



POLICY ISSUE **(Information)**

November 4, 2019

SECY-19-0112

FOR: The Commissioners

FROM: Margaret M. Doane
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SUBJECT: ANNUAL UPDATE ON THE INTEGRATED STRATEGY TO
MODERNIZE THE U.S. NUCLEAR REGULATORY COMMISSION'S
DIGITAL INSTRUMENTATION AND CONTROL REGULATORY
INFRASTRUCTURE

PURPOSE:

This paper provides the annual status update of ongoing work and planned future activities to improve the U.S. Nuclear Regulatory Commission's (NRC's) digital instrumentation and control (I&C) regulatory infrastructure in response to SRM-SECY-16-0070. Because of the staff's collaborative actions to modernize the digital I&C regulatory infrastructure, licensees are implementing digital I&C modifications under Title 10 of the *Code of Federal Regulations* (10 CFR) 50.59 and are planning more extensive modifications to be submitted to the NRC for approval in 2020, and the staff is transitioning to preparing for and conducting these licensing activities.

BACKGROUND:

In May 2016, the NRC staff provided a digital I&C regulatory infrastructure integrated action plan (IAP) to the Commission for approval in SECY-16-0070.¹ The IAP included four modernization plans: 1) Protection Against Common Cause Failure; 2) Considering Digital I&C in Accordance with 10 CFR 50.59 "Changes, Tests, and Experiments." 3) Commercial Grade Dedication of Digital Equipment; and 4) Assessment for Modernization of the I&C Regulatory Infrastructure. In October 2016, the Commission approved the IAP through SRM-SECY-16-0070 and directed the staff to provide annual updates of the modernization plans. The enclosure provides the status and completion schedules for the modernization plans.

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¹ SECY-16-0070, "Integrated Strategy to Modernize the Nuclear Regulatory Commission's Digital Instrumentation and Control Regulatory Infrastructure," dated May 31, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16126A137).

DISCUSSION:

I. Vision

The NRC's vision for digital I&C is to have a clear regulatory structure with reduced regulatory uncertainty that enables the expanded safe use of digital I&C in commercial nuclear reactors while continuing to ensure safety and security. The staff developed and implemented the IAP to achieve that vision by addressing a broad range of tactical and strategic digital I&C regulatory challenges for operating reactors, new and advanced reactors, and digital I&C vendors. The IAP was based on NRC licensing and inspection experiences as well as extensive stakeholder engagement to reach a common understanding of the regulatory challenges and priorities associated with digital I&C and potential solutions to address them.

II. Significant Accomplishments

In implementing the IAP, the staff engaged extensively with external stakeholders to complete significant improvements to the digital I&C regulatory infrastructure. These improvements have improved the confidence of licensees, applicants, and vendors as to the NRC's readiness to effectively license and inspect the use of digital I&C in commercial nuclear reactors.

The staff clarified how licensees could perform digital I&C modifications without NRC approval under 10 CFR 50.59, "Changes, Tests and Experiments," the staff issued Regulatory Information Summary (RIS) 2002-22, Supplement 1, "Clarification on Endorsement of Nuclear Energy Institute Guidance in Designing Digital Upgrades in Instrumentation and Control Systems," in May 2018 (ADAMS Accession No. ML18143B633). The Nuclear Energy Institute (NEI) conducted related industry workshops in the second half of 2018, in which the NRC staff participated to answer questions on the RIS. The staff also participated in subsequent industry workshops for non-NEI utilities and completed NRC inspector training on the RIS in June 2019. Industry feedback indicates that this guidance has been vital in supporting licensees in addressing real-time equipment obsolescence challenges and improving the performance of both safety-related and non-safety-related systems and components.

The staff improved the NRC's efficiency in conducting licensing reviews by issuing a revision to Interim Staff Guidance (ISG) DI&C-ISG-06, Revision 2, "Licensing Process," in December 2018 (ADAMS Accession No. ML18269A259). The ISG contains an alternate review process that provides greater clarity, predictability, and efficiency in the NRC review of a major digital upgrade. The alternate review process would have the NRC receive the amendment application at a more mature point in the licensee's design process and would call for only one submittal, rather than two. This alternate review process is also more performance-based because it leverages vendor and regional inspections for confirmatory checks during the implementation stages if the NRC approves the amendment request. The staff expects this alternate review process to result in faster NRC decisions than the traditional process, which remains available.

