Response to Public Comments on Draft Regulatory Guide DG-1330, "Guidance for Developing Principal Design Criteria for Non-Light Water Reactors" Proposed Revision 0 of Regulatory Guide 1.232 DRAFT VERSION RELEASED FOR FEBRUARY 7, 2018 ACRS MEETING

On April 5, 2017, the NRC published in the Federal Register (82 FR 16636) that Draft Regulatory Guide, DG-1330 (Proposed Revision 0 of RG 1.2332), was available for public comment. The public comment period ended on April 20, 2017. The NRC received comments from the organizations listed below. The NRC has combined the comments and NRC staff responses in the following table.

Comments were received from the following:

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#	Commenter/ Organization	Design Criteria No.	Comment	NRC Resolution
1	Industry/NEI	General	NRC should clarify the language throughout the document regarding the regulatory basis for Principal Design Criteria and the use of the regulatory guide once issued. Principal Design Criteria (PDCs) are required to be included in an application for construction permit, design certification, combined license, design approval, or manufacturing license. (see 10 CFR 50.35, 52.47, 52.79, 52.137, and 52.157). 10CFR50 Appendix A States: The principal design criteria establish the necessary design, fabrication, construction, testing, and performance requirements for structures, systems, and components important to safety; that is, structures, systems, and components that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public. These General Design Criteria establish minimum requirements for the principal design criteria for water-cooled nuclear power plants similar in design and location to plants for	NRC does not agree with this comment. NRC believes that the DG clearly states that it is guidance for non-LWR applicants and designers, and is not a regulatory requirement for advanced reactors. NRC does understand the industry's point regarding the first sentence in the "purpose" section of the DG and proposes to change it to: This regulatory guide (RG) describes the NRC's proposed guidance on how the general design criteria (GDC) in Appendix A, "General Design Criteria for Nuclear Power Plants," of Title 10 of the Code of Federal Regulations, Part 50 "Domestic Licensing of Production and Utilization Facilities" (10 CFR Part 50) (Ref. 1) may be adapted for non-light water reactor (non-LWR) designs. In addition, a similar modification was made to the "Role of the General Design Criteria for Non-LWRs," section of the Discussion in the RG. No other changes were made in response to this comment.

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			which construction permits have been issued by the Commission. The General Design Criteria are also considered to be generally applicable to other types of nuclear power units and are intended to provide guidance in establishing the principal design criteria for such other units. It is industry's position, based on the above, that the GDC's of Appendix A do not establish regulatory requirements for use with non-LWR designs but provide guidance in developing and submitting PDCs with an application. Industry believes that this RG document will essentially replace Appendix A of 10 CFR Part 50 as guidance for advanced reactors in developing PDC to be included with an application. There are a number of statements in the draft guidance document that appear to presume the GDC in Appendix A are regulatory requirements for advanced reactors. For example, the Purpose Section of the DG states, "this regulatory guide (RG) describes the NRC's proposed guidance on how the general design criteria (GDC) in Appendix A……..apply to non-light water reactor (non- LWR) designs." Industry believes it	

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			is unnecessary and inappropriate to attempt to make the GDC of Appendix A "apply" to non- LWRs through this guidance document but rather to simply state the objective as guidance to an applicant develop PDCs as is done in the second sentence of the section. This is also consistent with the section entitled Intended Use of This Regulatory Guide in Section C. There are a number of other places in the DG that imply conformance or alignment with Appendix A. It is recommended that a search for reference to Appendix A be performed and language appropriately clarified. **Suggested Change** Clearly state that the objective is to provide guidance to an applicant develop PDCs and not to meet the GDCs as they are regulatory requirements for non-LWR reactors. This should be clear and consistent through- out the document. For example the purpose section should state: This regulatory guide (RG) describes the NRC's ~~proposed~~ guidance on how ~~the general design criteria (GDC) in Appendix A, "General Design Criteria for Nuclear Power Plants," of Title 10 of~~	

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			~~the Code of Federal Regulations, Part 50 "Domestic Licensing of Production and Utilization Facilities" (10 CFR Part 50) (Ref. 1) apply to non-light water reactor (non-LWR) designs. This guidance may be used by~~ non-LWR reactor designers, applicants, and licensees ~~to~~ may develop principal design criteria (PDC) for any non-LWR designs, as required by the applicable NRC regulations. LWR general design criteria (GDC) in Appendix A, "General Design Criteria for Nuclear Power Plants," of Title 10 of the Code of Federal Regulations, Part 50 "Domestic Licensing of Production and Utilization Facilities" (10 CFR Part 50) (Ref. 1) are intended to only provide guidance to non-LWR designs. This RG derives Advanced Reactor Design Criteria (ARDC) from the intent of the GDC to provide more specific guidance. The RG also derives additional design-specific criteria ~~describes the NRC's proposed guidance for modifying~~ and ~~supplementing the GDC~~ to develop PDC that address two specific non-LWR design concepts: sodium-cooled fast reactors (SFRs), and modular high temperature gas-cooled reactors	

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			(MHTGRs). PDCs for other designs can be developed using the more generic ARDC with design-appropriate changes.	
2	Industry/NEI	General	**Security Design Considerations** As acknowledged in the preliminary draft guidance on non-light water reactor security design (83 FR 13511; March 13, 2017), the Commission's "Policy Statement on the Regulation of Advanced Reactors," (73 FR 60612; October 14, 2008) states that the design of advanced reactors should "include considerations for safety and security requirements together in the design process such that security issues (e.g., newly identified threats of terrorist attacks) can be effectively resolved through facility design and engineered security features, and formulation of mitigation measures, with reduced reliance on human actions." NRC goes on to observe that, as we have previously commented, design considerations and associated regulatory requirements related to security are currently addressed outside of 10 CFR 50 Appendix A. We appreciate the staff's attention to distinguishing security design considerations from general design criteria. This structure should be maintained, and design considerations	Security for SMRs and non-LWRs is an ongoing activity and it is not appropriate to include a discussion in the RG. The NRC's effort to incorporate "security design considerations" has been put on hold and the NRC is instead focusing on whether consequence-based security requirements should be developed for small modular reactors (SMRs) and non-LWRs.

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			related to security should not be incorporated into the advanced reactor design criteria. **Suggested Change** Without incorporating security design considerations in the advanced reactor design criteria, add a brief discussion of the relationship and expectations for security in design, i.e., advanced reactor design criteria and security design considerations should be addressed by advanced non-light water reactor developers in parallel.	
3	X-Energy	General	**Security Design Considerations** The degree to which integration of safety and security design requirements remains a challenge for designers of advanced reactors. Guidance on this will be beneficial. **Suggested Change** None provided.	Security for SMRs and non-LWRs is an ongoing activity and it is not appropriate to include a discussion in the RG. The NRC's effort to incorporate "security design considerations" has been put on hold and the NRC is instead focusing on whether consequence-based security requirements should be developed for small modular reactors (SMRs) and non-LWRs.
4	Industry/NEI	General	**Discussion, Harmonization with International Standards, Page 10** IAEA is also developing safety design criteria and safety design guidelines for MHTGRs.	NRC staff agrees with this comment. Reference to the IAEA Coordinated Research Activity on MHTGR safety design criteria was added to this section.

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			Suggested Change NRC should coordinate with MHTGR activities at IAEA in addition to SFRs.	
5	Industry/NEI	General	**Page 9 - Discussion, Key Assumptions and Clarifications Regarding the non-LWR Design Criteria** The draft regulatory guide states: "It is the responsibility of the applicant to demonstrate compliance with applicable severe accident and BDBE regulations and orders, demonstrate why any that are not applicable do not apply, and demonstrate why other design specific severe accidents or BDBE that can occur will be mitigated." Since ARDC/SFR-DC/MHTGR-DC apply to normal, AOOs, and design-basis events, and do not pertain to BDBE regulations, this sentence is outside the scope of this report. **Suggested Change** It is recommended that this key assumption be deleted.	NRC does not agree with this comment. The "Key Assumptions" provide insight into what the staff did and did not consider while developing the DG. The purpose of including this statement in the RG is to ensure that applicants are aware that severe accidents and BDBEs should be considered in the design of the plants, even though there are not explicit ARDCs for them.
6	Industry/NEI	General	**Page 9 - Discussion, Key Assumptions and Clarifications Regarding the non-LWR Design Criteria** The seventh bullet states: "The NRC intends the ARDC to apply to the six	The NRC staff agrees with this comment. This change was incorporated.

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			advanced reactor technology types identified in the DOE report; however, in some instances, the SFR-DC or MHTGR-DC may be more applicable to a design or technology than the ARDC." Clarification would be useful that a "mix and match" approach is entirely appropriate – i.e., an entire set of criteria for a given design won't necessarily apply. **Suggested Change** Change to: "The NRC intends the ARDC to apply to the six advanced reactor technology types identified in the DOE report; however, in some instances, one or more of the criteria from the SFR-DC or MHTGR-DC may be more applicable to a design or technology than the ARDC."	
7	Industry/NEI	General	**Page 9 - Discussion, Key Assumptions and Clarifications Regarding the non-LWR Design Criteria** The eighth bullet states, in part: "The SFR-DC and MHTGR-DC are intended to apply to all designs of these technologies," which could leave the impression that the criteria in the RG are inviolate, irrespective of specific design attributes. **Suggested Change**	NRC staff agrees with this comment. Sentence was modified to remove, "are intended to apply to all designs of these technologies." The phrase, "…were developed because the designs were mature and the design features diverse for these technologies," was added to clarify why the SFR and MHTGR DCs were developed.

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			Caveat with a statement indicating that, as with all criteria, design-specific exceptions may be proposed (and defended) by the applicant.	
8	DOE/Lab	General	**Page 3- Communications, and Policy Statements** The draft regulatory guide includes the following citation in its "Related Guidance, Communications, and Policy Statements" listing: NRC, "Next Generation Nuclear Plant - Assessment of Key Licensing Issues," dated July 17, 2014, provides the NRC staff's review and insights on the Next Generation Nuclear Plant MHTGR design (Ref. 11). **Suggested Change** The NGNP interactions did not include NRC review of a specific modular HTGR "design", but rather a series of proposals to address policy and key technical issues associated with MHTGR technology. The word "design" should be deleted and replaced with "proposed licensing approach."	The NRC staff agrees with this comment. Change was incorporated
9	DOE/Lab	General	**Page 6- Role of GDC in Regulatory Framework** The draft regulatory guide states: "The GDC are also intended to provide guidance in establishing the PDC for non-LWRs. The GDC serve as the	The NRC staff agrees with this comment. Change was incorporated

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			fundamental criteria for the NRC staff when reviewing the SSCs that make up a nuclear power plant design particularly when assessing the performance of their safety functions in design basis events postulated to occur during normal operations, anticipated operational occurrences (AOOs), and postulated accidents." **Suggested Change** Our understanding is that SSC safety functions are only relied on during plant response to postulated accidents. This sentence, which also refers to normal operations and AOOs, should be revised to more clearly reflect this. A suggested revision is to change "safety functions" to "intended functions".	
10	DOE/Lab	General	**Page 7- Role of GDC for Non-LWRs** The draft regulatory guide states: "Together, these requirements recognize that different requirements may be necessary for non-LWR designs." **Suggested Change** Based on the "generally applicable" statement from Appendix A in the previous paragraph, "requirements" should be revised to "adapted requirements."	The NRC staff agrees with this comment. Sentence was changed to, "Together, these requirements recognize that different requirements <u>may need to be adapted</u> for non-LWR designs."

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11	DOE/Lab	General	**Page 7- Role of GDC for Non-LWRs** The draft regulatory guide states: "The non-LWR design criteria developed by the NRC staff and included in Appendices A to C of this regulatory guide, are intended to provide stakeholders with insight into the staff's views on how the GDC could be interpreted to address non-LWR design features; however, these are not considered to be final or binding regarding what may eventually be required from a non-LWR applicant." **Suggested Change** This statement is not adequately clear and predictable for industry. The staff appears to be saying that the guidance in this draft regulatory guide may not be the complete list of design requirements that apply. However, the last phrase of the cited text implies that the items being addressed in the draft regulatory guide may be incomplete and not a fully acceptable approach for developing the associated principal design criteria. It is recommended that the phrase "however, these are not considered to be final or binding regarding what may eventually be required from a non-LWR applicant" be deleted.	The paragraph continues on, "It is the applicant's responsibility to develop the PDC for its facility based on the specifics of its unique design, using the GDC, non-LWR design criteria, or other design criteria as the foundation. Further, the applicant is responsible for considering public safety matters and fundamental concepts, such as defense in depth, in the design of their specific facility and for identifying and satisfying necessary safety requirements." This additional information explains what is meant by, "…what may eventually be required from a non-LWR applicant."

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12	DOE/Lab	General	**Page 7- Role of GDC for Non-LWRs** The draft regulatory guide states: "The NRC recognizes the benefits to risk informing the non LWR design criteria to the extent possible, depending on the design information and data available." **Suggested Change** Suggest changing "benefits" to "future benefits" to make it clear that this initial set has not been risk-informed beyond the general consideration of risk consistent with the LWR-based GDCs in Appendix A.	The NRC staff agrees with this comment. Change was incorporated.
13	X-Energy	General	Much work has been undertaken to risk-inform the regulatory requirements and guidance for large LWRs. More work will be needed for advanced non-LWRs. As DG-1330 is finalized, a statement needs to be included that acknowledges the maturity of these efforts and the expectation for future enhancements. The guidance that results from this DG-1330 effort should be noted as subject to further refinements as advanced non-LWR designs are brought into the marketplace.	The NRC staff does not agree with this comment. This is noted in the paragraph about the Vision and Strategy: Safely Achieving Effective and Efficient Non-Light-Water Reactor Mission Readiness, page 7, "Implementing the mid- and long-term Implementation Action Plans as part of the Vision and Strategy activities will help NRC determine whether risk informed non-LWR design criteria should be included as part of a new regulatory framework." The RG is a document that can be revised on an as-needed basis. This is repeated multiple times in the guide and

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			Suggested Change None provided.	the office instructions for developing RGs. There is no need to add another statement to this effect in the final regulatory guide.
14	DOE/Lab	General	**Page 8 - DOE-NRC Initiative Phase 1** The draft regulatory guide states: "The ARDC are intended to be technology neutral and, therefore, could apply to any type of non LWR design." **Suggested Change** A better term would be "technology inclusive" to align with the list of six technologies above, and to exclude LWRs. The DOE proposal was based on the six advanced reactor technologies summarized in the previous paragraph, and not "any type".	The NRC staff agrees. Change was incorporated.
15	DOE/Lab	General	**Page 9 - Key Assumptions** The draft regulatory guide states: "It is the responsibility of the applicant to demonstrate compliance with applicable severe accident and BDBE regulations and orders, demonstrate why any that are not applicable do not apply, and demonstrate why other design specific severe accidents or BDBE that can occur will be mitigated." **Suggested Change**	The NRC staff does not agree with this comment. Although beyond design basis events are not part of the scope of the Reg. Guide, applicants must still address them. This is consistent with other statements in the RG that mention additional considerations for applicants.

