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

May 6, 2022

Robert D. Quinn, Director
Nuclear Material Management
Westinghouse Electric Company
1000 Westinghouse Drive
Cranberry Township, PA 16066

SUBJECT: THE RENEWAL APPLICATION TO CERTIFICATE OF COMPLIANCE NO. 1026 FOR THE FUELSOLUTIONS™ SPENT FUEL MANAGEMENT SYSTEM (DOCKET NO. 72-1026, CAC NO. 001028, EPID: L-2020-RNW-0035) – REQUEST FOR ADDITIONAL INFORMATION

Dear Mr. Quinn:

By letter dated November 6, 2020 [Agencywide Document Access and Management System {ADAMS} Accession No. ML20315A012] and supplemented by a letter dated March 30, 2021 (ADAMS Accession No. ML21090A201), Westinghouse Electric Company (Westinghouse) submitted to the U.S. Nuclear Regulatory Commission (NRC) a request to renew the Certificate of Compliance (CoC) No. 1026 for the FuelSolutions™ Spent Fuel Management System. The renewal application contains two parts: the first part is the renewal application for the FuelSolutions™ Spent Fuel Management System, which includes the initial CoC and Amendment Nos. 1 through 4; and the second part is the renewal application for FuelSolutions™ Spent Fuel Management System SENTRY Dry Storage System Addenda. The SENTRY Dry Storage System is the main subject of Amendment No. 5 to CoC No. 1026, which is currently in house for review.

The staff reviewed the first part of the renewal application and determined the need for additional information as identified in the request for additional information (RAI) in the enclosure to this letter. We request that you provide the response to the RAI within 30 days from the date of this letter. If you are unable to meet this deadline, please notify us in writing, within two weeks of receipt of this letter, of your new submittal date and the reasons for the delay. The staff will review the second part of the renewal application once the staff determined that there is no additional change to the design basis of Amendment No. 5.

Please reference Docket No. 72-1026, CAC No. 001028, and EPID No. L-2020-RNW-0035 in future correspondence related to this licensing action. If you have any questions, please contact me at 301-415-1018.

Sincerely,

Signed by Chen, Yen-Ju
on 05/06/22

Yen-Ju Chen, Sr. Project Manager
Storage and Transportation Licensing Branch
Division of Fuel Management
Office of Nuclear Material Safety
and Safeguards

Docket No.: 72-1026
CAC No.: 001028
EPID: L-2020-RNW-0035

Enclosure:
RAI

SUBJECT: THE RENEWAL APPLICATION TO CERTIFICATE OF COMPLIANCE NO. 1026 FOR THE FUELSOLUTIONS™ SPENT FUEL MANAGEMENT SYSTEM (DOCKET NO. 72-1026, CAC NO. 001028, EPID: L-2020-RNW-0035) – REQUEST FOR ADDITIONAL INFORMATION DOCUMENT DATE:

May 6, 2022

ADAMS No.: ML22026A113

OFFICE	NMSS/DFM	NMSS/DFM	NMSS/DFM	NMSS/DFM	NMSS/DFM
NAME	YChen	WWheatley	CSydnor	TBoyce	C. Allen for YDiazSanabria
DATE	04/29/2022	05/02/2022	05/02/2022	05/03/2022	05/04/2022

OFFICIAL RECORD

Request for Additional Information

Docket No. 72-1026
Westinghouse Electric Company
FuelSolutions™ Spent Fuel Management System
Certificate of Compliance No. 1026
Renewal Application

By letter dated November 6, 2020 [Agencywide Document Access and Management System (ADAMS) Accession No. ML20315A012] and supplemented by a letter dated March 30, 2021 (ADAMS Accession No. ML21090A201), Westinghouse Electric Company (Westinghouse) submitted to the U.S. Nuclear Regulatory Commission (NRC) a request to renew the Certificate of Compliance (CoC) No. 1026 for the FuelSolutions™ Spent Fuel Management System.

The staff identified additional information needed in connection with its review of the application as provided in the request for additional information (RAI) discussed below. Each question describes information needed by the staff to complete its review of the application and to determine whether the applicant has demonstrated compliance with regulatory requirements in 10 CFR Part 72.

