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EVR_LTR_210037

November 15, 2021

Subject: Submittal of the Westinghouse **eVinci™** Micro-Reactor Pre-Application Regulatory Engagement Plan

I am pleased to submit on behalf of Westinghouse Electric Company the enclosed proprietary and non-proprietary versions of the Westinghouse **eVinci** ™[1] micro-reactor pre-application Regulatory Engagement Plan (REP). This plan is an update to the version submitted in January 2020 and covers the planned pre-application interactions with the NRC in support of future Westinghouse **eVinci** micro-reactor license application(s). The **eVinci** micro-reactor represents an important technical advancement for the electric power industry that supports national and international decarbonization goals and objectives by providing safe reliable carbon-free heat and electricity to remote and off-grid applications.

The enclosed plan includes information on the basic design of the eVinci micro-reactor as well as the regulatory strategies envisioned including design, manufacturing, and transportation phases of deployment. The plan includes our proposal of key topic areas that we would like to address through pre-application interactions to allow both Westinghouse and the NRC to determine the most effective means to license the advanced eVinci micro-reactor design. Through these interactions Westinghouse will continue to update the NRC of our deployment plans as they evolve.

This submittal contains proprietary information of Westinghouse Electric Company LLC ("Westinghouse"). In conformance with the requirements of 10 CFR Section 2.390, as amended, of the Nuclear Regulatory Commission's ("Commission's") regulations, we are enclosing with this submittal an Affidavit. The Affidavit sets forth the basis on which the information identified as proprietary may be withheld from public disclosure by the Commission.

Correspondence with respect to the proprietary aspects of this submittal or the Westinghouse Affidavit should reference AW-21-5236 and should be addressed to Anthony J. Schoedel, Manager, eVinci Licensing & Configuration Management, Westinghouse Electric Company, 1000 Westinghouse Drive, Building 1, Cranberry Township, PA 16066.

Michael M. Corletti

Michael M. Corletti
Sr. Director, Licensing & Advanced Reactors Engineering
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[1] eVinci is a trademark or registered trademark of Westinghouse Electric Company LLC, its affiliates and/or its subsidiaries in the United States of America and may be registered in other countries throughout the world. All rights reserved. Unauthorized use is strictly prohibited. Other names may be trademarks of their respective owners.

cc: Mohamed Shams (NRC)
Brian Smith (NRC)
William Kennedy (NRC)
Amy Cubbage (NRC)

Enclosures:

1. Affidavit AW-21-5236
2. Proprietary Information Notice and Copyright Notice
3. Westinghouse **eVinci** Micro-Reactor Pre-Application Regulatory Engagement Plan (Proprietary)
4. Westinghouse **eVinci** Micro-Reactor Pre-Application Regulatory Engagement Plan (Non-Proprietary)

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:
COUNTY OF BUTLER:

(1) I, Anthony J. Schoedel, have been specifically delegated and authorized to apply for withholding and execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse).

(2) I am requesting the proprietary portions of EVR_LTR_210037, Enclosure 3 be withheld from public disclosure under 10 CFR 2.390.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged, or as confidential commercial or financial information.

(4) Pursuant to 10 CFR 2.390, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse and is not customarily disclosed to the public.

(ii) The information sought to be withheld is being transmitted to the Commission in confidence and, to Westinghouse's knowledge, is not available in public sources.

(iii) Westinghouse notes that a showing of substantial harm is no longer an applicable criterion for analyzing whether a document should be withheld from public disclosure. Nevertheless, public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar technical evaluation justifications and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable

AFFIDAVIT

others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

(5) Westinghouse has policies in place to identify proprietary information. Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage (e.g., by optimization or improved marketability).

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

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(6) The attached documents are bracketed and marked to indicate the bases for withholding. The justification for withholding is indicated in both versions by means of lower-case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower-case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (5)(a) through (f) of this Affidavit.

I declare that the averments of fact set forth in this Affidavit are true and correct to the best of my knowledge, information, and belief.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: 11/15/2021

Anthony J. Schoedel, Manager
eVinci Licensing & Configuration Management

PROPRIETARY INFORMATION NOTICE

Transmitted herewith are the proprietary and non-proprietary versions of a document, furnished to the NRC in connection with requests for generic and/or plant-specific review and approval.

