UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 15, 2018

Mr. Bryan C. Hanson
Senior Vice President
Exelon Generation Company, LLC
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNITS 1 AND 2 – ISSUANCE OF AMENDMENT NOS. 323 AND 301 TO CHANGE TO LOW LEVEL REFUELING WATER TANK (CAC NOS. MF9491 AND MF9492; EPID L-2017-LLA-0191)

Dear Mr. Hanson:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment No. 323 to Renewed Facility Operating License No. DPR-53 and Amendment No. 301 to Renewed Facility Operating License No. DPR-69 for the Calvert Cliffs Nuclear Power Plant, Units 1 and 2, respectively. These amendments consist of changes to the Technical Specifications in response to your application dated March 28, 2017 (Agencywide Documents Access and Management System Accession No. ML17087A374).

These amendments revise the Calvert Cliffs Nuclear Power Plant, Units 1 and 2, Technical Specifications to change the low level of the refueling water tank to reflect a needed increase in the required borated water volume and change the allowable value of the refueling water tank level-low function.

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

Sincerely,

Michael L. Marshall, Jr., Senior Project Manager
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosures:
1. Amendment No. 323 to DPR-53
2. Amendment No. 301 to DPR-69
3. Safety Evaluation

cc: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

EXELON GENERATION COMPANY, LLC

DOCKET NO. 50-317

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 323
Renewed License No. DPR-53

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Exelon Generation Company, LLC (Exelon, the licensee) dated March 28, 2017, 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. 323, are hereby incorporated into this license. Exelon Generation 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 of the end of CC1R24 refueling outage.

FOR THE NUCLEAR REGULATORY COMMISSION

James G. Danna, Chief
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the License and
Technical Specifications

Date of Issuance: February 15, 2018

ATTACHMENT TO LICENSE AMENDMENT NO. 323

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT 1

RENEWED FACILITY OPERATING LICENSE NO. DPR-53

DOCKET NO. 50-317

Replace the following page of the Renewed Facility Operating License with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Remove Page	Insert Page
3	3

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove Pages	Insert Pages
3.3.4-6	3.3.4-6
3.5.4-2	3.5.4-2

(4) Exelon Generation pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use, in amounts as required, any byproduct, source, and special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and

(5) Exelon Generation pursuant to the Act and 10 CFR Parts 30 and 70 to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This license is deemed to contain and is subject to the conditions set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act, and the rules, regulations, and orders of the Commission, now or hereafter applicable; and is subject to the additional conditions specified and incorporated below:

(1) Maximum Power Level

Exelon Generation is authorized to operate the facility at steady-state reactor core power levels not in excess of 2737 megawatts-thermal in accordance with the conditions specified herein.

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 323, are hereby incorporated into this license. Exelon Generation shall operate the facility in accordance with the Technical Specifications.

(a) For Surveillance Requirements (SRs) that are new, in Amendment 227 to Facility Operating License No. DPR-53, the first performance is due at the end of the first surveillance interval that begins at implementation of Amendment 227. For SRs that existed prior to Amendment 227, including SRs with modified acceptance criteria and SRs whose frequency of performance is being extended, the first performance is due at the end of the first surveillance interval that begins on the date the Surveillance was last performed prior to implementation of Amendment 227.

(3) Additional Conditions

The Additional Conditions contained in Appendix C as revised through Amendment No. 318 are hereby incorporated into this license. Exelon Generation shall operate the facility in accordance with the Additional Conditions.

