flow is a critical input to the reactor heat balance and is monitored continuously via the plant process computer. Where maintenance or corrective action has been performed on a valve during a shutdown period, the subject valve will not be flow tested (i.e. opened) prior to being placed in service.

3.2.5 Evaluation of Relief Request VRR-02

The licensee requests relief from the requirements of the ASME OM Code, paragraphs ISTC-3510 and ISTC-5224 for FW check valves 1/2-B21-F010A and 1/2-B21-F010B at BSEP, Units 1 and 2.

3.2.5.1 Evaluation Related to the Code Requirements of Paragraph ISTC-3510

ASME OM Code, paragraph ISTC-3510, "Exercising Test Frequency," requires that Active Category A, Category B, and Category C check valves shall be exercised nominally every 3 months, except as provided by paragraphs ISTC-3520, ISTC-3540, ISTC-3550, ISTC-3560, ISTC-5221, and ISTC-5222.

The licensee proposes that exercising of these valves open will only be performed to the extent that adequate reactor FW flow is available. Full accident flow through each FW injection leg will be confirmed by monitoring A-loop and B-loop flow through FW flow venturis 1/2-C32-FE-N001A/B during power operation. In response to the NRC staff's RAI, the licensee stated that open verification of the check valves is also conducted by monitoring full flow on a monthly basis, per plant procedures during the post-refueling start-up test program. The licensee also states that when maintenance or corrective action has been performed on a valve during a shutdown period, the subject valve will not be flow tested (i.e. opened) prior to being placed in service, due to unavailability of the FW during an outage. Exercising the valve disc to ensure mobility prior to reassembly, and a local leak rate test to ensure acceptable leakage in accordance with the acceptance criteria, will adequately satisfy post-maintenance requirements.

GL 89-04, Position 1, states that a check valve's full stroke to the open position may be verified by passing the maximum required accident condition flow through the valve. The maximum required accident condition flow for these valves is the HPCI and RCIC accident flow requirements of 4,250 gpm and 400 gpm, respectively. During normal plant operation, the FW flow is approximately 12,500 gpm per loop, which is greater than the maximum accident flow of HPCI and RCIC, through these check valves. This relief is consistent with the criteria for a full-stroke exercise open as specified in GL 89-04, Position 1 and paragraphs 4.1.3 and 4.1.6 of the NUREG-1482, Revision 1, therefore, the staff concludes that the licensee's alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the proposed alternative provides an acceptable level of quality and safety.

3.2.5.2 Evaluation Related to the Code Requirement of Paragraph ISTC-5224

ASME OM Code, paragraph ISTC-5224, "Corrective Action," requires that if a check valve fails to exhibit the required change of obturator position, it shall be declared inoperable. A retest showing acceptable performance shall be run following any required corrective action before the valve is returned to service.

Paragraph ISTC-5224 requires a retest showing acceptable performance of valves that have failed tests prior to returning them to service. The licensee proposes to not perform an exercise test of these valves prior to returning them to service following corrective actions; therefore, this proposed alternative testing is a deviation from the code. Further, the licensee states that, when corrective actions are performed on these valves during shutdowns, it is impractical to establish design flow through them prior to startup because steam is not available to drive the HPCI and RCIC turbines. Exercising the valve disc to ensure mobility prior to reassembly, and a local leak rate test to ensure acceptable leakage in accordance with the acceptance criteria, will adequately satisfy post-maintenance requirements.

Since, it is impractical to exercise these valve open with flow prior to reactor startup, the first opportunity that an exercise to the open position can be verified is when normal FW flow is established into the reactor following startup. Even though the valve would already have been placed in service to allow reactor startup, this is the earliest practicable time that post-maintenance testing can be performed.

This method complies with NUREG-1482, Revision 1, paragraph 4.1.6, which allows extension of the test frequency for check valves to refueling outages to verify closed by leak testing and the performance of the open exercise test during the refueling outage or anytime during the fuel cycle interval.

3.2.6 Conclusion

Part A: The proposed alternative to paragraph ISTC-3510 related to the check valve's full stroke to the open position requirement is authorized pursuant to10 CFR 50.55a(a)(3)(i) on the basis that compliance with specified requirements and that the proposed alternative provides an acceptable level of quality and safety.

Part B: The relief related to the requirements of paragraph ISTC-5224, is granted based on the determination that it is impractical for the licensee to comply with the specified requirement. Granting relief pursuant to 10 CFR 50.55a(f)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The licensee's proposed alternative provides reasonable assurance of the operational readiness of the components.