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			Since ARDC/SFR-DC/MHTGR-DC apply to normal, AOOs, and design basis events, and do not pertain to BDBE regulations, this sentence is outside the scope of this report. It is recommended that this key assumption be deleted.	
16	DOE/Lab	General	**Page 9 - Key Assumptions** The draft regulatory guide states: "While developing the non-LWR design criteria, the staff assumed that a core disruptive accident will be demonstrated to be a severe accident or a BDBE by the applicant." **Suggested Change** This text implies that non-LWR designs must designed for a core disruptive accident that is a deterministic holdover from the past that current risk-informed design approaches will likely eliminate from consideration. For some technologies, the terms "severe accident" or "core disruptive accident" are not technically meaningful. A goal of non-LWR designs would be to eliminate core disruptive accidents from consideration by reducing their likelihood to less than the lower frequency threshold for beyond design basis events. It is recommended that this key assumption be deleted.	The NRC staff does not agree with deleting the key assumption. ASLBP Issuance LBP-84-4 (ADAMS Accession No. ML16357A782) describes the manner in which a core disruptive accident should not be considered a design basis accident. As part of the review of the Clinch River Breeder Reactor (CRBR) plant's Construction Permit, the applicant evaluated the potential failures of equipment and potential accidents which could cause fuel disruption. The applicant also evaluated the consequences of the disrupted core. The analyses demonstrated that there existed sufficient defense-in-depth in the CRBR plant design and that the consequences of core disruption was acceptable relative to the risk of a LWR design. As discussed in the ASLPB memorandum, the core disruptive accident was a potential consequence of a design basis accident only if

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				multiple defense-in-depth components failed for the CRBR plant design. The key assumption explicitly denotes that the all advanced reactors will need to demonstrate sufficient protection from and/or low consequence of core disruptive accidents in order to demonstrate that a core disruptive accident is not a probable event during a design basis accident. If a core disruptive accident is a probable outcome of a design basis accident, the applicant may need to develop specialized PDCs which would ensure that the reactivity control systems and heat removal systems are sufficient considering the unknown core configuration. PDC changes may include requiring the secondary shutdown mechanism to be safety-related and may require additional detail on "effective cooling."
17	DOE/Lab	General	**Page 9 - Key Assumptions** The draft regulatory guide states: "Safety design objectives for non-LWRs can differ substantially from those associated with LWRs." **Suggested Change**	The NRC staff agrees with this comment. Change was incorporated. (replaced "objectives" with "approach"). This was included as an assumption because staff considered this when developing the non-LWR design criteria.

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			The statement is correct (replace "objectives" with "approach") but it's not clear why it is listed as an "assumption".	
18	DOE/Lab	General	**Page 9 - Key Assumptions** The draft regulatory guide states: "Proposed GDC adaptations were focused on those needed for improved regulatory certainty and clarity." **Suggested Change** This is the better choice of language – NRC should use "adaptation" throughout.	The NRC does not understand this comment because it does not specify where such changes are needed or in what context."
19	DOE/Lab	General	**Page 9 - Key Assumptions** Currently, the following items are located in the text of the NRC rationales: • Prior to issuing this regulatory guide as final, it appears that Commission agreement will be needed on the "functional containment" performance requirements for the MHTGR. • In addition, staff acceptance of the "SARRDL" will also be needed. **Suggested Change** It seems reasonable to state these in the assumptions to highlight that there are key policy items discussed in the regulatory guide that are still unresolved.	The NRC staff agrees with this comment. Change was incorporated.
20	DOE/Lab	General	**Page 10 - Harmonization with International Standards**	The NRC staff agrees with this comment. The NRC will follow its standard procedures for public

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			The draft regulatory guide states: "The NRC will continue to monitor and collaborate on these documents and consider using them to the extent practical in developing SFR design criteria." The last sentence states that NRC will consider use of international standards. Will the US industry get to review and comment on these international standards-based criteria? **Suggested Change** The last sentence states that NRC will consider use of international standards. Will the US industry get to review and comment on these international standards-based criteria?	participation in the development of future NRC documents that reference or endorse international standards.
21	DOE/Lab	General	**Page 10 - Harmonization with International Standards** It's not clear why this section is included, and if it's retained, why it doesn't include other international efforts, such as the IAEA CRP on safety design criteria for MHTGRs. **Suggested Change** Include other international efforts, such as the IAEA CRP on safety design criteria for MHTGRs.	The NRC staff agrees with this comment. The Coordinated Research Activity on MHTGR safety design criteria was added.

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22	DOE/Lab	General	**Page 10 - Harmonization with International Standards** The draft regulatory guide states: "The International Atomic Energy Agency (IAEA), in collaboration with the International Project on Innovative Nuclear Reactors and Fuel Cycles and the Generation IV International Forum, established the Sodium-Cooled Fast Reactor Task Force." **Suggested Change** This last paragraph focuses solely on the SFR. There is a similar activity underway for modular HTGRs that should be cited.	The NRC staff agrees with this comment. Change was incorporated.
23	DOE/Lab	General	**Page 11 - Intended Use of this Regulatory Guide** The draft regulatory guide states: "For example, FHRs are liquid-metal reactors that use tristructural isotropic (TRISO) fuel, which is the same fuel used for MHTGR technologies." **Suggested Change** FHRs are not liquid-metal reactors. FHRs are a type of molten-salt cooled high-temperature reactors that use a fixed core rather than liquid fuel.	The NRC staff agrees with this comment. Change was incorporated.
24	DOE/Lab	General	**Page 11 - Intended Use of this Regulatory Guide**	The NRC staff agrees with this comment. Change was incorporated.

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			The draft regulatory guide states: "Applicants may use this RG to develop all or part of the PDC and are free to choose among the ARDC, SFR-DC, or MHTGR-DC to develop each PDC." **Suggested Change** Should add something like "after considering the underlying safety basis for the criterion and evaluating the rationale for the adaptation described in this Reg. Guide" to the end of this sentence.	
25	DOE/Lab	General	**Page 11 - Intended Use of this Regulatory Guide** The draft regulatory guide states: "Finally, the non-LWR design criteria as developed by the NRC staff are intended to provide stakeholders with insights into the staff's views on how the GDC could be interpreted to address non-LWR design features; however, these are not considered to be final or binding on what may eventually be required from a non-LWR applicant." **Suggested Change** Should add something like "after considering the underlying safety basis for the criteria and evaluating the rationale for the adaptation described in	NRC staff does not agree with this comment. A change was incorporated in the location specified in comment no. 24, but was not repeated in this second location because it would be repetitive and therefore unnecessary

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			this Reg. Guide" to the end of this sentence.	
26	Peter Smith	General	**Intended Use of this Regulatory Guide** It is unclear to me why "applicants would not need to request an exemption from the GDC in 10 CFR Part 50 when proposing PDC for a specific design." Is it the intention of the Staff that the RG represents an interpretation of how the GDC can be satisfied? **Suggested Change** None provided	The NRC staff does not agree with this comment. An exemption is not needed since the GDC in 10 CFR 50 Appendix A are not requirements for non-LWRs. They are considered to be generally applicable to non-LWRs and are intended to provide guidance in establishing the principal design criteria.
27	Michael Keller	General	**Intended Use of this Regulatory Guide** What is the legal basis for materially altering Appendix A to 10CFR50 using a low tier regulatory guidance document? Specifically, I am referring to the exemptions proposed for gas reactor (m-HTGR) - e.g. removing the requirements for a containment. **Suggested Change** None provided	The NRC staff does not agree with this comment. The GDC in 10 CFR 50 Appendix A are not requirements for non-LWRs. They are considered to be generally applicable to non-LWRs and are intended to provide guidance in establishing the principal design criteria.
28	DOE/Lab	General	**Page 14 - Table 1, Multiple Barriers** The draft regulatory guide states: MHTGR-DC 18 - "Same as GDC" **Suggested Change** Should say "Same as ARDC"	The NRC agrees with this comment. Change was incorporated.

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29	DOE/Lab	General	**Page 22 – Acronyms** The draft regulatory guide states: "SARRDL - specified acceptable system radionuclide release design limit" **Suggested Change** Not what was proposed; should be "specified acceptable core radionuclide release design limit". The detailed basis for this comment is provided with comments on modular HTGR-DC 10.	The NRC staff does not agree with this comment. See resolution to comment No. 43
30	DOE/Lab	General	**Page 25 – References** The draft regulatory guide states: 32. "DOE, Tanju Sofu, Argonne National Laboratory, "Sodium-cooled Fast reactor (SFR) Technology Overview…" **Suggested Change** The NGNP – modular HTGR training material also should be referenced.	NRC staff does not agree with this comment. Reference 35 is specific to the rationale for why a pressure retaining containment is needed for SFR designs. No change.
31	John Kirby	General	America needs regulations that promote thorium reactor research and development. Smaller and safer reactors may well add to the safety of America's citizenry not only by reducing carbon foot prints and reducing money funneled into the middle east, but the major reason to promote new research is to protect against natural disasters by providing a robust and redundant energy solution that	The NRC considers the comment to be outside the scope of this regulatory guide.

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			could even survive nuclear winters from volcanos, meteors, or man. **Suggested Change** None provided.	
32	Anonymous	General	Tax me more please :):):) **Suggested Change** None provided.	The NRC considers the comment to be outside the scope of this regulatory guide.
33	Herbert Burke – Energize Northwest	General	A general ·comment on this and other project Design criteria. Go easy! Experience from failures show that we cannot anticipate every problem with a complex system. So, don't try! GE, but I guess not Westinghouse, are big boys with deep pockets. If a big and complex program has troubles they just fix them. Boeing spent 32 billion on the 787 Dream liner. It had problems and was late and over budget. The same is true for the GEnx engines that power the Dreamliner. Both companies spent billions on development, had the best engineers and company experience but the both has serious problems. But they just fiedt them and went on to produce and. excellent products. These companies do not need hundreds of regulations. General ones like build the plant underground so nothing can get in or out will do. They can	The NRC considers the comment to be outside the scope of this regulatory guide.

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			do it for underground nuclear tests, why not for nuclear power plants? Remember, you can't beat Murphy's Law. Keep it simple and let the contractor handle the design details (with supervision). **Suggested Change** None provided.	
34	DOE/Lab	General	**Page A-1 - Appendix A** The draft regulatory guide states: "The NRC staff then determined what if any adaptation was appropriate for non-LWRs." **Suggested Change** The "if any" part should be separated from the rest of the sentence with commas: "The NRC staff then determined what, if any, adaptation was appropriate for non-LWRs."	The NRC staff agrees with this comment. Change was incorporated.
35	DOE/Lab	General	**Page C-1 - Appendix C** Reference is made to the "Glossary" section of the guide for a definition of the modular HTGR, but no Glossary section is provided in the draft. **Suggested Change** Remove reference to the glossary.	The NRC staff agrees with this comment. Change was incorporated.
36	X-Energy	General	**Appendix C**	The staff partially agrees with this comment. The title of Section IV, "Fluid

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			Much effort has been undertaken for MHGTRs in establishing top-level regulatory criteria. These criteria can be summarized in terms of reactivity control, heat removal, and radionuclide retention functions. The draft Appendix C (DG-1330) retains many of the existing terms that have been derived for LWRs. **Suggested Change** As the guidance is finalized, consideration should be given to rephrasing (at least at the level of the recommended GDC groupings) to better align with these top-level functions.	Systems," is not applicable to MHTGRs. The staff will change the title of MHTGR Section IV to "Heat Transport Systems." No changes to the titles for Section I, II, III, V, VI, and VII. The staff notes that all of the MHTGR-DCs within Section VI, "Reactor Containment" are not applicable to the MHTGR design. The MHTGR-DCs themselves are generally applicable to MHTGR designs. Therefore, a vendor can propose design specific terms for their design specific PDCs. The terminology used within the MHTGR-DCs and rationale are generally applicable to MHTGR designs. A vendor can propose design-specific terms for their design-specific PDCs.
37	Industry/NEI	Appendix B General	**Appendix B General** In several cases, SFR-DCs indicate "same as ARDC." Some others do not indicate this, when the only change is from "reactor coolant boundary" to "primary coolant boundary." **Suggested Change**	The NRC staff does not agree with this comment. The rationale currently describes the changes made to each design criteria. No change.

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			Consider indication, where applicable, that only difference from ARDC is coolant boundary designation.	
38	Industry/NEI	Appendix B General	**Appendix B General** In many cases, the SFR-DC rationale include: "The use of the term "primary" indicates that the SFR-DC are applicable only to the primary cooling system, not the intermediate cooling system." In several instances, however, "indicates" is replaced with "implies," which connotes less certainty as to applicability. **Suggested Change** Replace "implies" with "indicates" for consistency.	The NRC staff agrees with this comment. Change was incorporated.
39	Industry/NEI	Appendix C General (MHTGR-DC 17, 34, 44)	**Appendix C General** Many of the proposed MHTGR GDC retain the statement "assuming a single failure". This inclusion makes no reference to SECY-03-0047 and the Commission SRM that described the replacement of the single failure criterion with a probabilistic (reliability) criterion. **Suggested Change** The single failure requirement should be replaced with a probabilistic (reliability) criterion.	The NRC staff does not agree with this comment. The non-LWR design criteria are an important first step to address the unique characteristics of non-LWR technology. The NRC recognizes the future benefits to risk informing the non-LWR design criteria to the extent possible, depending on the design information and data available. Replacing single failure criterion with a probabilistic (reliability) criterion will be considered in the future as part of the NRCs Vision and Strategy activities. No change.

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40	Industry/NEI	Appendix B SFR-DC 1 and 10	**Appendix B SFR-DC 1 and 10** As regard quality standards and records, and reactor design, no specific SFR criteria are proposed **Suggested Change** It is suggested to add that "design codes adapted to SFR specificities (high temperature…) must be defined."	The NRC staff does not agree with this comment. Design codes for specific non-LWR technologies are beyond the scope of the design criteria. No change.
41	DOE/Lab	ARDC 10, SFR-DC 10	**Flexibility to Apply SARRDL** Some fast reactor designs utilize vented fuel concept that release the fission gas to the primary coolant during normal operation. SARRDL concept may be more applicable than SAFDL for such designs. SARDDL would also apply more readily to liquid fueled molten salt reactor concepts. **Suggested Change** It would be very useful if the ARDC-10 rationale offered the flexibility to adopt the MHTGR-DC 10 approach in such cases.	The NRC staff agrees with this comment and notes that this flexibility is stated in Section C, "Intended Use of This RG."
42	DOE/Lab	MHTGR-DC 10	The NRC staff's incorporation of the SARRDL as a replacement for the SAFDL is a very important step forward in the development of the modular HTGR design criteria. **Suggested Change** Positive comment, no change suggested.	Positive comment, no change required.

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43	DOE/Lab	MHTGR-DC 10	**SARRDL Definition** The NRC staff's incorporation of the SARRDL as a replacement for the SAFDL is a very important step forward in the development of the modular HTGR design criteria. However, the change in the definition of the SARRDL, replacing "core" with "system," is problematic. The NRC apparently expanded SARRDL applicability to the entire reactor helium pressure boundary rather just applying it as a measure of particle fuel coating effectiveness. In addition to the concerns expressed below, use of "system" could be misinterpreted in the future to include systems such as the helium purification system. The rationale for this criterion, and the NRC staff presentation of 02/22/17 to the ACRS Subcommittee, indicates that this change is intended to capture the idea that radionuclides that deposit, or plate out, on the internal surfaces of the reactor helium pressure boundary can be re-entrained during normal operations or AOOs, and that such re-entrainment needs to be taken into account in assessing whether the SARRDL is exceeded.	**SARRDL Definition** The NRC staff does not agree with this comment. The word "system" refers to the primary He coolant circuit and all connected systems that are not isolated and may potentially contribute to dose during an AOO. The first paragraph of the rationale MHTGR-DC 10states: The concept of specified acceptable fuel design limits, which prevent additional fuel failures during anticipated operational occurrences (AOOs), has been replaced with that of the specified acceptable system radionuclide release design limits (SARRDL), which limits the amount of radionuclide inventory that is released by the system under normal and AOO conditions. The term "system" refers to the fuel, the helium coolant circuit and all connected systems that are not isolated and may contribute to dose. Design features within the reactor system must ensure that the SARRDLS are not exceeded during normal operations and AOOs.

