U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

Introduction of IEC Endorsement Project

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Presentation Outline

- Project Introduction / Background
- NRC Transformation Team
- Relation to Digital I&C Integrated Action Plan
- Issues to be Addressed
- Project Plan and Upcoming Activities

Background

- Most countries look to one of two sources as the basis for their regulations
  - The US Code of Federal Regulations
    - Title 10 – Energy
      - Part 50 Licensing
      - Some other sections in title 10 also apply
  - IAEA Safety Standards
    - NS-R, GSR, & SSR series documents
      - NS documents are being updated to GSR or SSR documents
    - IAEA requirements are not mandatory, but
      - Some states adopt, other states are inspired by them

Background (continued)

- Within the current US regulatory structure
  - IEEE 603-1991 is incorporated by reference into 10 CFR 50.55(a)h and serves as the primary regulation
  - Regulatory Guides endorse standards (in most cases IEEE standard) as one acceptable way to meet the regulation
    - Other ways may be acceptable
    - However there is some project risk associated with not following endorsed standards

Harmonization of IEC and IEEE Standards

- Efforts to develop “dual logo” standards or endorse IEC standards directly
  - Completed
    - IEC 60780/IEEE 323 Environmental qualification dual logo
    - IEC 63147/IEEE 497 Post Accident Monitoring
    - IEC 61000 on EMI/RFI endorsed by NRC
  - In progress
    - IEC 60980/IEEE 344 Seismic qualification dual logo
    - IEC 62566 FPGA being considered for endorsement by NRC
    - IEC 63113 Spent Fuel Pool Instrumentation dual logo work is progressing
    - Possible new dual logo for IEC 61266 on Classification
    - Possible new dual logo for IEC 62340 on CCF

NRC Transformation Team

(Formed at the direction of the EDO)

- The Team gathered and analyzed innovation techniques and ideas from a variety of sources
- Objective was to gain a working knowledge of the mechanisms and methodologies used for successful transformations in other organizations
- Develop concepts, strategies to begin transformation initiatives with a emphasis on regulating new technologies
- Recommended a cultural framework to foster future innovation and transformation
- One major recommendation was to "develop a new regulation to define high-level performance-based I&C safety design principles and associated regulatory guidance"

Digital I&C Integrated Action Plan

- **MP4** - Assessment for Modernization of the I&C Regulatory Infrastructure
  - **MP 4A** included tactical activities to support improvements to the regulatory infrastructure. (ISG-06)
  - **MP 4B** includes broader strategic activities to address longer-term improvements.

Issues to be Addressed

- Concern that relying on the IEEE suite of standards (and associated Reg Guides) may be less effective and efficient than other possible paths
- Concern that the IEEE software development standards as implemented in NRC Reg Guides may be overly restrictive
- Without additional guidance licensees and applicants may be reluctant to use 10 CFR 50.55(a)z alternative requests

10 CFR 50.55(a)z Alternatives to Codes and Standards Requirements

Alternatives to the requirements of paragraphs (b) through (h) of this section or portions thereof may be used when authorized by the Director, Office of Nuclear Reactor Regulation, or Director, Office of New Reactors, as appropriate. A proposed alternative must be submitted and authorized prior to implementation. The applicant or licensee must demonstrate that:

(1) **Acceptable level of quality and safety.** The proposed alternative would provide an acceptable level of quality and safety; or

(2) **Hardship without a compensating increase in quality and safety**.

