

CHAIR

John White
True North Consulting, LLC
1030 E. Hwy 377
Ste. 110-266
Granbury, TX 76048
johnwhite@mac.com

VICE CHAIR

Mark Bowman
Tennessee Valley Authority
1101 Market Street LP4G-C
Chattanooga, TN 37402
mdbowman@ieee.org

SECRETARY

Robert Konnik
Champlain Cable Corp.
175 Hercules Dr.
Colchester, VT. 05446
rkonnik@ieee.org

PAST CHAIR

Daryl Harmon
Westinghouse Electric Co. LLC
20 International Dr.
Windsor, CT 06095
harmond@westinghouse.com

STANDARDS COORDINATOR

Greg Hostetter
Enercon
ghostetter@enercon.com

SUB-COMMITTEE CHAIRS

SC-2 Qualification

Eric Rasmussen
RSCC Wire and Cable
jeorneli@te.com

**SC-3 Operations, Maintenance,
Aging, Testing, and Reliability**

Rebecca Steinman
thrcrawford3@ieee.org

SC-4 Auxiliary Power

Mitch Staskiewicz
U.S. NRC
Kenn.Miller@nrc.gov

**SC-5 Human Factors, Control
Facilities, and Human Reliability**

David Desaulniers
U.S. NRC
David.Desaulniers@nrc.gov

SC-6 Safety Related Systems

C Lamb
Rock Creek Inovations, LLC
rufino.ayala@gmail.com

April 26, 2022

Ms. Louise Lund
Director, Division of Engineering, Office of Nuclear Regulatory Research
and NRC Standards Executive
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject:	Potential NRC Endorsement of IEEE Std 1819-2016, "IEEE Standard for Risk-Informed Categorization and Treatment of Electrical and Electronic Equipment at Nuclear Power Generating Stations and Other Nuclear Facilities"
----------	--

Dear Ms. Lund,

Thank you for the opportunity to participate in the March 16, 2022, public meeting on potential NRC endorsement of IEEE Std 1819-2016, "IEEE Standard for Risk-Informed Categorization and Treatment of Electrical and Electronic Equipment at Nuclear Power Generating Stations and Other Nuclear Facilities."

It was quite helpful to hear the perspectives of the various stakeholders, including the presentations by the NRC and that of NEI and the Owners Groups (OGs). As indicated at the close of discussion after the presentations were complete, NPEC has assembled a comparison of the NEI / OGs' statements and our assessment of those statements. We had verbally provided those comparisons for some of the industry statements during the public meeting, and as promised, are now providing the full set of comparisons for your consideration. Please see Attachment 1 for that assembly.

The IEEE standards process is based on consensus, and IEEE Std 1819-2016 was developed with consensus in the Working Group, the Subcommittee, NPEC and the people that individually balloted the standard. This consensus effort included members and experts working in probabilistic risk assessments, component categorization and treatment, and the general nuclear power industry. Their affiliations included consultants, utilities, NSSS vendors, NRC, NEI, and others. Comments received during the balloting process were resolved and consensus on the standard was achieved. No comments were received from the public or from Nuclear Risk Management Coordinating Committee (NRMCC) members, who were provided a copy of the near-final ballot draft (prior to ballot).

NPEC continues to strongly encourage the endorsement of IEEE Std 1819-2016. We reiterate that IEEE Std 1819-2016 was developed to be consistent in approach and complementary to NEI 00-04, addressing electrical and electronic components that were not clearly addressed in NEI 00-04. The rationale for endorsement of the standard was provided in the NPEC letter dated March 4, 2022 (ML22066A768) and that rationale remains unchanged.