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			While this is conceptually true, in fact the amount of re-entrainment that occurs during an AOO is negligible. Experiments to measure re-entrainment under depressurization conditions have shown that re-entrainment is a function of shear ratio. Shear ratio is the ratio of the maximum helium shear force during a transient event to the shear force of the flowing helium at any given location during normal, full power operation. As described in the NGNP Mechanistic Source Terms White Paper, which is listed as a reference in-situ measurements of re-entrainment vs. shear ratio indicate that re-entrainment of radionuclides greater than 1% does not occur until the shear ratio reaches 5. As discussed in the Preliminary Safety Information Document (PSID) for the General Atomics MHTGR, the peak shear ratio expected for the design basis depressurization event is 1.15. This design basis event entails a breach of the reactor vessel pressure relief line, resulting in an opening of 13 in^2 and a depressurization in a period of minutes.	

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			For the largest breach in the helium pressure boundary that would be expected to fall within the spectrum of the AOOs (failure of an instrumentation line equivalent to a breach of less than one square inch, resulting in depressurization over a period of hours), the changes in helium flow velocity and in the shear forces on the reactor helium pressure boundary surfaces result in shear ratios less than one. When the reactor is started up from cold shutdown, the shear forces around the helium pressure boundary are lower than those during normal, full power operation, so the shear ratios in this case are also less than one. Insignificant re-entrainment is expected to occur when shear ratios are less than one. It should be noted that essentially all fission product radionuclides on the reactor helium pressure boundary surfaces are originally released from the core. The release of activation products from reactor helium pressure boundary surfaces is expected to be minimal compared to release from the core. Core radionuclide release values are	

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			measured by grab samples (plateout activity) and plateout probes (condensed activity) for comparison with the SARRDL. Gross circulating activity is also monitored continuously. It is not possible to distinguish radionuclides that have been re-entrained from other circulating activity that is monitored or collected in a grab sample. The SARRDL value is set taking into account the fact that the plateout inventory of long-lived radionuclides will increase over time to an end of life maximum. Due to all of the above considerations, the definition of the SARRDL should be that which was proposed by DOE/INL: Specified Acceptable Core Radionuclide Release Design Limit. **Suggested Change** Due to all of the "SARRDL Definition" considerations, the definition of the SARRDL should be that which was proposed by DOE/INL: Specified Acceptable Core Radionuclide Release Design Limit. **SARRDL Approval** The Rationale states that the NRC has not yet approved the SARRDL concept for replacement of the SAFDL and refers	**SARRDL Approval** MHTGR-DC 10 rationale refers to MHTGR-DC 16 because SARRDL is intertwined with functional containment. The staff is preparing a SECY paper for the Commission to discuss functional containment performance requirements, as well as topics integral to functional

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			to the rationale for modular HTGR DC 16 for information. However, the DC 16 rationale has no link back to DC 10 and the SARRDL, so it is not clear what this means. **Suggested Change** The paragraph that states that the NRC has not yet approved the SARRDL concept should be revised so that the relationship between the referenced DC 16 discussion and this issue is clarified. Clarification is also needed regarding whether release of the Regulatory Guide will constitute approval of the SARRDL, and if release does not constitute approval, what further steps would be needed to obtain approval.	containment (e.g., specified acceptable system radionuclide release design limit, mechanistic source term, etc.). The staff expects to issue the SECY paper in early 2018. The RG may be modified to incorporate the Commission's position.
44	DOE/Lab	MHTGR-DC 12	SARRDL definition was changed from specified acceptable "core" radionuclide release design limits to specified acceptable "system" radionuclide release design limits. **Suggested Change** See DOE Lab comment on MHTGR-DC-10	NRC staff does not agree with this comment. See resolution to comment No. 43
45	Industry/NEI	Appendix B SFR-DC 14	The definition of the primary coolant boundary includes the cover gas boundary. Therefore, the Criterion 14 requiring an extremely low probability of	The NRC staff does not agree with this comment.

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			abnormal leakage for cover gas leakage is not necessary. A cover gas leakage would lead to very limited safety consequences (no impact on the fission process, no impact or limited radiological consequences). This allows for safety valves on the cover gas system to limit abnormal pressure on the reactor vessel. On the other hand, the failure of the reactor vessel could have very severe consequences (e.g. reactivity insertion, failure of the core coolability). **Suggested Change** It is therefore proposed to state that "<u>Each part of</u> the primary coolant boundary shall be designed, fabricated, erected, and tested so as to have <u>a prevention level</u> of abnormal leakage, of rapidly propagating failure, and of gross rupture, <u>commensurate with the consequences of such failures."</u>	Similar to LWR designs, the NRC allows the use of safety valves in sodium fast reactors to prevent the system from exceeding the design pressure. The staff does not believe that the SFR-DC language or the GDC language prohibits the use of safety valves. The cover gas system can be designed and constructed to meet this design criteria without undue burden. The cover gas system should be operating at a low pressure that inherently reduces the probability of propagating failure and gross rupture. The design criteria specifies abnormal leakage. The criteria should not be interpreted to prohibit a small amount of cover gas loss due to diffusion, seal leakage, leakage pathways due to fabrication gaps, etc., all of which can only be prevented at significant and unjustifiable cost. The staff does not require the system to have "perfect seals." The normal system leakage should be estimated and described by the applicant in the licensing basis as the baseline condition of the system. The staff envisions that small leakage of the cover gas (which is greater than the

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				normal system leakage) that does not challenge the safety of the plant would be permitted in a similar manner as the LWR Plant Technical Specifications. Additionally, the cover gas system for a sodium fast reactor should not have an active degradation mechanism based upon the environment in the piping system. Considering the consequences of leakage into the primary coolant system, the staff believes that the SFR-DC should remain as written.
46	Industry/NEI	MHTGR-DC 14, 30, 31, 32	The requirements as written imply the primary helium pressure retention is a safety function similar to LWRs. **Suggested Change** De-emphasize the pressure retention function of the helium pressure boundary. However, it is important to note that although the leak tightness and high quality of the helium pressure boundary is necessary for commercial operation of MHTGRs, the pressure retaining function of the helium pressure boundary is not a required safety function. **Suggested Change**	The NRC staff does not agree with this comment. The helium pressure boundary may still be part of the functional containment and credited in limiting radionuclide release. The quality and leak tightness of the reactor helium pressure boundary may still serve a safety function. Furthermore, as currently written in the ASME Boiler and Pressure Vessel Code, Section III, ASME class components forming the primary helium boundary are required to be pressure tested prior to ASME BPVC certification. Therefore, quality and leak

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			MHTGR-DC 70 correctly emphasizes seismic stability and geometric stability of the reactor vessel system. The safety function of the reactor vessel and its support system is to maintain core coolable geometry and provide sufficient conduction and convection heat transfer properties in the core region. **Suggested Change** However, emphasis on T/H properties of the reactor vessel at uninsulated the core region is lacking.	tightness for the helium pressure boundary are required for the construction of the system as part of meeting GDC 1. A vendor can provide justification that the helium pressure boundary does not perform any safety function and that the design would still meets regulatory requirements. At present, the NRC staff has not reviewed sufficient fuel qualification testing and DG-1330 does not sufficiently limit the fuel of MHTGRs for the staff to state in regulatory guidance that the primary coolant boundary is not required to protect the public health and safety for all MHTGR designs. The staff position may evolve as the Commissioners review policy papers on regulatory issues for advanced non-LWRs. The public comment over-emphasizes the function of helium coolant boundary as it applies to 10 CFR Part 100 limits (accident dose consequences). The staff emphasis on the leak-tight design, fabrication, and testing reflects the need to ensure operability of the helium coolant boundary compared to the as-constructed condition.

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47	DOE/Lab	MHTGR-DC 14	The addition of the reference to modular HTGR DC 30, and the associated changes to modular HTGR Criteria 14 and 30, are both excellent improvements. **Suggested Change** Positive comment, no change suggested.	Positive comment, no change required.
48	Industry/NEI	MHTGR-DC 15	The addition of "heat removal systems" appears to be limited solely to connected systems, i.e., the steam generator. Clarification is needed as to the role of the RCCS for heat removal under normal operations and AOOs. **Suggested Change** Clarify the role of the RCCS for heat removal under normal operations and AOOs.	The NRC staff does not agree with this comment. The heat removal system refers to any system, such as the stream generator, which serves as part of the helium pressure boundary. The RCCS is not assumed to be part the helium pressure boundary in the MHTGR design and hence not addressed by MHTGR DC 15. The heat removal capability of the RCCS may be, if necessary, credited to demonstrate that helium pressure boundary acceptance criteria is not exceeded during normal operation including an AOO.
49	DOE/Lab	MHTGR-DC 15	The changes to the text in the body of this criterion made by the NRC staff relative to the proposed text in the DOE/INL report are an improvement. **Suggested Change** Positive comment, no change suggested.	Positive comment, no change required.
50	Industry/NEI	MHTGR-DC 15	The addition of "heat removal systems" appears to be limited solely to connected	The NRC staff does not agree with this comment. The heat removal system

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			systems, i.e., the steam generator. Clarification is needed as to the role of the RCCS for heat removal under normal operations and AOOs. **Suggested Change** Clarify the role of the RCCS for heat removal under normal operations and AOOs.	refers to any system, such as the stream generator, which serves as part of the helium pressure boundary. The RCCS is not assumed to be part the helium pressure boundary in the MHTGR design and hence not addressed by MHTGR DC 15. The heat removal capability of the RCCS may be, if necessary, credited to demonstrate that helium pressure boundary acceptance criteria is not exceeded during normal operation including an AOO.
51	DOE/Lab	MHTGR-DC 15	**Removal of the Word "System"** The changes to the text in the body of this criterion made by the NRC staff relative to the proposed text in the DOE/INL report are an improvement. However, the word "System" should be removed from the title of the criterion. The reactor helium pressure boundary is not an individual system, but rather is constituted from parts of several systems, which are listed and referred to in the body of the criterion. Removal of the word "System" from the title will make the title consistent with modular HTGR terminology. **Suggested Change** Remove the word "System" from the title of the criterion.	The NRC staff agrees with this comment. Change was incorporated.

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52	Industry/NEI	ARDC 16	**Appendix A ARDC 16 Page A-4** The draft guidance for ARDC 16, Containment design, retains the original GDC language, thereby carrying forward design criteria intended for a pressure-retaining light water reactor. This results in limiting the applicability of the functional containment concept to applicable non-LWR designs, and appears to be inconsistent with the Commission's position on alternatives to a leak tight containment, as discussed in SECY 93-092 and the associated SRM. Advanced reactor containment design guidance should flow logically from ARDC 16 to the SFR and MHTGR design criteria. ARDC 16 should be a high-level technology-neutral design criterion from which technology-specific design criteria are derived. **Suggested Change** ARDC 16 language should include technology neutral containment requirements which can be subsequently applied to a specific technology. The original DOE/INL language for ARDC 16 is provided below. Containment design	The NRC staff does not agree with this comment. The staff believes that the Commission may wish to assess the reactor technologies and possible approaches to functional containment that are different from those previously presented for MHTGRs. The staff is preparing a SECY paper for the Commission to discuss functional containment performance requirements, as well as topics integral to functional containment (e.g., specified acceptable system radionuclide release design limit, mechanistic source term, etc.). The staff expects to issue the SECY paper in early 2018. The RG will be modified to incorporate the Commission's position. Until this time, ARDC 16 will remain as "same as GDC 16."

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			A reactor functional containment consisting of a structure surrounding the reactor and its cooling system or multiple barriers internal and/or external to the reactor and its cooling system, shall be provided to control the release of radioactivity to the environment and to assure that the functional containment design conditions important to safety are not exceeded for as long as postulated accident conditions require." The concept of a functional containment would be of interest for application to other technologies. Applying this recommendation would provide a high-level technology-neutral ARDC which could be used to obtain Commission approval of containment performance criteria. SFR and MHTGR DC 16 would then serve to illustrate how technology-specific design criteria can be derived from ARDC 16.	
53	DOE/Lab	ARDC 16	**Add Functional Containment Language** ARDC 16 language should include technology neutral containment requirements which can be subsequently applied to a specific technology. The	The NRC staff does not agree with this comment. The staff believes that the Commission may wish to assess the reactor technologies and possible approaches to functional containment that are different from those previously

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			original DOE/INL language for ARDC 16, which was written with the objective of being technology neutral, is provided below. "Containment design. A reactor functional containment consisting of a structure surrounding the reactor and its cooling system or multiple barriers internal and/or external to the reactor and its cooling system, shall be provided to control the release of radioactivity to the environment and to assure that the functional containment design conditions important to safety are not exceeded for as long as postulated accident conditions require." The concept of a functional containment would be of interest for application to other technologies. Applying this recommendation would provide a high-level technology-neutral ARDC which could be used to obtain Commission approval of containment performance criteria. SFR and MHTGR DC 16 would then serve to illustrate how technology-	presented for MHTGRs. The staff is preparing a SECY paper for the Commission to discuss functional containment performance requirements, as well as topics integral to functional containment (e.g., specified acceptable system radionuclide release design limit, mechanistic source term, etc.). The staff expects to issue the SECY paper in early 2018. The RG will be modified to incorporate the Commission's position. Until this time, ARDC 16 will remain as "same as GDC 16." The last sentence of the ARDC 16 rationale will be deleted. The second to the last sentence will remain until the Commission's position is clarified in its response to the SECY paper.

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			specific design criteria can be derived from ARDC 16. **Suggested Change** ARDC 16 language should include technology neutral containment requirements which can be subsequently applied to a specific technology. The original DOE/INL language for ARDC 16, which was written with the objective of being technology neutral, is provided below. "Containment design. A reactor functional containment consisting of a structure surrounding the reactor and its cooling system or multiple barriers internal and/or external to the reactor and its cooling system, shall be provided to control the release of radioactivity to the environment and to assure that the functional containment design conditions important to safety are not exceeded for as long as postulated accident conditions require." **Functional Containment Policy Issue**	

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			Discussions of Commission policy decisions on functional containment need to be worded carefully. For the modular HTGR, a policy decision is not needed regarding the general acceptability of applying a functional containment (radionuclide retention) approach that differs from a conventional LWR high-pressure, low-leakage structure. However, based on the SRM to SECY-03-0047, a policy decision is needed regarding the performance criteria to be applied to a functional containment. The information located in the MHTGR-DC 16 rationale correctly states that a policy decision regarding functional containment performance requirements and criteria will be needed. It's noted that containment performance criteria for LWRs are provided in 10 CFR 50 Appendix J, rather than in the GDC of Appendix A. **Suggested Change** The last two sentences in the rationale for ARDC 16 should be deleted.	
54	Industry/NEI	ARDC 16	**Appendix A ARDC 16 Page A-4** Clarify that use of ARDC 16 [per industry comment ##] for non-LWR designs other than MHTGRs may "be subject to a policy decision…" Making a justification, similar	The NRC staff does not agree with this comment. If a reactor is able to demonstrate safety margins and/or consequences below regulatory limits using barriers other than an essentially

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			to that for research reactors and non-power reactors has basis in NRC policy and should not require a Commission-level policy decision. Discussions of Commission policy decisions on functional containment need to be worded carefully. For the modular HTGR, a policy decision is not needed regarding the general acceptability of applying a functional containment (radionuclide retention) approach that differs from a conventional LWR high-pressure, low-leakage structure. However, based on the SRM to SECY-03-0047, a policy decision is needed regarding the performance criteria to be applied to a functional containment. The information located in the MHTGR-DC 16 rationale correctly states that a policy decision regarding functional containment performance requirements and criteria will be needed. It's noted that containment performance criteria for LWRs are provided in 10 CFR 50 Appendix J, rather than in the GDC of Appendix A. **Suggested Change** Revise rationale to state, "…However, it is also recognized that characteristics of the coolants, fuels,	leak-tight structure, a functional containment may be justified. However, the Commission may wish to assess the reactor technologies and possible approaches to functional containment that are different from those previously presented for MHTGRs. The staff expects to consider functional containment concepts and associated performance criteria within the broader development of a risk-informed, performance-based, technology-inclusive regulatory framework for non-LWRs. Those efforts will include making proposals and recommendations to the Commission, which will clarify the potential use of functional containment for various reactor technologies.

