



NUCLEAR ENERGY INSTITUTE

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September 10, 2010

7/15/2010  
75FR41241

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2010 SEP 10 PM 3:48

RULES AND DIRECTIVES  
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Ms. Cindy K. Bladey  
Chief, Rules, Announcements, and Directives Branch  
Office of Administration  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**Subject:** Comments on Draft Regulatory Guide, DG-1234, "Water Sources for Long-Term Recirculation Cooling Following a Loss-Of-Coolant Accident." (75FR41241) Docket ID NRC-2010-0249

**Project Number: 689**

Dear Ms. Bladey:

On behalf of the nuclear energy industry, the Nuclear Energy Institute (NEI)<sup>1</sup> submits comments on the subject draft Regulatory Guide (DG).

The objective of the proposed revision to Regulatory Guide 1.82 is to update the guidance to reflect current NRC staff positions on acceptable methods for the evaluation of ECCS strainer performance for long-term recirculation following a LOCA. The proposed revision is also intended to increase the consistency in regulatory positions that will be applied for PWRs and BWRs. We believe that the proposed DG generally meets these objectives.

It is important to acknowledge and emphasize (as stated in Section D of the DG) that the NRC does not intend or approve any imposition or backfit in connection with issuance of this regulatory guide and that applicants or licensees may propose an alternative or use previously established acceptable alternative methods for complying with specified portions of the NRC's regulations. This is an especially relevant point for the plants currently operating in the U.S.

<sup>1</sup> NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

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add = R.A. Jarvey (195)  
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While the proposed guidance does attempt to incorporate the evolution of staff positions since the previous issuance of guidance, this evolution is continuing. Consideration should be given to relevant topical area guidance that is likely to be issued or revised in the near future (e.g., in-vessel downstream effects, and air entrainment) and to incorporate this guidance in DG-1234 where appropriate. It is also recommended that issuance of the regulatory guide be withheld until after a Commission response to SECY-10-0113, "Closure Options for Generic Safety Issue – 191, Assessment of Debris Accumulation on Pressurized Water Reactor Sump Performance," is issued. This will enable Commission policy to be reflected, where appropriate, in the final Regulatory Guide.

Specific comments on the proposed guidance are provided in the attachment to this letter. If you have any questions, please feel free to contact me at (202) 739-8108; [jcb@nei.org](mailto:jcb@nei.org).

Sincerely,

A handwritten signature in black ink, appearing to read "John C. Butler", with a stylized flourish at the end.

