

POLICY ISSUE
(NOTATION VOTE)

May 31, 2016

SECY-16-0070

FOR: The Commissioners

FROM: Victor M. McCree
Executive Director for Operations

SUBJECT: INTEGRATED STRATEGY TO MODERNIZE THE NUCLEAR
REGULATORY COMMISSION'S DIGITAL INSTRUMENTATION AND
CONTROL REGULATORY INFRASTRUCTURE

PURPOSE:

This paper responds to Commission direction in the Staff Requirements Memorandum (SRM) for 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-AI98)," dated February 25, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16056A614). The U.S. Nuclear Regulatory Commission (NRC) staff is requesting Commission approval of its integrated action plan to modernize the NRC's digital instrumentation and control (I&C) regulatory infrastructure.

BACKGROUND:

The staff submitted SECY-15-0106 (ADAMS Accession No. ML113190983) for Commission approval to publish for public comment a proposed rule to incorporate by reference IEEE Standard (Std.) 603-2009 into Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a, "Codes and standards." Upon review and consideration of the proposed rule, the

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Enclosure 3 transmitted herewith
contains Official Use Only – Sensitive
Internal Information. When separated
from Enclosure 3, this transmittal
document is decontrolled.

SECY NOTE
This SECY Paper, with the exception
of enclosure 3, will be released to the
public in 10 working days.

Commission issued SRM-SECY-15-0106 and disapproved the staff's recommendation to publish the proposed rule for public comment.

SRM-SECY-15-0106 also directed the staff to develop an integrated strategy to modernize the NRC's digital I&C regulatory infrastructure and to provide the plan, with proposed implementation milestones to the Commission within 90 days of the date of the SRM. Furthermore, the Commission directed the staff to engage in public workshops and meetings with relevant IEEE standards setting committees, digital I&C vendors, licensees, and any other external stakeholders to reach a common understanding of the digital I&C regulatory challenges and priorities and to create potential solutions to address them. In addition to the plan, the staff was directed to present any policy issues that are ripe for Commission consideration.

DISCUSSION:

The staff has developed a strategy to modernize the NRC's regulatory infrastructure to enhance the agency's capability to determine whether there is reasonable assurance of safety and security in digital I&C systems for nuclear facilities. The objective is to provide a process that is timely, efficient and effective, and provides a consistent and predictable regulatory process for staff and stakeholders. In developing the strategy, the staff considered the current regulatory infrastructure, ongoing regulatory activities, and stakeholder input to identify near- and long-term strategies. The staff also followed the high level principles provided by the Commission in SRM-SECY-15-0106 as listed below:

1. The plan should include the establishment of a senior management steering committee (SC) to oversee resolution of digital I&C regulatory challenges.
2. Any new or revised requirements addressed in the action plan should be performance-based rather than prescriptive.
3. Digital I&C safety requirements should be technology neutral, however, guidance should be tailored if necessary. The same requirements should apply to operating and new reactors.
4. Guidance should focus on acceptable approaches to complying with requirements and may include specific technology-focused provisions. If only one approach is acceptable to the staff to ensure safety based on current understanding, and this approach is appropriately technology-neutral and performance-based, then it should be included in a requirement rather than in guidance.
5. NRC requirements and guidance should not pose an unnecessary impediment to advancement in nuclear applications of digital technology.

The current regulatory process provides reasonable assurance of safety and security through the staff's review and approval of license amendments for specific digital I&C systems and evaluation of new reactor applications that fully incorporate highly integrated digital technologies. However, the timeliness, efficiency, and predictability of the licensing and oversight processes can be improved.

To accomplish these improvements, the staff, in coordination with stakeholders, established an integrated action plan (IAP) (Enclosure 1). The IAP consists of Modernization Plans (MPs) for three key topics: common cause failure (CCF), changes under 10 CFR 50.59 “Changes, tests and experiments,” and commercial grade dedication of digital equipment under 10 CFR Part 21. These topics will have the greatest impact, in the near-term, in addressing regulatory challenges and improving timeliness, efficiency, and effectiveness. Successful implementation in these areas is needed to provide near-term regulatory clarity and the necessary confidence on the part of licensees to perform digital I&C upgrades. As part of MP #4A in the IAP, the staff will prioritize and implement the complete set of regulatory activities, including building upon those in the first three MPs.

