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10 CFR 50.55a

February 3, 2022

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Calvert Cliffs Nuclear Power Plant, Units 1 and 2
Renewed Facility Operating License Nos. DPR-53 and DPR-69
NRC Docket Nos. 50-317 and 50-318

Subject: Proposed Relief Request for Mitigation of Buried Saltwater Piping Degradation

References:
1) Letter from B. Beasley (U.S. Nuclear Regulatory Commission) to G. Gellrich (Calvert Cliffs Nuclear Power Plant, LLC), "Calvert Cliffs Nuclear Power Plant, Units 1 and 2 – Relief Request RR-ISI-04-08, Revision 1, Regarding Mitigation of Buried Saltwater Piping Degradation (TAC Nos. MF3413 and MF3414)," dated December 19, 2014 (ML14246A069)

2) Letter from K. Robinson (Constellation Energy Nuclear Group) to U.S. Nuclear Regulatory Commission, "Response to Request for Additional Information, Re: Calvert Cliffs Proposed Alternative RR-ISI-04-08, Revision 1," dated February 14, 2014 (ML14050A127)

3) Letter from K. Robinson (Constellation Energy Nuclear Group) to U.S. Nuclear Regulatory Commission, "Revised Proposed Alternative for Mitigation of Buried Saltwater Piping Degradation (RR-ISI-04-08, Revision 1)," dated January 29, 2014 (ML14034A172 and ML14034A173)

In the Reference 1 letter, the U.S. Nuclear Regulatory Commission approved a buried Saltwater System piping repair method for Calvert Cliffs Nuclear Power Plant (CCNPP), Units 1 and 2. This repair was intended to support contingency repairs if needed during the previous Inservice inspection (ISI) interval which ended June 30, 2019. This relief request was inadvertently omitted from the package of relief requests submitted for the start of the new interval. Constellation Energy Generation, LLC (CEG) is requesting approval of this contingency repair plan in accordance with 10 CFR 50.55a(z)(1) for the current fifth ISI interval which began on July 1, 2019 and is currently scheduled to end June 30, 2029.

This repair was not used during the previous or current ISI interval. CEG requests approval of this request by December 2, 2022.

A summary of the regulatory commitments contained in this submittal is provided in Attachment 1. Attachment 2 contains the relief request.

If you have any questions or require additional information, please contact Tom Loomis at 610-765-5510.

Respectfully,

David P. Helker
Senior Manager - Licensing & Regulatory Affairs
Constellation Energy Generation, LLC

Attachments: 1) Summary of Commitments
2) Proposed Relief Request for Mitigation of Buried Saltwater Piping Degradation

cc: USNRC Region I, Regional Administrator
USNRC Senior Resident Inspector, CCNPP
USNRC Project Manager, CCNPP
S. Seaman, State of Maryland

Attachment 1

Summary of Commitments

The following table identifies commitments made in this document. (Any other actions discussed in the submittal represent intended or planned actions. They are described to the NRC for the NRC's information and are not regulatory commitments.)

COMMITMENT	COMMITTED DATE OR "OUTAGE"	COMMITMENT TYPE	
		ONE-TIME ACTION (Yes/No)	Programmatic (Yes/No)
Disassemble and inspect the first installed sleeve assembly after two operating cycles. This inspection will include: • A check of the retaining bands and backing ring for corrosion • A check of the area under the sleeve for wetness • A check for any damage of the liner • A check for damage of the EPDM gasket	Upon installation of the sleeve assembly.	No	Yes

Attachment 2

Relief Request for Mitigation of Buried Saltwater Piping Degradation

Relief Request for Mitigation of Buried Saltwater Piping Degradation

1. ASME CODE COMPONENTS AFFECTED

30 and 36 inch Inservice Inspection (ISI) Class 3 Buried Saltwater System ductile cast iron piping for Calvert Cliffs Nuclear Power Plant (CCNPP), Units 1 and 2.