3.3 Valve Relief Request VRR-03

3.3.1 Code Requirements

ASME OM Code, paragraph ISTC-5114(b) requires that valves with reference stroke times less or equal to 10 seconds shall exhibit no more than ± 50 percent change when compared to the reference value.

3.3.2 Component Identification

The components affected by this relief request are main steam isolation valves (MSIVs) 1/2-B21-FO22A thru 1/2-B21-FO22D and 1/2-B21-FO28A thru 1/2-B21-FO28D for BSEP, Units 1 and 2.

3.3.3 Licensee's Basis for Relief

In accordance with 10 CFR 50.55a(a)(3)(i), the licensee is requesting a proposed alternative to the code requirements provided above. The stroke times of these valves are adjusted within an acceptable band of 3 to 5 seconds by adjusting orifices associated with hydraulic dashpots attached to each operator. Thus, the stroke time performance of each valve operator is more a function of the dashpot setting than the material condition of the valve.

The acceptable band of + 1 second is restrictive enough to ensure that each of the valves remains operable within the established limits of the plant safety analysis.

Elimination of the 50 percent limit on deviation will have no significant impact on the reliability of these valves, nor on the health and safety of the public.

3.3.4 Licensee Proposed Alternative Testing

The acceptance criteria for closure stroke time for these valves will be 3 to 5 seconds, as established by the BSEP Surveillance Requirement 3.6.1.3.5. An arbitrary reference value will be established at 4 seconds, and the acceptance value will be set at 3 and 5 seconds. These values are more restrictive than the values established per the acceptance criteria of ASME OM Code, paragraph ISTC-5114(b).

3.3.5 Evaluation of Relief Request VRR-03

The purpose of establishing reference values for full-stroke times is to provide a stroke time value that represents proper valve operation and can be used to evaluate subsequent stroke time test measurements. The measurements that deviate from the reference value indicate either a change in valve condition or a problem with the test method. When the deviation is of sufficient magnitude, the valve is considered to be degraded and corrective action is required. The licensee indicated that the stroke times of the subject valves are controlled by adjusting orifices to keep the stroke time within the TS limits of 3 to 5 seconds. Therefore, the stroke time for these valves is a controlled parameter that does not necessarily reflect the condition of the valves. Since the TS-required band of 3 to 5 seconds is fairly restrictive, the licensee's proposal to use the median value of 4 seconds for the reference value is a reasonable alternative to the requirement for establishing reference values of full-stroke times.

Only a 1-second deviation is allowed between the licensee's proposed reference value of 4 seconds and both the proposed upper stroke time limit (5 seconds) and the lower stroke time limit (3 seconds). Applying the ± 50 percent change criteria of ASME OM Code, paragraph ISTC-5114(b) to the 4 seconds reference value yields an allowable change of ± 2 seconds, which would make the upper and lower limits of 6 seconds and 2 seconds, respectively. Therefore, the licensee's proposal is conservative as far as the code-required action limits are concerned for the subject valves.

A common situation encountered with MSIVs is that, due to the tight band prescribed for stroke times in the TS, reference values can not be established in accordance with the OM Code, but must be controlled near the center of the operating band to reduce the likelihood of violating a limit. The licensee indicated that the stroke times of these valves are adjusted within an acceptable band of 3 to 5 seconds by adjusting orifices associated with hydraulic dashpots attached to each operator. Periodically adjusting the stroke times back to the reference value prevents a gradual change of the stroke times, which could be indicative of valve degradation. Since the adjustments would prevent the limits from being exceeded, corrective actions may not be taken to repair the degraded valve. Therefore, if frequent orifice adjustments are needed to maintain the stroke times near the reference value, it would be prudent for the licensee to recognize this situation and to perform an evaluation to determine the cause of the changes and ensure that the valve has not being subject to a slow degradation.

3.3.6 Conclusion

Based on the determination that the alternative testing proposed by the licensee is conservative in comparison to the code requirements and would provide an acceptable level of quality and safety, Relief Request VRR-03 is authorized in accordance with 10 CFR 50.55a(a)(3)(i). However, if frequent orifice adjustments are required for a valve, an analysis should be performed to determine the cause of the frequent changes in the measured stroke times.

3.4 Valve Relief Request VRR-04

3.4.1 Code Requirements

ASME OM Code, paragraph ISTC-3510 requires that active Category A, Category B, and Category C check valves shall be exercised nominally every 3 months.