Sincerely,



John White
IEEE Nuclear Power Engineering Committee - Chair

**Attachment 1
Comparison of the NEI / OGs Statements and NPEC Assessment of those Statements**

Industry Slide No.	Industry Statement	NPEC Assessment of Statement
3	<p>“No currently operating reactor, reactor vendor, or future operator indicated any intent to use IEEE 1819”</p> <p>“NRC endorsement would be detrimental to predictable and stable regulatory environment ... reduces clarity in 50.69 implementation and unnecessarily uses NRC staff resources with no end users”</p>	<p>NPEC developed IEEE Std 1819-2016 to provide guidance for categorization and treatment of electrical and electronic equipment that does not exist in NEI 00-04. The gaps are clear when a user attempts to categorize electrical equipment, especially equipment used to supply power to loads in mechanical systems of differing RISC categories.</p> <p>NPEC asserts that rather than reducing clarity in 50.69 implementation, the use of IEEE Std 1819 will enhance the clarity because this standard provides important technical aspects to support the characterization and treatment of electrical and electronic equipment, which are not currently available in NEI 00-04.</p> <p>Therefore, endorsement of IEEE Std 1819-2016 (with or without exceptions) would enhance regulatory licensing review with consistent technical attributes and thus would reduce the NRC staff review resources with respect to audits and requests for additional information. Further explanations are provided below.</p>
4	<p>“Complication of training inspection teams on inapplicability of endorsed standard at sites”</p>	<p>As NRC explained during the public meeting, applicability of standards is governed by the licensing basis of each licensee, and inspection teams are currently trained to observe the licensing basis. Endorsement provides indication of a method of meeting specific regulatory requirements but does not prohibit other methods from being reviewed and approved.</p>
4	<p>“IEEE-1819 does not contain anything specific to electrical components”</p>	<p>As indicated in the public meeting, this statement is completely not true. In fact, <u>NEI 00-04</u> has no specific information relative to categorization of electrical components or systems.</p> <p>IEEE Std 1819 on the other hand provides extensive information relative to categorization and treatments of electrical and electronic systems and components (EESCs). The entirety of clause 5.3 (pages 16 to 24) addresses categorization of EESCs. Clause 6 addresses treatments of EESCs.</p>
4	<p>“Would result in NRC endorsement of two incompatible categorization processes; NEI 00-04 is already endorsed; PRA sensitivity differences could lead to conflicting outcomes”</p>	<p>The scope of IEEE Std 1819-2016 is limited to categorization and treatment of EESCs. The methodology of NEI 00-04 and that of IEEE Std 1819 are not incompatible, but rather similar. As discussed in the background section, IEEE Std 1819 was developed based on the NEI 00-04 framework. The only distinction is that NEI 00-04 does not address the details of categorization for systems / components that serve components already having several RISC categories (RISC 1, 2, 3, 4); IEEE Std 1819 recognizes that EESCs are frequently associated with multiple RISC category components and thus more guidance is needed to assist users in categorization.</p> <p>IEEE Std 1819 specifically states that its categorization information does not apply to instrumentation associated with mechanical systems that are depicted on the P&IDs for that system, as those components are typically categorized within that system [clause 5.1, last paragraph].</p> <p>PRA sensitivity differences are addressed below (assessment on Slides 6 and 7, for IEEE Std 1819 clause 5.3.3.5).</p>