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			and containments to be used in other non-LWR designs could share common features with SFRs and MHTGRs…Use of the ARDC 16 for non-LWR designs other than MHTGRs-DC 16 ~~will~~ may be subject to a policy decision by the Commission. If a reactor is able to demonstrate safety margins and/or consequences on the order of those demonstrated by non-power and research reactors, a functional containment may be justified, and the reactor may be able to use ARDC 16 without a Commission level policy decision. ~~See rationale for MHTGR-DC 16 for further information on the policy decision.~~"	
55	Industry/NEI	SFR-DC 16	It is indicated that the reactor containment is a pressure retaining structure surrounding the reactor and its cooling systems. In case of SFR, it is possible to limit the pressure loadings on the containment structure in accident conditions. For example the rooms with sodium circuits can be designed so that the effect of a sodium leak or fire would not result in significant pressure on the containment structure and the pressure effect could be limited to the room where the leak occurs. Also, the reactor cooling systems could include secondary cooling systems which are partially outside the	The NRC staff does not agree with this comment. The NRC staff considers pressure retention essential to accommodate the impact of sodium reactions with air or water that could release significant energy inside the containment structure. The language in the rationale makes it clear that the pressure retention is not like that in an LWR containment. Several references have also been cited to clarify this point. [Ref: SRM to SECY-03-0047 (ML031770124), and VR to SECY-03-0047 (ML031770333) outline the

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			containment structure where this can be particular concern is cooling systems with air as the heat sink, for which sodium/air heat exchanger must be placed outside of the containment. **Suggested Change** It is therefore proposed to modify the first sentence of the criterion as: "A reactor containment consisting of a high strength, low leakage, ~~pressure retaining~~ structure surrounding the reactor ~~and it's cooling systems~~ shall be provided to control the release of radioactivity to the environment and to assure that the reactor containment design conditions important to safety are not exceeded for as long as postulated accident conditions require." Additionally, remove the phrase "and its primary cooling system."	Commission's view on pressure retaining containment…] The last paragraph of SFR-DC 16 clarifies the expectation for pressure retaining characteristics of SFR designs. Also, the words in the first sentence of the criterion "and its primary cooling system," are appropriate and need not be changed or removed.
56	Industry/NEI	SFR-DC 16	Under rationale, statement that "all past, current, and planned SFR designs use a high strength, low-leakage, pressure-retaining containment concept" seems broader than can be substantiated without knowledge of all planned designs. **Suggested Change** Delete "and planned"	The NRC staff agrees with this comment. Change was incorporated.
57	DOE/Lab	MHTGR-DC 16	**Functional Containment Policy Issue**	**Functional Containment Policy Issue**

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			Discussions of Commission policy decisions on functional containment need to be worded carefully. For the modular HTGR, a policy decision is not needed regarding the general acceptability of applying a functional containment (radionuclide retention) approach that differs from a conventional LWR high-pressure, low-leakage structure. However, based on the SRM to SECY-03-0047, a policy decision is needed regarding the performance criteria to be applied to a functional containment. The information located in the MHTGR-DC 16 rationale correctly states that a policy decision regarding functional containment performance requirements and criteria will be needed. It's noted that containment performance criteria for LWRs are provided in 10 CFR 50 Appendix J, rather than in the GDC of Appendix A. The last two sentences in the rationale for ARDC 16 should be deleted. **Functional Containment Language** ARDC 16 should discuss "functional containment" with the MHTGR-DC	The NRC staff does not agree with this comment. The rationale for MHTGR-DC 16 states that the Commission has found the concept of functional containment acceptable, "The NRC staff has brought the issue of functional containment to the Commission, and the Commission has found it generally acceptable, as indicated in the staff requirements memoranda (SRM) to SECY 93 092 (Ref. 8) and SECY 03 0047 (Ref. 9)." The rationale goes on to indicate that the Commission instructed the staff to "…develop performance requirements and criteria working closely with industry experts (e.g., designers, EPRI, etc.) and other stakeholders regarding options in this area, taking into account such features as core, fuel, and cooling systems design," and directed the staff to "submit options and recommendations to the Commission for a policy decision." This is language taken directly from the SRM to SECY 03-0047. The last sentence of ARDC 16 will be deleted. **Functional Containment Language**

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			referring to the ARDC. See ARDC 16 team comment. **Functional Containment Performance Standard** The NRC staff notes in the next-to-last rationale paragraph that the staff has provided feedback to DOE on the use of a functional containment as part of its review of the NGNP. The rationale should also note that the NRC staff also stated in its assessment report that it finds the DOE proposed performance standard for the modular HTGR functional containment to be reasonable. This performance standard ensures the integrity of the fuel particle barriers rather than to allow significant fuel particle failures and then to rely extensively on other mechanistic barriers. **Suggested Change** Reword the rationale to clarify what policy decisions have been made and what decisions need to be made. Delete last two sentences of the rationale.	The NRC staff does not agree with this comment. See NRC resolution to ARDC 16 comment No. 55 **Functional Containment Performance Standard** The NRC staff does not agree with this comment. Although the NRC staff noted that the DOE proposed performance standard for the modular HTGR functional containment is reasonable in the NGNP feedback, this was never brought before the Commission.
58	Industry/NEI	ARDC 17	**Appendix A, ARDC 17, Page A-4** Clarify "A reliable power system is required for SSCs during postulated accident conditions" to apply to SSCs whose safety performance relies on electric power	The NRC staff agrees with this comment. Change was incorporated.

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			Suggested Change Modify to: "A reliable power system is required for SSCs during postulated accident conditions when those SSCs' safety functions require electric power."	
59	Industry/NEI	ARDC 17	The following text is confusing: "The existing single switchyard allowance remains available under ARDC 17. If a particular advanced design requires the use of GDC single switchyard allowance wording, the designer should look to GDC 17 for guidance when developing PDC." **Suggested Change** Suggest rewording to: "The single switchyard allowance under GDC 17 is not eliminated because of the changes in ARDC 17; if a particular advanced design …"	The NRC staff agrees with this comment and has removed the text related to the single switchyard allowance.
60	Industry/NEI	ARDC 17	ARDC 17 states the safety function for the electrical systems "shall be to provide sufficient capacity, capability, and reliability to ensure that…vital functions that rely on electric power are maintained in the event of postulated accidents." The scope of "vital functions" is unclear. For example, it is unclear if the independent and diverse means of shutdown	The NRC staff agrees with this comment. ARDC 17 was modified to clarify functions that rely on electric power during postulated accidents and to address the use of electrical power for the performance of the prescribed safety functions.

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			prescribed by ARDC 26 paragraph 2 is considered such a vital function. Further, the Rationale for ARDC 17 states "If electrical power is not required to permit functioning of SSCs important to safety, the requirements in the ARDC are not applicable to the design. In this case, the functionality of SSCs important to safety must be fully evaluated and documented in the design bases." The requirements of ARDC 17 are related to performance of the prescribed safety functions (e.g., sufficient redundancy "to perform their safety functions"). Accordingly, it appears the appropriate test for applicability of ARDC 17 is whether electrical power is required to perform the specifically prescribed safety functions, not the functioning of SSCs important to safety more generally. **Suggested Change** Revise ARDC 17 with respect to the postulated accident safety function, or clarify the scope of "vital functions" with the Rationale. Revise the Rationale discussion on applicability of ARDC 17 to address the	

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			use of electrical power for the performance of the prescribed safety functions.	
61	Industry/NEI	SFR-DC 17	Editorial: "The existing single switchyard allowance remains available under ~~ARDC~~SFR-DC 17…" **Suggested Change** As indicated. However, also refer to comment on ARDC 17 suggesting rewording of this rationale discussion.	The NRC staff agrees with this comment. Change was incorporated.
62	Industry/NEI	MHTGR-DC 17	Editorial: "The existing single switchyard allowance remains available under ~~ARDC~~ MHTGR-DC 17…" **Suggested Change** As indicated. However, also refer to comment on ARDC 17 suggesting rewording of this rationale discussion.	The NRC staff agrees with this comment. Change was incorporated.
63	DOE/Lab	ARDC, SFR-DC, MHTGR-DC 17	The team commends the NRC for this criterion adaptation. The adaptation provides increased flexibility for designers and license applicants as they pursue enhanced margins of safety and the use of simplified, inherent, passive, or other innovative means to accomplish safety and security functions, consistent with the Commission's policy on advanced reactors.	Positive comment, no change required.

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			This positive comment also applies to the corresponding SFR-DC-17 and modular HTGR-DC-17. **Suggested Change** Positive comment, no change suggested.	
64	DOE/Lab	ARDC, SFR-DC, MHTGR-DC 17	**Use of the Word "Systems"** Based on the ACRS discussion of 02/22/17, we might wish to request increased clarity on what is intended when the plural "systems" is used with respect to duplicate and independent power supply. As written now, multiple independent systems are more implied rather than explicitly stated in the design criterion. **Suggested Change** None provided.	The NRC staff agrees with this comment. These design criteria and the rationale were modified to clarify "systems."
65	DOE/Lab	ARDC, SFR-DC, MHTGR-DC 18	**Rationale Wording Inconsistency** Paragraph two of the rationale refers to the deletion of words in GDC 18 pertaining to additional system examples, but there do not appear to be any such deletions from the text of the criterion. **Suggested Change** Remove the second sentence in the rationale.	The NRC staff does not agree with this comment. The last sentence of ARDC, SFR-DC and MHTGR-DC 18 was modified from the original GDC as shown below: "…and the transfer of power among ~~the nuclear power unit, the offsite power system and the onsite power~~ systems." This is what the second paragraph of the rationale is referring to.
66	Industry/NEI	ARDC 19	**Appendix A, ARDC 19, Page A-6**	The NRC staff does not agree with this comment. Remote operation of

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			This criterion presumes that operator action is required and that operator actions, including monitoring, must be performed from a single location (i.e., a control room). **Suggested Change** Consideration should be given to an applicant demonstrating that operator action, including monitoring, is not required for safety, and/or that any necessary actions, including monitoring, could be demonstrated to be feasible from additional and/or redundant and/or remote locations.	reactors requiring no operator action or monitoring may be subject to a policy decision by the NRC. Applicants can propose a non-traditional means of controlling the plant as part of the PDC and application.
67	Industry/NEI	ARDC 19	**Appendix A, ARDC 19, Page A-6** The way the text is written still appears to assume some fundamental, legacy needs in a power plant. None of this makes sense if operators have literally zero ability to influence the safety of the plant because it is physically inherent (note: not to be confused with "inherent" safety as defined by the IAEA, which requires no decay heat) **Suggested Change** As with some other sections, frame with "As applicable to plant design:"	The NRC staff does not agree with this comment. Elimination of the requirement for a control room may be subject to a Policy decision by the NRC. Applicants can propose a non-traditional means of controlling the plant as part of the PDC and application.

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68	Industry/NEI	ARDC 19	Delete "as defined in § 50.2" as this is implicit in all of the GDC statements. **Suggested Change** Delete "as defined in § 50.2"	NRC does not agree with this comment. Reference to § 50.2 appears in GDC 19 and was included in ARDC 19 as well.
69	Industry/NEI	ARDC 25-28	**Appendix A, ARDC 25 through 28, Page A-7** It appears assumed that control/protection systems are required for reactivity control. It also assumes that the ultimate reactivity protection mechanism is still an active function. This assumption is not necessarily true for all designs. The term "system" indicates active/designed to us. As with some other sections, frame with "As applicable to plant design:" **Suggested Change** As with some other sections, frame with "As applicable to plant design:"	The NRC staff does not agree with this comment. ARDC 26, which replaces GDCs 26 and 27, has been rewritten to state that either a system or means of reactivity control can be used. No changes to ARDCs 25 and 28 are necessary. The suggested change, "as applicable to plant design" is true of all ARDCs because the applicant can submit plant specific PDCs. Also, the staff envisions that many non-LWR designs will have an active means of adding positive reactivity to account for fuel depletion (e.g., control rods, dilution, reflector movement, or fuel additions) whose failure could add positive reactivity, which is addressed by ARDC 25 for AOOs and ARDC 28 for postulated accidents.
70	Industry/NEI	ARDC 26	**Appendix A, ARDC 26, Page A-7** (1) Capability (1) is specific to having a means to shut down the reactor in regularly occurring situations. The move from specified acceptable fuel design limits to fission product barriers	With the exception of the section regarding design basis events, the NRC staff does not agree with this comment. No change is proposed because the staff is not able to define appropriate margin based on the possible number

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			is a significant improvement towards technology neutrality, enabling accurate safety assessment of both more conventional fuel forms with more complex fuel forms including liquid fuel forms on the same basis. That being said, there was concern that there are some possible components considered as fission product barriers could fail without significant impact to safety. Therefore, words were added to ensure that the focus is on only those fission product barriers that are safety related. (2) Many industry comments included reasoning that two independent means for shutting down the reactor and maintaining shutdown may not be needed, especially for reactor types that have natural or passive means for shutdown as the primary means. In addition, the requirement for two fully independent means both capable of achieving and maintaining shutdown does not seem to be the standard for LWRs.	of different advanced reactor reactivity mechanisms and their associated failure modes. The staff notes GDCs 26 and 27 are explicit in stating that the appropriate margin is a stuck rod(s). Also, GDC 26 states that one of the reactivity mechanisms shall use control rods. Therefore, determination of a specific failure mechanism, a stuck rod(s), could be defined. Appropriate margin should be addressed on a case by case basis. (1) The current GDCs do not address safety versus non-safety related. Therefore, for consistency with the current GDCs, the ARDCs will not specify safety versus non-safety related and no change to the ARDC 26 will be made. The staff does agree that safety-related fission product barriers are those credited in determination of offsite dose consistent with the definition of 10 CFR 50.2. (2) Staff agrees with using anticipated operational occurrences and postulated accidents instead of design basis events. This change will be made in the RG.

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			This presents the simplest wording that allows for reactors with inherent or passive shutdown fundamental to the physics of the system to make a justification that a second means would be superfluous. It also allows for reactors to make a probability risk assessment to make a similar justification. The wording change from "design basis events" to "anticipated operational occurrences and postulated accidents" is taken from the NRC's Rationale and ensures that what is being referred to is clearly outlined terminology in the regulation. (3) The requirement of subcriticality may not be the most appropriate measure of safe shutdown. For example, it has been demonstrated in various reactor types that a safe, long term shutdown could be achieved naturally without rods or coolant even if brief moments of criticality occurred. (see "Secondary shutdown systems of Nuclear Power Plants," ORNLNSIC-7, January 1966). Wording was taken directly from the NRC	GDC 26 states that two independent reactivity control systems of different design principles shall be provided. ARDC 26 is written consistent with GDC 26 as two systems are still required even if one is inherent or passive. The staff notes that both the PRISM and MHTGR had inherent reactivity mechanisms but also retained a secondary means of achieving shutdown through the use of control rods. Therefore, the proposed modification to ARDC 26 to allow for one reactivity mechanism will not be incorporated. ARDC 26 (1) has been revised such that safe shutdown is achieved and maintained during an AOO. ARDC 26 (3) states that following an AOO or postulated accident shutdown is maintained. The combination of ARDC 26 (1) and (3) allow for a temporary re-criticality during a postulated accident consistent with the licensing basis of some PWRs. ARDC 26 (1) and (3) should be accomplished using safety-related SCCs. (3) The reactor should be subcritical, with appropriate margin, under conditions so corrective actions on

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			Rationale to expand the capability to account for such a capability in certain designs. With the addition of the phrase "appropriate margin for malfunctions," it is important that the subjective phrase be defined by NRC. This wording is an attempt to define "appropriate margin" with options for both deterministic and risk-informed scenarios for malfunction. Depending on the reactor type, it may be preferred to utilize the simplicity of a deterministic approach. There also may or may not be enough data to utilize a risk- informed approach. For others, a risk-informed approach may more accurately determine appropriate margin. The previous metric of maintaining fission product barriers is kept as the primary metric in this measurement of margin. The definition could be: (1) A single active failure must not result in exceeding design limits for safety related fission product barriers, or (2) The probability for a malfunction of the means must not be greater than the frequency for AOOs. If the probability is greater	SCCs or normal refueling operations can occur. The assumption is that the requirements of ARDC 26 (3) are met before preceding to conditions of lower pressure and/or temperatures (i.e., conditions) at which corrective actions or refueling can take place. Therefore, no change to ARDC 26 (4) will be made.