John C. Butler

Attachment

## Industry Comments on DG-1234

No.	Page	Section	Paragraph	Comment
1				Delay issuing RG 1.82, rev 4, until after a Commission response is received on SECY-10-0113. This will enable Commission policy direction to be incorporated and reflected in the guidance.
2	5		1 <sup>st</sup> paragraph	Discussion of and reference to NUREG/CR-6808 should be deleted since much of the information is no longer relevant as it has been superseded by more recent and appropriate NUREG/CR documents
3	6		4	NUREG/CR-2792, "An Assessment of Residual Heat Removal and Containment Spray System Pump Performance under Air and Debris Ingesting Conditions," Reference 10 – specifically states that the NPSHr correction factor used in Appendix A is "arbitrary". It also states that the relationship significantly overpredicts the effect of air on NPSH. Please explain how this arbitrary relationship applies to actual pump performance.
4	6		4	The proposed RG is inconsistent in its acceptance criteria between GL 2004-02 and GL 2008-01. The GL 08-01 acceptance criterion of 5% air is inconsistent with the 2% of GL 2004-02.
5	6		1	Recommended clarification of first and second sentence - Revise to read: "The calculation of NPSH margin should <u>subtract the total debris laden strainer head loss</u> from the <u>available hydraulic head</u> . The <u>total debris laden strainer head loss</u> , including the chemical reaction products, ..."
6	6		2 <sup>nd</sup> paragraph	The term 'prototypical' is used in a number of instances but is not defined. The use of the term and its meaning 'changes' throughout the proposed RG. The term 'prototypical' should be defined and the use of the term clarified in the RG
7	8		Figure 1	Figure 1 is based on initial sump screen designs prior to the issuance of GL 2004-02. In almost all cases, Licensees have replaced their existing, original sump screen with new designs. In essence, the components identified as 'debris screen', trash rack (in some cases), and cover plate have been replaced in their entirety by the new strainer designs. Accordingly, Figure 1 as presented is no longer relevant and should be either deleted and/or revised to represent current strainer designs implemented by Licensees
8	10			General: There are multiple instances where it is stated that a solid cover plate should be installed on the top surface of the strainer to prevent entrained air from being drawn into the strainer. This seems like an overly simplistic statement that doesn't address the potential for air to be drawn in from the side of the strainer. It is not clear that how a solid surface on the top of the strainer would actually be effective for preventing air entrainment
9	10			NUREG/CR-6772 - reference to subject document does not as stated provide debris sizing, type, and transport characteristics for all debris types. In addition, the subject NUREG/CR performed transport studies in non-prototypical conditions (i.e., clean, cold water without other debris types - particulate, fibrous, and chemical) that are not indicative of post-LOCA conditions where both non-chemical and chemical debris types would be mixed together. It is suggested that the subject reference be deleted since it provides non-prototypical/non-representative information

No.	Page	Section	Paragraph	Comment
10	14	1.1.1.10		<p>RG Section 1.1.1.10 refers to WCAP-16406-P, Reference 17. This document is not publically available and is not available for use without purchase or licensing agreement with the PWROG. The associated SE, Reference 18, does not provide sufficient detail to act as a stand-alone resource.</p> <p>Recommended Action: Reference section should be revised to include the non-proprietary version of the topical report.</p>
11	15	1.1.2.5		This section should state that coatings should be DBA-qualified. Otherwise, adding coatings to metals would potentially add to the debris source term
12	16	C.1.2		<p>This section titled "Evaluation of Alternative Water Sources" should be applicable only if the licensing basis credits alternative water sources to mitigate design basis accidents. This is the context in which alternative water sources were discussed in RG 1.82 Revision 3 (Section C.1.2).</p> <p>Recommended change: Change title to "Evaluation of Alternative Water Sources Credited in Design Basis Analysis"</p>
13	16	1.1.5		Inspections should have words "as practicable" added. Inspection of some BWR's ECCS suction strainers requires divers or draining the suppression pool to perform an inspection. This inspection type is an excessive requirement not warranted by operating experience or commissary with the safety impact.
14	17	1.3.1.1		For NPSH calculations performed at sump temperatures less than 212 F, allowance should be provided for using the containment pressure present prior to the postulated LOCA for the NPSH calculation, as opposed to using the very conservative approach that assumes containment pressure equals the containment pool fluid vapor pressure. Section 1.3.12.h recognizes that subcooling increases as the water cools; Section 1.3.1.1 should be consistent.
15	17	1.3.1.1	2 <sup>nd</sup>	The first sentence states that: "For containment pools with temperature less than 212 degrees F, it is <i>conservative</i> to assume that the containment pressure equals the vapor pressure of the pool water." For clarity and consistency with the first paragraph in this section, another statement should be added that for containment pools with temperature less than 212F, it is <i>acceptable</i> to assume that containment pressure does not decrease below that present before the postulated LOCA.
16	17	1.3.1.1		"For containment pools with temperature less than 212 degrees F, it is conservative to assume that the containment pressure equals the vapor pressure of the pool water." This is overly conservative. Air is present in containment that contributes to the pressure. Licensees should be able to credit the air pressure present prior to the accident
17	17	1.3.1.5		Section 1.3.1.5 should be removed. If uncertainties in NPSHR will be required and an NPSH <sub>eff</sub> calculated, then ALL the uncertainties should be addressed. These uncertainties include the correction factor for pumping high-temperature fluid as discussed in ANSI/HI 1.3-2009. If NPSHR as supplied by the pump vendor is to be used without uncertainties, then Section 1.3.1.5 would be acceptable.
18	18	1.3.2.a		Recommended revision: - Revise to read " A sufficient number of <u>high energy pipe break locations resulting in</u> recirculation should be considered ..."

