Co-Logo Technical Considerations and Options for IEEE 1023 Update

Background

NUREG-0711 has traditionally been NRC's preferred human factors standard for large light water reactors (LLWRs). It provides applicants a recognized path to meet U.S. and international human factors requirements.

While effective for LLWRs, it may be more restrictive than necessary for some designs with lower risk profiles, such as advanced reactors relying on passive safety. Alternative standards like IEEE 1023 or IEC 63351 could offer flexibility while maintaining safety.

IEEE 1023 and IEC 63351 align with NUREG-0711 principles but include fewer, higher-level criteria, allowing more flexibility in demonstrating compliance.

Both standards share similar scope, though IEC 63351 generally requires more detail and is somewhat more prescriptive than IEEE 1023.

Recent Efforts

IEEE and IEC are exploring a co-logo standard to harmonize human factors requirements for nuclear control rooms internationally. This could reduce licensing complexity while ensuring sound human factors practices.

In July 2025, SC5 and IEC members discussed the feasibility of a co-logo standard. Initial feedback was positive, though the optimal path forward remains under consideration.

In November, SC5 leadership requested white papers outlining potential approaches and considerations for a joint standard.

This paper presents options and considerations for a joint standard. It does not represent all viewpoints; members are encouraged to provide feedback and additional perspectives to ensure an effective, safety-focused strategy.

Considerations

Cultural, Linguistic, Legal and Other Regional Differences

To support international licensing, any co-logo approach must address regional differences affecting human factors design and performance. Updates to existing standards or new provisions may be necessary.

Standards should account for cultural norms, language, legal frameworks, and other regional factors. For example, validation results from an English-language U.S. design may require additional review for applicability in non-English contexts with different HSI and operational concepts.

If an existing standard is adopted, gaps should be reviewed and addressed. A new standard should explicitly incorporate these considerations to ensure global applicability.

Attachment A to this document includes some examples derived from IEEE 1203 that may need to be revised to support a co-logo standard.

Efficient Use of Limited Resources

Multiple standards can create confusion for applicants and increase maintenance burdens for designers, standards bodies, and regulators.

A balanced approach to the number and scope of standards can reduce redundancy and maintain clarity for all stakeholders.

Assessment of Industry Priorities

SC5 membership includes representatives from the nuclear industry, but the membership is limited in size and may not currently reflect the needs of advanced reactor designers. As the nuclear industry expands to include new types of reactors with different risk profiles it will be important to understand which standards are needed and desired by various stakeholders.

To the extent practical, SC5 should conduct outreach to see which standard or standards would make the largest impact. This may include outreach activities to EPRI, NEI, Owners Groups, and other methods used to include advanced reactor designers.

Options for a Co-Logo Standard

Option 1: Develop a new standard combining IEEE 1023 and IEC 63351 to cover a broad range of reactors.

Pro: It would be a collaborative effort that could address the needs of all regions.

Pro: It could address any gaps that exist in the existing standards (if any exist)

Con: It would be slow to merge the documents using a consensus-based process.

Option 2: One organization endorses the other's standard, allowing the non-endorsed standard to sunset.

Endorsing one standard over another would likely lead to the other expiring, ultimately reducing options for designers who may prefer the non-endorsed standard. This is a shared downside to both Option 2A and Option 2B below.

Option 2A: SC5 endorses IEC 63351.

IEC 63351 has a similar scope to IEEE 1023. IEC 63351 is somewhat more detailed than IEEE 1023 and therefore it may be a suitable replacement to IEEE 1023.

Some SC5 members signaled this may be a viable option during the July meeting. Initial discussions noted interest in this option, but broader support is unclear. Further dialogue is needed to address concerns about prescriptiveness.

Pro: Endorsing an existing standard may be relatively quick compared to starting from scratch.

Con: The existing documents do not explicitly address regional differences. Additional consideration may be needed to address these gaps.

Option 2B: IEC endorses IEEE 1023.

The current IEC standard requires a higher level of detail compared to IEEE 1023. It is possible that IEC members may not agree with adopting the less prescriptive IEEE 1023. To the best of my knowledge, IEC has not signaled that they consider this a viable option. Additional discussions would be necessary to see if this is a viable option.

