

RS-22-110

September 20, 2022

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

Braidwood Station, Units 1 and 2  
Renewed Facility Operating License Nos. NPF-72 and NPF-77  
NRC Docket Nos. STN 50-456 and STN 50-457

Byron Station, Units 1 and 2  
Renewed Facility Operating License Nos. NPF-37 and NPF-66  
NRC Docket Nos. STN 50-454 and STN-50-455

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

R.E. Ginna Nuclear Power Plant  
Renewed Facility Operating License Nos. DPR-18  
NRC Docket Nos. 50-244

Subject: Supplemental Information - Proposed Alternatives Related to the Steam  
Generators and Request for Forward Fit Analysis

- References:
- 1) Letter from D. Gudger (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Proposed Alternative for Examinations of Examination Category C-B Steam Generator Nozzle-to-Shell Welds and Nozzle Inside Radius Sections," dated September 1, 2021 (ML21244A328).
  - 2) Email from J. Wiebe (U.S. Nuclear Regulatory Commission) to T. Loomis (Constellation Energy Generation, LLC), "Final RAIs 9.1.2021 Constellation Relief Request," dated May 6, 2022.
  - 3) Letter from D. Gudger (Constellation Energy Generation, LLC) to U.S. Nuclear Regulatory Commission, "Response to Request for Additional Information - Proposed Alternative for Examinations of Examination Category C-B Steam Generator Nozzle-to-Shell Welds and Nozzle Inside Radius Sections," dated May 20, 2022 (ML22140A055).

- 4) Letter from D. Gudger (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Proposed Alternative for Examinations of Examination Categories B-B, B-D, and C-A Steam Generator Pressure Retaining Welds and Full Penetration Welded Nozzles," dated December 14, 2021 (ML21348A078).
- 5) Email from J. Wiebe (U.S. Nuclear Regulatory Commission) to T. Loomis (Constellation Energy Generation, LLC), "Draft RAIs for Requests for Alternatives I4R-17, I4R-23, ISI-05-018, I6R-10 (EPID Nos.: L-2021-LLR-091, L-2021-LLR-092, L-2021-LLR-093, L-2021-LLR-094)," dated May 6, 2022 (ML22129A013).
- 6) Letter from D. Gudger (Constellation Energy Generation, LLC) to U.S. Nuclear Regulatory Commission, "Response to Request for Additional Information - Proposed Alternative for Examinations of Examination Categories B-B, B-D, and C-A Steam Generator Pressure Retaining Welds and Full Penetration Welded Nozzles," dated June 17, 2022 (ML22168A005).

#### Proposed Performance Monitoring Plan

In the Referenced letters (References 1 and 4), Constellation Energy Generation, LLC (CEG) submitted proposed alternatives associated with examination of steam generator (SG) welds and components at Braidwood Generating Station (Braidwood), Units 1 and 2, Byron Generating Station (Byron), Units 1 and 2, Calvert Cliffs Nuclear Power Plant (Calvert Cliffs), Units 1 and 2, and R.E. Ginna Nuclear Power Plant (Ginna). In References 3 and 6 CEG provided RAI responses, including a proposed performance monitoring plan. The proposed performance monitoring plan of Reference 3 remains unchanged as discussed in this letter. Upon further review, CEG has developed an additional performance monitoring plan for Byron and Braidwood related to the Reference 4 relief request. This performance monitoring plan supplements the previous response provided in Reference 6, as well as the results of the deterministic fracture mechanics (DFM) and probabilistic fracture mechanics (PFM) evaluations of EPRI Report 3002015906 (the EPRI Report), which demonstrates that the steam generator welds and components are very flaw tolerant. The performance monitoring plan provided in this letter and Reference 3 will validate the continued adequacy of the PFM model and verify that no unexpected degradation mechanisms have developed over time.

As shown in Table 1 of Reference 4, Braidwood, Unit 1, requested a deferral of 36 years from the last ASME Code, Section XI, inspections for Category B-B, Item B2.40 and Category C-A, Item C1.30 components. This represents the maximum requested deferral for both the primary side (Class 1) and secondary side (Class 2) components for Braidwood, Units 1 and 2 and Byron, Units 1 and 2. As a performance monitoring plan, CEG will examine one (1) Category B-B, Item B2.40 primary side tubesheet-to-head weld and one (1) Category C-A, Item C1.30 secondary side tubesheet-to-shell weld at Braidwood, Unit 1, to the maximum extent possible. As shown in Sections 8.2 and 8.3 of EPRI Report 3002015906, the primary side tubesheet-to-head weld (B-B, B2.40) and the secondary side tubesheet-to-shell weld (C-A, C1.30) are the most limiting locations for the subject components at Braidwood and Byron on the primary side and secondary side, respectively.

