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Initial Test Program of Emergency Core Cooling Systems for Boiling-Water Reactors

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Comment on FR Doc # 2012-14684

Submitter Information

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1

General Comment

See attached file(s)

Attachments

GEH Comments on DG-1277

SUNSI Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = M. Bayssie (mmb2)
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MFN 12-093

August 14, 2012

Cindy Bladey, Chief
Rules, Announcements, and Directives Branch
Office of Administration
Mail Stop: TWB-05-B01M
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Via Federal Rulemaking Website

Subject: Comments: NRC-2012-0134, Draft Regulatory Guide 1277, "Initial Test Program of Emergency Core Cooling Systems for Boiling-Water Reactors," 77 Fed. Reg. 36014 (June 15, 2012)

Dear Ms. Bladey,

GE Hitachi Nuclear Energy ("GEH") provides comments on the subject request for comment. As explained in the Federal Register Notice, the draft guide describes methods that the NRC staff considers acceptable to implement with regard to initial testing features of emergency core cooling systems for boiling-water reactors. Specific comments are provided in Enclosure 1. The guidance was developed to provide "new guidance about the scope of ECCS initial plant tests for BWRs as a result of the NRC's design certification of the" ABWR and ESBWR designs.

GEH notes that the guidance also addresses earlier BWR designs (specifically, BWR 2-6 designs). It is unlikely that these earlier designs would be subject to initial pre-operational and startup testing programs. The NRC should consider removing information on and references to these earlier designs because including these designs with the ABWR or ESBWR results in sections that are not completely correct for either design (e.g., system names are not the same or may not perform the same function in the different designs). GEH has prepared comments on the guidance where such differences were identified, but resolution of the comments is to focus the guidance on ABWR and ESBWR designs. A discussion in a general section of the guidance could explain that there are earlier BWR designs that employ similar systems and were subject to pre-operational and startup in the past.

Please contact me if you have any questions regarding the GEH comments.

Sincerely,

Patricia L. Campbell

Patricia L. Campbell

Commitments:

None.

Enclosure:

1. Comments on DG-1277.

CC: NRC-2012-0134
K. Austgen, NEI

Enclosure 1
MFN 12-093
August 14, 2012

GE Hitachi Nuclear Energy ("GEH") provides the following comments related to NRC Draft Regulatory Guide DG-1277 (New Regulatory Guide), "Initial Test Program of Emergency Core Cooling Systems for Boiling-Water Reactors," (77 Fed. Register 36014; NRC-2012-0134; June 15, 2012).

Section of DG-1277	Comment	Basis	Suggested Change
General Comment	Including BWR 2 – 6 designs is confusing and these designs are not likely to be used in future plants.	It is expected that designs that are certified would be used in future new plant projects.	The regulatory guidance should focus on ABWR and ESBWR designs. Remove sections that are related only to BWR 2 – 6 and remove earlier designs from title of sections that also include ABWR or ESBWR.
Page 3, C. 2nd to last paragraph	A change is needed to reflect passive operation of ESBWR. Sentence: "If noncondensable gases are vented through high-point vent valves, verify closure of the valves before starting the ECCS pumps."	ESBWR does not have a pump to start the ECCS system.	"If noncondensable gases are vented through high-point vent valves, verify closure of the valves before starting the ECCS pumps (in active plants), or opening the system for operation in passive plants."
Page 5, a.(1)(j)/line 2	Sentence: "Verify the proper core spray sparger flooding pattern in the reactor vessel."	Core spray pattern is not used in ABWR HPCF. This statement needs to be clarified with a note.	Remove this sentence if BWR 2 – 6 designs are removed from the guidance. Otherwise, note that this sentence is not applicable to ABWR HPCF. "Verify the proper core spray sparger flooding pattern in

