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Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems

Comment On: NRC-2018-0076-0001
Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems

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General Comment

Comments to DG-1333 are provided in the attached spreadsheet on behalf of EPRI and the Nuclear Electromagnetic Compatibility Working Group. Any questions regarding the comments shall be submitted to Stephen Lopez at EPRI for further clarification.

Attachments

DG-1333 Draft Document Comment Matrix

SUNSI Review Complete
Template = ADM-013
E-RIDS=ADM-03
ADD= Jazel Parks, Michael Eudy, Thomas Boyce

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Document Revision	Document Section	Comment Originator	Comment	Response	Notes
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Center page	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	paragraph starting "The rationale..." seems to indicate this RG is now applicable to ALL I&C equipment (not just safety-related). Same comment as provided previously regarding references.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	General Comment	Southern Nuclear - James Flowers - 205-992-5781, jhflower@southernco.com	Recommend not deleting any reference or mention of EPRI TR102323. In many instances, Licensees have not committed to RG 1.180 but do refer to EPRI TR102323 in their procedures and analyses. The proposed version of the Regulatory Guide no longer mentions EPRI TR102323. The Licensees and their contractors heavily reference and use EPRI TR102323.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	General Comment	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	The revision removed dated references, but also removed all reference to the industry's guidance document. EPRI Technical Report (TR-102323) now at Revision 4, and the related NRC SER which was included in Revision 1 of TR-102323 are no longer listed. There is no explanation given for removal of these references. The entire section from RG 1.180 Rev.1 (Oct 2003) titled "Regulatory Analysis" was removed.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	General Comment	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	The NRC has removed the reference to NUREG-0800 "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants". This NUREG is still active; it is somewhat disturbing that this tie no longer exists. There are indications that the General Design Criteria (GDC) is still considered applicable, but are not directly tied by reference.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	General Comment	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	The NRC has added to the requirements as well. Electrostatic Discharge testing is a new requirement that was not part of RG 1.180 Rev.1.		

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	General Comment	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	The 8 dB 'margin' requirement for exclusion zones continues to be applied with no documented technical basis, especially with the removal of the SER for the EPRI Guide.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	General Comment	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	The proposed revision discusses a number of occasions where 'blended' standards (US and IEC) are considered acceptable, but the NRC position of maintaining testing in either the identified U.S. military standard or the international standards – without mixing and matching – continues to be documented without technical basis.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 1 - Purpose	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	First time 'electrostatic discharge' is added to the requirements. I can find no reference or specific technical basis for this addition.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 1 - Table 1	Chad Kiger - AMS	Can MIL-STD-461G CS118 also be used as an acceptable method for ESD testing?		
	Page 10 - C - Staff Regulatory Guidance, Section 1 General	Southern Nuclear - James Flowers - 205-992-5781, jhflower@southernco.com	C - Staff Regulatory Guidance, Section 1 General, page 10, 1st paragraph, 2nd sentence: Recommend reducing the 8 decibel margin requirement. This margin requirement is one of the primary obstacles to implementing enhancements to the stations. It essentially imposes a 250% margin on exclusion distances. Based upon changes to EMI regulations in other federally regulated industries like aviation and communications, this margin needs to be critically examined. The research, experience, and improvements in devices can easily be used to justify the reduction of the 250% margin.		
	Page 10 - discussion of exclusion zones	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	The use of 10 V/m electric field (maximum) is listed but no basis provided. The 8 dB margin is applied (no technical basis). There is no discussion about potential variations in the E-M field nor the possibility of equipment qualified for higher or lower environments.		