**Attachment 1
Comparison of the NEI / OGS Statements and NPEC Assessment of those Statements**

Industry Slide No.	Industry Statement	NPEC Assessment of Statement
5 and 6	<p>“IEEE 1819 5.2.3.a Supplementary analyses that are used to compensate for PRA limitations in quantifying the risk during plant shutdown and the risk of hazards such as fire risks, seismic risks, and other external risks (tornadoes, external floods, etc.) 5.2.3.b Deterministically derived risk assessments that consider, like the PRA, the impact and likelihood of failure of the EESC under consideration 5.2.3.c Plant design bases</p> <p>NEI 00-04 -- No Requirements. The non-PRA portions of NEI 00-04, including the IDP, adequately address the limitations of a quantitative PRA”</p> <p>“IEEE 1819 5.2.3.d Maintenance of defense-in-depth</p> <p>NEI 00-04 -- Section 6 Defense in Depth Assessment Fully covered by Section 6 and IDP Review”</p> <p>“IEEE 1819 5.2.3.e Maintenance of sufficient safety margins</p> <p>NEI 00-04 -- General Considerations Fully covered by IDP Review”</p> <p>“IEEE 1819 5.2.3.f Plant and industry operating experience</p> <p>NEI 00-04 -- Section 9 IDP Review Fully covered by IDP Review”</p> <p>“IEEE 1819 5.2.3g Operational and maintenance processes</p> <p>NEI 00-04 -- No Requirements. The non-PRA portions of NEI 00-04, including the IDP, adequately address the limitations of a quantitative PRA”</p>	<p>These items in IEEE Std 1819-2016 clause 5.2.3 are introduced by the following:</p> <p>“Deterministic insights shall be used to supplement the PRA risk results. Due to PRA assumptions and limitations, such as those mentioned in 5.2.2, deterministic insights are typically needed to categorize components within a particular plant system. In addition, these insights can provide an alternate and valuable perspective that can be blended with the PRA results to support an overall EESC safety significance assessment. Deterministic insights include, but are not necessarily limited to, the following:</p> <p>These items are listed as general items for consideration when the PRA risk results need to be supplemented for categorization purposes. There is no intent in IEEE Std 1819 to limit these considerations for use only by the IDP (and we suspect that NEI 00-04 does not intend to limit items shown in the IDP sections for consideration only by the IDP). They are intended as general principles and topics for consideration, while NEI 00-04 has more information in some cases.</p> <p>5.2.3.a The supplementary analyses for plant shutdown, fire, seismic and other external risks have counterparts in NEI 00-04 (e.g., 1.5 and 3.3) and IEEE Std 1819 and NEI 00-04 are thus consistent in principle.</p> <p>5.2.3.b The use of deterministic information has counterparts in NEI 00-04 (e.g., 1.3, 1.5) and IEEE Std 1819 and NEI 00-04 are thus consistent in principle.</p> <p>5.2.3.c Information from the plant design bases has counterparts in NEI 00-04 (e.g., 2, 9) as part of IDP functions, and IEEE Std 1819 and NEI 00-04 are thus consistent in principle.</p> <p>5.2.3.d IEEE Std 1819 clause 5.3.4.5 discusses defense-in-depth assessments, with more detail than NEI 00-04 Section 6. It covers topics generally included in “defense-in-depth” while NEI 00-04 only addresses core damage.</p> <p>5.2.3.e, 5.2.3.f, 5.2.3.g Maintenance of safety margins, plant and industry operating experience, and operational and maintenance processes / experience are identified as considerations in both IEEE Std 1819 and NEI 00-04.</p>