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			than the frequency for postulated accidents by an order magnitude or more, that malfunction must not result in exceeding design limits for safety-related fission product barriers. **Suggested Change** Define "Appropriate Margin" AND Change wording to the below (red italics indicates changed wording, red indicates added wording) Reactivity control systems shall include the following capabilities: (1) A means of shutting down the reactor shall be provided to ensure that, under conditions of normal operation, including anticipated operational occurrences, and with appropriate margin for malfunctions, design limits for safety-related fission product barriers are not exceeded. (2) A means of shutting down the reactor and maintaining a safe shutdown in *anticipated operational occurrences and postulated accidents*, with appropriate margin for malfunctions, shall be provided. If the primary means for shutdown is not inherent, passive, or shown to have a probability of failure an order of magnitude less than that of	

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			postulated accidents, a second means of reactivity control shall be provided that is independent, diverse, and capable of achieving and maintaining safe shutdown both for anticipated operational occurrences and postulated accidents. (3) A system for holding the reactor subcritical in the long term or in an equilibrium condition naturally achieved by the design under cold conditions shall be provided.	
71	Industry/NEI	ARDC 26	The second to last paragraph of the ARDC 26 rationale states: "The second sentence of ARDC 26(2) refers to a means of achieving and maintaining shutdown that is important to safety but not necessarily safety related. The second means of reactivity control serves as a backup to the safety-related means and, as such, margins for malfunctions are not required but the second means shall be highly reliable and robust (e.g., meet ARDC 1 -5)." The distinction between the terms "important to safety" and "safety-related" is not properly defined. To avoid	The NRC staff does not agree with this comment. ARDC 26 (2) is consistent with the second reactivity system of GDC 26. The requirement of having a second, backup shutdown system has been eliminated. Only one safety-related or a combination of safety-related means (SSCs) are needed to achieve and maintain shutdown for AOOs (ARDC 26 (1)) and maintain shutdown following an AOO or postulated accident (ARDC 26 (3)).

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			confusion, the statement should be revised. **Suggested Change** Recommend restating the rational to say: "The second sentence of ARDC 26(2) refers to a ~~means of achieving and maintaining shutdown that is important to safety but not necessarily safety related. The second~~ means of reactivity control <u>which</u> serves as a backup to the ~~safety-related~~ primary means and, as such, margins for malfunctions are not required but the second means shall be highly reliable and robust (e.g., meet ARDC 1-5)."	
72	Peter Smith	ARDC 26	ARDC 26, Reactivity Control Systems. ARDC 26 replaces "specified acceptable fuel design limits" with "design limits for fission product barriers." Why is "specified acceptable fuel design limits" not similarly replaced throughout the ARDC? **Suggested Change** None provided.	The NRC staff does not agree with this comment. This change is specific to ARDC 26. It would not be appropriate to change this throughout the ARDC.
73	Industry/NEI	SFR-DC 26 SFR-DC 27	GDC 26 and GDC 27 requirements are: • Two independent reactivity control systems of different design principles shall be provided.	The NRC staff does not agree with this comment Since SFR-DC 26 is the same as ARDC 26, this comment will therefore refer to ARDC 26.

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			• One of the systems shall use control elements and be capable of reliably controlling reactivity changes to assure that under conditions of normal operation, including anticipated operational occurrences (AOOs), and with appropriate margin for malfunctions such as stuck control elements, specified acceptable fuel design limits are not exceeded. • The second reactivity control system shall be capable of reliably controlling the rate of reactivity changes resulting from planned, normal power changes to assure acceptable fuel design limits are not exceeded. • One of the systems shall be capable of holding the reactor core subcritical under cold conditions. • The reactivity control systems shall be designed to have a combined capability of reliably controlling reactivity changes to assure that under postulated accident conditions and with appropriate margin for stuck	The first bullet is addressed by ARDC 26 (2), which states that an independent and diverse method is used for reactivity control. As stated in the ARDC 26 (2) rationale discussion, "The term "independent and diverse" indicates no shared systems or components and a design which is different enough such that no common failure modes exist between the system or means in ARDC 26 (2) and safety-related systems in ARDC 26 (1) and (3)." Regarding the second bullet, no changes are necessary as ARDC 26 (1) preserves the same requirements as GDC 26. Regarding the third bullet, the revised ARDC 26 (2) reverts back to the original reactivity requirement of the second reactivity system in GDC26, namely, controlling the rate of reactivity changes resulting from planned, normal power changes to assure acceptable fuel design limits are not exceeded. Addressing the fourth bullet, the word "cold" has been replaced with conditions which allow for interventions such as fuel loading, inspection and repair as there is no consistent

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			control elements the capability to cool the core is maintained. • Current BWRs and PWRs in the US have two independent systems for controlling reactivity through movement and positioning of control rods. To attain the desired core power level and power distribution during normal operation, one reactivity control system is used to position control rods to compensate for reactivity due to changes in temperature and fuel burnup. BWRs also used core flow and PWRs also use boration to help control reactivity during normal operation. To ensure all safety criteria are met during AOOs and DBAs, a second reactivity control system is used to provide rapid, full insertion of all control rods (scram). The circuitry and hardware used to move the control rods are completely independent for the two reactivity control systems. The reactivity worth of the control rods is sufficient to ensure reactor shutdown when the rods are fully inserted by either control system for BWRs. For PWRs, control rod insertion and boration ensure reactor shutdown.	definition of cold conditions for non-LWR designs. Addressing the fifth bullet, the revised ARDC 26 (1) and (3) replace the words "reliably controlling reactivity" in GDCs 26 and 27 with a quantitative requirement of achieving and maintaining shutdown during and following AOOs and maintaining shutdown following AOOs and postulated accidents. Consistent with the current licensing basis of some PWRs, re-criticality during a postulated accident would be allowed if adequate heat removal capability is available. The rationale associated with ARDCs 26 (3) describes the conditions which define following an AOO or postulated accident.

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			US LWRs have implemented design features to provide an alternate method for reactor shutdown in the event that the reactivity shutdown system (scram) fails. For PWRs, alternate control rod insertion methods in the event of scram failure have been implemented (same control rods as normal scram, but an independent method for inserting the rods). For BWRs, standby liquid boron injection systems are used to provide an alternate method for reactor shutdown. These alternate means to shut down the reactor are required to meet 10CFR50.62 requirements. Note, these alternate means of shutdown are for a beyond design basis event and the requirements are not addressed in the GDC. Requirement differences with NRC SFR-DC 26: • Item (1) of SFR-DC 26 changes "specified acceptable fuel limits" to "design limits for fission product barriers". Challenges to primary coolant boundary or containment boundary are addressed in other GDCs. Change is not necessary, but does not add new requirement.	

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			• Item (2) of SFR-DC 26 changes the requirement to "provide capability to cool the core" during "postulated accidents" to "maintaining a safe shutdown under design basis events". The reactivity control system requirement has been extended from ensuring core damage does not prevent core cooling to including other aspects (e.g. heat removal from primary system) of safe shutdown. Additional requirements to achieve safe shutdown are addressed by other GDCs. The term "design basis events" is not used in the GDCs. • Item (2) of SFR-DC 26 adds the requirement to have a second independent shutdown system for design basis events. 10CFR does not require a second independent shutdown system for design basis events. 10CFR requires an alternate means of shutdown for beyond design basis events (10CFR50.62). • SFR-DC 26 eliminates the requirement that the reactivity control system for normal operation reactivity control be	

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			independent from the reactivity control system used for shutdown (scram). **Suggested Change** Recommend retaining GDC 26 and 27 unchanged as SFR-DC 26 and SFR-DC 27. GDC 26 and 27 are applicable for currently licensed and operating LWRs. The reactivity control requirements currently in place for LWRs are sufficient for SFRs.	
74	Industry/NEI	MHTGR-DC 26	The existing GDC includes the wording "specified acceptable fuel design limits", while the proposed MHTGR-DC does not include the replacement "specified acceptable system radionuclide release design limits" wording. The wording that "design limits for fission product barriers are not exceeded" is imprecise and moves the intent from maintaining fuel design limits to fission product barriers. The rationale describes: "Additionally, "specified acceptable fuel design limits" is replaced with "design limits for fission product barriers" to be consistent with the AOO acceptance criteria." This appears to be inconsistent with other design criteria which include SARRDLs. See proposed MHTGR-DC 10, 17, 20, and 25.	The NRC staff agrees with this comment. MHTGR-DC 26 (1) was modified to reflect the AOO design criteria associated with MHTGR DC 10 (SARRDLs) and MHTGR DC 15 (Helium pressure boundary).

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			Suggested Change Recommend establishing consistency between MHTGR-DC 26 and other design criteria mentioned.	
75	DOE/Lab	ARDC, SFR-DC MHTGR-DC 26	The original GDC 26 language was unnecessarily confusing and the staff's proposed revision of ARDC 26-27 offers greater clarity of underlying safety intent. Generally speaking, the team agrees that the revised structure of ARDC 26 is a significant improvement. This positive comment also applies to the corresponding SFR-DC 26 and MHTGR-DC 26. **Suggested Change** Positive comment, no change suggested.	Positive comment, no change required.
76	DOE/Lab	ARDC, SFR-DC MHTGR-DC 26	**Important to Safety** The term "important to safety" is almost universally understood to mean safety-related in the context of the GDC and ARDC. ARDC 1-5, referenced in the phrase "…highly reliable and robust (e.g., meet ARDC 1-5)" most often refer to "safety functions," strongly implying safety systems. The DOE/INL ARDC report (December 2014) defined "important to safety" as follows: "Based on existing 10 CFR 50 Appendix A language, this designation refers to structures,	**Important to Safety** The NRC staff does not agree with this comment. Safety-related is a subset of Important to Safety. Specific examples include the PWR chemical and volume control system (CVCS) system that is used to satisfy GDC 33, "Reactor Coolant Makeup," and the second reactivity control system of GDC 26 that, "shall be capable of reliably controlling the rate of reactivity changes resulting from planned, normal power changes (including xenon burnout) to assure acceptable fuel design limits are not

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			systems, and components (SSCs) that provide reasonable assurance the facility can be operated without undue risk to the health and safety of the public. SSCs with this designation are safety related and are relied upon to remain functional during design basis accidents. Undue risk is associated with the inability to ensure the capability to prevent or mitigate the consequences of accidents which could result in offsite radiological consequences exceeding the limits set forth in 10 CFR 50.34 (or 10 CFR 52.79)." **Suggested Change** Within the scope and context of the GDC, "important to safety" is equivalent to safety related. Therefore, it is recommended that the subject paragraph in the rationale be reworded to avoid potential contradiction with the common usage of the term throughout the GDC and ARDC. **ARDC Scope Changes** Item (1) seems to have a narrower focus than the GDC, focusing more on shutdown capability than on reactivity	exceeded.". Many plants' CVCS systems are not credited to prevent or mitigate an AOO or postulated accident. In these cases, the CVCS system and the second reactivity control system are "important to safety," but not "safety-related." **ARDC Scope changes** The NRC staff does not agree with this comment. ARDC 26 (2) has been revised to maintain consistency with the second reactivity system of GDC 26. The requirement of having a second, backup shutdown system has been eliminated. Only one safety-related or a combination of safety-related means (SSCs) are needed to achieve and maintain shutdown for AOOs (ARDC 26 (1)) and maintain shutdown following an AOO or postulated accident (ARDC 26 (3)). The term fission product barriers was added to ARDC 26 to address reactors without mechanical fuel limits (i.e., SAFDLs) such as liquid fueled reactors. Adding fission product barriers is not an extension of requirements, because ARDC 15 requires that the reactor coolant system be designed withstand normal operations including AOOs.

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			control and does not appear to reflect the requirement of GDC 26 to have two reactivity control systems for controlling reactivity for normal operations and AOOs. In addition, Item (2) of this combined design criteria requires two independent and diverse means of achieving and maintaining safe shutdown under design basis conditions whereas GDC 27 seems to allow a collective and combined capability. The existing rationale does not explicitly explain the apparent scope changes that occurred in the transition from the original GDC language to the current ARDC 26 language. ARDC 26 Item (1) also included the replacement of "specified acceptable fuel design limits" with "design limits for fission product barriers." The discussion in the rationale and the NRC staff presentation of February 22, 2017, indicate that the focus of this change is on both the fuel and the reactor coolant boundary. Addition of the reactor coolant boundary is an increase in scope from GDC 26 relative to what needs to be protected from failure during normal operation and AOOs. This change is inconsistent with	MHTGR-DC 15 and MHTGR-DC 26 refer to maintaining the helium pressure boundary for initiating events that may not include small failures of the pressure boundary (e.g., failure of instrument or sample lines). Rather, these DC refer to preventing failures which substantially reduces the helium pressure boundary's effectiveness as a fission product barrier, if so credited, and would prevent preserving a passive coolable geometry. Determining the event classification of breaks associated with small lines connected to the helium coolant boundary is outside the scope of this task. The term "fission product barrier" does not include functional containment. The rationale of ARDC 26 notes that ARDC 15, "Reactor coolant system design," provides the appropriate design limits for the reactor coolant boundary. Also, the staff does not envision an AOO event of sufficient severity which would challenge functional containment. SFR-DC 26 is identical to ARDC 26. In MHTGR-DC 26, the term "design limits of fission product barriers" was replaced with terms from MHTGR design criteria MHTGR-DC 10 (SARRDL) and

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			the fact that some AOOs could involve failure of fission product barriers (e.g., failure of instrumentation lines, sample lines, etc.). Furthermore, nothing is provided in the rationale to prevent future interpretations of the language as also encompassing the reactor containment for those designs that use a traditional approach to containment. **Suggested Change** The rationale should be revised to include an explanation for the apparent scope changes. In addition, a change in the title, such as Reactivity Control System Shutdown Capability, would better align the ARDC and its title. All of these points need clarification. **Safe Shutdown, Cold Conditions Terminology** Suggested alternative to cold conditions for SFR DC 26. Use the definition of subcritical under cold conditions comes from the work on GIF SFR design criteria. Subcritical under cold conditions is defined as the state with the reactivity of the reactor kept to a margin below criticality under a prescribed coolant temperature condition in which interventions	MHTGR-DC 15 (helium pressure boundary). The helium pressure boundary criteria was explicitly included because the pressure boundary should not fail due to an initiating AOO such as reactivity or loss of normal heat removal event. MHTGR-DC 26 (1) has been explicitly written to denote the helium coolant pressure boundary and not the reactor functional containment – see the response to Comment 74. **Safe Shutdown, Cold Conditions** Agree. ARDC 26 (4) has been reworded to: "A system for holding the reactor shutdown under conditions which allow for interventions such as fuel loading, inspection and repair." **ARDC Development References** The NRC staff does not agree with this comment. The use of ARDC development references were primarily used to determine the safety function of the second reactivity system in GDC 26. The revised ARDC 26 (2) is consistent with the second reactivity in GDC 26

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			such as fuel reloading, periodic inspection and repair work in the reactor can be achievable. This is very similar to cold conditions for LWRs if the prescribed temperature condition is < boiling at atmospheric pressure. This might work for the MHTGR; if so, it could be used in ARDC since it will work for fluid fueled MSRs as well. It would avoid the confusion of "cold" for these high temperature systems. **Suggested Change** Consider using the definition of "subcritical under cold conditions" for all design criteria **ARDC Development References** The first paragraph of the rationale notes that the development of ARDC 26 was informed by a number of references. Most of these references preceded the current version of the GDC. **Suggested Change** An explanation of how these older references supported the changes from the current GDC would be helpful.	which is SAFDL preservation under planned, normal power changes. **Use of Design-Basis** Agree. "Design basis" will be replaced with "AOO and postulated accident" consistent with the rest of the ARDC language. **Common Cause Failures** The NRC staff does not agree with this comment. No change is necessary. The rationale states that secondary reactivity system (or mechanism) should be designed such that a common failure mode does not exist with the safety related system(s) needed for ARDC 26 (1) and (3). **Achieving Cold shutdown** The NRC staff does not agree with this comment. No change is necessary. Only one of the two reactivity systems specified by ARDC 26 needs to be capable of achieving shutdown conditions that allow for interventions such as fuel loading, inspection and repair; but, a third reactivity system is not precluded. **Basis for Operational Requirement** The NRC staff does not agree with this comment. No change necessary as the

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			Use of "Design-Basis Event" Language It is not clear why the wording "design-basis event conditions" is used explicitly in item (2) whereas "postulated accidents" is used consistently for the rest of the ARDC/SFR-DC/MHTGR-DC sets. **Suggested Change** Either correct or explain inconsistency. **Common Cause Failures** Suggest changing the Rationale discussion regarding "diverse" from "…different design than the safety related means" to "different design not subject to common cause failures." **Suggested Change** Suggest changing the Rationale discussion regarding "diverse" from "…different design than the safety related means" to "different design not subject to common cause failures." **Definition of Cold Shutdown** Item (2) specifies "safe shutdown" whereas item 3 specifies "reactor being subcritical under cold conditions." Safe shutdown state is defined in the rationale	requirement for a reactivity control system necessary to preserve the fission product barriers has been included in the revised ARDC 26 (2).

