Response to Public Comments on Draft Regulatory Guide (DG)-1333
"Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems"
Proposed Revision 2 of Regulatory Guide (RG) 1.180

On April 24, 2018, the NRC published a notice in the *Federal Register* (83 FR 17867) that Draft Regulatory Guide, DG-1333 (Proposed Revision 2 of RG 1.180), was available for public comment. The public comment period ended on June 25, 2018. The NRC received comments from the organizations listed below. The NRC has combined the comments and NRC staff responses in the following table.

Comments were received from the following:

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Commenter	Section of DG-1333	Specific Comments	NRC Resolution
Daniel Cronin	General	It's unclear whether or not the draft RG is intended to be applicable to non-power production and utilization facilities (NPUFs). Please consider making a definitive statement within the Applicability section that indicates whether or not NPUFs are included within the scope of this draft RG.	The NRC staff disagreed with the comment that applicability of this regulatory guide (RG) is unclear. This RG is identified within Division 1 guidance, which applies to power reactors. NPUFs are not addressed within Division 1 guidance. Therefore, NRC made no changes to the RG.
Mark Burzynski	Section C.6	Comment 1 - In TR-102323 Rl listed electrostatic discharge (ESD) testing as optional for safety-related equipment and was based in part on the conclusion that ESD is not a credible common mode failure vulnerability. DG-1333 now endorses ESD testing is on how the RG will be applied for use of equipment qualified to an earlier version of the RG. The basis for this change is not explained in DG-1333. ORNL/LTR-2015/254, Task 4 EMI/RFI Issues Potentially Impacting EMC ofl&C Systems, (MLl 7199A005), makes a thought argument that ESD may actually be a common cause failure vulnerability: Additionally, it should be recognized that the regulatory guidance on EMC applies to all safety-related I&C systems and components, which are not all implemented in redundant divisions. Therefore, the additional protection provided by redundancy with safety systems should not be the prevailing consideration in assessing potential threats. It is feasible for failure of a safety-related component to lead to immediate safety relevant effects. A cursory search of the Licensee Event Report.database found a small number of events	The NRC staff disagreed with the comment that ESD testing should be removed from the RG. The discussion in the comment cites an example of an ESD-induced event, which further reinforces the value of retaining the testing guidance. The guidance applies to analog and digital I&C equipment in new applications or in voluntarily initiated modifications so there is no impact on existing, installed equipment nor is there any restriction of the testing to digital systems. Therefore, NRC made no changes to the RG.

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		over the past three decades that are attributed to ESD. As an example, a plant trip occurred at the Donald C. Cook Nuclear Generating Station on March 11, 1997, as a result ofESD. Specifically, the controller for a feedwater regulating valve failed when a reactor operator touched it to switch it to manual for mandated surveillance. Consequently, the valve close, leading to a trip based on steam generator low level coincident with a steam flow/feed flow mismatch. Thus, it is seen that ESD can result in safety significant failures. This argument does not make the case that digital systems are vulnerable to common cause failures from ESD, only that components may be. The ESD testing requirement should be removed from DG-1333.	
Mark Burzynski	General	Comment 2 - DG-1333 does not address now equipment to be used in the future (e.g., an approved digitalI&C platform) that was qualified to Regulatory Guide (RG) 1.180, revision 1, will be treated in any NRC regulatory review. The past practice has been to require the licensees to provide an assessment of the changes to the standard between the one used and the one currently endorsed. This practice creates an expensive churn of paper that rarely results in any equipment of plant design change. In the case ofDG-1333, NRC has already been given the assessment performed for them by Oak Ridge National Laboratory in ORNL-SPR-2016-108, Task 5Technical Basis for EMC Regulatory Guidance Update (ML16112A369). DG-1333 should be revised to	The NRC staff disagreed with the comment. Section D of the RG provides clear guidance regarding when this RG applies and how previously-established acceptable methods of compliance with regulations are treated. Therefore, NRC made no changes to the RG.

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		clearly say that equipment qualified to RG 1.180, Revision 1, is considerable acceptable.	
David Herrell	General (pg. 8)	(1) Concern: MIL-STD-461 and the IEC Standards receive revisions much more frequently than the Regulatory Guide. These revisions often provide valuable clarification and improved test direction. Recommended Change: The revised RG 1.180 should include a statement that allows use of the latest versions of MIL-STD-461 and the IEC Standards, subject to the condition that the test levels and frequency ranges specified in the RG take precedence over any revised test levels or frequency ranges cited in the latest MIL-STD-461 or IEC Standards.	The NRC staff disagreed with the recommended change in the comment. While the statement expressed under Concern is frequently true, it is also recognized that substantial changes in the test methods and associated guidance can occur as these standards undergo revision (e.g., substantial changes in guidance transitioning between MIL-STD 461C + 462 and 461D + 462D). Consequently, blind endorsement of future versions of any standard poses the risk that the effectiveness of the endorsed method may be compromised by unreviewed changes. Therefore, NRC made no changes to the RG.
David Herrell	Section C.1 (pg. 8)	(2) Concern: This document should provide a path forward for industry since current existing installations use equipment qualified to RG 1.180 Rev. 1. Further, pre-qualified platforms have mostly been qualified against the requirements of RG 1.180 Rev. 1, and this document is silent about requirements for use of that equipment without repeating already-completed equipment qualification tests to new requirements. Recommended Change: Industry needs a statement that equipment previously qualified to RG 1.180 Rev 1 is still acceptable without having to generate an extensive comparison of RG 1.180 Rev 1 to Rev	The NRC staff disagreed with the comment. Section D of the RG provides clear guidance regarding when this RG applies and how previously-established acceptable methods of compliance with regulations are treated. Therefore, NRC made no changes to the RG.

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		2 levels and an evaluation of acceptance for each application.	
David Herrell	Section C.1 (pg. 8)	(3) Concern: This document indicates that new analog equipment is to be qualified to these levels. The older analog safety systems (that we are replacing with new analog safety system) would not pass many of these tests, and have operated successfully for many years. What is the technical basis for requiring such tests as EFT and SWC to these replacement modules, when EFT and SWC have not been demonstrated to be problems to the existing analog equipment? Recommended Change: Provide a method or process that would allow replacement analog modules to be subjected only to those tests that the equipment being replaced would have passed, especially for the potentially destructive ring wave and combination wave tests that the existing analog modules would have failed, but also other challenging tests that operating experience shows are not required to demonstrate proper function of components in these environments.	The NRC staff disagreed with the comment. Section D of the RG provides clear guidance regarding when this RG applies and how previously-established acceptable methods of compliance with regulations are treated. The comment appears to relate to replacement parts rather than modifications. However, if new, previously unqualified equipment is proposed to upgrade a system, then additional design qualification evidence may be necessary based on the results of a 10 CFR 50.59 evaluation. Nevertheless, as stated in Section D, an applicant or licensee can propose an acceptable alternate method for complying with regulations. Therefore, NRC made no changes to the RG.
David Herrell	Section C.1 (pg. 8)	(4) Concern: The last line of the paragraph starting "The electromagnetic conditions at the point of installation ... " is not very clear. Recommended Change: Replace "that are greater than 8 decibel (dB) below the specified operating envelopes." with something more like "that provide at least 8	The NRC staff agreed with the comment regarding the clarity of the clause. The wording of this sentence was modified as follows. “In accordance with the EMC practices endorsed herein, the EMI/RFI immunity of safety-related I&C systems should be demonstrated with a minimum of an 8 decibel (dB) margin provided above expected exposure

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		decibels (dB) of margin below the specified operating envelopes."	levels from all identified sources under any plant mode of operation (e.g., applied susceptibility operating envelopes provide an 8-dB margin above the anticipated highest exposure levels at the point of installation)."
David Herrell	Sections C.3 (pg. 11) and C.5 (pg. 14)	(5) Concern: Allowing use of both IEC and MIL-STD methods to test emissions, based on the phenomena, provides appropriate test flexibility, along with appropriate directions to ensure that overlap exists between frequency ranges tested. Recommended Change: None.	The NRC staff agreed with the comment. No changes to the RG were requested.
David Herrell	Section C.3.1 (pg. 12)	(6) Concern: The test ranges in the text and the figure should match. Recommended Change: Replace the first sentence with two sentences "For DC power leads, this test is performed from 30 Hz to 10 kHz. For AC power leads, this test is performed from the second harmonic of the power line frequency from 120 Hz for 60 Hz power or 100 Hz for 50 Hz power to 10 kHz."	The NRC staff agreed in part with the comment. To improve clarity, the following sentence was added after the cited first sentence of the paragraph. "For AC power leads, the frequency range over which the test is performed starts at the second harmonic of the power line frequency."
David Herrell	Section C.3.1 (pg. 12)	(7) Concern: In Figure 3.1, the AC curves have significant relaxation, in requirements, especially for the previous curves with power >1 kVA. It appears that eliminating the <1 kVA curve may generate problems in qualifying equipment, as there is a 2-3 db decrease in allowable at 120 Hz between	The NRC staff agreed in part with the comment. The referenced Technical Basis documentation does not capture the rationale for the change in the CE101 AC operating envelope. This change occurred late in the revision process and was inadvertently omitted from the technical basis report (ORNL/SPR-2016/108, ML16112A369).

