

Digital I&C Path Forward: Action Plan for Improving Regulatory Efficiency

David Rahn, Sr. Electronics Engineer, Office of NRR

**NEI-NRC PERIODIC UPDATE MEETING ON
DIGITAL INSTRUMENTATION AND CONTROL (DI&C)**

**August 19, 2015
NRC Headquarters, Rockville, MD**

Agenda

1. Goals
2. Context
3. Problem Statements
4. Next Steps

1. Goals

Identify a path forward for the future of digital I&C licensing activities that improves the efficiency of the evaluation process for digital I&C safety systems.

- Ensure the NRC mission to protect public health and safety, promote the common defense and security, and protect the environment is assured
- Find efficiencies appropriate to the evaluation of New Reactor designs and Operating Reactor license amendment requests
- Extend efficiencies to the evaluation of Licensing Topical Reports

1. Goals (continued)

- Make the staff regulatory evaluation process more reliable and predictable.
- Enable licensees, applicants, and platform vendors to experience a smoother and more efficient license submittal and evaluation process with predictable results.
- Ensure effective communications with all external stakeholders

2. Context

- SRP sections on I&C evolved from 1975 through 2007, with occasional revisions incorporated when NRC policy was formulated (e.g., SRM to SECY-93-087) or referenced industry standards were revised. I&C topical sections roughly follow the FSAR outline, with special topics covered in 20+ branch technical positions.
- In 2007 through 2010, the staff worked under the direction of a NRC Digital I&C Steering Committee with a charter to work together with industry counterparts to produce additional review guidance covering digital matters. Seven Digital I&C Interim Staff Guidance documents were produced.

2. Context (continued)

- Some of these ISGs were put to use immediately:
 - DI&C ISG-02 Diversity & Defense-in-Depth –now part of BTP 7-19
 - DI&C ISG-04 Digital Communications –addressed in IEEE 7-4.3.2
 - DI&C ISG-06 Licensing Process—now piloted for Diablo Canyon
 - DI&C ISG-05 Human Factors Manual Actions—incorporated into BTP 7-19, NUREG-0711, and SRP Chapter 18
- Some were addressed via new regulatory guidance:
 - DI&C ISG-01 Cyber Security—now covered by RG 5.71/NEI 08-09
- Others were issued, but not yet in permanent review plans:
 - DI&C ISG-07 Fuel Cycle Facilities—to be incorp. into NUREG-1520.
- Still other topics require additional definition and research:
 - DI&C ISG-03 Risk-Informed Digital I&C

2. Context (continued)

However, additional review guidance is still needed. For example, the NRC staff and stakeholders would like clarification and/or new guidance regarding:

- a potential graded approach to digital I&C design evaluation, commensurate with safety significance
- the staff's positions with respect to software CCF
- the evaluation of proposed systems developed via commercial grade dedication processes
- how to credit the proposed use of commercial grade control systems with significant operating history
- whether stakeholders could receive earlier staff feedback regarding the acceptability of proposed designs

2. Context (continued)

Action Plan Development

- Evaluate staff and stakeholder concerns expressed in public events that have occurred over the past year
- Formulate clear and concise Problem Statements
- Identify Action Plans for resolving Problem Statements
- Prioritize the Plans in accordance with their potential for greatest efficiency improvements and feasibility
 - Priority I: can be realistically accomplished in a short time frame, have a greater licensing efficiency improvement payback, or require immediate start of research to support accomplishment
 - Priority II: have less payback, require a significantly longer time and research commitment to accomplish, or are considered to be a continual improvement process

3. Problem Statements

Priority I Items

Staff Support of NEI in Updating Industry Guidance for DI&C 10 CFR 50.59 Modifications

Inadequate guidance for the 50.59 screening and evaluation of digital I&C systems has resulted in several licensees having improperly performed 50.59 analyses for modifications of I&C systems using digital technologies, and therefore greater clarity is needed.

[This item addresses the following concerns raised by industry stakeholders: high review costs, regulatory uncertainty, and the need for clarification of the common cause software failure policy.]

3. Problem Statements

Priority I Items (continued)

Content and Schedule of DI&C Application Submittals

The level of technical detail required for submittal in license applications, license amendments, and licensing topical reports, as well as the timing and sequence of the technical information expected to be submitted for NRC evaluation during the review cycle, has been inconsistent.

[This item addresses the following concerns: high review costs, regulatory uncertainty, and incorporation of factory acceptance test results as a final regulatory review item.]