Section of DG-1277	Comment	Basis	Suggested Change
			the reactor vessel (not applicable to ABWR HPCF)."
Page 5, a.(2)/lines 1 - 3	Sentence: "Verify the HPCF/HPCS system shall initiate automatically, when low water levels (Level 1 and 2) are reached during the initial transient following isolation."	HPCF initiates at Level 1.5. This requirement needs to be more general. Also, the use of "shall" in this sentence should be reconsidered.	"Verify the HPCF/HPCS system ~~shall~~ initiates automatically at the appropriate low water level setpoint. ~~when low water levels (Level 1 and 2)~~."
Page 5, a.(2)/lines 3 - 6	Sentence: "The minimum capacity and maximum delay time between the time the vessel water level drops below the set point and makeup water enters the vessel shall meet safety analysis requirements".	The use of "shall" in this sentence should be reconsidered.	Replace with: "Verify the minimum capacity and maximum delay time between the time the vessel water level drops below the set point and makeup water enters the vessel ~~shall~~ meets safety analysis requirements".
Pages 5 and 6, C.1.c.(1)	This subsection does not recognize that DPV valves are also part of ADS for ESBWR; and, therefore, there are no DPV requirements shown.	Appendix A correctly identifies that DPV is part of ADS, but it is missing from Section C.	To reflect the pre-operational instrumentation and control testing in cold conditions, use information described in the ESBWR design control document (Section 14.2.8.1.1), add the following to c.(1): c.(1)(d) Verify proper operation of DPV and SRV position indication.

Section of DG-1277	Comment	Basis	Suggested Change
(1) Page 6, d (1)/line 3	Sentence: "The purpose of this preoperational test is to test the signals to automatically start the reactor core isolation cooling (RCIC) system at low reactor water level or high drywell pressure and the signal for automatic isolation of the RCIC system at low steam pressure to the RCIC pump turbine."	For BWR 3-6, RCIC system initiates only on low level, and not high drywell pressure. However, the ABWR initiates on low reactor water level or high drywell pressure.	Remove BWR 3-6 from the guidance or revise the sentenance as follows: "The purpose of this preoperational test is to test the signals to automatically start the reactor core isolation cooling (RCIC) system at low reactor water level or, for ABWR, high drywell pressure and the signal for automatic isolation of the RCIC system at low steam pressure to the RCIC pump turbine."
Page 6, d(1)(c)/line 1	This paragraph is based on the plant having a temporary steam supply (e.g., auxiliary boilers are included in the ABWR design).	Not all BWR 3 – 6 designs have auxiliary boilers to generate steam to power the RCIC turbine when the RPV is not pressurized. This paragraph would not be applicable to all BWR 3 – 6 designs and a note should be added for clarification.	If earlier BWR designs are removed from the guidance, then no change is needed. Otherwise, modify the sentence as follows: "For those plants with a temporary steam supply, verify alignment of RCIC system suction from the condensate storage pool..."
Page 6, d(1)(c)/line 1	"...from the condensate storage pool and inject water ..."	Some designs refer to condensate storage "pool" while others refer to condensate storage "tank."	"...from the condensate storage pool (or tank) and..."
Page 7, d(1)(d)/line 2	Sentence: "...Perform an RCIC pump ..."	Change "an" to "a" as an editorial change.	"...Perform ~~an~~ a RCIC pump..."

Section of DG-1277	Comment	Basis	Suggested Change
Page 7, (2)(a)	This section discusses testing RCIC through a full flow test line to the suppression pool and by flow injection directly into the reactor vessel.	This section is applicable only to the ABWR design. For earlier designs, testing of RCIC is a recirculation test from the condensate storage tank and returned to the condensate storage tank.	If earlier BWR designs are removed from the guidance, then the section will be applicable to the ABWR design. Otherwise, the guidance for low power flow testing at hot conditions *should be separated into* earlier BWR designs and the ABWR.
Page 7, (2)(b)/last sentence	This sentence discusses making small step changes in speed and flow demand. In addition, the guidance uses "shall" in regard to testing.	The ABWR design certification (Section 14.2.12.2.22) states: "Proper controller adjustment is verified by introducing small step disturbances in speed and flow demand and then demonstrating satisfactory system response at both low RCIC pump flow (but above minimum turbine speed) and near rated RCIC pump flow conditions, in order to span the RCIC operating range." However, the turbine pump set installed in ABWRs under construction do not use a flow controller. As such, small step changes cannot be directly made in	"~~The test shall~~ Verify satisfactory RCIC system performance under the final set of controller settings after controller adjustment are made by ~~small step~~ changes in speed and flow demand and then verify system response at both low and near rated RCIC pump flow conditions."