(4) Secondary Water Chemistry Monitoring Program

Exelon Generation shall implement a secondary water chemistry monitoring program to inhibit steam generator tube degradation. This program shall include:

Table 3.3.4-1 (page 2 of 3)
Engineered Safety Features Actuation System Instrumentation

FUNCTION	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
4. Steam Generator Isolation Signal[c]		
a. Steam Generator Pressure-Low[d]	SR 3.3.4.1 SR 3.3.4.2 SR 3.3.4.3 SR 3.3.4.4 SR 3.3.4.5	≥ 685 psia
5. Containment Sump Recirculation		
a. Refueling Water Tank Level-Low	SR 3.3.4.2 SR 3.3.4.4 SR 3.3.4.5	≥ 42.5 inches above tank bottom
6. Auxiliary Feedwater Actuation System		
a. Steam Generator 1 Level-Low	SR 3.3.4.1 SR 3.3.4.2 SR 3.3.4.4 SR 3.3.4.5	≤ -149 inches and ≥ -194 inches
b. Steam Generator 2 Level-Low	SR 3.3.4.1 SR 3.3.4.2 SR 3.3.4.4 SR 3.3.4.5	≤ -149 inches and ≥ -194 inches
c. Steam Generator Pressure Difference-High (1 > 2) or (2 > 1)	SR 3.3.4.1 SR 3.3.4.2 SR 3.3.4.4 SR 3.3.4.5	≤ 135.0 psid for Unit 1 ≤ 130.0 psid for Unit 2

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.4.1	----------NOTE---------- Only required to be performed when ambient air temperature is < 40°F. ---------- Verify RWT borated water temperature is ≥ 40°F.	In accordance with the Surveillance Frequency Control Program
SR 3.5.4.2	----------NOTES---------- 1. Only required to be met in MODE 1. 2. Only required to be performed when ambient air temperature is > 100°F. ---------- Verify RWT borated water temperature is ≤ 100°F.	In accordance with the Surveillance Frequency Control Program
SR 3.5.4.3	Verify RWT borated water volume is ≥ 412,350 gallons.	In accordance with the Surveillance Frequency Control Program
SR 3.5.4.4	Verify RWT boron concentration is ≥ 2300 ppm and ≤ 2700 ppm.	In accordance with the Surveillance Frequency Control Program

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EXELON GENERATION COMPANY, LLC

DOCKET NO. 50-318

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 301
Renewed License No. DPR-69

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Exelon Generation Company, LLC (Exelon, the licensee) dated March 28, 2017, 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. 301, are hereby incorporated into this 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 of the end of CC2R23 refueling outage.

FOR THE NUCLEAR REGULATORY COMMISSION

James G. Danna, Chief
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the License and
Technical Specifications

Date of Issuance: February 15, 2018

ATTACHMENT TO LICENSE AMENDMENT NO. 301

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT 2

RENEWED FACILITY OPERATING LICENSE NO. DPR-69

DOCKET NO. 50-318

Replace the following page of the Renewed Facility Operating License with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Remove Page	Insert Page
3	3

Calvert Cliffs Nuclear Power Plant, Unit 2, uses the same Appendix A as Calvert Cliffs Nuclear Power Plant, Unit 1. Accordingly, the Unit 1 Renewed Facility Operating License has been updated with the following pages, which are applicable to both Units 1 and 2.

Remove Pages	Insert Pages
3.3.4-6	3.3.4-6
3.5.4-2	3.5.4-2

(4) Exelon Generation pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use, in amounts as required, any byproduct, source, and special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and

(5) Exelon Generation pursuant to the Act and 10 CFR Parts 30 and 70 to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This license is deemed to contain and is subject to the conditions set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act, and the rules, regulations, and orders of the Commission, now or hereafter applicable; and is subject to the additional conditions specified and incorporated below:

(1) Maximum Power Level

Exelon Generation is authorized to operate the facility at steady-state reactor core power levels not in excess of 2737 megawatts-thermal in accordance with the conditions specified herein.

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 301, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications.

(a) For Surveillance Requirements (SRs) that are new, in Amendment 201 to Facility Operating License No. DPR-69, the first performance is due at the end of the first surveillance interval that begins at implementation of Amendment 201. For SRs that existed prior to Amendment 201, including SRs with modified acceptance criteria and SRs whose frequency of performance is being extended, the first performance is due at the end of the first surveillance interval that begins on the date the Surveillance was last performed prior to implementation of Amendment 201.