The Case IDs for these Items are SGPTH-P4A (Item B2.40) and SGSTS-P12A (Item C1.30) in Tables 8-3 of the EPRI Report.

The components selected for performance monitoring at Braidwood, Unit 1, in Reference 3 (one Category C-B, Item C2.21 feedwater nozzle-to-shell weld and one Category C-B, Item C2.22 feedwater nozzle inside radius section) are also the most limiting locations in EPRI Report 3002014590. The Case IDs for these components are FEW-P3A (Item C2.21) and FEW-P1N (Item C2.22) in Table 8-31 of the EPRI Report. Collectively, the four (4) welds/components selected for performance monitoring of the Braidwood, Unit 1, SGs are the most limiting locations and therefore should be sufficient to validate the continued adequacy of the PFM model and verify that no unexpected degradation mechanisms have developed over time.

The proposed performance monitoring plan for Braidwood, Unit 1, will be performed by the end of 2030. This will ensure that no more than 20 years elapses between the performance of an ASME Code, Section XI, examination for the Category B-B and Category C-A components at Braidwood, Unit 1. The schedule for completing the proposed performance monitoring plan by 2030 corresponds to the same timeline proposed in the Reference 3 performance monitoring plan for the feedwater nozzle-to-shell weld (C-B, C2.21) and nozzle inside radius section (C-B, C2.22). Coordinating the performance monitoring examinations will allow for CEG to complete the required performance monitoring in the most efficient manner possible, considering common tasks required to access the components (remove insulation, erect scaffolding, etc.) and the use of common inspection equipment, qualifications, and non-destructive examination personnel.

With the proposed CEG performance monitoring plan provided in this letter, an ASME Code Section XI, Category B-B and Category C-A examination of the steam generator welds covered by the proposed alternative will be performed during the analytically determined safe operating period for Braidwood, Unit 1. This performance monitoring plan represents a sample of 25% (1 of 4) of the ASME Code, Section XI, Category B-B required examinations and a sample of 6.25% (1 of 18) of the Category C-A required examinations for Braidwood and Byron. ASME Code, Section XI, Table IWB-2500-1 (B-B), Note 1 states that "The examination may be limited to one vessel among the group of vessels performing a similar function." Similarly, ASME Code, Section XI, Table IWC-2500-1 (C-A), Note 4 and Table IWC-2500-1 (C-B), Note 2 states that "In the case of multiple vessels of similar design, size, and service (such as steam generators, heat exchangers), the required examinations may be limited to one vessel or distributed among the vessels." Therefore, ASME Code, Section XI, only requires a sample of 25% of the total number of steam generator welds for a given unit at Braidwood and Byron since all units have four steam generators. The ASME Code, Section XI, initial scheduling requirements should be given consideration when evaluating the proposed performance monitoring plan. Factoring in the proposed performance monitoring plan of Reference 3 for Category C-B, the overall CEG proposed performance monitoring plans for the steam generator welds represent a sample of greater than 50% of the total required ASME Code, Section XI, examinations (1 of 1 B-B exams, 1 of 4 C-A exams, and 2 of 2 C-B exams) for Braidwood, Unit 1, and a sample of 12.5% of the total required ASME Code, Section XI examinations (1 of 4 B-B exams, 1 of 18 C-A exams, and 2 of 10 C-B exams) for all Braidwood and Byron units combined.

The components selected for examination as part of the performance monitoring plan are considered representative of the remaining components covered by the proposed alternative given the similarities in design, materials, construction methods, service conditions, and operating strategies between Braidwood and Byron. Given the number of examinations and the representative nature of the components selected, the performance monitoring plan is considered adequate in representing the material condition of the remaining components covered by the proposed alternative at Braidwood and Byron.

Performing an ASME Code, Section XI, examination of the components included in the performance monitoring plan provided in this letter by the specified date will provide direct evidence to the presence or extent of any unexpected degradation experienced by these components. Due to the similarities between the components and operating conditions at Braidwood and Byron, the results of the performance monitoring plan for Braidwood, Unit 1, are considered to accurately represent the material condition for Category B-B and Category C-A components at Braidwood, Unit 2, as well as at Byron, Units 1 and 2.

In the unlikely event that any new unacceptable indications (i.e., indications exceeding the acceptance standards of IWB-3500 or IWC-3500, as applicable, that are accepted by Repair/Replacement Activity or analytical evaluation) are identified during the performance monitoring plan at Braidwood, Unit 1, they will be evaluated as required by ASME Code, Section XI, and the CEG corrective action program. The additional examination and successive inspection requirements of ASME Code, Section XI, also apply. Any new unacceptable indications identified as part of the performance monitoring plan at Braidwood, Unit 1, will result in the same population of welds being examined at Braidwood, Unit 2, and Byron, Units 1 and 2, during the next regularly scheduled outage.

