May 16, 2002

Mr. Charles H. Cruse
Vice President - Nuclear Energy
Calvert Cliffs Nuclear Power Plant, Inc.
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, MD 20657-4702

SUBJECT: REQUEST FOR RELIEF NO. PR-12 ASSOCIATED WITH THE THIRD 10-YEAR INTERVAL INSERVICE TESTING PROGRAM, CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2 (TAC NOS. MB3782 AND MB3783)

Dear Mr. Cruse:

By letter dated January 4, 2002, you requested approval to implement alternative inservice testing (IST) requirements for the emergency core cooling system (ECCS) pumps and auxiliary feedwater (AFW) pumps at Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2. Specifically, you requested relief to perform the IST of the ECCS and AFW pumps in accordance with the 1995 Edition of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) through the 1996 Addenda of the Operations and Maintenance (OM) Code, subsection ISTB as an alternative to the requirements of the OM-6 Standard (1987 Edition through the 1988 Addenda). In addition, you proposed three alternatives to the requirements of the 1995 Edition up to and including the 1996 Addenda of the OM Code.

The Nuclear Regulatory Commission staff has reviewed Relief Request PR-12 as documented in the enclosed safety evaluation. The staff concludes that the use of the OM Code, Subsection ISTB, 1995 Edition with 1996 Addenda is approved pursuant to 10 CFR 50.55a(f)(4)(iv). The staff also concludes that your proposed alternative (group B test during Mode 1-4 and group A test during Mode 5-6) to the Code requirements for the low-pressure safety injection (LPSI) pumps is authorized pursuant to 10 CFR 50.55a(a)(3)(i), based on the alternative providing an acceptable level of quality and safety. The staff finds that previously authorized Relief Request PR-11 may be extended for use with the Code 1995 Edition including 1996 Addenda, Subsection ISTB Table 5.2.1-1, and is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) on the basis that compliance with the Code requirements results in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. The staff further concludes that your proposed alternative for the LPSI pump test (comprehensive pump test instead of group B test during refueling outage/cold shutdown) is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety. These approvals are authorized for the third 10-year IST interval.

Sincerely,

/RA/

Richard J. Laufer, Chief, Section 1
Project Directorate 1
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosure: Safety Evaluation

cc w/encl: See next page

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The Nuclear Regulatory Commission staff has reviewed Relief Request PR-12 as documented in the enclosed safety evaluation. The staff concludes that the use of the OM Code, Subsection ISTB, 1995 Edition with 1996 Addenda is approved pursuant to 10 CFR 50.55a(f)(4)(iv). The staff also concludes that your proposed alternative (group B test during Mode 1-4 and group A test during Mode 5-6) to the Code requirements for the low-pressure safety injection (LPSI) pumps is authorized pursuant to 10 CFR 50.55a(a)(3)(i), based on the alternative providing an acceptable level of quality and safety. The staff finds that previously authorized Relief Request PR-11 may be extended for use with the Code 1995 Edition including 1996 Addenda, Subsection ISTB Table 5.2.1-1, and is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) on the basis that compliance with the Code requirements results in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. The staff further concludes that your proposed alternative for the LPSI pump test (comprehensive pump test instead of group B test during refueling outage/cold shutdown) is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety. These approvals are authorized for the third 10-year IST interval.

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Project Directorate 1
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318
Enclosure: Safety Evaluation
cc w/encl: See next page

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Accession Number: ML021000690
*Input provided by safety evaluation dated April 2, 2002, incorporated with no significant changes
**See previous concurrence

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE THIRD 10-YEAR INTERVAL INSERVICE TESTING PROGRAM

FOR PUMPS AND VALVES TO RENEWED

FACILITY OPERATING LICENSE NOS. DPR-53 AND DPR-69

CALVERT CLIFFS NUCLEAR POWER PLANT, INC.

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2

DOCKET NOS. 50-317 AND 50-318

1.0 INTRODUCTION

Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a, requires that inservice testing (IST) of certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Class 1, 2, and 3 pumps and valves be performed at 120-month (10-year) IST program intervals in accordance with a specified ASME Code and applicable addenda, except where alternatives have been authorized or relief has been requested by the licensee and granted by the U.S. Nuclear Regulatory Commission (NRC) pursuant to paragraphs (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a.