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			but a definition of "cold shutdown" is also needed (confusion might arise for some systems if the coolant is frozen at room temperature). **Suggested Change** Suggest including a sentence in the rationale that "cold conditions" imply temperatures at which refueling, inspections, and repair functions can be performed. **Achieving Cold Shutdown** It is not clear if item (3) calls for a third system/mechanism to render the reactor subcritical. **Suggested Change** A paragraph should be added in the rationale to clarify that the safety-related shutdown system is expected to achieve safe shutdown; but "cold shutdown" can be achieved by either a safety or non-safety shutdown system. **Basis for Operational Requirement** The reference should be provided where the staff identified the requirement that the third sentence of GDC 26 is	

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			considered to be an operational requirement and not relevant as a DC. **Suggested Change** The reference should be provided where the staff identified the requirement that the third sentence of GDC 26 is considered to be an operational requirement and not relevant as a DC.	
77	DOE/Lab	MHTGR-DC 28	The deletion of the list of postulated reactivity accidents, leaving each design to determine its list of postulated reactivity accidents, is a very good change. **Suggested Change** Positive comment, no change suggested.	Positive comment, no change required.
78	Industry/NEI	MHTGR-DC 29	With the inclusion of AOOs within MHTGR GDC 20, 25, and 26, it is recommended that this GDC is duplicative and can be deleted. **Suggested Change** Delete MHTGR-DC 29	The NRC staff does not agree with this comment. ARDCs 20, 25, 26, and 29 are related to the Protection and Reactivity Control Systems. The protection requirements are covered by ARDC 20 and 25, and the reactivity controls are covered by ARDC 26. GDC 29 is related to protection against AOOs. AOOs are explicitly described in ARDC 20 and 26. The specific intent for GDC 29 is to design the protection and reactivity control systems in such a way that a safety function would be accomplished in the event of an AOO.

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79	Industry/NEI	SFR-DC 30	Similar comment as the one for SFR-DC 14. The definition of the primary coolant boundary includes the cover gas boundary. A cover gas leakage would lead to very limited safety consequences (no impact on the fission process, no impact or limited radiological consequences). This allows for safety valves on the cover gas system to limit abnormal pressure on the reactor vessel. On the other hand, the failure of the reactor vessel could have very severe consequences (e.g. reactivity insertion, failure of the core coolability). **Suggested Change** It is therefore proposed to state that “Each component~~s~~ that ~~are~~ is part~~s~~ of the primary coolant boundary shall be designed, fabricated, erected and tested ~~to the highest quality standards practical~~ with high quality standards, consistent with its safety significance.”	The NRC staff does not agree with this comment. See response to Comment no. 45
80	DOE/Lab	MHTGR-DC 30	The NRC staff’s addition of the last sentence to this criterion is an excellent improvement. **Suggested Change** Positive comment, no change suggested.	Positive comment, no change required.

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81	DOE/Lab	ARDC 31	**Concern Regarding "Coolant Chemistry"** Item (2) adds "…and coolant chemistry" to material property considerations. This creates a degree of uncertainty. The justification identifies "unique potential coolants" as a concern but "chemistry" infers a reactive property. Does this include secondary/tertiary reaction product interactions decedent from some initial "coolant chemistry"? Are coolant contaminants considered in the criterion? "Coolant chemistry" could be interpreted as a scope expansion and is unnecessary given ARDC-14 requirements. **Missing Words** Proposed ARDC language seems to accidentally drop the highlighted words in item (2) **"The design shall reflect consideration of service temperatures, service degradation of material properties…"** These words properly appear in SFR-DC 31 and GDC 31. **Suggested Change** None provided.	**Concern Regarding "Coolant Chemistry"** Staff agrees. GE Hitachi submitted an informal public comment related to SFR-DC 31, which stated, in part: "GEH recommends adding requirements for coolant chemistry and service degradation of properties, creep, fatigue, and stress rupture to address unique concerns of CRBRP because of the high design and operating temperatures of the primary coolant boundary and the use of sodium as the coolant under NUREG-0968." Based on this comment, the staff added the phrase "coolant chemistry" to ARDC 31, SFR-DC 13, and MHTGR-DC 31 since each reactor type has high design and operating temperatures, and unique coolants. The staff's addition of the phrase "coolant chemistry" was intended to include the current composition of the coolant including fission products and contaminants. Based on this formal public comment the staff proposes changing ARDC 31

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				to clarify the initial intent. The staff proposes revising ARDC 31 to state: "(2) the effects of irradiation and coolant composition, including contaminants and reaction products, on material properties," The staff proposes changing ARDC 31 rationale to state: "Specific examples are added to the MHTGR-DC to account for the high design and operating temperatures, coolant composition, contaminants, and reaction products." The staff proposes changing SFR-DC 31 to state: "(2) the effects of irradiation and coolant composition, including contaminants and reaction products, on material properties" The staff proposes changing SFR-DC 31 rationale to state: "Specific examples are added to the SFR-DC to account for the high design and operating temperatures, coolant composition, contaminants, and reaction products." **Missing Words**

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				The staff agrees with the second part of the comment and added as ARDC 31 contains the words "consideration of" so that ARDC 31 will state, "The design shall reflect consideration of service temperatures, service degradation of material properties…" which is consistent with GDC 31 and SFR-DC 31.
82	DOE/Lab	MHTGR-DC 31	**Coolant Chemistry** The staff has added "coolant chemistry" to item (2) in the criterion, and the second paragraph of the rationale refers to "unique potential coolants." The working fluid in the modular HTGR is helium, which is chemically inert. Concerns regarding "coolant chemistry" in HTGRs pertain to the effects of contaminants on material properties. **Suggested Change** Item (2) in the criterion should be changed to, "(2) the effects of irradiation and helium contaminants on material properties," The last three words of the rationale should be replaced with, "potential helium contaminants".	Agree. See response to Comment no. 81
83	DOE/Lab	ARDC 32, SFR-DC 32	**Addition of the word "Functional"** For the replacement of "testing" with "functional testing"; information should be	**Addition of the Word "Functional"** Functional testing is testing that assesses component and system

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			added to the rationale to explain the intent behind the addition of the word “functional.” The word is not included in GDC 32. What kind of functional testing is intended? What is the rationale for the addition of this word? **Suggested Change** None provided.	operational readiness such as required in the ASME OM Code as incorporated by reference in 10 CFR 50.55a and in Plant Technical Specifications. Functional testing was added to ARDCs 32, 37, 40, 43, 46; SFR-DCs 32, 37, 40, 43, 46, 77; and MHTGR-DCs 32, 37, 46
84	DOE/Lab	ARDC, SFR-DC, MHTGR-DC 32	**Addition of the Word “Functional”** Replacement of “testing” with “functional testing”; information should be added to the rationale to explain the intent behind the addition of the word “functional.” The word is not included in GDC 32. **Suggested Change** The rationale for the criterion (and for the ARDC and SFR criteria) does not address this change in wording and does not explain what is intended by “functional testing.” Either an explanation should be provided in the three rationales or, preferably, the word “functional” should be deleted. **“Leaktight” vs. Allowable Leakage** The inclusion of the words “and leaktight” in the criterion is not necessary when “structural integrity” is sufficient to describe the requirement. The allowable	**Addition of the Word “Functional”** The NRC staff does not agree with this comment. Functional testing is testing that assesses component and system operational readiness such as required in the ASME OM Code as incorporated by reference in 10 CFR 50.55a and in Plant Technical Specifications. **“Leaktight” vs. Allowable Leakage** The NRC staff does not agree. GDC 32, and the other related GDCs, have a requirement of inspecting and testing the RCS to ensure structural and leaktight integrity. There is no current industry definition of “structural integrity” of a piping system. Leak tightness is a critical part of the philosophy of defense-in-depth. For an LWR plant, operational leakage within the Plant Technical Specifications is

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			leak rate for a given design should be one of the acceptance criteria for the test for "structural integrity." **Suggested Change** The words "and leaktight" should be deleted here and in the ARDC and the SFR versions of this criterion.	permitted with understanding that the system will be returned to leak-tight conditions during the next outage. For the MHTGR specifically, the helium pressure boundary may still be part of the functional containment and therefore credited in limiting radionuclide release. Therefore, the quality and leak tightness of the reactor helium pressure boundary may still serve a safety function. If the primary system is treated as a barrier for radionuclide retention than the baseline of the system should be leak-tightness. A specific vendor can provide justification on the safety function of the helium pressure boundary that would impact the design and inspection requirements For advanced reactors, a leak may represent a significant safety hazard in a way different than LWRs. Because none of the design criteria specify requirements on the heat transfer medium for the systems, a leak in these system may contaminate the reactor coolant or containment environment. If a SFR or MHTGR containment had a

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				significant amount of water due to a leak, an accident event may result in sodium fires or failure of the TRISO fuel beyond that which is expected.
85	Industry/NEI	SFR-DC 33	The goal of GDC 33 is that the cooling function of the primary heat removal system shall not be impacted during normal operation by primary coolant inventory loss due to leakage from the primary coolant boundary and rupture of small piping or other small components which are part of the boundary. For SFRs specifically, the primary concern is ensuring primary coolant inventory is sufficient to maintain the cooling function for the primary heat removal system. This ensures specified acceptable fuel design limits are not exceeded. **Suggested Change** Replace the phrase "specified acceptable fuel design limits are not exceeded" with the phrase "the cooling functions of the primary heat removal system and the residual heat removal system are not impacted". To eliminate redundancy, delete the phrase "for protection against small breaks in the primary coolant boundary".	The NRC staff does not agree with this comment. The NRC staff believes that ensuring the cooling functions of the primary and residual heat removal systems serve the same purpose as ensuring that SADFL are not exceeded. The proper measure for adequacy of the cooling function is meeting the SAFDL.

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86	Industry/NEI	SFR-DC 34	SFR-DC 34 deleted reference to postulated accidents (e.g. DBAs) without an explanation in the rationale section. **Suggested Change** Explain the reasoning for SFR-DC 34 being for normal operations and AOOs, similar to the explanation provided for SFR-DC 35.	The NRC staff does not agree with this comment. No change is necessary. SFR-DC 34 addresses SAFDL protection consistent with the current GDC 34. SFR-DC 35 addresses residual heat removal under postulated accident conditions. The staff acknowledges that a single residual heat removal system can be used to satisfy both SFR-DC 34 and DC 35. This comment also applies to ARDC 34 and 35.
87	DOE/Lab	MHTGR-DC 34	**Passive vs. Active Residual Heat Removal** To ensure that the first line of the criterion is not interpreted as requiring that the residual heat removal system operate passively during normal operations and AOOs, the first paragraph of the rationale should note that the system may operate actively for heat removal during normal operations/AOOs, but that it shall operate passively during postulated accidents. **Suggested Change** Note in the first paragraph of the rationale that the system may operate actively for heat removal during normal operations/AOOs, but that it shall operate passively during postulated accidents.	**Passive vs. Active Residual Heat Removal** The NRC staff does not agree with this comment. The word "passive" was added, based on the definition of an MHTGR. The system may operate actively during normal operations but must operate passively during AOOs and postulated accidents. In definitions Section 3.1 of the DOE report titled "Guidance for Developing Principal Design Criteria for Advanced (Non-Light-Water) Reactors" (Ref. 17), it is noted that the MHTGR design has a low power density and hence residual heat is removed by a passive system. **Effective Core Cooling**

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			Effective Core Cooling In the second paragraph of this criterion, NRC staff has changed the words "effective cooling" submitted by DOE/INL to "effective core cooling." DOE/INL used the words "effective cooling" because it is not just the core that needs to be effectively cooled during postulated accidents, but also structural components such as the core barrel and the reactor vessel. Effective cooling for these components is needed to ensure that a passively coolable geometry is maintained. **Suggested Change** Remove the word "core" from "effective core cooling". To explain the basis for changing "effective core cooling" to "effective cooling", the following paragraph should be added to the rationale: The modular HTGR residual heat removal system protects the integrity of the core, the core structural components, and the reactor vessel when needed under postulated accident conditions, thereby helping to ensure that the geometry required for passive heat removal is maintained. Therefore,	Agree. The second paragraph has been modified to read: During postulated accidents, the system safety function shall provide effective cooling. Additionally Rationale will be modified to read: Effective cooling under postulated accident conditions is defined as maintaining fuel temperature limits below design values to help ensure the siting regulatory dose limits criteria at the exclusion area boundary (EAB) and low-population zone (LPZ) are not exceeded and the integrity of the core, the core structural components, and the reactor vessel is maintained under postulated accident conditions, thereby ensuring a geometry required for passive heat removal. **Rationale for Ultimate Heat Sink** Staff does not agree with this comment. Although MHTGRs do not have a cooling water system, the function that the system provides, structural and equipment cooling, may still be needed. MHTGR-DC 44-46 were included in DG-1330 as a reminder for reviewers to

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			"effective core cooling" was replaced with "effective cooling" to reflect the broader range of necessary cooling provided by the system during postulated accidents. **Rationale for Ultimate Heat Sink** The second paragraph of the rationale, which explains the basis for adding the words "ultimate heat sink" to the criterion, is taken from the rationale for ARDC 34 that was provided in the original DOE/INL submittal. As it is written here, the second paragraph is tied to the possible need for a system like that addressed in GDC 44. In the case of the modular HTGR version of the criterion, "ultimate heat sink" was added to the criterion by DOE/INL only for consistency with the ARDC and completeness, and the second paragraph was intentionally not included by DOE/INL in the modular HTGR DC 34 rationale. The paragraph was not included because modular HTGRs, unlike LWRs, SFRs, and possibly other advanced non-LWRs, do not have or need a system that corresponds to the Cooling Water System that is required by GDC 44. The staff seems to have incorrectly assumed that the paragraph was omitted in error by	verify that this function is accomplished in the design. Also, the MHTGR-DC states that, "…systems to transfer heat from structures systems and components to an ultimate heat sink shall be provided, **as necessary**…" **Definition of Effective Core Cooling** Agree. See Effective Core Cooling above.