Section of DG-1277	Comment	Basis	Suggested Change
		speed and flow demand. The use of "shall" in this sentence should be reconsidered.	
Page 8, (2)(c)/lines 1- 3	Sentence: "After completing RCIC system controller adjustments, test automatic initiation of the RCIC system from cold standby conditions (i.e., 72 hours without RCIC operation) to demonstrate RCIC system reliability."	Section 14.2.12.2.22 of the ABWR design control document discusses automatic initiation from cold standby conditions and defines "cold" as "a minimum of 72 hours without any *king of* RCIC operation." This 72 hours was an arbitrary number chosen for cold quick start when the system was first designed. The concern was priming of the hydraulic governor system on the Woodward control system of the steam turbine driver. Subsequent changes to the control systems have made this restriction unnecessary. Decades of surveillance testing has shown negligible difference between a "cold" and "hot" start of the system.	It is suggested that the guidance be modified based on ABWR lessons learned, as follows: "After completing RCIC system controller adjustments, test automatic initiation of the RCIC system *from standby conditions* ~~(i.e., 72 hours without RCIC operation)~~ to demonstrate RCIC system reliability." This change would suggest that cold or hot standby conditions for testing are acceptable, while removing an unnecessary restriction to cold standby conditions.
Page 8, e.(1)/lines 7 and 8	Sentence: "To prevent actuation of single use squib	The GDCS Squib valves will need more than isolation.	"....To prevent actuation of single use squib valves

Section of DG-1277	Comment	Basis	Suggested Change
	valves during the logic portion of testing, the valves may be isolated."	They will need to be replaced with a GDCS performance testing spool piece. If there is not an open flow path where the squib valves are located, there will be no GDCS flow to the RPV.	during the logic portion of testing~~, the valves may be isolated~~.it may be necessary to remove the valves and install testing spool pieces."
Page 8, (2)(g)	This paragraph includes another ABWR lessons learned item regarding flow control.	The "quarter damped" response may not apply to ABWR (see comment 8 above) and may not apply to other existing systems, depending on governor and flow controllers that have replaced the original systems.	Remove reference to "at least quarter damped" as a lesson learned as follows: "...test inputs are ~~at least quarter damped~~ as stated in the RCIC design specifications." This will ensure that there is no unnecessary restriction on the testing, while ensuring that the test inputs are consistent with the RCIC design specification.
Page 9, C.1.e(c)	Paragraph: "Verify the operation of system valves, including time to open and close. The electrical power supplies should demonstrate their capability to actuate the "explosive chargers" used to open GDCS squib valves."	Squib valves cannot be re-closed once actuated to the open position.	Add "(not applicable to squib valves)" at the end of the first sentence, as follows: "Verify the operation of system valves, including time to open and close (not applicable to squib valves). The electrical power