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		Revision 1 and this revision. There is no technical reason to reduce the limit for low power equipment for the lower harmonics. Recommended Change: The present allowable limit is slightly higher from 120Hz to about 240Hz and the tighter limit could especially affect qualification of equipment < 1 KVA. Please consider whether providing an equivalent small second harmonic allowance when power levels are <1 kVA is reasonable.	The basis for the modified AC limit is described below. No change to the RG was warranted. NUREG/CR-6431 (ML003706139) gives the technical basis for the CE101 operating envelopes in RG 1.180, Rev. 0 and Rev 1. No change was initially proposed for this revision of the RG. However, interactions with industry at standards meetings indicated some difficulty arising from application of the AC limits. Consequently, the technical basis for those envelopes was reviewed. It was determined that the AC limits for the RG and those presented in the current versions of EPRI TR-102323 were derived from different platform limits in the MIL-STD. The RG had adopted the Navy surface ship and submarine limit as the operating envelope for AC-powered equipment with the rationale that a nuclear-powered submarine seemed more appropriate than aircraft as the basis for a nuclear power plant limit. Conversely, the EPRI Guide specifies the limit for Navy anti-submarine warfare aircraft and Army aircraft applications. In each case, the AC limits are more conservative than the limit accepted in the SER on EPRI TR-102323, Rev. 0/1. Additionally, the AC limits in each guide provide significant margin (>20 dB) between the emissions limits and the comparable susceptibility limits. Consequently, it was determined that adoption of the aircraft limit specified in the MIL-STD for AC power line emissions from equipment with source voltage greater than 28 V was justified. Given the substantial margin below the conducted

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			susceptibility limit, it was determined that this change resulted in no appreciable reduction in reasonable assurance of safety while promoting harmony between regulatory and industry guidance.
David Herrell	Section C.3.4 (pg. 14)	(8) Concern: Incorporating requirements to test to 10 GHz is appropriate. However, many older NRC Safety Evaluations and equipment in use were only tested to 1 GHz. Recommended Change: Please provide a statement that equipment previously qualified to RG 1.180 Rev 1 is still acceptable without having to generate an extensive argument for the missing 1 GHz to 10 GHz testing for each application.	The NRC staff disagreed with the recommended change in the comment. Section D of the RG provides clear guidance regarding when this RG applies and how previously-established acceptable methods of compliance with regulations are treated. No backfit for installed equipment is required. Therefore, NRC made no changes to the RG.
David Herrell	Section C.3.2 (pg. 12)	(9) Concern: For the CE102 test, the allowable emissions levels are dependent on the equipment operating voltage. It is not clear which level should be used when the equipment operating voltage falls between two given levels. Recommended Change: Provide a CE102 specific requirement for which test levels are to be used when the equipment operating voltage falls between two given test levels.	The NRC staff disagreed with the recommended change in the comment. The specification of the limits is consistent with the MIL-STD. The practice for relaxation in the limit is a stair step in which the relaxation factor applies when the equipment voltage is greater than or equal to the specified level. No change to the RG was warranted.
David Herrell	Section C.3.5 (pg. 14)	(10) Concern: Section 3.5 describes two options for addressing the lack of low frequency conducted or radiated emissions measurement in IEC 61000-6-4. Option 1 states that omitting low frequency	The NRC staff disagreed with the recommended change in the comment. The conditions for omitting low frequency emissions testing were first established in accordance with agreements that formed the basis for acceptance of EPRI

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		emissions measurements is acceptable if "power quality controls are in place" as described in Section 3.1 for CE-101 testing. In Section 3.1 two conditions are given: 1) power quality requirements of the equipment are consistent with the existing power supply, and 2) the equipment does not impose additional harmonic distortion on the existing power distribution system that exceeds 5% THD. It is not clear how these two conditions would be demonstrated for new l&C equipment. Recommended Change: Condition 1) seems to require that the existing plant power supply can provide power quality within the specifications of the new equipment. Provide examples of what these power quality specifications would be {voltage, frequency, current, ripple, dip and rise?), and explain why this is a concern regarding emissions from the new equipment. Condition 2) would seem to require a test that measures the change in the THD on the existing plant power distribution system when the new equipment is operated. The THD of the new equipment could be measured separately but it is not understood how those results could be mathematically combined with the THD of the existing system. Also, under what conditions would the THD of the existing system be measured? If this is intended to be an actual, practical approach to justifying omission of low frequency emissions testing, more guidance is needed on how to implement it.	TR-102323 by an SER. The statement of the omission conditions is consistent throughout versions of the RG and the EPRI Guide. Power quality practices relate specifically to the electrical power distribution system of a plant and are outside the scope of this guide on EMC for safety-related I&C systems. Extensive detail on power quality practices (methods, measurements, tests) would be suitable for treatment in separate guidance (see ORNL/SPR-2016/108, ML16112A369). No change to the RG was warranted.

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David Herrell	Section C.4 (pg. 17)	(11) Concern: In Table 7, IEC 61000-4-16 applies from 0 Hz {DC) to 150 kHz. Recommended Change: In Table 7, revise the description for IEC 61000-4-16 to read "0 Hz to 150 kHz".	The NRC staff agreed with the comment. The description for IEC 61000-4-16 in Table 7 was changed to “0 Hz to 150 kHz”. The same change was applied to Table 9.
David Herrell	Section C.4.1.1 (pg. 18)	(12) Concern: The first sentence in the CS101 test definition incorrectly specifies the frequency range, which conflicts with the last sentences in the same paragraph. Recommended Change: Replace the end of the first sentence" ... in the frequency range 30 Hz to 150 kHz." with" ... in the frequency ranges specified below." Since the ac powered devices start at a different frequency than dc powered devices.	The NRC staff disagreed with the comment. The first sentence specifies that the test method ensures systems are not susceptible to EMI/RFI present on power leads in the full frequency range. The subsequent sentences clarify specific applicability based on equipment types. There is no conflict. No change to the RG was warranted.
David Herrell	Section C.4.1.2 (pg. 19)	(13) Concern: Figure 4.2 does not specifically define the test levels at 0.01 MHz and 0.15 MHz. Recommended Change: Revise Figure 4.2 to specifically define the test levels at 0.01 MHz and 0.15 MHz, both as dotted horizontal lines and numeric dBµA values.	The NRC staff agreed with the comment. The specific levels (49 dBµA and 72.5 dBµA, respectively) was added to Figure 4.2.
David Herrell	Section C.4.1.3 (pg. 20)	(14) Concern: Table 10 has a blank row between Harmonic Nos. 7 and 9. Recommended Change:	The NRC staff agreed with the comment. The blank row was deleted from Table 10.

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		In Table 10, remove the blank row between Harmonic Nos. 7 and 9.	
David Herrell	Section C.4.2 (pg. 21)	(15) Concern: In Table 15, the CS115 levels increased from 2A in Rev. l to 5 A in Rev. 2. Further, the text requires doubling this limit for installations with greater exposure. There is no apparent technical reason provided for either of these substantial increases in test levels. Recommended Change: Either provide a technical rationale for going from 2 to 5 amps and for doubling the test levels in high exposure installations, or restore the previous test levels.	The NRC staff agreed in part with the comment. The basis for the change to 5 A is specified in ORNL/SPR-2016/108 (ML16112A369). The MIL-STD gives one limit for power and signal lines so the 2 A limit in RG 1.180, Rev. 1, was not consistent with the MIL-STD. Therefore, the 5A limit was adopted from the MIL-STD and is justified. However, the MIL-STD does not differentiate exposure according to locations and doubling the limit for CS115 is not clearly supported by the MIL-STD. The appropriate interpretation is that the MIL-STD limits bound the anticipated surge environments for those platforms. Consequently, the signal line susceptibility limits for CS115 and CS116 were modified to directly adopt the MIL-STD limits with no variation. The sentence concerning test levels for areas with elevated surge conditions was modified to remove the guidance on doubling the test level for CS115 and CS116. The CS116 test limit was modified to adopt the maximum peak current of 10 A as given in MIL-STD 461G. Therefore, the limit for CS116 in Table 15 was changed to reference the MIL-STD frequency-dependent limit given in Figure CS116-2 of the MIL-STD (see the response to the following comment by the same commenter). In addition, the cited sentence in the preceding paragraph of the RG was changed as follows.