2. APPLICABLE CODE EDITION AND ADDENDA

The following table identifies the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Section XI Code of Record for performing Inservice Inspection Activities.

Plant	Interval	Current Edition and Addenda	Interval Start	Interval End
Calvert Cliffs Nuclear Power Plant, Units 1 and 2	Fifth	2013 Edition	July 1, 2019	June 30, 2029

The original "Code of Construction" of the affected components is United States of America Standards (USAS) B31.1, 1967 Edition and applicable addenda as supplemented by the requirements of American National Standards Institute (ANSI) A21.1-1967 / American Water Works Association (AWWA) C101-67 and ANSI A21.50-1976 (AWWA C150-1976).

3. APPLICABLE CODE REQUIREMENT

ASME B&PV Code, Section XI, Subarticle IWA-4000 is applicable to repairs / replacements of the affected components.

IWA-4220 - CODE APPLICABILITY - This section states in part that an item to be used for repair/replacement activities shall meet the Owner's Requirements and Construction Code. Additionally, this section requires reconciliation of the technical requirements of the Construction Code and Owner's requirements.

IWA-4412 - Defect Removal - states "Defect removal shall be accomplished in accordance with the requirements of IWA-4420."

IWA-4340 - MITIGATION OF DEFECTS BY MODIFICATION - states in part that the defect shall be characterized using non-destructive examination and evaluated to determine its cause and projected growth. It also states that the modification shall meet the Construction Code and Owner's Requirements for the item in accordance with IWA-4220. This section also provides the requirements for successive examination of the modification.

4. REASON FOR REQUEST

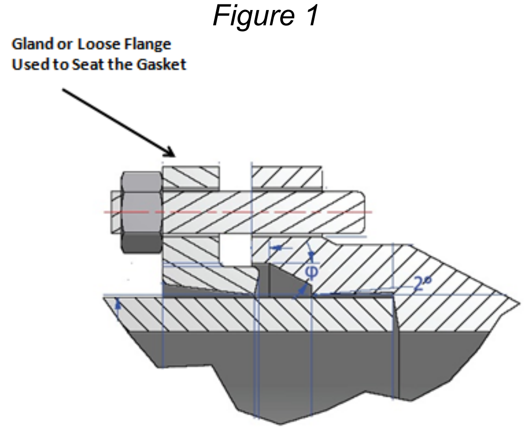
In accordance with 10 CFR 50.55a(z)(1), Constellation Energy Generation, LLC (CEG) is requesting approval of this proposed alternative repair method on the basis that the proposed repair provides an acceptable level of quality and safety.

Saltwater System components at CCNPP, Units 1 and 2 are routinely monitored and inspected. Much of the buried Saltwater System piping to be inspected runs under the concrete base mat of the Turbine Building. The base mat supports numerous equipment and components that are located directly above the path of the buried piping. In addition, there are no welded type repair technologies that can be applied to ductile cast iron piping that are allowed by the original codes of construction USAS B31.1, 1967 Edition and applicable addenda, ANSI A21.1-1967 (AWWA C101-67) and ANSI A21.50-1976 (AWWA C150-1976), or ASME Code Section XI repair rules. As such, the only alternatives to eliminate a defect are via direct replacement of the affected component or a mechanical repair.

The reason for this proposed alternative repair is to allow the use of a mechanical repair system to restore pressure boundary integrity for degraded conditions found during inspections. The specific limitations of the repair systems will be governed by conditions identified and those limitations discussed in Section 5 below. The proposed mechanical repair system will be utilized only for localized degradation in the piping. The direct replacement of this piping to correct relatively minor localized conditions is considered overly burdensome due to its location underneath the turbine building and does not result in a compensating increase in the system's overall level of quality and safety when compared to the proposed mechanical repair alternative.

