Charles H. Cruse
Vice President
Nuclear Energy

1650 Calvert Cliffs Parkway
Lusby, Maryland 20657
410 495-4455

Constellation
Nuclear

Calvert Cliffs
Nuclear Power Plant

A Member of the
Constellation Energy Group

January 4, 2002

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
Request for Relief from ASME Code Requirements for ECCS and AFW Pump Testing Requirements; PR-12

REFERENCE: (a) Letter from Mr. S. Sing Bajwa (NRC) to Mr. C. H. Cruse (BGE), dated February 11, 1998, "Safety Evaluation of the Inservice Testing Program Third Ten-Year Interval For Pumps and Valves, Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 (TAC Nos. M98523 and M98524)"

Pursuant to 10 CFR 50.55a(a)(3)(i), Calvert Cliffs Nuclear Power Plant, Inc. (CCNPP) hereby submits proposed alternatives to certain requirements of 10 CFR 50.55a(f). The proposed alternatives are applicable to pump testing per our Inservice Test (IST) Program, for the third ten-year interval, which began in January 1998 (Reference a). Calvert Cliffs Nuclear Power Plant's IST Program for the third ten-year interval is based on the requirements in the 1989 Edition of the American Society of Mechanical Engineers (ASME) Code, Section XI. The 1989 Edition of the Code, Subsection IWP for inservice testing of pumps, references the 1987 Edition through 1988 Addenda of the Operations and Maintenance (OM) Code, Part 6 (OM-6), "Inservice Testing of Pumps in Light-Water Reactor Power Plants."

This relief request seeks Nuclear Regulatory Commission (NRC) approval to implement alternative inservice testing requirements for the Emergency Core Cooling System (ECCS) pumps and Auxiliary Feedwater (AFW) pumps at CCNPP Units 1 and 2. Specifically, CCNPP proposes using the requirements contained in the 1995 Edition through 1996 Addenda of the OM Code Subsection ISTB (1995/96 Code), with modifications as described in the attached relief request in lieu of the requirements contained in the 1987 Edition through 1988 Addenda of the OM-6 Code (1987/88 Code).

Adopting the requirements of the 1995/96 Code, which has been incorporated by reference in 10 CFR 50.55a(b), maintains an acceptable level of safety and quality. In addition, CCNPP has modifications in this relief request that remove minor requirements from the 1995/96 Code which we believe offer little benefit. We have concluded that these proposed modifications have no affect on the philosophy, or the intent of the 1995/96 Code, and an acceptable level of quality and safety is still maintained.

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To clarify several specific aspects of our IST Program, the following discussions are presented for informational purposes only.

Quarterly Testing as a Fixed-Resistance System

All ECCS and AFW pump tests at low-flow conditions using the minimum recirculation flow path will be performed without throttling flow to avoid potential pump damage. With the manual isolation valve in the minimum recirculation flow path for each pump fully open, the test line-up is actually a fixed-resistance flow path. As a result of implementing this "fixed resistance" aspect of the Code, Relief Requests PR-1, PR-2, PR-3, PR-4, and PR-6, which were granted in Reference a, are no longer required and are no longer in use at CCNPP.

Augmented Testing of the 12/22 HPSI Pumps

The 12/22 HPSI pumps are included in the scope of CCNPP's Augmented IST Program only, as discussed in NUREG-1482 Section 2.2. The 12 and 22 HPSI pumps are maintained in the Augmented IST Program only because they contribute to our philosophy of defense-in-depth. Also, several Emergency Operating Procedures allow their use, and their availability is beneficial to Calvert Cliffs' Probabilistic Risk Assessment Model. Since the 12/22 HPSI pumps are not included in the mandatory scope of the IST Program, this relief request is not applicable to their testing.