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			"…Regulatory Position 5) ~~and, in those special cases, the operating envelopes given in Table 15 for CS115 and CS116 should be doubled. F~~ . Consequently, for the IEC tests, the operating envelopes in Table 17 should be used as a special case…"
David Herrell	Section C.4.2 (pg. 21)	(16) Concern: Table 15, the specification for CS116 is incomplete. Implementing CS116 requires specifying the frequencies that are to be tested (defaults are 0.01, 0.1, 1, 10, 30 and 100 MHz). The test level varies by frequency according to Figure CS116-2 in MIL-STD-461, and does not reach the maximum level until the test frequency is at or above 1 MHz. Recommended Change: Revise Table 15 to specifically state the frequency and test level criteria for performing CS116.	The NRC staff agreed in part with the comment. To avoid confusion, the envelope guidance in Table 15 was modified to reference the MIL-STD frequency-dependent limit given in Figure CS116-2 of the MIL-STD. However, guidance on the minimum set of frequencies at which the test must be conducted is explicitly specified in the test methods description of the MIL-STD and does not require repetition in the RG. Thus, the table entry for CS116 was changed from 5A to the following. "CS116 Apply damped sinusoidal waveform using frequency-dependent peak current specified in Figure CS116-2 of the MIL-STD"
David Herrell	Section C.4.2 (pg. 22)	(17) Concern: In Tables 16 and 17, the legend uses Withstand as does the text. However, the IEEE standard discusses Low, Medium, and High Exposure which generates questions when trying to apply the. RG. While we see the distinction made in the text introducing the tables, the tables should provide a straightforward path to the standards. Changing the terminology does not provide that straightforward path.	The NRC staff disagreed with the comment. The IEEE standard C62.41.2-2002 discusses exposure levels (low, medium, and high) but no longer gives limits specific to the exposure levels. Instead, a single limit is specified for all exposures. The RG takes an exception to the IEEE guidance regarding limits for SWC. The levels presented in the RG correspond to withstand levels that can be applied based on anticipated exposure; however, these levels do not strictly relate to the historical exposure categories in the IEEE standard. The RG is clear what specific local exposure conditions would

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		Recommended Change: Replace "Withstand" with "Exposure" in the legends for Tables 16 and 17, as well as within the text associated with the figures.	lead to the application of the elevated withstand level. It is expected that this limit would be applied only for special cases and the low withstand level should generally apply for almost all plant locations. No change to the RG was warranted.
David Herrell	Section C.4.2 (pg. 22)	(18) Concern: In Table 16, the IEC 61000-4-5 test levels are doubled when compared with RG 1.180 Revision 1. The levels were 1,000 volts and 500 amps which is increased to 2,000 and 1,000 amps, with no .referenced technical rationale or requirement for increasing the susceptibility test levels. Recommended Change: Provide a technical basis for doubling the test levels (changing Level 2 to Level 3), or return to the test levels provided in RG 1.180, Rev. 1.	The NRC staff disagreed with the comment. The basis for the change in test levels is specified in ORNL/SPR-2016/108 (ML16112A369). The IEC standard gives one limit for power and signal lines so the 1 kV and 500 A limits in RG 1.180, Rev. 1, were not consistent with the IEC standard. Therefore, to apply industry consensus limits, the Level 3/Level 4 limits were adopted for signal lines as they had been for power lines and are justified. No change to the RG was warranted.
David Herrell	Section C.4.3.2 (pg. 23)	(19) Concern: In Figure 4.3, there is no label on the vertical dashed line, which appears to be around 60 Hz. Recommended Change: Please add a label defining the frequency on the vertical dashed line, between 0.01 Hz and 0.1 Hz.	The NRC staff agreed with the comment. The label (0.06) was added to the x-axis of Figure 4.3 at the intersection with the dashed line.
David Herrell	Section C.5 (pg. 26)	(20) Concern: In Tables 21 and 22, the Ring Wave surge waveform has short-circuit current specifications similar to those for the Combination wave specification. From IEC 61000-4-123, the short circuit current rise time	The NRC staff disagreed with the comment. As opposed to the Combination wave, only one waveform is specified for the Ring wave. IEEE C62.41.2-2002 specifically states that “No short-circuit current waveform is specified for the 100 kHz Ring Wave.” The current characteristics derive directly from the applied

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		is 0.6 μs, the duration is 100 kHz, and the peak current varies with peak voltage. Recommended Change: Revise Tables 21 and 22 to include the relevant Ring Wave surge waveform short-circuit current specifications. At 2 kV, the peak current is 66.7 A. At 4 kV, the peak current is 133.3 A.	open-circuit voltage waveform and do not need to be specified. No change to the RG was warranted.
David Herrell	Section C.5.3 (pg. 29)	(21) Concern: Section 5.3 for EFT testing does not specify the' burst period (time between 15 msec bursts). Recommended Change: Section 5.3 should be revised to specify the EFT testing burst period (presumably 300 msec).	The NRC staff disagreed with the comment. The burst period is shown in Figure 5.5 and is specified in the IEEE and IEC standards. Thus, it does not need to be further specified in the RG. No change to the RG was warranted.
David Herrell	Section C.5.3 (pg. 29)	(22) Concern: The EFT testing specification states that for peak test voltages less than or equal to 2 kV, the pulse frequency is 5 kHz, and for peak test voltages greater than 2 kV, the pulse frequency is 2.5 kHz. IEC 61000-4-4 has no requirement for a pulse frequency of 2.5 kHz, regardless of the peak test voltage. The two pulse frequencies given in IEC 61000-4-4 are 5 kHz and 100 kHz, where 5 kHz is traditional and 100 kHz is optional. Test generators built for implementing IEC 61000-4-4 typically do not have the option to use a pulse frequency of 2.5 kHz, requiring custom test equipment or justification for deviation when working to this guideline. Recommended Change:	The NRC staff agreed with the comment. The distinction between peak test voltages in specifying pulse frequency (repetition rate) is a legacy from 1990s equipment (pulse generators). Current capabilities are reflected in the guidance within IEC 61000-4-4, which does not make the distinction and which gives an additional pulse frequency option. The distinction no longer applies for IEC 61000-4-4. The RG was changed as follows. “The number of pulses in a burst is determined by the pulse frequency. The pulse frequency is 5 kHz±1 kHz. For testing under IEC 61000-4-4, the 100 kHz±20kHz option for pulse frequency, with the associated 0.75 ms burst duration, can be alternately selected. The selection of pulse frequency of 2.5 kHz±0.5 kHz for peaks greater

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		If implementing IEC 61000-4-4 EFT testing, consider revising the requirement to include only 5 kHz pulse frequencies.	than 2 kV, as specified in IEEE C62.41.2-2002, is not necessary."
David Herrell	Section C.6 (pg. 30-31)	(23) Concern: With the restriction of ESD testing limited to overt effects (i.e., visible or detectable disturbance) and the implicit elimination of latent damage to the electronics from ESD, the testing is acceptable. Recommended Change: No change recommended. Much like testing for smoke exposure, ESD exposure can create latent defects in integrated circuits, which manifest months or years later. The testing provided is appropriate.	The NRC staff agreed with the comment. No changes to the RG were requested.
David Herrell	Section C.6 (pg. 30-31)	(24) Concern: With the restriction of ESD testing to that which can be touched during normal operation, there is an implicit, unstated requirement for ESD protection for maintenance of equipment not normally accessible. Recommended Change: Please provide an explicit statement that the licensee is responsible for ensuring that appropriate, effective ESD protection is worn during any evolution where equipment is touched that has not been ESD tested for overt effects.	The NRC staff disagreed with the recommended change. Guidance for maintenance practices is not within the scope of the RG. No change to the RG was warranted.
David Herrell	Section C.6 (pg. 31)	(25) Concern: Normally, the 8 kV and 15 kV requirements are stated as bipolar exposures, ±8 kV and ±15 kV.	The NRC staff disagreed with the recommended change. The IEC standard 61000-4-2 specifies both positive and negative polarity for testing so the limit is given in absolute values to be

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		This ensures that both polarities of ESD tests are performed. Recommended Change: Unless the intent is to require only one of the tests, please add the ± symbol to both the 8 kV and 15 kV requirements.	consistent with the levels defined in the standard. No change to the RG was warranted.
WEC	Section C.1 (pg. 9) Table 1	(1) Add "N/A" under "Standards Endorsed" column.	The NRC staff disagreed with the comment. Consistent with past versions of this RG, the entry in this column is blank because the position addresses the overall program, not the endorsement of specific standards. A similar rationale applies to the entry in this column for Position 7. No change to the RG was warranted.
WEC	Section C.1 (pg. 10) 1st paragraph	(2) The units for the values in parentheses should be “dBµV/m” instead of “dB/m” in the following text: “ ...(140 dB/m), the size of the exclusion zones ... “ and “ ...from the portable EMI/RFI emitters are limited to 4 V/m (132 dB/m) ... "	The NRC staff agreed with the comment. The units were changed in the cited text to “dBµV/m”.
WEC	Section C.3.4 (pg. 13) 1st paragraph	(3) Remove the word "emissions" after “2MHz to 10 GHz.”	The NRC staff agreed in part with the comment. The editorial problem resulted from formatting issues associated with Figure 3.3. The formatting of the Figure has been corrected. The wording in question now reads as follows: “…from 2 MHz to 10 GHz. It is applicable for emissions…”
WEC	Section C.4.2 (pg. 21) 1st paragraph	(4) Remove the “f” in front of “methods in fIEC 61000-4.”	The NRC staff agreed with the comment. The extraneous “f” has been removed from the cited text.