There are no approved methods or new technologies that provide an adequate method to weld ductile cast iron piping without adversely affecting the integrity of the base metal. The ductile cast iron Saltwater System underground piping contains bell and spigot pipe with fittings that connect to compress the joint gasket. This consists of a loose flange or gland that is slid over the spigot section of the pipe prior to insertion into the bell. Once inserted into the joint, bolting is installed between the gland and the integrally cast flange on the bell section of piping. The bolting is then tightened to seat the "V" wedge type gasket and thus provide a leak tight joint. Figure 1 below provides the general configuration of an ANSI/AWWA A21.10/C110 style joint.

Figure 1



Repairs and modifications to ductile cast iron pipe must use similar methods of mechanical compression for connectivity. In some cases, threaded joints may also be utilized.

The planned comprehensive inspection of the buried Saltwater System piping is being performed to assess and ensure the long-term integrity of the pipe. During previous internal inspections of the piping, areas of missing or deteriorated cement mortar liner have been identified and the mortar lining repaired. Areas where base metal deterioration has been noted have been minor and have not fallen below minimum wall thickness criteria. At this time there is no reason to believe that the integrity or reliability of the buried piping has been compromised. Nor is CEG aware of any specific areas that may be subject to accelerated degradation due to saltwater corrosion or areas of high stress concentration that could be prone to cracking or fracture. Regarding external corrosion of the pipe there is a protective coating on the piping outer diameter (OD) and this generally provides a barrier from external corrosion.

A visual inspection of the concrete liner and base metal, if exposed, will be performed. Any suspect indications will be subject to NDE methods.

The construction cost, impact on outage duration, and operational challenges to replace a portion of the buried Saltwater System piping during an outage are substantial. The physical proximity of the Saltwater System piping and the constraints encumbered by interferences located in the Turbine Building make replacement very challenging. Furthermore, since the Saltwater System is the ultimate heat sink, and replacement could affect both trains of that system, a full reactor core offload would be required. Also, it would be required to align the unaffected unit to provide cooling to the spent fuel pool, thus establishing abnormal plant configurations for an extended period of time.

Therefore, CEG is proposing an alternate repair in accordance with 10 CFR 50.55a(z)(1) on the basis that the proposed contingency repair will provide and acceptable level of quality and safety.

5. <u>PROPOSED ALTERNATIVES AND BASIS FOR USE</u>

Component Scope

The scope of the repair alternative is limited to the buried sections of the 30 and 36 inch Saltwater System ductile cast iron piping. As such, this proposed repair alternative is not applicable for use on any gray cast iron section of the Saltwater System piping.

The supporting calculation (supplied in the Reference 3 letter) states any repairs are made in straight lengths of pipe. This includes the bell and spigot joints that are part of straight lengths of pipe within the Saltwater System. The proposed repair alternative is not designed to be used in pipe fittings or across mitered joints.

The buried saltwater piping has a design pressure of 50 psig. The Saltwater System temperature varies in accordance with Chesapeake Bay temperature throughout the year and load demands on the system. The Saltwater System is designed to temperatures from 30°F up to the design temperature of 200°F.

Description of Repair/Replacement

The repair/replacement alternative (Figure 2) is a sleeve assembly primarily consisting of a pressure retaining backing plate, an internal rubber gasket and four retaining bands.

