Resolution of Public Comments on DG-1107

(For Proposed Revision 3 to Regulatory Guide 1.82)

	Commentor	ADAMS Accession #
1.	TVA (4)*	ML031200078
2.	John Walker (6)	ML031250073
3.	NEI (33)	ML031250071
4.	Dominion (17)	ML031250065
5.	ENERCON (8)	ML031320481
6.	STAR (4)	ML031400186
7.	Westinghouse (17)	ML031400062

( ) *Number of comments

Total comments received -89

				PUBLIC COMMENTS ON DG-1107 FROM TVA *(Comments 1 of 7)*	
TVA CMT #	Page	Section	Paragraph	Comment	Comment Resolution
1.		C.1.3.1.2 and C.1.3.1.3		The staff specifically notes that certain existing plants cannot meet the regulatory position on containment over pressure. There are a number of other provisions of this draft guide such as C.1.1.1.1 on having multiple sumps that many existing plants do not meet. We believe that a general position statement at the introduction to Section C on the conformance of existing plant designs should be made. Otherwise, each position in Section C needs to provide guidance on alternative positions for current plants.	Introduction to Section C has been added.
2.		C.1.3.2, Debris Sources and Generation General Comment		The positions requiring application of large breaks at essentially all locations in the Reactor Coolant System (RCS) for debris generation based on the requirements of 10 CFR 50.46 is inconsistent with other regulations. The NRC allows the application of leak-before-break (LBB) and the consideration of specific break locations in evaluating the dynamic effects of pipe breaks. The considerations directly affect the design of the Emergency Core Cooling System (ECCS) and, as stated in **§**50.46(b)(4), the requirements for a coolable geometry. Instruments, valves, smaller RCS pipes, other piping inside containment, and cables needed to ensure ECCS signals, or system functions necessary to ensure ECCS performance after hypothetical Loss of Coolant Accidents (LOCAs) are evaluated based on specific break locations or do not have to be evaluated for pipe whip and jet impingement based on LBB considerations. If the requirement for a break anywhere was imposed for jet impingement and pipe whip for equipment required for ECCS to function, system redesigns would be required or pipe whip restraints, and guard pipes would need to be installed to show conformance with **§**50.46. Similarly, almost every Pressurized Water Reactor (PWR) in the United States uses LBB as the basis for limiting hydrodynamic loads on the fuel to ensure a coolable core geometry as required by **§**50.46. Given that debris generation is clearly a dynamic effect of a pipe break and other features of ECCS design do not require double-ended breaks for dynamic effects, the requirements of this section should be revised to allow the same treatment. If this position is retained without modification, it is likely that some utilities will conclude that the addition of guard pipes or pipe restraints will be necessary to reduce the amount of debris generation to a level that can be accommodated even with large sump screens. This is a step backwards in risk and in regulation.	No change is made to the staff position on LBB as documented in a letter to Westinghouse Owners Group, dated June 9, 2000. Staff Position is that GDC 4 is not applicable to LOCA-generated debris. NRC is in receipt of an NEI request to consider alternatives to a double ended guillotine break (DEGB) for debris generation, and this is a policy issue that may result in changes to break size used for debris generation.
3.		C.1.1.1.12		Concerning the size of the opening in a fine screen mesh, clearances in pumps and seals can be very small. For many current plants, the screen hole size is larger than the minimum restriction. It was generally believed that tough, hard particles such as	Regulatory position. 1.1.1.12 has been clarified.

				metals would not be transported to the screens. Some hard particles such as paint chips are brittle enough that the pump impeller would chop them up and if they made it to the reactor vessel, then they would drop out in the bottom head. Small soft particles would not damage impellers or seals. Having a screen that has openings smaller than seal or impeller clearances will be on the order of mils. Meshes this fine will have much higher pressure drops than current screens. Sump screen areas may have to be so large that installation is not practical. Also, having very small openings in the fine screens make them more susceptible to plugging than current screen designs. This position should be reconsidered to determine if it can be met given reasonable containment volumes, configurations, and water levels.	
4.		Section D		TVA agrees with the statement that no backfitting is intended with the issuance of this guide. However, the last sentence of this section indicates that the guide will be used to evaluate licensee compliance with **§**50.46. Since this guide will be the basis for compliance with **§**50.46 and it is already known that many current plants do not conform to this guide, then backfitting will result since it will be concluded that plants do not comply with **§**50.46.	Section D has been modified for current operating plants.

				PUBLIC COMMENTS ON DG - 1107 FROM JOHN WALKER *(Comments 2 of 7)*	
Walker CMT #	Page	Section	Paragraph	Comment	Comment Resolution
1.		C.1.1.1.3 C.1.1.1.7		The draft Regulatory Guide appears to prescribe a particular configuration of screens and trash racks (Regulatory Positions 1.1.1.3 and 1.1.1.7) to protect ECCS sump outlets. This same configuration also appears to be implicitly assumed throughout Appendix A to the draft Regulatory Guide. This formulation appears to preclude use of several strainer designs that have been used to resolve ECCS debris blockage concerns in Boiling Water Reactors and which appear to have promise for application to Pressurized Water Reactors. Does the NRC intend to accept ECCS suction strainer designs that vary from the configuration outlined in these Regulatory Positions for use in PWRs?	Position 1.1.1.16 has been added. Clarification is provided in section B.
2.		C.1.1.1.6		The draft Regulatory Guide appears to prescribe trash racks to protect PWR ECCS debris screens from missiles and other large debris (Regulatory Position 1.1.1.6). In the case of PWRs, a torturous path through the containment to the suppression pool was deemed to preclude direct missile impingement on ECCS suction strainers; those strainers were still required to meet a variety of challenging hydrodynamic load conditions along with seismic and operational loads. The physical configuration of equipment and ECCS sump outlets in some PWRs may also impose a torturous path between piping/components containing high energy fluid and ECCS sump outlets that precludes direct missile impingement on ECCS sump outlet screens. Will the NRC give consideration to the existence of torturous paths that would prevent direct missile impingement on ECCS suction screens for some PWRs? Will the NRC develop and publish criteria that it deems adequate to establish whether a given ECCS sump screen is sufficiently remote from structures containing high energy fluid that such trash racks are not required to protect the ECCS sump screen from missile impact loads due to LOCAs or other HELBs?	Regulatory Position 1.1.1.6 has been clarified.
3.		C.1.1.1.14 Appendix A		The draft Regulatory Guide requires consideration of air ingestion and other adverse hydraulic effects (Regulatory position 1.1.1.14 and Appendix A). Some of the strainer designs that appear to have promise for application in PWRs, but which do not conform to the explicit screen and trash rack configuration noted above, may also enhance margin to air ingestion effects. The PWR design guidelines for air ingestion provided in Appendix A do not appear to address the potential benefits of these designs. Does the NRC intend to update Appendix A guidelines for determining vulnerability to air ingestion effects in light of new strainer technology?	A clarification is provided in Section B. There is as yet no consensus as to whether these “advanced” strainer designs can minimize air ingestion or vortexing.