No.	Page	Section	Paragraph	Comment
19	21	1.3.4.2		Recommend that NUREG/CR-2982, <i>Buoyancy, Transport, and Head Loss of Fibrous Reactor Insulation</i> be added to this section since it provides relevant guidance.
20	22	1.3.4.6		Section states that if settlement of fine fibrous and particulate debris is credited during recirculation or pool fill up, that adequate theoretical and experimental basis should be provided to demonstrate that such settling is prototypical of plant conditions. Since 'adequate theoretical and experimental basis' are very subjective terms, can the Staff provide specific examples and or reference documents? In addition, NUREG/CR-2982, <i>Buoyancy, Transport, and Head Loss of Fibrous Reactor Insulation</i> should be added to this section since it provides relevant guidance.
21	22	1.3.4.7		Page 22, section 1.3.4.7 - both paragraphs are essentially stating the same thing. Section should be re-written
22	26	1.3.11.4		The DG states in this and other sections, that the headloss across BWR (as well as PWR) strainers should be determined by prototypical strainer testing, and not by empirical correlations. However, many BWRs determined their strainer headloss using an empirical correlation (e.g., NUREG/CR-6224). The BWROG is currently evaluating lessons-learned from GSI-191 to determine what additional actions need to be taken by BWRs. It may be premature to make such a definitive statement about the need for prototypical strainer headloss testing for BWRs. The text in the third sentence of the first paragraph on page 11 seems more appropriate.
23	26	1.3.11.1		It appears that the section is requiring a 'matrix' of debris combinations that should be tested by the Licensee. This appears to be different from the current practice where the postulated 'worse case pipe break' and the associated resultant debris types and quantities were utilized for strainer head loss testing. Please clarify the intent of this section
24	26-27	1.3.12b		The draft guidance states in part ... conditions within the test tank should be prototypical or conservative ... However, a plant condition or design parameter may be prototypical and realistic of the post-LOCA condition, but it may not be conservative. Likewise, something could be conservative, but not prototypical. The Staff has used the 'prototypical or conservative' statement in other parts of this proposed RG as well as extensively in the "March Guidance Document" (i.e., proposed RG reference 8). The Staff's use of the two (2) terms has created much confusion and discussion due to the subjective nature of the terms. It is highly suggested that the Staff eliminate the 'dual usage' of the terms for the same issue, specifically define the terms when they are used, and provide the basis for what is prototypical and what is conservative. This would eliminate considerable confusion and discussion in the future
25	27	1.3.12.e		The conservative approach of a linear extrapolation of test data is provided; a natural log curve fit extrapolation should also be offered as an acceptable alternative

