

IEEE NPEC PERSPECTIVE: NRC ENDORSEMENT OF IEEE STD 1819-2016

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IEEE NUCLEAR STANDARDS FRAMEWORK

- IEEE nuclear-related standards were developed under a binary categorization system – a component was either safety-related or non-safety related. Depending on which category the item fell within, additional design and qualification treatment requirements might need to be applied.
- Historically, IEEE Standards 603, 308, and 497 define which power, instrumentation, and control equipment is classified as Class 1E and what types of additional special treatments are required.
- Additional IEEE daughter standards expand upon how the required special treatments are applied to Class 1E equipment.

OPTIONS FOR RISK-INFORMING IEEE STANDARDS

1. Replace existing standards that stipulate deterministic criteria and requirements for IEEE Class 1E equipment with one risk-informed standard that stipulates equipment criteria based on safety significance determination;
2. Add sections or addenda to existing standards that stipulate deterministic criteria and requirements for IEEE Class 1E equipment that do not supersede deterministic requirements, but offer an alternative acceptable risk-informed approach; and
3. Develop one new standard that does not specifically supersede existing deterministic criteria and requirements for IEEE Class 1E equipment but offers an alternative acceptable risk-informed approach that can be used in conjunction with existing deterministic standards.

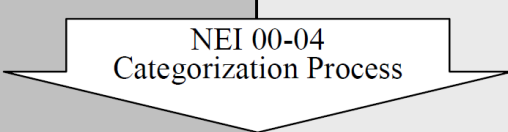
NPEC adopted Option 3 and developed IEEE 1819-2016 – a standard that provides methods to categorize electrical and electronic components using a risk-informed process and provides the recommended treatment of categorized components commensurate with their safety significance.

RISK-INFORMED SAFETY CLASSIFICATIONS

IEEE 1819-2016 Figure 1

	Class 1E	Non-Class 1E
Safety significant	RISC-1 Class 1E Safety Significant (Current IEEE standards apply)	RISC-2 Non-Class 1E Safety Significant (Can have increased requirements)
Low safety significant	RISC-3 Class 1E Low Safety Significant (Alternate Treatment can be applied)	RISC-4 Non-Class 1E Low Safety Significant (No special requirements)

NEI 00-04 Rev 0 Figure 1
(similar to RG 1.201)

	Safety-Related	Nonsafety-Related
	 NEI 00-04 Categorization Process	
Safety Significant	RISC-1	RISC-2
Low Safety Significant	RISC-3	RISC-4

CATEGORIZATION GUIDANCE FOUND IN 1819

- Electrical equipment is different from mechanical equipment, specifically
 - Electrical equipment serves several to many different mechanical and instrumentation components
- 1819 provides methods to correctly categorize components of electrical systems with two or more categorizations (RISC-1, 2, 3, or 4)
- Categorization methodology discussed for:
 - 1) Power-supplying systems – based on what what loads are powered and their RISC categories
 - 2) For 1) -- functions not associated with supplying power, e.g., overcurrent or fault protection functions
 - 3) systems that do not supply power, such as a lighting system or instrument monitoring system
- Subclause 5.3.4.5 addresses specific component types, including circuit breakers; busbars, cables and transformers; and distribution panels and relay panels

TREATMENT GUIDANCE IN 1819

Treatment of components is based on the safety significance of the component in risk-informed approach consistent with 10 CFR 50.69

RISC-1

- Continue to meet the existing special treatment requirements identified in applicable regulatory requirements (existing scope of the deterministic IEEE standards)

RISC-2

- Current treatments are evaluated and potentially augmented based on their safety significant classification

RISC-4

- Unchanged because special treatment never applied

TREATMENT GUIDANCE IN 1819

Treatment of components is based on the safety significance of the component in risk-informed approach consistent with 10 CFR 50.69

RISC-3

- IEEE 1819 provides treatment considerations for RISC-3 components, to ensure that reasonable confidence is provided that the RISC-3 components can perform their safety functions
 - **Reasonable assurance**: A justifiable level of confidence used to satisfy regulatory requirements, based upon objective and/or measurable evidence.
 - **Reasonable confidence**: A level of confidence based on facts, actions, knowledge, experience, and/or observations, which is deemed to be adequate. Reasonable confidence is a lower level of confidence than reasonable assurance.
- IEEE 1819 provides a means to determine those treatments that can safely be adjusted

NRC ENDORSEMENT IS DESIRED

IEEE standards complement NRC or industry developed guidance.

Current guidance has gaps regarding categorization and “special treatment” requirements. IEEE 1819 provides:

- general electrical / electronic categorization considerations for specific components such as breakers, cables, and relays not explicitly covered in other current endorsed guidance
- specific guidance on special treatment and alternative treatments for electrical and electronic components not covered in current guidance
- quantitative methods (Annex B) that do not exist in other guidance
- a bridge between risk-informed categorization and other deterministic IEEE standards – which helps advanced or small modular reactor developers better understand application of currently endorsed standards under a new categorization scheme

Endorsement does not invalidate current guidance; it simply provides an additional information on methods that are acceptable to the NRC

QUESTIONS?