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 10 - C.1	Andy Nack - Paragon	The basis for an 8 dB maragin should be provided.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 10 - C.1	Mike Zagami - Duke Chad Kiger - AMS J Shank - PSEG	References to a radiated electric field operating envelope of 10 V/m (140 dB/m) should be clarified to read "a radiated electric field susceptibility limit of 10 V/m (140 dBμV/m)"		Editorial
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 10 - C.1	Mike Zagami - Duke Chad Kiger - AMS J Shank - PSEG	Top paragraph of this page identifies 4 V/m as 132 dB/m but should be 132 dBuV/m		Editorial
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 10 - C.1	Mike Zagami - Duke	Definition of P_t related to the minimum exclusion distance is described as "the effective radiated power of the EMI/RFI transmitter (in Watts), but should be descibed as "the peak conducted power of the EMI/RFI emitter (in Watts)"		"Effective Radiated Power" generally includes antenna gain and cable losses. Using the description as written in the equation would utilize the Gain term twice resulting in an erroneous exclusion distance. Note: This terminology was corrected from EPRI TR-102323 Rev 3 to Rev 4. Note: EPRI TR-102323 contains more material on ths subject of Exclusion Zones and portable EMI/RFI emitters that is helpful.
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 10 - C.3	Andy Nack - Paragon	The name of the section would make more sense to be EMC Emissions Testing. Instead of using the acronym "EMI/RFI". Then substitute "EMC" for "EMI/RFI" throughout the section.		editorial
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 10 - discussion of exclusion zones	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	The gain value in the equation should be shown as numerical gain – a numerical gain of 1 for an isotropic radiator is 0 dB gain (using this would result in the distance going to zero).		

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 10 & 11 - C.3	Mike Zagami - Duke	In the introductory discussion of MIL-STD-461G, there should be a more detailed discussion of which Limits are chosen for the specific test criterea. Each section should identify specifically which limits are chosen perhaps with a brief explanation of why they are applicable to the Nuclear Power Plant environment. Many of the limits appear to be customized, but there is no discussion of this in the DG. References to other documents to support the test criteria is difficult to follow.		There seems to be no use of the limit lines provided in MIL-STD-461G, but rather the use of the modified limit lines in DG-1333 are presented without detailed discussion. Note: EPRI TR-102323 Rev 4 identifies which category limit line is applicable for each type of test. RG 1.180 Rev 1 had a discussion about the operating envelopes and how/why thay may have been tailored for the applicable testing based on NUREG/CR-6431, NUREG/CR-5609 and NUREG/CR-6782, however, this discusion has been omitted in DG.1333.
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 10 and 11 - C - Staff Regulatory Guidance, Section 3 EMI/RFI Emissions Testing	Southern Nuclear - James Flowers - 205-992-5781, jhflower@southernco.com	C - Staff Regulatory Guidance, Section 3 EMI/RFI Emissions Testing, page 10 2nd paragraph, next to last sentence and page 11 2nd paragraph, 1st sentence: Recommend clarifying when military standards and IEC standards must be used in their entirety and when then can be used in combination. Currently, these two paragraphs seemingly contradict each other in regards to performing tests entirely using one standard and when testing can be combined. My guess is that a clarifying sentence would be helpful in removing uncertainty.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 11 - C.3, Table 2	Mike Zagami - Duke	This Table describes RE102 testing from 2 MHz to 10 GHz where MIL-STD-461G describes the test from 2 MHz to 18 GHz. There is no explanation for the deviation from the MIL-STD-461G frequency range requirement.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 11 -- second-last paragraph	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	test methods (US and IEC) are stated to be able to be combined; adds to the confusion when other comments indicate standards may not be combined when looking at threshold values. Does not appear that there is a technical basis for requiring 'one standard' approach.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 12 - C.3.1	Mike Zagami - Duke	The power sensitive criteria (limit line relaxation) in MIL-STD-461G is not shown or described in Figure 3.1.		