No.	Page	Section	Paragraph	Comment
26	27	1.3.12e		The draft guidance indicates that head loss testing may require extrapolation for a time period matching the mission time of the ECCS (i.e., typically 30 days post-LOCA). Since the head loss testing is performed with the entire design basis non-chemical and chemical debris that would be generated post-LOCA, it appears that extrapolation beyond the end of head loss testing as the Staff has required is actually beyond the 'time period matching the mission time of the ECCS'. Therefore any extrapolation of the test head loss would actually be for a period beyond the ECCS mission time of 30 days. Please provide clarification.
27	29	1.3.12f		The guidance is suggesting new and different criteria with regard to scaling as it relates to debris. Since the post-LOCA conditions are virtually unknown, following the Staff's suggestions/guidance would be next to impossible. Clarification is required. Staff also states that due to the complexities of an integrated transport, settlement, and head loss test, that conservatisms should be applied to the tests. However, the Staff does not provide any guidance and/or examples. Clarification is required. Furthermore, the Staff once again uses the term 'prototypical or conservative'. The inconsistency associated with the use of this term has been previously discussed and requires clarification
28	29-30	1.3.12j		The guidance recommends repeatability of head loss testing. No guidance is provided with regard to the acceptability of results that differ by some unknown margin. Clarification is required.
29	30	2.1.1	1 <sup>st</sup> paragraph	The subject NUREG/CRs performed transport studies in non-prototypical conditions that are not indicative of post-LOCA conditions where both non-chemical and chemical debris types would be mixed together. It is suggested that the subject references be deleted since they are neither representative or prototypical regarding debris transport and expected post-LOCA containment conditions
30	31		Figure 4	Containment Pool Transport column - column fails to recognize that debris within the post-LOCA pool will have been thoroughly mixed, will not be immediately transported to the strainer, and the debris will have approximately 15 - 45 minutes to settle before the ECCS /CSS recirculation is initiated. How does this phenomenon integrate with the 'prototypical or conservative' head loss test guidance that the Staff has provided in sections 1.3.4.6, 1.3.12b, 1.3.12f, and 2.1.1? Please provide clarification
31	32	C.3.2.2		In the last sentence, C.1.3.4.7 should be C.1.3.4.6.
32	A-1			Typo – Appendix A, Figure A-1 "Ingestion" not "Injection"
33	A-3	A-2		Page A-3, Section A-2, last sentence of the second paragraph - Placement of "U" in the sentence makes it appear that it refers to the effective area, instead of the pipe velocity; revise as follows: "The ratio of the water depth above the pipe centerline and the inlet pipe velocity ( <u>U</u> ) based on the effective pipe flow area $\bar{U}$ can be expressed...
34	A-3	A-2	2 <sup>nd</sup>	Figure reference for the Froude Number equation should be Figure A-2, not A-1a.

No.	Page	Section	Paragraph	Comment
35	A-4	A-3		With regard to evaluating the effect of air ingestion – the RG states that the only pump acceptance criteria is NPSH margin. It also states a 2% air ingestion limit. Please provide a technical basis or references that support application of this criterion to all pumps regardless of their design and operating conditions. GL 08-01 criteria is now included stating that 5% air is OK from a pump performance perspective – using the same NPSHr adjustment leads to a 3.5XNPSHr requirement – GL 04-02 and 08-01 are inconsistent.
36	A-4		Footnote 5	Coordinate the Froude numbers cited for transport of gas with the GL2008-01 criteria.
37	A-4		Last sentence	The definition of Alpha should be revised from "air ingestion rate" to "void fraction". (The term "rate" implies a quantity/time relationship)
38	A-4	A-2	2 <sup>nd</sup> on page	Need to add a clarification that Table A-1 (should be A-2) vortex data is only applicable to PWR sump screens without a complete water seal (e.g., screens are not fully submerged), to be consistent with the limitation stated in second-to-last sentence in the first paragraph on page 9.
39	A-5		Table A-1	Coordinate the allowable void fractions cited for acceptable pump performance with the GL2008-01 criteria.
40	A-5	A-5.1	First paragraph	Delete item 2, "flow starvation"; a fully submerged strainer cannot become flow-starved. (The bullets on the next page correctly omit this)
41	A-5	Table A-1		Based on review of latest NRC guidance (dated 6-7-10), the PWR single stage pump 20 second transient void fractions should be 5%.
42	A-6	A-5.2	First paragraph	Delete item 2, "structural failure"; a partially submerged strainer should not be susceptible to structural failure. (The bullets on the next page correctly omit this)
43	A-7		Figure A-3b	Figure is not clearly depicting a partially submerged strainer as indicated in the text