The longer-term goal, as outlined in MP #4B, is to then evaluate and implement the next steps for continued improvement of the NRC’s digital I&C regulatory infrastructure. The infrastructure improvements will result in a state where the nuclear power industry can use current and future digital technology efficiently, assuring safety and security with less uncertainty in the regulatory process, and minimizing the dependence on judgment by utilizing performance-based technical criteria that can be applied consistently across different technologies. The staff will review and modify the current regulatory structure to be more performance based and flexible by using new methods in the most effective way and updating the regulatory and guidance structure to acknowledge changes in the technology, the way it is developed and how it is used. The staff will evaluate the results of implementation of the near-term activities and, with continued stakeholder interaction will develop a performance based, technology-neutral regulatory infrastructure that will anticipate the evolution and future development of digital I&C technology as it is applied to nuclear technologies.

The IAP is a living document. At appropriate stages, the staff will engage the industry in demonstration activities, tabletops, etc. to test planned processes, guidance, etc. before they are finalized for implementation.

The following provides more information on the content of the IAP, the formation of a SC to provide oversight of modernization activities, and a discussion of the stakeholder interactions thus far in the development of the digital I&C IAP.

Digital I&C Integrated Action Plan

The IAP builds upon ongoing regulatory activities, stakeholder feedback concerning previous versions of a draft action plan, specific Commission direction in SRM-SECY-15-0106, and evaluation of comments received through internal and external stakeholder interactions.

The NRC and external stakeholders agree that the technical and regulatory challenges associated with evaluating the agency’s position on CCF and development of improved guidance for implementation of digital I&C changes under 10 CFR 50.59 need to be addressed in a timely manner. There is a clear dependency between these issues and they need to be addressed on similar schedules. The current regulatory positions and guidance for these two topics pose challenges to the implementation of digital I&C systems and to the implementation

of additional regulatory modernization efforts as explained below. Therefore, these critical first steps in the plan have been identified as the first two items in the action plan (MPs #1-2).

The NRC's current position on defense against CCF is guided by SRM-SECY-93-087¹ and does not include specific criteria to eliminate the potential of software CCF from consideration in a defense-in-depth and diversity analysis. In addition, licensees have stated that the current regulatory treatment and acceptance criteria dealing with the potential for CCF in the analysis of digital I&C systems has been problematic. Specifically, they have stated that the proper application of the screening criteria for "simple systems" in Standard Review Plan (SRP) Branch Technical Position (BTP)-7-19² regarding 100% testability, and the lack of a graded approach based on safety significance place a high burden for demonstrating that adequate digital I&C system development processes have been employed - especially for systems containing localized embedded digital I&C components. Therefore, the resolution of CCF concerns is the lead technical issue and a critical enabler for addressing other issues related to digital I&C. Industry stakeholders are looking for clearer NRC staff guidance on methods for analysis of the potential for CCF of digital I&C systems. The staff will examine the technical basis to evaluate a graded approach based on safety significance, including consideration of the likelihood of CCF and a risk-informed, consequence based regulatory structure. This activity is MP#1 in the IAP. The objective of assessing the NRC position on potential CCF is to ensure safety and security while enhancing efficiency and clarity in determining the potential for CCF in the analysis of digital I&C systems.

Guidance for 10 CFR 50.59 evaluation of digital I&C plant modification requires improvement and will be addressed by the staff. This activity is MP#2 in the IAP. Inadequate guidance for the 10 CFR 50.59 screening and evaluation of digital I&C systems has contributed to several licensees having improperly performed 10 CFR 50.59 analyses for modifications of I&C systems using digital technologies. In addition, industry representatives stated that they are hesitant to pursue the deployment of digital I&C upgrades through changes under the 10 CFR 50.59 process because of regulatory uncertainty and a lack of clarity in the regulatory process. The objective of this effort is to ensure that there is adequate guidance with sufficient clarity for staff and stakeholder understanding of 10 CFR 50.59 evaluations of digital I&C upgrades.

Based on stakeholder feedback and on-going staff activities, commercial grade dedication of digital equipment under 10 CFR Part 21 was identified as a near-term issue. This activity is MP#3 in the IAP. Many digital I&C components and other digital equipment that are readily available for licensee procurement are not specifically designed for nuclear facilities and have not been subject to the quality assurance criteria specified in Appendix B to 10 CFR Part 50, thus necessitating commercial grade dedication. Due to the increasing burden of I&C equipment obsolescence, this activity is intended to evaluate the need for and suitability of additional guidance and industry standards. The staff will evaluate whether it should approve or

¹ SRM-SECY-93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light Water Reactor Designs" (ADAMS Accession No. ML003708056).

² SRP-BTP-7-19, "Guidance for Evaluation of Diversity and Defense-in-Depth in Digital Computer-Based Instrumentation and Control Systems" (ADAMS Accession No. ML070550072).

endorse standards for the purpose of defining critical characteristics of commercial grade items and the mechanism by which they are verified.