In accordance with 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 subsequent 120-month IST program intervals. Licensees whose IST program reaches its 120-month (10-year) interval after November 22, 2000, are required to implement the 1995 Edition with the 1996 Addenda of the ASME *Code for Operation and Maintenance of Nuclear Power Plants* (ASME OM Code).

In proposing alternatives or requesting relief, a 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 to and grant relief from ASME Code requirements upon making the necessary findings. NRC guidance in Generic Letter (GL) 89-04, “Guidance on Developing Acceptable Inservice Testing Programs,” provides acceptable alternatives to the Code requirements. Further guidance is given in GL 89-04, Supplement 1, and NUREG-1482, “Guidelines for Inservice Testing at Nuclear Power Plants.”

Enclosure

In a letter dated January 4, 2002 (Ref. 1), the Calvert Cliffs Nuclear Power Plant, Inc. (CCNPPI or the licensee) submitted a Relief Request No. PR-12 associated with the third 10-year interval IST program plan for pumps and valves at Calvert Cliffs Nuclear Power Plant (CCNPP). The third 10-year interval for CCNPP began on January 15, 1998, and is scheduled to end January 14, 2008. The plant's IST program was developed in accordance with Section XI of the 1989 Edition of the ASME Code, which references ASME OM Standards Part 6 and Part 10 (OM-6 and OM-10) for IST of pumps, and valves respectively.

2.0 PROPOSED RELIEF REQUEST

2.1 Relief Request No. PR-12

The licensee requests relief from the IST requirements of the 1987 Edition through the 1988 Addenda of the OM-6 for the following emergency core cooling system (ECCS), and auxiliary feedwater (AFW) system pumps:

- ECCS pumps
  - high-pressure safety injection (HPSI) pumps 11 & 13 and 21 & 23
  - low-pressure safety injection (LPSI) pumps 11 & 12 and 21 & 22
  - containment spray (CS) pumps 11 & 12 and 21 & 22
- AFW system pumps
  - turbine-driven AFW pumps 11 & 12 and 21 & 22
  - motor-driven AFW pumps 13 and 23

As an alternative, the licensee proposes to use the 1995 Edition through the 1996 Addenda of the OM Code, Subsection ISTB, "Inservice Testing of Pumps in Light-Water Reactor Power Plants," which allows the licensee to use the comprehensive pump test (CPT).

2.2 Licensee's Basis for Requesting Relief

The licensee states:

> The 1995 Edition through the 1996 Addenda, of the OM Code Subsection ISTB, Inservice Testing of Pumps in Light-Water Reactor Power Plants, has been approved by the Nuclear Regulatory Commission (NRC) for use by reference in 10 CFR 50.55a(b). This is the first edition of the OM Code approved for use by the NRC that incorporates the concept of the comprehensive pump test.
>
> Differential Pressure Measurements
>
> Calvert Cliffs' current quarterly pump test program requires differential pressure to be measured. Our current quarterly ECCS pump tests are performed using very accurate (±1/2%) test pressure gauges.
>
> These pressure gauges are installed prior to, and removed after, each test (an annual total of 112 gauge installation/removal evolutions). These very accurate gauges are not

required by the current OM-6 Code, however, they are necessary because the hydraulic margin available, based on design calculations, is less than the amount of degradation allowed by OM-6. Using less accurate permanently installed pressure gauges could result in a pump being unnecessarily declared inoperable solely due to pressure gauge uncertainty.

Installation and removal of these test pressure gauges for each ECCS pump every quarter requires significant dedication of manpower, results in significant cumulative annual radiation dose, increased radioactive waste, increased wear on fittings, and additional challenges for possible personnel contamination. Calvert Cliffs' estimates that eliminating the test pressure gauge installation and removal evolutions will save at least 1/4 man-rem per year and almost 300 man-hours per year.

Quarterly ECCS pump tests are performed using the minimum recirculation flow path under low-flow conditions. In this region, the pumps are operating at or near shut-off head, the pump curves are flat or nearly flat, and pump differential pressure is not very sensitive to pump degradation. Flow rate alone is an adequate indication of possible pump degradation or flow blockage since the minimum recirculation flow path is a fixed-resistance flow path. The conclusion that measurement of pump differential pressure is of minimal value is supported by our historical test data.