4.		C.1.3.2.2		The draft Regulatory Guide requires consideration of the size and shape of the zone of influence in determining the quantity of debris generated for a PWR by (among others) postulated breaks in reactor coolant system piping, main steam piping, and main feedwater piping. The reactor coolant system of a PWR is normally at significantly higher pressure than the main steam and main feedwater systems; the specific total energy of a unit mass of reactor coolant will be greater than the specific total energy of an equal unit mass of 'main' steam, which in turn will be greater than the specific total energy of a unit mass of 'main' feedwater. This would seem to suggest that the zone of influence for a postulated break in the reactor coolant piping should be larger than the zone of influence for a postulated break in the main steam piping, which in turn should be larger than the zone of influence for a postulated break in the main feedwater piping. Does the NRC intend to scale the size of the zone of influence for debris generation based on the operating pressure or design pressure for a particular system, or based on the specific total energy of the process fluid for that system?	First bullet in Regulatory Position 1.3.2.2 has been modified.
5.		C.1.3.2.6		The draft Regulatory Guide requires consideration of debris in the form of precipitates generated by chemical reactions between high energy fluids released into the containment and other materials inside the containment (Regulatory Position 1.3.2.6). The draft Regulatory Guide does not appear to identify any published references pertinent to consideration of these chemical reactions. Does the NRC intend to publish the results of its studies of chemical reactions between high energy fluids and containment materials? Does the NRC intend to cite public domain references that provide an acceptable methodology for quantifying the amount of precipitates generated by chemical reactions inside containment?	The staff acknowledges that there are no published references pertinent to consideration of these chemical reactions.

6.		References		The draft Regulatory Guide cites numerous NUREG references throughout the document (Part B, Discussion, pages 3-4, 6; Part C, Regulatory Position, pages 13-15; References, pages 23-25). Some of these references (e.g. NUREG/ CR 6224) appear to be currently unavailable from either the Electronic Reading Room or the ADAMS sites. Returning key references to these sites would be helpful. Does the NRC intend to provide Internet access either via the Electronic Reading Room or via ADAMS to key NUREG references cited by draft Regulatory Guide 1.82 Revision 3, either before or in conjunction with final publication of the Regulatory Guide?	No. copies of NUREG can be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC

				PUBLIC COMMENTS ON DG-1107 FROM NEI *(Comments 3 of 7)*	
NEI Cmt	Page	Section	Paragraph	Comments	Comments Resolution
1.				General: Application of Guidance to Expected Modification in Sump Screen Designs The draft guidance, while updated to address the detrimental effects caused by debris accumulation on debris interceptors has not been updated to readily accommodate newer sump screen designs (stacked disc, perforated pipe, etc.) that are specifically designed to address these same detrimental effects. The guidance maintains an unintended preference toward vertical screen designs. The guidance should be revised to address alternative screen designs.	A clarification is provided in Section B,
2.		C.1.1.1.13 C.1.1.1.14		General: Application of Guidance to ECCS and CSS DG-1107 needs a clear explanation of how the ECCS and containment heat removal systems affect the long-term core cooling requirement in 10CFR50.46. A section with definitions and licensing requirements is warranted. Further, DG-1107 needs to clarify differences in requirements for ECCS versus containment heat removal systems. For example, Regulatory Positions 1.1.1.13 and 1.1.1.14 state that the design considerations are applicable to ECCS pumps. While the intent may be to apply them to the containment heat removal pumps, it's not explicit. In other areas of the guide, conditions are placed on analysis requirements for all pumps based on the time of ECCS switchover to the sump, while the containment heat removal systems may take suction from the sump much earlier than ECCS switchover. In general, DG-1107 should distinguish between design and analytical requirements for the sump based on differences in the design and operation of ECCS and containment heat removal systems.	Regulatory Positions 1.1.1.13 and 1.1.1.14 have been modified to include CSS along with ECCS
3.	3	B	1st	The draft guidance states that all potential debris sources should be evaluated for the potential blockage of the debris interceptors. Examples of potential debris sources are provided. The guidance does not address transient debris sources. Plant personnel and their attendant equipment are used to perform work within containment during operation (e.g., operation rounds, radiation protection surveys, emergency maintenance). The guidance should identify that plant personnel and attendant equipment, due to the limited window of exposure, are not addressed as potential debris sources.	Disagree. Dismissal of transient debris sources would be based on risk aspects which have not been otherwise included in this guide.
4.	3	B	1st	The Discussion section provides a list of references that provide additional information relative to the concerns addressed by the regulatory guide. We	Reference to Generic Letter 98-04 has been

				recommend that this list be revised to include Generic Letter 98-04, *Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System After a Loss-of-Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment.*	added.
5.	3	B	2nd	We recommend rewording the last sentence of the paragraph as follows: "Therefore, for advanced PWR and BWR designs, the guidance provided in both the PWR and BWR sections of this regulatory guide ~~*should be considered*~~ that is appropriate and consistent with the plant's design features*, should be considered*."	Last sentence in second paragraph on Page 3 has been reworded.
6.	4	B	6th	The reference to "static" NPSH calculations could be misinterpreted as meaning zero flow conditions. The term "steady state" may be more appropriate for use in this paragraph.	Appropriate changes have been made in Section B, Page 5.
7.	4 & 7	B		1**.**The draft guidance uses the following statement to define NPSH: *The available NPSH is a function of the static head of water above the pump suction, the pressure of the atmosphere above the sump water surface, and the temperature of the pumped water at the suction of the pump.* The statement is not complete and may lead to confusion or misinterpretation. The following is a suggested rewrite to clarify and define available NPSH: Available NPSH is the total suction head available at the pump impeller centerline (or other reference pump location) less the vapor pressure of the liquid being pumped. In the application to long-term recirculation, available NPSH is a function of a) Static head of sump water above the pump impeller centerline (or other reference pump location) b)The containment pressure above the sump water surface c)The vapor pressure of the sump water d)Head loss in the suction piping, including entrance losses at the suction pipe e)Head loss through the sump structure and screens/strainers.	NPSH Definitions has been clarified in Section B, Page 4, and also in Appendix A..
8.	5 9	 C.1.1.1.6	3rd	The guidance states, "Isolation of the ECC sumps from high-energy pipe lines is an important consideration in protection against missiles, and it is necessary to shield the screens and racks adequately from impacts of ruptures high-energy piping and associated jet loads from the break." The guidance also states: The strength of the trash racks should be adequate to protect the debris screens from missiles and other large debris. Trash racks and sump screens should be capable of withstanding the load imposed by expanding jets, missiles… under design-basis flow conditions." While we agree that this is an important consideration, it is possible that design constraints may exist for some plants that would limit or make impractical the	Clarification added in section B and Regulatory Position 1.1.1.6.

				changes necessitated by this guidance to fully isolate or shield the sumps from local dynamic effects of high-energy pipe lines. The guidance should acknowledge the potential for circumstances that would inhibit the strict adherence to the guidance and allow for consideration of the low frequency of rupture of high energy line piping in a manner similar to that which is allowed by GDC-4.	
9.	5 6 9 9	 C.1.1.1.3 C.1.1.1.7	Last Second	Alternate ECC Sump Geometries In a number of instances the guidance appears to focus unnecessarily on a sump design composed of a combination of vertical and horizontal screens. While this is the predominant sump design currently in use by PWR plants, it fails to adequately take into account alternate sump geometries now available for use. The guidance should identify the phenomena and processes that all sump designs need to address and avoid design guidance that is applicable to a subset of sump geometries. Guidance that is applicable to specific sump geometries should be identified as such. The following portions of the draft regulatory guide should be reviewed to ensure that the guidance is appropriate for the broadest possible range of sump designs and geometries: Page 5, last paragraph: *Therefore, in the computation of available interceptor surface area, no credit may be taken for any horizontal interceptor surface unless plant evaluations that adequately account for inherent water source uncertainties demonstrate that the horizontal surface will be submerged at the time of recirculation.* Page 6, second paragraph: *A vertical or nearly vertical inner debris screen located above the containment floor level would minimize the deposition or settling of debris on screen surfaces and thus help to ensure the greatest possible free flow through the fine inner debris screen.* Page 9, Section 1.1.1.3: *The sump outlet should be protected by at least two vertical or nearly vertical debris interceptors.* Page 9, Section 1.1.1.7: *The top of the debris interceptor structures should be a solid cover plate that is designed to be fully submerged after a LOCA and completion of the ECC injection. It should be designed to ensure the venting of air trapped underneath the cover.*	A new paragraph in Section B and a new Regulatory Position 1.1.1.16 have been added to recognize alternate designs.
10.	6		1st	The last sentence of the first paragraph states “credit should only be given to the portion of the sump screen that is expected to be submerged at the beginning of recirculation.” This statement provides no allowance for circumstances in which the level of submergence changes substantially following the beginning of recirculation. The water level in ice condenser containment designs, for example, may continue to increase following initiation of recirculation as a result of continued ice melt.	Appropriate change has been made.

