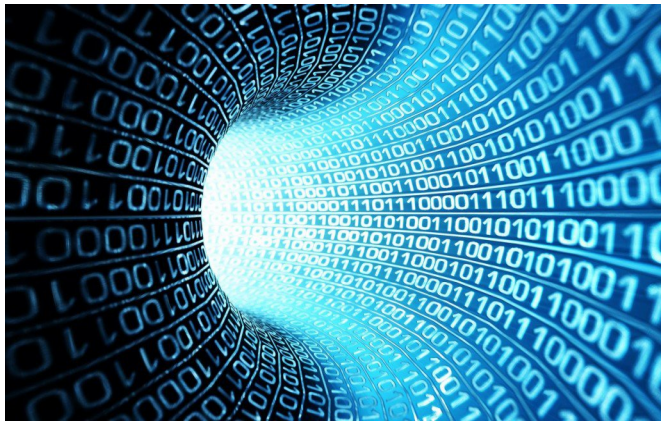
U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

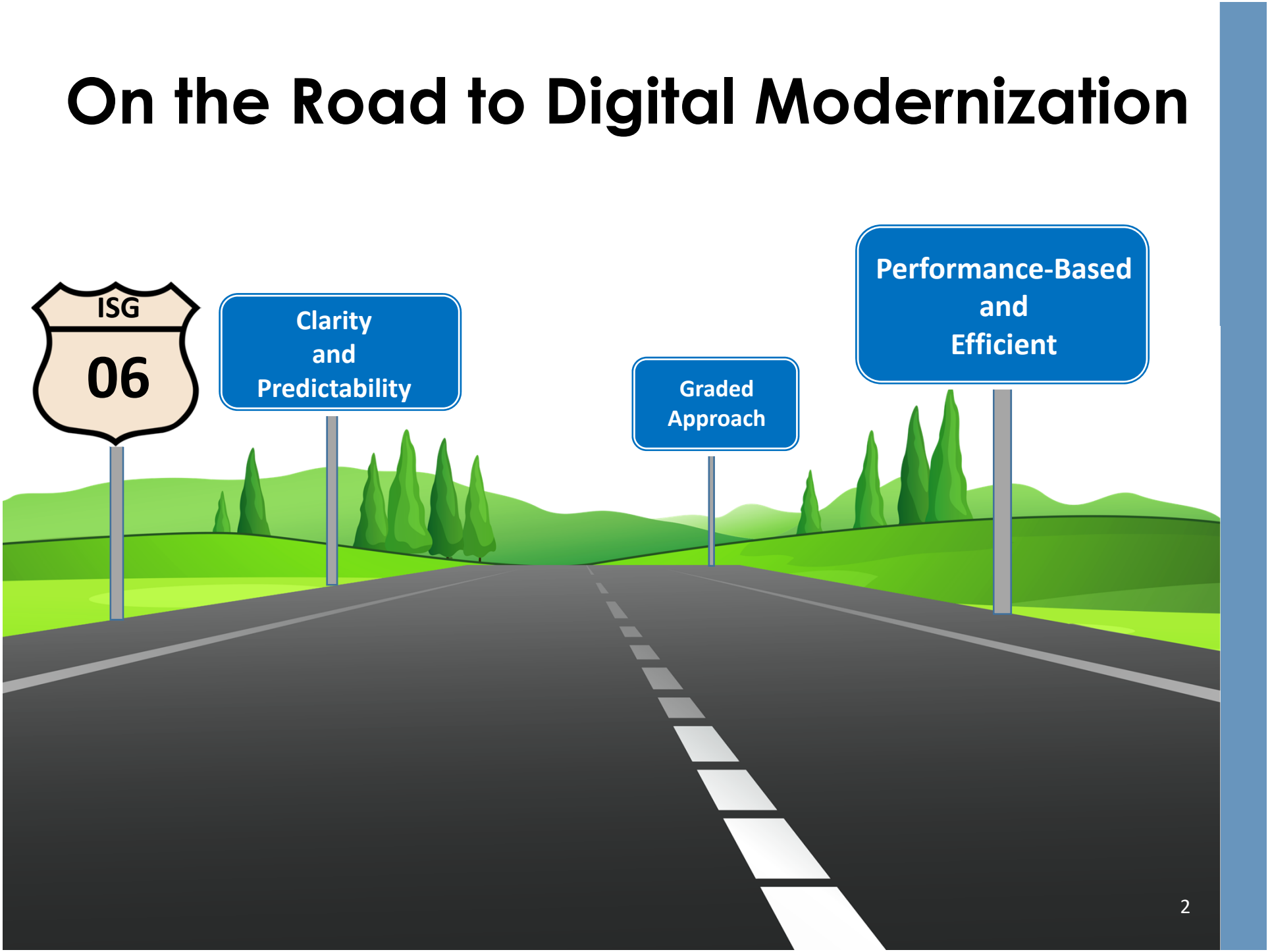
BRIEFING ON DIGITAL INSTRUMENTATION AND CONTROL

Commission Meeting

May 14, 2019



On the Road to Digital Modernization

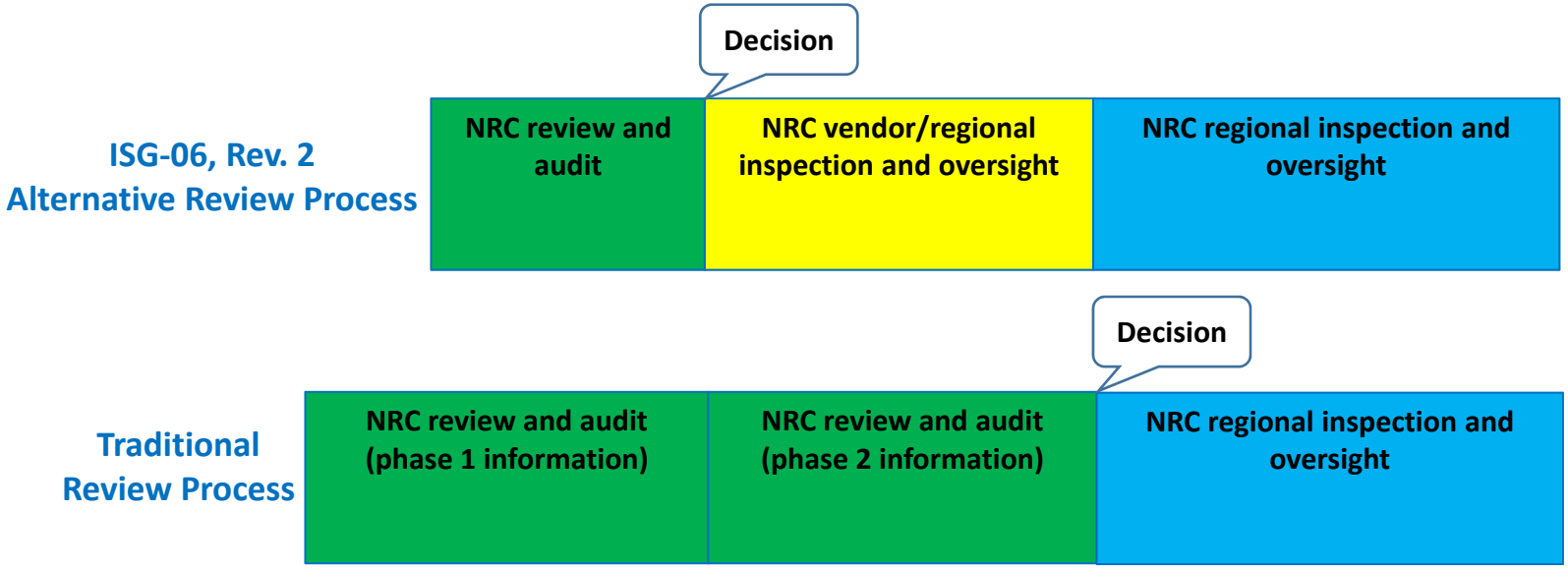


Speakers

- Margaret Doane, Executive Director for Operations (EDO)
- Ho Nieh, Director, Office of Nuclear Reactor Regulation (NRR)