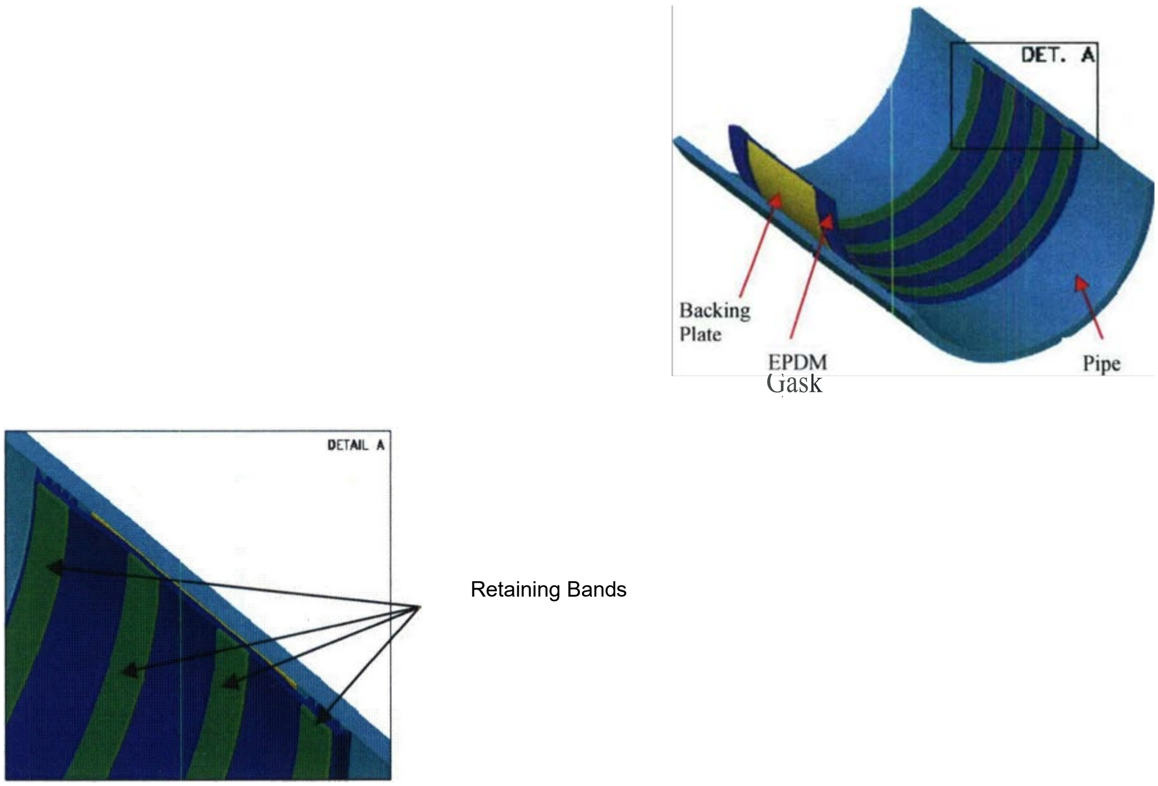
The backing plate is made of AL6XN (UNS N08367), a single sheet of 16 gauge sheet metal 14" wide and designed to enclose the entire inside circumference of the 30" and 36" size pipe. It is placed directly over the degraded area on the inner diameter of the pipe to restore pressure boundary integrity.

The rubber gasket is made of Ethylene Propylene Diene Monomer (EPDM). It is factory vulcanized to form one continuous piece and designed to fit the piping inner surface. The gasket is 0.3" thick and about 20" wide. The ends of the gasket have grooved ribs. It is placed over the backing plate completely enclosing the entire backing plate and extends beyond each end of the backing plate.

The retaining bands are also made of AL6XN (UNS N08367), 2" wide and 0.1875" thick and ring shaped. Two retaining bands are placed on each end of the gasket and two near the middle where the backing plate is located. To keep the backing plate and the gasket in place and held tightly against the pipe, the retaining bands are radially expanded by a hydraulic expander. The retaining bands are locked in place by wedges also made of AL6XN material. The two end retaining bands compress the groove ends of the gasket against the pipe inner circumference and provide a leak tight seal to prevent water intrusion past the gasket. The two middle retaining bands secure the backing plate in place.

The Saltwater System underground piping has a nominal 1/4" cement lining on the inside surface. Prior to installation of the sleeve, the cement lining for the entire length of the sleeve assembly should be removed and repaired with an approved coating. To prevent galvanic corrosion, the outer surface of the backing plate will be wrapped with a 1/8" thick rubber gasket so that the stainless-steel backing plate does not come in direct contact with ductile cast iron piping. Should water leak under the outer stainless-steel retaining bands, it is possible, although unlikely, to have crevice corrosion. Therefore, periodic inspections will be performed by disassembling the sleeve assembly and checking for any deterioration of the retaining bands, signs of leakage past the gasket, or any other degradation.

