

Rulemaking Comments

**From:** Herbert Feinroth [hfeinroth@gamma-eng.com]  
**Sent:** Monday, October 05, 2009 11:35 AM  
**To:** Rulemaking Comments  
**Cc:** Matt Ales; Tom Rodeheaver; Paul Perrone  
**Subject:** RIN 3150-AH42 - Comments from Ceramic Tubular Products - Performance Based  
Emergency Core Cooling System Acceptance Criteria  
**Attachments:** CTP letter NRC ANPR RIN3150-AH42.doc

US Nuclear Regulatory Commission, Rulemaking and Adjudication Staff

Please find attached our letter of comments on the proposed rulemaking ANPR RIN3150-AH42, Performance Based Emergency Core Cooling System Acceptance Criteria. Please contact us if you have questions or need clarification of our comments.

Sincerely,

*Herbert Feinroth*

Herbert Feinroth, CEO  
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DOCKETED  
USNRC

October 5, 2009 (4:15pm)

OFFICE OF SECRETARY  
RULEMAKINGS AND  
ADJUDICATIONS STAFF



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October 5, 2009

Secretary, U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001  
Attention: Rulemaking and Adjudications Staff

Subject: Proposed Rulemaking regarding Performance-Based Emergency Core  
Cooling System Acceptance Criteria (RIN 3150-AH42)

The Nuclear Regulatory Commission (NRC) posted the subject proposed rulemaking in the Federal Register on August 13, 2009. The purpose of this letter is to provide comments from Ceramic Tubular Products on the proposed rulemaking.

Ceramic Tubular Products, with offices in Rockville, MD and Lynchburg, VA, has been developing silicon carbide material as a potential cladding material for commercial reactors as part of an industry-government-university consortium. This material shows considerable promise as a cladding material, although further work is required to demonstrate the capability of silicon carbide and fulfill that potential.

The proposed rulemaking includes four objectives, as stated on page 40767. The first of these is to “[e]xpand the applicability of Sec. 50.46 to include any light-water reactor fuel cladding material.” The proposed rulemaking further states on the same page that, “[b]ecause this applicability expansion may also aim to encompass any potential new cladding materials developed in the future that are not zirconium-based, the NRC notes that such materials would still need an extensive technical foundation to receive NRC approval. However, this applicability expansion would eliminate the need for licensees to request, and the NRC to review and approve, exemptions from Sec. 50.46 for these potential new non-zirconium cladding materials.”

On page 40772, the proposed rulemaking also requests comments on several questions and issues. The first of these is as follows:

“Applicability Considerations

“1. Objective 1 describes a conceptual approach to expanding the applicability of Sec. 50.46 to all fuel cladding materials. Should the rule be expanded to include any cladding material, or only be expanded to include all zirconium-based cladding alloys? The NRC also requests comment on the potential advantages and disadvantages of the specific approach described that would expand the applicability beyond zirconium-based alloys. Is there a better approach that could achieve the same objective?”

Ceramic Tubular Products (CTP) wishes to comment on this objective and applicability consideration. We have no comment on the other objectives or considerations.

There are several aspects to Applicability Consideration 1 and Objective 1 of the proposed rulemaking. Each aspect, along with CTP's comments, is discussed below:

#### Applicability Consideration 1

a. Should the rule be expanded to include any cladding material, or only be expanded to include all zirconium-based cladding materials?"

**CTP comment: CTP strongly supports extending the applicability of the 10 CFR 50.46 requirements to non-zirconium based materials. Zirconium-based cladding has served the nuclear industry well for many decades. However, CTP believes that silicon carbide has significant potential to provide better performance than the zirconium-based alloys in several regards, based on the potential for higher strength at high temperature, greater resistance to the damaging effects of radiation, improved resistance to fretting, and better corrosion resistance. These improved properties provide the potential for a lower failure rate during routine operation, increased margin to failure during accident conditions, and increased lifetime. There may eventually be other new cladding materials that provide better overall performance than zirconium-based alloys. Recognition that there may be alternatives to zirconium-based cladding will encourage further development and result eventually in use of the best overall cladding material.**

b. What are the "potential advantages and disadvantages of the specific approach described?"

The specific approach is described in objective 1 on page 40767, and can be summarized as follows:

1. "Such [non-zirconium based] materials would still need an extensive technical foundation to receive NRC approval."

