



**Westinghouse
Electric Company**

Box 355
Pittsburgh Pennsylvania 15230-0355

February 21, 2001
NSBU-NRC-01-5984

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Attention: J. S. Wermiel, Chief
Reactor Systems Branch
Division of Systems Safety and Analysis

Subject: Westinghouse's Vogtle Creep/Growth Test (Slide Presentation of February 21, 2001), (Proprietary)

Dear Mr. Wermiel:

Enclosed are copies of the Proprietary and Non-Proprietary versions of the presentation material from the Westinghouse/NRC meeting on the Vogtle Creep/Growth Test held in Rockville, Maryland on February 21, 2001.

Also enclosed are:

1. One (1) copy of the Application for Withholding, AW-01-1440 with Proprietary Information Notice and Copyright Notice.
2. One (1) copy of Affidavit, AW-01-1440.

This submittal contains Westinghouse proprietary information of trade secrets, commercial or financial information which we consider privileged or confidential pursuant to 10 CFR 9.17(a)(4). Therefore, it is requested that the Westinghouse proprietary information attached hereto be handled on a confidential basis and be withheld from public disclosure.

This material is for your internal use only and may be used solely for the purpose for which it is submitted. It should not be otherwise used, disclosed, duplicated, or disseminated, in whole or in part, to any other person or organization outside the Office of Nuclear Reactor Regulation without the expressed prior written approval of Westinghouse.

Correspondence with respect to any Application for Withholding should reference AW-01-1440 and should be addressed to H. A. Sepp, Manager of Regulatory and Licensing Engineering, Westinghouse Electric Company, P. O. Box 355, Pittsburgh, Pennsylvania 15230-0355.

Very truly yours,

A handwritten signature in black ink, appearing to read "H. A. Sepp". The signature is fluid and cursive, written over the printed name.

Henry A. Sepp, Manager
Regulatory and Licensing Engineering

Copy to:
S. L. Wu, NRR
R. Caruso, NRR
M. S. Chatterton, NRR
R. Wharton, NRR
S. Bloom, NRR



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Attention: J. S. Wermiel, Chief,
Reactor Systems Branch
Division of Systems Safety and Analysis

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

Subject: Westinghouse's Vogtle Creep/Growth Test (Slide Presentation of February 21, 2001), (Proprietary)

Reference: Letter from H. A. Sepp to J. S. Wermiel, NSBU-NRC-01-5984, dated February 21, 2001

Dear Mr. Wermiel:

The application for withholding is submitted by Westinghouse Electric Company LLC, a Delaware limited liability company ("Westinghouse"), pursuant to the provisions of paragraph (b)(1) of Section 2.790 of the Commission's regulations. It contains commercial strategic information proprietary to Westinghouse and customarily held in confidence.

The proprietary material for which withholding is being requested is identified in the proprietary version of the subject report. In conformance with 10 CFR Section 2.790, Affidavit AW-01-1440 accompanies this application for withholding, setting forth the basis on which the identified proprietary information may be withheld from public disclosure.

Accordingly, it is respectfully requested that the subject information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.790 of the Commission's regulations.

Correspondence with respect to this application for withholding or the accompanying affidavit should reference AW-01-1440 and should be addressed to the undersigned.

Very truly yours,

A handwritten signature in black ink, appearing to read "H. A. Sepp". The signature is fluid and cursive, with a large initial "H" and "S".

Henry A. Sepp, Manager
Regulatory and Licensing Engineering

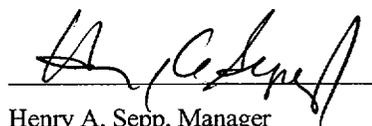
AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

SS

COUNTY OF ALLEGHENY:

Before me, the undersigned authority, personally appeared Henry A. Sepp, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC, a Delaware limited liability company ("Westinghouse") and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:



Henry A. Sepp, Manager
Regulatory and Licensing Engineering

Sworn to and subscribed
before me this 20th day
of February, 2001.