Section of DG-1277	Comment	Basis	Suggested Change
			supplies should demonstrate their capability to actuate the "explosive chargers" used to open GDCS squib valves."
Page 9, C.1.f(1)(b)	There is an error in this paragraph.	The information shown in this item pertains to the isolation condenser (IC) system and not inside containment.	"Verify that the steam flowpaths from the ~~inside containment~~ isolation condenser (IC)/passive containment cooling system (PCCS) pools to the atmosphere are not obstructed. Verify that isolation condenser steam and condensate-return piping flow passages are not obstructed."
Page 9, e.(1)(b)/line 1	Sentence: "Verify instrumentation and alarms functions used to monitor system operation and availability."	Change "alarms" to "alarm," as "functions" is plural and "alarms" is not in the possessive.	"Verify instrumentation and alarms functions..."
Page 10, C.1.f.(2)(b)	This paragraph related to performing a heat removal capacity test on one train of ICS refers to "ICS heat exchanger, piping, and tubing."	A change is suggested to be consistent with ESBWR terminology.	Replace "heat exchanger" with "condenser" as follows: Determine proper operation to verify measurement of vibration, displacement, and strain on the ICS condenser~~heat exchanger~~, piping, and tubing.
Page 11, C.1.i	The title of this section	The RHR (RWCU) system	Delete "ESBWR" from the

Section of DG-1277	Comment	Basis	Suggested Change
	includes ESBWR.	for ESBWR is not a safety related system and no testing of this system is included for pre-operational or startup testing in Chapter 14 of the ESBWR design control document.	title.
Page 12, (i)(2) Low-Power Test—Hot Conditions ¶ (a)	Paragraph: " (a) Verify that the RHR system is capable of operating in the suppression pool cooling and shutdown cooling modes at the heat exchanger capacity as determined by flow rates and temperature differentials indicated on the RHR system process flow diagram."	Paragraph (a) should be deleted because it is an unnecessary detail for Section (i)(2) and is not consistent with RHR startup testing description in Section 14.2.12.2.20 of the ABWR design control document.	Deleted ¶ (a) while maintaining Section (i)(2) in its current form.
Page 12, Section 2, Component Testing	Paragraph: "The components of the systems involved in the system tests described in Regulatory Position C.1 should be tested, either in conjunction with the system tests at the appropriate test phase or by independent component tests. Components that are common to the ECCS and other systems should be	Clarify the sentence for a more clear understanding of "more stringent criteria" for testing.	Suggested changes: "The components of the systems involved in the system tests described in Regulatory Position C.1 should be tested, either in conjunction with the system tests at the appropriate test phase or by independent component tests. Components that are

Section of DG-1277	Comment	Basis	Suggested Change
	tested to the more stringent criteria."		common to the ECCS and other systems should be tested according to whichever of these systems has the more stringent testing criteria." Or: "The components of the systems involved in the system tests described in Regulatory Position C.1 should be tested, either in conjunction with the system tests at the appropriate test phase or by independent component tests. Components that are common to the ECCS and other systems should be tested to the most stringent testing criteria of any of these systems to ensure that such component is capable of performing acceptably each applicable system function."
Page 13, Section 2 b. (2) and (3)	Items: (2) Verify valve operation	It is not clear if there is a difference between "verify valve operation" and "verify	Suggested Change: (2) Verify valve operation

Section of DG-1277	Comment	Basis	Suggested Change
	under maximum expected differential pressure conditions (consistent with system test limitations). (3) Verify operability at *maximum expected* pressure and temperature (consistent with system test limitations).	operability" in these two items.	under maximum expected differential pressure conditions (consistent with system test limitations). (3) Verify ~~operability at~~ valve *operation under maximum* expected pressure and temperature (consistent with system test limitations).
Page 13 Section 2 c.(2)	This section discusses verifying that no foreign *material has entered into the* pump being tested. Generally, a temporary strainer will be installed to prevent debris from entering the pump.	"Verify by inspection that no foreign material has entered *into the pump" implies that* at some point following pre-operational testing the pump must be disassembled. A check to verify that permanent or temporary strainers are not clogged (or are installed or removed, as appropriate) and adequate pump operation should be an acceptable verification that debris is not in the pump. This section should clarify that disassembly is not necessary for this verification.	"Verify that design acceptance criteria are met *for NPSH performance* under maximum system flow and temperature conditions. The test should also verify, by inspection, that no foreign material has entered into the pump, to ensure that performance degradation does not occur, and it should verify that the pump suction strainer is not clogged with debris, so that pump failures or other system degradation does not occur. This inspection and verification may involve inspecting and removing a temporary test strainer or inspecting and