- Eric Benner, Director, Division of Engineering (DE), NRR
- Brian Thomas, Director, DE, Office of Nuclear Regulatory Research (RES)

NRC has Addressed High Priority Challenges

ISG-06, Rev. 2 Explained

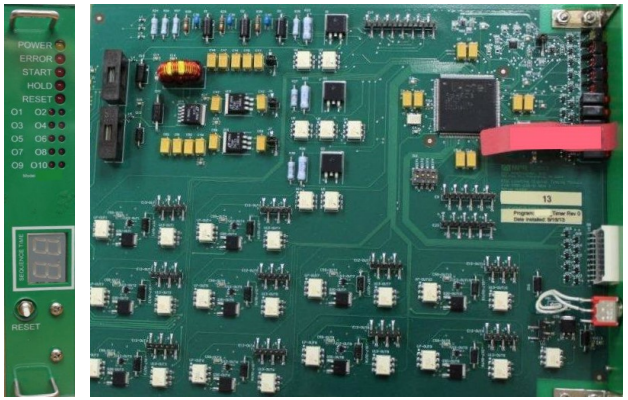


Concept and NRC pre-application meetings	Initial system design and planning	Detailed hardware & software design and fabrication	Implementation, software validation/verification, and factory testing	Onsite installation and site acceptance testing