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WEC	Section C.4.2 (pg. 21) Table 13	(5) Table 13 should reference MIL-STD-461G instead of MIL-STD-461E.	The NRC staff agreed with the comment. The identification of the standard in Table 13 has been corrected to “MIL-STD-461G”.
WEC	Section C.4.2 (pg. 22) Table 17	(6) The IEC 61000-4-12 Level 3 test voltage is 2kV for line to ground, not 4 kV as documented in the table. The Level 4 test voltage is 4kV.	The NRC staff agreed with the comments. The IEC 61000-4-12 Level 3 test voltage in Table 17 has been corrected to show “2kV”.
WEC	Section C.4.3 (pg. 22) Table 18	(7) Table 18 should reference MIL-STD-461G instead of MIL-STD-461E.	The NRC staff agreed with the comment. The identification of the standard in Table 18 has been corrected to “MIL-STD-461G”.
WEC	Section C.4.3 (pg. 23) Tables 18 and 19	(8) Tables 18 and 19 identify different upper frequency limits for radiated susceptibility, electric field tests (te., 10 GHz vs. 6 GHz). Please add clarification, noting that testing above 6 GHz is not required if the IEC 61000-4-3 test method is used.	The NRC staff agreed in part with the comment. Clarification has been added that the IEC test should be applied up to 10 GHz if wireless communication devices are expected to be used at the site. The following sentence was added: “If wireless communication devices operating above 6 GHz are expected to be used at the site of installation, then the IEC test for high-frequency susceptibility should be applied up to 10 GHz. “
WEC	Section C.5.1 (pg. 27) 1st paragraph	(9) The beginning of the section reads: "The Ring Wave simulates oscillatory surges of relatively high frequency on the ac power leads ... " Is the ring wave test not applicable to DC power lines?	The NRC staff disagreed with the comment. The practices in IEEE Std C62.41.1, C62.41.2, and C62.45 only apply to AC power leads. The prior versions of the RG only addressed surge on AC power leads because this was the phenomenon of concern. The issue for DC power leads was considered to be properly attributed to power supplies as a power quality concern. Thus, while IEC 61000-4-12 applies to AC and DC power leads, the RG only specifies its application for AC power leads. No change to the RG was warranted.

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WEC	Section C.5.2 (pg. 28) 1st paragraph	(10) The beginning of the third line of this paragraph reads: " ... switching on the ac power leads of equipment and subsystems." Is the combination wave test not applicable to DC power lines?	The NRC staff disagreed with the comment. The practices in IEEE Std C62.41.1, C62.41.2, and C62.45 only apply to AC power leads. The prior versions of the RG only addressed surge on AC power leads because this was the phenomenon of concern. The issue for DC power leads was considered to be properly attributed to power supplies as a power quality concern. Thus, while IEC 61000-4-5 applies to AC and DC power leads, the RG only specifies its application for AC power leads. No change to the RG was warranted.
WEC	Section C.5.3 (pg. 29) 1st paragraph	(11) Is the Electrically Fast Transients test not applicable to DC power lines?	The NRC staff disagreed with the comment. The practices in IEEE Std C62.41.1, C62.41.2, and C62.45 only apply to AC power leads. The prior versions of the RG only addressed surge on AC power leads because this was the phenomenon of concern. The issue for DC power leads was considered to be properly attributed to power supplies as a power quality concern. Thus, while IEC 61000-4-4 applies to AC and DC power leads, the RG only specifies its application for AC power leads. No change to the RG was warranted.
EPRI	Section B (pg. 6)	(1) 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.	The NRC staff disagreed with the comment. This sentence is a minor revision to a sentence that is present in RG 1.180, Rev. 1. No change to the RG is warranted.
EPRI	General	(2) 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	The NRC staff disagreed with the comment. The staff acceptance of EPRI TR-102323, Rev. 0/1, as an acceptable method is not withdrawn nor is the EMC testing for any previously installed systems affected by this revised RG. Section D

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
		of the Regulatory Guide no longer mentions EPRI TR102323. The Licensees and their contractors heavily reference and use EPRI TR102323.	of the RG provides clear guidance regarding when this RG applies and how previously-established acceptable methods of compliance with regulations are treated. Regarding whether the revised RG mentions the EPRI guide, it is important to recognize that RG 1.180 has never endorsed any version of EPRI TR-102323. The reference to the SER and EPRI guide in prior versions of the RG occurred in the Discussion section (Section B) and served as background information providing context. This discussion was not considered necessary for this revision since the RG itself has been in use for almost 20 years so context should be well understood. No change to the RG is warranted.
EPRI	General	(3) 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.	The NRC staff disagreed with the comment. (1) Dated references are used for the endorsed standards. (2) The reference to the SER and EPRI guide in prior versions of the RG occurred in the Discussion section (Section B) and served as background information providing context. This discussion was not considered necessary for this revision since the RG itself has been in use for almost 20 years so context should be well understood. The removal of the references is of no regulatory consequence. The Regulatory Analysis section was issued as a separate document (ML17188A397). No change to the RG is warranted.
EPRI	General	(4) 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	The NRC staff agreed in part with the comment. NUREG 0800 is active and identifies relevant guidance against which the staff can conduct a review. This RG is identified in Chapter 7 of NUREG 0800 so the relationship is direct and

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		exists. There are indications that the General Design Criteria (GDC) is still considered applicable, but are not directly tied by reference.	unchanged from that point of perspective and implicit from the perspective of the RG. Nevertheless, NUREG-0800 Chapter 7 is now included in the identification of related guidance. Regarding the GDC, specific relevant GDC are cited in the RG (pg. 2). The following bullet was added to the Related Guidance subsection of Section B: • NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Chapter 7, "Instrumentation and Controls," identifies electromagnetic compatibility among the acceptance criteria for safety-related I&C systems (Ref. 5).
EPRI	General	(5) 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.	The NRC staff agreed in part with the comment. ESD testing is new to the RG. The basis for the change is described in ORNL/SPR-2016/108 (ML16112A369) and ORNL/SPR-2015/254 (ML17199A005). Thus, no change to the RG is warranted.
EPRI	General	(6) 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.	The NRC staff disagreed with the comment. The basis for the margin was established in the SER and remains unchanged. The SER has not been withdrawn. The lack of a reference to the SER in the RG does not affect its regulatory standing. No change to the RG is warranted.

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EPRI	General	(7) 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.	The NRC staff disagreed with the comment. The basis for the no mixing and matching provision was established early in the development of the technical basis for the first versions of the RG (see NUREG/CR-6431, NUREG/CR-6782 and other cited technical basis documents). No change to the RG is warranted.
EPRI	(pg. 1)	(8) First time 'electrostatic discharge' is added to the requirements. I can find no reference or specific technical basis for this addition	The NRC staff disagreed with the comment. The basis for including ESD testing is described in ORNL/SPR-2016/108 (ML16112A369) and ORNL/SPR-2015/254 (ML17199A005). Thus, no change to the RG is warranted.
EPRI	Table 1	(9) Can MIL-STD-461G CS118 also be used as an acceptable method for ESD testing?	No change to the RG was made. The NRC staff has not reviewed MIL-STD-461G CS118. It was issued very late in the development of the technical basis for revision of the RG and was not considered necessary given the availability of the longstanding guidance in IEC 61000-4-2.
EPRI	Section C.1 (pg. 10) 1st paragraph 2nd sentence	(10) 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.	The NRC staff disagreed with the comment. The basis for the margin was established in the SER and remains unchanged. It is noted that applicants and licensees are free to propose alternate methods for compliance with the Commission's regulations. No change to the RG is warranted.
EPRI	(pg. 10)	(11) The use of 10 V/m electric field (maximum) is listed but no basis provided. The 8 dB margin is applied (no technical basis).	The NRC staff disagreed with the comment. An example of how the margin could be applied is given using 10 V/m. This value is based on the

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		There is no discussion about potential variations in the E-M field nor the possibility of equipment qualified for higher or lower environments.	radiated electric field operating envelope for susceptibility. If a different maximum field strength is justified, then that value would apply. Again, the basis for margin is long established and its use is consistent across all regulatory guidance (including the SER on the EPRI guide). No change to the RG is warranted.
EPRI	Section C.1 (pg. 10)	(12) The basis for an 8 dB margin should be provided.	The NRC staff disagreed with the comment. The basis for the margin was established in the SER on the EPRI guide and remains unchanged. No change to the RG is warranted.
EPRI	Page 10 - C.1	(13) 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)"	The NRC staff agrees in part with the comment. For clarity, the wording was changed to the following. "For the operating envelope of 10 V/m (140 dB μV/m) associated with radiated electric field susceptibility,…"
EPRI	Page 10 - C.1	(14) Top paragraph of this page identifies 4 V/m as 132 dB/m but should be 132 dBuV/m	The NRC staff agreed with the comment. The units were changed in the cited text to "dBμV/m".
EPRI	Page 10 - C.1	(15) Definition of Pt related to the minimum exclusion distance is described as "the effective radiated power of the EMI/RFI transmitter (in Watts), but should be described as "the peak conducted power of the EMI/RFI emitter (in Watts)"	The NRC staff agreed in part with the comment. However, the power is radiated, not conducted. The sentence in the RG was changed as follows. "…the peak radiated power of the EMI/RFI emitter (in Watts)"
EPRI	Page 10 - C.3	(16) 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.	The NRC staff disagreed with the comment. While the proposed change would be rigorously correct, the existing term has been consistently used in current and prior guidance and is maintained to avoid confusion about whether

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
			the guidance has changed its purpose. No change was made to the RG.
EPRI	Page 10 - discussion of exclusion zones	(17) 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).	The NRC staff disagreed with the comment. The gain is a numerical value. It was not intended for the gain to be interpreted as a value in decibels. However, to reduce the apparent confusion, the term "(dimensionless)" was removed from the definition.
EPRI	Page 11 - C.3, Table 2	(18) In the introductory discussion of MIL-STD-461G, there should be a more detailed discussion of which Limits are chosen for the specific test criteria. 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.	The NRC staff disagreed with the comment. The operating envelopes (limits) for the MIL-STD tests are customized to reflect the nuclear power plant environment established through plant measurements. The basis for the limits is captured in the cited reference documents containing the technical basis information. Repeating this information after many of these envelopes (limits) have been in effect for 15 years is considered unnecessary. No change to the RG is warranted.
EPRI	Section C.3 (pg. 10 & 11) 2nd paragraph next-to-last sentence 2nd paragraph 1st sentence	(19) 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.	The NRC staff disagreed with the comment. The RG states “Either set of test methods should be applied in its entirety or in specified combinations subject to the clarifications and conditions identified in the guidance below.” Subsequently, the RG defines specific combinations and conditions in which the test methods from one standard can be used to address coverage gaps in the other set of standards. The guidance is not contradictory. No change to the RG is warranted.
EPRI	Page 10 & 11 - C.3	(20) 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	The NRC staff disagreed with the comment. The frequency ranges above 1 GHz as specified in the draft regulatory guide are identical to those