Under the 1995/96 Code, the operational readiness of pumps is reasonably assured without requiring quarterly differential pressure measurements. Adopting the 1995/96 Code (eliminating the requirement to measure differential pressure from the quarterly tests, and only measuring flow) will allow CCNPP to cease these gauge installation and removal evolutions every quarter, while maintaining an acceptable level of quality and safety.

Vibration Measurements

Calvert Cliffs' current quarterly pump test program requires pump vibration measurements. The overall vibration readings recorded during quarterly low-flow testing have always been relatively "high." These vibration readings have been subject to spectral analysis under our Rotating Machinery Condition Monitoring Program, which is separate from the IST Program. The spectral analyses have consistently confirmed the major contributor to the "high" overall vibration readings occurs at the "blade pass frequency" for each ECCS pump and is not indicative of bearing degradation.

However, spectral analysis is not required by the Code. Therefore, the effect of low-flow operation on a centrifugal pump make the required broadband vibration readings during the current quarterly test of minimal value. This conclusion is supported by our historical test data. Under the 1995/96 Code, the operational readiness of pumps is reasonably assured without requiring quarterly vibration measurements. Based on this, we feel that an acceptable level of quality and safety is still maintained while many of the burdens and cost associated with vibration testing, including cumulation annual radiation dose and manpower, will be eliminated.

Minimum Pump Run-Time

The 1995/96 Code also eliminates the two-minute minimum pump run-time for quarterly group B pump tests. Eliminating the minimum pump run-time requirement and the requirement to record differential pressure and vibration levels is expected to slightly reduce the length of each pump test. This will help to reduce the cumulative run-time of each ECCS pump under low-flow conditions to support testing, with a commensurate reduction in potential pump wear.

Other Considerations

These proposed changes simplify the quarterly IST pump test to allow combining the quarterly IST pump test into the related quarterly engineering safety features actuation logic test for each pump. As a result, the total number of starting demands on each pump motor to support testing may be reduced and cumulative run-time of each ECCS pump under low-flow conditions to support testing may be further reduced. Calvert Cliffs Nuclear Power Plant estimates that this course of action could eliminate approximately two hours of operation under low-flow conditions for each ECCS pump per year.

This proposed change is also expected to reduce total out-of-service time for HPSI and CS pumps. The CS pumps currently incur an estimated 3.5 hours of unavailability per pump each year for quarterly IST testing that could be eliminated. This is a significant reduction compared to CCNPP's current Maintenance Rule unavailability limit of 90 hours per CS pump per two-year period. This is also a significant reduction in unavailability hours against our NRC Performance Indicator for the residual heat removal safety function in Modes 1-4.

Although the AFW pumps are not located in radiological controlled areas and do not require test pressure gauges for measuring pump suction and discharge pressures, similar benefits can be realized utilizing the 1995/96 Code requirements. The quarterly test for the AFW pumps is performed using the minimum recirculation flow path at low-flow conditions. Reducing the length of each test will reduce the time each AFW pump is operated under low-flow conditions that are potentially detrimental to the pumps. An additional benefit is the reduced time personnel are exposed to the hot humid environment of the AFW pump rooms. Although the length of each test is reduced, the necessary data is still collected to verify the operational readiness of the pump, therefore an acceptable level of quality and safety is still maintained.

Relationship to Calvert Cliffs' Technical Specification Surveillance Requirements

The Calvert Cliff's Technical Specification Surveillance Requirement (SR) for each pump (SR 3.5.2.3: HPSI and LPSI pumps; SR 3.6.6.4: CS pumps; SR 3.7.3.3: AFW pumps) requires periodic testing of each pump to verify that the "developed head at the test flow point is greater than or equal to the required developed head." The specified frequency for all three surveillance requirements is, "in accordance with the Inservice Test Program." Calvert Cliffs' Technical Specification Surveillance Requirements do not contain any additional (explicit or implied) testing requirements for these pumps beyond those required by the IST Program. This means that, as long as the testing complies with the requirements of the approved IST Program, there is no conflict with Calvert

Cliffs' Technical Specification Surveillance Requirements. Therefore, none of the changes to the IST Program requested in this relief request would conflict with any Calvert Cliffs' Technical Specification Surveillance Requirements.