Section of DG-1277	Comment	Basis	Suggested Change
			cleaning of a permanent pump suction strainer (if one is installed), and need not necessitate a pump disassembly."
Page 18, Glossary of Acronyms	There is a term listed that is not used (based on a comment above).	There are no applications in this DG that pertain to "inside containment" (the correct terminology in the guidance is in relation to the isolation condenser).	Delete "IC – inside containment."
Page 18, Glossary of Acronyms	There is a term listed that is not used (based on a comment above).	The applications of this acronym in this guidance pertain to the IC system and not "inside containment."	Revise "IC/PCCS – inside containment/passive containment cooling system" to "IC/PCCS – isolation condenser/passive containment cooling system"
Appendix A General Comments (note that specific comments are provided below that would not apply if Appendix A is deleted).	It is not clear that including Appendix A, "Design Descriptions of Emergency Core Cooling Systems," is necessary or appropriate.	There is no reference to Appendix A in the body of the draft guidance and the descriptions in the appendix could result in confusing the different BWR designs. Specific design descriptions are available in design certification information or other public documents that would not result in confusing the designs.	Consider deleting Appendix A from the guidance. This would also necessitate deleting a portion of the acronyms included in the glossary that are "used in Appendix A of this guide" on pages 19 and 20.
Appendix A, Page A-5	At the top of Page A-5, there are a number of paragraphs	These RHR paragraphs should be relocated or an	Move the RHR paragraphs to a section entitled

Section of DG-1277	Comment	Basis	Suggested Change
	that discuss the RHR system. However, the title of the subsection is "High-Pressure Core Flooder."	appropriate heading should be added to reflect that the discussion relates to the RHR system. There is a section entitled "Low-Pressure Core Flooder (LPCF) Mode of Residual Heat Removal" that precedes the "High-Pressure Core Flooder" subsection for the ABWR.	"Residual Heat Removal" as the first section of A.2, "Advanced Boiling-Water Reactor," and add it to the introduction of A.2 on Page A-1.
Appendix A, Page A-5, RCIC Subsection in Section A.2	Appendix A, Section A.2, applies to the ABWR design. However, the description in the Reactor Core Isolation Cooling subsection describes earlier BWR designs. Information related to these earlier designs should be removed. One important distinction, for example, are statements in this subsection regarding control rod drop accident. For the ABWR, the control rod drop accident is not considered a credible event (see ABWR design control document, Section 15.4.10).	Because this Section applies to the ABWR, and the second paragraph mentions earlier BWR designs, most of the second paragraph should be removed to avoid confusion.	Retain the first two sentences of the second paragraph and deleted the remainder of that paragraph.
Appendix A, Page A-5,	An additional item of	This information may be out-	Based on the comment

Section of DG-1277	Comment	Basis	Suggested Change
RCIC Subsection, ¶ 2	potential confusion in the second paragraph of the ABWR RCIC subsection is that main steam isolation on a high radiation signal has been deleted from earlier BWR plants (except for two plants).	of-date and including it could create confusion.	above, the discussion in the second paragraph that relates to earlier BWR designs should be removed.
Appendix A, Page A-5, RCIC Subsection ¶ 2	Another item of potential confusion is the first sentence that is related to the ABWR design: "The functional classification of the RCIC system is as a safety-related and engineered safety feature (ESF) system."	This information is correct for the ABWR, but not for earlier designs.	Based on the comment above, the discussion in the second paragraph that relates to earlier BWR design should be removed. By removing the earlier designs, the information retained is correct for the ABWR design.
Appendix A, Page A-5, RCIC Section, ¶ 4	This paragraph discusses using the RCIC system in conjunction with the RHR system in the steam condensing mode. This mode is not used in the ABWR and have been abandoned by most (if not all) operating BWRs. It also discusses other design features that are not necessarily correct for the ABWR design:	This is not applicable to the ABWR design, which is the subjection of Section A.2 and the RCIC Subsection. Information from the ABWR design control document that covers the points in the fourth paragraph would be more representative of the ABWR design. Regarding turbine lube oil cooling, not all RCIC turbine	Replace this paragraph with the following information, which is from the ABWR design control document, Section 6.3.2.2.3: "During RCIC operation, the suppression pool acts as the heat sink for steam generated by reactor decay heat. This will result in a rise in pool water temperature. Heat exchangers in the RHR System are used to maintain