ASME OM Code, paragraph ISTC-3700 requires that valves with remote indicators shall be observed locally at least once every 2 years to verify that valve position is accurately indicated.

3.4.2 Component Identification

The components affected by this relief request are the following excess flow check valves (EFCVs):

| | | | |
|---|---|---|---|
| 1/2-B21-F008 | 1/2-B-21-F047D | 1/2-B21-F058N | 1/2-B32-F005A |
| 1/2-B21-F014A | 1/2-B-21-F048A | 1/2-B21-F058P | 1/2-B32-F005B |
| 1/2-B21-F014B | 1/2-B-21-F048B | 1/2-B21-F058R | 1/2-B32-F006A |
| 1/2-B21-F014C | 1/2-B-21-F049C | 1/2-B21-F058S | 1/2-B32-F006B |
| 1/2-B21-F014D | 1/2-B-21-F049D | 1/2-B21-F058T | 1/2-B32-F039A |
| 1/2-B21-F014E | 1/2-B-21-F050A | 1/2-B21-F058U | 1/2-B32-F039B |
| 1/2-B21-F014F | 1/2-B-21-F050B | 1/2-B21-F060 | 1/2-B32-F039C |
| 1/2-B21-F014G | 1/2-B-21-F050C | 1/2-B21-IV-2149 | 1/2-B32-F039D |
| 1/2-B21-F014H | 1/2-B-21-F050D | 1/2-B21-IV-2196 | 1/2-B32-F041A |
| 1/2-B21-F014J | 1/2-B-21-F052A | 1/2-B21-IV-2455 | 1/2-B32-F041B |
| 1/2-B21-F014K | 1/2-B-21-F052B | 1/2-B21-IV-2456 | 1/2-B32-F041C |
| 1/2-B21-F014L | 1/2-B-21-F052C | 1/2-E21-F017A | 1/2-B32-F041D |
| 1/2-B21-F014M | 1/2-B-21-F052D | 1/2-E21-F017B | 1/2-B32-F042A |
| 1/2-B21-F014N | 1/2-B-21-F054 | 1/2-E41-F023A | 1/2-B32-F042B |
| 1/2-B21-F014P | 1/2-B-21-F056 | 1/2-E41-F023B | 1/2-B32-F042C |
| 1/2-B21-F014R | 1/2-B-21-F058A | 1/2-E41-F023C | 1/2-B32-F042D |
| 1/2-B21-F014S | 1/2-B-21-F058B | 1/2-E41-F023D | 1/2-B32-F058A |
| 1/2-B21-F040 | 1/2-B-21-F058C | 1/2-E51-F043A | 1/2-B32-F058B |
| 1/2-B21-F042A | 1/2-B-21-F058D | 1/2-E51-F043B | |
| 1/2-B21-F042B | 1/2-B-21-F058E | 1/2-E51-F043C | |
| 1/2-B21-F044A | 1/2-B-21-F058F | 1/2-E51-F043D | |
| 1/2-B21-F044B | 1/2-B-21-F058G | | |
| 1/2-B21-F046A | 1/2-B-21-F058H | | |
| 1/2-B21-F046B | 1/2-B-21-F058L | | |
| 1/2-B21-F047C | 1/2-B-21-F058M | | |

3.4.3 Licensee's Basis for Relief

In accordance with 10 CFR 50.55a(a)(3)(i), the licensee is requesting a proposed alternative to the code requirements provided above. Because of the design of EFCVs, verifying their closure indication requires a simulated instrument line break. Based on the burden and costs associated with testing these EFCVs, the licensee is proposing to perform the exercise tests and valve position verification test on a sampling basis (i.e., approximately an equal number of EFCVs every 24 months such that each EFCV is tested at least once every 10 years.)

The licensee has determined that alternative EFCV testing will provide an acceptable level of quality and safety for the following reasons:

1. EFCVs are a simple and reliable device. The major components are a poppet and spring. The spring holds the poppet open only under static conditions, such that the valve will close upon sufficient differential pressure across the poppet. Functional testing of the valve is accomplished by venting the instrument side of the tube. The

resultant increase in flow imposes a differential pressure across the poppet, which compresses the spring and decreases flow through the valve.