Licensee activities

Current NRC Guidance is Enabling Safe Digital Upgrades via 50.59

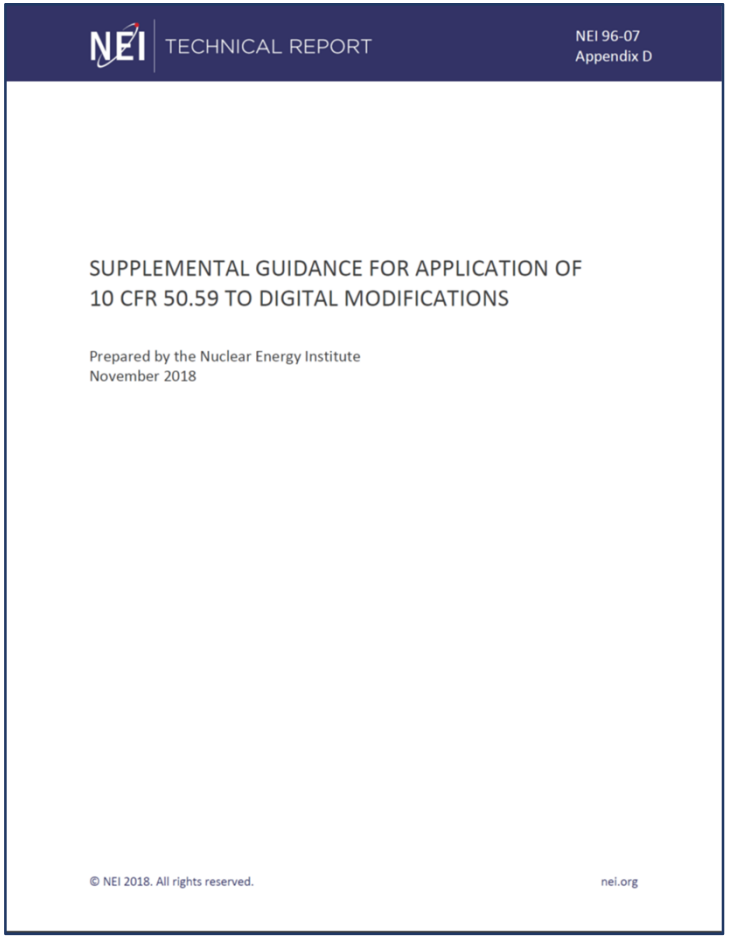
Chiller Controls



Diesel Generator Controls

Feedwater/Turbine Control System

Evaluation of an Issue with NEI 96-07 Appendix D is in Progress


NEI TECHNICAL REPORT

NEI 96-07
Appendix D

SUPPLEMENTAL GUIDANCE FOR APPLICATION OF
10 CFR 50.59 TO DIGITAL MODIFICATIONS

Prepared by the Nuclear Energy Institute
November 2018

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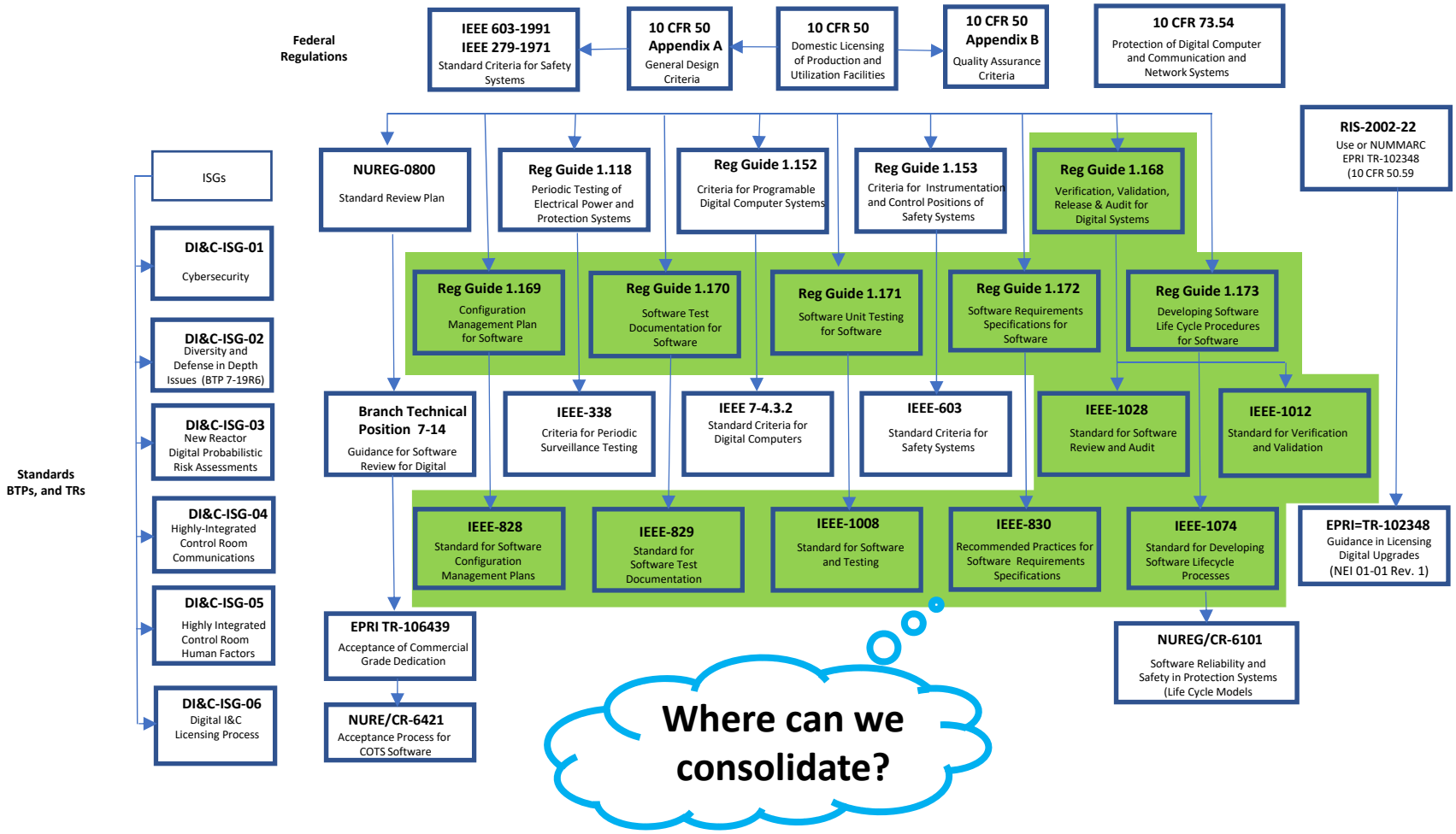
10 CFR 50.59(c)(2)(vi)

A license amendment is required if the change would "create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in the final safety analysis report (as updated)."

Where else can we improve the regulatory framework?



Proactively Addressing Additional Common Cause Failure Concerns

Propose Risk-Informed Graded Approach for BTP 7-19

	Safety-Related	Not Safety-Related
