NRC Approach to DI&C and Cyber Security

Perry Pederson
Security Specialist (Cyber)
Office of Nuclear Security and Incident Response
U.S. Nuclear Regulatory Commission
November 2012

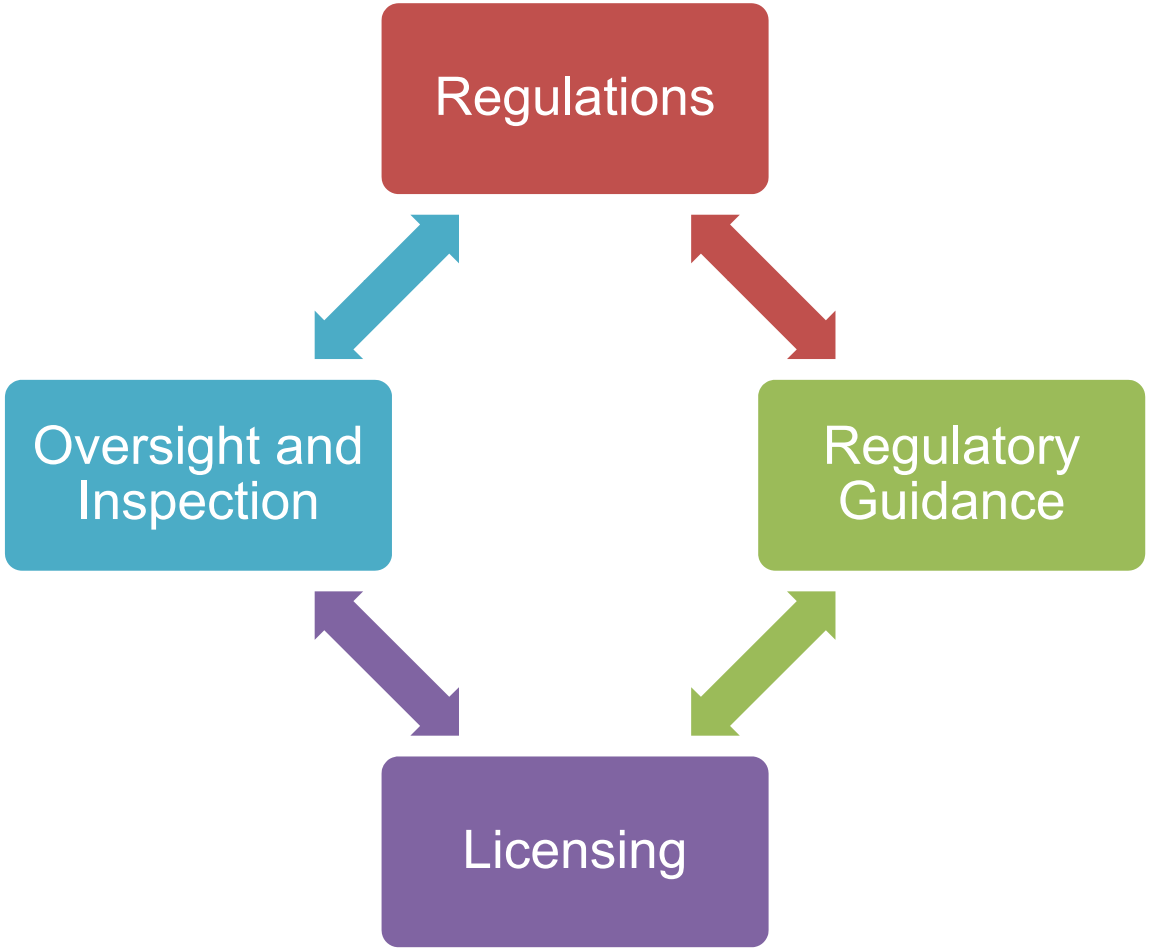
U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Overview

- Regulatory Framework
- Part 50 Safety and Part 73 Security
- Title 10 CFR 73.54
- Regulatory Guide 1.152
- Regulatory Guide 5.71
- Oversight Activities
- Research Activities
- Paradigm Shift
- Questions

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

Regulatory Framework



Cyber Security for Nuclear Reactors

Requirements

- 10 CFR 73.1 (Design Basis Threat)
- 10 CFR 73.54 (Cyber Security)

Regulatory Objective

PREVENT RADIOLOGICAL SABOTAGE

Scope

Systems that provide:
- **Safety, Important-to-Safety** functions
- **Security** functions
- **Emergency Preparedness** functions
- Support Systems whose failure would have an *Adverse Impact** on one of the above functions

*Adverse Impact** = Compromise of support system impairs/defeats the functionality of a safety system, important-to-safety system, security system, or emergency response system

Approach

Programmatic
Defense-in-Depth
Risk-informed

Guidance

RG 5.71 & Appendices
NEI 08-09 (Generic Cyber Security Plan Template)

Implementation

Oper. Rx Cyber Security Plan (10 CFR 50.34)
COLA Cyber Security Plan (10 CFR Part 52)