FIGURE 2



The design calculation (supplied in the Reference 3 letter) qualifies the repair sleeve assembly for the loads applied during installation and operation. The calculation addresses the following:

1) The repair sleeve assembly is capable of restoring pressure boundary of localized pipe wall thinning that can be contained within a 3" diameter area.

2) The friction force created by the retaining bands between the repair assembly and the pipe is significantly larger than the hydrodynamic force of the flowing fluid and seismic loads and will prevent it from being dislodged.

3) The host pipe can withstand the pressure exerted by the retaining bands during installation, the system design pressure, and the pressure due to thermal expansion/contraction of the retaining bands.

The design calculation determines the following:

1) Contact pressure between the retaining bands, EPDM elastomer seal and the pipe

2) Compressive stress in the retaining band

3) Minimum wall thickness required by the host pipe based on resultant forces of retaining bands

4) Thermal effects on the forces in the retaining band

5) The minimum friction force between the seal assembly and the pipe wall

6) Hydrodynamic loads on the seal assembly for all design basis flow conditions to ensure it stays in place

7) Seismic loads on the sleeve assembly

8) Abnormal loading condition

9) Maximum allowable flaw size on the pipe

10) Thermal cycles for the retaining bands and the gasket

Table 1 below provides a summary of the results from the design calculation:

	30-inch Ductile Iron	36-inch Ductile Iron
Maximum compressive stress of yield stress at installation in retaining band	$\frac{\sigma_{c\_chk}}{S_y}$ = 46.5%	$\frac{\sigma_{c\_chk}}{S_y}$ = 46.5%
Required minimum wall thickness of the host pipe to support sleeve assemblies	t_{DI_30min} = 0.387 in	t_{DI_36min} = 0.409 in
Minimum friction force available between the sleeve and the pipe wall to resist seismic and hydraulic loads follows	F_{fS_DI30} = 9255 lbf	F_{fS_DI36} = 9237 lbf
Hydrodynamic load on the assembly with an impact of 2	F_{HYD_30} =236 lbf	F_{HYD_36} =139 lbf
Hydrodynamic load on the assembly with an impact of 2 under abnormal load	$F_{HYD\_ab\_30}$ = 305 lbf	$F_{HYO\_ab\_36}$ = 186 lbf
Axial direction seismic acceleration required to dislodge sleeve assembly	A_{S_DI30} = 82.0 g	A_{S_DI36} = 82.7 g
Alternating stress due to thermal fatigue	S_{ALT_DI30} = 5237 psi	S_{ALT_DI36} = 5.287 x 10^3 psi
Maximum flaw size at operating pressure	d_{flaw} = 3.09 in	d_{flaw} = 3.09 in

Results:

The calculation demonstrates that this repair provides a mechanism to restore pressure boundary integrity by utilizing the reinforcing plate as the new pressure boundary for a locally degraded section of the piping.

This proposed repair system will be applied in cases where degradation has resulted in saltwater piping wall thickness falling below minimum design wall thickness values and is the result of corrosion initiated on the interior diameter of the saltwater piping. This proposed repair system will not be used in cases of discovered crack-like flaws, through wall degradation, or on corrosion that initiated on the external diameter of the saltwater piping. Should any of those cases be discovered, additional analysis would be performed and a separate proposed repair alternative would have to be submitted.

Reconciliation will be addressed as part of repair and replacement plan.

Key attributes of the proposed repair system include:

1) High Strength ASME SB-688 (AL6XN) material is utilized for all load carrying components.

2) ASME SB-688 is resistant to corrosion attack due to submersion in saltwater.