				Provided that a conservative calculation of submergence is provided that accounts for water holdup and delivery, there should be no restriction on the level of submergence as currently stated in the draft guide.	
11.	6		4th	Reference to NUREG 0837 should be NUREG 0897.	Appropriate change has been made.
12.	9	C.1.1.1.3		The last sentence states "A curb should be provided upstream of the trash racks to prevent high-density debris from being swept along the floor into the sump." The guidance would benefit from the addition of desirable characteristics of a debris curb.	Appropriate clarification has been provided in Regulatory Position 1.1.1.3
13.	10	C.1.1.1.11		The Regulatory Position referenced in the last line of this section should be 1.1.4, not 2.1.5.	Reference has been corrected.
14.	10	C.1.1.1.12		Clearances in pumps and seals can be very small. For many current plants the screen hole size is larger than the minimum pump seal restriction. It is generally believed that tough, hard particles such as metals would not be transported to the screens. Some hard particles such as paint chips are brittle enough that the pump impeller would chop them up and if they made it to the reactor vessel they would drop out in the bottom head. Small soft particles would not damage impellers or seals. Having a screen that has openings smaller than seal or impeller clearances will be on the order of mils. Meshes this fine will have much higher pressure drops than current screens. Sump screen areas may have to be so large that it is not practical to install them. Also, having very small openings in the fine screens make them more susceptible to plugging than current screen designs. This position should be reconsidered to determine if it can be met given reasonable containment volumes, configurations, and water levels.	The Regulatory Position 1.1.1.12 has been clarified.
15.	10 11	C.1.1.2.2 C.1.2		The guidance states, *Procedures should be established for using alternative water sources to be activated when unacceptable head loss renders the sump inoperable. The valves needed to align the ECCS with an alternative water source should be periodically inspected and maintained.* This guidance is associated with actions that could be taken in response to a loss of sump operation. Except in cases where a loss of sump operation is assumed as part of the design basis, these actions go "beyond design basis" and should either be removed or clearly identified as recommendations for actions to address conditions that are beyond the design-basis.	Disagree. For current plant this position is not a backfit but a good practice. For future plants it will be part of the design and licensing basis.
16.	12	C.1.3.1.1		The statement "no increase in containment pressure from that present prior to the postulated LOCAs" is not consistent with the licensing basis for subatmospheric	Regulatory Position 1.3.1.1 has been

				containment plants, which can operate as low as 9 psia air partial pressure. This discussion is also inconsistent with Standard Review Plan 6.2.2 and Generic Letter 97-04. GL 97-04 states that NPSH should be based on the assumption that the containment pressure equals the vapor pressure of the sump water. This is consistent with SRP 6.2.2; which states that available NPSH should be determined assuming maximum expected temperature of pumped fluid with atmospheric pressure in containment. This statement should be modified to be consistent with current guidance and plant licensing bases.	clarified.
17.	12	C.1.3.1.3		This section limits credit for operation of pumps in cavitation to time periods equal to or less than the time the pump was run during confirmatory tests. There should be credit for the results of the teardown/inspection results following confirmatory testing. If no abnormal post-test wear or degradation is observed, and no performance related problems are observed, the pump is defensibly not near failure at the end of the test period. Trending/projection of wear or performance should be taken into account in establishing this limit.	Disagree. It is conservative to test for the full duration of the calculated need.
18.	13	C.1.3.2.2		A wide range and variety of materials that have the potential to contribute to the debris source term are used in PWR containments. While it is desirable that key characteristics of potential debris sources (e.g., destruction pressure, size distribution, and minimum transport velocity) be determined experimentally, this would impose a significant experimental burden for materials used in small quantities in containment or materials expected to marginally impact the overall debris loading for ECC sumps. The guidance should provide an allowance for conservative treatment of miscellaneous debris sources.	Clarification has been added to Regulatory Position 1.3.2.2.
19.	13	C.1.3.2.1 C.1.3.2.2		The 1987 revision to General Design Criterion (GDC) 4 in Appendix A to 10 C.F.R. Part 50 allowed the use of leak-before-break (LBB) technology to exclude local dynamic effects such as shock wave and jet impingement from the design basis of qualified piping. Most, if not all, PWR plants have utilized the LBB exclusion of GDC-4 to remove local dynamic effects from the design basis of qualified piping. This allows the exclusion or removal of devices such as pipe whip restraints and jet impingement shields designed to mitigate the impact of these dynamic effects. Section 1.3.2.2 of the regulatory guide calls for the inclusion of these same local dynamic effects for all postulated break locations, irrespective of whether the piping is LBB qualified. Any requirement that calls for local dynamic effects to be returned to the design basis for LBB qualified piping would be a design backfit and subject to the provisions of 10 CFR 50.109. The exclusion of local dynamic effects from the design basis of qualified piping allowed by GDC-4 is not conditional in the sense that it can only be applied to the removal specific hardware devices. As stated in 53 FR 11311,	No change is made to the staff's position on LBB as documented in a letter to Westinghouse Owners Group, dated June 9, 2000. Staff position is that GDC 4 is not applicable to LOCA-generated debris. NRC is in receipt of an NEI request to consider alternatives to a DEGB for debris

				"…local dynamic effects uniquely associated with pipe rupture may be deleted from the design basis of containment systems, structures and boundaries, from the design basis of ECCS hardware (such as pumps, valves, accumulators, and instrumentation), and from the design bases of safety related electrical and mechanical equipment when leak-before-break is accepted" (emphasis added). The Federal Register Notice also stated that "… while functional and performance requirements for containment, ECCS, and EQ remain unchanged under the now effective modification of GDC-4, the design bases for these aspects of facility design have been modified in that local dynamic effects uniquely associated with ruptures in piping which qualified for leak-before-break may be excluded from consideration." Very simply stated, the functional and performance requirements for containment, ECCS and EQ that were retained with the modification of GDC-4 explicitly excludes local dynamic effects associated with ruptures in LBB piping. Local debris generation is a direct consequence of these local dynamic effects. To be consistent with GDC-4, the regulatory guide should incorporate language that acknowledges treatment of debris generation under the LBB provisions of GDC-4. We recommend that section 1.3.2.1 be revised as follows: *"Consistent with the requirements of 10 CFR 50.46, debris generation should be calculated for a number of postulated LOCAs of different sizes, locations, and other properties sufficient to provide assurance that the most severe postulated LOCAs are calculated. <u>In accordance with GDC-4, dynamic effects associated with postulated pipe ruptures (including local debris generation) may be excluded from the design basis when analyses reviewed and approved by the Commission demonstrate that the probability of fluid system piping rupture is extremely low under conditions consistent with the design basis for the piping.</u> Some PWRs may require recirculation from the sump for licensing basis events other than LOCAs. Therefore, plants should review the licensing basis and include potential break locations in the main steam and main feedwater lines as well in determining the most limiting conditions for sump operation."* Additional information on the basis for application of GDC-4 exclusions of local dynamic effects to debris generation were provided by NEI in an October 4, 2002 letter to G. Holahan (Accession Number ML022880011).	generation, and this is a policy issue that may result in changes to break size used for debris generation.
20.	13	C.1.3.2.3		The last bullet defines a minimum uniform thin bed as 1/8-inch of fiber but does not have a supporting technical basis and/or reference to supporting basis. Please add a technical basis/reference to this value and to similar numerical values used throughout the document.	Clarification has been added to Regulatory Position 1.3.2.3.
21.	14	C.1.3.3		This section does not address treatment of floating/buoyant debris. Containment	A new Regulatory