Chapter 3 – Aging Management Review

RAI 3-1

Provide a time-limited aging analysis (TLAA) or supporting analysis to show that the loss of toughness and ductility due to thermal aging is not expected to compromise the intended function of the 17-4 precipitation-hardened stainless steel (PHSS) fuel basket support rod in the W21 Canister during the 60-year extended storage period. Further, revise the aging management review (AMR) results for the 17-4 PHSS fuel basket support rod in the left half of Tables 2-4a and 2-4b of the application to be consistent with the corresponding AMR line item in Table 4-21 of NUREG-2214, “Managing Aging Process in Storage (MAPS) Report (MAPS Report).

The application AMR results in the left half of Tables 2-4a and 2-4b identify that loss of toughness and ductility due to thermal aging of the 17-4 PHSS fuel basket support rod (helium environment) is addressed by the canister fatigue TLAAs. The application cites Section 3.2.2.8 of the MAPS Report as the technical basis for this AMR result. The corresponding MAPS Report AMR line item for this subcomponent in Table 4-21 of the MAPS Report states that a “TLAA/AMP or a supporting analysis is required” to address loss of toughness and ductility due to thermal aging of the 17-4 PHSS fuel basket support rod in a helium environment. MAPS Report Section 3.2.2.8 provides specific recommendations for performing a case-specific evaluation of loss of toughness and ductility due to thermal aging in subcomponents fabricated from 17-4 PHSS. The MAPS Report Section 3.2.2.8 states that the degree of embrittlement of a specific subcomponent will depend on the service temperature and time duration, as well as the initial heat treatment condition of the SSC. As such, a review of the thermal aging effects should be performed on a case-by-case basis for all subcomponents constructed from Type 17-

4 PHSS. Further, the MAPS Report states that the application should provide a bounding analysis to show that the loss of toughness and ductility due to thermal aging is not expected to compromise the SSC's intended function during the period of extended operation.

Considering the above guidance provided in MAPS Report Section 3.2.2.8, the staff identified that the application does not provide a case-specific evaluation of the loss of toughness and ductility due to thermal aging for the 17-4 PHSS fuel basket support rod in the W21 Canister. The fatigue TLAA, as cited in the applicant's AMR results for this item, is a structural analysis of the effects of cyclic loading on the components and is unrelated to the evaluation of thermal aging and associated loss of toughness and ductility for 17-4 PHSS.

This information is needed to demonstrate compliance with 10 CFR 72.240(c).

RAI 3-2

Considering that the W74 canister fuel basket drawing includes steel fuel basket bolts, clarify the AMR scoping results in Table 2-4a of the application, which state that steel fuel basket bolts are not applicable for the W74 canisters. If steel fuel basket bolts actually do exist for the W74 canisters, then (a) provide a TLAA, aging management program (AMP), or supporting analysis to address loss of bolt preload due to stress relaxation during the 60-year extended storage period; (b) revise the fuel basket bolt subcomponent screening results in the right half of Table 2-4a to address the constituent parts and their quality categorizations; and (c) revise the AMR results for the steel fuel basket bolts in the left half of Tables 2-4a and 2-4b of the application to be consistent with the response to this request.

For the W74 canister, the application AMR results in the left half of Table 2-4a (as well as the corresponding AMR result for the W21 canister) identify that loss of preload due to stress relaxation of steel fuel basket bolts (helium environment) is addressed by the canister fatigue TLAAs. The application cites Section 3.2.1.10 of the MAPS Report as the technical basis for this AMR result. The corresponding MAPS Report AMR line item for this subcomponent in Table 4-21 of the MAPS Report states that a "TLAA/AMP or a supporting analysis is required" to address loss of preload due to stress relaxation of the steel fuel basket bolt in a helium environment. MAPS Report Section 3.2.1.10 provides guidance for aging management of steel bolting in higher temperature environments (such as the canister interior helium or storage cask interior sheltered environments) to look for evidence of loss of bolt preload due to stress relaxation.