Pro: Endorsing an existing standard may be relatively quick compared to starting from scratch.

Con: The existing documents do not explicitly address regional differences. Additional consideration may be needed to address these gaps.

Option 3: Co-develop a new standard specifically for microreactors while retaining existing standards for larger facilities.

Pro: Less risk associated with micro-reactors may justify a scaled standard that applies high level principles in a manner that is less prescriptive than IEEE 1023 and IEC 63351.

Pro: Can address unique issues not addressed by existing standards such as the need for rapid deployment to many locations. This would help address an existing industry need for microreactor guidance.

Pro: NRC is considering streamlined endorsement processes for microreactor standards, which could reduce regulatory burden compared to current guidance processes. This may increase the likelihood that this standard will have significant impact.

Pro: Creating a new standard increases the number of options available to industry, thus adding more flexibility.

Con: There would likely be a need to maintain IEEE 1023 and IEC 63351. Adding a new co-logo standard would mean that there'd be more overhead to maintain unless the legacy standards are sunset.

Con: Creating a new standard will take significant effort.

Option 4. Consider a co-logo standard that is not derived from IEEE 1023 and IEC 63351.

IEC is beginning work on a new standard related to operator actions. SC5 could consider supporting that standard or standard on a different topic not already considered here. (Note: ANS 58.8 already addresses this topic. A new standard in this area may not be the most efficient use of resources.)

- Pro: This may provide a useful standard that would be consistent across regions and may address a different need that has not otherwise been considered here.
- Con: This strategy does not address the need to update IEEE 1023.

Conclusions & Recommendations

The four options described above document some of the benefits and drawbacks associated with developing a co-logo standard. These options may be helpful when planning future SC5 activities, but they are probably not the only options available. Some members of SC5 may see additional options not listed here which should also be considered. Additionally, SC5 has the option to not pursue a co-logo standard.

Recommendations

Based on the considerations and options discussed above, the following recommendations are proposed to support SC5's decision-making process.

1. SC5 should consider the positions in this paper, responses to these positions, and other white papers submitted by other members before selecting an option that best meets the needs of stakeholders.
2. Careful consideration should be given to the needs of various stakeholders (such as the operating fleet and advanced reactor designers). SC5 should consider trying to expand the size of SC5 to include a broad range of stakeholders to help ensure that any future standard is useful to a broad set of stakeholders.
3. If SC5 chooses to pursue a co-logo standard with IEC, then additional consideration should be given to the topics in the Consideration section above to ensure that regional differences influencing human factors are appropriately in future standards.

Implementing these recommendations will help ensure that any future co-logo standard is technically sound, globally applicable, and responsive to stakeholder needs.

Attachment A: Examples from IEEE 1023 that show regional considerations that may need revision in a co-logo standard

- IEEE 1023 Section 4 "Systematic application of human factors engineering" indicates that HFE planning should include assessment of past experience and current practices to identify relevant HFE concerns. Since different countries will have different past experiences and current practices, they will have different HFE needs, therefore, relying solely on an HFE analysis from another country may not be appropriate. Additional guidance would be needed to help users determine which information is relevant from other countries, which is not, and how to use the results.
- IEEE 1023 Section 5.4.2 "Anthropometry" describes workplace layouts compatible with bodily dimensions. Notable anthropometric differences between some countries exist. Therefore, relying on an anthropometric analysis completed by another country may be inappropriate in some cases.
- IEEE 1023 Section 5.4.5 "Knowledge and abilities" discusses the important of ensuring that personnel have the necessary abilities to safely operate the plant. The section is written at a sufficiently high level to address "technical training and qualification programs" without being overly prescriptive. This may be suitable language for a joint standard; however, additional considerations may be necessary. Take for instance a country that designs and validates a plant that has high standard for training operators. Then that same design is implemented in another country with significantly different training and qualification requirements. The delta in skills between the two populations of operators may be significant, and the conclusions of the first validation may no longer be appropriate to apply to the second country.
- IEEE 1023 Section 5.5.4 "Standardization" addresses issues like measurement units, information coding, nomenclature, and acronyms. All of these can vary between regions.