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 12 - Section 3.1	Chad Kiger - AMS Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	The curve for the AC power does not include a relaxation value based upon the fundamental current draw. This is in line with the MIL-STD-461G guidance but will cause systems drawing greater than 1 amp of current to have a much higher likelihood of failing this test. I would recommend adopting a limit relaxation factor similar to EPRI TR-102323 Revision 4 guidance or keep the same limit (and relaxation factor) that was in NRC RG 1.180 Revision 1.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 12 - Section 3.1, 3.2, 3.3, and 3.4 Headings	Chad Kiger - AMS	I would recommend putting MIL-STD-461G in front of CE101, CE102, RE101, and RE102 in the headings just for clarity.		Editorial
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 12 and 13 - Section 3.2 CE102	J Shank - PSEG	The first paragraph states, "This RG provides an acceptable method for qualifying digital and advanced analog systems for the projected electromagnetic environment in nuclear power plants." It's not clear if this guidance should be applied to all electrical and electronic equipment or only advanced analog and digital instrumentation and control (I&C) equipment.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 12 and 13 - Section 3.2 CE102	J Shank - PSEG	DG-1333 references performing CE102 testing from 10 kHz to 2 MHz, however MIL-STD-461G CE102 specifies this test be conducted from 10 kHz to 10 MHz. It's not clear why DG-1333 suggests terminating this test at 2 MHz versus 10 MHz. The use of customized testing limits that differ from approved standards is not recommended.		

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 13 - C - Staff Regulatory Guidance, Section 3 EMI/RFI Emissions Testing	Southern Nuclear - James Flowers - 205-992-5781, jhflower@southernco.com Mike Zagami - Duke J Shank - PSEG	C - Staff Regulatory Guidance, Section 3 EMI/RFI Emissions Testing, page 13, Figures 3.2 and 3.3: Recommend reformatting Figure 3.2 and Figure 3.3. It seems that Figure 3.2 has a second figure overlaid upon it while Figure 3.3 is missing.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 13 - C.3.2	Mike Zagami - Duke	The power sensitive criteria (limit line relaxation) in MIL-STD-461G is not shown or described in Figure 3.2.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 13 - C.3.4	Mike Zagami - Duke	This section describes RE102 testing from 2 MHz to 10 GHz where MIL-STD-461G describes the test from 2 MHz to 18 GHz. There is no explanation for the deviation from the MIL-STD-461G frequency range requirement.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 13 - Section 3.4 First Sentence	Chad Kiger - AMS	Remove the word "emissions" after "2MHz to 10 GHz".		Editorial
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 14	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	"separation" from equipment 'sensitive to magnetic fields' needs a definition or a technical basis.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 14 - Section 3.5 Second Paragraph	Chad Kiger - AMS	I do not believe that power quality controls should be used to justify removed testing requirements from 10 kHz to 150 (or 450) kHz. First, most sites do not have well documented power quality controls in place to be able to use the exemption properly. Second, the traditional frequency range for power quality is considered to be up to the 40th harmonic or 2.4 kHz for 60 Hz systems. These controls will not address DC power supplies and other power converters with switching harmonics in the frequency range of 50 kHz to 100 kHz. New equipment typically fails to meet the CE102 requirements within this range. This was also a gap in the previous RG when using exemptions.		

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 15	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	Last paragraph – Again, discussion of 'unrestrained mixing and matching' of standards with no basis. In addition, there is no supporting discussions for using actual field measurements (E-M environment) and matching them to susceptibility values that may be lower than 10 V/m.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 15 - C - Staff Regulatory Guidance, Section 3.6 EMI/RFI Emissions Test Summary	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	FCC 47 CFR Part 15 Class A (and B) requirements have been removed from the entire document. No basis for removal; these levels apply to many of the unlicensed radiators being used today.		
		Southern Nuclear - James Flowers - 205-992-5781, jhflower@southernco.com	C - Staff Regulatory Guidance, Section 3.6 EMI/RFI Emissions Test Summary, page 15: Recommend keeping the alternative option of using FCC Part 15 Class A. In the majority of evaluations, non-safety-related components are justified using this alternative option related to FCC Part 15, Class A. Most non-safety-related vendors will not perform separate testing in accordance with military standards and IEC standards. However, they will provide a certificate of conformance with FCC Part 15 Class A. Without this option, Licensees will have to perform unnecessary testing which will provide no additional benefit to nuclear safety.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 15 - Section 3.6 First Paragraph	Chad Kiger - AMS	For the CE101, I suggest changing it to "plant has power quality controls in place and the equipment won't impose more than 5% THD (see conditions in the CE101 test guidance)."		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 15 - Section 3.6 First Paragraph	Chad Kiger - AMS	I suggest not allowing a CE102 test exemption up to 450kHz based upon power quality controls. In addition, it is not discussed regarding the FCC testing beginning at 450 kHz. So if used, it would seem more natural to exempt it from 10 kHz to 150 kHz since that is where the IEC testing begins.		