LPSI Pump Group Classification

Subsection ISTB Paragraph 1.3 of the 1995/96 Code defines group A pumps as, "pumps that are operated continuously or routinely during normal operation, cold shutdown, or refueling operations," and group B pumps as "pumps in standby systems that are not operated routinely except for testing." Based on these definitions and CCNPP's Operating Procedures, the HPSI, CS, and AFW pumps clearly meet the definition of group B pumps. However, the classification of the LPSI pumps is not as obvious.

The LPSI pumps clearly meet the definition of group B pumps during normal operation in Modes 1-4. In Modes 5-6, the LPSI pumps are used for shutdown cooling and appear to meet the definition of group A pumps. Subsection ISTB, Paragraph 3.1(b), states "a pump that meets both group A and group B definitions shall be categorized as a group A pump." This means that the LPSI pumps would be classified as group A and would be subjected to essentially the same quarterly test requirements that currently apply under the 1987/88 OM-6 Code.

NUREG/CP-0137, Vol. 1, Proceedings of the Third NRC/American Society of Mechanical Engineers (ASME) Symposium on Valve and Pump Testing, includes a paper entitled, "Description of Comprehensive Pump Test Change to ASME Code, Subsection ISTB." This paper describes the philosophy of classifying pumps in one group or the other (group A vs. group B). According to this paper, the intent of having different test requirements for different pump groups, is to relate the amount and degree of quarterly performance monitoring required to the amount of degradation expected due to pump operation.

Requiring the LPSI pumps to be tested quarterly as group A pumps during normal operation in Modes 1-4 is contrary to the philosophy of the referenced paper. Quarterly testing subjects the LPSI pumps to increased test requirements, performance monitoring, and potentially more degradation due to the low-flow operation at the time when they are standby pumps and would not otherwise be subject to operation-induced degradation. In fact, out of all of the ECCS and AFW pumps, the LPSI pumps are the ones, due to their design conditions, for which the detrimental effects of cumulative low-flow operation are most drastic. Calvert Cliffs considers the requirement to test LPSI pumps as group A pumps during normal operation in Modes 1-4 to be potentially detrimental on a long-term basis. Therefore, the LPSI pumps will be considered to be group B pumps during normal operation in Modes 1-4, and will be tested accordingly.

As previously stated, the LPSI pumps are typically run continuously during cold shutdown and refueling operations, depending on the decay heat rate. As a result, they may be subject to operation-induced degradation in Modes 5-6. Therefore, the LPSI pumps will be treated as group A pumps during any quarterly test that comes due during cold shutdown or refueling operations.

However, typically during Modes 5-6, a comprehensive pump test is preferable to a group A test for the LPSI pumps. This avoids the need to realign the LPSI pumps out of the normal shutdown cooling line-up and also avoids the detrimental effects of testing the LPSI pumps at low-flow conditions. Therefore, Calvert Cliffs expects that a comprehensive pump test will typically be substituted for any group A test that may be required during Modes 5-6.

LPSI Pump Bearing Acceptance Criteria During Low-Flow Testing

Many of the normal vibration levels experienced when operating the LPSI pumps under low-flow conditions during quarterly testing routinely exceed or challenge the absolute Alert Acceptance Criteria of 0.325 inches per second specified in OM-6 Table 3a. This would necessitate either testing at six-week intervals, or a new evaluation each quarter. Relief Request PR-11 (References 2 and 3) discussed Calvert Cliffs' detailed academic research regarding the effects of low-flow operation on centrifugal pump vibration levels and included extensive spectral analysis of all Calvert Cliffs' LPSI pump performance vibration data from an extended time period under low-flow and substantial-flow conditions. The analysis confirmed the presence and effect of this phenomenon. Therefore, PR-11 established a new set of relative and absolute vibration Alert Acceptance Criteria and a new set of relative Action Acceptance Criteria for the specific LPSI pump bearings typically affected by this phenomenon. The vibration acceptance criteria contained in the 1995/96, Subsection ISTB Table 5.2.1-1 presents the same problems should a group A test at low-flow conditions using minimum recirculation flow path be necessary following LPSI pump maintenance during normal operation in Modes 1-4. The results of the analysis performed for PR-11 have not changed. However, the relief granted to PR-11 (Reference 4) is technically applicable to only the 1987/1988 OM-6 requirements.