In order to conform to the requirements of 10 CFR 2.390 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the Affidavit accompanying this transmittal pursuant to 10 CFR 2.390(b)(1).

COPYRIGHT NOTICE

The reports transmitted herewith each bear a Westinghouse copyright notice. The NRC is permitted to make the number of copies of the information contained in these reports which is necessary for its internal use in connection with generic and plant specific reviews and approvals as well as the issuance, denial, amendment, transfer, renewal, modification, suspension, revocation, or violation of a license, permit, order, or regulation subject to the requirements of 10 CFR 2.390 regarding restrictions on public disclosure to the extent such information has been identified as proprietary by Westinghouse, copyright protection notwithstanding. With respect to the non-proprietary version of this report, the NRC is permitted to make the number of copies beyond those necessary for its internal use which are necessary in order to have one copy available for public viewing in the appropriate docket files in the public document room in Washington, DC and in local public document rooms as may be required by NRC regulations if the number of copies submitted is insufficient for this purpose. Copies made by the NRC must include the copyright notice in all instances and the proprietary notice if the original was identified as proprietary.

Enclosure 4

Westinghouse eVinci Micro-Reactor Pre-Application Regulatory Engagement Plan

(Non-Proprietary)

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1. PURPOSE AND SCOPE

1.1. Purpose

This Regulatory Engagement Plan (REP) describes the basic design of the eVinci micro-reactor, the regulatory strategy to be used to license the plant, and the planned pre-application interaction between the NRC and Westinghouse. The primary purpose of the REP is to describe the interactions between the NRC staff and Westinghouse that will ultimately support future regulatory decisions.

1.2. Scope

This REP covers pre-application engagement activities with the NRC for the commercial plant. It will be updated periodically to address major changes to the project. The post-application regulatory engagement activities will be included in future revisions of this REP as the project progresses. Changes to the REP will be communicated to the NRC staff via a formal letter.

2. BRIEF DESIGN OVERVIEW

2.1. Basic Plant Overview

[

]a,c,e

[a,c,e

]

Figure 2.1-1 eVinci Micro-Reactor Overview

2.2. Novel and Advanced Design Features and Processes

[

]a,c,e

2.3. Deployment Model

The reactor will be fabricated in a manufacturing facility. The reactor will initially be loaded with unirradiated fuel [ ]a,c,e. The fueled plant will then be transported to the licensed operating site and undergo commissioning and startup. At the end of operational life, the depleted reactor will be transported to the manufacturing facility (or other facility) for refueling, refurbishment, storage, and/or decommissioning. Details pertaining to the licensing and regulatory engagement activities associated with each phase of the reactor deployment model is detailed in Section 3 of this REP.

2.4. Design Development and Testing

<u>Design Development</u>

Westinghouse is currently in the conceptual design phase for the eVinci micro-reactor. [

]a,c,e

Testing Activities

Testing activities envisioned prior to a Design Certification application include the following:

- Electrical Demonstration Unit (EDU) Testing – This is an integral system test focused on the interface between the core block, heat pipes, and the heat exchanger.
- Unit Cell Assembly (UCA) Testing – This testing primarily provides criticality and neutronics benchmarking. It will also improve understanding of material properties under irradiation.
- Separate effects or proof of design tests that may be performed on the component or subcomponent level
- Test unit at a DOE facility or Nonpower reactor at a University – Such a test would be an integrated nuclear test in a non-commercial facility such as at a Department of Energy (DOE) site or a University.

The aforementioned testing activities would contribute to meeting the regulatory requirements to support modeling and simulation of the safety features of the eVinci reactor design.

Design Reconciliation

It is envisioned that the eVinci micro-reactor design will incorporate lessons learned from the testing activities described above prior to completion of design certification.