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 15 - Section 3.6 Second Paragraph	Chad Kiger - AMS	Do not allow for the exemption of frequencies from 10 kHz to 150 (or 450) kHz based upon power quality controls. This will miss a major source of excessive emissions from switch-mode power supplies and AC-DC or DC-DC converters.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 15 – Table 4	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	CISPR Class A removed, and average values removed. Quasi-peak values from Table 5 also changed.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 15 - Table 5	Chad Kiger - AMS	Table 5 provides the limits at 10 meters for frequencies less than 1 GHz and 3 meters for frequencies above 1 GHz. I suggest stating that these emissions can be collected in an Open Area Test Site (OATS), within a 10 meter semi-anechoic chamber, or within a 3 meter semi-anechoic chamber with the limits adjusted accordingly based upon free space propagation.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 16 - C.4	Andy Nack - Paragon	The name of the section would make more sense to be EMC Susceptibility Testing. Instead of using the acronym "EMI/RFI". Then substitute "EMC" for "EMI/RFI" throughout the section.		editorial
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 16 - C.4	Andy Nack - Paragon	Clarification of the following statement should be added to address if ESD and Surge are included in what is being considered the scope of susceptibility testing: "Regardless of which susceptibility testing program is chosen, either set of test methods should be applied in its entirety, without selective application of individual methods (i.e., no mixing and matching of test methods)."		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 16 - C.4, Table 6	Mike Zagami - Duke	Table 6 describes the CS114 testing from 10 kHz to 30 MHz where MIL-STD-461G describes the testing from 10 kHz to 200 MHz. There is no explanation for the deviation from the MIL-STD-461G frequency range requirement.		

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 16 – Section 4 second paragraph	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	no mix and match of standards. No basis.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 16 through 30 - Sections 4 & 5	Andy Nack - Paragon	Surge is handled in a confusing manner between sections 4 and 5. CS116 is not included in section 5 but is in section 4. IEC surge standards are covered in both. IEEE surge standard is only in Section 5.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 17 – Table 7 (and more)	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	there is no indication of the acceptable operating class (A, B, C, etc.) when discussing IEC standards. Need to define if safety-related devices need to be Class A (normal operation before, during, and after event), Class B (normal operation before, and after, may not operate during event), or Class C (normal before, may need manual action to reset after). One assumes that Class D / E (essentially failed during / after event) are not acceptable.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 18 - C.4.1.2	Mike Zagami - Duke	This section describes the CS114 testing from 10 kHz to 30 MHz where MIL-STD-461G describes the testing from 10 kHz to 200 MHz. There is no explanation for the deviation from the MIL-STD-461G frequency range requirement.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 18 and 19 - Section 4.1.2	J Shank - PSEG	The proposed CS114 testing limit represents a customized testing level not found in MIL-STD-461G. The technical bases for the CS114 testing limit is believed to be flawed as reported in EPRI report 1016158 "Review of High-Frequency Conducted Susceptibility Limits." The primary concern is the plant data reported at 150 kHz that resulted in and required the use of a customized testing limits that differs from approved standards, which is not recommended. Additional testing should be performed as required to determine if endorsement of one of the MIL-STD-461G Figure CS114 limit curves is possible.		

