U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Proposed Path Forward for Industry's Use of Institute of Electrical and Electronics Engineers Standard (IEEE) 603-2018, Criteria for Safety Systems

10 CFR 50.55a(h), IEEE Std. 603

Outline

- Meeting Purpose
- Background
- Objectives and Options
- Evaluation of Options
- Combining IEEE and ASME Rulemakings
- Comparison Between IEEE 603-1991 and IEEE 603-2018
- Clause 5.16 - Common Cause Failure
- Staff Approach and Considerations
- Rulemaking Process and Milestones
- Questions

Meeting Purpose

To present the staff's progress on the path forward to address the use of the 2018 version of IEEE 603, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," in the development of safety-related instrumentation and control (I&C) systems.

- Obtain stakeholder feedback on the staff's proposed path forward.
- Help inform the staff's proposed rulemaking for IEEE 603-2018.

Background

- Regulations for the design of protection and safety systems for nuclear power plants.
  - Title 10 of the Code of Federal Regulations (10 CFR), Section 50.55a(h), Protection and safety systems, provides requirements for the design of protection and safety systems for nuclear power reactors.
  - IEEE 279-1968, 279-1971, and 603-1991 are incorporated by reference (IBR) into 10 CFR 50.55a(h).
- On September 14, 2023, NRC staff engaged with external stakeholders, receiving input on its plans for the development on a path forward for the use of IEEE 603-2018 (ML23242A169).
- NEI provided their recommendation November 3, 2023, for IBR of IEEE 603-2018 with exception to Clause 5.16 Common Cause Failure (ML23307A127).

Objectives and Options

- Objectives
  1. Provide industry with the regulatory confidence to use the 2018 version in the development of safety-related I&C systems.
  2. Establish a streamlined path to endorse new and improved standards that are developed to address digital technology advancements.
- Options
  A. Revise a Regulatory Guide (e.g. RG 1.153).
  B. Initiate rulemaking to incorporate by reference IEEE 603-2018.
  C. Issue generic communication to summarize licensing pathways to using newer versions of the standard.
- Staff evaluated the options on the basis of how well the options meet the two objectives to determine the path forward.

Option A – Regulatory Guide

Revise a Regulatory Guide (e.g., RG 1.153)

Objective 1 is partially met

Does not provide licensees and applicants the equivalent regulatory confidence as updating the regulations.

Objective 2 is met

Utilizes existing regulatory guide process to endorse a standard.

Option B – Rulemaking

Initiate rulemaking to incorporate by reference IEEE Std 603-2018

Objective 1 is met

Provides licensees and applicants regulatory confidence to use IEEE Std. 603-2018.

Objective 2 is met

Provides the opportunity to generate a blueprint for IEEE-603 to streamline future rulemaking efforts.

Option C – Generic Communication

Issue generic communication to summarize licensing pathways to using newer versions of the standard

Objective 1 is partially met

Does not provide licensees and applicants the equivalent regulatory confidence as updating the regulations.

Objective 2 is not met

Utilizes existing generic communication process.

Other Option - Removal of IEEE Stds. from 50.55a

Removal of the IEEE reference may necessitate alternative requirements either through IBR of a different industry standard (e.g., International Standards) or development and inclusion of newly developed requirements within 10 CFR Part 50.55a.

Selected Option for Path Forward

- Along with factoring stakeholder input and feedback, NRC staff evaluated and determined to proceed with Option B, Rulemaking.

- Develop staff position and blueprint to pursue rulemaking to incorporate by reference of IEEE 603-2018.

Combining IEEE and ASME Rulemakings

- NRC staff considered combining IEEE and ASME Rulemakings
- Results Summary
  - Complications from the misalignment in frequency of updates (ASME 2/6 yrs. vs IEEE 10 yrs.).
  - Increase in scope of the combined rulemaking could negatively impact both rules (i.e. schedule, complexity).
- NRC staff decided not to pursue combined rulemaking
  - OMB accepts one rulemaking per CFR at a time.
  - Coordinate with ASME Code rulemaking to ensure schedules do not conflict.

