



WESTINGHOUSE ELECTRIC COMPANY LLC

2000 Day Hill Road
Windsor, CT 06095
USA

3 May, 2001
LD-2001-0028

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

SUBJECT: ASSESSMENT OF FT. CALHOUN FUEL ROD FRETTING HISTORY AND ROOT CAUSE AS IT RELATES TO IMPLEMENTATION OF ZIRLO™ CLADDING MATERIAL IN FUEL DESIGNED BY CE NUCLEAR POWER
[CONTAINS PROPRIETARY INFORMATION]

- Reference(s): 1) Letter, P. W. Richardson (CENP) to USNRC Document Control Desk, "Submittal of CENPD-404-P, Rev. 0 Regarding Implementation of ZIRLO™ Cladding Material in CENP Fuel Assembly Designs", LD-2001-0005, January 22, 2001
- 2) Letter, J. S. Cushing (NRC) to P.W. Richardson (WEC), Acceptance of CENPD-404-P, Rev. 0, 'Implementation of ZIRLO™ Cladding Material in CE Nuclear Power Fuel Assembly Designs' for Review (TAC No. MB1035)", February 27, 2001
- 3) Memorandum, J. S. Cushing (NRC) to S. A. Richards (NRC), "Summary of Meeting Held on February 8, 2001, With CE Nuclear Power to Discuss CENPD-404-P, Rev. 0 – 'Implementation of ZIRLO™ Cladding Material in CE Nuclear Power Fuel Assembly Designs'", April 4, 2001

On January 22, 2001 (Reference 1), Westinghouse Electric Company LLC (WEC) submitted CENPD-404-P, Rev. 0, "Implementation of ZIRLO™ Cladding Material in CE Nuclear Power Fuel Assembly Designs", to the Nuclear Regulatory Commission (NRC) for review and acceptance for referencing in licensing analyses. Subsequently, WEC and NRC staff members met on February 8, 2001 (Reference 2), to further discuss this initiative. During the course of the meeting, Ralph Caruso (NRC) requested information regarding fretting of fuel (some of which was ZIRLO™ clad) at the Omaha Public Power District Ft. Calhoun nuclear power plant. The information requested is provided in Enclosure 1-P to this letter.

WEC has determined that the information contained in Enclosure 1-P is proprietary in nature. Consequently, it is requested that Enclosure 1-P be withheld from public disclosure in accordance with the provisions of 10 CFR 2.790 and that these copies be appropriately safeguarded. The reasons for the classification of this information as proprietary are delineated in the affidavit provided in Enclosure 2. Enclosure 3 provides a non-proprietary version of Enclosure 1-P for your information and use.

Too 7

If you have any questions regarding this matter, please do not hesitate to call Chuck Molnar of my staff at (860) 285-5205.

Very truly yours,
Westinghouse Electric Company LLC

A handwritten signature in black ink, appearing to read 'Philip W. Richardson', written in a cursive style.

Philip W. Richardson
Licensing Project Manager
Windsor Nuclear Licensing

Enclosure(s): As stated

xc: R. Caruso (NRC)
M. S. Chatterton (NRC)
J. S. Cushing (NRC)

| | | |
|--|--------------------------|---|
| Project Number: 2009656 | Originator: C. M. Molnar | Initials: CMM |
| Project Name: ZIRLO™ Cladding Implementation | | |
| Document Number: LD-2001-0028 | Rev: 000 | Quality Record? <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (See note below) |
| Document Title: Assessment of Ft. Calhoun Fuel Rod Fretting History and Root Cause As It Relates to Implementation of ZIRLO™ Cladding Material in Fuel Designed By GE Nuclear Power | | Quality Record Retention Period (see QP 17.1): <input checked="" type="checkbox"/> Lifetime <input type="checkbox"/> 3 years <input type="checkbox"/> 10 years |
| Transmittal Reason: Provide the subject information to the NRC. | | |
| Reference: See attached document. | | |

| Name | Title | CEP Code | w / Encl. | | Approval Required | | Signature | Date |
|------------------|-----------------------|----------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------------|--------|
| | | | Y | N | Y | N | | |
| P. W. Richardson | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| Z. E. Karoutas | | | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <i>Z. E. Karoutas</i> | 5/3/01 |
| I. B. Fiero | | | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| T. Rodack | | | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <i>T. Rodack</i> | 5/3/01 |
| S. Ray | | Columbia, SC | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| W. H. Slagle | | Pittsburgh, PA | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| C. B. Brinkman | | Rockville, MD | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| D. D. Seels | | Pittsburgh, PA | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| M. Y. Young | | Pittsburgh, PA | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | |
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| | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | |
| Licensing File | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| DBPower | Prop. Rec. Controller | | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |

Comments

Future distributions of the Proprietary Information contained herein can be obtained through the DBPower Proprietary Records Controllers.

Note: This form must include the attached document when designated a Quality Record.

WESTINGHOUSE ELECTRIC COMPANY LLC

**FT. CALHOUN NUCLEAR POWER PLANT
FUEL ROD FRETTING HISTORY AND ROOT CAUSE
NON-PROPRIETARY VERSION**

MAY 2001

**Westinghouse Electric Company LLC
Proprietary Information**

FT. CALHOUN NUCLEAR POWER PLANT FUEL ROD FRETTING HISTORY AND ROOT CAUSE

BACKGROUND:

Westinghouse Electric Company LLC (WEC) first supplied fuel to Ft. Calhoun in 1991, and the spacer grid design was an adaptation of the [] design that had been used in ten (10) plants and eleven (11) regions by that period. The [] Subsequent regions delivered to Ft. Calhoun included changes in the cladding material, as well as modifications to the grid design, as shown in Table 1. The history of leaking fuel rods resulting from fretting and the mix of fuel assemblies in reactor Cycles 14 through 18 at Ft. Calhoun is shown in Table 2.

ROOT CAUSE:

The leaking fuel rods at Ft. Calhoun in [] were due to fretting through of the clad at the [] An extensive study was performed to determine the root cause, with the determination being that the [] compared with other designs. Based on recent data obtained for the [], it is now known that [] are due to:

[

]

It is important to note that these fretting induced failures occurred [] A [revised grid spring design] was developed that showed some improvement in [] The [

]

However, as shown in Table 2, there was [] In hindsight, based on more recent tests, []

Also as shown in Table 2, the [] As shown in Table 1, [

Table 2, the number of [] As shown in

]

In summary, the Ft. Calhoun fuel failures are due to [] As pointed out in the ZIRLO™ Topical Report (CENPD-404-P, Rev. 0), cladding material as it affects mechanical properties does play a role in grid to rod fretting. For example, a different rod growth characteristic will affect how the cladding is exposed to the wearing surface of the grid support. However, []

TABLE 1

FT. CALHOUN - REGION FEATURE COMPARISON



TABLE 2

LEAKING FUEL ROD HISTORY FOR WESTINGHOUSE FUEL AT FT. CALHOUN

