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CORRESPONDENCE CONTROL TICKET

Date Printed: Jul 14, 2003 15:50

PAPER NUMBER: LTR-03-0446 **LOGGING DATE:** 07/14/2003

ACTION OFFICE: EDO

To: Collins, NRR

AUTHOR: Bob Leyes

AFFILIATION: ID

ADDRESSEE: Nils Diaz

SUBJECT: INEEL and Idaho Small Business

cys: EDO
DEDMRS
DEDR
DEDM
AO
RES

ACTION: Appropriate

DISTRIBUTION: Chairman, Comrs

LETTER DATE: 07/11/2003

ACKNOWLEDGED No

SPECIAL HANDLING:

NOTES:

FILE LOCATION: Adams

DATE DUE: **DATE SIGNED:**

Template: SECY-017

ERIDS: SECY-01

From: <Bobleyse@aol.com>
To: <chairman@nrc.gov>, <pettinam@id.doe.gov>, <rra@inel.gov>
Date: Sun, Jul 13, 2003 8:59 AM
Subject: Fwd: Revised Abstract

Correction to the attachment, ralap10. Change the units at the end of the third sentence, third paragraph:

Change watts/cm2 to W/(cm2)(C)

From: <Bobleyse@aol.com>
To: <chairman@nrc.gov>, <pettinam@id.doe.gov>, <rra@inel.gov>, <rritter@boisestate.edu>
Date: Sat, Jul 12, 2003 3:44 PM
Subject: Fwd: Revised Abstract

Action: Chairman NRC; Last two sentences of third paragraph.

Action: DOE addressee; Wake up your management.

From: <Bobleyse@aol.com>
To: <gwj@inel.gov>
Date: Sat, Jul 12, 2003 3:29 PM
Subject: Revised Abstract

Attached is my revised abstract for the 2003 RELAP5 International Users Seminar. The Reviewers of the first version provided useful suggestions that have been incorporated herein.

An Unmet Challenge: Application of SCDAP/RELAP5-3D to Analysis of Severe Accidents for Light Water Nuclear Reactors with Heavily Fouled Cores

Robert H. Leyse, CEO
Inz, Inc.

The SCDAP/RELAP5-3D series of codes have not been employed to evaluate the impact of heavy fouling of fuel elements on the path of severe accidents such as Reactivity Insertion Accidents and Loss of Coolant Accidents. This is the case even though operation of nuclear power reactors with significant fouling deposits is commonplace. [1,2,3,4]

Fouling deposits have substantial thermal resistance. This has led to fuel element failures in several instances as the zirconium alloy cladding has failed due to high temperature corrosion.[3,6] Although the details of current fouling have not been disclosed, in one case[3] the deposits have been described as, "...unusually heavy...which induced the corrosion by thermally insulating the fuel rods..." and "...rods that failed had heavy crud with clumpy formations." Such heavy clumpy fouling is complex with substantial thermal resistance.

Relatively straightforward fouling at the Experimental Boiling Water Reactor was classified in terms of the thickness and the thermal conductivity.[6] Thickness of the fouling was 0.013 cm and the thermal conductivity was 0.008 W/cm-C; thus the heat transfer coefficient was 0.6 watts/cm^2. The peak heat flux in today's large light water reactors is in the range of 150 W/cm^2 and the temperature gradient for EBWR-type fouling would be 250 C. However, the effective heat transfer coefficient of the heavy, clumpy fouling in today's reactors is likely substantially less than the EBWR case. Clearly, the heat transfer characteristics are vastly degraded in contrast to clean as-built cores. The challenge for the U. S. Nuclear Regulatory Commission is to fund the SCDAP/RELAP5-3D experts in a thorough scope of work to determine the impact of a range of heavy fouling characteristics on severe accidents. The findings are needed for the accurate licensing of water-cooled nuclear reactors (homeland security).

Currently the Nuclear Regulatory Commission is evaluating several related Petitions for Rulemaking[7,8,9] that have been initiated by the author regarding these matters. The results of those deliberations should be available at the 2003 RELAP5 International Users Seminar, West Yellowstone Meeting.

References

1. United States Patent, US 6,396,892, Robert D. Varrin, May 28, 2002.
2. Ultrasonic Fuel Cleaning Process, EPRI Press Release, March 19, 2003.
3. USNRC Licensee Event report 50-458/99-016-00, March 1, 2000.
4. Kovan, D., Fuel damage at Paks-2 leads to incident uprate, *Nuclear News,* June 2003, 40-41.
5. Transcript, Reactor Fuels Subcommittee of the Advisory Committee on Reactor Safeguards, United States Nuclear Regulatory Commission, April 23, 24, 1998.
6. Breden and Leyse, 1960, Water chemistry and fuel element scale in the EBWR, ANL-6136.
7. Leyse, Petition for Rulemaking to USNRC, PRM 50-73, September 3, 2001.
8. Leyse, Petition for Rulemaking to USNRC, PRM 50-73A, November 4, 2001.
9. Leyse, Petition for Rulemaking to USNRC, PRM 50-76, May 1, 2001.

From: <Bobleyse@aol.com>
To: <RRitter@boisestate.edu>
Date: Fri, Jul 11, 2003 4:04 PM
Subject: Re: INEEL and Idaho Small Business

Rick:

SBIR is only one of several avenues that I thought your group pursued in assisting small business.

Regarding the impact of fouling on nuclear power safety, the more the feds document their denial of the danger, the faster they are losing their credibility.

Driving an automobile into Death Valley during midsummer with a clean radiator is one thing. Driving an automobile into Death Valley during midsummer with a highly fouled radiator is another.

A reactvity insertion accident with a clean core is bad enough. A reactivity insertion accident with a highly fouled core is substantially worse.

Even NRC and DOE as well as the Deans and the Navy vendors should recognize that!

Bob

CC: <chairman@nrc.gov>, <RRA@inel.gov>, <FROSL@inel.gov>, <pettinam@id.doe.gov>

From: <Bobleyse@aol.com>
To: <chairman@nrc.gov>, <pettinam@id.doe.gov>, <rra@inel.gov>, <rritter@boisestate.edu>
Date: Sat, Jul 12, 2003 3:45 PM
Subject: Fwd: Revised Abstract

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