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 2 - Related Guidance	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	not clear why this is not simply included as pointers to the References section, there is no real detail provided		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 2 - under Applicable Regulations	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	first bullet starting "Criterion III..."; appears to refer to GDC which does not apply to all plants (especially older sites). Also appears to invoke the need to provide and maintain "sufficient records". Was unable to find this as a direct correlation to Rev.1.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 20	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	Table 11 is new. Do not believe there is an equivalent US standard.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 21	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	Table 15 is updated. (need to verify curves for CS114 are correct for Figure 4.2)		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 21 - C - Staff Regulatory Guidance, Section 4.2 EMI/RFI Conducted Susceptibility Testing - Signal Leads	Southern Nuclear - James Flowers - 205-992-5781, jhflower@southernco.com	C - Staff Regulatory Guidance, Section 4.2 EMI/RFI Conducted Susceptibility Testing - Signal Leads, Table 13 page 21: Recommend revising the title of Table 13 to use "MIL-STD-461G" instead of "MIL-STD-461E".		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 21 - C.4.2	Mike Zagami - Duke Chad Kiger - AMS	Top paragraph has an erroneous "f" placed prior to IEC 6100-4.		Editorial
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 21 - C.4.2, Table 15	Mike Zagami - Duke	The limit for CS115 is indicated as 5A, but does not indicate if this value is peak/RMS/average. This entry should be described as peak which matches the criteria in MIL-STD-461G Figure CS115-1.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 21 - C.4.2, Table 15	Mike Zagami - Duke	The limit for CS116 is indicated as 5A, but does not indicate if this value is peak/RMS/average. This entry should be described as peak which matches the criteria in MIL-STD-461G Figure CS116-2.		Note: EPRI TR-102323 Rev 4 does not recommend using the MIL-STD CS116 procedure, but suggests using the commercial standard IEC 61000-4-18.
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 21 - Table 13	Chad Kiger - AMS	Table 13 should reference MIL-STD-461G instead of MIL-STD-461E		

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 21 and 22 - Table 15	J Shank - PSEG	DG-1333 recommends CS116 testing to 5 A. EPRI TR-102323 does not endorse CS116 because the MIL-STD-461 CS116 damped sinusoidal wave test represents coupled and not unidirectional energy. The slower rise time and longer duration result in a less challenging test than the combination wave test (IEC 61000-4-5). Thus the CS116 is not recommended as an alternate to the IEC 61000-4-5 test.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 22	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	Table 16 is revised but essentially the same. Table 17 has higher values than Rev.1. Table 18 was revised for RS103 from 1 GHz to 10 GHz. Table 19 was revised from 1 GHz to 6 GHz.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 22 - Table 17	Chad Kiger - AMS	The IEC 61000-4-12 Level 3 voltage is 2kV for line to ground and not 4 kV. 4 kV is the Level 4 test voltage.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 22 - Table 18	Chad Kiger - AMS	Table 18 should reference MIL-STD-461G instead of MIL-STD-461E		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 23	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	Section 4.3.2 requires an electric field level of 10 V/m up to 10 GHz with no technical basis, but there appears to be some flexibility in providing additional definition of acceptable levels in the test plan.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 24 - C.4.4	Andy Nack - Paragon	Clarification of the following statement should be added to address if ESD and Surge are included in what is being considered the scope of susceptibility testing: "Regardless of which susceptibility testing program is chosen, either set of test methods should be applied in its entirety, without selective application of individual methods (i.e., no mixing and matching of test methods)."		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 27	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	Table 23 no longer includes Category C 'Exterior' levels.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 27 - Section 5.1	Chad Kiger - AMS	Is the Ring Wave test only applicable to ac power leads? Are DC leads not to be tested?		

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 28 - Section 5.2	Chad Kiger - AMS	Is the Combination Wave test only applicable to ac power leads? Are DC leads not to be tested?		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 29	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	Section 5.3 removed the requirement to use a frequency "up to 10 times the base frequency" above 1 GHz (acceptable).		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 29 - Section 5.3	Chad Kiger - AMS	Is the EFT test only applicable to ac power leads? Are DC leads not to be tested?		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 3 - A - Related Guidance	Southern Nuclear - James Flowers - 205-992-5781, jhflower@southernco.com	A. Introduction, Related Guidance,5th bullet: Recommend deleting the reference to RG 1.89. RG 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants" is listed in the "Related Guidance". However, the RG does not address EMI specifically. Traditionally EQ does not include EMI which is why it has its own separate Regulatory Guide.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 30 - Section 6	Chad Kiger - AMS	Is the MIL-STD-461G CS118 test an acceptable substitute for the IEC 61000-4-2 ESD test?		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 30 and 31	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	New section 6 for Electrostatic discharge testing. Values identified are 8 kV for direct contact discharge and 15 kV for indirect air discharge. Assumes very low humidity but doesn't define a value; also assumes the use of synthetic fabrics but provides no technical basis.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 31 - Section 7	Mike Zagami - Duke	Suggest referencing MIL-STD-461G section 6.3 which points to DI-EMCS-80200 for the Electromagnetic Interference Test Report.		This is the standard format for MIL-461G testing. The documentation required should be aligned with the information in this standardized test report to minimize customization of the report by the test facility. Note: This is discussed in EPRI TR-102323 Section 5.