Therefore, during any required group A test of the LPSI pumps (e.g., a post-maintenance test during normal plant operation, or quarterly test during an extended outage) conducted at low-flow conditions, the vibration analysis and acceptance criteria shall be revised, as appropriate, as described in Calvert Cliffs' Relief Request PR-11 (References 2 and 3) and approved by letter dated August 22, 2000 (Reference 4).

Quarterly Group B Pump Tests During a Refueling Outage/Cold Shutdown Period

The comprehensive pump test provides a much better indication of the pump's condition than the quarterly group B test under low-flow conditions. Whereas the quarterly group B test only verifies the ability of the pump to start and to produce a minimal amount of flow, the comprehensive pump test accomplishes these goals and much more, without subjecting the pump to operating under potentially detrimental low-flow conditions. Performing the quarterly group B test either shortly before or shortly after the comprehensive pump test does not provide sufficient additional benefit to justify the additional unavailability or operating time under low-flow conditions. Therefore, the normal biennial comprehensive pump test performed during each refueling outage will supersede the quarterly group B test requirement for that quarter.

Similarly, a comprehensive pump test may be substituted in lieu of a quarterly group B test that comes due during any non-refueling outage or any extended refueling outage.

2.3 Licensee's Proposed Alternative Testing

In lieu of using the requirements in the 1988 Addenda to the OM Part 6 standard, the licensee has proposed to perform IST of the ECCS and AFW pumps in accordance with the 1995 Edition through the 1996 Addenda of the OM Code, Subsection ISTB. However, the licensee has proposed three alternatives to the 1995 ASME OM Code requirements as described below.

1. LPSI Pump Group Classification

   The OM Code subsection ISTB, Paragraph 3.1(b), requires that a pump that meets both group A and group B definitions shall be categorized as a group A pump. The licensee proposes that the LPSI pumps will be tested as standby pumps (group B) during Modes 1-4 and as continuously operating pumps (group A) during Modes 5-6. In Modes 5-6, the comprehensive pump test may be substituted for a quarterly group A test that comes due during a mid-cycle cold shutdown period.

2. LPSI Pump Bearing Acceptance Criteria During Low-Flow Testing

   The licensee proposes that Relief Request PR-11, which was previously approved against the 1987 Edition including the 1988 Addenda of OM-6 (Ref. 4) will be applicable to any low-flow LPSI pump post-maintenance (group A) testing under the 1995 Edition including the 1996 Addenda of the OM Code.

3. Quarterly Group B Tests During a Refueling Outage/Cold Shutdown Period

   The licensee proposes that any time a comprehensive pump test is performed, the Code-required quarterly low-flow test (group B) requirement may be deleted for that quarter.

3.0 EVALUATION

3.1 Use of ASME OM Code Subsection ISTB (1995 Edition with 1996 Addenda) in lieu of OM-6 Code (1987 Edition with 1988 Addenda) for ECCS and AFW pumps.

The licensee requested to perform the IST of its ECCS and AFW pumps in accordance with the 1995 Edition through the 1996 Addenda of the OM Code, Subsection ISTB as an alternative to the requirements of the OM-6 Standard (1987 Edition through the 1988 Addenda). The major difference between the OM Code and the OM Standard is the addition of the "comprehensive pump test (CPT)," which shall be conducted with the pump operating at a specified reference point.

Because the NRC incorporated the 1995 Edition through 1996 Addenda of the OM Code by reference in 10 CFR 50.55a(b), the use of the OM Code, Subsection ISTB, 1995 Edition with 1996 Addenda, related to the CPT for CCNPP is approved pursuant to 10 CFR 50.55a(f)(4)(iv). The licensee has met all related requirements.

3.2 LPSI Pump Group Classification

The licensee has proposed that the LPSI pumps be tested as standby pumps (group B) during Modes 1-4 and as continuously operating pumps (group A) during Modes 5-6. In Modes 5-6, the CPT may be substituted for a quarterly group A test that comes due during a mid-cycle cold shutdown period as provided by the OM Code, Subsection ISTB 4. The Code states that when a group A test is required, a comprehensive test may be substituted.