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
		is no explanation for the deviation from the MIL-STD-461G frequency range requirement.	existing in the current version of the regulatory guide. The applicable frequency ranges from RE102 and RS103 are addressed in technical basis documents (i.e., NUREG/CR-6782) and in Position 6 of RG 1.180, Rev. 1. The applicable frequency ranges specified in the regulatory guide are different from those in the MIL-STD because of differences in the nature and intensity of interference sources of concern. For nuclear power plants, the concern above 1 GHz arises primarily from wireless communications and internally generated noise (which drops off rapidly in the near-field). The MIL-STD guidance addresses military platforms and applications. In the rationale for the tests, it is stated that the intent of RE102 and RS103 are to "protect sensitive receivers from interference coupled through the antennas associated with the receiver" and to "ensure that equipment will operate without degradation in the presence of electromagnetic fields generated by antenna transmissions both onboard and external to the platform," respectively. Sensitive receivers and high-powered transmitters are not generally employed in nuclear plant environments. Thus, the limits and frequency ranges specified in RG 1.180, Rev. 1, were selected to be appropriate to a nuclear plant environment. The 10 GHz upper range for frequency was chosen as reasonable to address the potential threat from portable and fixed transmitters, which generally operate at 900 MHz, 2.4 GHz, and 5.8 GHz. No change to the RG is warranted.

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EPRI	(pg. 11) 2nd to last paragraph	(21) 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.	The NRC staff disagreed with the comment. The basis for the no mixing and matching provision was established early in the development of the technical basis for the first versions of the RG (see NUREG/CR-6431, NUREG/CR-6782 and other cited technical basis documents). However, to offer some flexibility for passive emissions testing, the RG defines specific combinations and conditions in which the test methods from one standard can be used to address coverage gaps in the other set of standards. No change to the RG is warranted.
EPRI	Page 12 - C.3.1	(22) The power sensitive criteria (limit line relaxation) in MIL-STD-461G is not shown or described in Figure 3.1.	The NRC staff disagrees with the comment. The limit relaxation referenced in the comment does not apply to the CE101 limits for military aircraft. The relaxation only applies to the AC limits for submarines and surface ships. No change to the RG was warranted.
EPRI	Page 12 - Section 3.1	(23) 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.	The NRC staff disagrees with the comment. The limit relaxation referenced in the comment does not apply to the CE101 limits for military aircraft. The relaxation only applies to the AC limits for submarines and surface ships. No change to the RG was warranted.
EPRI	Page 12 - Section 3.1	(24) 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	The NRC staff disagrees with the comment. The limit relaxation referenced in the comment does not apply to the CE101 limits for military aircraft. The relaxation only applies to the AC

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
		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.	limits for submarines and surface ships. No change to the RG was warranted.
EPRI	Page 12 - Section 3.1, 3.2, 3.3, and 3.4 Headings	(25) I would recommend putting MIL-STD-461G in front of CE101, CE102, RE101, and RE102 in the headings just for clarity.	The NRC staff agrees in part with the comment. It is considered to be understood from the preceding guidance that the test methods are from the MIL-STD. However, it is recognized that labeling is important. CE101, CE102, and RE102 are shown in the figures. RE101 Operating Envelope was added to Figure 3.3.
EPRI	Page 12 and 13 - Section 3.2 CE102 [Section B, pg. 5]	(26) 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.	The NRC staff agrees with the comment. The sentence (and an earlier sentence) was modified to add "I&C" between "analog" and "systems"
EPRI	Page 12 and 13 - Section 3.2 CE102	(27) 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.	The NRC staff agrees in part with the comment. The frequency range addressed in Section 3.2 was corrected to address an upper range of 10 MHz. The operating envelope plot (Figure 3.2) was extended from 2 MHz to 10 MHz (@ 73 dB)
EPRI	Section C.3 (pg.13) Figures 3.2 and 3.3	(28) Recommend reformatting Figure 3.2 and Figure 3.3. It seems that Figure 3.2 has a	The NRC staff agreed with the comment. The editorial problem resulted from formatting

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		second figure overlaid upon it while Figure 3.3 is missing.	issues associated with Figure 3.3. The formatting of Figures has been corrected.
EPRI	Page 13 - C.3.2	(29) The power sensitive criteria (limit line relaxation) in MIL-STD-461G is not shown or described in Figure 3.2.	The NRC staff disagrees with the comment. The limit relaxation referenced in the comment does not apply to the CE101 limits for military aircraft. The relaxation only applies to the AC limits for submarines and surface ships. No change to the RG was warranted.
EPRI	Page 13 - C.3.4	(30) 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.	The NRC staff disagreed with the comment. The frequency ranges above 1 GHz as specified in the draft regulatory guide are identical to those existing in the current version of the regulatory guide. The applicable frequency ranges from RE102 and RS103 are addressed in technical basis documents (i.e., NUREG/CR-6782) and in Position 6 of RG 1.180, Rev. 1. The applicable frequency ranges specified in the regulatory guide are different from those in the MIL-STD because of differences in the nature and intensity of interference sources of concern. For nuclear power plants, the concern above 1 GHz arises primarily from wireless communications and internally generated noise (which drops off rapidly in the near-field). The MIL-STD guidance addresses military platforms and applications. In the rationale for the tests, it is stated that the intent of RE102 and RS103 are to "protect sensitive receivers from interference coupled through the antennas associated with the receiver" and to "ensure that equipment will operate without degradation in the presence of electromagnetic fields generated by antenna transmissions both onboard and external to the platform," respectively. Sensitive receivers and

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
			high-powered transmitters are not generally employed in nuclear plant environments. Thus, the limits and frequency ranges specified in RG 1.180, Rev. 1, were selected to be appropriate to a nuclear plant environment. The 10 GHz upper range for frequency was chosen as reasonable to address the potential threat from portable and fixed transmitters, which generally operate at 900 MHz, 2.4 GHz, and 5.8 GHz. No change to the RG is warranted.
EPRI	Page 13 - Section 3.4 First Sentence	(31) Remove the word "emissions" after "2MHz to 10 GHz".	The NRC staff agreed in part with the comment. The editorial problem resulted from formatting issues associated with Figure 3.3. The formatting of the Figure has been corrected. The wording in question now reads as follows: "…from 2 MHz to 10 GHz. It is applicable for emissions…"
EPRI	Page 14	(32) "separation" from equipment 'sensitive to magnetic fields' needs a definition or a technical basis.	The NRC staff disagrees with the comment. This condition for omission of the test methods has been in place as stated for more than 20 years. No change to the RG is warranted.
EPRI	Section 3.5 (pg. 14) 2nd Paragraph	(33) 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	The NRC staff disagreed with the comment. Regarding CE102, the MIL-Std states that "The basic concept in the lower frequency portion of the requirement is to ensure that the EUT does not corrupt the power quality (allowable voltage distortion) on the power buses present on the platform" while "At higher frequencies, the CE102 limit serves as a separate control from RE102 on potential radiation from power leads". Thus, the lower frequency band is directly related to power quality issues. It should be noted that the electrical power systems of a nuclear power plant are outside the scope of the

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		range. This was also a gap in the previous RG when using exemptions.	RG. This issue can be further considered as part of subsequent investigation of power quality practices which is outside the scope of this RG. No change to the RG is warranted.
EPRI	(pg. 15) last paragraph	(34) 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.	The NRC staff disagreed with the comment. The basis for the no mixing and matching provision was established early in the development of the technical basis for the first versions of the RG (see NUREG/CR-6431, NUREG/CR-6782 and other cited technical basis documents). No change to the RG is warranted.
EPRI	Section C.3.6 (pg. 15)	(35) 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.	The NRC staff agreed in part with the comment. FCC certification can be credited in lieu of additional emissions testing for non-safety-related I&C systems over the frequency ranges covered by the certification. However, in the case of safety-related I&C systems, credit for this testing should be fully documented and available for review. The following paragraph was added to Section C.3.6 and the appropriate reference added: "Finally, Federal Communications Commission (FCC) certification for Class A or Class B devices under 47 CFR 15 may be credited over the frequency ranges covered by certification testing in lieu of additional testing for non-safety-related I&C systems. In order to take credit for FCC certification for safety-related I&C systems, test data and documentation equivalent to the information identified in Regulatory Position 7 should be maintained and be available for review."
EPRI	Section C.3.6 (pg. 15)	(36) Recommend keeping the alternative option of using FCC Part 15 Class A. In the majority	The NRC staff agreed in part with the comment. FCC certification can be credited in lieu of

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		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.	additional emissions testing for non-safety-related I&C systems over the frequency ranges covered by the certification. However, in the case of safety-related I&C systems, credit for this testing should be fully documented and available for review. The following paragraph was added to Section C.3.6 and the appropriate reference added: "Finally, Federal Communications Commission (FCC) certification for Class A or Class B devices under 47 CFR 15 may be credited over the frequency ranges covered by certification testing in lieu of additional testing for non-safety-related I&C systems. In order to take credit for FCC certification for safety-related I&C systems, test data and documentation equivalent to the information identified in Regulatory Position 7 should be maintained and be available for review."
EPRI	Page 15 - Section 3.6 First Paragraph	(37) 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)."	The NRC staff agreed with the comment. The suggested wording was adopted and the sentence was changed as follows: "plant has power quality controls in place and the equipment won't impose more than 5% THD (see conditions in the CE101 test guidance)."
EPRI	Page 15 - Section 3.6 First Paragraph	(38) 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.	The NRC staff agreed with the comment. The omission criteria for the lower frequency band of CE102 (here and in Section 3.2) was changed to an upper frequency bound of 150 kHz. Figure 3.5 was changed to reflect the adjustment.