The staff improved applicable technical standards by participating extensively with the Institute of Electrical and Electronics Engineers (IEEE) during the development of the latest version of IEEE-603, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," which was issued in September 2018.

Concurrent with these infrastructure modernization activities, the staff also completed digital I&C licensing activities in an efficient and effective manner. Recent licensing successes include a license amendment for the Purdue research reactor for a complete digital replacement of the reactor protection and control system, completion of the staff review of the design certification for the Advanced Power Reactor 1400, a license amendment for Hope Creek Generating Station's power range neutron monitoring system, and approvals of generic topical reports for digital I&C platforms from Lockheed Martin (Nuclear Protection and Control), Mitsubishi Heavy Industry, and Radiy. The staff also successfully evaluated the highly integrated I&C systems for the NuScale small modular reactor using the approach of a design-specific review standard (DSRS) for digital I&C that is based on adherence to fundamental safety principles with a focus on risk importance and safety significance. This was the first time an applicant and the staff used a DSRS approach to prepare and evaluate a highly integrated digital I&C design. Use of this approach resulted in the completion of the first three phases of the NuScale design certification application review in an efficient and effective safety-focused manner.

III. Completion of Remaining Digital I&C Integrated Action Plan Activities

The staff still has important infrastructure modernization activities to complete as described below and in Enclosure 1.

Regarding further clarity on the use of 10 CFR 50.59 for digital I&C modifications, NEI submitted NEI 96-07, Appendix D, "Supplemental Guidance for Application of 10 CFR 50.59 to Digital Modifications," in November 2018. This document provides guidance on the application of the 10 CFR 50.59 guidance contained in NEI 96-07, Revision 1, to activities involving digital I&C modifications. It also provides screening guidance for digital I&C modifications that is not contained in the RIS 2002-22, Supplement 1. The staff is in the process of endorsing this document through a revision to Regulatory Guide (RG) 1.187, "Guidance for Implementation of 10 CFR 50.59, 'Changes, Tests, and Experiments.'" The staff issued the revised RG for public comment in May 2019, and held public meetings on June 25 and September 18, 2019, in which NEI and the staff discussed approaches for revising NEI 96-07 such that staff could endorse it without exceptions. The staff intends to publish the final endorsement in December 2019. The staff will assess whether additional inspector training is needed after issuance of this guidance and will support related industry workshops if requested. The staff continues to support industry requests to discuss use of RIS 2002-22, Supplement 1.

Regarding licensing guidance, the staff has initiated efforts to update Branch Technical Position (BTP) 7-19, "Guidance for Evaluation of Diversity and Defense-In-Depth in Digital Computer Based Instrumentation and Control Systems," to address key technical issues identified by industry stakeholders with the current revision to BTP 7-19 that have led to regulatory uncertainty. The update will incorporate the five guiding principles outlined in SECY-18-0090² and introduce an approach to grade the level of review based on safety significance. The staff actively engaged industry through public meetings on January 31, April 4, June 26, August 1, and August 29, 2019, to obtain stakeholder feedback on potential areas of improvement and the staff's proposed changes to the document. The staff intends to publish BTP 7-19 for public comment in December 2019, to support issuance of the final BTP by June 2020.

Regarding technical standards, a revision to IEEE-603 was issued in 2018 as discussed above. The 1991 edition of the standard is currently incorporated by reference into 10 CFR 50.55a(h).

² SECY-18-0090, "Plan for Addressing Potential Common Cause Failure in Digital Instrumentation and Controls," dated September 12, 2018 (ADAMS Accession No. ML18179A066).

The staff continues to engage the consensus standard development organizations on updates to additional standards including IEEE Std 7-4.3.2, "IEEE Standard Criteria for Programmable Digital Devices in Safety Systems of Nuclear Power Generating Stations," to address regulatory issues previously identified in the rulemaking proposal in SECY-15-0106.³ The issuance of the 2018 edition of IEEE-603, as well as the staff's efforts to review applicability of other standards, such as standards issued by the International Electrotechnical Commission, provide the NRC staff opportunities to leverage more recent standards for satisfying the Commission's regulations with respect to the design, reliability, qualification, and testability of digital I&C systems. The staff continues to engage with stakeholders to determine how to best use these standards in licensing reviews and address them within the NRC's regulatory infrastructure.