(3) Less Than Four Pump Operation

The licensee shall not operate the reactor at power levels in excess of five (5) percent of rated thermal power with less than four (4) reactor coolant pumps in operation. This condition shall remain in effect until the licensee has submitted safety analyses for less than four pump operation, and approval for such operation has been granted by the Commission by amendment of this license.

(4) Environmental Monitoring Program

If harmful effects or evidence of irreversible damage are detected by the biological monitoring program, hydrological monitoring program, and the

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO

AMENDMENT NO. 323 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-53

AMENDMENT NO. 301 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-69

EXELON GENERATION COMPANY, LLC

CALVERT CLIFFS NUCLEAR POWER PLANT, UNITS 1 AND 2

DOCKET NOS. 50-317 AND 50-318

1.0 INTRODUCTION

By application dated March 28, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17087A374), Exelon Generation Company, LLC (the licensee) submitted a request for changes to the Calvert Cliffs Nuclear Power Plant (Calvert Cliffs), Units 1 and 2, Technical Specifications (TSs). The proposed changes would revise Calvert Cliffs, Units 1 and 2, TSs to change the minimum level of the refueling water tank (RWT) to reflect a needed increase in the required borated water volume and change the allowable value (AV) of the RWT level-low function.

Specifically, the licensee requested approval of a license amendment to revise the Calvert Cliffs TS Table 3.3.4-1, Function 5a, and Surveillance Requirement 3.5.4.3 to reflect the modification of the AV of the RWT level-low borated water volume in the RWT and the minimum volume of borated water required in the RWT.

The licensee stated that these changes are necessary to provide the sufficient RWT borated water volume as needed and solve a potential nonconservative TS based on the guidance of U.S. Nuclear Regulatory Commission (NRC or the Commission) Administrative Letter 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety" (ADAMS Accession No. ML031110108). This administrative letter was issued to reiterate to addressees the NRC staff's expectations regarding correction of facility TSs when they are found to contain nonconservative values. The proposed license amendment request (LAR) is necessary to minimize or eliminate air entrainment in the emergency core cooling system (ECCS) during the injection phase following a loss-of-coolant accident (LOCA).

2.0 REGULATORY EVALUATION

2.1 System Description

In the ECCS of Calvert Cliffs, the function of the RWT is to provide a source of borated water for emergency safety feature (ESF) pump operation in the event of a large break LOCA. In the safety injection operation, two of three high-pressure safety injection (HPSI) and two low pressure safety injection (LPSI) pumps and twelve safety injection line isolation valves open to inject the water from the RWT into the reactor coolant system (RCS). At the end of the injection phase, the RWT will be empty. However, the ECCS must continue to provide cooling to remove decay heat. Therefore, the source of water for the ECCS is automatically switched to the containment recirculation sump when the RWT level-low recirculation actuation signal (RAS) setpoint is reached.

The engineered safety features actuation system mitigates accidents in order to protect the public and plant personnel from the accidental release of radioactive fission products. After adequate water has been transferred from the RWT, the RWT level-low RAS setpoint is reached and automatically initiates a signal to open the isolation valves in the two lines from the containment sumps and secure the LPSI pumps. As a result, the ESF pump's suction will continuously provide the borated water by recirculating containment sump water.

To prevent a loss of core cooling capability and ECCS pump damage, the switchover must occur before the RWT is emptied. For the same reason, the switchover must not occur before adequate water is in the containment sump to support pump suction. In addition, early switchover must not occur so that adequate borated water is injected from the RWT to ensure the reactor remains shutdown in the recirculation mode.