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EPRI	Section 3.6 (pg. 15) 2nd Paragraph	(39) 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.	The NRC staff disagreed with the comment. Regarding CE102, the MIL-Std states that "The basic concept in the lower frequency portion of the requirement is to ensure that the EUT does not corrupt the power quality (allowable voltage distortion) on the power buses present on the platform" while "At higher frequencies, the CE102 limit serves as a separate control from RE102 on potential radiation from power leads". Thus, the lower frequency band is directly related to power quality issues. It should be noted that the electrical power systems of a nuclear power plant are outside the scope of the RG. This issue can be further considered as part of subsequent investigation of power quality practices which is outside the scope of this RG. No change to the RG is warranted.
EPRI	Page 15 – Table 4	(40) CISPR Class A removed, and average values removed. Quasi-peak values from Table 5 also changed.	No change made to the RG. No change requested. The CISPR Class A limits are no longer used (above 1 GHz is not covered). The limits from IEC 61000-6-4 are now used.
EPRI	Page 15 - Table 5	(41) 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.	The NRC staff disagreed with the comment. The IEC standard gives equivalent limits depending on the test method used. It is considered unnecessary to document all of the test method variations covered within the standard since the equivalent limits are readily evident. No change to the RG is warranted.
EPRI	Page 16 - C.4	(42) 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.	The NRC staff disagreed with the comment. While the proposed change would be rigorously correct, the existing term has been consistently used in current and prior guidance and is maintained to avoid confusion about whether

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
			the guidance has changed its purpose. No change was made to the RG.
EPRI	Section C.4 (pg. 16)	(43) 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)."	The NRC staff disagreed with the comment. ESD is covered in C.6 (with only IEC) and Surge Withstand is covered in C.5 (with the IEEE and IEC test methods being essentially interchangeable – basically identical). No change was made to the RG.
EPRI	Section C.4 Table 6 (pg. 16)	(44) 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.	The NRC staff disagreed with the comment. The 30 MHz to 200 MHz frequency band is omitted because it is covered by RS103 testing (per MIL-STD). The rationale is given in cited technical basis documents and the MIL-STD. No change to the RG was warranted.
EPRI	Section C.4 (pg. 16) 2nd paragraph	(45) no mix and match of standards. No basis.	The NRC staff disagreed with the comment. The basis for the no mixing and matching provision was established early in the development of the technical basis for the first versions of the RG (see NUREG/CR-6431, NUREG/CR-6782 and other cited technical basis documents). No change to the RG is warranted.
EPRI	Page 16 through 30 - Sections 4 & 5	(46) 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.	The NRC staff disagreed with the comment. The CS115 and CS116 tests are only identified for signal lines. The IEEE standard specifically defines its application as being for AC power lines. The organization of the guidance is maintained from the prior version of the RG. No change to the RG is warranted.
EPRI	Page 18 - C.4.1.2	(47) there is no indication of the acceptable operating class (A, B, C, etc.) when discussing	The NRC staff disagreed with the comment. As is the case for all qualification testing, the

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
		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.	acceptance criteria depends on the equipment specification and the function being performed. It is not appropriate for the RG to specify generic acceptance criteria. No change to the RG was warranted.
EPRI	Page 18 - C.4.1.2	(48) 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.	The NRC staff disagreed with the comment. The 30 MHz to 200 MHz frequency band is omitted because it is covered by RS103 testing (per MIL-STD). The rationale is given in cited technical basis documents and the MIL-STD. No change to the RG was warranted.
EPRI	Page 18 and 19 - Section 4.1.2	(49) 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.	The NRC staff disagrees with the comment. Customized testing levels are allowed in the MIL-STD and can be specified based on the unique conditions for the application. Additionally, the defined levels in the MIL-STD apply to specific military platforms so there is no imperative to force their application to other platforms. ORNL/SPR-2015/485 (ML17199A004) documents the basis for the CS114 operating envelope in the RG. No change to the RG was warranted.
EPRI	Page 2 - Related Guidance	(50) not clear why this is not simply included as pointers to the References section, there is no real detail provided	There is no change to the RG. This organization is consistent with the RG style adopted by NRC.

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
EPRI	Page 2 - under Applicable Regulations	(51) 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.	The NRC staff disagreed with the comment. These criteria are cited in RG 1.180, Rev. 0 and Rev. 1. No change to the RG was warranted.
EPRI	Page 20	(52) Table 11 is new. Do not believe there is an equivalent US standard.	No change to the RG is made. No change requested.
EPRI	Page 21	(53) Table 15 is updated. (need to verify curves for CS114 are correct for Figure 4.2)	No change to the RG is made. No change requested.
EPRI	Section C.4.2 (pg. 21) Table 13	(54) Recommend revising the title of Table 13 to use "MIL-STD-461G" instead of "MIL-STD-461E".	The NRC staff agreed with the comment. The identification of the standard in Table 13 has been corrected to “MIL-STD-461G”.
EPRI	Section C.4.2 (pg. 21)	(55) Top paragraph has an erroneous "f" placed prior to IEC 6100-4.	The NRC staff agreed with the comment. The extraneous “f” has been removed from the cited text.
EPRI	Page 17 – Table 7 (and more)	(56) 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.	The NRC staff disagreed with the comment. As is the case for all qualification testing, the acceptance criteria depends on the equipment specification and the function being performed. It is not appropriate for the RG to specify generic acceptance criteria. No change to the RG was warranted.
EPRI	Page 21 - C.4.2, Table 15	(57) 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.	The NRC staff disagreed with the comment The detail on the test waveform is contained in the MIL-STD and does not require repeating in the RG. However, the expression of the guidance has been changed in response to another comment (PC-3 #16)

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EPRI	Page 21 - Table 13	(58) Table 13 should reference MIL-STD-461G instead of MIL-STD-461E	The NRC staff agreed with the comment. The identification of the standard in Table 13 has been corrected to “MIL-STD-461G”.
EPRI	Page 21 and 22 - Table 15	(59) 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.	The NRC staff disagreed with the comment. The CS116 test is not offered as an alternate to IEC 61000-4-5 for surge withstand testing of power lines. However, it is adopted as an alternative for the less extreme testing of signal lines. No change to the RG was warranted.
EPRI	Page 22	(60) 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.	No change to the RG is made. No change requested.
EPRI	Page 22 - Table 17	(61) 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.	The NRC staff agreed with the comment. The 4 kV limit was changed to the correct value of 2 kV.
EPRI	Page 22 - Table 18	(62) Table 18 should reference MIL-STD-461G instead of MIL-STD-461E	The NRC staff agreed with the comment. The editorial change was made to the RG.
EPRI	Page 23	(63) 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.	The NRC staff disagreed with the comment. The technical basis for the limit is given in NUREG/CR-6782 and MIL-STD. No change to the RG was warranted.
EPRI	Section C.4.4 (pg. 24)	(64) 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,	The NRC staff disagreed with the comment. ESD is covered in C.6 (with only IEC) and Surge Withstand is covered in C.5 (with the IEEE and IEC test methods being essentially

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
		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)."	interchangeable – basically identical). No change was made to the RG.
EPRI	Page 27	(65) Table 23 no longer includes Category C 'Exterior' levels.	No change to the RG is made. No change is requested.
EPRI	Page 27 - Section 5.1	(66) Is the Ring Wave test only applicable to ac power leads? Are DC leads not to be tested?	The NRC staff disagreed with the comment. The practices in IEEE Std C62.41.1, C62.41.2, and C62.45 only apply to AC power leads. The prior versions of the RG only addressed surge on AC power leads because this was the phenomenon of concern. The issue for DC power leads was considered to be properly attributed to power supplies as a power quality concern. Thus, while IEC 61000-4-12 applies to AC and DC power leads, the RG only specifies its application for AC power leads. No change to the RG was warranted.
EPRI	Page 28 - Section 5.2	(67) Is the Combination Wave test only applicable to ac power leads? Are DC leads not to be tested?	The NRC staff disagreed with the comment. The practices in IEEE Std C62.41.1, C62.41.2, and C62.45 only apply to AC power leads. The prior versions of the RG only addressed surge on AC power leads because this was the phenomenon of concern. The issue for DC power leads was considered to be properly attributed to power supplies as a power quality concern. Thus, while IEC 61000-4-5 applies to AC and DC power leads, the RG only specifies its application for AC power leads. No change to the RG was warranted.
EPRI	Page 29	(68) Section 5.3 removed the requirement to use a frequency "up to 10 times the base frequency" above 1 GHz (acceptable).	No change to the RG is made. No change is requested.