				designs with remote sumps could include “weir” features that protect sump screens from floating debris.	Position 1.3.3.9 has been added.
22.	14	C.1.3.3.4		Section 1.3.3.4 identifies computational fluid dynamic (CFD) simulations as an acceptable analytical approach for predicting debris transport. Section 1.3.3.8 identifies that in lieu of performing a debris transport analysis, it should be assumed that all debris will be transported to the sump screen. While CFD simulations provide one means of predicting debris transport, these simulations are not the only means to conservatively predict debris transport. Section 1.3.3.4 should be revised to acknowledge that other calculational techniques that are properly supported by experimental debris transport data and conservatively predict debris transport behavior are acceptable.	Clarification to Regulatory Position 1.3.3.4 has been added.
23.	15	C.1.3.3.6		This section states “All debris (e.g., fine fibrous, particulates) that is assumed or demonstrated to suspend indefinitely or to sink very slowly should be considered to reach the sump screen.” As worded, the statement is subjective without a definition of “sink very slowly.” Significant settling can occur, and should be credited, in zones with low pool flow velocities. In addition, credit for retention in dead volumes should be acknowledged. The draft guidance addresses only debris that is “demonstrated to suspend indefinitely or to sink very slowly.” This specification should address the full range of debris types and settling characteristics by merely requiring “experimental or analytical evidence of debris water pool settling characteristics credited in the debris transport analysis” similar to what is specified in Section 2.3.2.4.	Regulatory Position 1.3.3.6 has been modified with an intent to provide a conservative approach due to a lack of definitive test data.
24.	15	C.1.3.3.8		Section 1.3.3.8 States “in lieu of performing debris transport analyses, it should be assumed that all debris will be transported to the sump screen.” This is an unnecessarily conservative assumption that does not allow the conservative incorporation of experimental transport data, phenomenological analysis and engineering judgement based upon detailed knowledge of plant design. Similar to the analysis performed in NUREG/CR 6762, conservative debris transport fractions can be determined in a manner that does not require detailed computational fluid dynamic calculations. We recommend that section 1.3.3.8 be revised as follows: “In lieu of performing debris transport analyses, conservative debris transport fractions supported by experimental debris transport data may be used ~~it should be assumed that all debris will be transported to the sump screen.~~”	Regulatory Position 1.3.3.8 has been clarified.
25.	15	C.1.3.4.4		This section states that for partially submerged sumps, credit should only be given to that portion of the screen submerged at the beginning of recirculation. For licensees that are able to show a worst-case accumulation debris rate, credit for subsequent sump water sources (e.g., continued ice melt in Ice Condenser containment designs) should be allowed in determining the area of submerged screen. The licensee is incumbent to provide a time line of head loss over critical points of the post-LOCA	Regulatory Position 1.3.4.4 has been clarified.

				recovery and to demonstrate sufficient NPSH margin exists throughout this time line consistent with Regulatory Position 1.3.1.9.	
26.	15	C.1.3.4.4 Appendix A		Section 1.3.4.4 and Appendix A The draft guidance implies that "credit should be given to the portion of the sump screen that is expected to be submerged at the beginning of recirculation." Guidance provided in Section 1.3.4.4 and the last paragraph of Appendix A are predicated on the assumption that "information and time-dependent pool depths is difficult to obtain." Since time-dependent analysis is required to establish injection-to-recirculation switchover time to begin with, this assumption cannot be accepted as valid. Additionally, event specific time-dependent analysis of water pool level will likely be performed to evaluate potential benefits of specific operator actions or design changes (e.g., containment spray actuation setpoints) that could reduce risk associated with sump screen blockage. We suggest restating Section 1.3.4.4 to simply specify conservative event specific analysis of minimum pool depth when demonstrating a submerged sump condition or crediting increased wetted area. The last paragraph of Appendix A should also be modified consistent with recommended changes to Section 1.3.4.4.	Clarification to Regulatory Position 1.3.4.4 and Appendix A have been added.
27.	22	D		Implementation -- Section D of the guidance states that no backfitting is intended or approved in connection with the issuance of the guidance. Section D also states that the active guide will also be used by the NRC staff to evaluate licensees' compliance with 10 CFR 50.46. Many licensed PWR plants contain design attributes that do not fully conform to the draft guidance. Full conformance with the guidance would necessitate significant design modification. As such, we believe that use of the guidance by NRC staff to evaluate compliance with 10 CFR 50.46 will inevitably raise backfit concerns. NRC has stated an intention to issue generic communications addressing PWR sump performance and compliance with applicable regulations. In anticipation that the guidance provided in DG-1107 will be referenced in support of the generic communications, we reserve the opportunity to supplement our comments following receipt of the planned generic communication.	Section D has been modified for current operating plants.
28.	26 & 27		Fig. 1 & 2	Add descriptive titles to Figures 1 and 2.	Agreed.
29.	28		Fig. 3	The caption for the vertical piping in this figure contains typographical errors.	Agreed.
30.	29 & 30		Fig. 4 & 5	The information provided in these figures is applicable to BWRs. The figure titles should be revised to identify the applicability to BWRs.	Agreed.
31.	A-1	Appendix A	2nd	Appendix A, Add a space between centerline and (s) (e.g., should be centerline (s)).	Agreed.
32.	A-3	Appendix A		Appendix A, Page A-3 refers repeatedly to "sump failure." The considerations of Appendix A	Appendix A. has been revised to include

				affect operation of one or more of the pumps that utilize the containment sump. Each pump will have different requirements for operation and different criteria for "failure." A failure to meet established criteria for one pump would not constitute a failure for all pumps and thus would not be a "sump failure." The terminology for "failure" used in the Appendix should be clarified. Page A-3 uses the term NPSHmargin without a clear definition. Is the term defined as NPSH available (NPSHa) minus NPSH required (NPSHr), where NPSHa already includes all other losses from piping friction, dimensional changes in the pump can, and the sump screens (without debris)? For clarity, the failure criterion may be defined plainly as "NPSH required cannot be satisfied". What does it mean to reach the failure criterion and what kind of time-dependence is applied? While NPSHr may not be satisfied for a short period of time, sump conditions can change enough to shortly return to a positive NPSH margin condition. Regulatory Position 1.3.1.3 allows for credit to be taken for operation of pumps in cavitation for a limited time. If a plant has tested pumps in cavitation and can show that the sump failure criterion was met for a period of time shorter than the test time, then does 1.3.1.3 justify the conclusion that the acceptance criterion for long-term core cooling has been met? Clarify the use of the failure criterion relative to 1.3.1.3. Provide a reference to the technical basis document for the statement "Numerical simulations confirm that an effective head loss across a debris bed approximately equal half the pool height is sufficient to prevent adequate water flow" on page A-3.	clarifications on NPSH margin definitions, sump failure, etc. The approach taken in Appendix A is conservative.
33.	A-4	Appendix A		Appendix A, This section states "…because the most significant debris transport will occur early in the scenario when the pool is shallow, analysis should preferably be based on the pool depth at the time of switchover to ECCS recirculation…". Similar to the comment made on Section 1.3.4.4, licensees that are able to show a worst-case accumulation debris rate, credit for subsequent sump water sources (e.g., continued ice melting for ice condenser containments) should be allowed in determining the area of submerged screen. The licensee is incumbent to provide a time line of head loss over critical points of the post-LOCA recovery and to demonstrate sufficient NPSH margin throughout this time line consistent with Regulatory Position 1.3.1.9.	Clarification has been provided in Appendix A.
				PUBLIC COMMENTS ON DG-1107	