2. This "would eliminate the need for licensees to request, and NRC to approve, exemptions ... for these potential new non-zirconium cladding materials."

In addition, on page 40768, NRC further states that, "[t]o accomplish such a change, the NRC is considering an approach where the proposed revision would specify that all fuel cladding material used in LWRs, without regard to its composition, must satisfy the three general conditions which currently exist as the criteria specified in Sec. 50.46(b)(3) Maximum hydrogen generation, Sec. 50.46(b)(4) Coolable geometry, and Sec. 50.46(b)(5) Long-term cooling. The Sec. 50.46(b)(3) criterion would be modified to limit generation of any combustible gas, rather than just hydrogen, with recognition that different cladding materials could potentially react to produce different combustible gases."

**CTP comment:** CTP agrees that any alternative material would need an extensive technical foundation, and that specifying that the three general conditions of 10 CFR 50.46 (b) be met is a proper basis against which to evaluate any new material from the standpoint of emergency core cooling. Specifying the requirement in this manner gets directly at the intent. The proposed requirements for zirconium-based alloys include additional requirements that relate to the ductility of those materials, since lack of ductility can lead to failure to meet the three general requirements. However, it is not clear that ductility is an appropriate measure for other materials. For example, although ceramic materials are not typically considered “ductile,” the three-layer silicon carbide material being developed by CTP provides for a graceful failure that shows the potential for better meeting the three general requirements of 10 CFR 50.46(b).

CTP further considers that that it is appropriate to specify performance-based requirements that must be met and to state that, if they are met and there is sufficient technical foundation, an exemption to the requirements is not required. This will encourage development of alternative materials and puts those materials in proper context: if the materials do what they need to do, their use should be an application of the requirements, not an exemption to the requirements.

Finally, CTP notes that the proposed requirements can be used to guide research and development of new materials, ensuring that new materials provide the performance needed.

c. “Is there a better approach that could achieve the same objective?”

**CTP comment:** CTP considers the proposed approach to be excellent and does not recommend an alternative. The proposed approach properly defines specific performance-based requirements that must be met. It provides that materials meeting these requirements with strong technical foundation will be treated as if they meet they requirements (which they do) instead of requiring an exemption, which would imply that they somehow do not met the requirements.

In sum, CTP appreciates the opportunity to comment on the proposed rulemaking. CTP wholeheartedly agrees with and enthusiastically supports the proposed rulemaking as it applies to non-zirconium based cladding materials.

Sincerely,

*Herbert Feinroth*

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Received: from mail2.nrc.gov (148.184.176.43) by TWMS01.nrc.gov  
(148.184.200.145) with Microsoft SMTP Server id 8.1.393.1; Mon, 5 Oct 2009  
11:42:25 -0400

X-Ironport-ID: mail2

X-SBRS: 4.4

X-MID: 7691036

X-IronPort-AV: E=Sophos;i="4.44,506,1249272000";  
d="doc'32?scan'32,208,217,32";a="7691036"

Received: from omr1.networksolutionsemail.com ([205.178.146.51]) by  
mail2.nrc.gov with ESMTP; 05 Oct 2009 11:42:20 -0400

Received: from mail.networksolutionsemail.com (ns-omr1.mgt.netsol.com  
[10.49.6.64]) by omr1.networksolutionsemail.com (8.13.6/8.13.6) with SMTP id  
n95FgJqh008184 for <Rulemaking.comments@nrc.gov>; Mon, 5 Oct 2009 11:42:20  
-0400

Received: (qmail 9265 invoked by uid 78); 5 Oct 2009 15:34:52 -0000

Received: from unknown (HELO Herb) (98.231.210.133) by  
ns-omr1.lb.hosting.dc2.netsol.com with SMTP; 5 Oct 2009 15:34:52 -0000

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Subject: RIN 3150-AH42 - Comments from Ceramic Tubular Products - Performance Based  
Emergency Core Cooling System Acceptance Criteria

Date: Mon, 5 Oct 2009 11:34:48 -0400

Message-ID: <000f01ca45d1\$629f9f30\$27dedd90\$@com>

MIME-Version: 1.0

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X-Mailer: Microsoft Office Outlook 12.0

Thread-Index: AcpF0V9pQP7BWNp0QLCdsIEQKp0oHg==

Content-Language: en-us

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