

**From:** [Holahan, Patricia](#)  
**To:** [markleyse@gmail.com](mailto:markleyse@gmail.com)  
**Subject:** RESPONSE: Chairwoman Svinicki, Please Remedy Problems with the NRC Technical Analysis of PRM-50-93/95  
**Date:** Monday, April 02, 2018 10:54:00 AM

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Dear Mr. Leyse:

I am responding to the email you sent to Chairman Svinicki on March 12, 2018. In this email, you identified some concerns you have about a publicly available report that documents the U.S. Nuclear Regulatory Commission (NRC) staff's technical safety analysis of petition for rulemaking (PRM)-50-93 and PRM-50-95 (ADAMS Accession No. [ML16078A318](#)). You further requested that Chairman Svinicki direct the staff to correct what you believe are serious omissions in the technical safety analysis report. Per your request, this email was placed into ADAMS (ADAMS Accession No. [ML18071A351](#)).

In your petitions, you asserted that data from multi-rod (assembly) severe fuel damage experiments indicate that specific aspects of the NRC's regulations and associated regulatory guidance pertaining to emergency core cooling system (ECCS) acceptance criteria and evaluation models are not conservative and that additional regulations are needed. Therefore, you requested that the NRC: (1) amend its regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors," to require that the calculated maximum fuel element cladding temperature not exceed a limit based on data from cited experiments, rather than the limit of 2,200 degrees Fahrenheit (F) specified in 10 CFR 50.46(b)(1); (2) amend its regulations in Appendix K to 10 CFR Part 50, "ECCS Evaluation Models," and associated regulatory guidance in Regulatory Guide 1.157, "Best-Estimate Calculations of Emergency Core Cooling System Performance," to require that the rates of energy release, hydrogen generation, and Zircaloy cladding oxidation from the metal-water reaction of zirconium with steam considered in evaluation models used to calculate ECCS cooling performance be calculated based on data from cited experiments, rather than using the Baker-Just or Cathcart-Pawel equations; and (3) issue a new regulation that requires minimum allowable core reflood rates in the event of a loss-of-coolant accident (LOCA).

The purpose of my email is to inform you that: (1) the staff's evaluation of the issues raised in your petitions and its recommendation regarding the final determination on your petitions are with the Commission for its consideration; (2) as appropriate, the Commission will consider the additional comments you provided in your email during its review; and (3) the NRC will notify you of its determination before publishing a notice in the *Federal Register* that documents the NRC's evaluation of these petitions and the basis for its determination.

Thank you for your continued interest and participation in NRC's regulatory decisionmaking process.

Sincerely,

Patricia K. Holahan, Ph.D.  
Director, Division of Rulemaking  
Office of Nuclear Material Safety and Safeguards  
Washington, DC 20555

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**DRM Vision:** *The Division of Rulemaking champions the Principles of Good Regulation through its rulemaking function, models the NRC Organizational Values in its interactions, exhibits a positive safety culture, and demonstrates agility in executing high-quality work as a center of expertise.*

**From:** Mark Leye [<mailto:markleyse@gmail.com>]

**Sent:** Monday, March 12, 2018 7:28 AM

**To:** CHAIRMAN Resource ; [CMRSVINICKI@nrc.gov](mailto:CMRSVINICKI@nrc.gov); CMRBARAN Resource ; RulemakingComments Resource ; CHAIRMAN Resource ; PDR Resource ; CMRBurns Resource

**Cc:** Burnell, Scott ; Bladey, Cindy ; DeJesus, Anthony ; Inverso, Tara ; Valliere, Nanette ; Moore, Johari ; Johnson, Michael ; [Patrick.Castlernan@nrc.gov](mailto:Patrick.Castlernan@nrc.gov); Frazier, Alan ; Cubbage, Amy ; Bloomer, Tamara ; Krsek, Robert ; Dave Lochbaum ; Ed Lyman ; Matthew G. McKinzie ; Thomas B. Cochran ; Geoffrey Fettus ; Alemayehu, Bemnet ; Jim Riccio ; Paul Gunter ; Kevin Kamps ; Doyle, Daniel ; Shane, Raeann ; [michal\\_freedhoff@markey.senate.gov](mailto:michal_freedhoff@markey.senate.gov); Mizuno, Geary ; Borges Roman, Jennifer ; Gavrilas, Mirela ; Lund, Louise ; [karen\\_paczkowski@markey.senate.gov](mailto:karen_paczkowski@markey.senate.gov); [gene\\_gerzhoy@markey.senate.gov](mailto:gene_gerzhoy@markey.senate.gov); Paul Gallay

**Subject:** [External\_Sender] Chairwoman Svinicki, Please Remedy Problems with the NRC Technical Analysis of PRM-50-93/95

Dear Chairwoman Svinicki:

This letter regards an NRC technical analysis (dated March 18, 2016, according to ADAMS); its ADAMS accession number is ML16078A318. The technical analysis was placed into ADAMS on March 5, 2018. The analysis concerns PRM-50-93, submitted to the NRC on November 17, 2009 (it also concerns PRM-50-95, submitted on June 7, 2010).