2. The Boiling Water Reactor (BWR) Owners Group (OG) has developed a basis, documented in BWROG Topical Report B21-00658-01, “Excess Flow Check Valve Testing Frequency Relaxation,” dated November 1988, for reducing the EFCV testing frequency. The report was initially submitted to the NRC as part of a Duane Arnold Energy Center proposed license amendment on April 12, 1999. The BWROG report was supplemented by a BWROG letter dated January 6, 2000, “Generic Response to NRC Request for Additional Information on Lead Plant Technical Specification Change Request Regarding EFCV Surveillance Requirements.” The report was approved for use by an NRC Safety Evaluation dated March 14, 2000. Additionally, issues raised by the NRC in the March 14, 2000, safety evaluation were addressed in the issuance of General Electric (GE) Topical Report NEDO-32977-A (i.e., BWROG Topical Report B21-00658-01), “Excess Flow Check Valve Testing Relaxation,” dated June 2000.

TS Task Force (TSTF) Traveler TSTF-334, “Relaxed Surveillance Frequency for EFCV Testing,” Revision 2 was previously submitted to the NRC and was approved on September 18, 2000. The BWROG Topical Report BWROG-63, Revision 0, (TSTF-334, Revision 2) concluded that the change in EFCV test frequency has an insignificant impact on EFCV reliability. The topical report evaluated the reliability of EFCVs at various BWR plants, including BSEP, based on information covering a 10-year period. Industry experience with EFCVs indicates that they have very low failure rates. A large portion of the reported test failures at other plants was related to test methodologies and not actual valve failures.

On October 4, 2001, the NRC issued License Amendment 215 and 242 for BSEP, Units 1 and 2, respectively, revising the BSEP TSs to incorporate EFCV testing requirements consistent with TSTF-334.

EFCVs have been extremely reliable throughout the industry. No EFCV has failed to close due to actual valve failure at BSEP, Units 1 and 2, since 1995.

An orifice is installed on each of the affected instrument lines. The orifice limits leakage to a quantity where the integrity and functional performance of secondary containment and the associated safety systems are maintained. The process fluid loss for a postulated rupture of an instrument line is within the capability of the reactor coolant makeup systems.

The reduced testing associated with the alternative will result in an increase in the availability of the associated instrumentation during plant refueling outages. The reduced testing associated with the alternative will also reduce occupational radiological exposure.

3.4.4 <u>Licensee’ Proposed Alternative Testing</u>

The licensee proposes to test a representative sample of EFCVs consisting of an approximately equal number of EFCVs every 24 months, such that each EFCV will be tested at least once every 10 years. In addition, CP&L proposes to verify the open position indication at a frequency more often than what the ASME Code requires, but verify the close position indication in conjunction with EFCV tests.

3.4.5 Evaluation of Relief Request VRR-04

EFCVs are installed on BWR instrument lines to limit the release of fluid in the event of an instrument line break. Examples of EFCV installations include reactor pressure vessel level and pressure instrumentation, main steam line flow instrumentation, recirculation pump suction pressure, and RCIC 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 conditions.

ASME OM Code, paragraph ISTC-3510 requires that active Category A, Category B, and Category C check valves shall be exercised nominally every 3 months, and paragraph ISTC-3700 requires that valves with remote indicators shall be observed locally at least once every 2 years to verify that valve position is accurately indicated. The licensee proposes alternative test frequency by allowing a representative sample of EFCVs to be tested, and close-position verified every 24 months. The representative sample is based on approximately 20 percent of the EFCVs being tested each refueling outage such that each valve is tested and close-position verified at least once every 10 years.

The licensee's justification for the relief request is based on GE Topical Report NEDO-32977-A. 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 staff reviewed the GE topical report and issued its evaluation on March 14, 2000. In its evaluation, the staff found that the test interval may be extended up to a maximum of 10 years. In conjunction with this finding, the staff noted that each licensee who adopts the relaxed test interval program for EFCVs must have a failure feedback mechanism and corrective action program to ensure EFCV performance continues to be bounded by the topical report results. Also, each licensee is required to perform a plant-specific radiological dose assessment, EFCV failure analysis, and release frequency analysis to confirm that they are bounded by the generic analyses of the topical report.

In this safety evaluation, the staff reviewed the licensee's proposal for its applicability to GE Topical Report NEDO-32977-A and conformance with the NRC staff's guidance regarding radiological dose assessment, EFCV failure rate and release frequency, and the proposed failure feedback mechanism and corrective action program. Based on its review, the staff concludes that the radiological consequences of an EFCV failure are sufficiently low and acceptable, and that the alternative testing in conjunction with the corrective action plan provides a high degree of valve reliability and operability. Additionally, an orifice is installed upstream of the EFCVs to limit reactor water leakage in the event of rupture. The orifice limits leakage to a level where the integrity and functional performance of secondary containment and associated safety systems are maintained. In addition, the proposed alternative is consistent with TSTF-334, which was previously submitted to the NRC and approved by NRC on September 18, 2000. Therefore, the staff finds that the licensee's proposed test alternative provides an acceptable level of quality and safety.

