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72-1025

July 25, 2001

U.S. Nuclear Regulatory Commission  
11555 Rockville Pike  
Rockville, MD 20852-2738

Attn: Document Control Desk

Subject: Submittal of NAC International Topical Report 790-TR-001, Revision 0, "Requirements for Dry Storage of High Burnup Fuel"

References: 1. NAC-UMS® Universal Storage System, Docket 72-1015

NAC International (NAC) herewith submits five copies of the NAC Proprietary Topical Report 790-TR-001, Revision 0, "Requirements for Dry Storage of High Burnup Fuel." NAC requests the U.S. Nuclear Regulatory Commission (NRC) to review this Topical Report and provide acceptance of the approach and methodology for predicting fuel cladding behavior during dry storage.

The overall objectives of this Topical Report are: 1) to present a technically justified approach and methodology for predicting fuel cladding behavior during dry storage; and 2) to define and propose new technical criteria for the dry storage of commercial PWR and BWR spent nuclear fuel up to 55 GWD/MTU in the NAC spent fuel dry storage systems. These objectives are accomplished by:

- Reviewing the underlying limits and metallurgical processes used to establish the current NRC guidelines (ISG-15) for the dry storage and transportation of spent fuel with burnups in excess of 45 GWD/MTU.
- Documenting pertinent results from research relevant to technical literature and experiments related to the behavior of zircaloy-clad spent fuel under dry storage conditions.
- Developing and benchmarking a method and a proprietary computer code for the "best estimate" prediction of zircaloy cladding creep during dry storage.

Technical issues reviewed in this report include: oxide spalling (leading to localized hydride concentrations); annealing and recovery effects during vacuum drying of the fuel and storage canister; radial hydride reorientation as a result of annealing, and then cooling, of the fuel rods; and creep modeling.

NAC is proposing the criteria defined in Topical Report 790-TR-001 because we believe that the limits and acceptance criteria for the dry storage and transport of spent fuel, as specified in the NRC's Interim Staff Guidance, ISG-15, are overly conservative. The Topical Report provides justification for NAC's proposed new limits and acceptance criteria based on actual mechanistic behavior of zircaloy-clad spent fuel under dry storage conditions.

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New limits/acceptance criteria are proposed for:

- A higher creep strain limit that can satisfy the fuel integrity criteria during dry storage.
- A higher acceptance limit on the fuel cladding oxide layer thickness for interim dry storage, which will be consistent with volume average hydrogen concentrations in the cladding of up to 800 ppm.
- A realistic peak cladding temperature limit during the relatively short period of vacuum drying and helium backfill of the fuel canister. The temperature limit is demonstrated to have negligible effects on both hydride reorientation and annealing of radiation hardening.

The NAC Topical Report clearly illustrates that the methodology underlying the current NRC approach is overly conservative when applied to thermal creep of zircaloy cladding. This report establishes the foundations for a conservative, but practical, creep strain limit approach to replace the creep failure philosophy in ISG-15.

The NAC Topical Report 790-TR-001 is NAC Proprietary Information. The executed Proprietary Information Affidavit is attached. NAC will submit a non-proprietary version of this Topical Report not later than August 17, 2001.

If you have any comments or questions, please contact me on my direct line at (678) 328-1321.

Sincerely,



Thomas C. Thompson  
Director, Licensing  
Engineering & Design Services

Enclosures

**AFFIDAVIT**

**IN SUPPORT OF PROPRIETARY INFORMATION CONTAINED IN NAC  
INTERNATIONAL TOPICAL REPORT 790-TR-001, REVISION 0,  
“REQUIREMENTS FOR DRY STORAGE OF HIGH BURNUP FUEL”**

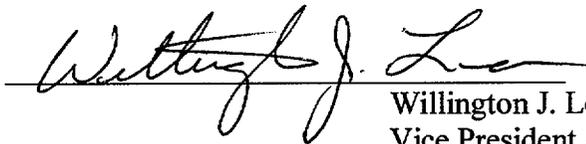
State of Georgia, County of Gwinnett

Willington J. Lee (Affiant), Vice President & Chief Engineer of NAC International, hereinafter referred to as NAC, at 655 Engineering Drive, Norcross, Georgia 30092, being duly sworn, deposes and says that:

1. Affiant is personally familiar with the trade secrets and privileged information contained in the NAC Topical Report 790-TR-001 that is being submitted. Affiant requests that the Nuclear Regulatory Commission, pursuant to Chapter 10 of the Code of Federal Regulations, Part 2.790 (10 CFR 2.790), “Public Inspections, Exemptions, Request for Withholding,” withhold the information contained within the Topical Report being submitted, hereafter referred to as the Proprietary Material, from public disclosure.
2. This information has been and is held in confidence by NAC.
3. The information contained within the Proprietary Material is the result of a computer code that was developed by NAC. This type of information is held in confidence based on the significant commercial investment of time and money expended in its development.
4. The Proprietary Material being transmitted to the Nuclear Regulatory Commission in confidence includes NAC Topical Report 790-TR-001.
5. The information that is being claimed as trade secret and privileged information has not been and is not available in public sources.

**AFFIDAVIT**  
(continued)

6. NAC has invested a considerable amount of time, engineering labor, and money in the development of this Topical Report. Public disclosure of this information would cause substantial harm to the competitive position of NAC. Others seeking to develop similar analysis would have to make similar investments to develop the information on their own as long as the information is not disclosed to the public.



Willington J. Lee  
Vice President & Chief Engineer  
Engineering & Design Services  
NAC International

Subscribed and sworn to before me this 25th day of July 2001.



Notary Public in and for the  
County of Forsyth  
State of Georgia

My commission expires the 15th day of May, 2005.