The staff noted that the application's subcomponent screening results in the right half of Table 2-4a identify that the steel fuel basket bolts are not applicable for the W74 canister, although canister drawing W74-120 appears to contain this item.

Considering the above guidance provided in MAPS Report Section 3.2.1.10, the staff determined that if steel fuel basket bolts exist in any available design configuration for the W74 canister, the application should include the appropriate provisions for aging management or specific analysis of the steel fuel basket bolts to address loss of bolt preload due to stress relaxation during the 60-year extended storage period. The fatigue TLAA, as cited in the applicant's AMR results for this item, is a structural analysis of the effects of cyclic loading on

the components and is not related to analytical evaluation or management of loss of bolt preload due to stress relaxation.

This information is needed to demonstrate compliance with 10 CFR 72.240(c).

RAI 3-3

Explain the basis for the conclusion stated in Section 3.3.5.5 of the renewal application that the rigid polyurethane foam impact limiter does not require an AMP or TLAA. Alternatively, revise the AMR results in Table 2-8 and Section 3.3.5.5 of the renewal application to address how the aging effects that are applicable to the polyurethane foam impact limiter are managed or otherwise dispositioned for the renewal period.

For the rigid polyurethane foam impact limiter in an embedded environment, Table 2-8 of the renewal application for the FuelSolutions system identifies polyurethane degradation due to thermal aging as the aging effect and mechanism. This Table 2-8 line item lists "Monitoring of Metallic Surfaces AMP" as the aging management activity and Section 3.2.8 (Coatings) of NUREG-2214 as the technical basis. The staff notes that polymers can be susceptible to both heat- and radiation-induced changes, such as embrittlement, shrinkage, decomposition, and changes in physical configuration, as discussed in Section 3.3.1 of NUREG-2214. The basis for the use of the monitoring of metallic surfaces (MMS) AMP for managing polyurethane degradation due to thermal aging is unclear. Further, the staff noted that the MMS AMP does not include any activity addressing polyurethane degradation due to thermal aging.

Section 3.3.5.5 of the renewal application for the FuelSolutions system states that no damage or change in the properties of the polyurethane foam is expected to occur over the life of the impact limiter. Therefore, the applicant concluded in this section that no AMP or TLAA is required to address polyurethane degradation for the polyurethane foam impact limiter. The staff notes that thermal aging and radiation embrittlement are identified as credible aging mechanisms for polymers in Section 3.3.1 of NUREG-2214. Therefore, the basis for the application's conclusions that no AMP or TLAA is required to address degradation of polyurethane foam is unclear.

This information is needed to demonstrate compliance with 10 CFR 72.240(c).

Appendix A – Aging Management Programs

Note: The technical RAIs below for AMPs are based on the AMP descriptions provided in Appendix A of the renewal application. Discrepancies between AMP descriptions provided in Appendices A and D of the application are covered in a separate RAI (RAI D-1).

RAI A-RCS1

Provide technical justification that the visual inspections of the concrete per ACI 349.3R-02, as described in Element 4 of the Reinforced Concrete Structures (RCS) AMP, are an acceptable alternative approach to the use of radiation surveys for managing loss of shielding due to concrete degradation during the 60-year extended storage term.

Section 6.6 of the MAPS Report states that, if supported by a technical justification, visual inspections of the concrete per ACI 349.3R-02 may be an acceptable alternative approach to the use of radiation surveys for managing loss of shielding due to concrete degradation. This section states that the use of the visual inspections per ACI 349.3R02 should be supported by a shielding evaluation that demonstrates that the ACI 349.3R-02 acceptance criteria, which are developed to assess structural performance, are sufficiently conservative to provide for timely identification of concrete degradation and corrective actions before a loss of shielding performance. The NRC staff performed generic shielding evaluations (referenced below) for several storage system designs and identified instances where the use of visual inspections in lieu of radiation surveys may be justified. An applicant may reference the NRC evaluations provided that (1) the applicant can justify that the NRC evaluations apply to, or are bounding for, the applicant's design, including consideration of the assumptions and system parameters (both design and contents) used in the NRC evaluation; and (2) the NRC evaluations indicate that the use of visual inspection for that design would be sufficiently conservative for ensuring against a loss of shielding performance.