3.4.6 Conclusion

Based on the above evaluation, the NRC staff finds the proposed extension of the BSEP test frequency allowing a representative sample of EFCVs to be tested and close-position verified every 24 months with all EFCVs being tested and close-position verified at least once every 10 years to be acceptable. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), Relief Request VRR-04 is authorized for use on the basis that the proposed alternative provides an acceptable level of quality and safety.

3.5 Valve Relief Request VRR-05

3.5.1 Code Requirements

ASME OM Code, paragraph ISTC-3510 requires that active Category A, Category B, and Category C check valves shall be exercised nominally every 3 months except as provided by paragraphs ISTC-3520, ISTC-3540, ISTC-3550, ISTC-3560, ISTC-5221, and ISTC-5222.

ASME OM Code, paragraph ISTC-3522(c) states that if exercising is not practicable during operation at power and cold shutdowns, it shall be performed during refueling outages.

ASME OM Code, paragraph ISTC-5221(c)(3) states that at least one valve from each group shall be disassembled and examined at each refueling outage; all valves in each group shall be disassembled and examined at least once every 8 years.

3.5.2 Component Identification

The components affected by this relief request are service water (SW) check valves 1/2-SW-V683, 1/2-SW-V684, 1/2-SW-V685, and 1/2-SW-V686 for BSEP, Units 1 and 2.

3.5.3 Licensee's Basis for Relief

These service water check valves open to provide flow paths for cooling water to the emergency diesel generators (EDGs), and close to ensure service water system train isolation. These are simple check valves, with no external means of exercising the valves or determining obturator position. Due to the absence of isolation valves and vent and drain connections, there is no practical way these check valves can be back-flow (i.e., closure) tested. Therefore, the only means of determining valve operability is to observe system parameters. Since there are no position indicating devices on these check valves and no flow instrumentation installed on the EDG service water supply headers, verification of full flow through these check valves is not possible.

These valves are located in the diesel generator building adjacent to the machinery to which they supply cooling water. Each valve is oriented horizontally. The valves operate in a saltwater environment and are only operated during the monthly diesel generator testing, quarterly partial stroke testing, and during a system hydraulic test that is performed once every other refueling outage (i. e., approximately every 4 years). The design of these check valves is very robust, and the valves are limited operation; therefore, the potential for wear is minimum.

Being nozzle check valves, the piston does not oscillate during diesel generator operation, which eliminates the primary contributor to wear in check valves.

ASME OM Code, paragraph ISTC-5221(c) specifies requirements for a sample disassembly and inspection program where the owner determines that it is not feasible to otherwise test the check valves. The program involves grouping similar valves and testing at least one valve in each group during each refueling outage. A different valve of each group is required to be disassembled, inspected, and manually full-stroke exercised at each successive refueling outage, until the entire group has been tested. The identified check valves will be assigned to eight valve group, each group consisting of a single check valve.

The valves will be disassembled and inspected on a nominal 24-month frequency. This valve grouping and inspection frequency is acceptable, as described in GL 89-04, Position 2, and as well as in accordance with ASME OM Code. Following check valve disassembly and inspection, the check valve will be partial-stroke tested.

The valves have been routinely disassembled and inspected during normal at-power operation as part of the 24-month EDG inspection. The time allotted for the diesel generator inspection is approximately 72 hours. The TS Limiting Condition for Operation (LCO) allows the EDG to be out-of-service for 7 days. The 24-month diesel generator inspection consists of inspections and maintenance of diesel engine, generator, and supporting systems such as lubrication oil, fuel oil, starting air, and cooling water. The approximate time period for the work associated with the check valve inspection is 4 to 5 hours and check valve inspections are usually performed in the first 24 hours of the diesel generator inspection work. Due to the physical arrangement of the valves, both check valves on a diesel generator are inspected at the same time.

