

December 27, 2007

Mr. James A. Spina, Vice President
Calvert Cliffs Nuclear Power Plant, Inc.
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, MD 20657-4702

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2 -
AMENDMENT RE: REVISED CONTAINMENT SUMP SURVEILLANCE
REQUIREMENT TO VERIFY STRAINER INTEGRITY (TAC NOS. MD4237 AND
MD4238)

Dear Mr. Spina:

The Commission has issued the enclosed Amendment No. 284 to Renewed Facility Operating License No. DPR-53 and Amendment No. 261 to Renewed Facility Operating License No. DPR-69 for the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2. These amendments consist of changes to the Technical Specifications (TSs) in response to your application dated February 1, 2007, as supplemented by letter dated August 17, 2007.

These amendments revise Surveillance Requirement 3.5.2.8 in TS 3.5.2, "ECCS – Operating," to reflect the replacement of the containment recirculation sump suction inlet trash racks and screens with strainers. The containment recirculation sump suction inlet trash racks and screens are being replaced with a strainer design with significantly larger effective surface area in response to Nuclear Regulatory Commission Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors."

A copy of the related Safety Evaluation is enclosed. A Notice of Issuance will be included in the Commission's next regular biweekly *Federal Register* notice.

Sincerely,

/RA/

Douglas V. Pickett, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosures:

1. Amendment No. 284 to DPR-53
2. Amendment No. 261 to DPR-69
3. Safety Evaluation

cc w/encls: See next page

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Package No.: ML073231025
Amendment No.: ML073230984
Tech Spec No.: ML

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|--------|-----------|-----------|---------------------|----------------------|-------------|-----------|
| OFFICE | LPLI-1/PM | LPLI-1/LA | SSIB/BC | EMCB/BC | OGC | LPLI-1/BC |
| NAME | DPickett | SLittle | MScott as signed on | KManoly as signed on | EWilliamson | MKowal |
| DATE | 12/12/ 07 | 12/12/ 07 | 10 / 25 / 07 | 9 / 25 / 07 | 12/18/ 07 | 12/21/ 07 |

OFFICIAL RECORD COPY

DATED: December 27, 2007

AMENDMENT NO. 284 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-53
CALVERT CLIFFS UNIT 1

AMENDMENT NO. 261 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-69
CALVERT CLIFFS UNIT 2

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CALVERT CLIFFS NUCLEAR POWER PLANT, INC.

DOCKET NO. 50-317

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NO. 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 284
Renewed License No. DPR-53

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Calvert Cliffs Nuclear Power Plant, Inc. (the licensee) dated February 1, 2007, as supplemented by letter dated August 17, 2007, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.2. of Renewed Facility Operating License No. DPR-53 is hereby amended to read as follows:

2. Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 284, are hereby incorporated into the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 60 days following completion of the installation and testing of the plant modifications described in the licensee's letters dated February 1 and August 17, 2007.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Mark G. Kowal, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the License and Technical
Specifications

Date of Issuance: December 27, 2007

CALVERT CLIFFS NUCLEAR POWER PLANT, INC.

DOCKET NO. 50-318

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NO. 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 261
Renewed License No. DPR-69

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Calvert Cliffs Nuclear Power Plant, Inc. (the licensee) dated February 1, 2007, as supplemented by letter dated August 17, 2007, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.2. of Renewed Facility Operating License No. DPR-69 is hereby amended to read as follows:

2. Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 261, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 60 days following completion of the installation and testing of the plant modifications described in the licensee's letters dated February 1 and August 17, 2007.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Mark G. Kowal, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the License and Technical
Specifications

Date of Issuance: December 27, 2007

ATTACHMENT TO LICENSE AMENDMENTS

AMENDMENT NO. 284 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-53

AMENDMENT NO. 261 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-69

DOCKET NOS. 50-317 AND 50-318

Replace the following pages of the Facility Operating License with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove Pages

3 (DPR-53)

3 (DPR-69)

Insert Pages

3 (DPR-53)

3 (DPR-69)

Replace the following page of the Appendix A Technical Specifications with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

Remove Page

3.5.2-3

Insert Page

3.5.2-3

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 284 TO RENEWED
FACILITY OPERATING LICENSE NO. DPR-53
AND AMENDMENT NO. 261 TO RENEWED FACILITY OPERATING LICENSE NO. 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

By letter dated September 13, 2004 (Agencywide Documents Access and Management Systems (ADAMS) Accession No. ML042360586), the Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors." The GL letter identified a potential susceptibility of recirculation flow paths and containment sump screens to debris blockage. The GL requested that addressees perform an evaluation of the emergency core cooling system (ECCS) and containment spray system (CSS) recirculation functions and, if appropriate, take additional actions to ensure system functionality.