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 31 Section 7 Documentation	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	[here is where the 'admin controls' over EMI / RFI sources is called out for those looking for a 'procedural' reference] – requirements for organized, understandable, and traceable documentation that can be audited. (Note this was in Rev.1) Added 5.6 Resolution of anomalies (good thing).		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 5 - B - Discussion	Southern Nuclear - James Flowers - 205-992-5781, jhflower@southernco.com	B. Discussion, Reason for Revision, entire subsection: Recommend that either the "Reason for Revision" or "Background" sub-sections address why the NRC no longer endorses EPRI TR-102323. It has been the key document for the nuclear industry for EMI for many years and there needs to be a clear reason why this version of the RG is silent on the document.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 5 - B - Discussion	Southern Nuclear - James Flowers - 205-992-5781, jhflower@southernco.com	B. Discussion, Background, 1st paragraph: Recommend providing a reference that supports the claim in the first paragraph of subsection "Background" that states "However, the electronic architecture used with these technologies may be more sensitive to the nuclear power plant EMI/RFI environment than existing I&C systems." If there is no research to support this claim, then recommend removing the statement.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 5 - B - Discussion	Southern Nuclear - James Flowers - 205-992-5781, jhflower@southernco.com	B. Discussion, Background, 3rd paragraph, 3rd sentence: Recommend deleting "recent". This wording is a holdover from the RG version that was issued 15 years ago. Therefore, the word "recent" no longer seems appropriate.		editorial

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 5 - B - Discussion	Southern Nuclear - James Flowers - 205-992-5781, jhflower@southernco.com	B. Discussion, Background, 4th paragraph, 2nd sentence: Recommend revising to remove the statement "and non-safety-related I&C system whose failure can affect safety functions". The wording is inconsistent with the title for the regulatory guide which limits the guidance to "Safety-Related Instrumentation and Control Systems". The wording is inconsistent with the title and involves expanding the scope of the guidance.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 5 - End of Second paragraph	Chad Kiger - AMS	This RG says it applies to digital and advanced analog systems. This should also encompass simply replacement analog systems such as like-for-like modules. Can this guidance also be applied to electrical equipment?		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 5 (and more)	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	The use of 'advanced analog systems' needs some further technical basis or definition (term carried from Rev.1). The comment "electronic architecture used with these technologies may be more sensitive..." needs to either be removed or provided with a technical basis – it appears to be the opinion of the author when using "may be" in the discussion.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 5 (and more)	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	Discussion in last paragraph noting "close proximity" installations of non-safety equipment to safety-related equipment – needs to be further defined or a technical basis provided.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 5 through 7 - Section B	J Shank - PSEG Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	R.G. 1.180 Rev. 1 included a paragraph documenting an endorsement of TR-102323 as an acceptable alternate approach. This paragraph should be put back in R.G. 1.180 Rev. 2 to provide flexibility and make it clear TR-102323 is an acceptable method for qualifying digital I&C equipment for commercial nuclear licensees to they can choose either option.		