3. Problem Statements

Priority I Items (continued)

Evaluation of NRC Policy on Software CCF

The current regulatory treatment and acceptance criteria dealing with Common Cause Software Failure in the analysis of digital I&C systems has been problematic for licensees. The proper application of the screening criteria for “simple systems” in BTP 7-19 regarding 100% testability, and the lack of a graded approach based on safety significance, places a high burden for demonstrating adequate development processes have been employed—especially for localized embedded digital I&C systems.

[This item addresses the following concerns: high review costs, regulatory uncertainty, and clarification of the common cause software failure policy.]

3. Problem Statements

Priority I Items (continued)

Guidance for Evaluation of Proposed Alternatives to Regulatory Guides and Endorsed Standards

More guidance is needed for NRC technical reviewers to evaluate licensee-submitted proposed alternatives to the criteria in regulatory guidance and endorsed codes and standards, applicable to the licensing of digital I&C systems and components. Current guidance does not provide sufficient detail to enable consistent review and crediting of digital systems developed using commercial grade dedication (CGD) processes. These gaps in guidance create a challenge for technical reviewers seeking to make appropriate and consistent engineering judgments on the safety assurance of proposed alternative solutions for meeting applicable acceptance criteria presented in regulatory guides and the SRP.

[This item addresses: high review costs, regulatory uncertainty, and CGD]

3. Problem Statements

Priority II Items

Guidance for Evaluation of Highly-Integrated Digital Technology

New reactor I&C proposed designs, with their advanced and more fully-integrated digital technologies, are challenging for both the staff and industry to evaluate for safety assurance, in part because the existing review guidance does not fully address the accompanying hazards impacting safety that can result from highly-integrated I&C systems.

[This item addresses the following concerns: high review costs, regulatory uncertainty, and the need for better guidance concerning the evaluation of human factors engineering issues.]

3. Problem Statements

Priority II Items (continued)

Regulatory Infrastructure Improvements

The regulatory infrastructure (regulatory guides, SRP, branch technical positions, etc.) makes it difficult to achieve efficient, effective and consistent staff implementation, for a number of reasons. The infrastructure: a) is cumbersome, b) is not well organized and is somewhat redundant, c) does not allow for graded approaches based on safety significance, d) is not updated frequently enough to address advancements in technology, and e) lacks appropriate integration with other areas/disciplines of regulatory evaluation.

[This item addresses the following concerns: high review costs and regulatory uncertainty.]

3. Problem Statements

Priority II Items (continued)

Improvement in DI&C Technical Consistency Among NRC Headquarters and Regional Offices

Representatives of the US nuclear industry have expressed that regulatory activities performed among the Offices at Headquarters, and the Regional Offices are not always technically consistent. There has been inconsistency in interpretation of regulatory guidance. For example, feedback from industry representatives indicates NRC staff interpretation/application of 10 CFR 50.59 criteria has changed or is inconsistent between region inspectors and headquarters staff.

[This item addresses the following concerns: high review costs and regulatory uncertainty.]

3. Problem Statements

Priority II Items (continued)

Early-Development Stage Evaluation of Security Aspects of Proposed DI&C Designs

Absent a timely evaluation against cyber security criteria during the development phase, concerns remain that cyber vulnerabilities could adversely impact safety. However, the current licensing process does not require applicants to submit information or identify acceptance criteria to support an evaluation of design features for cyber security. Regulatory inefficiencies result when staff does not evaluate digital I&C system design features for their ability to satisfy cyber security criteria when the staff is evaluating the same (or closely-related) features for safety.

[This item addresses the following concerns: high review costs and regulatory uncertainty.]

3. Problem Statements

Priority II Items (continued)

DI&C Topical Report Evaluation and Update Process

The expenditure of NRC staff resources for the review of digital I&C platform topical reports has not gained the efficiencies in performing licensing evaluations as was originally envisioned. A means or process to effectively and efficiently address updates to the topical report, to address design changes made to the platform following issuance of the original topical report safety evaluation, has not been established.

[This item addresses the following concerns: high review costs and regulatory uncertainty.]

4. Next Steps

- The DI&C Working Group must complete the detailed action plans for resolving the problem statements and resource estimates.
- The Path Forward Action Plan will be issued for concurrence by the three Engineering Division Directors of NRR, NRO, and RES.
- The Office Directors of RES, NRR, and NRO will approve the allocation of resources and schedules for expenditure of these resources.
- The staff will implement the plans by integrating them into the staff's regular activities in concert with available resources.

- **Questions**