In my opinion the technical analysis has numerous errors, misrepresentations, and omissions. I intend to address the technical analysis's flaws at a later date. Presently, in this letter, I am only addressing a couple of omissions--major omissions.

## **BACKGROUND:**

As you may recall, I gave a you and four other Commissioners a presentation on January 31, 2013 at the Meeting on Public Participation in NRC Regulatory Decision-Making. I dedicated a large part of my presentation to pointing out that the NRC staff members conducting the technical analysis of PRM-50-93 had made a serious mistake in a computer simulation of an important Westinghouse experiment (FLECHT Run 9573).

The computer simulation of FLECHT Run 9573 was performed with the TRACE code. The results of the simulation are reported in the staff's "Draft Interim Review of PRM-50-93/95,"

dated October 16, 2012, (ML12265A277).

And, as you may recall, in my presentation, I said that the staff's TRACE simulation of Run 9573 did NOT include a section of zirconium cladding that incurred thermal runaway, burning in steam: the severely damaged section is pictured below.

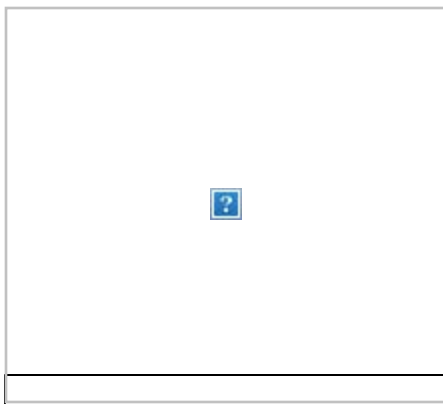
**Not simulating what happened to the severely damaged section of cladding is like simulating a forest fire and omitting the areas of the forest where trees burned down.**

The TRACE simulation of FLECHT Run 9573 only simulated the sections of the test bundle were in excellent condition.

The TRACE simulation of FLECHT Run 9573 did not include data from a steam-probe thermocouple located by the severely damaged section, at the 7 foot elevation.

Westinghouse reported that the 7 foot steam-probe thermocouple recorded temperatures exceeding 2500°F, at 16 seconds into FLECHT Run 9573. See page 3.97 of WCAP-7665 (ML070780083).

As you may also recall, in my presentation, I showed a slide with the photograph of the severely damaged section of the FLECHT Run 9573 test bundle that is placed below.



**The severely damaged section of the FLECHT Run 9573 test bundle--within approximately  $\pm 8$  inches at the 7 foot elevation.**

At the January 31, 2013 meeting I was assured by the Commissioners that the staff members performing the technical analysis of PRM-50-93 would consider and respond to my criticisms of the TRACE simulation of FLECHT Run 9573.

The NRC's transcript of the proceedings for the January 31, 2013 meeting are in ADAMS (ML13036A057).

Then on March 5, 2013, Secretary of the Commission, Annette Vietti-Cook, sent a memorandum, "Staff Requirements: Briefing on Public Participation on NRC Regulatory Decision-Making," to R. W. Borchardt, Executive Director for Operations, and Margaret M. Doane, General Counsel, regarding the January 31, 2013 meeting (ML13064A407). The memorandum stated: "The staff should consider and respond to Mark Leyse's comments regarding his petition for rulemaking PRM-50-93 in its review of that petition."

**Important Information:**

On November 24, 2015, Aby Mohseni, Deputy Director of Division of Policy and Rulemaking, wrote an e-mail to me revealing the staff's TRACE simulation of what happened at the severely damaged section of the FLECHT Run 9573 test bundle (ML15341A160). TRACE simulated the cladding and steam temperatures at the 7-ft elevation, at 18 seconds into the experiment.

**A copy of Mr. Mohseni's e-mail is placed below:**

On Tue, Nov 24, 2015 at 1:44 PM, Mohseni, Aby <[Aby.Mohseni@nrc.gov](mailto:Aby.Mohseni@nrc.gov)> wrote:

Mr. Leyse,

Your questions and comments have been forwarded to the staff reviewing the petition and will be taken into consideration. We appreciate your patience as the NRC's completes the evaluation of your petitions and the related comments. A full response to your rulemaking requests must wait until the NRC's evaluation is complete; please consider the following information to be preliminary. The staff's review of the completed simulation shows the cladding and steam temperatures at the 7-ft elevation (at 18 seconds) are as follows.