The OM Code, paragraph ISTB 1.3, 1995 Edition with 1996 Addenda, defines pumps that are operated continuously or routinely during normal operation, cold shutdown, or refueling operations, as group A pumps, and pumps in standby systems that are not operated routinely except for testing as group B pumps. Based on these definitions and CCNPP's Operating Procedures, the HPSI, CS, and AFW pumps clearly meet the definition of group B pumps. However, the classification of the LPSI pumps is not obvious.

The LPSI pumps clearly meet the definition of group B pumps during normal operation in Modes 1-4. In Modes 5-6, the LPSI pumps are used for shutdown cooling and appear to meet the definition of group A pumps. Subsection ISTB 3.1(b) states that a pump that meets both group A and group B definitions shall be categorized as a group A pump. This would cause LPSI pumps to be classified as group A; however the LPSI pumps cannot be tested as group A pumps or by CPT during Modes 1-4, because they are standby pumps. Rather, these pumps can only be tested during operation utilizing the minimum-flow recirculation line as group B pumps. LPSI pumps are standby pumps and little degradation is expected with respect to hydraulic performance during the operational period when the pumps are idle.

In GL 89-04, Position 9, the NRC determined that, in cases where flow can only be established through a non-instrumented, minimum-flow path during quarterly pump testing, and a path exists at cold shutdown or refueling outages to perform a test of the pump under full or substantial flow conditions, the increased interval is an acceptable alternative to the Code requirements. Therefore, the proposed alternative testing of the LPSI pumps as group B during Modes 1-4, and as group A during Modes 5-6 is consistent with GL 89-04, Position 9 and, provides reasonable assurance of operational readiness of LPSI pumps.

The NRC staff concludes that the licensee's proposed alternative to the Code requirements for the testing of LPSI pumps is authorized pursuant to 10 CFR 50.55a(a)(3)(i), based on the alternative providing an acceptable level of quality and safety.

3.3 LPSI Pump Bearing Acceptance Criteria During Low-Flow Testing

The licensee proposed that the previously approved Relief Request PR-11 under the OM-6 Standard, 1987 Edition with 1988 Addenda, dated August 22, 2000 (Ref. 4) be carried forward for any low-flow LPSI pump post-maintenance (group A) testing under the OM Code, 1995 Edition with 1996 Addenda.

The licensee stated in PR-11 that many of the normal vibration levels experienced when operating the LPSI pumps under low-flow conditions during quarterly testing routinely exceed or challenge the absolute alert acceptance criterion of 0.325 inch per second specified in OM-6, Table 3a. The licensee proposed to use the same alert range acceptance criteria that the staff previously authorized for Relief Request PR-11 (as shown below).

Reference Value (V_R) inches per second (ips)	Acceptable Range	Alert Range	Action Range
$V_R \leq 0.11$	$V \leq 2.5\ V_R$	$2.5\ V_R < V \leq 6\ V_R$	$6\ V_R < V$
$0.11 < V_R \leq 0.13$	$V \leq 2.5\ V_R$	$2.5\ V_R < V \leq 6\ V_R$	$0.700 < V$
$0.13 < V_R < 0.26$	$V \leq 0.325$	$0.325 < V < 0.700$	$0.700 < V$
$0.26 \leq V_R \leq 0.50$	$V \leq 1.25\ V_R$	$1.25\ V_R < V \leq 0.700$	$0.700 < V$
$0.50 \leq V_R$	$V \leq 0.630$	$0.630 < V \leq 0.700$	$0.700 < V$

The NRC staff authorized Relief Request PR-11 pursuant to 10CFR 50.55a(a)(3)(ii), based on the determination that compliance with the specified requirements results in a hardship without a compensating increase in the level of quality and safety (Ref. 4). Relief Request PR-11 included the results of CCNPPI's detailed academic research regarding the effects of low-flow operation on centrifugal pump vibration levels and included an extensive spectral analysis of CCNPP LPSI pump performance vibration data under low-flow and substantial-flow conditions. A new set of relative and absolute vibration alert acceptance criteria and a new set of relative action acceptance criteria were established for the specific measured LPSI pump bearings' vibration directions typically affected by this phenomenon.