				FROM DOMINION *(Comments 4 of 7)*	
DOM CMT #	Page	Section	Paragraph	Comment	Comment Resolution
1.		A		"Introduction" DG-1107 needs a clear explanation of how the ECCS and containment heat removal systems affect the long-term core cooling requirement in 10CFR50.46. A section with definitions and licensing requirements is warranted. Further, DG-1107 needs to clarify differences in requirements for ECCS versus containment heat removal systems. For example, Regulatory Positions 1.1.1.13 and 1.1.1.14 state that the design considerations are applicable to ECCS pumps. While the intent may be to apply them to the containment heat removal pumps, it's not explicit. Nonetheless, several positions are not clear and the guide overall is not clear on the design distinctions between ECCS and containment heat removal systems. In other areas of the guide, conditions are placed on analysis requirements for all pumps based on the time of ECCS switchover to the sump, while the containment heat removal systems may take suction from the sump much earlier than ECCS switchover. In general, DG-1107 should distinguish between design and analytical requirements for the sump based on differences in the ECCS and containment heat removal systems.	Regulatory Positions 1.1.1.13 and 1.1.1.14 have been modified to include CSS along with ECCS.
2.		B		"Discussion" It's difficult to discern important points from the text. Each major topic should be separated under a heading (e.g., Air Ingestion, Containment Pressure Credit, and Sump Screen Structural Design). Design considerations should be clearly identified rather than embedded in the middle of paragraphs, and direct references to applicable Regulatory Positions in Part C should be included with a cross-reference. The fifth paragraph on page 4 discusses a "credit for the reduction in required NPSH" without providing a baseline fluid temperature that should be used to determine the required NPSH. It should be acceptable for a licensee, with pump head curves based on sufficient test data, to justify the use of a variable NPSH required based on the calculated fluid temperature during the transient, provided that adequate conservatism is included in the analysis. As an example, a licensee should not be forced to use an NPSH required at 100 F when the transient temperatures are above 160 F during the time of minimum NPSH margin. Dominion disagrees with the draft position, but if it is maintained, then DG-1107 should provide an acceptable fluid temperature for determining the base NPSH required for comparison to the results from a transient analysis.	Disagree.

3.		C.1.1.1.4		<u>"Regulatory Position"</u> Item 1.1.1.4: It's not clear how a gradual slope away from the sump would reduce debris if water levels are several feet above the floor and most of the lighter, problematic debris (e.g., fibrous insulation) is in solution. This recommendation may be counterproductive to the primary objective of the floor, which is to slope toward the sump to direct more water to the sump. More technical basis should be provided to justify the trade-off between water flow and debris holdup.	Regulatory Positions 1.1.1.3 and 1.1.1.4 have been clarified.
4		C.1.1.2.2		Item 1.1.2.2: This position has no effect on "Minimizing Debris," which is the objective of this section, and should be relocated. Further, this discussion should not be limited to ECCS, since some plants have spray systems that take suction from the sump and may have to find alternative water.	Sections 1.2 and Regulatory Position 1.1.2.2 have been modified.
5		C.1.1.2		Section 1.1.2 should provide guidance on selecting insulation types (e.g., omit Cal-Sil and fibrous insulation) to minimize the debris head loss, with references to NRC research documents.	Regulatory Position 1.1.1.16 has been added
6		C.1.2		Section 1.2: The last sentence should include any valves that align the recirculation spray system to an alternative water source.	Agreed.
7		C.1.3.1.1		Item 1.3.1.1: The statement "no increase in containment pressure from that present prior to the postulated LOCAs" is not consistent with the licensing basis for subatmospheric containment plants, which could operate as low as 9 psia air partial pressure. The regulatory position should recommend that atmospheric pressure, as a minimum, be used in the NPSH available analysis.	Regulatory Position 1.3.1.1 has been modified
8		C.1.3.1.2		Item 1.3.1.2: The second sentence is confusing and leads the reader to think that 0.01 ft of NPSH margin from a static calculation is an acceptable analytical approach to establish operating limits. Dynamic transient analyses (as recommended in Regulatory Position 1.3.1.9) that produce an NPSH available based on the time-dependent containment conditions should be acceptable, provided the analysis uses conservative assumptions to minimize containment pressure and maximize sump liquid temperature. The second sentence should be replaced with a statement advocating transient analyses to determine NPSH available versus time.	Disagree. Regulatory Position. 1.3.1.2 is clear without modification.
9		C.1.3.2.3		Item 1.3.2.3: The last bullet defines a minimum uniform thin bed as 1/8-inch of fiber but does not have a reference. Please add a technical reference to this value and to similar numerical bases throughout the document.	Regulatory Position 1.3.2.3 has been modified

10		C.1.3.3.4		Item 1.3.3.4: This position recommends CFD simulations "to predict debris transport within the sump pool", but does not specify whether CFD analyses are acceptable for predicting debris transport to the sump, e.g., from upper elevations to the sump area. Please specify the types of phenomena and the transport capabilities that should be modeled with CFD computer codes.	Currently CFD is one of the acceptable methods for predicting containment sump pool debris transport. For airborne and washdown debris transport, other more practical methods are available and acceptable.
11		C.1.3.3.6		Item 1.3.3.6: What is the quantitative threshold for "sink very slowly"? Either debris stays suspended indefinitely or it has the possibility of settling to the floor, depending on flow velocities. Also, some fibrous or particulate debris from upper elevations may be heldup and may not necessarily reach the sump; thus, a generic statement about "all debris" is inappropriate. This position should generically state that the debris transport analysis must consider for all debris the containment geometry, post-LOCA environment, and debris distribution, physical properties and transport characteristics	Regulatory Position 1.3.3.6 has been modified with an intent to provide a realistic approach due to a lack of definitive test data.
12		C.1.3.3.8		Item 1.3.3.8: What does "all debris" represent? Is it all debris generated in the zone of influence, or all potential debris in containment, regardless of location? The time-dependent accumulation of debris should also be considered, since some debris in upper elevations will take time to transport to the screens. This position needs to specifically identify the default analysis assumption for the debris source term.	Regulatory Position 1.3.3.8 has been modified.
13		C.1.3.4.2		Item 1.3.4.2: For some plants, the containment heat removal pumps take suction from the sump before ECCS switchover occurs. Thus, the first sentence should be tailored to address the screen submergence at times earlier than ECCS switchover	Regulatory Position 1.3.4.2 has been modified

14		C.1.3.4.4		Item 1.3.4.4: This position focuses on the sump screen submergence level at the beginning of recirculation. DG-1107 repeatedly recommends a transient analysis to accurately detail changes in conditions but then restricts credit for any increases in water level after recirculation. Further, this position does not address recirculation spray pumps that experience minimum NPSH margin well before the safety injection system switches to recirculation mode (and perhaps early enough where pool level and debris thickness are changing rapidly). It is recommended that variable pool depths be considered conservatively to ensure a reliable transient prediction of sump behavior. To allow for a generic approach, delete the phrase “at the beginning of recirculation” from Item 1.3.4.4, from the end of the first paragraph on page 6, and from page A-4.	Regulatory Position 1.3.4.4. and the last paragraph in Appendix A, Page A-4 have been modified.
15			Fig. 1 & 2	Add descriptive titles to Figures 1 and 2.	Agreed.
16			Fig. 4 & 5	Add descriptive titles to Figures 1 and 2.	Agreed.