2.2 Description of Proposed Changes

This proposed change modifies the AV of the RWT level-low from 24 inches above tank bottom to 42.5 inches above tank bottom. This proposed change consequently increases the minimum borated water volume required in the RWT to meet the design basis. The licensee proposed to modify the AV of the RWT level-low, Function 5a, "Refueling Water Tank Level-Low," in Table 3.3.4-1, "Engineered Safety Features Actuation System Instrumentation," from ≥ 24 inches to ≥ 42.5 inches. Additionally, the licensee proposed to modify Surveillance Requirement 3.5.4.3 by increasing the minimum borated water volume from 400,000 gallons to 412,350 gallons.

The licensee provided the following reason for the change:

> The purpose of the proposed change is to minimize or eliminate air entrainment in the Emergency Core Cooling System (ECCS) during the injection phase following a Loss-of- Coolant-Accident (LOCA). Increasing the amount of water remaining in the RWT when the ECCS pump suction is switched from the tank to the Containment sump minimizes or prevents air entrainment by the ECCS pumps.

2.3 Regulatory Requirements and Guidance

Regulatory Requirements

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.36(c)(1)(ii)(A) states, in part:

> Limiting safety system settings for nuclear reactors are settings for automatic protective devices related to those variables having significant safety functions. Where a limiting safety system setting is specified for a variable on which a safety limit has been placed, the setting must be so chosen that automatic protective action will correct the abnormal situation before a safety limit is exceeded. If, during operation, it is determined that the automatic safety system does not function as required, the licensee shall take appropriate action, which may include shutting down the reactor.

The principal design criteria requirements for Calvert Cliffs, Units 1 and 2, are the Atomic Energy Commission draft general design criteria (GDC) that were published on July 10, 1967. The applicable draft GDC for this review are Criterion 12, 15, and 37.

Criterion 12, "Instrumentation and Control Systems (Category B)," states:

> Instrumentation and controls shall be provided as required to monitor and maintain variables within prescribed operating ranges.

Criterion 15, "Engineered Safety Features Protection Systems (Category B)," states:

> Protection systems shall be provided for sensing accident situations and initiating the operation of necessary engineered safety features.

Criterion 37, "Engineered Safety Features Basis for Design (Category A)," states:

> Engineered safety features shall be provided in the facility to back up the safety provided by the core design, the reactor coolant pressure boundary, and their protection systems. As a minimum, such engineered safety features shall be designed to cope with any size reactor coolant pressure boundary break up to and including the circumferential rupture of any pipe in that boundary assuming unobstructed discharge from both ends.

Regulatory Guidance

Regulatory Guide (RG) 1.105, Revision 3, "Setpoints for Safety-Related Instrumentation," dated December 1999 (ADAMS Accession No. ML993560062), describes a method acceptable to the NRC staff for complying with the NRC's regulations for ensuring that setpoints for safety-related instrumentation are initially within and remain within the TS limits. RG 1.105 endorses Part 1 of the International Society of Automation (ISA) Standard S67.04-1994, "Setpoints for Nuclear Safety-Related Instrumentation."

Technical Specifications Task Force (TSTF) Traveler TSTF-493, Revision 4, "Clarify Application of Setpoint Methodology for LSSS [Limiting Safety System Setting] Functions," dated July 31, 2009 (ADAMS Accession No. ML092150990), establishes the pertinent setpoint definitions and requirements in accordance with 10 CFR 50.36(c)(1)(ii)(A) requirements.

3.0 TECHNICAL EVALUATION

3.1 RWT Level Increase

In its LAR, the licensee stated that at least 360,000 gallons of borated water from the RWT provides sufficient volume for full flow from the required ESF pumps, assuming two HPSI pumps, two LPSI pumps, and two containment spray pumps are running. The water volume assumed for initial injection into the core is consistent with the assumption of the appropriate accident analyses in the Updated Final Safety Analysis Report (UFSAR). This volume meets the design criteria to provide sufficient deliverable volume to the ESF pumps prior to the RWT level-low RAS setpoint switchover to the containment sump for recirculation.