Calvert Cliffs requests approval of this relief request by June 2002 to facilitate implementation after the Spring 2002 Unit 1 Refueling Outage. Should you have questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,

CHC/ALS/bjd

Attachment: (1) Relief Request Number PR-12, "ECCS and AFW Pump Testing"

cc: R. S. Fleishman, Esquire
J. E. Silberg, Esquire
Director, Project Directorate I-1, NRC
D. M. Skay, NRC
H. J. Miller, NRC
Resident Inspector, NRC
R. I. McLean, DNR

ATTACHMENT (1)

RELIEF REQUEST NUMBER PR-12

"ECCS and AFW PUMP TESTING"

ATTACHMENT (1)

RELIEF REQUEST NUMBER PR-12,
"ECCS AND AFW PUMP TESTING"

COMPONENTS

Emergency Core Cooling System (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

Auxiliary Feedwater (AFW) System Pumps

- Turbine-Driven AFW Pumps 11 & 12 and 21 & 22
- Motor-Driven AFW Pumps 13 & 23

TEST REQUIREMENT

Perform inservice testing of the ECCS and AFW pumps per the 1987 Edition through the 1988 Addenda, of the Operations and Maintenance (OM) Code, Part 6 (OM-6), "Inservice Testing of Pumps in Light-Water Reactor Power Plants" during the third ten-year Inservice Test (IST) Interval (Reference 1).

PROPOSED ALTERNATE TESTING

Perform inservice testing of the ECCS and AFW Pumps per the 1995 Edition, through the 1996 Addenda, of the OM Code Subsection ISTB, "Inservice Testing of Pumps in Light-Water Reactor Power Plants," with the following modifications:

1. LPSI Pump Group Classification

   The LPSI pumps will be tested as stand-by pumps (group B) during Modes 1-4 and 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

   Relief Request PR-11, which was previously approved against the 1987 Edition - 1988 Addenda of the Code (Reference 4) shall be carried forward for any low-flow LPSI pump post-maintenance (group A) testing under the 1995 Edition – 1996 Addenda of the Code.

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

   Any time a Comprehensive Pump Test is performed, the normal quarterly low-flow test (group B) requirement may be deleted for that quarter.

BASIS FOR RELIEF

The 1995 Edition through 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 Calvert Cliffs Nuclear Power Plant (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 effects 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 costs associated with vibration testing, including cumulative 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 the 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 the 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 Cliffs' 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.

BASES FOR PROPOSED MODIFICATION OF THE 1995-1996 CODE

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 the 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 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 and test conditions, for which the detrimental effects of cumulative low-flow operation are the most drastic. Calvert Cliffs considers the requirement to test the 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 Code, Subsection ISTB Table 5.2.1-1 presents the same problems should a group A test at low-flow conditions using the 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 in response to PR-11 (Reference 4) is technically applicable to only the 1987/88 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 a 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 April 22, 2000 (Reference 4).

Quarterly Group B 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 supercede 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.

REFERENCES:

1. Letter from Mr. S. Sing Bajwa (NRC) to Mr. C. H. Cruse (BGE), dated February 11, 1998, "Safety Evaluation of the Inservice Testing Program Third Ten-Year Interval For Pumps and Valves, Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 (TAC Nos. M98523 and M98524)"
2. Letter from Mr. C. H. Cruse (BGE) to NRC Document Control Desk, dated December 30, 1999, "Revised and New Relief Requests for the Third Ten year Inservice Test Program"
3. Letter from Mr. C. H. Cruse (BGE) to NRC Document Control Desk, dated May 19, 2000, "Response to Request for Additional Information: Relief Request PR-11 Low Pressure Safety Injection Pumps"
4. Letter from Ms. M. Gamberoni (NRC) to Mr. C. H. Cruse (CCNPP), dated August 22, 2000, "Safety Evaluation of Relief Requests for the Third 10-Year Pump and Valve In-Service Testing Program Calvert Cliffs Nuclear Power Plant Units 1 and 2 (TAC Nos. MA7848 and MA7849)"