

Regulatory Guide Periodic Review

Regulatory Guide Number: **1.53**
Revision number: **2**
Title: **Application of the Single-Failure Criterion to Safety Systems**
Office/division/branch: **RES/DE/ICEEB**
Technical Lead: **Bernard Dittman**
Staff Action Decided: **Reviewed with issues identified for future consideration**

1. **What are the known technical or regulatory issues with the current version of the Regulatory Guide (RG)?**

Revision 2 of RG 1.53 was published in 2003. It endorses the Institute of Electrical and Electronics Engineers (IEEE) Standard (Std) 379-2000, "IEEE Standard for Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems," and there are no immediate technical issues with the current revision of RG 1.53.

However, there are inconsistencies between the edition of IEEE Std 379-2000, which was cleanly endorsed in Revision 2 of RG 1.53, and other referenced and endorsed industry consensus standards such as IEEE Std 7-4.3.2, "IEEE Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations," endorsed by RG 1.152. The NRC endorsed edition of an IEEE standard does not always agree with the edition identified as a normative reference within the IEEE standard. This cross referencing presents a regulatory clarity and efficiency challenge for equipment vendors, applicants, and the NRC staff due to the variations in the editions being endorsed by the NRC and those identified in the IEEE standards.

There is a newer edition of the standard, IEEE Std 379-2014. It discusses treatment of common-cause failures (CCFs) in terms of screening CCFs from its scope. It applies the latest edition for undated references. For example, it identifies the latest editions of IEEE Std 7-4.3.2 and IEEE Std 352, "IEEE Guide for General Principles of Reliability Analysis of Nuclear Power Generating Station Protection Systems," as indispensable normative references. IEEE Std 7-4.3.2 provides standard criteria for digital computers in safety systems while IEEE Std 352 is a guide for general principles for reliability analysis. Both normative references include methods to address CCFs. IEEE Std 379-2014 identifies IEEE Std 7-4.3.2-2010 as an example of a standard which addresses the analysis and the design techniques for prevention of CCFs for safety systems containing digital computers. IEEE Std 379-2014 states IEEE Std 352 should be used to identify and screen out CCF mechanisms not normally considered in an analysis of independent component failures. IEEE Std 352-1987 is not endorsed by NRC regulatory guide, but it is referenced by Clause 5.15 of IEEE Std 603-1991, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," which is included in regulation by reference. Additionally, there is a proposed Draft 6 February 2016 edition of IEEE Std 352. Both IEEE Std 352 editions include an extended qualitative analysis for CCF to assess likelihood and gain maximum assurance CCF likelihood is sufficiently low.

Neither the latest edition of IEEE Std 7-4.3.2 nor IEEE Std 352 have been endorsed by the NRC as providing acceptable methods for addressing CCF. As such, there is a need to coordinate any future revision of RG 1.53 with the regulatory infrastructure modernization activities under the "Integrated Action Plan to Modernize Digital Instrumentation and Controls Regulatory Infrastructure," (IAP) (ADAMS Accession No. [ML16097A182](#)). Likewise, any future endorsement of IEEE Std 379-2014 via a revision of RG 1.53 should be pursued

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in a coordinated and consistent fashion with the IAP activities to prevent additional technical or regulatory issues.

- 2. What is the impact on internal and external stakeholders of not updating the RG for the known issues, in terms of anticipated numbers of licensing and inspection activities over the next several years?**

There is no impact to not updating the RG to address the known issues. Industry has stated operating licensees do not intend to submit many licensing actions until greater regulatory certainty is obtained through IAP efforts to modernize the regulatory infrastructure. Furthermore, most new reactor licensing actions are near completion based on the current RG 1.53. As such, the staff expects activities involving the single-failure criterion to be minimal. Although changes to IEEE Std 379 from the 2000 to the 2014 edition include its discussion of CCFs, the remaining changes are largely administrative. Until IAP efforts address CCF policy, the current guidance provided by RG 1.53 is sufficient to address any licensing or inspection activities that may occur prior to the completion of a revision of RG 1.53.

- 3. What is an estimate of the level of effort (LOE) needed to address identified issues in terms of full-time equivalent (FTE) and contractor resources?**

No specific LOE is needed for a new RG 1.53 revision this fiscal year. Less than 0.1 FTE for 1 year, which will be conducted as part of IAP efforts. No contractor resources are required.

- 4. Based on the answers to the questions above, what is the staff action for this guide (Reviewed with no issues identified, Reviewed with issues identified for future consideration, Revise, or Withdraw)?**

Reviewed with issues identified for future consideration.

- 5. Provide a conceptual plan and timeframe to address the issues identified during the review.**

Staff will not begin to address the identified issues before the 3rd Quarter of 2017, and a draft revision of RG 1.53 would not be published before the 2nd Quarter of 2018. Staff will defer a revision of RG 1.53 to endorse IEEE Std 379-2014 (or its successor), so that it can be coordinated with IAP objectives. The staff will work to limit additions, modifications, or clarifications to allow a clean endorsement that is consistent with modernized infrastructure priorities and goals. The staff will identify issues and include plans for any revision of RG 1.53 within an integrated plan under the IAP.

NOTE: This review was conducted in December 2016 and reflects the staff's plans as of that date. These plans are tentative and are subject to change.