In addition, containment sump water volume is supplied by the RWT borated water inventory by injection through the reactor core and spillage into the containment volume. When ESF pump suction is transferred to the containment sump, sufficient water must be available in the containment sump to ensure adequate net positive suction head for the ESF pumps. The minimum RWT borated water capacity must be sufficient to supply this amount of water without considering the inventory added from the safety injection tanks or RCS, but accounting for loss of inventory to containment subcompartments and reservoirs due to containment spray operation and to areas outside containment due to leakage from ECCS injection and recirculation equipment.

The Calvert Cliffs UFSAR indicates that the total of 360,000 gallons is the minimum amount of borated water needed during a LOCA condition. The licensee in the LAR indicates that the amount of water due to leakage from ECCS and recirculation equipment is an additional 13,567 gallons. Therefore, the required amount of available RWT borated water during a LOCA condition is the total of 373,567 gallons. The licensee stated that raising the RWT level-low allowable value from 24 inches to 42.5 inches results in an additional 12,303 gallons of borated water in the RWT. Thus, the increase in the RWT level from 400,000 gallons to 412,350 gallons allows for sufficient amounts of borated water to meet the accident analyses assumptions with a similar amount of margin as the current requirement. Therefore, the proposed minimum RWT borated water of 412,350 gallons for surveillance requirement purposes continues to meet draft GDC Criterion 37, as specified in the Calvert Cliffs UFSAR.

3.2 Refueling Water Tank Level-Low Allowable Value

Using the regulatory requirements and guidance listed in Section 2.3 of this safety evaluation, the NRC staff reviewed and evaluated the licensee's submittal associated with this LAR. This evaluation was performed to accomplish the following objectives:

- Verify that the proposed limits for RWT level-low solve the issue with the current nonconservative RWT level-low of ≥ 24 inches above tank bottom and that the new limit will provide adequate water level in the containment.

- Verify that the licensee's proposed setpoint calculation values are sufficient to assure, with a high confidence level, the required protective actions are initiated before the associated plant process parameters exceed the safety limits of Calvert Cliffs, Units 1 and 2.

3.2.1 Current RWT Level-Low Allowable Value

The licensee determined the appropriate RAS setpoint to ensure that sufficient RWT borated water will be transferred to the containment sump to support long-term core cooling. The RAS setpoint also ensures that the RWT level does not drop below the critical submergence level required to prevent the vortex-induced air entrainment.

The licensee performed a design-basis calculation to determine the RAS setpoint in the revised Calvert Cliffs TS Table 3.3.4-1. This calculation, CA10206, Revision 0, "Refueling Water Tank Level RAS Setpoint Determination," is contained in Attachment 3 of the LAR. This calculation was performed to determine the setpoint for the RAS of the RWT level switches.

In Section 6 of the calculation, the RAS setpoints were evaluated against the three considered failure cases: (1) "No Failure Case"; (2) "LPSI Pump Throttled after Failure of a LPSI Pump to Stop"; and (3) "Failure of a Diesel/Bus Resulting in a Loss of Safety Train." These three cases were evaluated at four critical points: (1) "Prepare for RAS – Full LPSI Flow still in effect"; (2) "Just Prior To RAS"; (3) "Just prior to Mini-flow Valve Closure"; and (4) "Just prior to RWT Flow Termination." The vortex-induced air entrainment was also evaluated just after RAS and just after mini-flow valve closure.

3.2.2 Current RWT Level-Low Allowable Value

The NRC staff reviewed calculation CA10206, "RWT Level RAS Setpoint Determination," Attachment 3 of the LAR, to verify that the distance from the bottom of the RWT to the top of the outlet pipe is an appropriate setting for automatic protective action that will correct an abnormal situation before a safety limit is exceeded.