No MWR: T<sub>cladding</sub> = 1446 K T<sub>steam</sub> = 1313 K

CP: T<sub>cladding</sub> = 1526 K T<sub>steam</sub> = 1370 K

BJ: T<sub>cladding</sub> = 1561 K T<sub>steam</sub> = 1397 K

The NRC's findings on PRM-50-93/95 issues will not be final until the NRC publishes a notice of final action on this petition for rulemaking in the Federal Register. Your email will be placed in ADAMS as requested.

Respectfully,

Aby Mohseni

Deputy Director  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission

**Aby Mohseni's important information on the TRACE simulation of the severely damaged section of the FLECHT Run 9573 test bundle is not included in the technical analysis of PRM-50-93 (March 18, 2016).**

The technical analysis of PRM-50-93 (March 18, 2016) discusses the staff's TRACE simulation of FLECHT Run 9573 on pages 10-12, 19-20. However, the technical analysis does not include the TRACE simulation of the severely damaged section of the FLECHT Run 9573 test bundle. The technical analysis does not include information about the results of the simulation for the cladding and steam temperatures at the 7-ft elevation, at 18 seconds into the

experiment.

Section 3.12 of the technical analysis of PRM-50-93 (March 18, 2016) is titled "**Issues Raised at the Public Commission Meeting in January 2013;**" however, that section (on pages 27 and 28) does not mention of my complaints about the staff's TRACE simulation of FLECHT Run 9573.

That section also does not mention the information that Aby Mohseni provided in his November 24, 2015 e-mail, revealing the staff's TRACE simulation of what happened at the severely damaged section of the FLECHT Run 9573 test bundle.

**PLEASE REMEDY PROBLEMS WITH THE NRC TECHNICAL ANALYSIS OF PRM-50-93/95**

Chairwoman Svinicki would you please direct the staff to remedy problems with the NRC technical analysis of PRM-50-93/95?

The information that Aby Mohseni provided in his November 24, 2015 e-mail, revealing the staff's TRACE simulation of what happened at the severely damaged section of the FLECHT Run 9573 test bundle, needs to be included in the technical analysis of PRM-50-93/95.

The results of the TRACE simulation for the cladding and steam temperatures at the 7-ft elevation of the FLECHT Run 9573 test bundle, at 18 seconds into the experiment, need to be included in the technical analysis of PRM-50-93/95.

As I stated above: not simulating what happened to the severely damaged section of cladding is like simulating a forest fire and omitting the areas of the forest where trees burned down.

And as I stated in the January 31, 2013 meeting, a computer simulation of a loss-of-coolant accident experiment that does not simulate temperatures at the hottest section of the test bundle is INCOMPLETE.

**Chairwoman Svinicki, please let me know that you are directing the staff to remedy the problems with the technical analysis (March 18, 2016) of PRM-50-93/95 that I have discussed in this e-mail.**

Please place this letter in ADAMS.

Thank you,

Mark Leyse

**References:**

1) NRC, "Technical Safety Analysis of PRM-50-93/95 A Petition for Rulemaking to Amend 10 CFR 50.46 and Appendix K to 10 CFR Part 50," March 18, 2016, (ADAMS Accession No. ML16078A318).

- 2) NRC, "Draft Interim Review of PRM-50-93/95 Issues Related to Conservatism of 2200 degrees F, Metal-Water Reaction Rate Correlations, and 'The Impression Left from [FLECHT] Run 9573' ," October 16, 2012, (ADAMS Accession No. ML12265A277).
- 3) F. F. Cadek, D. P. Dominicis, R. H. Leyse, Westinghouse, "PWR FLECHT (Full Length Emergency Cooling Heat Transfer) Final Report," WCAP-7665, April 1971, (ADAMS Accession No. ML070780083).
- 4) NRC, "Transcript of Proceedings: Meeting on Public Participation on NRC Regulatory Decision-Making," January 31, 2013, (ADAMS Accession No. ML13036A057).
- 5) NRC, "Staff Requirements: Briefing on Public Participation on NRC Regulatory Decision-Making, January 31, 2013," March 5, 2013, (ADAMS Accession No. ML13064A407).
- 6) Aby Mohseni, Deputy Director of Division of Policy and Rulemaking, E-Mail to Mark Leyse, November 24, 2015 (ADAMS Accession No. ML15341A160).