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Comment On: NRC-2008-0332-0060
Performance-Based Emergency Core Cooling Systems Cladding Acceptance Criteria

Document: NRC-2008-0332-DRAFT-0099
Comment on FR Doc # 2014-05562

Submitter Information

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General Comment

Comments provided by attached letter.

Attachments

LO-0814-8163_NuScale 5046c comments

NuScale Power™

LO-0814-8163

August 21, 2014

Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555–0001
ATTN: Rulemakings and Adjudications Staff

SUBJECT: NuScale Power, LLC comments on "Performance-Based Emergency Core Cooling Systems Cladding Acceptance Criteria," 79 *Fed. Reg.* 16106 (Docket ID NRC–2008–0332)

In Federal Register Notice (FRN) dated March 24, 2014, the U.S. Nuclear Regulatory Commission requested public comment on a proposal to amend its regulations to revise the acceptance criteria for the emergency core cooling system (ECCS) for light water nuclear power reactors. The comment period was subsequently extended by 79 *Fed. Reg.* 22456. NuScale's comment and basis therefor are provided in the attachment to this letter.

Sincerely,

Gary A. Becker
Licensing Engineer

Attachment: NuScale Comments on Proposed Rule "Performance-Based Emergency Core Cooling Systems Cladding Acceptance Criteria"

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NuScale Comments on Proposed Rule "Performance-Based Emergency Core Cooling Systems Cladding Acceptance Criteria"

Comment: Testing to determine performance based criteria for peak clad temperature, integral time at temperature and breakaway oxidation to ensure post quench ductility should not be required for LWR designs where LOCA events do not result in core uncovery or any significant clad heat up. A lower peak clad temperature threshold (650 °C) should be specified below which testing is not required.

Basis: 10 CFR § 50.46 as currently written requires sufficient cooling by the ECCS to limit clad heatup during a LOCA to 2200 °F and limit clad oxidation to 17%. These limits were established in order to ensure adequate clad ductility after quenching the clad when reflooding the core.

For the proposed 50.46c rule, paragraph (d)(1) would define performance-based requirements for the ECCS which are established according to paragraph (g)(1). Paragraph (g)(1)(ii) requires that analytical limits for peak clad temperature and integral time at temperature are established based on an NRC-approved experimental technique. Paragraph (g)(2)(iii) requires that "The total accumulated time that the cladding is predicted to remain above a temperature at which the zirconium-alloy has been shown to be susceptible to breakaway oxidation shall not be greater than a limit that corresponds to the measured onset of breakaway oxidation for the zirconium-alloy cladding material based on an NRC-approved experimental technique." The required performance based limits can be established using techniques proposed in three NRC draft regulatory guides, DG-1261, DG-1262, and DG-1263.

For some advanced passive LWR designs, such as NuScale, the core is not uncovered during or after a LOCA and very little or no clad heatup is predicted. As a result, clad ductility is not degraded by oxidation and hydrogen pickup at high temperatures. Additionally, because the core is never uncovered, reflood and associated phenomena do not occur. For designs where LOCAs do not result in significant clad heatup, loss of clad ductility and breakaway oxidation does not need to be evaluated. Such evaluations would provide no meaningful information relevant to evaluating the safety of these designs. Therefore, the proposed requirements in 50.46c for testing to establish performance-based limits would introduce an unnecessary burden for designs where clad degradation due to oxidation, hydrogen pickup with subsequent quenching, and break away oxidation are not predicted for LOCA events based on the existing integral time at temperature calculation methods identified in DG-1263.

DG-1263 (*Establishing Analytical Limits for Zirconium-based Alloy Cladding*) does state that "Oxidation at lower temperatures has been shown to increase the allowable calculated oxidation before embrittlement. Therefore, conducting tests at lower peak temperatures may provide additional margin for some zirconium-alloy cladding materials." Even though additional margin at lower temperatures is mentioned, the focus of these tests is to establish oxidation limits associated with subsequent embrittlement from quenching. Quenching is not expected during a LOCA for designs where little or no clad heatup is demonstrated and where the core remains covered. DG-1263 concludes, based on data reported by Leistikow and Schanz (Ref. 12 of DG-1263), time spent in steam at ≤650 °C is benign for

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zirconium alloys with regard to breakaway oxidation and hydrogen accumulation because of the very low oxidation rate. Therefore, testing should not be required by the proposed rule for designs where it can be shown that for LOCAs the peak clad temperature remains below 650 °C.

Including the suggested provision in 50.46c—that performance-based clad limits do not need to be established when it can be shown that clad conditions associated with clad heatup and clad quench are not encountered—will prevent unnecessary testing and analysis for such designs. Precluding the need for testing in these cases will provide certainty in the rule and allow plant designers, license applicants, and NRC staff to better focus resources on areas of greater safety significance for those designs, consistent with the NRC's policy on risk-informed regulation.