Calvert Cliffs Nuclear Power Plant (CCNPP) has evaluated the containment recirculation sumps for adverse effects due to debris blockage of flow paths necessary for ECCS and CSS recirculation and containment drainage. The licensee's evaluation concluded that in order for CCNPP to address the concerns discussed in GL 2004-02, large sump strainers of a different design would be required.

By letter dated February 1, 2007 (ADAMS ML070330599), as supplemented by letter dated August 17, 2007 (ADAMS ML072330306), Calvert Cliffs Nuclear Power Plant, Inc., the licensee for CCNPP, Unit Nos. 1 and 2, submitted a request for a change to the CCNPP Technical Specifications (TS). The proposed TS change involves revision to Surveillance Requirement (SR) 3.5.2.8 that addresses the replacement of the containment recirculation sump suction inlet trash racks and screens with strainers.

The proposed revision to SR 3.5.2.8 is intended to reflect the revised terminology associated with the replacement of the existing sump screen and trash racks with a strainer assembly. To reflect the planned containment recirculation sump modifications, the licensee has proposed to revise SR 3.5.2.8 to replace the phrase "trash racks and screens" with the word "strainers."

The letter dated August 17, 2007, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the staff's

original proposed no significant hazards consideration determination as published in the *Federal Register* on March 13, 2007 (72 FR 11385).

2.0 REGULATORY EVALUATION

The licensee has proposed a change to SR 3.5.2.8, which covers the periodic inspection of the containment sump screen assembly and trash racks relied upon by the ECCS and CSS for long-term functionality. The licensee's submittal dated February 1, 2007, describes the Nuclear Regulatory Commission's (NRC's) requirements regarding the long-term functionality of the ECCS and CSS that are applicable to CCNPP. The regulatory requirements pertinent to the proposed TS change are summarized below.

- Paragraph (b)(5) of 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," states that after any calculated successful initial operation of the ECCS, the calculated core temperature shall be maintained at an acceptably low value and decay heat shall be removed for the extended period of time required by the long-lived radioactivity remaining in the core.
- Draft General Design Criterion (GDC) 44 of Appendix A to Part 50, "Emergency core cooling system capability," states that an ECCS with the capability for accomplishing adequate emergency core cooling shall be provided. This core cooling system and the core shall be designed to prevent fuel and clad damage that would interfere with the emergency core cooling function and to limit the clad metal-water reaction to acceptable amounts for all sizes of breaks in the reactor coolant piping up to the equivalent of a double-ended rupture of the largest pipe. The performance of such emergency core cooling system shall be evaluated conservatively in each area of uncertainty.
- Draft GDC 49 of Appendix A to Part 50, "Containment design basis," states that the containment structure including any necessary containment heat removal systems shall be designed so that the containment structure can accommodate the pressures and temperatures resulting from the largest credible energy release following a loss-of-coolant accident.
- Draft GDC 52 of Appendix A to Part 50, "Containment heat removal," states that when active heat removal systems are needed under accident conditions to prevent exceeding containment design pressure, at least two systems of different principles, each with full capacity, shall be provided.

The basis for pressurized-water reactor (PWR) licensees to demonstrate compliance with the above requirements is documented in GL 2004-02. The primary purpose of GL 2004-02 was to request that PWR licensees evaluate the performance of their containment recirculation sumps and implement any modifications necessary to ensure compliance with applicable regulatory requirements on a mechanistic basis in light of the technical issues associated with Generic Safety Issue 191 (GSI-191), "Assessment of Debris Accumulation on PWR Sump Performance."

The GL requested that PWR licensees complete actions necessary for compliance with applicable regulatory requirements using the updated information associated with GSI-191 by December 31, 2007. Prior to this date, GL 2004-02 concluded that licensees' compliance with their current licensing bases was sufficient to support continued plant operation.

This safety evaluation reviews the licensee's proposed TS change to ensure that consistency with the current licensing basis is maintained. Assurance that PWR licensees' proposed sump modifications are adequate in light of the technical issues associated with GSI-191 will be provided separately through the NRC staff's review of GL 2004-02 supplemental responses, through selected sample audit reviews of PWR licensees' sump performance calculations, and through reviews of standardized industry guidance and vendor practices.

3.0 TECHNICAL EVALUATION

3.1 Proposed TS Change

Currently, CCNPP TS SR 3.5.2.8 reads as follows:

Verify, by visual inspection, each ECCS train containment sump suction inlet is not restricted by debris and the suction inlet trash racks and screens show no evidence of structural distress or abnormal corrosion.

The licensee has proposed to revise SR 3.5.2.8 by replacing the phrase "trash racks and screens" with the word "strainers."