Since their installation in 1994/1995, these valves have not exhibited any signs of wear or degradation. However, early signs of degradation would likely not have an impact on valve operability. This would allow ample time to obtain additional replacement parts, if needed. BSEP maintains one new replacement check valve in stock. In the event that a deficiency was found that warranted inspections of the other check valve groups, the additional inspections would be planned and carried out within the framework of the 12-week rolling schedule used at the BSEP.

Isolation of the affected check valves is accomplished by closing two upstream motor operated butterfly valves (i.e., one valve on each unit's service water supply line to the diesel) and manually closing a single butterfly valve on the common discharge line. The butterfly valves used to isolate the affected check valves are not leak tested, as they are Category B valves and there are no taps available to perform leak testing. Historically, the isolation valves have performed well, with only one instance of one of the isolation valves leaking to a point that inhibited inspecting the check valves. In the event that one of the isolation valves should lose isolation capability during the inspection, it would cause a reduction in service water header pressure on the affected unit. This results in an alarm in the control room and entry into plant procedure OAOP-18, “Nuclear Service Water System Failure.” Plant procedure OAOP-18 directs closure of manual upstream isolation valves, isolating one unit's service water header into the diesel generator building. Service water to the remaining three EDGs is provided from the other unit's nuclear service water header. A flooding event in the out-of-service diesel generator cell will not impact the three remaining diesel generators in the adjoining cells. Level switches in the room sumps would alert the control room of a flooding condition.

The check valve disassembly and inspection does not add time to EDG out-of-service time and can be completed well within the allowed TS LCO time of 7 days. There is no net adverse impact associated with performing the on-line IST of these check valves since the work is performed when the diesel generator is already unavailable (i.e., during on-line diesel generator maintenance and surveillance activities). Overall diesel generator maintenance activities are performed within the restrictions of the TS LCO, and the risk is managed in accordance with 10 CFR 50.65 requirements. As such, there is no increase in plant risk associated with the check valve disassembly and inspection activity during plant operation versus during refueling. Performing this task during refueling outages will add tasks to the refueling outage and potentially extend the refueling work window.

Based on the above, the proposed alternative to verify the full stroke capability of the identified check valves on a nominal 24-month frequency, and not during refueling outages, by valve disassembly and inspection will provide an acceptable level of quality and safety.

3.5.4 Licensee Proposed Alternative Testing

The check valves will be full-stroke exercised every 24 months instead of every refueling outage as required by paragraph ISTC-5221(c)(3). Also the check valves IST will be performed by valves disassembly and inspection in accordance with the guidelines provided in Position 2 of NRC GL 89-04. This check valve testing will be performed at a frequency of at least once per operating cycle (i.e. 24 months), in lieu of during each refueling outage.

3.5.5 Evaluation of Relief Request VRR-05

ASME OM Code, paragraphs ISTC-3510 and ISTC-3522 requires check valves to be exercised or examined quarterly, if practical, otherwise at cold shutdowns. If this, too, is not practicable, the code allows testing to be deferred to refueling outages. The licensee proposes as an alternative to perform the inspection IST activities once every refueling cycle in lieu of during the refueling outage. Paragraphs ISTC-3522 and ISTC-5221 of the ASME OM Code and Position 2 of GL 89-04 limit the performance of check valve IST activities (including disassembly) to refueling outages.

The licensee states that as more system outages are performed on-line, it is evident that selected refueling outage IST activities could be performed during system outages on-line without sacrificing quality or safety. The licensee proposes, as an alternative, to perform the IST disassembly and inspection activities during normal plant operation (on-line), in conjunction with appropriate system outages, or during refueling outages. In any case, disassembly, inspection, and manual exercising will be performed at least once each operating cycle (i.e., 24-months).

Check valves 1-SW-V683, 1-SW-V684, 1-SW-V685, and 1-SW-V686 of BSEP, Unit 1 and check valves 2-SW-V683, 2-SW-V684, 2-SW-V685, and 2-SW-V686 of BSEP, Unit 2 are in the service water system, and are ASME Class 3 check valves. These check valves are 6-inch, Enertech model KRV, and are made of Grade 400 Monel. These check valves open to provide flow paths for cooling water to the EDGs, and close to ensure service water system train isolation. The licensee states that these check valves will be assigned to eight valve groups, each group consisting of a single check valve.