3. REGULATORY STRATEGY

3.1. General Overview of Regulatory Strategy

There are several paths available to achieve regulatory approval for the eVinci micro-reactor. The final regulatory path chosen for the project will ultimately depend on several factors, including the final eVinci micro-reactor design, NRC rulemaking for advanced reactors, future Westinghouse partnerships, and information from preapplication discussions with the NRC.

Westinghouse currently plans to use 10 CFR Part 52 for the licensing of the eVinci micro-reactor design. To support commercial licensing, Westinghouse is planning a comprehensive testing and analysis program that will be sufficient for Design Certification (DC) of the eVinci facility. A DC approval under Part 52 would support the deployment of standard eVinci reactors for a range of sites in the United States. In addition to a DC, Westinghouse intends to explore the various licenses that will be required for eVinci deployment including a manufacturing license under 10 CFR 52 Subpart F, certificate of compliance and license for transport under 10 CFR 71, as well as other potential licenses. The DC would be referenced in these license applications, as applicable. Figure 3.1-1 below shows a graphical representation of this deployment model for the project along with the potential licenses for each step. This general approach is aligned with NRC's draft whitepaper on micro-reactor licensing (Reference 1).

a,c,e

Figure 3.1-1: eVinci Micro-Reactor Deployment Model and Anticipated Licenses

Westinghouse is closely following, and participating in, the development of 10 CFR Part 53. However, given current plans, the new rule will not be published in time for it to be used for the initial licensing of the first commercial plant. Westinghouse will consider using 10 CFR Part 53 if the timing supports the project schedule and if the rule is shown to be more efficient and less burdensome than 10 CFR Part 52. In addition, future consideration may be given to 10 CFR Part 50 as the project progresses. However, at this stage in the project, pursuing a Part 52 DC provides a sufficient standard to achieve NRC approval of the standard eVinci design.

3.2. Licensing Modernization Project

Westinghouse plans to use a process based on the Licensing Modernization Project (LMP), as discussed in NEI 18-04, "Risk-Informed Performance-Based Guidance for Non-Light Water Reactor Licensing Basis Development" (Reference 2) and Regulatory Guide 1.233, "Guidance for a Technology-inclusive, Risk-informed, and Performance-based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors" (Reference 3) for developing the foundation for the safety case for the eVinci facility.

3.3. NRC Review Strategy

It will be important for Westinghouse to understand early in the project what review guidance the NRC will use to review the EVR. Two potential options under consideration are:

- Advanced Reactor Content of Application Project (ARCAP)
- NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors" (Reference 4) - NUREG-1537 may be more applicable to the eVinci micro-reactor because the thermal power level is several orders of magnitude lower than current nuclear plant power levels and, as such, the accumulated inventory of radioactive fission product in the fuel (in core) of the reactor is proportionally less than current power reactors. It is expected that this review guidance would apply if the NRC formally reviewed and approved a nonpower research or test reactor at a University.

Regardless of the review guidance used for the project, it will be important for Westinghouse to gain alignment with the NRC staff regarding those systems, structures, and components (SSCs) that are the most important to the safety basis of the design in order to facilitate a safety-focused review. Westinghouse expects the NRC to use a risk-informed, performance-based approach with a focus on those SSCs that are important to safety.

4. PRE-APPLICATION ENGAGEMENT

4.1. Summary of Pre-Application Engagement Strategy

Pre-application engagement will consist of design familiarization through white papers and technical reports, and approval of key regulatory issues through Topical Reports. Figure 4.1-1 below summarizes the planned pre-application engagement activities, and how these activities interface with the design and testing activities described above.

a,c,e

Figure 4.1-1: Pre-application Engagement Summary

4.2. Interaction Plan

The type and frequency of staff interaction will vary as the development of the reactor evolves, as new questions and issues arise, and on the availability of NRC staff resources. Westinghouse plans to hold routine project management discussions, drop-ins, and technical meetings with the NRC staff.

- Routine project management discussions - Westinghouse expects to have routine and frequent interactions with the NRC staff project managers to ensure timely communication of issues and

consistent understanding of the status of issue resolution. These interactions may also take the form of simple phone calls and email communications and are expected to occur on monthly basis.