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EPRI	Page 29 - Section 5.3	(69) Is the EFT test only applicable to ac power leads? Are DC leads not to be tested?	The NRC staff disagreed with the comment. The practices in IEEE Std C62.41.1, C62.41.2, and C62.45 only apply to AC power leads. The prior versions of the RG only addressed surge on AC power leads because this was the phenomenon of concern. The issue for DC power leads was considered to be properly attributed to power supplies as a power quality concern. Thus, while IEC 61000-4-4 applies to AC and DC power leads, the RG only specifies its application for AC power leads. No change to the RG was warranted.
EPRI	Section A (pg. 3) 5th bullet	(70) 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.	The NRC staff disagreed with the comment. Electromagnetic conditions are identified as relevant service conditions and EMC testing is included in the testing sequence within current EQ standards. Therefore, the inclusion of RG 1.89 is appropriate given the consensus scope of EQ. No change to the RG was warranted.
EPRI	Page 30 - Section 6	(71) Is the MIL-STD-461G CS118 test an acceptable substitute for the IEC 61000-4-2 ESD test?	No change to the RG was made. The NRC has not reviewed MIL-STD-461G CS118. It was issued very late in the development of the technical basis for revision of the RG and was not considered necessary given the availability of the longstanding guidance in IEC 61000-4-2.
EPRI	Page 30 and 31	(72) 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.	No change to the RG is made. No change is requested.

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EPRI	Page 31 - Section 7	(73) Suggest referencing MIL-STD-461G section 6.3 which points to DI-EMCS-80200 for the Electromagnetic Interference Test Report.	No change was made to the RG. The suggestion would require adoption of an unreviewed standard/document (DI-EMCS-80200). The RG does not prohibit this format from being used.
EPRI	Page 31 Section 7 Documentation	(74) [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).	No change was made to the RG. There was no change requested.
EPRI	Section B (pg. 5)	(75) 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.	The NRC staff disagreed with the comment. The endorsement of EPRI TR-102323, Rev. 0/1, has not been withdrawn. The RG has never endorsed the EPRI guide and it is not necessary to reference it. No change was made to the RG.
EPRI	Section B (pg. 5) 1st paragraph	(76) 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.	The NRC staff disagreed with the comment. There have been several research investigation in the cited technical basis references and other project reports that support the statement. It is a valid statement. No change to the RG was warranted.
EPRI	Section B (pg. 5) 3rd paragraph 3rd sentence	(77) 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.	The NRC staff agreed with the comment. The word "recent" was deleted from the cited sentence.
EPRI	Section B (pg. 5)	(78) Recommend revising to remove the statement "and non-safety-related I&C system	The NRC staff disagreed with the comment. The emissions from non-safety-related systems and

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	4th paragraph 2nd sentence	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.	components can affect safety-related systems and functions. Controlling emissions from all new I&C systems is necessary to ensure that the operating envelopes (limits) remain valid. No change to the RG is warranted.
EPRI	Page 5 - End of Second paragraph	(79) 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?	The NRC staff disagreed with the comment. The guidance does not automatically apply to maintenance of existing I&C systems (replacement/refurbishment with like-for-like parts). Section D of the RG provides clear guidance regarding when this RG applies and how previously-established acceptable methods of compliance with regulations are treated. The scope of the equipment covered by the RG is limited to I&C systems. While the EMC practices in the RG can apply to electrical equipment, the full range of applicable practices and limits have not been identified for this guide. No change to the RG was warranted.
EPRI	Page 5 (and more)	(80) 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.	The NRC staff disagreed with the comment The usage is consistent with prior versions of RG. An extensive technical basis provided in cited and other NUREG/CRs. No change to the RG is warranted.
EPRI	Page 5 through 7 - Section B	(81) 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.	The NRC staff disagreed with the comment The usage is consistent with prior versions of RG. An extensive technical basis provided in cited and other NUREG/CRs. No change to the RG is warranted.

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EPRI	Page 5 through 7 - Section B	(82) 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.	The NRC staff disagreed with the comment. The staff acceptance of EPRI TR-102323, Rev. 0/1, as an acceptable method is not withdrawn nor is the EMC testing for any previously installed systems affected by this revised RG. Section D of the RG provides clear guidance regarding when this RG applies and how previously-established acceptable methods of compliance with regulations are treated. Regarding whether the revised RG mentions the EPRI guide, it is important to recognize that RG 1.180 has never endorsed any version of EPRI TR-102323. The reference to the SER and EPRI guide in prior versions of the RG occurred in the Discussion section (Section B) and served as background information providing context. This discussion was not considered necessary for this revision since the RG itself has been in use for almost 20 years so context should be well understood. No change to the RG is warranted.
EPRI	Page 6	(83) 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?	The rationale and technical support for changes in the operating envelopes are described in the referenced technical basis documents identified in Section B. Thus, no change to the RG is warranted.
EPRI	Page 6	(84) Why are MIL STD and IEEE standards locked into specific versions while the IEC standards are not? It would be preferred that none of them are locked in, and the latest versions of all are what should be used.	The NRC staff disagreed with the comment. Given that substantial changes in the test methods and associated guidance can occur as these standards undergo revision (e.g., substantial changes in guidance transitioning between MIL-STD 461C + 462 and 461D + 462D), blind endorsement of future versions of any standard poses the risk that the effectiveness

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			of the endorsed method may be compromised by unreviewed changes. Consequently, the endorsements are limited to reviewed versions of the standards. Consequently, Therefore, NRC made no changes to the RG.
EPRI	Page 7	(85) top full paragraph; implies that technical bases / documentation for planned locations needs to be prepared and maintained.	The NRC staff disagreed with the comment. The background in the Discussion section provides information, not regulatory positions. The relevant regulatory position (in RP 1) occurs in the third paragraph of that position, which addresses the need to assess the electromagnetic environment at the point of installation and confirm that the operating envelopes maintain the margin above the expected environment. No change to the RG is warranted.
EPRI		(86) It seems incomplete that the section titled "Harmonization with International Standards" does not discuss IEC 62003	No change was made to the RG. The current version of IEC 62003 is not considered adequate for endorsement so no harmonization was occurred.
EPRI		(87) 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.	No change to the RG was made. The IEEE standard 473 was cited in the Discussion section of Revision 1 of the RG. It has never been endorsed as part of the regulatory guidance. Future review and endorsement of the standard can be considered when it is reissued.
EPRI	Section C.1 (pg. 8)	(88) first of multiple instances where the “8 dB margin” is invoked. No technical basis for the margin is provided.	The NRC staff disagreed with the comment. The basis for the margin was established in the SER and remains unchanged. It is noted that applicants and licensees are free to propose alternate methods for compliance with the

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
			Commission's regulations. No change to the RG is warranted.
EPRI	Page 8	(89) 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.	The NRC staff disagreed with the comment. It is unclear to which paragraph the comment refers. However, the paragraph on testing configuration offers relief from the interpretation of the prior guidance that all possible configurations must be tested. The examples are given to illustrate the concept of worst case for establishing bounding configurations. The subsequent paragraph essentially repeats prior guidance from RG 1.180, Rev. 1, which has been in place for 15 years. No change to the RG was warranted.
EPRI	Section C.1 (pg. 8) 2nd paragraph 4th sentence	(90) 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.	The NRC staff disagreed with the comment. The emissions from non-safety-related systems and components can affect safety-related systems and functions. Controlling emissions from all new I&C systems is necessary to ensure that the operating envelopes (limits) remain valid. No change to the RG is warranted.
EPRI	Section C.1 (pg. 8) 3rd paragraph	(91) 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,	The NRC staff disagreed with the comment. The basis for the margin was established in the SER and remains unchanged. It is noted that applicants and licensees are free to propose alternate methods for compliance with the Commission's regulations. No change to the RG is warranted.