Notary Public

Notarial Seal
Lorraine M. Piplica, Notary Public
Monroeville Boro, Allegheny County
My Commission Expires Dec. 14, 2003
Member, Pennsylvania Association of Notaries



- (1) I am Manager, Regulatory and Licensing Engineering, in the Nuclear Services Division, of the Westinghouse Electric Company LLC, a Delaware limited liability company ("Westinghouse") and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rulemaking proceedings, and am authorized to apply for its withholding on behalf of the Westinghouse Electric Company.
- (2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.790 of the Commission's regulations and in conjunction with the Westinghouse application for withholding accompanying this Affidavit.
- (3) I have personal knowledge of the criteria and procedures utilized by the Westinghouse Electric Company in designating information as a trade secret, privileged or as confidential commercial or financial information.
- (4) Pursuant to the provisions of paragraph (b)(4) of Section 2.790 of the Commission's regulations, 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.
 - (ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

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.

There are sound policy reasons behind the Westinghouse system which include the following:

- (a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.
 - b) It is information which is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.
 - c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.
 - (d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.
 - (e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.
 - (f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.
- (iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.790, it is to be received in confidence by the Commission.
 - (iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.

- (v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked "Westinghouse's Vogtle Creep/Growth Test (Slide Presentation of February 21, 2001), (Proprietary)," February 21, 2001, for submittal to the Commission, being transmitted by Westinghouse Electric Company (W) letter (NSBU-NRC-01-5984) and Application for Withholding Proprietary Information from Public Disclosure, Henry A. Sepp, Westinghouse, Manager Regulatory and Licensing Engineering to the attention of J. S. Wermiel, Chief, Reactor Systems Branch, Division of Systems Safety and Analysis. The proprietary information as submitted by Westinghouse Electric Company is to provide the material as presented to the NRC staff at the meeting on February 21, 2001.

This information is part of that which will enable Westinghouse to:

- (a) Resolve questions related to fuel performance behavior.
- (b) Assist customers in improving their fuel performance.

Further this information has substantial commercial value as follows:

- (a) Westinghouse fuel performance results will have enhanced margins.

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.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended for developing the enclosed improved core thermal performance methodology.

Further the deponent sayeth not.

Proprietary Information Notice

Transmitted herewith are proprietary and non-proprietary versions of documents furnished to the NRC. In order to conform to the requirements of 10 CFR 2.790 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 2.790(b)(1).

Copyright Notice

The documents transmitted herewith each bear a Westinghouse copyright notice. The NRC is permitted to make the number of copies for the information contained in these reports which are 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 2.790 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 versions of these reports, the NRC is permitted to make the number of copies beyond these 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.

**Westinghouse
Vogtle Creep/Growth Test
(Slide Presentation of February 21, 2001)**

February 2001

Vogtle Creep/Growth Test



John Foster

Meeting with the NRC on February 21, 2001

Westinghouse Electric Company

Westinghouse Proprietary Class 3

Outline

- 
- Describe Westinghouse/Southern Nuclear Operating Company Vogtle Creep/Growth test.
 - Obtain NRC acknowledgement that the test setup and subsequent data acquired should be sufficient to resolve questions related to tensile versus compressive creep rates based on the test proposed.
 - Discuss aspects of material used in the tests.

Note: The use of ZIRLO™ by itself refers to the licensed product. All other references are ZIRLO™ variants (developmental).

Test Objectives



- Generate ZIRLO™ tensile/compressive in-reactor creep data.
- Determine the effects of []^{a, c}.
- Evaluate low Sn ZIRLO™ []^{a, c}.
- Screen []^{a, c}.

Vogtle Creep/Growth Test Overview



- Test samples will be irradiated in []^{a, c}. Test samples do not contain fuel.
- Four assemblies irradiated for 1, 2, 3 & 4 cycles. Additional test assemblies are being considered.
- Samples discharged for measurement will not be reinserted.
- Disassemble samples after the refueling outage in the pool and ship to AECL for examination.
- Similar method to EPRI/B&W Oconee-2 test:
 - Considered the best available PWR in-reactor creep test.