17		Appendix A		Page A3 uses the term $NPSH_{margin}$ without a clear technical definition. Is the term defined as NPSH available (NPSHa) minus NPSH required (NPSHr), where NPSHa already includes all other losses from piping friction, dimensional changes in the pump can, and the sump screens (without debris)? For clarity, the sump failure criterion may be defined plainly as "NPSH required cannot be satisfied". What does it mean to reach the sump failure criterion and what kind of time-dependence is applied? While NPSHr may not be satisfied for a short period of time, sump conditions can change enough to return to a positive NPSH margin condition. Regulatory Position 1.3.1.3 allows for credit to be taken for operation of pumps in cavitation for a limited time. If a plant has tested pumps in cavitation and can show that the sump failure criterion was met for a period of time shorter than the test time, then does 1.3.1.3 justify the conclusion that the acceptance criterion for long-term core cooling has been met? Clarify the use of the sump failure criterion relative to 1.3.1.3. Provide a reference to the technical basis document for the statement "Numerical simulations confirm that an effective head loss across a debris bed approximately equal half the pool height is sufficient to prevent adequate water flow" on page A-3. The final paragraph should address the use of transient conditions for changing sump screen submergence when the recirculation spray pumps take suction from the sump before ECCS recirculation begins.	Page A-3 and page A-4 have been modified.

				PUBLIC COMMENTS ON DG-1107 FROM ENERCON *(Comments 5 of 7)*	
ENER CMT #	Page	Section	Paragraph	Comment	Comment Resolution
1.		C.1.1.1.6		Section 1.1.1.6 states that trash racks should be adequate to protect the debris screens from missiles and other large debris. This is assuming the use of a standard "screen box" design using conventional wire screening material. The strainer/screen could be fabricated of perforated plate material of a thickness that is not easily damaged by large debris or missiles. In addition, with a strainer design of more complex geometry that maximizes surface area, it is important that the surrounding trash rack structure not become blocked with debris thus preventing water flow to the strainer. The trash rack structure should not be the limiting component for the quantity of debris handled by the strainer. This is also true for debris interceptor "gates" that are located away from the sump but in the main flow paths to the sump. These debris interceptor "gates" could be used to stop or reduce the quantity of tumbling debris along the containment floor, but should not become blocked to the point of preventing water flow to the sump. Thus placement of trash racks and the selection of the grating material as presented in Tables A-1 through A-6 may not always be the best choice. The type of debris may affect the placement of trash racks and the selection of grating material. These Tables are for simple standard "screen box" design whereas future PWR strainers may need a more complex geometry to maximize strainer surface area in the smallest footprint.	Clarification added in Section B. and Regulatory Position 1.1.1.6
2.		C. 1.1.1.7		Section 1.1.1.7 states that the top of the debris interceptor structures should be a solid cover plate that is designed to be fully submerged after a LOCA and completion of the ECC injection. We would recommend that the words be stated more like the statement in the Discussion section on page 5, "For certain sump designs, it is preferable that the top of the interceptor structure is a solid cover plate …". This design feature is more for a standard "screen box" and may not be needed with strainers of more complex geometry. Further clarification for the need of the solid cover plate may be needed.	Regulatory Position 1.1.1.7 has been clarified.
3.		C.1.1.1.8		Section 1.1.1.8 states that the debris interceptors should be designed to withstand the vibratory motion of seismic events without loss of structural integrity. This section should clarify the possible seismic event with the containment flooded in a post LOCA environment. Though a seismic event concurrent with a LOCA is typically not postulated, during the thirty days following a LOCA, a seismic event may be possible. This event would create the sloshing and hydrodynamic loads on the strainer assembly.	Regulatory Position 1.1.1.8 has been modified.

4.		C.1.1.1.12		Section 1.1.1.12 addresses the size of openings in the screen/strainer material to protect the downstream component from clogging or damage. This section addresses one dimension of a particle of debris. The second dimension should also be addressed. Long thin slivers of paint, insulation material, and other debris theoretically could pass through the strainer but then not pass through the downstream component thus clogging or damaging the component. This should be addressed in this Regulatory Guide	Regulatory Position 1.1.1.12 has been clarified.
5.		C.1.1.1.15		Section 1.1.1.15 recommends that drains from the upper regions of the containment building not discharge downstream of the sump screen. In addition, any floor drain opening in the sump area that is connected to the existing floor drain system, should be covered with strainer/screen material to prevent backflow of debris from the drain system during containment flood up.	Regulatory Position 1.1.1.15 has been modified.
6.		C.1.3.1.1 and C.1.3.1.2		For Sections 1.3.1.1 and C.1.3.1.2, these sections should acknowledge that for PWR's the water that is flowing onto the containment floor that will eventually flood up to form the containment sump water level is very hot. The containment water temperature will be in excess of 212°F and would be boiling if it were not for the over-pressure of containment. By definition, the water level calculations take credit for the vapor pressure of the water at the elevated temperatures resulting in liquid water accumulating on the containment floor. The NPSH calculations should also credit this same vapor pressure. To have a statement in Section 1.3.1.1 stating no increase in containment pressure from that present prior to the postulated LOCA's is not appropriate. For the containment water level calculations and the NPSH calculations, using the predicted containment water temperatures and then selecting the conditions for saturated water would be appropriate. No sub-cooling of the water would be credited.	Regulatory Positions 1.3.1.1 and 1.3.1.2 have been modified.
7.		C.1.3.1.6		Section 1.3.1.6 addresses calculating the minimum static head of water above the pump suction. This section gives general guidance on not including the amount of water in enclosed areas which cannot readily be returned to the sump. However, more guidance could be included. Other items that might need to be considered are condensation on surfaces, vapor/steam in the atmosphere, and water in transient. It is recommended that more guidance be given for developing this calculation to insure consistent methodology between the PWR facilities.	Regulatory Position 1.3.1.6 has been modified.

8.		C.1.3.2.3		In Section 1.3.2.3, the last bullet addresses the “thin bed” effect. This section should also acknowledge that large strainers of complex geometry and/or low approach velocities, if experimentally demonstrated, may not be susceptible to this described “thin bed” effect.	Regulatory Position 1.1.1.16 states that some advanced strainer designs could prevent the thin bed effect.

				PUBLIC COMMENTS ON DG-1107 FROM STAR *(Comments 6 of 7)*	
STAR Cmt	Page	Section	Paragraph	Comment	Comment Resolution
1.	3		1st	NEI provided a comment on the consideration of transient activities. Licensees perform additional activities prior to refueling outages. The potential for an individual blocking the sump is an insignificant contributor, therefore they need not be considered. STARS proposes to add to the examples in the NEI comment: pre-outage preparation..	Disagree. Dismissal of transient debris sources would be based on risk aspects which have not been otherwise included in this guide.
2.	9	C.1.1.1.2		This paragraph should be clarified to indicate that the redundant sumps should be physically separated from high-energy piping systems whose resulting pipe breaks have the potential of damaging components of the sumps 'and' where the recirculation sumps are required to be operable to mitigate the consequences of these specific high-energy piping systems.	Regulatory Position 1.1.1.2 has been modified.
3.	13	C.1.3.2.3		This paragraph should include the pressurizer surge line as one of the minimum lines where break locations should be considered.	Regulatory Position 1.3.2.3 has been modified

4.	22	D		Implementation, specifically states that the guide will serve as guidance for reviews under 10 CFR 50.59 dealing with modifications to the primary coolant system that might affect the availability of water sources. It is understood that this section would be used by licensees when performing 10 CFR 50.59 reviews. Conformance to the regulatory guide would lead to a conclusion that changes were acceptable because they implement a methodology approved by the NRC. However, the generic concept should be identified without giving specific reference to the regulation. One of the issues of concern during the revision of 10 CFR 50.59 was guidance on the regulation scattered throughout regulatory documents that could become outdated or inaccurate. This reference could be viewed as another of the same. Therefore, STARS recommends this section be clarified as follows: -The regulatory guide will also serve as guidance for the conduct of reviews by licensees that deal with plant modifications installed on primary coolant system piping and components when such modifications may affect the availability of water sources for long-term recirculation (e.g., altering potential sources of debris). Conformance to this guidance is a methodology acceptable to the NRC. The regulatory guide will also serve as guidance for the conduct of reviews by licensees that deal with plant modifications installed on primary coolant system piping and components when such modifications may affect the availability of water sources for long-term recirculation (e.g., altering potential sources of debris). Conformance to this guidance is a methodology acceptable to the NRC.	Disagree. This Regulatory Guidance is not prescriptive to be problematic for 10 CFR 50.59 changes.