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		and improvements in devices can easily be used to justify the reduction of the 250% margin.	
EPRI	Section C.1 (pg. 8) 3rd paragraph	(92) The basis for an 8 dB margin should be provided.	The NRC staff disagreed with the comment. The basis for the margin was established in the SER on the EPRI guide and remains unchanged. No change to the RG is warranted.
EPRI	Page 8 - C.1 3rd Paragraph	(93) "implemented as part of installation, maintained, and controlled." should be changed to "implemented and controlled through installation and maintenance practices."	The NRC staff agreed with the comment. The sentence was changed as follows. "...implemented during installation and then maintained and controlled"
EPRI	Page 9	(94) 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.	The NRC staff disagreed with the comment. The Table was made complete to conform to current RG style conventions. Thus, Regulatory Positions 1 and 7 were described. No change to the RG was warranted.
EPRI	Pages 10 and 11	(95) references to the EPRI Guide from Rev.1 have been removed (with no explanation).	The NRC staff disagreed with the comment. The staff acceptance of EPRI TR-102323, Rev. 0/1, as an acceptable method is not withdrawn nor is the EMC testing for any previously installed systems affected by this revised RG. Section D of the RG provides clear guidance regarding when this RG applies and how previously-established acceptable methods of compliance with regulations are treated. Regarding whether the revised RG mentions the EPRI guide, it is important to recognize that RG 1.180 has never endorsed any version of EPRI TR-102323. The reference to the SER and EPRI guide in prior versions of the RG occurred in the Discussion

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
			section (Section B) and served as background information providing context. This discussion was not considered necessary for this revision since the RG itself has been in use for almost 20 years so context should be well understood. No change to the RG is warranted.
EPRI	Pages 12 and 13 - C.3.2	(96) 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.	The NRC staff agrees with the comment. The frequency range addressed in Section 3.2 was corrected to address an upper range of 10 MHz. The operating envelope plot (Figure 3.2) was extended from 2 MHz to 10 MHz (@ 73 dB)
EPRI	Section C.3	(97) DG-1333 should include an endorsement for FCC 47 CFR Part 15 Class A (and B) requirements.	The NRC staff agreed in part with the comment. FCC certification can be credited in lieu of additional emissions testing for non-safety-related I&C systems over the frequency ranges covered by the certification. However, in the case of safety-related I&C systems, credit for this testing should be fully documented and available for review. The following paragraph was added to Section C.3.6 and the appropriate reference added: “Finally, Federal Communications Commission (FCC) certification for Class A or Class B devices under 47 CFR 15 may be credited over the frequency ranges covered by certification testing in lieu of additional testing for non-safety-related I&C systems. In order to take credit for FCC certification for safety-related I&C systems, test data and documentation equivalent to the information identified in

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
			Regulatory Position 7 should be maintained and be available for review."
EPRI	General	(98) IEC Specifications not readily available for review. They are costly as obtained from the IEC. Did not review specifics for IEC testing.	This comment requires no NRC action.
SNC	Section A (pg. 3) 5th bullet	(1) Comment: 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. Proposed Resolution: Recommend deleting the reference to RG 1.89.	The NRC staff disagreed with the comment. Electromagnetic conditions are identified as relevant service conditions and EMC testing is included in the testing sequence within current EQ standards. Therefore, the inclusion of RG 1.89 is appropriate given the consensus scope of EQ. No change to the RG was warranted.
SNC	Section B (pg. 5)	(2) Comment: EPRI TR-102323 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. Proposed Resolution: Recommend that either the "Reason for Revision" or "Background" sub-sections address why the NRC no longer endorses EPRI TR-102323.	The NRC staff disagreed with the comment. The endorsement of EPRI TR-102323, Rev. 0/1, has not been withdrawn. The RG has never endorsed the EPRI guide and it is not necessary to reference it. No change was made to the RG.
SNC	Section B (pg. 5) 1st paragraph	(3) Comment: Proposed Resolution: Recommend providing a reference that supports the claim in the first paragraph of subsection	The NRC staff disagreed with the comment. There have been several research investigation in the cited technical basis references and other project reports that support the statement. It is a

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
		"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.	valid statement. No change to the RG was warranted.
SNC	Section B (pg. 5) 3rd paragraph 3rd sentence	(4) Comment: This wording is a holdover from the RG version that was issued 15 years ago. Therefore, the word "recent" no longer seems appropriate. Proposed Resolution: Recommend deleting "recent".	The NRC staff agreed with the comment. The word "recent" was deleted from the cited sentence.
SNC	Section B (pg. 5) 4th paragraph 2nd sentence	(5) Comment: The statement "and non-safety-related I&C system whose failure can affect safety functions" 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. Proposed Resolution: Recommend revising to remove the statement "and non-safety-related I&C system whose failure can affect safety functions".	The NRC staff disagreed with the comment. The emissions from non-safety-related systems and components can affect safety-related systems and functions. Controlling emissions from all new I&C systems is necessary to ensure that the operating envelopes (limits) remain valid. No change to the RG is warranted.
SNC	Section C.1 (pg. 8) 2nd paragraph 4th sentence	(6) Comment: The statement " and non-safety-related systems and components whose operation can affect safety-related system or component functions" is inconsistent with the title for the regulatory guide which limits the guidance to "Safety-	The NRC staff disagreed with the comment. The emissions from non-safety-related systems and components can affect safety-related systems and functions. Controlling emissions from all new I&C systems is necessary to ensure that the

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
		Related Instrumentation and Control Systems". The wording is inconsistent with the title and involves expanding the scope of the guidance. Proposed Resolution: Recommend revising to remove the statement "and non-safety-related systems and components whose operation can affect safety-related system or component functions".	operating envelopes (limits) remain valid. No change to the RG is warranted.
SNC	Section C.1 (pg. 8) 3rd paragraph last sentence	(7) Comment: The 8-decibel 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. Proposed Resolution: Recommend reducing the 8 decibel margin requirement.	The NRC staff disagreed with the comment. The basis for the margin was established in the SER and remains unchanged. It is noted that applicants and licensees are free to propose alternate methods for compliance with the Commission's regulations. No change to the RG is warranted.
SNC	Section C.1 (pg. 10) 1st paragraph 2nd sentence	(8) Comment: The 8-decibel 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,	The NRC staff disagreed with the comment. The basis for the margin was established in the SER and remains unchanged. It is noted that applicants and licensees are free to propose alternate methods for compliance with the Commission's regulations. No change to the RG is warranted.

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
		and improvements in devices can easily be used to justify the reduction of the 250% margin. Proposed Resolution: Recommend reducing the 8 decibel margin requirement.	
SNC	Section C.3 (pg. 10 & 11) 2nd paragraph next-to-last sentence 2nd paragraph 1st sentence	(9) Comment: These two paragraphs seemingly contradict each other in regards to performing tests entirely using one standard (military or IEC) and when testing can be combined. A clarifying sentence would be helpful in removing uncertainty. Proposed Resolution: Recommend clarifying when military standards and IEC standards must be used in their entirety and when then can be used in combination.	The NRC staff disagreed with the comment. The RG states "Either set of test methods should be applied in its entirety or in specified combinations subject to the clarifications and conditions identified in the guidance below." Subsequently, the RG defines specific combinations and conditions in which the test methods from one standard can be used to address coverage gaps in the other set of standards. The guidance is not contradictory. No change to the RG is warranted.
SNC	Section C.3 (pg.13) Figures 3.2 and 3.3	(10) Comment: It seems that Figure 3.2 has a second figure overlaid upon it while Figure 3.3 is missing. Proposed Resolution: Recommend reformatting Figure 3.2 and Figure 3.3.	The NRC staff agreed with the comment. The editorial problem resulted from formatting issues associated with Figure 3.3. The formatting of Figures has been corrected.
SNC	Section C.3	(11) Comment: The proposed revision implies that licenses must use and adhere to the CISPR 16 tests referenced in IEC 61000-6-4 when not testing to MIL-STD-461. Currently, IEC 61000-6-4 incorporates the test methods of both CISPR 16 and CISPR 11 by reference. Because CISPR 11 was the only one referenced in IEC 61000-6-4 prior to 2006, the proposed guidance implies licensees will have to retest a considerable	The NRC staff disagreed with the comment. Section D of the RG provides clear guidance regarding when this RG applies and how previously-established acceptable methods of compliance with regulations are treated. Therefore, NRC made no changes to the RG.

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
		number of legacy components in inventory without gaining any safety benefit. This effort would not only be very costly to licensees, but would likely delay beneficial modifications. Proposed Resolution: Recommend removing the explicit reference to only CISPR 16, or adding a statement that permits licensees to utilize components currently tested to older EMI/RFI certifications.	
SNC	Section C.3.6 (pg. 15)	(12) Comment: For 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. Proposed Resolution: Recommend keeping the alternative option of using FCC Part 15 Class A.	The NRC staff agreed in part with the comment. FCC certification can be credited in lieu of additional emissions testing for non-safety-related I&C systems over the frequency ranges covered by the certification. However, in the case of safety-related I&C systems, credit for this testing should be fully documented and available for review. The following paragraph was added to Section C.3.6 and the appropriate reference added: "Finally, Federal Communications Commission (FCC) certification for Class A or Class B devices under 47 CFR 15 may be credited over the frequency ranges covered by certification testing in lieu of additional testing for non-safety-related I&C systems. In order to take credit for FCC certification for safety-related I&C systems, test data and documentation equivalent to the information identified in Regulatory Position 7 should be maintained and be available for review."

Commenter	Section of DG-1333	Specific Comments	NRC Resolution
SNC	Section C.4.2 (pg. 21) Table 13	(13) Comment: Proposed Resolution: Recommend revising the title of Table 13 to use "MIL-STD-461G" instead of "MIL-STD-461E".	The NRC staff agreed with the comment. The identification of the standard in Table 13 has been corrected to “MIL-STD-461G”.
SNC	General	(14) Comment: 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. Proposed Resolution: Recommend not deleting any reference or mention of EPRI TR102323.	The NRC staff disagreed with the comment. The staff acceptance of EPRI TR-102323, Rev. 0/1, as an acceptable method is not withdrawn nor is the EMC testing for any previously installed systems affected by this revised RG. Section D of the RG provides clear guidance regarding when this RG applies and how previously-established acceptable methods of compliance with regulations are treated. Regarding whether the revised RG mentions the EPRI guide, it is important to recognize that RG 1.180 has never endorsed any version of EPRI TR-102323. The reference to the SER and EPRI guide in prior versions of the RG occurred in the Discussion section (Section B) and served as background information providing context. This discussion was not considered necessary for this revision since the RG itself has been in use for almost 20 years so context should be well understood. No change to the RG is warranted.