- Drop-ins - Drop-in meetings will be used for the general exchange of information on non-technical topics such as planning for future interactions and schedule discussions. These meetings will not be directly related to regulatory action or decisions. Limited discussion of technical issues may occur, but typically it will be in the context of the status of a review or identification of topics for separate discussion. Westinghouse anticipates having a drop-in meeting once a quarter.
- Technical discussions and pre-submittal meetings - The technical discussions with the NRC staff will provide the opportunity for direct engagement with NRC staff reviewers in specific subject areas and will include reviewers and management. Meetings will be focused on the reports discussed in Section 4.3.

4.3. Topical Reports, Technical Reports, and White Papers

Pre-application engagement will mainly consist of identifying and addressing key high-risk topics. An initial set of key topics will be addressed through submitting various Topical Reports, technical reports, and white papers. Table 4.3-1 lists the various reports Westinghouse plans to submit. The table also provides a brief purpose statement and the planned initial submittal date for each report. The initial version of the reports will reflect the conceptual design. The reports will be updated and resubmitted, as necessary, as the eVinci facility progresses through the preliminary and final design phases.

Table 4.3-1 does not represent an exhaustive list of high-risk regulatory topics. It is acknowledged additional regulatory topics may be identified and addressed during pre-application discussions. In addition, multiple topics may be combined into a single paper, as appropriate.

The following activities are expected for each report listed in Table 4.3-1, as necessary:

1. Pre-submittal meeting: Westinghouse gives an overview of the report. Westinghouse and the NRC agree on the expected outcome of the review and the review schedule.
2. Submit report: Westinghouse formally submits the report to the NRC for their review. This date is captured in Table 4.3-1 below.
3. Post-submittal meeting: NRC provides verbal feedback on the report to Westinghouse. Westinghouse receives feedback, asks clarifying questions, and provides any necessary clarification to the NRC.
4. NRC submits written feedback: NRC submits a letter to Westinghouse detailing their feedback on the report. This feedback will align with the pre-submittal discussion on the expected outcome of the review. In general, Westinghouse will seek pre-application approval of eVinci micro-reactor design features to avoid revisiting items later in the design process. It is understood that the degree of "finality" may vary based on several factors, including design maturity, policy issues, and the form the approval takes (i.e., a formal safety evaluation for a Topical Report vs. written observations/feedback for a white paper).
5. Revise Report: Westinghouse addresses NRC feedback in future versions of the report, as necessary.

Table 4.3-1: List of Planned Reports for Pre-Application Engagement

Report #	Report Topic	Planned Purpose	Planned Initial Submittal Date
1	LMP Implementation	Demonstrate how the eVinci project will implement the LMP process described in NEI 18-04.	[ ]a,c,e
2	Principal Design Criteria	Establish the necessary design, fabrication, construction, testing, and performance requirements for safety related SSCs, along with the method on how the requirements were developed.	[ ]a,c,e
3	Safety and Accident Analysis Methodologies and Associated Validation	Demonstrate the safety analysis methodology. This includes the treatment of uncertainties, the required level of model validation, and the plan for code qualification and validation.	[ ]a,c,e
4	Plant Description, Plant Purpose, and Novel Methodologies Report	• Describe the purpose and need for the project. • Describe the basic plant design. • Describe novel/FOAK design features and methodologies	[ ]a,c,e
5	Fuel Qualification and Testing	• Describe the design basis and applicability of Advanced Gas Reactor (AGR) 2 SER • Identify important phenomena to establish qualification envelope and to identify potential differences with respect to the AGR qualification envelope. • Describe the fuel performance methodology, testing, and code qualification	[ ]a,c,e
6	Regulatory Exemptions and 'Not Applicable'	• Summarize which licensing path is being used. • Describe the analysis performed on the regulatory framework. • Identify necessary exemptions, with justification. • Identify regulations that are not applicable, with justification.	[ ]a,c,e
7	Functional Containment	Outline the system configuration that comprises the functional containment.	[ ]a,c,e
8	Mechanistic or accident source term development	Describe the FATE code, code qualification plan, and outline the methodology that will be used to generate the mechanistic source terms.	[ ]a,c,e
9	Test & Analysis Plan	Describe the planned testing and analyses to be conducted for the plant.	[ ]a,c,e
10	eVinci Deployment Model	• Describe the overall lifecycle of the plant • Describe the planned path to licensure, including what licenses are needed for each phase of the lifecycle.	[ ]a,c,e