Reference: "Study of the ACI 349.3R-02 Tier 2 (i.e., Section 5.2.1) Criteria Impacts on Dose Rates for Several Spent Nuclear Fuel Dry Storage System Designs." Washington, DC, U.S. Nuclear Regulatory Commission. ADAMS Accession No. ML19072A031, 2019.

This information is needed to demonstrate compliance with 10 CFR 72.240(c).

RAI A-RCS2

For the visual inspection of lower vent interior concrete areas described in Element 4 of the RCS AMP, revise the AMP to identify the criteria to be used to select the one storage cask per ISFSI site for visual inspection of the lower vent interior concrete areas.

Element 4 of RCS AMP in the renewal application states that visual inspection of lower vent interior concrete areas (normally inaccessible) is to be performed for one storage cask at each ISFSI site, at least once every five years, using video camera, boroscope, or other remote visual inspection equipment. Element 4 of the RCS AMP described in Table 6-3 of the MAPS Report states that cask selection criteria should be predefined and/or justified. Element 4 of the RCS AMP in the renewal application does not include criteria for selection of the one storage cask per ISFSI site for visual inspection of the lower vent interior concrete areas.

This information is needed to demonstrate compliance with 10 CFR 72.240(c).

RAI A-TC1

Address the apparent discrepancy between Element 6 of the Transfer Cask (TC) AMP, which cites acceptance criteria for inaccessible internal surfaces based on no evidence of leakage from the liquid neutron shield jacket or loss of wall thickness beyond a predetermined limit, and the other TC AMP elements, which do not address aging management activities for the liquid neutron shield jacket. Based on the resolution of this discrepancy, revise the TC AMP in the renewal application, as appropriate.

With respect to aging management of the liquid neutron shielding jacket, Element 6 (third paragraph) of the TC AMP states: “For inaccessible surfaces, the acceptance criteria are no evidence of leakage from the [liquid] neutron shield jacket or loss of wall thickness beyond a predetermined limit established by system-specific design standards or industry codes and standards.” This information indicates a reliance on aging management activities for components containing liquid neutron shielding.

However, TC AMP Elements 1, 3, 4, and 5 do not address aging management of the liquid neutron shielding jacket.

This information is needed to demonstrate compliance with 10 CFR 72.240(c).

RAI A-HBUF1

Provide information that justifies the applicability of the EPRI High Burnup Dry Storage Cask Research and Development Project (HDRP) surrogate demonstration program to the W21 canister high-burnup (HBU) fuel considering that the maximum allowable burnup limit for the HBU fuel stored in the W21 canister is 60 GWd/MTU, which is 5 to 10 GWd/MTU greater than the specified nominal burnup of the HBU fuel stored in the HDRP research project cask.

The specified nominal burnup of the HBU fuel stored in the HDRP research project cask is 50 to 55 GWd/MTU, whereas the maximum allowable burnup limit for the HBU fuel stored in the W21 canister is 60 GWd/MTU. Element 1 of the HBU Fuel Monitoring and Assessment AMP described in Table 6-7 of the MAPS Report states that the scope of the program provides (among other things) “a description of how the parameters of the surrogate demonstration program are applicable to the design-bases HBU fuel;” that the “maximum burnup of the design-bases HBU fuel [to be stored in the canister] is less than the burnup of the fuel in the surrogate demonstration program;” and “If the criteria cannot be met, justification is provided that the fuel from the demonstration program is reasonably characteristic of the stored fuel, and higher burnups will not change the results determined by the demonstration.”

This information is needed to demonstrate compliance with 10 CFR 72.240(c).

RAI A-HBUF2

Identify the parameters monitored and inspected in the HDRP that are applicable to the W21 canister HBU fuel and describe how they meet the guidance in Appendix D of NUREG-1927, Revision 1.