Comparison Between IEEE 603-1991 and IEEE 603-2018

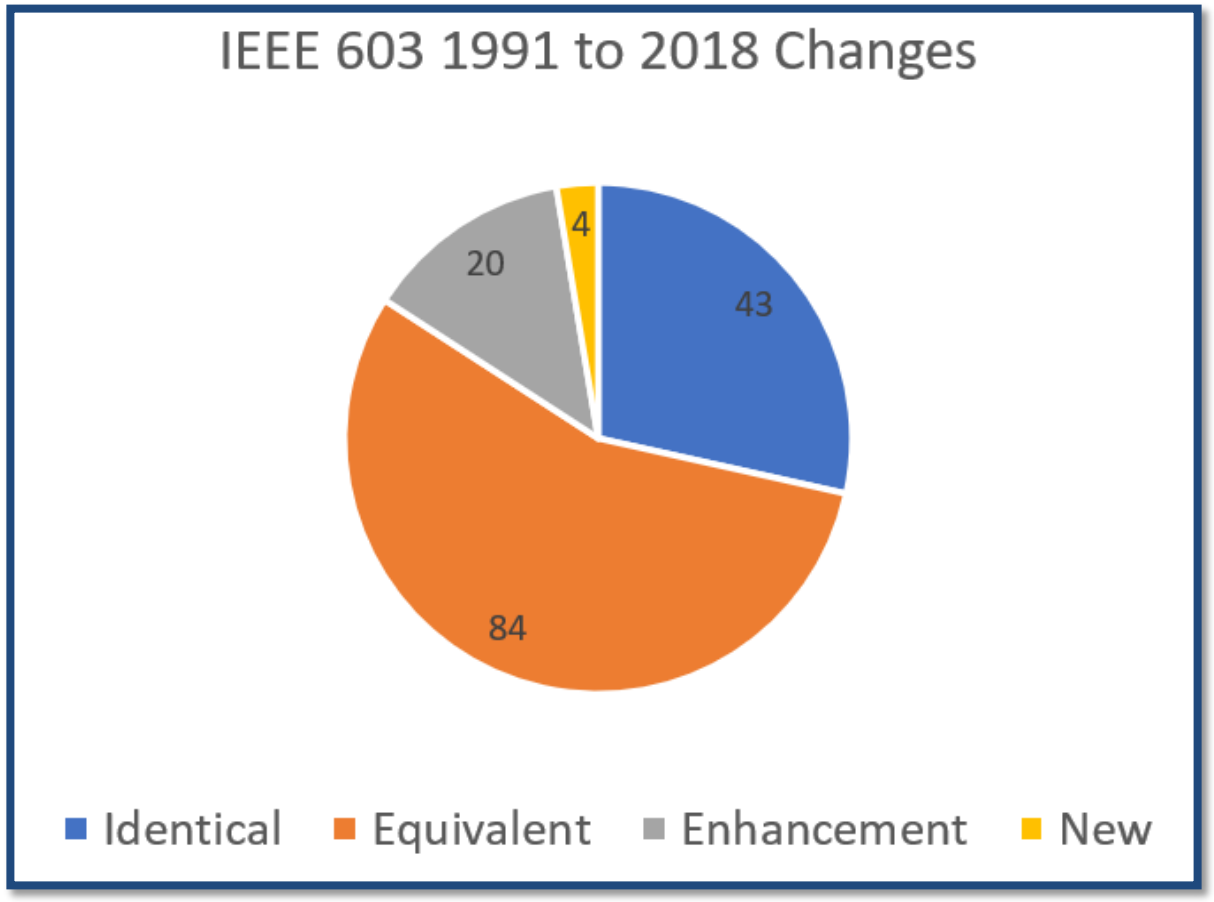
Clauses and subclauses were divided into items (151) to facilitate the comparison.