**Attachment 1
Comparison of the NEI / OGS Statements and NPEC Assessment of those Statements**

Industry Slide No.	Industry Statement	NPEC Assessment of Statement
6 and 7	<p>“IEEE-1819 5.3.3.5 Increasing the failure rate of LSS EESCs simultaneously by a common multiplier</p> <p>NEI 00-04 -- 8. Increase failure rate of all RISC-3 SSCs Increasing the failure rate of RISC-4 SSCs is inappropriate as there are changes to the requirements for RISC-4 SSCs”</p>	<p>IEEE Std 1819 clause 5.3.3.5 is titled Sensitivity studies, and the cited items are listed below the following:</p> <p>Components that are characterized by the PRA as LSS shall be subjected to sensitivity studies to verify that assumptions of the PRA are not masking the importance of the component. Recommended sensitivity studies include the following:</p>
	<p>“IEEE-1819 5.3.3.5 Removal of credit for all operator recovery actions associated with LSS EESCs</p> <p>NEI 00-04 -- Table 2 – Set HEPs to 95th and 5th percentile Complete removal of HEPs for LSS equipment is inappropriate as the operator actions should not be impacted by alternate treatment. Exploring the impact of the range of realistic HEPs as identified in NEI 00-04 provides assurance that reliability of equipment is not be masked by and undue reliance on operator actions” [editorial corrections shown in blue for clarity]</p>	<p>LSS EESC failure rates: NEI 00-04 on page 13 states that “the risk sensitivity study verifies that the combined impact of a postulated simultaneous degradation in reliability of all LSS SSCs would not result in a significant increase in CDF or LERF.” This is equivalent to “increasing the failure rate of LSS EESCs simultaneously” in IEEE Std 1819-2016. Other NEI 00-04 sections prior to Section 8 also address sensitivity studies for LSS components and these values. Those sections do not distinguish between safety-related and non-safety-related classifications; they only say if the component is LSS and safety-related, then the analyst is to define why that component is of low risk significance. [See pages 37-38 and Table 5-2; pages 40-41 and Table 5-3; pages 42-43 and Table 5-4; pages 44-45 and Table 5-5.] A component that is non-safety-related (or non-Class 1E) and evaluated as LSS is RISC-4 and should have no changes in requirements.</p>
	<p>“IEEE-1819 5.3.3.5 Increasing the common cause failure contributions of the LSS EESCs by a common multiplier</p> <p>NEI 00-04 -- Table 2 – Change CCF events to 95th and 5th percentiles Limiting the sensitivity study to LSS components is non-conservative and addressed by the importance measures used to determine potential LSS/HSS components”</p>	<p>Operator recovery actions credit: Is reference to NEI Table 2 meant to be Table 5-2? That table (and Tables 5-3, 5-4, and 5-5) reflect increasing / decreasing all human error basic events to 95th / 5th percentile values.</p> <p>Common cause failure contributions: Is reference to NEI Table 2 meant to be Table 5-2? That table (and Tables 5-3, 5-4, and 5-5) reflect increasing / decreasing all common cause events to 95th / 5th percentile values. If the component has been classified as HSS, then changes in the common cause failure contributions cannot increase the safety significance, i.e., cannot increase past HSS. Thus, it is unnecessary to address HSS components.</p>
	<p>“IEEE-1819 5.3.3.5 Increasing the planned maintenance unavailability by an appropriate multiplier</p> <p>NEI 00-04 -- Table 2 – Set all maintenance terms to 0.0”</p>	<p>Planned maintenance unavailability: Is reference to NEI Table 2 meant to be Table 5-2? That table (and Tables 5-3, 5-4, and 5-5) reflect setting all maintenance unavailability terms to 0.0.</p>
8	<p>“IEEE 1819 5.3.4.1 a) List all components in the system. Remove from the list any identified components that are considered spared, abandoned, or simply represent an empty space in a cubicle. b) Sort the scoped components by type and current flow order. For example, identify a particular component as a bus that receives power</p>	<p>These items are in clause 5.3.4 “Qualitative risk assessment”, subclause 5.3.4.1 “Data capture and development” and the lead-in to the list states: “The following requirements apply primarily to systems that supply electrical power:”</p> <p>While the word “requirements” could be softened, it seems that this method for assembling the component list in an electrical system supplying power to components is the most logical.</p>

