

November 30, 2012

MEMORANDUM TO: Gloria J. Kulesa, Chief  
Steam Generator Tube Integrity and  
Chemical Engineering Branch  
Division of Engineering  
Office of Nuclear Reactor Regulation

FROM: Aloysius O. Obodoako, Materials Engineer */RA/*  
Steam Generator Tube Integrity and  
Chemical Engineering Branch  
Division of Engineering  
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF THE OCTOBER 4, 2012, CATEGORY 2 PUBLIC  
MEETING WITH THE NUCLEAR INDUSTRY TO DISCUSS  
NEUTRON ABSORBING MATERIAL DEGRADATION IN SPENT  
FUEL POOLS

On October 4, 2012, the Nuclear Regulatory Commission (NRC) staff participated in a public meeting with Nuclear Energy Institute (NEI) and several industry representatives regarding neutron absorbing material degradation in spent fuel pools. The meeting was held at the NRC One White Flint North building in Rockville, Maryland. The topics discussed are summarized in the staff and industry slides, which are available in the Agencywide Documents Access and Management System (ADAMS) under Accession No. ML12279A273. The enclosure is a list of those in attendance. This meeting was noticed as a public meeting and the meeting agenda is available via the ADAMS Accession No. listed above.

The purpose of this meeting was to discuss neutron absorbing material degradation in spent fuel pools at nuclear plants. The meeting consisted of four presentations given by NRC staff members and six presentations given by industry representatives. Information exchanged during the meeting that is not included in the slides is summarized below.

The following items were discussed:

- NRC and industry current state of knowledge of industry surveillance programs and neutron absorber materials: The NRC developed a knowledge base of surveillance programs and materials and has made the information publicly available (ADAMS Accession Nos. ML113550241 and ML121090500). The staff noted that more information is needed to complete the knowledge base. The industry presented information on its current state of knowledge on neutron absorber materials. Much of the industry information has been provided by industry at various times during previous industry meetings and events.

- Tretrabor and Carborundum neutron absorbing materials: Although the two materials are similar, there is not much industry conducted research on them. The industry current state of knowledge on neutron absorbing materials is published in the industry neutron absorbing materials handbook. The industry does not currently have plans to update the neutron absorbing materials handbook. The degradation mechanism for Tretrabor and Carborundum is not well understood and due to the limited number of licensees that use these materials, there has not been much industry wide impetus to pursue research on them.
- Slide 4: Staff presentation, "Neutron Absorber Criticality Safety Concern." Industry representatives noted that one should be careful with the curve in the figure because neutron absorbing material degradation is highly based on specific environmental conditions (e.g., Pressurized Water Reactor (PWR) vs. Boiling Water Reactor (BWR)) and the neutron absorbing material being used. Industry representatives stated that decreased Boron 10 (B-10) in neutron absorbing materials is accounted for in the criticality analysis and there is usually time available to discover current state of material before impacting criticality margin.
- Industry use of RACKLIFE and Boron Areal Density Gauge for Evaluating Racks (BADGER) methodologies: Industry representatives stated that the majority of Boraflex cells in spent fuel pools (SFPs) at United States (US) plants have been declared inoperable as a result of decreased margin to criticality. A statistically based algorithm is used to determine the sample size for the BADGER in-situ testing. The number of panels for BADGER testing is typically around 60 panels.
- Slide 5: Industry presentation, "Use of RACKLIFE and BADGER and Input to Criticality Analysis." Each dot in the graph represented a BADGER measurement versus a RACKLIFE prediction. The data in the graph is based on the in-situ BADGER campaigns at plants owned by Exelon. The data consists of at least three BADGER campaigns per SFP. Exelon reviews repeatability and compares data from campaign to campaign.
- Industry perspective on neutron absorber surveillance: Boraflex is somewhat different from other materials. In the past, the material was widely used but currently only 12-14 plants use Boraflex and many of them plan to replace the material. When plants reach up to 40 percent or greater degradation plants generally stop taking credit of the Boraflex material in the criticality safety analysis. For those plants that continue to manage Boraflex, many of the programs are site specific. Furthermore, many plants in the US now use Boral neutron absorbing materials. Many Boral surveillance programs have coupons, but some do not. For Boral, blisters have been identified to develop on the material during operation and may affect the SFP flux trap design; however, the affect is not significant.
- An industry-wide surveillance program is being developed and will be submitted to the NRC for comment by December 2012. The final guidance document is scheduled to be completed by the end of February 2013. It was noted that the guidelines for the