The licensee indicated that the proposed revision would not fundamentally alter the current inspection practice required by SR 3.5.2.8. Specifically, the licensee will continue to be required to visually inspect the containment sump suction inlet to verify that it is not restricted by debris and that its debris filters show no evidence of structural distress or abnormal corrosion.

3.2 Description of Existing Screens and Trash Racks

The existing recirculation sump design uses multiple screens located above the sump area. The design consists of an outer trash rack which is constructed of grating material, an inner stainless steel wire mesh screen with a nominal opening of 0.244 inch, and a stainless steel frame constructed of 0.25-inch angle iron and bar stock. In addition, the sump screen is supported by a 12-inch concrete curb, which is intended to prevent high density particles from entering the recirculation sump.

3.3 Description of New Strainer System

CCNPP plans to install new containment recirculation sump strainers to increase the currently available strainer area from approximately 102 square feet to an expected area of approximately 6000 square feet. The new design will remove the existing screen hardware described above and replace it with new fabricated strainer assemblies utilizing a cassette-type suction strainer system designed by Control Components, Inc. On the floor of each containment building, modules of the cassettes will be installed and will extend approximately 3 feet above the containment building floor. The licensee stated that this strainer design was chosen based on the largest available sump strainer area that would fit in the available space within the containment building and compatibility with the anticipated water level.

The licensee stated that the new sump strainer is designed to reduce both head loss and the ingestion of debris which could affect downstream components. The licensee also stated that

the containment recirculation sump strainers are sized to preclude the passage of debris large enough to damage downstream CSS and ECCS components or block flow passages such as flow channels in the fuel and the CSS nozzles. This function is required to permit operation of the supported systems during postulated accidents which credit recirculation flow from the containment recirculation sump.

The licensee stated that activities are currently underway to ensure that the containment recirculation sump functions under debris loading conditions at CCNPP will be in full compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of NRC GL 2004-02 following the Unit 1 refueling outage scheduled to begin in February 2008. The licensee also stated that full compliance will be achieved through a combination of analysis, testing, modifications to increase the available recirculation sump screen area, other changes to the plant to reduce the potential debris loading on the installed containment recirculation sump strainers, and programmatic and process changes as needed.

3.4. Licensee Justification for Proposed TS Change

The licensee's submittal indicated that the proposed change to TS SR 3.5.2.8 provides a more appropriate description of the sump configuration after the installation of a larger strainer assembly is completed. The licensee stated that although the configurations of the existing trash racks and screens and the replacement sump strainer assemblies are different, they serve the same fundamental purpose of passively removing debris from the recirculation sump's suction supply to the supported system pumps. The licensee also stated that the proposed replacement of "trash racks and screens" with "strainers" is a descriptive change and SR 3.5.2.8 will continue to ensure the containment recirculation sump strainers are not restricted by debris and show no evidence of structural distress or abnormal corrosion.

By letter dated August 17, 2007, the licensee stated that the replacement strainer assembly is functionally equivalent to the existing trash racks and screens for meeting the requirements of 10 CFR 50.46(b)(5) for long-term reactor core cooling, and that based upon the sump performance evaluation conducted in response to GL 2004-02, the design function of the trash racks is not considered necessary once the replacement sump strainers have been installed.

3.5 NRC Staff Evaluation

In determining the adequacy of the licensee's proposed TS change, the NRC staff's evaluation considered whether the planned replacement strainer assembly is capable of fulfilling the design functions of the existing screen and trash rack configuration under the current licensing basis. Under the current licensing basis, CCNPP demonstrates adequate sump functionality based on an assumption, from Regulatory Guide (RG) 1.82, that half of each of the existing sump screens is covered with debris such that water cannot flow through the blocked portion of the screen, while the other 50 percent is assumed to remain completely unblocked.

The planned replacement strainer assembly does not have a trash rack or screen to intercept large pieces of debris prior to their arrival on the strainer surfaces. Nevertheless, the staff considers the replacement strainer configuration as meeting the intent of the current sump performance licensing basis because the filtration capacity associated with the replacement strainers' large, complex surface is significantly in excess of the filtration capacity associated with the existing screen assembly and trash racks. Also, the new strainers are robustly designed

and constructed such that the arrival of large pieces of debris at the sump is not expected to threaten the integrity of the strainers.

3.5.1 Pipe Whip, Jet Impingement, and Missile Impact

The NRC staff review focused on whether the planned replacement strainer evaluation adequately considered the potential dynamic effects associated with high energy line break, pipe whip, jet impingement, and missile impact. In the licensee's supplemental response dated August 17, 2007, the licensee provided a drawing showing the strainer layout, and a drawing of the strainer module anchor system. The licensee stated that the analysis for pipe whip, jet impingement, and missile impact is part of the licensee's engineering service package, which will be finalized and included in response to NRC GL 2004-02.