**Attachment 1
Comparison of the NEI / OGs Statements and NPEC Assessment of those Statements**

Industry Slide No.	Industry Statement	NPEC Assessment of Statement
	<p>from a supply circuit breaker and distributes power to various loads through individual load circuit breakers. The supply circuit breaker would be listed first, then the bus, and finally the load circuit breakers, with all of these components grouped under the bus name.</p> <p>c) Identify each end load that is powered from this system. Obtain the relevant end load information, such as identification number, description, and risk data, where available. End loads may be powered directly from a load breaker, or from a distribution panel that is fed by a load breaker, or from a relay panel that is fed from a distribution panel that is itself fed from a load breaker.</p> <p>NEI 00-04 -- No Requirement Could be one way to document, but shouldn't be perceived as a requirement</p>	
9	<p>"IEEE 1819 5.3.4.5.2 Busbars may be categorized as LSS even if there are HSS loads powered from that bus, because of the passive and inherently reliable nature of a busbar, as demonstrated by facility-specific operating experience. Cables shall be categorized the same as the equipment they support. Transformers shall be categorized as HSS if they are the only source of power for one or more downstream electrical component(s) that are classified as HSS.</p> <p>NEI 00-04 -- Not Applicable NEI 00-04 does not allow for categorization of SSCs as LSS because they are inherently reliability reliable" [editorial corrections shown in blue for clarity]</p>	<p>The title of clause 5.3.4.5.2 is "Considerations for busbars, cables, and transformers."</p> <p>While NEI 00-04 does not specifically address <u>any</u> electrical equipment, it does address passive equipment classification. In Section 4, on page 28, it states: "The classification of SSCs having only a pressure retaining function (also referred to as passive components), or the passive function of active components, should be performed using the ASME Code Case N-660, "Risk-Informed Safety Classification for Use in Risk-Informed Repair/Replacement Activities..."</p> <p>Section 5.1 on page 34 states that PRAs are not as capable of easily assessing the importance of passive components such as pipes and tanks, and again references ASME Code Case N-660 as well as other code cases, a WCAP and an EPRI report.</p> <p>Clearly an ASME Code Case is not applicable to electrical equipment. Busbars are solid conductor bars, rigidly mounted, with solid connections. Thus, they are passive and inherently reliable. There is no pressure mechanism to cause their failure, as is the case with piping and tanks. Thus IEEE Std 1819-2016 provides the appropriate clarification that busbars may be categorized as LSS even if there are HSS loads powered from that bus.</p>
9	<p>"IEEE 1819 6 Alternate Treatment Requirements</p> <p>NEI 00-04 -- No Applicable 50.69 does not require NRC approval or endorsement of alternate treatment requirements. Each utility may use the information related to</p>	<p>Many of the IEEE NPEC standards deal with treatments of components, e.g., separate standards for environmental qualification and seismic qualification; individual standards reference those two standards and may also have additional treatment requirements or recommendations. Those additional requirements could include design, specification, purchase, qualification of various sorts, maintenance, surveillance, repair and replacement, and condition monitoring.</p>

**Attachment 1
Comparison of the NEI / OGs Statements and NPEC Assessment of those Statements**

Industry Slide No.	Industry Statement	NPEC Assessment of Statement
	<p>alternat treatment in IEEE 1819 if it meets there needs, but endorsement would imply utilities should use this guidance.”</p>	<p>Because IEEE standards often cover treatment requirements, NPEC determined that IEEE Std 1819 should cover both: how to categorize electrical and electronic components, and how to consider modifying the required treatments for those risk-categorized components. Additionally, the treatment clause was prepared to address 10CFR50.69 (d) “Alternative treatment requirements.”</p> <p>The Working Group prepared IEEE Std 1819-2016 with a considered set of minimum requirements for alternate treatments of RISC-2 and RISC-3 components. The standard was balloted and comments were addressed; no public comments were received; no comments were received from provision of the late-draft standard to NRMCC members. Thus, it is a consensus standard, with the implication that information in the standard made sense.</p> <p>While 10CFR50.69 (d) does not specifically require NRC approval or endorsement of alternate treatment plans, that regulation has requirements for the alternate treatments, and IEEE Std 1819-2016 provides guidance on how to meet those requirements for electrical and electronic components. If IEEE Std 1819-2016 is endorsed in a Regulatory Guide, users may choose to not apply that RG to their licensing basis or may choose to apply it completely or in part. However, endorsement would clarify the intended minimum requirements from NRC regarding alternate treatments for EESCs.</p>
9	<p>“IEEE 1819 Annex B</p> <p>NEI 00-04 -- No Requirement Completing this information for each SSC is cumbersome with no commensurate value. To our knowledge, it has not been piloted to determine the level of effort or how the results would vary from the endorsed NEI 00-04 process.”</p>	<p>IEEE Std 1819 Annex B is an informative annex, with a recommended method of answering the essential questions posed by clause 5.3.4.3. These questions are for categorizing electrical and electronic equipment, a topic which is not covered sufficiently in NEI 00-04. There is no requirement to use the method of Annex B.</p>