				PUBLIC COMMENTS ON DG-1107 FROM WESTINGHOUSE *(Comments 7 of 7)*	
West. Cmt	Page	Section	Paragraph	Comments	Comments Solutions
1.	2	B		"Discussion," states that: "The primary safety concerns regarding <u>long-term recirculation</u> .....", Due to the uniqueness of some containment designs, the containment spray system is realigned to draw suction from the containment sump early in the transient. The ECC is realigned to draw suction from the containment sump somewhat later in the transient. For example, a representative plant of this design might realign to draw suction for containment spray at about 300 seconds after a postulated LOCA, and realign the ECC to draw suction from the containment sump at about 2500 to 2900 seconds. For this class of plants, sump blockage may be a concern earlier in the transient. It is suggested that the use of the phrase, "long-term recirculation," be amended or footnoted to recognize that sump blockage may be a concern early in the postulated event.	Section B, first paragraph has been modified
2.	3	B 6	 3rd	The text on page 3 of Section B, "Discussion," identifies three categories of debris: "Debris can be further subdivided into (1) debris that has a high density and could sink but is still subject to fluid transport if local recirculation flow velocities are high enough, (2) debris that has an effective specific gravity of 1.0 and tends to be suspended or sink slowly but will nonetheless be transported by very low velocities or local fluid turbulence phenomena, and (3) debris that will float indefinitely by virtue of low density and will be transported to and possibly through the debris interceptors… All potential debris sources should be evaluated, including but not limited to, the fire barrier material, insulation materials (e.g., fibrous, ceramic, and metallic), filters, corrosion material, and paints and coatings." In the subsequent section on Pressurized Water Reactors, page 6, third paragraph, it states the following with respect to sump screen sizing: "The size of openings in the screens is dependent on the physical restrictions that may exist in the systems that are supplied with coolant from the ECC sump. The size of the mesh of the fine debris screen is determined by considering a number of factors, including the size of the openings in the containment spray nozzles, coolant channel openings in the core fuel assemblies, the presence of fuel assembly inlet debris screens, the minimum dimension within the flow-path (e.g., high pressure safety injection (HPSI) throttle valves), and such pump design characteristics as seals, bearings, and impeller running clearances." Based on the sump screen sizing requirements, it is suggested that it is not physically possible to develop a sump screen that would filter out debris that could potentially cause blockage concerns downstream of the ECC sump. For example,	Section B and Regulatory Position 1.1.1.12 have been modified.

				an illustrative top view portion of a fuel assembly mid-grid is provided in the figure to the right. If the coolant channel opening in the fuel assembly is identified channel 'A', then it can be shown, based on geometrical calculations, that the effective flow diameter of 'A' meets the sump screen sizing requirements at initiation for a post-LOCA long-term core cooling scenario. If fibrous material and paint chips/coatings are accounted for in an analysis, fibrous material may be considered to wrap around the components of a mid-grid (like hair around a strainer in a sink drain). With time, the build-up of this type of debris could potentially block the coolant channel opening. This example can be extended to other components downstream of the ECC sump, i.e., seals, bearings and impeller clearances. Thus, given the set of boundary conditions and assumptions to be accounted for in the analysis, the requirement to show no blockage is not possible.	
3.	3			At the bottom of page 3, the end of the first sentence under "Pressurized Water Reactors." Suggest adding that the sump also serves as a source of water for containment cooling.	Agree.
4.	4			On page 4, the last sentence of the second paragraph. Suggest adding, ". . in a slower containment depressurization and cooldown that is unacceptable to the safety equipment and components, and an increase in the offsite dose . .".	Disagree.
5.	5			At the top of page 5, the guide notes that the design of drains or flow paths that might result in holdup of water away from the containment sump is not addressed by this document. It goes on to note that these flow paths are best terminated in a manner that will prevent debris from being transported to and accumulating on or within the containment sump. The concern of debris blockage of containment drainage flow paths is again identified in the middle of the last paragraph on page 11. It is suggested that if the issue is of sufficient concern as to be mentioned twice in the guide, guidance on how to address the concern should be provided.	Disagree. Regulatory positions C.1.1.15 and C.1.3.1.6 provide adequate guidance.
6.		C1.1.1.1 C1.1.1.2		Sections C1.1.1.1 and C1.1.1.2 state that "a minimum of two sumps should be provided" and "to the extent possible, the redundant sumps should be physically separated", respectively. The impact of multiple redundant sumps is not discussed further in this guide. Redundant sumps may have an impact on post-LOCA subcriticality when the ECCS is realigned to draw suction from the containment sump, and again at the time when the recirculation flow path is realigned from the cold leg to the hot leg (hot leg switch over). Additional discussion of these concerns is provided below. <u>Post-LOCA Subcriticality</u> Subcriticality at start of recirculation is confirmed by calculating the mixed mean boron concentration in the sump at the time entering recirculation. These calculations use conservative assumptions (boration sources are minimized, dilution sources are maximized) regarding water sources that end up in the sump. Complete	Regulatory Position 1.1.1.1 has been modified

				and instantaneous mixing is assumed. Redundant sumps would likely complicate these calculations. If regulatory guidance will recommend that two redundant and physically separated sumps are provided, it is suggested that additional guidance be given regarding the following: ·Factors to consider in determining the distribution of the various water sources between the sumps. ·Factors to consider in determining the distribution of containment spray between the sumps (min/max spray and no spray must be considered). ·Factors to consider in determining the distribution of the RCS spill (initial and recirculation spill) between the sumps (all breaks must be considered). ·The relationship between the redundant sumps, inactive sump volumes and the reactor cavity volume. Desirable and non-desirable alignments for drawing recirculating flow from the sumps. ·Factors to consider in determining if the sumps communicate during the event and desirable design features to accomplish that communication. ·The consideration and treatment of single failures. (Do two sumps introduce additions single failures, either active or passive, that must be considered?) ·The desirability of enabling suction to be switched from one sump to another, and factors to consider when providing for the capability of switching suction between sumps. Having two redundant and physically separated sumps will likely impact shutdown calculations for PWRs. Providing guidance to address the items identified above will enable that impact to be assessed. <u>Hot Leg Switchover (HLSO)</u> The time at which HLSO is required is calculated using initial conditions based on the containment sump mixed mean boron concentration. These calculations use conservative assumptions (boration sources are maximized, dilution sources are minimized) regarding water sources that released to the containment sump. As with the post-LOCA subcriticality calculations, complete and instantaneous mixing is assumed. As with the post-LOCA subcriticality calculations, redundant sumps would complicate these calculations. The post-LOCA subcriticality issues identified with two redundant and physically separated sumps, and guidance that would be applicable to addressing those issues, are also applicable to HLSO calculations. Given the above, it is suggested that either: · The guidance of Sections C1.1.1.1 and C1.1.1.2 be reconsidered in light of these concerns, or, · Guidance is added to DG-1107 to address the issues associated with post-LOCA subcriticality and hot-leg switchover margin that are associated with having two redundant and physically separated sumps.	