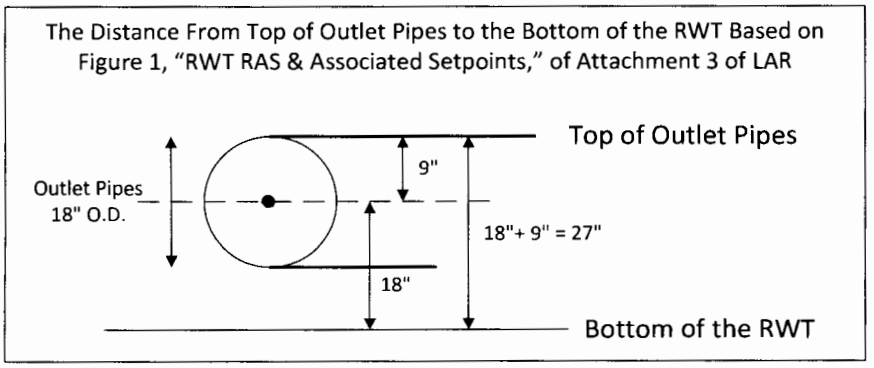

Figure 1. Distance from Top of Outlet Pipes to the Bottom of the RWT

The current TS Table 3.3.4-1 RWT level–low AV of ≥ 24 inches is nonconservative, as shown in Figure 1 above. In order to minimize or eliminate air entraining in the ECCS during the injection phase following a LOCA, the licensee proposed to raise this parameter from greater than 24 inches to 42 inches. Consequently, the staff finds this proposed change to be acceptable, because the proposed RWT level is higher than the required water level to prevent vortexing.

3.2.3 Proposed Allowable Value

Section 8, "Results And Conclusions," of Attachment 3 of the LAR contains the licensee's proposed RAS setpoints, which were developed in accordance with the methods of TSTF-493, Revision 4. The RAS setpoints are summarized below:

Maximum RAS Actuation	46 inches
RAS Nominal Trip Setpoint (NTSP)	45 ± 1 inches
(As-Found Value) Minimum RAS Actuation	44 inches
RAS Limiting Trip Setpoint (LTSP)	43.5 inches
RAS TS Allowable Value	42.5 inches
RAS Analytical Limit (AL)	41.5 inches

In Section 7, "Numeric Analysis," of calculation CA10206, tables were developed using the applicable flow rates (found in Section 2 of the same calculation). From the tables in Section 7, the highest required water levels of all the applicable tests were selected. These levels were selected to establish water level necessary to prevent vortexing. The vortex-induced air entrainment evaluation is based on RAS actuation occurring at an RWT level of 41.5 inches and compares this level to the available water level in order to determine if it is sufficient to prevent a loss of core cooling capability, prevent ECCS pump damage, and protect against vortexing. From this analysis, the RAS actuation at an RWT water level of 41.5 inches was assumed because: (1) this available RWT level is higher than the water level required in the tables, thus no air-entrainment due to vortexing will occur if RAS actuates at 41.5 inches, and (2) this RWT level also prevents a loss of core cooling capability and ECCS pump damage, because it is the RWT level just prior to RAS and just after RAS.

The NRC staff found that in the Section 7 tables, the RWT levels available at all times for each scenario were marked as "acceptable". These RWT levels are acceptable since they are higher than the water levels required, which are also stated in these tables.

This calculation provided the RAS setpoint value of 45 ± 1 inches and a value of 42.5 inches for the AV RWT level-low in the revised Calvert Cliffs TS Table 3.3.4-1. The staff finds this proposed change to be acceptable, because the proposed RWT AV level is higher than the required water level to prevent vortexing.

3.2.4 Instrument Uncertainty

In the "Uncertainty Analysis of Magnetrol Level Switches," Appendix A of calculation CA10206, the analysis is based on the determination of the repeatability of the RAS activation RWT switches. The licensee used this analysis to determine the uncertainty of the RWT level RAS setpoint.

The methodologies found in Section 4 of Appendix A were applied to analyze the Unit 1 data in Table 1, and their results are included in Appendix A, Table 2. The average of the two standard deviation unit values of the "As-Found" and "Change" values was rounded up to 0.75 inches. In Section 5.2 of Appendix A, this value is assumed to include all repeatability differences based on empirical data and to be added to the manufacturer's accuracy data (± 0.25 inches). In Section 7.1, the conclusion is the control band value uncertainty of ± 1 inch.