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			DOE/INL and that the paragraph needs to be added to tie into a system like that addressed in GDC 44. **Suggested Change** Delete the second paragraph from the modular HTGR rationale, and Criterion 44 and its associated criterion for inspection, etc. should be listed as "Not Applicable to the modular HTGR." **Definition of Effective Core Cooling** The next to last paragraph of the rationale provides a definition of "effective core cooling under postulated accident conditions." It is not clear why the staff has added this paragraph here but not done so in the ARDC or in the SFR DC. For the modular HTGR, effective cooling is not just a matter of fuel temperature, but also of time at temperature. As it is written, this paragraph could be interpreted by future regulators as requiring a specific temperature limit, or a "design value," under accident conditions. Such a requirement would not be an accurate reflection of the effects of fuel temperature on coated particle fuel performance.	

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			Suggested Change Delete the second to the last paragraph of the rationale should be deleted (preferred), or define effective cooling in the ARDC and SFR DC versions of Criterion 34.	
88	Industry/NEI	ARDC 35	ARDC 35 states "A system to provide sufficient emergency core cooling shall be provided. The system safety function shall be to transfer heat from the reactor core such that effective core cooling is maintained and fuel damage is limited." Regarding the addition of the words "and fuel damage is limited" to the first paragraph of the criterion, the rationale does not provide guidance for how these new words (which reflect an expansion relative to GDC 35) should be interpreted or why they have been added. The added words are ambiguous when considering (1) to what level should fuel damage be limited? (2) What are the appropriate measures of fuel damage? (3) How would fuel damage be interpreted for a molten salt reactor or for a modular HTGR? **Suggested Change**	The NRC staff agrees with this comment. See resolution to number 90.

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			It appears that the cited ARDC 35 text expands the scope of the existing GDC, and is therefore outside of the scope of this ARDC effort. Absent further information regarding the intent of these words, it is recommended that they be deleted from the criterion.	
89	DOE/Lab	ARDC 35, SFR-DC 35	**Reference to Fuel Damage** Regarding the addition of the words "and fuel damage is limited" to the first paragraph of the criterion, the rationale does not provide guidance for how these new words (which reflect an expansion in scope relative to GDC 35) should be interpreted or why they have been added. The added words are ambiguous when considering (1) to what level should fuel damage be limited? (2) What are the appropriate measures of fuel damage? (3) How would fuel damage be interpreted for a molten salt reactor or for a modular HTGR? It appears that the cited ARDC 35 text expands the scope of the existing GDC, and is therefore outside of the scope of this ARDC effort. Absent further information regarding the intent of these words, it is recommended that they be deleted from the criterion.	The NRC staff agrees with this comment. See resolution to number 90.

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			ARDC Missing Words Proposed ARDC language seems to accidentally drop the following highlighted words: "The system safety function shall be to transfer heat from the reactor core **at a rate** such that effective core cooling is maintained. **Suggested Change** None provided.	
90	Industry/NEI	SFR-DC 35	For SFRs, the residual heat removal system may be all that is required to provide adequate heat removal during postulated accidents. SFR-DC 34 is specified as being applicable for normal and AOO conditions. However, residual heat removal will also be necessary for postulated accident conditions and should be addressed in SFR-DC 35. The draft SFR-DC 35 added "and fuel damage is limited". Other than maintaining effective core cooling, the meaning of this statement is not clear – what is being prevented by limiting the fuel damage? Suggest using wording similar to that used in GDC 35; that is use "…. such that fuel and clad damage that could interfere with continued effective	NRC staff agrees with this comment. ARDC 35 will be modified to read: "A system to assure sufficient core cooling during postulated accidents and to remove residual heat following postulated accidents shall be provided. The system safety function shall be to transfer heat from the reactor core during and following postulated accidents such that fuel and clad damage that could interfere with continued effective core cooling is prevented." The statement, "and the design conditions of the primary system boundary are not exceeded" was not included as SFR-DC 35 and ARDC 35 allow for coolant makeup (injection) if

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			core cooling is prevented…." instead of "…. such that effective core cooling is maintained and fuel damage is limited …". SFR-DC 35 does not address protection of the primary coolant system boundary. Add "…and the design conditions of the primary system boundary are not exceeded." **Suggested Change** Replace the first paragraph of SFR-DC 35 with the following paragraph: "A system to assure sufficient core cooling during postulated accidents and to remove residual heat following postulated accidents shall be provided. The system safety function shall be to transfer heat from the reactor core during and following postulated accidents such that fuel and clad damage that could interfere with continued effective core cooling is prevented and the design conditions of the primary system boundary are not exceeded."	the primary system boundary fails similar to the current LWR LOCA.
91	DOE/Lab	MHTGR-DC 35	**Suggested Rationale Wording Change** The decision to classify Criterion 35 as not applicable to the modular HTGR is correct. However, the rationale cites the reactor power density and the core	The NRC staff agrees with this comment. Change was incorporated.

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			length-to-diameter ratio as the reasons that maintaining helium inventory is not needed. The power density and core geometry are only two of the reasons that might be listed. Others include, but are not limited to, high graphite heat capacity and the high temperature capability of the fuel and the graphite. **Suggested Change** Rather than trying to list all of the factors that apply, it would be better to revise the first sentence of the rationale as follows: "In the MHTGR design maintaining the helium inventory is not necessary to maintain effective cooling." Note that this suggested wording also deletes the word "core," consistent with the comment on the rationale for modular HTGR DC 34.	
92	DOE Lab	MHTGR-DC 36	**Editorial Comment** **Suggested Change** In the first line of the criterion, the word "system" should be inserted between the words "removal" and "shall."	The NRC staff agrees with this comment. Change was incorporated.
93	Industry/NEI	MHTGR-DC 36	Add the word "system" after residual heat removal. **Suggested Change** Add the word "system" after residual heat removal.	The NRC staff agrees with this comment. Change was incorporated.
94	Industry/NEI DOE/Lab	SFR-DC 36 & 37	The title of these SFR-DC refers to the "residual heat removal system." The text	The NRC staff agrees with this comment. Change was incorporated.

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			that follows refers to the emergency core cooling system. While a single system may be provided to perform both residual heat removal and emergency core cooling functions, it would be logical for the title and the text to use the same nomenclature to describe the system. **Suggested Change** Revise title of SFR-DC 36 to Inspection of emergency core cooling system. Revise title of SFR-DC 37 to Inspection of emergency core cooling system.	
95	DOE/Lab	ARDC 37	**Use of the Word "Leaktight"** "Leaktight" standards may not be necessary for certain advanced reactor SSCs, but keeping this word in the criterion infers expectation of leaktight capability. Determination of the degree to which a system is "leaktight" should be subject to acceptance criteria that are appropriate for each reactor technology. **Suggested Change** The words "and leaktight" should be deleted. **Title Change** Title should read "Testing of ~~residual heat removal~~ emergency core cooling system."	**Use of the Word "Leaktight"** The NRC staff does not agree with this comment. Same response as Comment 84. **Title Change** Agree. This change was made to ARDC, SFR-DC, and MHTGR-DC 37, and ARDC, SFR-DC, and MHTGR-DC 36 related to "inspection" of emergency core cooling system. **Connection Between Defense in Depth and System Leakage** The NRC staff does not agree with this comment. Same response as Comment 84.

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			Suggested Change As noted. **Connection Between Defense in Depth and System Leakage** Additional clarification is needed in the rationale to explain the criterion that a non-leaktight system may be acceptable if "defense in depth is not impacted by system leakage." This clarification applies to other criteria (e.g., ARDC 40, 43, and 46) that address defense in depth. **Suggested Change** None provided.	
96	DOE/Lab	MHTGR-DC 37	**Leaktight vs. Allowable Leakage** As in MHTGR-DC 32, the inclusion of the word "leaktight" in the criterion is not necessary when "structural integrity" is sufficient to describe the requirement. The allowable leak rate for a given design should be one of the acceptance criteria for the test for "structural integrity." In particular, for the air-cooled variant of the RCCS, the system is open and not leaktight at all. **Suggested Change**	**Leaktight vs. Allowable Leakage** The NRC staff does not agree with this comment. Same response as Comment 84. **Air-Cooled vs. Water-Cooled RCCS** The staff agrees with this comment. The staff will add "if applicable" and delete the words in MHTGR-DC 37 that follow: "relied upon during postulated accidents…" The staff modified MHTGR-DC 37 as follows:

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			The words "and leaktight" should be deleted here and in the ARDC and the SFR versions of this criterion. **Air-Cooled vs. Water-Cooled RCCS** Item (3) of the criterion addresses the full operational sequence that brings the RCCS into operation, which is intended to include the transition from the normal active operating mode to the passive operating mode. The DOE/INL suggested text for this criterion included the words "if applicable" with this part of the criterion, but those words were omitted by the NRC staff. The words were proposed because there are two possible designs of the RCCS. The air-cooled design operates passively both during normal operating conditions and during postulated accident conditions. There is no transition such as that intended to be described under Item (3) of the criterion. The water-cooled design variant, on the other hand, operates actively during normal operation and AOOS and operates passively during postulated accident conditions, so a transition such as that intended to be described under Item (3) of the criterion is applicable. **Suggested Change**	"(3) the operability of the system as a whole and, under conditions as close to design as practical, the performance of the full operational sequence that brings the system into operation, including associated systems, and, if applicable, any system(s) necessary to transition from active normal operation to passive mode for AOO or postulated accident decay heat removal to the ultimate heat sink. **Removal of Text from Rationale** Agree. The staff modified the 4th paragraph in the rationale of MHTGR-DC 37 to convey that "including operation of associated systems" means testing any auxiliary or secondary systems needed to perform the passive residual heat removal function.

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			Edit the beginning of the criterion item (3) to read as follows: "the operability of the system as a whole and, if applicable, under conditions as close to design as practical, the performance of the full operational sequence…" It appears from the words at the end of the third paragraph of the rationale for this criterion that the NRC staff intended to include the words "if applicable" in the criterion, but they were inadvertently omitted. **Removal of Text from Rationale** Also, at the end of Item (3), the NRC staff has added wording at the end of the item, relative to the DOE/INL proposed language, regarding "operation of applicable portions of the protection system and the operation of the associated structural and equipment cooling water system." These words are not included in either the ARDC or SFR versions of Criterion 37, so the reasons for adding them only to the modular HTGR version of the criterion are not clear. The protection system does not play a role in operation of the RCCS. Furthermore, as noted in comments above on modular HTGR DC 34, modular HTGRs, unlike LWRs, SFRs, and possibly other advanced non-LWRs, do	

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			not have or need a system that corresponds to the Cooling Water System that is required by GDC 44. **Suggested Change** All words at the end of the criterion that follow “relied upon during postulated accidents” should be deleted. It appears from the fourth paragraph of the rationale for this criterion that at one time there was also reference to “power transfers,” which are also not applicable to operation of the RCCS, which does not rely on electric power for its operation. The fourth paragraph of the rationale should also be deleted.	
97	DOE/Lab	MHTGR-DC 38	The conclusion of the NRC staff that these criteria are not applicable to the modular HTGR is appropriate. This comment also applies to MHTGR-DC 39 through MHTGR-DC 43. **Suggested Change** Positive comment, no change suggested.	Positive comment, no change required.
98	DOE/Lab	ARDC, SFR-DC 40, 43, 46	**Use of the Word “Leaktight”** “Leaktight” standards may not be necessary for certain advanced reactor SSCs but keeping it in the criterion infers	**Use of the Word “Leaktight”** The NRC staff does not agree with this comment. Same response as Comment 84

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			expectation of leaktight capability. Leaktight should be interpreted as a structural integrity element and subject to functional testing in that capacity. Determination of the degree to which a system is "leaktight" should be subject to acceptance criteria that are appropriate for each reactor technology. **Suggested Change** The words "and leaktight" should be deleted	
99	DOE/Lab	ARDC 41, SFR-DC 41	**Additional Wording** First paragraph should end as "… to ensure that containment integrity and other safety functions are maintained." If the intent is to exempt SFR-DC 41 from the requirement for "other safety functions," then "Same as ARDC" phrase should be removed. **Suggested Change** Add "and other safety functions are maintained," to the end of the first paragraph	The NRC staff agrees with this comment. Change was incorporated.
100	Industry/NEI	SFR-DC 44	The opening sentence is confusing. **Suggested Change** The opening sentence needs to be revised to make its meaning clearer.	The NRC staff agrees with this comment. Sentence was changed to, "A system to transfer heat from structures, systems, and components important to safety to an ultimate heat sink shall be provided, as necessary, to transfer the combined heat load of

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				these structures, systems, and components under normal operating and accident conditions."
101	Industry/NEI	ARDC 45	Clarify "important" refers to "important to safety" **Suggested Change** Change to "The structural and equipment cooling systems shall be designed to permit appropriate periodic inspection of <ins>safety related</ins> components, such as heat exchangers and piping, to ensure the integrity and capability of the systems."	The NRC staff does not agree with this comment. The term "safety related" is not used in the original GDCs or in the non-LWR design criteria. The language from the original GDC, "important components," will be retained.
102	Industry/NEI	ARDC 45	Clarify applicability to SSCs with a safety function **Suggested Change** Change to "~~The structural~~ <ins>Safety Related structural</ins> and equipment cooling systems shall be designed…"	The NRC staff does not agree with this comment. The term "safety related" is not used in the original GDCs or in the non-LWR design criteria. The language from the original GDC, "structural and equipment cooling systems," will be retained.
103	DOE/Lab	MHTGR-DC 44, 45, 46	**Cooling Water Systems** As noted in comments on modular HTGR DC 34 and 37, modular HTGRs (unlike LWRs), SFRs, and possibly other advanced non-LWRs, do not have or need a system that corresponds to the Cooling Water System that is required by GDC 44. The DOE/INL comment in this regard on MHTGR-DC 34 offers a possible explanation of why NRC staff seems incorrectly to believe otherwise.	The NRC staff does not agree with this comment. Although MHTGRs do not have a cooling water system, the function that the system provides, structural and equipment cooling, may still be needed. MHTGR-DC 44-46 were included in DG-1330 as a reminder for reviewers to verify that this function is accomplished in the design. Also, the MHTGR-DC states that, "…systems to transfer heat from

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			The addition of the words "as necessary" to the criterion is helpful, but relative to the language in the rationale for this criterion, every design that is consistent with the definition of the modular HTGR contained in the DOE/INL submittal is designed such that the RCCS provides indefinite core cooling capability. **Suggested Change** Criteria 44, 45, and 46 should be marked as "Not Applicable to the modular HTGR."	structures systems and components to an ultimate heat sink shall be provided, **as necessary**…"
104	Industry/NEI	ARDC 50	Editorial: "The example at the end of subpart 1 of ~~the ARDC~~ GDC 50 is LWR specific…" **Suggested Change** As indicated.	The NRC staff agrees with this comment. The last sentence in rationale is modified accordingly.
105	Industry/NEI	SFR-DC 52	SFR structures are sensitive to pressure and it may be chosen to avoid high pressure elevation in the containment design during leakage rate testing, in order to preserve the facility and prevent undesirable over or under pressurization risks during those tests. It may be chosen to perform those tests at a pressure below the containment design pressure, in order to extrapolate them at the containment design pressure (in this case	The NRC staff agrees with this comment. Change was incorporated. "Same as ARDC" is removed since the SFR-DC 52 now deviates from ARDC-52.

