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LTR-NRC-20-10

March 9, 2020

Subject: Transmittal of Executive Summary of Topical Report WCAP-18482-P, "Westinghouse Advanced Doped Pellet Technology (ADOPT™¹) Fuel"

Enclosed are the proprietary and non-proprietary versions of Executive Summary of Topical Report WCAP-18482-P, "Westinghouse Advanced Doped Pellet Technology (ADOPT™) Fuel."

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-20-5009 and should be addressed to Korey L Hosack, Manager, Licensing, Analysis, and Testing, Westinghouse Electric Company, 1000 Westinghouse Drive, Building 1, Suite 133, Cranberry Township, PA 16066.

A handwritten signature in black ink, appearing to read "K. Hosack", written over a circular stamp or mark.

Korey L. Hosack, Manager
Licensing, Analysis, and Testing

cc: Ekaterina Lenning (NRC)
Dennis Morey (NRC)
Jason Drake (NRC)

¹ ADOPT™ 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.

Enclosures:

1. Affidavit AW-20-5009
2. Executive Summary of Topical Report WCAP-18482-P, "Westinghouse Advanced Doped Pellet Technology (ADOPT™) Fuel" (Proprietary)
3. Executive Summary of Topical Report WCAP-18482-P, "Westinghouse Advanced Doped Pellet Technology (ADOPT™) Fuel" (Non-Proprietary)

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

COUNTY OF BUTLER:

- (1) I, Korey L. Hosack, 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 LTR-NRC-20-10 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) 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 others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

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- (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.
- (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


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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: 2020 03 05



Korey L. Hosack, Manager
Licensing, Analysis, and Testing

**Executive Summary of Topical Report WCAP-18482-P, “Westinghouse
Advanced Doped Pellet Technology (ADOPT™) Fuel”**

(Non-Proprietary)

March 2020

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Cranberry Township, PA 16066

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Executive Summary of Topical Report WCAP-18482-P, “Westinghouse Advanced Doped Pellet Technology (ADOPT™) Fuel”

The Westinghouse Advanced Doped Pellet Technology (ADOPT™) fuel topical report will describe all the information necessary to obtain Nuclear Regulatory Commission (NRC) approval for the use of ADOPT fuel in commercial pressurized water reactors in the United States. ADOPT fuel is a direct replacement for standard uranium dioxide (UO₂) fuel and provides enhanced fuel pellet properties to enable higher burnup and improved accident tolerance. This topical report submittal will not seek to take full advantage of the higher burnup and enhanced accident tolerance of the ADOPT fuel, but will instead seek approval for the fuel product through similarity to the current UO₂ fuel materials. Subsequent licensing submittals will further expand upon the approval of ADOPT fuel to more fully exercise all the benefits of the fuel material.

ADOPT fuel is a modified UO₂ pellet doped with small amounts of chromia (Cr₂O₃) and alumina (Al₂O₃). The additives facilitate greater densification and diffusion during sintering, resulting in a higher density and an enlarged grain size as compared to undoped UO₂. ADOPT fuel is characterized by the nominal inclusion of []^{a,c} chromium oxide and []^{a,c} ppm of aluminum oxide. It exhibits an increased nominal density of []^{a,c} which corresponds to an approximate theoretical density (TD) of []^{a,c}, and an average grain size of []^{a,c}.

As a result of the higher density and larger grain size, ADOPT fuel exhibits:

- []^{a,c}
- []^{a,c}
- []^{a,c}
- []^{a,c}

These performance characteristics result in higher burnup capability and enhanced accident tolerance when compared to standard UO₂ pellets; however, as stated above, the specific credit to be taken for these benefits will be the subject of a future supplement to the topical report.

Westinghouse has obtained extensive operating experience with ADOPT fuel through its use as a commercial fuel product in Europe. This operating experience will be used to characterize the ADOPT fuel material properties and performance. Westinghouse will describe in detail how the properties and performance of ADOPT fuel will be incorporated into existing NRC-approved analytical methods for use in plant-specific safety analyses.

The topical report will demonstrate that ADOPT fuel may be modeled consistent with, and can demonstrate compliance to, NRC GDC 10 and the specified acceptable fuel design limits (SAFDLs) in the following Standard Review Plan (SRP) Chapters:

- Section 4.2: Fuel System Design
- Section 4.3: Nuclear Design
- Section 4.4: Thermal and Hydraulic Design
- Chapter 6.2.1: Containment Functional Design
- Chapter 15: Transient and Accident Analysis.

The inclusions of the dopants do not introduce any new failure modes or phenomena that require new or revised SAFDLs. The topical report will establish generic qualification of the ADOPT fuel material, its properties and performance, and the approach for modeling ADOPT fuel in safety analysis methods. Once approved, the topical

report will form the basis for implementation of **ADOPT** fuel at domestic commercial nuclear power plants through plant-specific analysis and licensing actions.

ADOPT fuel is planned for use with all current NRC-approved Westinghouse and Combustion Engineering pressurized water reactor mechanical fuel designs and will be manufactured to the pellet dimensions reflected in the approved fuel design descriptions. In this fuel topical report, **ADOPT** fuel will be used with enrichments up to 5 weight percent and peak rod average burnups up to 62 GWd/MTU.

The **ADOPT** fuel topical report is planned for submittal to the NRC in the second quarter of 2020 for NRC review beginning at that time. Implementation constraints on fuel assembly design and fuel rod design will be specified in the topical report, suitable for NRC Staff consideration in their Safety Evaluation discussion of Limitations and Conditions. This will be a stand-alone topical report; no revisions to previous core reference reports will be submitted.