Safety-Significant	A1 **D3 Analysis**	B1 **Defense-in-Depth/Qualitative Assessment**
Low-Safety-Significant	A2 **Defense-in-Depth/Qualitative Assessment**	B2 **Assessment May be Needed**

Perceptions vs. Reality

Common Perceptions	Reality
A diverse analog system is mandatory to backup all DI&C safety systems	No. There are many options to accomplish the intended safety function, including ATWS and operator actions.
100% testing is required of the digital system to address CCF	100% testing is NOT required to address CCF in digital systems and may not be practical.
BTP 7-19 is applicable to DI&C modifications under 10 CFR 50.59	No, a licensee is NOT required to follow BTP 7-19 for digital modifications under 10 CFR 50.59.

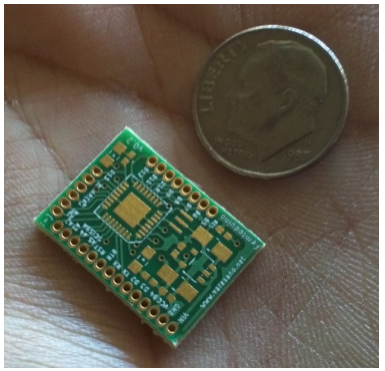
Pursuing Alternative Regulatory Approaches and Safety Standards

- Broader use of IEC standards as an alternative way to meet the requirements of IEEE 279 and 603-1991
- Ready to evaluate proposed industry guidance for commercial grade dedication