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			the relevance of the extrapolation will of course have to be justified). **Suggested Change** We propose to state that: "The reactor containment structure and other equipment that may be subjected to containment test conditions shall be designed so that periodic integrated leakage rate testing can be conducted to demonstrate resistance at containment design pressure".	
106	Industry/NEI	SFR-DC 54	As indicated in criterion 57, an isolation of lines penetrating the reactor containment structure may not be required in some cases. This could for example could apply to the intermediate heat transport system penetrating the reactor containment (provided adequate justification is given). **Suggested Change** To ensure coherency of the text, this could be reflected in the Criterion 54: "Piping systems penetrating the reactor containment structure shall be provided with leak detection, isolation if necessary and containment capabilities (…)"	The NRC staff does not agree with this comment. SFR-DC-54 is written to provide the designer the opportunity to present the safety case without containment isolation valves and the associated need for testing.
107	Industry/NEI	SFR-DC 56	Why is "Isolation valves outside containment…" deleted? It's not deleted in 55. It appears from the wording that the intent was that this phrase NOT be	The NRC staff agrees with this comment. It appears that this paragraph was deleted accidentally. It was added back in.

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			deleted from SFR-DC 56. Deletion may have been unintentional. **Suggested Change** Add the wording to SFR-DC 56.	SFR-DC 56 applies to instrumentation lines etc. Therefore, its primary purpose is to assure the containment integrity. The paragraph is intended to provide that assurance.
108	Industry/NEI	ARDC 50-57 SFR-DC 50-57	In several cases, the word "reactor" is removed from "reactor containment" in recognition that containment is a barrier between the fission products and the environment, yet "reactor containment" is retained in several other cases. (As an example, ARDC 57 and SFR-DC differ in this regard) reactor (LWR) containment. **Suggested Change** Consider removing "reactor" for consistency or explain the distinction.	The NRC staff agrees with this comment. The word "reactor" has been removed from ARDC 50-57.
109	DOE/Lab	MHTGR-DC 50-57	The conclusion of the NRC staff that these criteria are not applicable to the modular HTGR is appropriate. This comment also applies to MHTGR-DC 51 through MHTGR-DC 57. **Suggested Change** Positive comment, no change suggested.	Positive comment, no change required.
110	DOE/Lab	SFR-DC 61	**Missing Wording** Following passage seems accidentally dropped from the end: "…confinement, and filtering systems, (4) with a residual heat removal capability having reliability and testability that reflects the importance to safety of decay heat and other residual	The NRC staff agrees with this comment. Change was incorporated.

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			heat removal, and (5) to prevent significant reduction in fuel storage cooling under accident conditions." **Suggested Change** Add missing wording.	
111	Industry/NEI	SFR-DC 70	The first sentence, "If an intermediate coolant system is provided, then the system shall be designed to transport heat from the primary coolant system to the energy conversion system as required," is not required. **Suggested Change** Rewrite the DC to state "If an intermediate cooling system is provided, then the system shall be designed with sufficient margin …"	The NRC staff agrees with this comment. The first sentence of SFR-DC 70 was deleted.
112	Industry/NEI	SFR-DC 72	Sodium freezing may not impact the safety function of all systems. **Suggested Change** Add phrase "...if necessary to ensure that the safety function of the system is accomplished" to the beginning of the first sentence.	The NRC staff agrees with this comment. Sentence was modified as shown in comment #113
113	Industry/NEI	SFR-DC 72	"Heating systems shall be provided for systems and components important to safety, which contain or could be required to contain sodium," could be inferred to	The NRC staff agrees with this comment. Change was incorporated.

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			mean that all systems and components important to safety contain or could be required to contain sodium. **Suggested Change** To minimize confusion, restate as: "Heating systems shall be provided for systems and components that are important to safety~~, which~~ and that contain or could be required to contain sodium."	
114	Industry/NEI	SFR-DC 73	Is the intent of the last sentence to ensure that all sodium systems be in inerted enclosures or guard vessels? Not all plant systems containing sodium need to be in inerted spaces. **Suggested Change** Recommend deleting the last sentence.	The NRC staff agrees with this comment. Sentence was modified as shown in comment #115.
115	Industry/NEI	SFR-DC 73	"Special features, such as inerted enclosures or guard vessels, shall be provided for systems containing sodium." implies a significant hazard exists for any system containing sodium. **Suggested Change** Replace this sentence in its entirety with: "Systems from which sodium leakage constitutes a significant safety hazard shall include measures for protection,	The NRC staff agrees with this comment. Change was incorporated.

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			such as inerted enclosures or guard vessels."	
116	Industry/NEI	SFR-DC 74	Fire protection and mitigation due to sodium water interaction is covered by SFR-DC 3 and SFR-DC 73. **Suggested Change** Delete phase "…, including mitigation of the effects of any resulting fire involving sodium."	NRC does not agree with this comment. The SFR-DC-73 addresses sodium leakage and detection. SFR-DC 3 addresses consideration against fire in general. SFR-DC-74 focuses on sodium-water reaction as a specific safety concern.
117	Industry/NEI DOE/Lab	SFR-DC 75-77	SFR-DC 70 states "The intermediate coolant system to be designed with sufficient margin to assure that (1) the design conditions of its boundary are not exceeded during normal operations and anticipated operational occurrences, and (2) the integrity of the primary coolant boundary is maintained during intermediate coolant system accidents." SFR-DC 75, 76, and 77 are superfluous when evaluated in combination with the cited text from SFR-DC 70. SFR-DC 75, 76, and 77 appear to be applicable when the role of the intermediate coolant system is commensurate with a safety function. However, other than the case when it could serve as a path for decay heat removal, the intermediate coolant system does not have any safety function.	NRC does not agree with this comment. See resolution to comments 122-127

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			If the intermediate cooling system provides a safety-related heat removal capability, then SFR-DC 34-37 and SFR-DC 78 specify its requirements. The quality and fracture prevention requirements specified in SFR-DC 75 and 76 are supplementary requirements that are not consistent with the requirements for the decay heat removal and emergency core cooling systems specified in SFR-DC 34 and 35. Likewise, the inspection and testing requirements specified in SFR-DC 77 for the intermediate cooling system are contained in SFR-DC 36 and 37. Therefore, for the case where the intermediate cooling system provides safety-related heat removal capability, SFR-DC 75, 76, and 77 are redundant and unnecessary. If the intermediate cooling system does not provide safety-related heat removal capability, then only the requirements of SFR-DC 70 are necessary to specify the system design with appropriate margin to assure the design conditions of its boundary and the integrity of the primary coolant boundary. Therefore, for the case where the intermediate cooling system does not provide safety-related heat	

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			removal capability, SFR-DC 75, 76, and 77 are also redundant and unnecessary. **Suggested Change** Recommend deletion of SFR-DC 75, 76, and 77. If SFR-DC 76 is not deleted, it should include wording such as "commensurate with their importance to safety."	
118	Industry/NEI	SFR-DC 78	It is possible that there either be such a configuration or that there be not be enough liquid metal to cause a severe consequence or even a significant consequence due to reactions with either air or water or both, both in terms of the reaction itself as well as consequence to the reactor and safety system functions. Instead of being prescriptive, there needs to be a mechanistic method to determine whether multiple boundaries are necessary. Ultimately, the prescriptive condition for two boundaries is redundant; for both fluids and coolants which are compatible or incompatible, the required conditions should be the same, which are the conditions (1) and (2). So long as there is no failure of the intended safety functions of structures, systems or components important to safety or result in exceeding the fuel design limits, then	NRC does not agree with this comment. See resolution to comments 122-124 and 126

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			the size of the reaction is small enough to justify not needing redundant boundaries. **Suggested Change** Move the first sentence to the end with added wording described below: After "compatible" in the second sentence, add "or incompatible". Add wording to the end to read: "If the primary coolant system interfaces with a structure, system, or component containing fluid that is chemically incompatible with the primary coolant, and cannot meet condition (1) and condition (2), the interface location shall be designed to ensure that the primary coolant is separated from the chemically incompatible fluid by two redundant, passive barriers.	
119	Industry/NEI	SFR-DC 79	The requirement to ensure that "primary coolant sodium limits" are not exceeded as a result of cover gas leakage are already addressed in SFR-DC 71, item (4). **Suggested Change**	The NRC staff does not agree with this comment. SFR-DC 71 is related to maintaining the purity of the primary coolant and cover gas to ensure that the primary coolant sodium limits are not exceeded.

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			Delete SFR-DC 79	SFR-DC 79 is related to the makeup system for the cover gas similar to the makeup system for primary coolant that is described in SFR-DC 33.
120	Industry/NEI	MHTGR-DC 34 MHTGR-DC 71 MHTGR-DC 72	The word "passive" implies that only a passive system is to be provided. Maintaining geometry is needed for both active and passive means of heat removal. Note that proposed new MHTGR-DC 72 does not mention passive (while the rationale does). **Suggested Change** Remove the word "passive"	The NRC staff does not agree with this comment. The word "passive" was used based on the specific definition of an MHTGR. It is not intended to be applicable to a broader class of HTGR designs that may utilize active or passive systems.
121	DOE/Lab	MHTGR-DC 70-72	The wording adopted by the staff for these criteria is correct and consistent with the modular HTGR approach to safety design. This comment also applies to MHTGR-DC 71 and MHTGR-DC 72. **Suggested Change** Positive comment, no change suggested.	Positive comment, no change required.
122	DOE/Lab	SFR-DC 75	SFR-DC-75 implies that the ICS may perform a safety function. What safety functions are envisioned other than the potential decay heat removal path that is covered in SFR-DC 34-37? **Suggested Change** Delete SFR-DC 75	The NRC staff does not agree with this comment. 10 CFR Part 50, 10 CFR Part 52, Regulatory Guides, and NUREGs use the terms "Important to Safety," "Safety Related," "Safety Functions," etc. to discuss specific regulatory requirements and regulatory scope. An applicant may choose to use

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				the ICS system as a heat removal system, but may not choose to credit the ICS system as a RHR or ECCS system. This may be done to add defense-in-depth or to lower the risk of the plant. The term "important to safety" describes a larger scope of systems than just safety-related components. As stated in the November 20, 1981 memo "Standard Definitions for Commonly-Used Safety Classification Terms" (Memo is contained in ADAMS Accession No. ML031150515): Important to Safety is defined as, "Those structures, systems, and components that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public." Additionally, Important to Safety "Encompasses the broad class of plant features, covered (not necessarily explicitly) in the General Design Criteria that contribute in important way to safe operation and protection of the public in all phases and

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				aspects of facility operation (i.e. normal operation and transient control as well as accident mitigation)." Finally, Important to Safety "Includes … safety-related as a subset" As described in SECY-04-109, deterministically evaluated Important to Safety components some share characteristics with risk-informed RTNSS systems. A vendor may decide to credit cooling functions to the ICS as a RTNSS system. In this case, the ICS would be expected to be designed, fabricated, erected, and tested to a quality standard commensurate with the risk-significance of the safety function performed. The staff supplemented the rationale for SFR-DC 75 to further clarify "commensurate with the systems importance to safety."
123	DOE/Lab	SFR-DC 76	SFR-DC-76 does not include the phrase "commensurate with the importance of the safety functions" as SFR-DC-75 and 77 do. Doesn't this exclusion imply that ICS has be a safety grade system even though it may not serve any safety function? If the concern is sodium fires,	The NRC staff does not agree with this comment. The staff intentionally did not include the words "commensurate with the importance of the safety functions" in this criterion.

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			isn't it already addressed in SFR-DC-73 which requires "sodium leakage detection and reaction prevention and mitigation"? **Suggested Change** Delete SFR-DC 76	The verbiage is not intended to imply that the ICS will serve a safety function. The SFR-DC 76 wording implies that the sodium within the system has an inherent relation to the safety of the plant. A sudden rupture of the ICS would result in massive sodium-air, -water, or -concrete reactions and would constitute a risk to the safe operation of the plant and challenge the integrated safety of the plant. The staff asserts that requiring the intermediate system (that is filled with sodium or NaK) to not fail in a brittle manner or rapidly propagate a fracture is necessary engineering practice. The staff modified the rationale for SFR-DC 76 to clarify this. Considering the low pressure and high temperatures of the ICS, typical materials (stainless steels) should have sufficient ductility to meet SFR-DC 76 without modification to ASME/ASTM specifications. The staff does not believe that SFR-DC 73 and SFR-DC 76 overlap. SFR-DC 73 provides criteria for detecting and mitigating leakage of systems. SFR-DC

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				76 ensures that gross failure of the ICS is prevented as part of the design of the plant.
124	DOE/Lab	SFR-DC 77	SFR-DC-77 imposes inspection, testing, and leak detection requirements for the ICS. In what way are these specific ICS requirements differ from the "sodium leakage detection and reaction prevention and mitigation" requirements already covered under SFR-DC-73? **Suggested Change** Delete SFR-DC 77	The NRC staff does not agree with this comment. SFR-DC-73 does not have a requirement for periodic inspections or testing of sodium systems. The staff added, "and identify sodium leakage as practical," to SFR-DC 73 and removed it from SFR-DC 77. SFR-DC 77 will be retained and additional discussion added to the rationale to clarify why inspection, testing and material surveillance is needed.
125	DOE/Lab	SFR-DC 77	The NRC rationale in slide 54 of the August 24, 2017 Public Meeting Slides (ML17233A213 first bullet) seems to suggest a distinction between "safety related" and "important to safety". Can you clarify this distinction? **Suggested Change** None provided	The distinction is stated in the November 20, 1981 memo "Standard Definitions for Commonly-Used Safety Classification Terms" (Memo is contained in ADAMS Accession ML031150515).
126	DOE/Lab	SFR-DC 70	The NRC rationale in slide 54 of the August 24, 2017 Public Meeting Slides (ML17233A213 second bullet) seems to suggest that ICS leakage can "have impact on other aspects (post-accident recovery)." Isn't this concern already	This statement was made to clarify that the ICS system may have other regulatory functions other than those discussed as part of the advanced reactor design criteria. An ICS that is not credited for residual heat removal or

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			addressed in SFR-DC-73 for "sodium leakage detection and reaction prevention and mitigation"? **Suggested Change** None provided	emergency core cooling (which are systems associated with normal, abnormal, and accident conditions) may be credited to reduce risk or increase defense-in-depth. This logic is consistent with the introductory paragraphs of 10 CFR Part 50 Appendix A. SFR-DC 70 only describes functions that the ICS needs to meet during normal, abnormal, and accident conditions.
127	DOE/Lab	SFR-DC 75-77	In general, an ICS leakage (without activated coolant) is an operational concern (unless the ICS performs a decay heat removal function). Do SFR-DC-75-77 imply that any ICS leakage will be treated as a postulated accident? **Suggested Change** Delete SFR-DC 75-77	The NRC staff does not agree with this comment. The staff would need more information on a SFR design to determine the scope of design basis accidents. If ICS leakage would result in a credible challenge to the public health and safety or represent a significant hazard to the environment, then the designer should consider ICS leakage as a postulated accident. However, the staff does not believe that ICS leakage would rise to this level. The safety significance of an individual system does not necessarily determine whether the failure of that system should or should not be considered a postulated accident. LWR designs have

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				postulated accidents which are caused by non-safety systems (flooding, fires, main steam or main feedline breaks, etc.). For a LWR pressurized water reactor, the reactor coolant pump seals have a significant impact on plant safety even though the reactor coolant pumps have limited safety significance. The selection of licensing basis events is outside the scope of this regulatory guide. The staff suggests that interested members of the public should monitor the progress on the following two projects: The NRC is supporting activities related to the Licensing Modernization Project (LMP) being led by Southern Company, coordinated by NEI, and cost-shared by DOE. The NRC is currently reviewing LMP white paper "Modernization of Technical Requirements for Licensing of Advanced Non-Light Water Reactors - Selection of Licensing Basis Events, Draft Report."

Response to Public Comments on Draft Regulatory Guide DG-1330, "Guidance for Developing Principal Design Criteria for Non-Light Water Reactors" Proposed Revision 0 of Regulatory Guide 1.232

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				NRC Non-LWR Vision and Strategy and Implementation Action Plans, Near-Term Strategy 3 includes Contributing Activity No. 3.2: "Determine and document appropriate non-LWR licensing bases and accident sets for highly prioritized non-LWR technologies."