Identical – No changes in wording between the two standards;

Equivalent – Formatting changes, updated standard revisions, updated wording, restructured numbering or similar;

Enhancement – Improvements, clarifications, additional text modifying items on existing topics; and

New – Added items (clauses, subclauses, or text) addressing new topics.



Comparison Between IEEE 603-1991 and IEEE-2018 (Cont.)

- The staff completed a comparative analysis of IEEE 603-1991 and IEEE 603-2018.
- The staff concluded the following:
  - the update to the standard is generally routine in nature, with predominantly identical, equivalent, or enhanced language
  - for the four new items related to CCF, further evaluation necessary to ensure consistency with Commission Policy

Clause 5.16 - Common Cause Failure

Item 1

The safety system design and development shall address common-cause failures (CCF) that create a potential to degrade or defeat the safety system function. Methods for addressing CCF should include determining the following:

Item 2

a) The CCF has sufficiently low likelihood of occurring.

Acceptable ways of reducing the likelihood of occurrence of some sources of CCF include the requirements imposed by this standard. Quality assurance programs (5.3), equipment qualification (5.4), and design attributes (e.g., 5.5 and 5.6) afford protection from design and manufacturing defects, external environmental effects, and internal failures. Human factors considerations (5.14) afford protection from operator errors.

Additionally, personnel training and plant procedures (i.e., operating, maintenance, and surveillance) afford protection from human errors. Other factors that may be considered are testability, applicable operating experience, and diversity within the safety system design.

Item 3

b) The safety consequence that would result from the occurrence of the CCF in conjunction with any design basis event is low, such that public health and safety are maintained.

An acceptable way of determining the consequence of a CCF of the safety system is to perform a plant-level analysis of the loss or degradation of safety functions concurrent with applicable design basis events.

Item 4

A safety system design that contains a source of CCF may be justified if the resulting consequence of the CCF is low, even when it cannot be demonstrated that the likelihood of occurrence of the CCF is sufficiently low. If the resulting consequence of the CCF is severe, a determination that the CCF has a very low likelihood of occurrence could be credited toward justification of the safety system design. Each identified source of CCF should be evaluated on a case-by-case basis.

Clause 5.16 Common Cause Failure (cont.)

- Item 1 is consistent with our current CCF policy
  - **SRM-SECY-22-0076,** SRM-SECY-93-087, NUREG-0800 BTP 7-19 Revision 9.

- Items 2, 3 and 4 are not fully congruent with our current CCF policy
  - Not requirements but are methods or guidance on how to address CCF
  - SRM-SECY-22-0076 provides for the expanded use of risk-informed approaches.

- NRC staff recommends to IBR to 10 CFR 50.55a(h) the entirety of IEEE 603-2018 (with just the bolded portion of Item 1) with exemption to Items 2, 3 and 4 in order to be aligned with current Commission Policy.

Staff Approach and Considerations

- Incorporate the entirety of IEEE 603-2018 into 50.55a(h), with only the first sentence of Clause 5.16.
  - Aligned with existing CCF policies and guidance.
  - Regulatory treatment of referenced standards (i.e. secondary references) would remain unchanged - treated as guidance.
  - Applicable to new applicants, optional for current licensees.
- Once the rulemaking is complete, NRC may evaluate repurposing RG 1.153 to provide implementation guidance.

*This slide represents current staff position and subject to change

Rulemaking Process & Milestones

Proposed Rule (Estimated)		Final Rule (Estimated)	
Rule Commencement	8/15/2024	Submission to Signature Authority	4/7/2026
Submission to Signature Authority	3/25/2025	Publication in the Federal Register	7/24/2026
Publication in the Federal Register	6/30/2025	Rule Becomes Effective	8/23/2026
Public Comment Period	6/30 -8/29/2025		
Public Meeting	TBD		

For more information on NRC's rulemaking process click here:https://www.nrc.gov/about-nrc/regulatory/rulemaking/rulemaking-process.html

For updates regarding this rulemaking click here: https://www.nrc.gov/reading-rm/doc-collections/rulemaking-ruleforum/active/ruledetails.html?id=2203

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Questions?