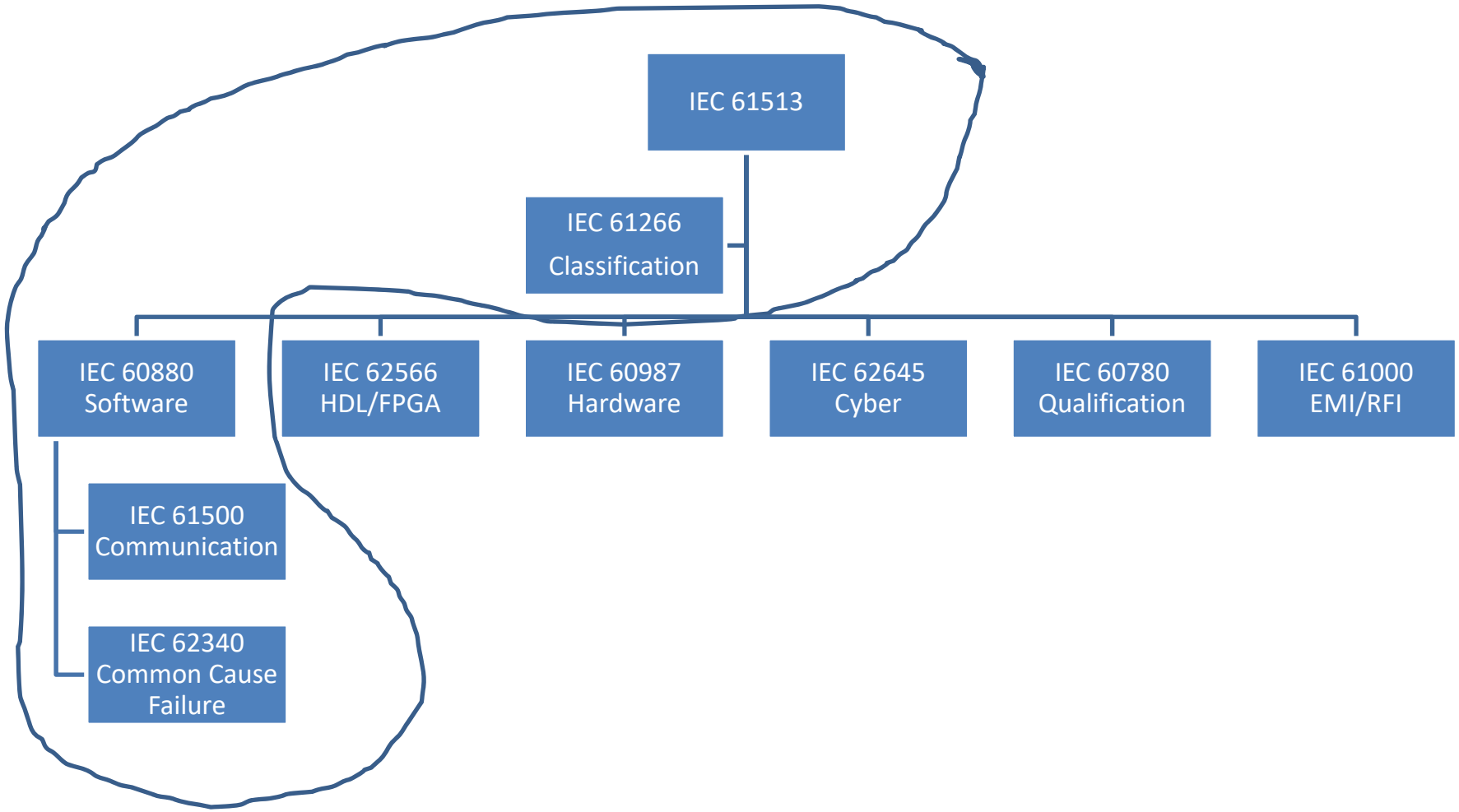
Project Objectives

- In the short term develop guidance (preferably in the form of a Regulatory Guide) that defines how the staff would view specific alternatives (including IEEE 603 – 2018 and IEC 61513) if used as part of an alternatives to the IEEE standards specified in 10 CFR 50.55a(h)
- Address how alternative approaches would impact current regulatory guidance, including the current regulatory guides, with respect to other IEC and/or IEEE standards
  - Evaluate a specific set of Regulatory Guides/IEEE Standards to determine if they should be modified as well

There are two main standards frameworks Electrical and I&C for nuclear

- IEEE Nuclear Power Engineering Committee
  - The top level IEEE standard for NPP safety systems (IEEE 603) is part of US Nuclear Regulatory Commission regulations (Incorporated By Reference (IBR))
- IEC Subcommittee 45A
  - IEC takes IAEA safety standards, as the basis for their standards
  - 45A belongs to Technical Committee 45 which includes nuclear instruments (TC45) and radiation protection instruments (45B)
- Thus
  - USNRC requirements are an important framework element for IEEE.
  - IAEA safety standards are an important framework element for IEC

IEC 61513 and IEC Software Standards



Systems Important to Safety

Safety Systems

Reg. Guide 1.152	IEEE 7-4.3.2 Computers in safety systems	IEC 60987 Computer hardware	
		IEC 61500 Data communications for Category A functions	
Reg. Guide 1.168	IEEE 1012 SW V&V	IEC 880 Software for category A functions	IEC 62138 software for category B or C functions
	IEEE 1028 SW reviews		
Reg. Guide 1.169	IEEE 828 SW configuration management		
Reg. Guide 1.170	IEEE 829 SW test docs		
Reg. Guide 1.171	IEEE 1008 SW unit testing		
Reg. Guide 1.172	IEEE 830 SW requirements specifications		
Reg. Guide 1.173	IEEE 1074 Software lifecycle processes		
		IEC 62566 HDL programmed devices for cat A functions	IEC 63xxx HDL programmed devices for cat B&C functions
		IEC 62340 Common cause failure	

Practical Considerations

- Lessons learned has shown that stakeholder engagement is critical to the success
- With the large number of IEC standards, it would likely be more effective to look at only one specific set of the IEC 61513 suite
- Project will require significant interactions with IEEE and IEC to ensure their support and cooperation

Stakeholder Engagement

- NRC would like to work with an industry working group
  - Help identify a subset of the suite of IEC standards that would be of most use to industry
  - Provide early feedback on NRC strategy for endorsement
  - Provide feedback on overlaps, gaps and possible challenges to endorsement
- Table top/example review
  - The NRC would like to use a specific system or platform to evaluate the new process to ensure the guidance is practical and well understood
  - The NRC would like to make a selection as soon as possible
  - The review will be done over the course of a few months, so will need to be appropriately scoped

Proposed Project Plan
(Key Milestones)

- Public meeting to engage stakeholders on the proposal, identify participants for the working group, and identify a subset of the suite of IEC standards that would be of most use to industry (Jan 31, 2019)
- Formalize project plan and select IEC standards to include (Feb 2019)
- Work with OGC to determine appropriate guidance document (Feb 2019)
- Select system or platform for example review (April 2019)
- Coordinate with IEEE and IEC (April 2019)
- Conduct review of current and in-development IEC nuclear (45a) standards to determine overlaps, gaps and possible challenges with endorsement of IEC 61513 suite of standards (May 2019)
- Develop possible solutions to previously identified concerns associated with endorsement of IEC standards (June 2019)
- Complete example review (Oct 2019)
- Brief ACRS (Nov 2019)
- Publish draft guidance for public comment (Nov 2019)

Path Forward

- Continue with the preparation work
  - Work with OGC to determine appropriate guidance document
  - Identify a subset of the suite of IEC standards
  - Develop a NRC project plan and subset of IEC standards
- Hold the January public meeting and assess industry support
- Solicit pilot application
- Begin coordination with IEEE and IEC