The licensee states that to perform the IST disassembly and inspection activities of these check valves during normal plant operation (on-line), isolation of these check valves is accomplished by closing two upstream motor-operated butterfly valves (i.e., one valve on each unit's service water supply line to the diesel) and manually closing a single butterfly valve on the common discharge line. Historically, isolation valves have performed well, with only one instance of one of the isolation valves leaking to a point that inhibited inspection of the check valves. In the event that one of the isolation valves should lose isolation capability during the inspection, it would cause a reduction in service water header pressure on the affected unit. This results in an alarm in the control room and entry into plant procedure OAOP-18. Plant procedure OAOP-18 directs closure of manual upstream isolation valves, isolating one unit's service water header into the diesel generator building. Service water to the remaining three EDGs is provided from the other unit's nuclear service water header.

The NRC staff finds that disassembly and inspection of service water system check valves 1/2-SW-V683, 1/2-SW-V684, 1/2-SW-V685, and 1/2-SW-V686, can be safely accomplished during system outages when the plant is on-line. The NRC staff's finding is based on the following considerations:

1. Approximately the same number of IST will be performed using the proposed operating cycle test frequency as would be performed using the code-required refueling outage frequency. IST performed on a frequency (24 months) that maintains the acceptable time period between testing activities during the operating cycle (i.e., 24 months) is consistent with the intent of the OM Code and GL 89-04.

2. Over time, approximately the same number of tests will be performed using the proposed operating cycle test frequency as would be performed using the current refueling outage frequency.

3. During IST of check valves, the licensee will perform on-line testing by isolating two upstream motor-operated butterfly valves and manually closing a single butterfly valve on the common discharge line. The licensee states that historically, the isolation valves have performed well, with only one instance one of the isolation valves leaking to a point that inhibited inspecting the check valves. This resulted in entry into plant procedure OAOP-18. Plant procedure OAOP- 18 directs closure of manual upstream isolation valves, isolating one unit's service water header into the diesel generator building. Service water to the remaining three EDGs is provided from the other unit's service water header.

4. There are no technical barriers to performing these IST activities during either the refueling outage or the operating cycle when plant is on-line.

5. The IST of check valves will be performed during normal at-power operation as part of the 24 month EDG inspection. The time allotted for the diesel generator inspection is approximately 72 hours. The TS LCO allows the EDG to be out-of-service for 7 days.

The approximate time period for the work associated with the check valve inspection is 4 to 5 hours and check valves testing is usually performed in the first 24 hours of the diesel generator inspection work. Due to the physical arrangement of the valves, two check valves on a diesel generator are inspected at the same time. This provides adequate margin to complete disassembly and inspection activities in an orderly manner.

6. There is no net adverse impact associated with performing the on-line IST of these check valves since the work is performed when the diesel generator is already unavailable (i.e., during on-line diesel generator maintenance and surveillance activities).

7. The BSEP maintains one new replacement check valve in stock, in case an inspected valve is found to be defective.

8. The licensee states that in the event that a deficiency was found that warranted inspections of the other check valve groups, the additional inspections would be planned and carried out within the framework of the 12-week rolling schedule used at the BSEP.

On the basis of these considerations, the NRC staff finds that the proposed alternative provides an acceptable level of quality and safety.

3.5.6 Conclusion

Based on the NRC staff's review of the information provided in the relief request, the staff concludes that the licensee's proposed alternative will provide an acceptable level of quality and safety. Therefore, the proposed alternative for the check valves 1/2-SW-V683, 1/2-SW-V684, 1/2-SW-V685, and 1/2-SW-V686 to perform IST once per operating cycle (24-month), in lieu of once per refueling outage, is authorized pursuant to 10 CFR 50.55a(a)(3)(i).

3.6 Pump Relief Request PRR-03

3.6.1 Code Requirements

ASME OM Code, paragraph ISTB-3510 requires that pressure instruments be accurate to within ± .5 percent of full-scale for comprehensive and pre-service pump tests. It also requires that pressure instruments be accurate to within ± 2 percent of full-scale for Group B pump tests.

ASME OM Code, paragraph ISTB-3510(b)(1) requires that the full-scale range of each analog instrument not be greater than three times the reference value for pre-service, comprehensive, and Group B pump tests.

3.6.2 Component Identification

The components affected by this relief request are core spray (CS) pumps 1-E21-C001A&B and 2-E21-C001A&B, and suction pressure instruments 1-E21-PI-R001A&B and 2-E21-PI-R001A&B for BSEP, Units 1 and 2.

