

Westinghouse Non-Proprietary Class 3



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LTR-NRC-22-18
April 12, 2021

Subject: Submittal of "Westinghouse Slide Packages for the April 21st, 2022 ACRS Thermal-Hydraulic Phenomena Subcommittee Meeting on WCAP-18482-P/NP" (Proprietary/Non-Proprietary)

Enclosed are the Westinghouse Electric Company LLC ("Westinghouse") non-proprietary open session slide package, as well as the proprietary and non-proprietary versions of the closed session slide package for the ACRS Thermal-Hydraulic Phenomena Subcommittee Meeting on WCAP-18482-P/NP, "Westinghouse Advanced Doped Pellet Technology (ADOPT™) Fuel" on April 21st, 2022.

This submittal contains proprietary information of 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-22-018 and should be addressed to Zachary S. Harper, Manager, Licensing Engineering, Westinghouse Electric Company, 1000 Westinghouse Drive, Building 1, Cranberry Township, PA 16066.

A handwritten signature in black ink, appearing to read "Zachary S. Harper".

Zachary S. Harper, Manager
Licensing Engineering

cc: Ekaterina Lenning
Richard Chang

Enclosures:

- (1) Affidavit, AW-22-018
- (2) Westinghouse Open Session Slide Package for the ACRS Thermal-Hydraulic Phenomena Subcommittee Meeting on WCAP-18482-P/NP (Non-Proprietary)
- (3) Westinghouse Closed Session Slide Package for the ACRS Thermal-Hydraulic Phenomena Subcommittee Meeting on WCAP-18482-P/NP (Proprietary)
- (4) Westinghouse Closed Session Slide Package for the ACRS Thermal-Hydraulic Phenomena Subcommittee Meeting on WCAP-18482-P/NP (Non-Proprietary)

Commonwealth of Pennsylvania:

County of Butler:

- (1) I, Zachary Harper, Manager, Licensing Engineering, 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-22-18 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 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.
- (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: 4/13/2022

A handwritten signature in black ink, appearing to read "Zachary Harper", is written over a horizontal line.

Signed electronically by

Zachary Harper

Enclosure 2

Westinghouse Open Session Slide Package for the ACRS Thermal-Hydraulic Phenomena Subcommittee Meeting on WCAP-18482-P/NP

(Non-Proprietary)

(7 pages including this cover page)

April 2022

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ACRS Thermal-Hydraulic Phenomena Subcommittee Meeting

Westinghouse Advanced Doped Pellet Technology (**ADOPTTM**) Fuel,
WCAP-18482-P/NP

Kallie Metzger, Ph.D.

Manager, Accident Tolerant Fuel Program

April 21, 2022

Enclosure 2

EnCore® Fuel

We're changing nuclear energy ... again



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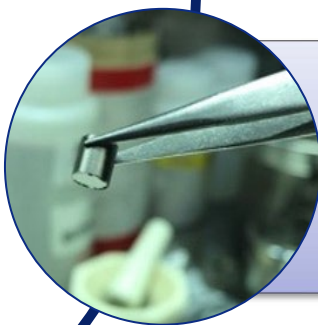
Westinghouse's EnCore® Fuel Program

The EnCore® Fuel program is developing and commercializing advanced fuel products to improve safety and economic performance



Advanced Cladding

- Cr-Coated Zirconium – increases safety and operational margin, and may enable high burnup
- Silicon Carbide Cladding – safety and operational benefits



Advanced Fuel

- ADOPT™ fuel pellets – higher density, benefits to fuel cycle costs, and may support high burnup
- Advanced Pellet (UN) - provide improved fuel cycle economics, thermal properties, and lower operating temperatures

**Chromium-Coated
Zr Cladding**



**SiGA™ Silicon
Carbide (SiC)
Composite Cladding**

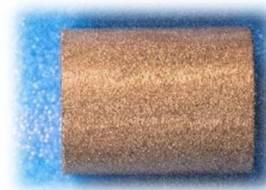


Product Evolution

ADOPT™ Pellets



**Uranium Nitride
(UN) Pellets**



U¹⁵N Fuel

Photo courtesy of Los Alamos National Lab

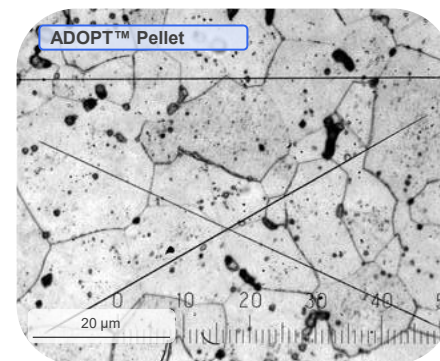
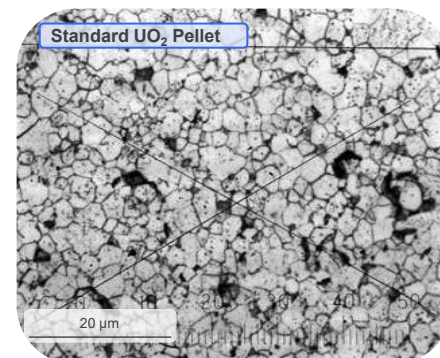
Introduction to **ADOPT** Fuel

ADOPT (Advanced DOped Pellet Technology):
standard UO_2 fuel doped with small amounts of
 Cr_2O_3 & Al_2O_3

Additives facilitate densification & diffusion during
sintering resulting in a **higher density & enlarged
grain size** compared to undoped UO_2

- **Benefits:**

- Higher uranium density for improved fuel cycle economics
- Larger grain size provides improved Pellet-Cladding Interaction (PCI) margin at high temperatures
- Increased oxidation resistance
- Reduced transient fission gas release



Topical Report is focused on bringing **ADOPT** technology to the US PWR market

Operating Experience

- **ADOPT** fuel is a commercial product for the European market with extensive BWR operating experience and superior performance compared to standard UO_2 .
 - 23 years of irradiation experience
 - 17 years of deliveries in reload scale
 - Commercial OE with burnups greater than 62 MWd/kgU
 - More than 3400 fuel assemblies delivered
 - More than 680 metric tons of ADOPT pellets delivered

ADOPT is a standard commercial product

Westinghouse Topical Report Overview

- WCAP-18482-P/NP is a topical report to enable efficient licensing and region implementation of Westinghouse **ADOPT** Fuel
 - Proposes limits of applicability
 - Discusses interaction with other topical reports and licensing considerations for implementation
 - Discusses available qualification data
 - Demonstrates applicability of existing analytical methods and models including:
 - Nuclear Design
 - Fuel Rod Design
 - Thermal-Hydraulic Design, and
 - Safety Analysis