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 6	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	the comment that the RG "...adjusts frequency ranges when appropriate, and relaxes operating envelopes..." could use further elaboration. Is the technical reference for such relaxation provided for those cases, and if so, how?		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 6	Andy Nack - Paragon	Why are MIL STD and IEEE standards locked into specific versions while the IEC standards are not? It would be prefered that none of them are locked in, and the latest versions of all are what should be used.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 7	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	top full paragraph; implies that technical bases / documentation for planned locations needs to be prepared and maintained.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 7	Andy Nack - Paragon	It seems incomplete that the section titled "Harmonization with International Standards" does not discuss IEC 62003		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 7 - End of First paragraph	Chad Kiger - AMS	Revision 1 of the Reg Guide supported the use of IEEE 473 for EMI/RFI site surveys. This standard has been withdrawn since it was outdated. It is currently going through the revision process. While that could not be endorsed, it would be good to include a discussion on the use of in-situ EMI/RFI site surveys when allowing the use of modified or different electromagnetic operating envelopes.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 8	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	first of multiple instances where the "8 dB margin" is invoked. No technical basis for the margin is provided.		

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 8	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	The following paragraph is confusing; discusses multiple methods for equipment testing (physical configurations) which all appear to be acceptable. The discussion continues with what appears to be permanent record requirements for testing of I&C systems, including an indication of "control" of the E-M environment. The top of Pag 9 includes a laundry list of items to be controlled.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 8 - C - Staff Regulatory Guidance, Section 1 General	Southern Nuclear - James Flowers - 205-992-5781, jhflower@southernco.com	C - Staff Regulatory Guidance, Section 1 General, page 8, 2nd paragraph, 4th sentence: Recommend revising to remove the statement "and non-safety-related systems and components whose operation can affect safety-related system or component functions". The wording is inconsistent with the title for the regulatory guide which limits the guidance to "Safety-Related Instrumentation and Control Systems". The wording is inconsistent with the title and involves expanding the scope of the guidance.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 8 - C - Staff Regulatory Guidance, Section 1 General	Southern Nuclear - James Flowers - 205-992-5781, jhflower@southernco.com	C - Staff Regulatory Guidance, Section 1 General, page 8, 3rd paragraph, last sentence: Recommend reducing the 8 decibel margin requirement. This margin requirement is one of the primary obstacles to implementing enhancements to the stations. It essentially imposes a 250% margin on exclusion distances. Based upon changes to EMI regulations in other federally regulated industries like aviation and communications, this margin needs to be critically examined. The research, experience, and improvements in devices can easily be used to justify the reduction of the 250% margin.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 8 - C.1 3rd Paragraph	Andy Nack - Paragon	The basis for an 8 dB maragin should be provided.		

DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 8 - First Sentence of last paragraph	Chad Kiger - AMS	"implemented as part of installation, maintained, and controlled." should be changed to "implemented and controlled through installation and maintenance practices."		Editorial
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Page 9	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	Table 1 has changed from Rev.1 to include a General EMC Program. There are no standards or other requirements listed – this appears to be a significant expansion in the RG. Electrostatic discharge testing is also new (values discussed later) and appear significant. Documentation was not previously listed in the table but was discussed elsewhere in Rev.1.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Pages 10 and 11	Michael A. Hoffman, NCE (Certified EMC Engineer, iNARTE) / Exelon / Peach Bottom	references to the EPRI Guide from Rev.1 have been removed (with no explanation).		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Pages 12 and 13 - C.3.2	Mike Zagami - Duke	Table 2 of DG-1333 describes the CE102 test from 10 kHz to 10 MHz which aligns with the range in MIL-STD_461G. The CE-102 testing is described in section 3.2 over the range of 10 kHz to 2 MHz where the MIL-STD-461G test range is 10 kHz to 10 MHz. There is no explanation for the deviation from the MIL-STD-461G frequency range requirement.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Section C.3 EMI/RFI Emissions Testing	J Shank - PSEG	DG-1333 should include an endorsement for FCC 47 CFR Part 15 Class A (and B) requirements.		
DG-1333 (Draft Reg. Guide 1.180 Revision 2)	Throughout	Mike Zagami - Duke	IEC Specifications not readily available for review. They are costly as obtained from the IEC. Did not review specifics for IEC testing.		General Feedback Suggest that the IEC Specification be procured or licensed and provided for power plant use.