Section of DG-1277	Comment	Basis	Suggested Change
	"The RCIC system is also used in conjunction with the RHR system in the steam condensing mode to pump condensate from the RHR heat exchangers back to the RPV. The RCIC system also has alternate paths to allow recirculation back to the CST for testing purposes, discharge to the suppression pool to ensure minimum flow through the pump, and recirculation for turbine lube oil cooling."	pump sets use a lube oil cooler (this should be removed from the content).	pool water temperature within acceptable limits by cooling the pool water directly during normal plant operation. A design flow functional test of the RCIC System may be performed during normal plant operation by drawing suction from the suppression pool and discharging through a full flow test return line back to the suppression pool. The discharge valve to the vessel remains closed during the test, and reactor operation remains undisturbed. Should an initiation signal occur during test mode operation, flow will be automatically directed to the vessel."
Appendix A, Page A-6, Figure A-5.	The title of this figure includes "BWR3-6."	Section A.2 is entitled "Advanced Boiling Water Reactor." This would imply that the earlier designs should not be discussed in Section A.2.	"Figure A-5: ~~BWR3-6,~~ ABWR reactror core isolation cooling"
Appendix A, Page A-6, ADS, ¶ 1/line 4	This paragraph refers to "nuclear SRVs" as follows:	It is not necessary to include "nuclear" in this sentence and tends to imply that there	"The ADS employs ~~nuclear~~ SRVs to relieve high-pressure steam to the

Section of DG-1277	Comment	Basis	Suggested Change
	"The ADS employs nuclear SRVs to relieve high-pressure steam to the suppression pool."	are components referred to as "nuclear SRVs."	suppression pool."
Appendix A, Page A-7, ¶¶ 1 and 2	Paragraphs 1 and 2 need to be combined and edited.	Paragraphs 1 and 2 contain duplicate information.	Consider combining these two paragraphs.
Appendix A, Page A-7, ¶ 5/line 2	This section on automatic depressurization system, which is applicable to ABWR, includes information that is related to ESBWR and not ABWR. Specifically, depressurization valves (DPVs) are not included in ABWR.	The ADS DPV valve is a specific squib valve that was designed for and is used exclusively on the ESBWR as a passive plant.	"...used to activate the SRVs and ~~depressurization valves (DPVs)~~ ADS valves."
Page A-8, ICS description/line 1	Section A.3 applies to the ESBWR design. Under "Isolation Condenser System," the first sentence makes a comparison of the ICS to the BWR RCIC system. This is not a useful comparison and is unnecessary, as reflected in the second sentence, which notes that natural circulation differs significantly from the BWR RCIC, which is an active system.	The passive ICS removes decay heat by transferring it to the condensate pool, maintaining inventory by preventing the SRVs from opening. The active RCIC provides high pressure injection to makeup water lost through the SRVs and requires RHR cooling to remove the RPV decay heat.	Delete the following sentence: "The ESBWR ICS (Figure A-7) is the system most comparable to the BWR RCIC system."
App A, Page A-9, ¶ 4 under GDCS/line 4	There is reference to the "loss of GDCS" providing	The sentence makes no sense as written and is	"~~The loss of the GDCS~~ The initiation of GDCS

Section of DG-1277	Comment	Basis	Suggested Change
	short-term makeup water.	apparently in error. GDCS provides short term post-LOCA water makeup upon initiation.	provides...."