Element 3 of the HBU Fuel Monitoring and Assessment AMP described in Table 6-7 of the MAPS Report states that the "applicant identifies the parameters monitored and inspected in a surrogate demonstration program that are applicable to its particular design-bases HBU fuel and describes how this meets the guidance in Appendix D of NUREG-1927, Revision 1." Element 3 of the applicant’s W21 Canister HBU Fuel Monitoring and Assessment AMP does not include the specific parameters monitored and inspected in the HDRP that are applicable to the W21 canister HBU fuel and how they meet the guidance in Appendix D of NUREG-1927, Revision 1.

The staff notes that the HDRP is a broad program that includes both the demonstration cask and the related sibling pin testing, and it is monitoring a wide range of parameters. All parameters may not be specifically relied on to manage aging in the HBU Fuel Monitoring and Assessment AMP. For clarity in the future implementation and oversight of the AMP, identification of the specific parameters monitored is requested.

This information is needed to demonstrate compliance with 10 CFR 72.240(c).

RAI A-HBUF3

Identify the methods for detecting aging effects in the HDRP that are applicable to the W21 canister HBU fuel and describe how they meet the guidance in Appendix D of NUREG-1927, Revision 1.

Element 4 of the HBU Fuel Monitoring and Assessment AMP described in Table 6-7 of the MAPS Report states that the "applicant identifies the detection of aging effects in a surrogate demonstration program that are applicable to its particular design-bases HBU fuel and describes how this meets the guidance in Appendix D of NUREG-1927, Revision 1." Element 4 of the applicant's W21 Canister HBU Fuel Monitoring and Assessment AMP does not include the methods for detecting aging effects in the HDRP that are applicable to the W21 canister HBU fuel and how they meet the guidance in Appendix D of NUREG-1927, Revision 1.

This information is needed to demonstrate compliance with 10 CFR 72.240(c).

Appendix D – Aging Management FSAR Changes

RAI D-1

Revise the renewal application to address all of the discrepancies between the AMP descriptions provided in Appendix A, "FuelSolutions Aging Management Programs," of the renewal application and the corresponding AMP descriptions included in Appendix D, "Aging Management FSAR Changes," of the renewal application.

The following are examples of significant discrepancies between the AMP descriptions provided in Appendix A of the renewal application and the corresponding AMP descriptions included in the proposed FSAR change pages in Appendix D of the renewal application:

- For Element 4 of the RCS AMP, the description in Appendix A differs significantly from the description in the Appendix D FSAR change pages for the FuelSolutions Storage System (WSNF-220). In particular, the Appendix A description of RCS AMP Element 4 does not include any provision for the performance of radiological surveys of the storage cask, whereas the Appendix D description of RCS AMP Element 4 does include radiological surveys.
- For Elements 3 and 5 of the W100 TC AMP, the description in Appendix A includes monitoring for deterioration of the solid neutron shielding material performance, whereas the description in the Appendix D FSAR change pages for the FuelSolutions Storage System (WSNF-220) does not include this activity.

- Element 4 of the W100 TC AMP in Appendix A includes radiological surveillance inspection of the RX-277 or NS-3 solid neutron shielding material performance in the top, bottom, and ram access covers of a loaded transfer cask, whereas the description in the Appendix D FSAR change pages for the FuelSolutions Storage System (WSNF-220) does not include this activity.

Note that the above list identifies some of the most significant discrepancies. There are also other discrepancies between the AMP descriptions in Appendix A and the corresponding AMP descriptions in Appendix D. The NRC staff did not attempt to locate and itemize all of the discrepancies between the information in the Appendix D FSAR change pages and the corresponding information provided in the preceding sections of the renewal application. The applicant should ensure that such issues are addressed in its submittal.

This information is needed to demonstrate compliance with 10 CFR 72.240.

RAI D-2

The following three AMP descriptions are included in the renewal application Appendix D FSAR change pages for the FuelSolutions Storage System (WSNF-220) and FuelSolutions W21 Canister (WSNF-221). Address whether these three AMP descriptions should be removed from WSNF-221 and address the discrepancies in these three AMP descriptions between the ones in WSNF-220 and in WSNF-221.