Containment sump recirculation is not required at Calvert Cliffs for a main steam line break. Therefore, the licensee only needed to address the dynamic effects of reactor coolant system (RCS) pipe breaks. The NRC approved Calvert Cliff's application for a leak before break (LBB) methodology for the primary system piping (hot and cold legs). With the LBB provision, the replacement sump strainers do not need protection from the effects for a break in hot or cold leg piping. The separation distance between the pressurizer surge line and the containment sump is sufficiently large such that impingement from a surge line break onto the containment sump is not credible. The safety injection lines, which are maintained at RCS pressure, are located in compartments which will shield the sump strainer from jet impingement loads. The licensee evaluated smaller piping which is maintained at RCS pressure (i.e., 3-inch diameter piping and smaller), and concluded that these lines are sufficiently separated from the containment sump strainer and will not impact the sump strainer. Based on a review of the above information provided by the licensee, the staff finds that the sump strainer is adequately protected from pipe whip, jet impingement, and missiles.

3.5.2 Structural Design of the Replacement Strainer

In response to the NRC staff's request for information on a summary of evaluations performed for the structural adequacy, the licensee stated that the strainer vendor prepared a structural analysis report for the new strainer, water duct, and sump cover using both classical and finite-element analysis (FEA) methods. The FEA was based on the use of ANSYS general purpose finite element computer program. The rules of American Society of Mechanical Engineers Boiler and Pressure Vessel Code Section III, Division I - Subsection NF ("Supports") were applied. The following loads were used for the design.

- The strainer was designed for a differential pressure of 2.103 psi at a fluid temperature of 220° F.
- The deadweight of the strainer along with the weight of the maximum debris load was used in the seismic qualification of the strainer, which the vendor performed using plant specific seismic response spectra curves. Since the strainer modules were installed on the base slab, differential seismic motion is negligible. The "water sloshing" effect during a seismic event was incorporated in the analysis.
- Sliding joints were incorporated between the strainer duct and the strainer support to ensure no significant thermal stresses develop. Slotted joints allow for thermal

expansion of 0.394 inches. At maximum temperature conditions the thermal expansion was only 0.196 inches.

- The strainer hydrodynamic water mass was incorporated into the design.

The NRC staff finds that the load combinations used in the structural design of the strainer meet the guidelines of RG 1.82. Based upon a review of the input from the licensee regarding pipe whip, jet impingement, missile impact, and loads utilized in the structural design, the NRC staff concludes that the licensee adequately evaluated the replacement sump strainer assemblies.

3.6 Summary

Based upon the above discussion, the NRC staff considers the replacement strainers to be functionally equivalent to the existing screen assembly and trash racks under the non-mechanistic current licensing basis for satisfying the requirements of 10 CFR 50.46(b)(5) for long-term reactor core cooling. Consistent with the intent of GL 2004-02, current licensing basis compliance is sufficient until December 31, 2007 (or as extended beyond that date by separate NRC staff correspondence with the licensee).

The NRC staff has requested that licensees complete modifications to their licensing bases for containment recirculation sump performance to ensure consistency with the mechanistic methodology associated with GSI-191 no later than December 31, 2007. Assurance that licensees' replacement strainer designs are adequate for satisfying the intent of GL 2004-02 will be provided by the staff's regulatory activities regarding GL 2004-02 and GSI-191, including reviews of licensees' supplemental responses to GL 2004-02, sample audits of licensees' sump performance calculations, and reviews of generic industry guidance and practices.

The NRC staff has reviewed the licensee's proposed revision to SR 3.5.2.8 of the CCNPP TS. As described above, the proposed revision would clarify terminology associated with the replacement strainers and sump configuration. The licensee will continue to be required to visually inspect the containment sump suction inlet with a 24-month frequency to verify that it is not restricted by debris and that its debris filters show no evidence of structural distress or abnormal corrosion. The staff determined that, under the current licensing basis, the planned replacement strainers are functionally equivalent to the existing trash racks and screen assembly for satisfying 10 CFR 50.46(b)(5) for long-term reactor core cooling. In addition, the staff noted that generic review activities associated with GL 2004-02 will provide assurance that PWR licensees' replacement strainer designs are adequate to satisfy applicable regulatory requirements in accordance with the mechanistic criteria associated with GSI-191. Based upon these findings, the staff concludes that the proposed revision to SR 3.5.2.8 is acceptable.

4.0 STATE CONSULTATION

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

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes an SR. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (72 FR 11385). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

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

Principal Contributors: Ruth Reyes, NRR
Chakrapani Basavaraju, NRR

Date: December 27, 2007