The vibration acceptance criteria contained in the OM Code, 1995 Edition with 1996 Addenda, Subsection ISTB, Table 5.2.1-1, only apply to group A and comprehensive tests, whereas OM-6, Table 3a applied to any pump test including low-flow tests. Therefore, the vibration acceptance criteria contained in the OM Code, Subsection ISTB, Table 5.2.1-1 present the same problem when a group A test is necessary at low-flow conditions using the minimum recirculation flow path following LPSI pump maintenance during normal operation in Mode 1-4. The results of the analysis performed by the licensee for PR-11 have not changed. Therefore, previously authorized Relief Request PR-11 for Table 3a of the OM-6 Standard, 1987 Edition with 1988 Addenda, may be extended for use with the Code 1995 Edition including 1996 Addenda, Subsection ISTB, Table 5.2.1-1.

The NRC staff concludes that the licensee's alternative in PR-11 is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) on the basis that compliance with the Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

3.4 Quarterly Group B Tests During a Refueling Outage/Cold Shutdown Period

The licensee requested that any time a comprehensive pump test is performed, the normal quarterly low-flow test (group B) requirement may be deleted for that quarter. The Code Subsection ISTB 4, states that when a group B test is required, a group A or comprehensive test may be substituted.

The Code requires that group B tests be performed quarterly for group B pumps. The licensee proposes not to perform group B tests for that quarter in which the CPT is performed. This may be during a refueling outage or cold shutdown period, or any non-refueling or extended refueling outage. The scheduled quarterly group B test only verifies the ability of the pump to start and to produce a minimum amount of flow, because quarterly group B tests are performed under low-flow conditions that could be detrimental for longer periods of operation. The CPT provides an improved method to assess the pump's condition, because the CPT is performed near full-flow conditions and measures important data, including speed, differential pressure, flow, and vibration, in accordance with ISTB Table 4.1-1.

The NRC staff found that performing quarterly group B test, either shortly before or shortly after a CPT, does not provide any compensating benefit to justify the additional unavailability or operating time under low-flow conditions. The CPT provides more meaningful results to assess the operational readiness of the pump.

The NRC staff concludes that the licensee's proposed alternative to the Code requirements is authorized pursuant to 10 CFR 50.55a(a)(3)(i), based on the alternative providing an acceptable level of quality and safety.

4.0 CONCLUSION

The NRC staff concludes that the use of the OM Code, Subsection ISTB, 1995 Edition with 1996 Addenda, related to the CPT for CCNPP is approved pursuant to 10 CFR 50.55a(f)(4)(iv). The NRC staff also concludes that the licensee's proposed alternative (group B test during Mode 1-4 and group A test during Mode 5-6) to the Code requirements for the LPSI pumps is authorized pursuant to 10 CFR 50.55a(a)(3)(i), based on the alternative providing an acceptable level of quality and safety. The NRC staff finds that previously authorized Relief Request PR-11 may be extended for use with the Code 1995 Edition including 1996 Addenda, Subsection ISTB Table 5.2.1-1, and is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) on the basis that compliance with the Code requirements results in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. The NRC staff concludes that the licensee's proposed alternative for the LPSI pump test (CPT instead of group B test during refueling outage/cold shutdown) is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety.

5.0 REFERENCES

1. Letter from C.H. Cruse, The Constellation Energy Group, to U. S. Nuclear Regulatory Commission, "Calvert Cliffs Nuclear Power Plant Units 1 and 2, Request for Relief from ASME Code Requirements for ECCS and AFW Pump Testing Requirements; PR-12," dated January 4, 2002.

2. Letter from C.H. Cruse, BG&E, to NRC Document Control Desk, "Revised and New Relief Requests for Third Ten Year Inservice Program," dated December 30, 1999.

3. Letter from C.H. Cruse, BG&E, to NRC Document Control Desk, "Response to Request for Additional Information: Relief Request PR-11 Low Pressure Safety Injection Pumps," dated May 19, 2000.

4. Letter from M. Gamberoni, NRC, to C.H. Cruse, BG&E, “Calvert Cliffs Nuclear Power Plant-Safety Evaluation of Relief Requests for the Third Ten-Year Pumps and Valves Inservice Testing Program,” dated August 22, 2000.

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