The staff identified a list of broad-scoped topics that require a comprehensive assessment to identify additional opportunities for modernization of the regulatory infrastructure (MP #4 in the IAP). The staff will prioritize and implement the complete set of regulatory activities, including building on the results of the first three items in the IAP, needed to provide near-term regulatory clarity and support industry confidence to perform digital I&C upgrades. For the longer-term items, the staff will identify actions needed to implement a simpler, streamlined and agile I&C regulatory infrastructure that will effectively address larger scale digital I&C upgrades. This effort will also improve the clarity of the priorities and sequencing of further improvements with consideration of the objectives of transparency, regulatory stability and predictability, effective consideration of the cumulative effects of regulation, and efficient and effective use of limited NRC resources.

In response to Commission direction in SRM-SECY-15-0106, the staff will be coordinating with the IEEE Standards committee to address IEEE Std. 603 through the 2018 update process. The staff is engaging with the IEEE standards committee through the routine standard development activities. The continued NRC review and approval of such industry standards will be evaluated as part of the efforts to assess modernization of the regulatory infrastructure.

The IAP will be reviewed and updated at least semi-annually with approval of the SC to indicate progress made within each activity and identify, plan, and prioritize future activities.

Policy Issues for Commission Consideration

In SRM-SECY-15-0106, the Commission directed the staff to present any policy issues ripe for Commission consideration with the action plan. The staff has determined that there are no policy issues that are ready for Commission consideration at this time. As the staff completes activities in accordance with the IAP, any policy issues will be presented to the Commission.

Steering Committee

The staff established a SC to provide oversight of the formulation of the strategy to modernize the digital I&C regulatory infrastructure and the development and execution of an action plan to facilitate implementation of the strategy. The SC will ensure revisions to the regulatory programs are aligned with the principles specified in SRM-SECY-15-0106 as noted above, and ensure safety and security without posing an unnecessary impediment to the advancement of digital technology in nuclear applications.

The SC is comprised of Division Directors in the Office of Nuclear Reactor Regulation, Office of New Reactors, and the Office of Nuclear Regulatory Research with management responsibility for I&C technology, supplemented as needed with Division Directors from the Office of Nuclear Material Safety and Safeguards and the Office of Nuclear Security and Incident Response. The SC ensures appropriate management focus on the resolution of digital I&C regulatory

infrastructure issues and enhancement initiatives. The SC will also ensure timely resolution of complex technical or policy issues across the respective agency offices and will assess the status and evaluate the progress of meeting the key milestones and the overall objectives of the action plan.

The SC has been meeting and will continue to periodically brief the Office Directors of the participating offices on the status of the action plan, staff activities, digital I&C issues, and potential policy issues or other matters that may warrant senior management or Commission review.

Internal and External Stakeholder Interaction

In the development of the strategy and associated action plan, the staff engaged with internal and external stakeholders via public meetings and workshops. Participants included members of relevant IEEE standards setting committees, digital I&C vendors, licensees, and other external stakeholders. The staff issued a draft version of the integrated action plan for external stakeholder review and comment. Additionally, the SC met with the Nuclear Energy Institute Industry digital I&C working group to discuss the action plan.

A summary of the specific interactions with stakeholders can be found in Enclosure 2.

RECOMMENDATION:

Given Commission direction in SRM-SECY-15-0106 to provide an integrated plan within 90 days, the NRC staff recommends that the Commission approve the following staff action:

1. Implement the enclosed IAP.

Because this plan is a living document, the staff will update and modify the plan as needed and provide the Commission with periodic status updates.

RESOURCES:

The staff estimates 2.7 full-time equivalent (FTE) in fiscal year (FY) 2016 and \$735K and 8.3 FTE in FY 2017 will be needed to implement the proposed action plan in FY 2016 and FY 2017. Shortfalls in the FY 2016 and FY 2017 budgets will be addressed through the add/shed process. Enclosure 3 provides the staff resource estimates for FYs 2016-2018.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection. The Office of the Chief Financial Officer has reviewed this paper for resource implications and has no objections.

/RA/

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Enclosures:

1. Integrated Action Plan to Modernize Digital Information and Controls Regulatory Infrastructure
2. Overview of Public and Stakeholder Interactions
3. Resource Estimate (not publically available)

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SRM-S15-0106-1

ADAMS ACCESSION Nos.: Pkg: ML16126A137; SECY: ML16126A140; Enc. 1: ML16097A182; Enc. 2: ML16126A139; Enc. 3: ML16132A401 *concurrence via e-mail SECY-012

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