Since the RWT level switches are physically installed, they have no calibration process and no true as-found and as-left values associated with the drift and calculation tolerances. The as-found and as-left values, which are based on the level switch uncertainty of ± 1 inch, as discussed above, will be applied to the revised switch location. In addition, the NRC staff also reviewed Table 4, "Calibration Data And Data Analysis" of Appendix A, which is the Unit 1 and Unit 2 calibration check analysis for Channels A, B, C, and D, and found that the data was sufficient for the analysis described in Section 4 of Appendix A and supported the conclusions in Section 7.1.

3.2.5 Limiting Trip Setpoint (LTSP) and Nominal Trip Setpoint (NTSP)

The licensee selected the NTSP of RAS of 45 inches. From this selected NTSP, the LTSP is adjusted down by 1.5 inches to allow more margin for conservatism, resulting in an LTSP that is 43.5 inches. The NTSP is the actual setpoint implemented in the plant surveillance procedures where margin has been added to the calculated value. Therefore, the NTSP is more conservative than the LTSP.

As stated in Section 2.4, "RWT Level Switch Uncertainty," of Attachment 3 of the LAR, the level switch uncertainty is ± 1 inch. Upon this uncertainty, the maximum RAS actuation water level based off the NTSP is 46 inches, and the minimum RAS actuation water level is 44 inches. The minimum RAS actuation water level based off the LTSP is 42.5 inches. Thus, per TSTF-493, Revision 4, the proposed TS AV cannot be greater than 42.5 inches, and the AL cannot be greater than 41.5 inches.

The AL of 41.5 inches would prevent vortex-induced air entrainment and would prevent a loss of core cooling capability and ECCS pump damage.

3.2.6 Total Loop Uncertainty (TLU) and Margin

The TLU is the combination of the multiple uncertainties of the instruments, drift, etc. It also can be determined based on a set of actual field data during periodic channel calibrations or channel functional tests.

In Section 4.6 of Appendix A (Attachment 3 of the LAR), the licensee stated:

> Typical instrument and setpoint determinations combine the multiple uncertainties of an instrument including accuracy, drift, and density of a liquid being measured. Since this calculation is based on a significant set of actual field data over a long period, all of the typical uncertainties are already incorporated in the data values. Therefore specific typical uncertainties are not required to be combined again.

Based on RG 1.105, Revision 3, the NRC staff calculated the TLU as shown in Figure 2 below.

Margin, in setpoint determination, is an allowance added to the instrument channel uncertainty. Margin moves the setpoint farther away from the analytical limit. RG 1.105, Revision 3, specifies acceptable methods for combining uncertainties in determining a trip setpoint and its AVs. The NTSP for a trip or actuation on an increasing process would be calculated using the equations in Section 4.4, "Choosing trip setpoints," of the American National Standards Institute (ANSI)/ISA S67.04-1994.