Regarding commercial grade dedication of digital equipment, NEI plans to submit NEI 17-06, "Supplemental Guidance for Acceptance of Digital Equipment using 3rd Party Certification" for NRC endorsement through issuance of an NRC regulatory guide. NEI provided a draft document on September 27, 2019, which will be discussed at a public meeting scheduled for October 30, 2019. NEI intends to submit the final document in December 2019. The staff expects that its technical review of the document would be complete by March 2020, and it would initiate the RG development process immediately thereafter.

Regarding an overall assessment to identify potential longer-term regulatory improvements, the staff held stakeholder engagement meetings on January 31, and April 4, 2019, and has developed a preliminary list of recommendations to be discussed with stakeholders in November 2019 and finalized in December 2019. The staff will also continue to: 1) evaluate expanding the use of risk-informed approaches to the regulatory infrastructure; 2) evaluate data provided by stakeholders on the likelihood of digital I&C common cause failures; and 3) assess any new issues arising from the use of emergent digital technologies.

While the staff's infrastructure modernization is not complete, the improvements completed to date appear to be achieving the vision of enabling the expanded safe use of digital I&C in commercial nuclear reactors. This is evidenced by widespread use of RIS 2002-22, Supplement 1, and licensees planning for more complex digital I&C projects to be submitted as license amendment requests using the alternate review process contained in ISG-06. Specifically, Waterford has issued a letter of intent (ADAMS Accession No. ML19137A082), to submit a license amendment on potential digital equipment modifications regarding the Core Protection Calculator and Control Element Assembly Calculator in the first quarter of 2020, and another licensee has informed the staff of its intent to submit a license amendment request for a major digital upgrade later in 2020 using ISG-06. Because of this interest, the staff is now preparing for this licensing work, including undertaking pre-application activities. The staff believes that all remaining IAP activities can be managed through routine processes, so the staff will not issue future formal revisions to the IAP as these resources will be better spent on specific licensing activities and applying lessons learned from those licensing activities to the ongoing infrastructure improvement activities. The staff will also disband the digital I&C IAP Steering Committee but will track the remaining infrastructure activities to ensure appropriate management oversight for their completion. The staff intends for this to be the last annual Commission paper reporting the status of the IAP but will continue to provide the Commission with information and recommendations, as appropriate, for emerging policy issues and status of

³ SECY-15-0106, "Proposed Rule: Incorporation by Reference of Institute of Electrical and Electronics Engineers Standard 603-2009, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations" (RIN-3150-A198)," dated August 24, 2015 (ADAMS Accession No. ML113190983).

the staff's DI&C infrastructure, licensing and certification activities. The staff will continue enhanced stakeholder interaction on infrastructure modernization activities.

CONCLUSION:

The Commission direction in SRM-SECY-15-0106⁴ and SRM-SECY-16-0070 provided a clear path to modernizing the NRC's digital I&C regulatory infrastructure through the IAP. The staff extensively engaged with external stakeholders on both the development and implementation of the IAP, and the implementation of the IAP has significantly improved the digital I&C regulatory infrastructure by removing unnecessary impediments and reducing regulatory uncertainty. Conformance with the improved regulatory infrastructure will continue to maintain safety and security while not posing an unnecessary impediment to the expanded safe use of digital I&C in commercial nuclear reactors. As a result, licensees are implementing digital I&C modifications under 10 CFR 50.59 and are planning more extensive modifications to be submitted to the NRC for approval using the alternate review process contained in ISG-06. The staff is transitioning to preparing for and conducting these licensing activities, so it will no longer issue annual revisions to the IAP.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objections.



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Enclosure:
Status and Completion Schedules for
Digital I&C IAP Modernization Plans

⁴ SRM-SECY-15-0106, "Staff Requirements -SECY-15-0106- Proposed Rule: Incorporation by Reference of Institute of Electrical and Electronics Engineers Standard 603-2009, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations" (RIN-3150-A198)," dated February 25, 2016 (ADAMS Accession No. ML16056A614).

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ADAMS Accession Nos.:

SECY: ML19261B815

Enclosure: ML19261B814

Package: ML19261B629

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* Via email

SECY-012

OFFICE	NRR/DLP/PLPB/PM	NRR/DLP/PLPB/LA	Tech Ed*	NRR/DLP/PLPB/BC
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DATE	9/5/2019	9/4/2019	9/4/2019	8/29/2019
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