Test Environment

- Parameters:

Fluences: $4.9, 9.8, 14.7, 19.6 \times 10^{21} \text{ n/cm}^2 \text{ E}>1 \text{ MeV}$
(associated with cycles 1, 2, 3 & 4)

Constant flux: $\sim 1.06 \times 10^{14} \text{ n/cm}^2\text{-sec E}>1 \text{ MeV}$

Temperatures: in the range of 576 - 607 °F

Test Matrix/TA-1, TA-2, TA-3 & TA-4



Alloy

Cycles

No. of Samples

Hoop Stress (ksi): -14.5 -10.2 -5.8 -1.5 0 1.5 5.8 10.2

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|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|

a, c

Test Matrix/TA-1, TA-2, TA-3 & TA-4 (cont.)



Alloy

Cycles

No. of Samples

Hoop Stress (ksi): -14.5 -10.2 -5.8 -1.5 0 1.5 5.8 10.2

| | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|
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a, c

Alloy Compositions/Initial Phase



| <u>Alloy</u> | <u>Nb</u> | <u>Sn</u> | <u>Fe</u> | <u>Cr</u> | a, c |
|---|-----------|-----------|-----------|-----------|------|
| ZIRLO™ (current) | [| | | |] |
| ZIRLO™, low Sn (Byron & Vandellos LTA) | | | | | |
| Alloy A | | | | | |
| ZIRLO™, low Sn-high Fe | | | | | |
| Zr-1.0Nb | | | | | |

Irradiation Schedule



Assembly

Cycle:

11

12

13

14

15

16

a, c



Test Matrix/TA-5, TA-6 & TA-7



a, c



Mechanical Design Key Features



- Most samples are internally pressurized with helium.
 - Some reference (unstressed) samples are open to the coolant.
- Internal mandrels (inside the pressurized samples) to support the tubing in case of collapse.
- Screw threads connect the test samples and spacers. Locking Heli-Coils fix the test samples and spacers in position.
 - Heli-Coils were successfully used in the W/BWR Fitzpatrick demo assemblies.

Core Design Key Features



- Irradiate the inserts in 1-cycle burned fuel assemblies. New host fuel assembly for each irradiation cycle.
- Place four assemblies in symmetric locations.
 - Use dummy insert(s) and assembly(ies) for core flux symmetry,
 - Approximately the same flux for all assemblies,
 - Approximately constant cycle-to-cycle flux.
- Total fluence greater than the value associated with a burnup of 75,000 MWD/MTU.
- Reload design and analysis methods are applicable.

Temperature Considerations

- 
- Analytically calculate the coolant temperatures using the measured inlet and mixed mean outlet temperatures and post-cycle fuel assembly powers.
 - Irradiation effects (creep & growth) not strongly temperature dependent over the test temperatures.
 - EPRI/B&W Program calculated all temperatures.

Fluence Confirmation



- Experimentally measure the flux/fluence using PNNL dosimetry capsules.
 - PNNL/Larry Greenwood laboratory in the USA with this expertise.
 - Include different wire segments with cross-sections sensitive to different neutron energies (Fe, Ti, Nb & Cu).
 - EPRI/B&W Program relied on calculated flux/fluence values.

Post Irradiation Examination/AECL



- Measure the sample oxide thickness, diameter change and length change
 - Samples designed with the AECL measurement methods.
- Perform metallography on selected samples for oxide thickness data.
- Perform hydrogen pickup analysis on selected samples.

Major Milestones



- **Technical Feasibility**
- **Design Review**
- **Fabricate Hardware**
- **Initiate Irradiation**
- **Continue Irradiation/1-cycle assembly**
- **Continue Irradiation/2-cycle assembly**
- **Complete Irradiation**
- **Discharge & PIE**
- **Final Report**

Date

a, c

| | |
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Summary



- SRA ZIRLO™ tension and compression data for 7 stress levels at ~590 °F up to $\sim 20 \times 10^{21}$ n/cm² (E>1 MeV).
- Vogtle Creep/Growth test samples do not have fuel. These test capsules are []^{a, c} of the assembly.
- No exemptions to 10 CFR 50.44 and 50.46 are required for the advanced test material.
- Vogtle intends to license these inserts under 10 CFR 50.59.