In addition to the direct evidence provided by the performance monitoring plan, examination of Category B-B and Category C-A steam generator components is expected to continue to be performed by other units across the domestic and international PWR fleet. Continued examination of these steam generator components across the industry will provide additional opportunities to detect known degradation mechanisms, as described in Section 6.0 of the EPRI Report, and will also provide the opportunity to detect any new or unexpected degradation mechanisms that may occur in the future for the subject components. If a new degradation mechanism is identified during continued industry examinations, CEG will follow the industry guidance to address the new degradation mechanism.

The absence of any new unacceptable indications in the Braidwood, Unit 1, components selected for examination as part of the performance monitoring plan and the absence of any unexpected degradation across the operating fleet provides validation that the assumptions and methods of the PFM Model used in the EPRI Report are adequate to predict the future behavior of the subject components. The strong technical basis provided by the results of the PFM Model and EPRI Report, along with the implementation of the proposed performance monitoring plan, including scope expansion criteria, will provide additional assurance that the steam generator welds at Braidwood and Byron can operate safely for the remainder of plant life and will continue to provide an acceptable level of quality and safety.

As shown in Table 1 of Reference 4, Ginna requested a deferral of 13.9 years from the last ASME Code, Section XI, inspections for Category B-B, Item B2.40 components and a deferral of 16.9 years for Category C-A, C1.20 components. Calvert Cliffs, Unit 2, requested

a deferral of 23.5 years from the last ASME Code, Section XI inspections for Category B-B, Item B2.40 components and a deferral of 25.5 years for Category B-D, Item B3.130 components. All other requested deferrals for Calvert Cliffs, Units 1 and 2, are 20 years or less. For the purposes of performance monitoring, 25.5 years is not considered substantially longer than the duration of two inservice inspection intervals (20 years) and therefore no additional examinations are proposed for Ginna or Calvert Cliffs for the subject components for the remainder of plant life. The strong technical basis provided by the results of the PFM Model and EPRI Report, along with the satisfactory inspection history and relatively short duration of the proposed examination deferrals compared to the analytically determined safe operating period, provide sufficient assurance that the steam generator welds at Ginna and Calvert Cliffs can operate safely for the remainder of plant life and will continue to provide an acceptable level of quality and safety.

The Attachment contains a regulatory commitment.

With regard to the response to RAI 2.a. contained in Reference 6, the following clarification is provided. As stated in Reference 6, as used in the EPRI Report pre-service inspection (PSI) refers to the collective examinations required by ASME Code, Section III, during fabrication and any ASME Code, Section XI, examinations performed prior to service. The EPRI Report also states "These components did receive 100% coverage during PSI through a combination of the required Section III fabrication and Section XI PSI examinations." A signed N-1 or N-2 Certificate Holders Data Report, as applicable, certifies that the steam generators were designed, fabricated, and examined in accordance with ASME Code, Section III, requirements. This includes meeting all requirements of NB-5000 or NC-5000, as applicable, for required examination of welds, acceptance standards, and qualification of personnel and provides assurance that complete coverage was achieved for the required fabrication examinations. Additionally, all the SG welds at the subject units also received ASME Code, Section XI, preservice examinations prior to initial service, which further contributed to thorough initial examinations and satisfies the assumption of the EPRI Report of 100% coverage during PSI.

CEG is requesting approval of these proposed alternatives on the requested schedule.

#### Forward Fit Analysis

Based on the RAIs and discussions with the NRC staff during public meetings, CEG believes that the staff's approval of the proposed alternatives will be contingent upon implementing some form of a performance monitoring plan that the staff finds acceptable. Because the staff appears to be conditioning the approval of a voluntary licensee request upon the imposition of an additional requirement that was not included in CEG's underlying request, the staff should formally analyze the imposition of a performance monitoring plan as a forward fit.

Management Directive (MD) 8.4<sup>1</sup> describes forward fitting as "the imposition of a new or modified requirement or regulatory staff interpretation of a requirement that results in the modification of or addition to systems, structures, components, or design of a facility; or the

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<sup>1</sup> CEG recognizes that while draft Revision 1 to NUREG-1409, "Backfitting Guidelines," also contains additional guidance on forward fitting, it is still pending Commission approval.

design approval or manufacturing license for a facility; or the procedures or organization required to design, construct or operate a facility as a condition of approval by the NRC of a licensee-initiated request for a licensing action when the underlying request did not propose to comply with the new or revised requirement or interpretation.” (MD 8.4 at 6). It states that the NRC may condition its approval of a licensing action on a new requirement only if “(1) there is a direct nexus to the licensee’s request, and (2) the imposition of the new or modified requirement or regulatory staff position is essential to the NRC staff’s determination of the acceptability of the licensee’s request” and that these elements must be addressed and adequately justified in the staff’s analysis. (*Id.*) Furthermore, MD 8.4 requires that, for new requirements not necessary to ensure adequate protection, the NRC must consider cost before imposing the requirement.