7.		C1.1.2.2		Section C1.1.2.2 states that, "Procedures should be established for using alternative water sources to be activated when unacceptable head loss renders the sump inoperable." The concept of alternate water sources is not discussed further in the guide. It is unclear what is meant by "alternate water sources." It is suggested that, for this guidance to be meaningful, an explanation of "alternate water sources" should be added.	Disagree. Section 1.2 provides adequate guidance on alternate water sources.
8.		C.1.3.1.2 C.1.3.1.3		In setions C.1.3.1.2 and C.1.3.1.3, the staff specifically notes that certain existing plants cannot meet the regulatory position on containment overpressure. There are a number of other provisions of this draft guide, such as C.1.1.1.1 that identifies that a minimum of two sumps should be provided, that many existing plants do not meet. It is suggested that either: ·The addition of a general position statement the introduction to section C on the conformance of existing plant designs, or, ·Provide guidance for each position in Section C regarding what are the alternative positions for current plants.	An introduction to Section C has been added for existing plant designs.
9.				The Regulatory Positions requiring application of large breaks at essentially all locations in the Reactor Coolant System (RCS) for debris generation based on the requirements of 10 CFR 50.46 is inconsistent with other regulations. For example: ·The NRC allows the application of Leak Before Break (LBB) and the consideration of specific break locations as described in Branch Position MEB-3.1 in evaluating the dynamic effects of a postulated pipe break. These considerations directly affect the design of the ECCS systems and the requirements for a coolable geometry as stated in 10 CFR 50.46(b)(4) . ·Instruments, valves, smaller RCS piping, other piping inside containment, and cables needed to assure transmittal of either ECCS signals or system functions necessary to assure ECCS performance are either: Evaluated based on specific break locations, or, ¨Do not have to be evaluated for pipe whip and jet impingement based on LBB considerations. ·If the requirement for a break anywhere was imposed for jet impingement and pipe whip for equipment required for ECCS to function, system redesigns would be required or pipe whip restraints and guard pipes would have to be installed to show conformance with 10 CFR 50.46. ·Similarly, almost every PWR in the United States uses LBB as the basis for limiting hydrodynamic loads on the fuel to assure a coolable core geometry as required by 10 CFR 50.46. Given that debris generation is clearly a dynamic effect of a pipe break, and that other features of ECCS design do not require double ended breaks for dynamic	No change is made to the staff position on LBB as documented in a letter to Westinghouse Owners Group, dated June 9, 2000. Staff position is that GDC 4 is not applicable to LOCA-generated debris. NRC is in receipt of an NEI request to consider alternatives to a DEGB for debris generation, and this is a policy issue that may result in changes to break size used for debris generation.

				effects, it is suggested that the requirements of this section be revised to allow the same treatment. If this position is retained without modification, some utilities may conclude that the addition of guard pipes or pipe restraints will be necessary to reduce the amount of debris generation to a level that can be accommodated even with large sump screens. Such actions would be a step backwards in both risk and in regulation.	
10.		C.1.1.1.12		C.1.1.1.12 identifies that the size of the opening in a fine screen mesh should be smaller than the minimum restrictions found in the systems served by the containment sumps. · Clearances in pumps and seals can be very small. For many current plants, the screen hole size is larger than the minimum clearance associated with ECCS or Containment Spray pump designs. · Experimental data and current evaluations show that debris made of dense, hard materials such as metals would not be transported to the screens under the fluid velocities associated with containment sump operation for most operating PWRs. · Other particles, such as paint chips, are brittle enough that the pump impeller would further break up the particles and, if the resulting debris was transported to the reactor vessel, this debris would settle out in the bottom head. · Small soft particles would not damage impellers or seals. A screen mesh that has openings smaller than seal or impeller clearances will have a dimension on the order of mils. Sump screen meshes this fine will result in a higher, perhaps significantly higher, pressure drop than what is calculated for current screen designs. This result may lead a plant to design and install a sump screen area that is so large that may not be practical to install in the plant. Also, having very small openings in fine screens make them more susceptible to plugging than current screen designs. It is suggested that this position be reconsidered with the objective to determine if it can be met given reasonable containment volumes, configurations, and water levels associated with current PWR containment designs.	Regulatory position 1.1.1.12 has been modified
11.		C.1.3.3.4		In public meetings addressing Generic Safety Issue GSI-191, NRC has several times stated that it is not their intent to suggest or require that CFD calculations be performed for plants to demonstrate their sumps are operable. Section C.1.3.3.4 specifically identifies the use of computational fluid dynamics (CFD) as an acceptable analytical approach to predict debris transport within the sump pool. This statement appears to contradict the earlier public statements made by NRC. Channel flow has also been successfully used to demonstrate debris transport in both the nuclear industry and other industries and also have data base to support this approach. This position should be reconsidered to identify other acceptable methods or predicting debris transport.	Regulatory position 1.3.3.4 has been clarified.

12.		C.1.3.3.8		In section 1.3.3.8 states that all debris transported to the sump may be assumed in lieu of performing debris transport analyses. The inherent assumption in this statement is that the transport of all debris to the sump screen is a more limiting condition than debris blocking or partially blocking the drains leading to the sump (holdup of water away from the containment sump). This may not be the case. More limiting cases might be the assumption that all drains leading to the containment sump are completely blocked, or a combination of inventory holdup in containment coupled with debris loading on the sump screen. Suggest that this needs to be either addressed or closed as not a concern. (See comment 5, above.).	Regulatory position 1.3.3.8 has been modified.
13.		D		Westinghouse agrees with and supports the statement in Section D, "Implementation," that no backfitting is intended with the issuance of this guide. However, the last sentence of Section D states that the guide will be used to evaluate licensee compliance with 10 CFR 50.46. This statement suggests that this guide will be the basis for compliance with 50.46. Since it is already known that many current plants do not conform to this guide, it is likely that the application of this guide will lead to the conclusion that plants do not comply with 50.46. Therefore, the application of this guide is likely to result in backfit actions.	Section D has been modified for current operating plants.
14.		Appendix A		Appendix A provides guidelines for review of water sources for emergency core cooling. These guidelines, developed from extensive hydraulic tests on full-scale sumps, have been issued previously by NRC. The guidelines of Appendix A provide a rapid means of assessing sump hydraulic performance. For example, Appendix A indicates that: · Zero air ingestion into the sump intake piping can be ensured by the use of submergence > 9 ft, Fr < 0.25 and V < 4 fps (Table A-1), and, · Sump designs having ingestion levels of 2% or less can be obtained using correlations given in Table A-2. The guidance of Appendix A also indicates that if the PWR sump design deviates significantly from the design boundaries noted, similar performance data should be obtained to verify adequate sump hydraulic performance. Therefore, it may very well be the case that plant particular sump hydraulic model testing may need to be performed by each utility. It is noted that the guidelines given in Appendix A are more restrictive than parameters used for design of containment sumps for a number of current operating plants. For example, a representative plant might have a submergence = 4 feet, Fr = 1.5, and V =10 fps. Appendix A indicates that the NPSH requirements should be increased rather significantly when the guidelines in Table A-1 are not met. It is suggested that a statement be added at the beginning of Appendix A recognizing that licensed operating plants design having design parameters different from those in Appendix A have been demonstrated to provide acceptable hydraulic performance.	Disagree. The staff has not verified the adequacy of hydraulic performances for current sump designs in accordance with the current methodologies. The resolution for air ingestion/vortexing issue is not considered to be a backfit for current plants.

15.			Fig. 1 & 2	Suggest adding titles to Figures 1 and 2	Agree.
16.			Fig. 3	Suggest amend “Targete piping” to read “targeted piping”	Agree.
17.			Fig. 1,2,3, and 4	In Figures 1,2,4, and 5, suggest adding a note to identify if these figures apply to both PWRs and BWRs.	Agree.