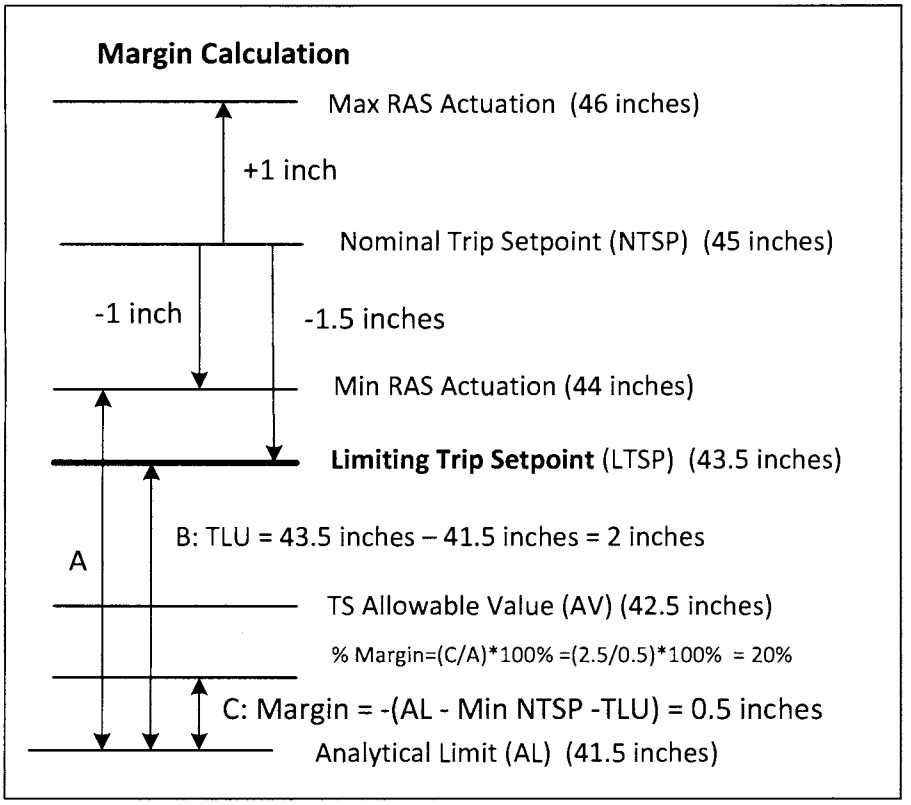

Figure 2. NRC Staff Margin Calculation

The NRC staff used RG 1.105, as shown in Figure 2 above, to independently calculate and verify the margin between the NTSP and associated AL for the worst-case minimum RAS actuation (which requires an as-found value of at least 44 inches).

The NRC staff, based on the evaluation above, found that:

(1) The proposed RWT level-low AV of 42.5 inches is a sufficient AV to solve the current nonconservative RWT level-low. This new AV will prevent the vortex-induced air entrainment and will continue to ensure adequate water level in the containment.

(2) The proposed RAS NTSP of 45 (±1) inches is the RWT level just prior to RAS or just after RAS. This level will ensure that the requirement of the maximum volume of RWT borated water, which will be transferred to the containment sump to support long-term core cooling, is satisfied.

(3) The proposed AL will provide a sufficient margin (greater than or equal to 20 percent, as shown in the margin calculation above) that exists between the NTSP (as-found value) and the AL. This margin reflects the trip setpoint, which has been chosen to assure that a trip or safety actuation occurs before the process reaches the AL level to satisfy the 10 CFR 50.36(c)(1)(ii)(A) requirements. In addition, the RWT level switch function meets the performance criteria of RG 1.105.

Therefore, the proposed change to Calvert Cliffs TS Table 3.3.4-1, Function 5a, "Containment Sump Recirculation/Refueling Water Tank Level-Low ≥ 42.5 inches," is acceptable.

The NRC staff evaluated the licensee's justifications for the proposed TS changes against the applicable regulatory requirements and guidance. The NRC staff concludes that the systems will continue to meet the requirements of 10 CFR 50.36(c)(1)(ii)(A) and continue to meet Criteria 12 and 15. Therefore, the staff finds the proposed change to modify the AV of the RWT level-low, Function 5a, "Refueling Water Tank Level-Low," in Table 3.3.4-1, "Engineered Safety Features Actuation System Instrumentation," from ≥ 24 inches to ≥ 42.5 inches to be 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 on January 10, 2018. 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. 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 published in the *Federal Register* on June 19, 2017 (82 FR 27887). 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) there is reasonable assurance that 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: Hang Vu
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Date: February 15, 2018

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNITS 1 AND 2 – ISSUANCE OF AMENDMENT NOS. 323 AND 301 TO CHANGE TO LOW LEVEL REFUELING WATER TANK (CAC NOS. MF9491 AND MF9492; EPID L-2017-LLA-0191) DATED FEBRUARY 15, 2018

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