Therefore, prior to any staff action to condition the approval of CEG’s requests upon implementation of a performance monitoring plan, the staff should perform the forward fit analysis described above and in accordance with MD 8.4.<sup>2</sup> As part of its analysis, the staff should consider that it has yet to provide a clear technical basis to require performance monitoring as a condition of approving CEG’s proposed alternatives. While the staff has cited the potential for “unknown degradation mechanisms” that could occur throughout the remaining life of the component, that alone does not provide a compelling basis upon which to require performance monitoring. In fact, it is not clear that the current ASME Code, Section XI, examination methods are even capable of detecting such an unknown degradation mechanism. CEG’s proposed alternatives are supported by EPRI analysis that contains extensive analyses and operating experience. Similar proposed alternatives, citing the same EPRI analysis for the technical basis, were previously approved by the NRC with no performance monitoring requirements. Furthermore, the lack of technical basis and guidance regarding an acceptable approach for performance monitoring has resulted in an unnecessary expenditure of time and resources by both the NRC and CEG. These factors should be considered in the staff’s forward fit analysis.

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

Respectfully,

**Reddick,  
Darani M.**

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Darani M. Reddick  
Director - Licensing & Regulatory Affairs  
Constellation Energy Generation, LLC

Attachment: Summary of Commitments

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<sup>2</sup> These relief requests are time sensitive. Therefore, if the staff determines that conducting the requested forward fit analysis will delay the issuance of a decision in a manner that will not support the nuclear stations’ needs, CEG requests that the proposed alternatives be approved in a timely manner and the forward fit analysis be conducted retroactively. Should the forward fit analysis determine that the proposed alternatives are not appropriately justified, CEG retains the ability to eliminate those conditions using the appropriate regulatory vehicle.

Proposed Alternatives Related to the Steam Generators

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cc: Regional Administrator - NRC Region I  
Regional Administrator - NRC Region III  
NRC Senior Resident Inspector - Braidwood Station  
NRC Senior Resident Inspector - Byron Station  
NRC Senior Resident Inspector - Calvert Cliffs Nuclear Power Plant  
NRC Senior Resident Inspector – Ginna Nuclear Power Plant  
NRC Project Manager - Braidwood Station  
NRC Project Manager - Byron Station  
NRC Project Manager - Calvert Cliffs Nuclear Power Plant  
NRC Project Manager - Ginna Nuclear Power Plant  
Illinois Emergency Management Agency – Division of Nuclear Safety  
S. Seaman - State of Maryland  
Alyse Peterson - NYSERDA

**Attachment**

**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)
<p>As part of the performance monitoring plan, CEG will examine one (1) Examination Category B-B, Item B2.40 primary side tubesheet-to-head weld and one (1) Examination Category C-A, Item C1.30 secondary side tubesheet-to-shell weld at Braidwood, Unit 1 to the maximum extent possible.</p> <p>Any new unacceptable indications identified as part of the performance monitoring plan at Braidwood, Unit 1 will result in the same population of welds being examined at Braidwood, Unit 2 and Byron Units 1 and 2 during the next regularly scheduled outage.</p> <p>The components available for examination are provided in the table below.</p>	<p>The required examinations will be completed by the end of 2030 to ensure that no more than 20 years elapses between the performance of an ASME Code, Section XI examination for the Examination Category B-B and Category C-A components at Braidwood, Unit 1.</p>	Yes	No

Unit	SG	Component ID	Item Number	Description
1	A	1SG-05-SGC-01	B2.40	Primary Head - Tubesheet
1	A	1SG-05-SGC-02	C1.30	Tubesheet - Lower Secondary Shell
1	B	1SG-06-SGC-01	B2.40	Primary Head - Tubesheet
1	B	1SG-06-SGC-02	C1.30	Tubesheet - Lower Secondary Shell
1	C	1SG-07-SGC-01	B2.40	Primary Head - Tubesheet
1	C	1SG-07-SGC-02	C1.30	Tubesheet - Lower Secondary Shell
1	D	1SG-08-SGC-01	B2.40	Primary Head - Tubesheet
1	D	1SG-08-SGC-02	C1.30	Tubesheet - Lower Secondary Shell