Proposed Regulatory Issue Summary on Embedded Digital Devices

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Introduction

- Nuclear facilities are increasingly relying on digital technology in plant systems and components
- The application of digital technology results in benefits and challenges (safety issues)
- Many types of plant equipment (e.g., pumps, valves, breakers, relays, diesel generators, uninterruptible power supplies, etc.) now include digital devices
  - In this RIS, the digital devices in such plant equipment are called ‘embedded digital devices’

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Introduction

- These devices, as part of the actuated equipment, often perform the safety requirements in safety systems
  - e.g., they are relied upon to achieve the safety function
- The same safety issues as those applicable to other (non-embedded) digital systems are applicable
  - e.g., quality, reliability, qualification, and software common cause failure

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Purpose of the RIS

- To heighten awareness that embedded digital devices may exist in plant equipment and that potential safety issues may result in their applications

- To clarify the technical position on existing regulatory requirements applicable when embedded digital devices are used in plant equipment

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Regulatory Requirements (Reactors)

- 10 CFR Part 50 Appendix A, General Design Criteria
- 10 CFR 50.55a(h) – IEEE Standard 603-1991
- Staff Requirements Memorandum (SRM) to SECY 93-087 II.Q, Defense against common-mode failure in digital I&C system (policy)
- 10 CFR Part 50 Appendix B, Quality Assurance Program Requirements

CFR: Code of Federal Regulations

IEEE: Institute of Electrical and Electronics Engineers

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Regulatory Requirements (Reactors)

- 10 CFR Part 21, Reporting of Defects and Noncompliance
- 10 CFR 50.59, Changes, Tests, and Experiments

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Major Regulatory Guidance (Reactors)

- Chapter 7 of NUREG-0800 (Standard Review Plan)
  - Including Branch Technical Positions
- Interim Staff Guidance documents
- Regulatory Guides, including
  - 1.152, “Criteria for Use of Computers in Safety Systems of Nuclear Power Plants”
  - 1.180, “Guideline for Evaluating EMI/RFI in Safety-Related I&C Systems”
  - 1.209, “Guidelines for Environmental Qualification of Safety-Related Computer-Based Instrumentation and Control Systems in Nuclear Power Plants”

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Key Safety Issues

- Quality and reliability
  - Software and software tools
- Qualification
  - Electromagnetic/radio-frequency interference
- Defense against the vulnerability to potential software common cause failure
  - Safety system execute features
  - Confirmation of no unanalyzed condition

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Staff Perspectives (Reactors)

- The use of embedded digital devices in safety systems should be consistent with applicable requirements and the facility license
- Licensees/applicants should be aware of the potential existence or application of the devices early in, and throughout, the project life cycle
- Licensees/applicants should understand the challenging nature of digital applications and apply the necessary rigor and best industry practices

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Staff Perspectives (Reactors)

- Licensees/applicants should identify and address technical/safety issues involving application of these devices
  - Sufficient defense-in-depth and safety margin should be maintained

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Status/Path Forward

- Draft issued in May
- Held public meeting in June
- Received public comments in July
  - Reviewing and addressing comments now
- Will consider engaging industry for resolution of comments before final RIS issuance
- Issue final RIS (later in 2013)