3) There is no welding required for installation.

4) There are no adverse effects to the system's hydraulic capacity.

5) Installation of the repair system will be performed with controlled procedures.

6) The repair system can easily be removed to allow inspection and monitoring of the deteriorated area.

The following provides a summary of the proposed repair systems:

1) The materials utilized in the repair system are non-corrosive when exposed to the saltwater in the Saltwater System.

2) The maximum size of the degraded area including projected growth will fit within a 3-inch diameter area.

3) No additional supports are required for the repair system. The component to be utilized relies only on the ductile cast iron piping for structural and pressure integrity.

4) The repair system has been designed for pressure boundary integrity only. The remaining non-degraded ductile cast iron pipe maintains full design structural capacity of the piping system.

5) The repair system utilized considers all design basis loading requirements including seismic and ensures that it will continue to perform its intended function during all those types of events.

6) The repair system to be utilized is designed in such a manner so as not to damage or adversely affect the existing ductile cast iron piping.

7) The intended use of the repair system is to repair localized degraded areas in the piping and is not designed to transmit longitudinal loads or a full circumferential severance of the piping.

8) When degradation is identified in the ductile cast iron pipe it will be characterized to ascertain whether the degradation is ID or OD initiated and the characterization will be considered in the projected degradation growth.

9) The repair system will be installed in a piping that is continuously supported and the additional weight does not increase bending in the ductile cast iron pipe.

10) Any degradation identified that is due to erosion or corrosion of the thickness of the material at the load transfer area will be determined and checked against design criteria.

11) The constraining effects of the repair system have also been considered and there are no adverse effects from the installation of the repair system on the ductile cast iron pipe.

The internal mechanical seal (e.g., EPDM Rubber & Retaining Bands), upon which this design is based on, has been utilized as a corrosion barrier in numerous Class 3 systems throughout the industry for many years. These seals have ensured that the host pipes, in the area where they are installed, are isolated from the effects of the process fluid corrosive effects.

The installation of this proposed alternative repair is considered to arrest the growth of the corrosion since it will completely seal the degraded area from the corrosive fluid (saltwater). Calvert Cliffs will disassemble the first installed repair system and inspect the degraded area after two operating cycles. This inspection will include:

- A check of the retaining bands and backing ring for corrosion
- A check of the area under the sleeve for wetness
- A check for any damage of the liner
- A check for damage of the EPDM gasket

The results from this inspection will then be used to determine if any change in the periodicity of this action is warranted. In case of multiple installations, only one of the proposed repair systems will be disassembled while the rest will be visually inspected every other refueling outage during conduct of our current preventive maintenance task to inspect Saltwater System piping.

All degradation identified will be assessed on a case-by-case basis. Depending on the defect size the pressure plate may be altered to provide adequate strength to account for degradation outside of the design basis calculation. Appropriate changes will be made to the calculation to reconcile any changes to the pressure plate dimensions. Defects where the repair system is utilized will be characterized to ensure that the defect will be contained within the specified limits of the repair system. Subsequent inspections frequencies of the encapsulated degraded area will also be determined. Monitoring of the size of the degradation will be performed as required.

Information provided in the Reference 2 and 3 letters remain applicable to this relief request.

6. DURATION OF PROPOSED ALTERNATIVE

CEG is requesting approval of this contingency repair plan for the current fifth ISI interval which began on July 1, 2019 and is currently scheduled to end June 30, 2029.

7. REFERENCES

1) Letter from B. Beasley (U.S. Nuclear Regulatory Commission) to G. Gellrich (Calvert Cliffs Nuclear Power Plant, LLC), “Calvert Cliffs Nuclear Power Plant, Units 1 and 2 – Relief Request RR-ISI-04-08, Revision 1, Regarding Mitigation of Buried Saltwater Piping Degradation (TAC Nos. MF3413 and MF3414),” dated December 19, 2014 (ML14246A069)

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