Research is Supporting the Success of Future Regulatory Modernization

User Needs

- Embedded Digital Devices
- Common Cause Failure
- Risk-Informing
- Operational Experience

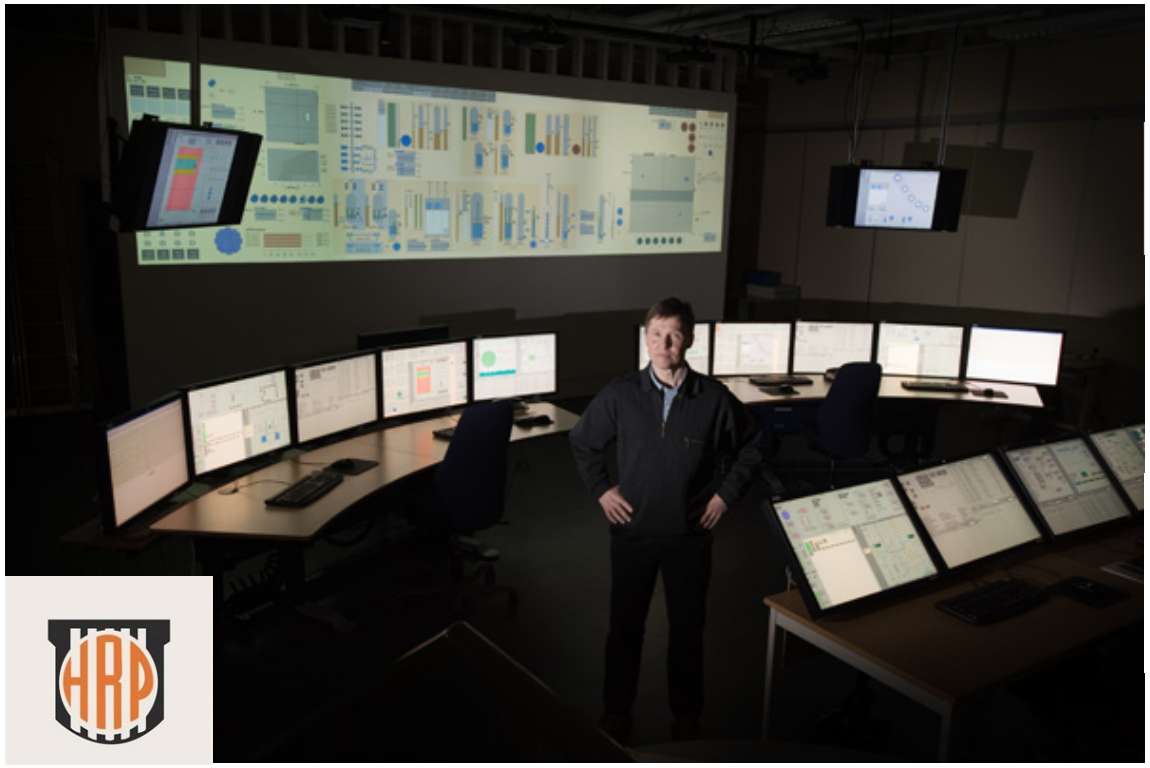


NRC is Coordinating with other Domestic Research Activities

LWRS LIGHT WATER REACTOR SUSTAINABILITY

Domestic research activities are focused on using digital technologies to improve safety and reliability

NRC's International Collaboration is Focused on Safe Use of Digital I&C



IAEA
International Atomic Energy Agency

NEA
Nuclear Energy Agency

What does success look like?

Shippingport control room circa 1957

Typical control room today
> 60 years from Shippingport

Success is expanding the safe use of digital

We're Making Progress on Achieving an Efficient and Effective Digital I&C Framework

- Continue our efforts to:
  - Modernize our decision making in the use of DI&C systems
  - Effectively communicate with all stakeholders to understand their challenges, priorities, and potential solutions
  - Transform with risk-informed and innovative approaches

Acronyms

- BTP – Branch Technical Position
- CCF – Common Cause Failure
- CFR – Code of Federal Regulations
- D3 – Diversity and Defense-in-Depth
- DI&C – Digital Instrumentation and Control
- I&C – Instrumentation and Control
- IEEE – Institute of Electrical and Electronics Engineers
- IAEA – International Atomic Energy Agency
- IEC – International Electrotechnical Commission
- ISG – Interim Staff Guidance
- NEI – Nuclear Energy Institute
- RIS – Regulatory Issue Summary
- NEA – Nuclear Energy Agency
- SSC – Safety Systems, Structures, and Components
- EPRI – Electric Power Research Institute
- TR – Topical Report