11	Safeguards Information Plan	Summarize the current Westinghouse safeguards information program and how it will apply to the project.	[ ]a,c,e
12	Composite Material Qualification and Testing	Describe the testing plan for ceramic matrix composite material based on requirements set forth in ASME Div. 5. This will include any alternative approaches to material testing or qualification.	[ ]a,c,e
13	Code Qualification	Describe the methodology for code qualification.	[ ]a,c,e
14	Advanced Logic System® (ALS)-II	Describe the eVinci I&C platform and the I&C development processes.	[ ]a,c,e
15	Emergency Planning and EPZ Sizing Methodology	Describe the EPZ methodology using a performance-based, risk informed approach.	[ ]a,c,e
16	Component Qualification	• Identify how to best leverage ASME. • Define the path for qualification of each component. • Define jurisdictional boundaries between components. • Identify gaps in existing ASME Code rules and guidance and outline approach to address them for each instance.	[ ]a,c,e
17	Physical Security	Describe the analysis and design features to address requirements in 10 CFR 73.55.	[ ]a,c,e
18	Heat Pipe Design, Qualification, and Testing	Describe the heat pipe design and the heat pipe qualification and testing program.	[ ]a,c,e
19	Nuclear Design Report	Describe core design neutronic characteristics, calculation methods, and validation plan.	[ ]a,c,e
20	Transportation and Packaging	Describe the transportation and packaging strategy for the eVinci plant.	[ ]a,c,e
21	Operations & Remote Monitoring	Describe the operations strategy for the plant, including remote monitoring and autonomous control.	[ ]a,c,e
22	Refueling/Decommissioning	Describe the refueling and decommissioning strategy.	[ ]a,c,e
23	UCA, EDU, Transient Testing Report	Provide the results of the various testing programs.	[ ]a,c,e
24	Phenomena Identification and Ranking Table (PIRT)	Describe the PIRT methodology and results.	[ ]a,c,e
25	Seismic Methodology	Define and describe the required seismic design criteria.	[ ]a,c,e

4.4. Regulatory Collaboration

NRC Collaboration with the CNSC

Westinghouse is evaluating the potential to license the eVinci facility in Canada through the Canadian Nuclear Safety Commission (CNSC). The goal for the project is to develop a design capable of meeting

the requirements of both the CNSC and NRC without requiring redesign or special provisions for deployment in either jurisdiction. To streamline concurrent NRC and CNSC review activities, Westinghouse is evaluating utilization of the Memorandum of Cooperation (MOC) (Reference 5) between the NRC and the CNSC. The goal of the MOC is to foster open communications between the NRC, CNSC, and Westinghouse and to gain consensus on the acceptability of the various topics discussed in Section 4.3. At first, Westinghouse may limit the joint NRC-CNSC reviews to only a single report to determine how well the process works.

NRC Collaboration with the DOE

As stated above, Westinghouse may either build and test a test unit at a DOE facility or a nonpower research or test reactor at a university. The final regulatory approval path chosen for the non-commercial unit will ultimately depend on several factors, including the final design, future Westinghouse partnerships, and information from pre-application discussions. Westinghouse has begun to investigate what regulatory approvals will be necessary for this unit and will continue to do so as the project evolves.

5. REFERENCES

1. Micro-reactors Licensing Strategies (ML21235A418)
2. NEI 18-04, “Risk-Informed Performance-Based Guidance for Non-Light Water Reactor Licensing Basis Development”
3. Regulatory Guide 1.233, “Guidance for a Technology-inclusive, Risk-informed, and Performance-based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors”
4. NUREG-1537, “Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors”
5. Memorandum of Cooperation on Advanced Reactor and Small Modular Reactor Technologies between the United States Nuclear Regulatory Commission and the Canadian Nuclear Safety Commission (ADAMS Accession No. ML19275D578)