guidance document have not been formalized as of yet. The generic program is geared towards new programs and not intended for backfit purposes.

- Improved BADGER methodology: The improved BADGER detector head will have spring loaded retractable wheels and that the geometric changes of panels that are being tested will have less of an effect on the operation of the device when compared to the current device. The improved BADGER device is designed to have enhanced water tightness. The misalignment challenges with the BADGER tool were evaluated.
- The industry five year Boral test program: The five year Boral test program will focus more on normal operating conditions and long term management strategy.
- Industry will continue to engage in future dialogue with staff on concerns and questions regarding neutron absorbing material degradation. The staff described its preliminary plan to draft generic communication, as necessary, to gather more information on neutron absorbing materials, material degradation, and industry surveillance approach on monitoring the materials. The staff provided feedback to the industry on several issues and indicated that some of these issues may warrant further discussion at subsequent meetings.

No Public Meeting Feedback Forms were received for this meeting.

Other acronyms used in the slide presentations not provided above include:

- CFR: Code of Federal Regulation
- EMI: Electromagnetic Interference
- EPRI: Electric Power Research Institute
- GALL: Generic Aging Lessons Learned
- GDC: General Design Criteria
- GL: Generic Letter
- ID: Inside Diameter
- IN: Information Notice
- NUREG: NRC technical report
- PSU: Pennsylvania State University
- RFI: Radio Frequency Interference
- RTV: Room Temperature Vulcanizing
- TLR: Technical Letter Report
- TMI: Three Mile Island
- TS: Technical Specification

Enclosure:  
List of Attendees

CONTACT: Aloysius O. Obodoako, NRR/DE/ESGB  
(301) 415-1502

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| <b>OFFICE</b> | NRR/DE/ESGB | NRR/DE/ESGB |
| <b>NAME</b>   | AObodoako   | GKulesa     |
| <b>DATE</b>   | 11/30 /2012 | 11/29/2012  |

**OFFICIAL RECORD COPY**

LIST OF ATTENDEES  
OCTOBER 4, 2012, MEETING WITH THE NUCLEAR INDUSTRY  
REGARDING NEUTRON ABSORBING MATERIAL DEGRADATION IN SFPs

Industry

Tom Schleicher, Dominion  
Robert Smith, Areva  
David Phegley, Exelon  
Jeffrey Dunlap, Exelon  
Matt Eyre, NETCO  
Keith Waldrop, EPRI  
Kristin Bennett, GE  
Kris Cummings, Westinghouse  
Marcus Nichol, NEI  
Zita Martin, TVA  
Donald Beckman, Zion Solutions  
Stefan Anton, HOLTEC

Phone Participants

Matt Kirkland, DTE  
Glenn Schwartz, PSEG  
Ray Lambert, Consultant to EPRI  
Ken Lindquist, Curtisswright

NRC

Emma Wong  
John Klos  
Christopher Hunt  
Mike Case  
Amrit Patec  
Jack Davis  
Greg Makar  
Matt Hiser  
Christopher Jackson  
April Pulvirenti  
Reed Anzacone  
Matt Hardgoove  
John Wise  
Kent Wood  
Rick Ennis  
Joel Jenkins  
Allen Hiser  
Mirela Gavrilas  
Matt Yoder  
Gloria Kulesa  
Aloysius Obodoako  
Todd Mintz, Contractor for NRC  
Miriam Juckett, Contractor for NRC

ENCLOSURE