3.6.3 Licensee's Proposed Alternative

The range of the BSEP, Units 1 and 2 CS pumps' suction pressure instruments exceeds three times the reference value during pre-service, comprehensive, and Group B pump tests. Temporary CS pump suction pressure instruments will be installed and calibrated to be accurate within ±0.1 percent of full scale of 0 to 30 pounds per square inch (psi) instead of ±0.5 percent of full scale as specified by paragraph ISTB-3510 to compensate for not meeting the paragraph ISTB-3510(b)(1) requirement for range during pre-service and comprehensive pump tests. The CS pump permanent suction pressure instruments will be calibrated to be accurate within ±0.8 percent of full scale of 0 to 30 psi instead of ± 2 percent of full scale as specified by paragraph ISTB-3510 to compensate for not meeting the paragraph ISTB-3510(b)(1) requirement for range during Group B pump tests.

3.6.4 Licensee's Basis for Proposed Alternative

Although the range of the CS pumps' suction pressure instruments exceeds three time the reference values, the combination of the range and accuracy of the pressure instruments yield readings that are more accurate to that achieved using instrumentation that meets the ASME OM Code requirements.

3.6.5 Evaluation of Relief Request PRR-03

Section 5.5.1 of NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," Revision 1, provides guidance for evaluating alternatives to code requirements when permanently installed analog instrumentation does not meet ASME OM Code accuracy requirements. NUREG-1482 Section 5.5.1 states that the NRC staff may authorize alternatives when the combination of instrument range and accuracy is equivalent to or more conservative than the ASME OM Code instrument accuracy requirements.

3.6.5.1 Pre-service and Comprehensive Pump Tests

The accuracy of the temporary CS pump suction pressure instruments based upon a reference value of 4 psi and a calibration of 0.1 percent over a 0 to 30 psi range for pre-service and comprehensive pump tests, is as follows:

Full scale range = 0 to 30 psi
Instrument accuracy (± 0.1 percent x full-scale range) = ± .001 x 30 psi = ± .03 psi

The accuracy at the reference value is 4 psi ± .03 psi when using temporary CS pump suction pressure instruments.

The accuracy of CS pump temporary suction pressure instrumentation using ASME OM Code instrumentation calibrated to ± 0.5 percent of full-scale range, which is three times the reference value, is as follows:

ASME OM Code full-scale range (3 x reference value) = 3 x 4 psi = 12 psi
ASME OM Code instrument accuracy (± 0.5 percent x full-scale range) = ± .005 x 12 psi = ± .06 psi

The instrument accuracy would be 4 psi ± .06 psi when using pressure instrumentation meeting ASME OM Code accuracy requirements.

As demonstrated above, the combination of range and accuracy for temporary CS pump suction pressure instruments during pre-service and comprehensive pump test is more conservative to the combination of range and accuracy of the instrumentation required by the ASME OM Code. Thus, the temporary CS pump suction pressure instruments provide an indicated accuracy at the reference value that is superior to the minimum indicated accuracy that would be required by paragraph ISTB-3510.

3.6.5.2 Group B Pump Tests

The accuracy of the existing CS pump suction pressure instruments based upon a reference value of 4 psi and a calibration of 0.8 percent over a 0 to 30 psi range for Group B pump test, is as follows:

Full scale range = 0 to 30 psi
Instrument accuracy (± 0.8 percent x full-scale range) = ± .008 x 30 psi = ± .24 psi

The accuracy at the reference value is 4 psi ± .24 psi when using existing CS pump suction pressure instruments.

The accuracy of CS pump suction pressure instruments using ASME OM Code instrumentation calibrated to ± 2 percent of full-scale range that is three times the reference value, is as follows:

ASME OM Code full-scale range (3 x reference value) = 3 x 4 psi = 12 psi
ASME OM Code instrument accuracy (± 2 percent x full-scale range) = ± .02 x 12 psi = ± .24 psi

The instrument accuracy would be 4 psi ± .24 psi when using pressure instruments meeting ASME OM Code accuracy requirements.

As demonstrated above, the combination of range and accuracy for existing CS pumps suction pressure instruments during Group B test is the same as the combination of range and accuracy of the instrumentation required by ISTB-3510 of the ASME OM Code.

3.6.6 Conclusion

Based on the above evaluations, the NRC staff concludes that the licensee's alternative to the code accuracy requirements for BSEP, Units 1 and 2 CS pump (1-E21-C001A&B and 2-E21-C001A&B) suction pressure instruments (1-E21-PI-R001A&B and 2-E21-PI-R001A&B) is authorized pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the alternative provides an acceptable level of quality and safety. The proposed alternative provides reasonable assurance of the operational readiness of the pumps.

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