- Table 9.A.1-2, FuelSolutions Reinforced Concrete Structures AMP
- Table 9.A.1-3, FuelSolutions Monitoring of Metallic Surfaces AMP
- Table 9.A.1-4, FuelSolutions W100 Transfer Cask AMP

The renewal application Appendix D FSAR change pages for the FuelSolutions W21 Canister (WSNF-221) indicate, in the table of contents and in the summary of AMPs (FSAR Appendix 9.A), that the above three AMP descriptions are supposed to be located in the FSAR change pages for the FuelSolutions Storage System (WSNF-220) and not in the FSAR change pages for the FuelSolutions W21 Canister (WSNF-221). However, the above three AMP descriptions are currently located in the FSAR change pages for both the FuelSolutions W21 Canister (WSNF-221) and the FuelSolutions Storage System (WSNF-220). Further, there are several discrepancies between the above three AMP descriptions located in the FSAR change pages for the FuelSolutions W21 Canister (WSNF-221) and the corresponding AMP descriptions located in the FSAR change pages for the FuelSolutions Storage System (WSNF-220).

This information is needed to demonstrate compliance with 10 CFR 72.240.

References

EPRI. “High Burnup Dry Storage Cask Research and Development Project: Final Test Plan,” Revision 0. Palo Alto, CA, Electric Power Research Institute. DOE Contract No. DE-NE-0000593, 2014.

NRC. NUREG-2214, “Managing Aging Processes in Storage (MAPS) Report,” Final Report. Washington, DC, U.S. Nuclear Regulatory Commission. ADAMS Accession No. ML19214A111, 2019.

NRC. NUREG-1927, “Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel,” Revision 1. Washington, DC, U.S. Nuclear Regulatory Commission. ADAMS Accession No. ML16179A148, 2016.

NRC. “Study of the ACI 349.3R-02 Tier 2 (i.e., Section 5.2.1) Criteria Impacts on Dose Rates for Several Spent Nuclear Fuel Dry Storage System Designs.” Washington, DC, U.S. Nuclear Regulatory Commission. ADAMS Accession No. ML19072A031, 2019.

Westinghouse. “FuelSolutions™ Storage System Final Safety Analysis Report,” WSNF-220, Revision 4. Westinghouse Electric Company. ADAMS Accession Nos. ML071510207 (public) and ML071510220 (proprietary), 2007a.

Westinghouse. “FuelSolutions™ W21 Canister Storage Final Safety Analysis Report,” WSNF-221, Revision 5. Westinghouse Electric Company. ADAMS Accession Nos. ML071510213 (public) and ML071510223 (proprietary), 2007b.

Westinghouse. “FuelSolutions™ W74 Canister Storage Final Safety Analysis Report,” WSNF-223, Revision 6. Westinghouse Electric Company. ADAMS Accession Nos. ML071510215 (public) and ML071510227 (proprietary), 2007c.

Renewal Application To Certificate of Compliance No. 1026 for The FuelSolutions Spent Fuel Management System Request for Additional Information DATE May 6, 2022

DISTRIBUTION:
YChen, NMSS/DFM/STLB
WWheatley, NMSS/DFM/STLB
ASotomayor-Rivera, NMSS/DFM/NARAB
CSydnor, NRR/DNRL/NVIB
JSmith, NMSS/DFM/NARAB
MDiazMaldonado, NMSS/DFM/FFLB
TBoyce, NMSS/DFM/MSB
DMarcano, NMSS/DFM
YDiaz-Sanabria, NMSS/DFM/STLB

ADAMS Accession No.: Ltr ML22026A113

OFFICE	NMSS/DFM/STLB	NMSS/DFM/STLB	NRR/DNRL/NVIB	NMSS/DFM/MSB
NAME	YChen *YC*	WWheatley *WW*	CSydnor *CS*	TBoyce *TB*
DATE	Apr 29, 2022	May 2, 2022	May 2, 2022	May 3, 2022
OFFICE	NMSS/DFM/CTCFB	NMSS/DFM/STLB		
NAME	YDiaz-Sanabria WAllen for *WA*	YChen *YC*		
DATE	May 4, 2022	May 6, 2022		

OFFICIAL RECORD COPY