NRC Licensing

NSIR Safety Evaluation (Chapter 13)
NRR/NRO Issue License Condition

Support Systems whose failure would not have an *Adverse Impact** on a safety, important-to-safety, security, or EP function fall under **FERC** regulations (i.e., **NERC** cyber security standards)

MOA with **FERC**
and
MOU with **NERC**

NRC Oversight

Inspection Procedures
ITAAC [no programmatic ITAAC]
Inspector Training
Significance Determination Process

Requirements

- 10 CFR 50.34
- 10 CFR 50.55a
- 10 CFR 50 Appendix A (General Design Criteria)
- 10 CFR 50 Appendix B (Quality Assurance)
- 10 CFR 52.4

Regulatory Objective

SYSTEM FUNCTIONALITY & RELIABILITY

Scope

Systems that are:
- **Safety-Related**
- **Important-to-Safety**

Approach

System-level design features
Diversity and Defense-in-Depth
Deterministic

Guidance

RG 1.152 Rev 3
IEEE Std. 603, IEEE Std. 7-4.3.2
Design Acceptance Criteria [Part 52]

Implementation

Amendment Request (10 CFR 50.90)
DC Application (10 CFR Part 52)

NRC Licensing

NRR/NRO Safety Evaluation (Chapter 7)
NRR/NRO Issue License Condition

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

10 CFR 73.54

Title: Protection of digital computer and communication systems and networks

- Performance-Based, Programmatic (< 2 pages)
  - Provide high assurance against cyber attack
  - Integrated with Physical Security Program (10 CFR 73.55)
- Basic Requirements
  - Critical digital assets must be protected
  - Safety, important-to-safety, security, and emergency preparedness functions and support systems that can impact those functions
  - Defense-in-depth protective strategy
  - Records maintained for duration of license

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

Regulatory Guide 1.152

Title: Criteria for use of computers in safety systems of nuclear power plants

- Describes a method that the NRC staff deems acceptable for complying with the Commission's regulations for promoting high functional reliability, design quality, and a secure development and operational environment for the use of digital computers in the safety systems of nuclear power plants.
- The NRC's intention is that the combination of this regulatory guide and the programmatic provisions under 10 CFR 73.54 [RG 5.71] should seamlessly address the secure design, development, and operation of digital safety systems.

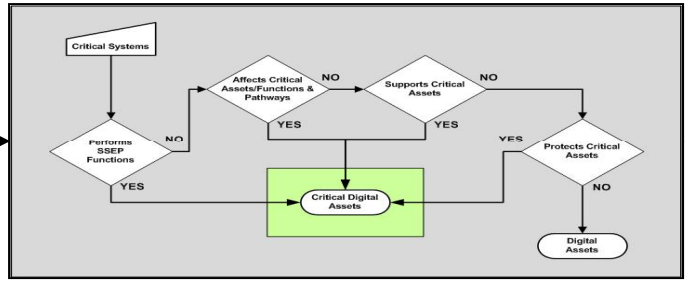
U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Regulatory Guide 5.71

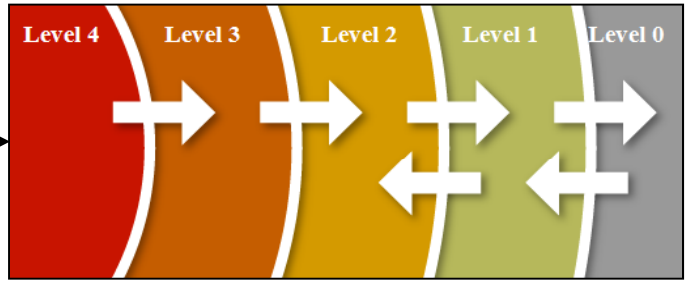
Title: Cyber security programs for nuclear facilities

Form Cyber Security Team

Identify Critical Digital Assets



Apply Defensive Architecture



Address Security Controls

1. Address each control for each CDA, or
2. Apply alternative measures, or
3. Explain why a control is N/A

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

Oversight Activities

- Inspection Program
  - pilot process
  - inspector training
- Significance Determination Process
- Threat information sharing
  - Protected Web Server (PWS)
  - United States Computer Emergency Response Team (US-CERT)
  - Industrial Control Systems Cyber Emergency Response Team (ICS-CERT)

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

Research on Safety Aspects of DI&C

- On going
  - Analytical Assessment of DI&C Systems
  - Development of Benchmark Reliability Data
  - Digital System PRA
- New research
  - Safety Assessment of Tool Automated Processes
  - Diagnostics and Prognostics
- Future research
  - Communications Among Plant-wide systems
  - Integrated Plant & DI&C System Modeling

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

Research on Security Aspects of DI&C

- Security of Digital Platforms
- Network Security
- Security Assessments of EM/RF Vulnerabilities
- Quantification of Security Posture
- Reliability Impacts of Smart Grid

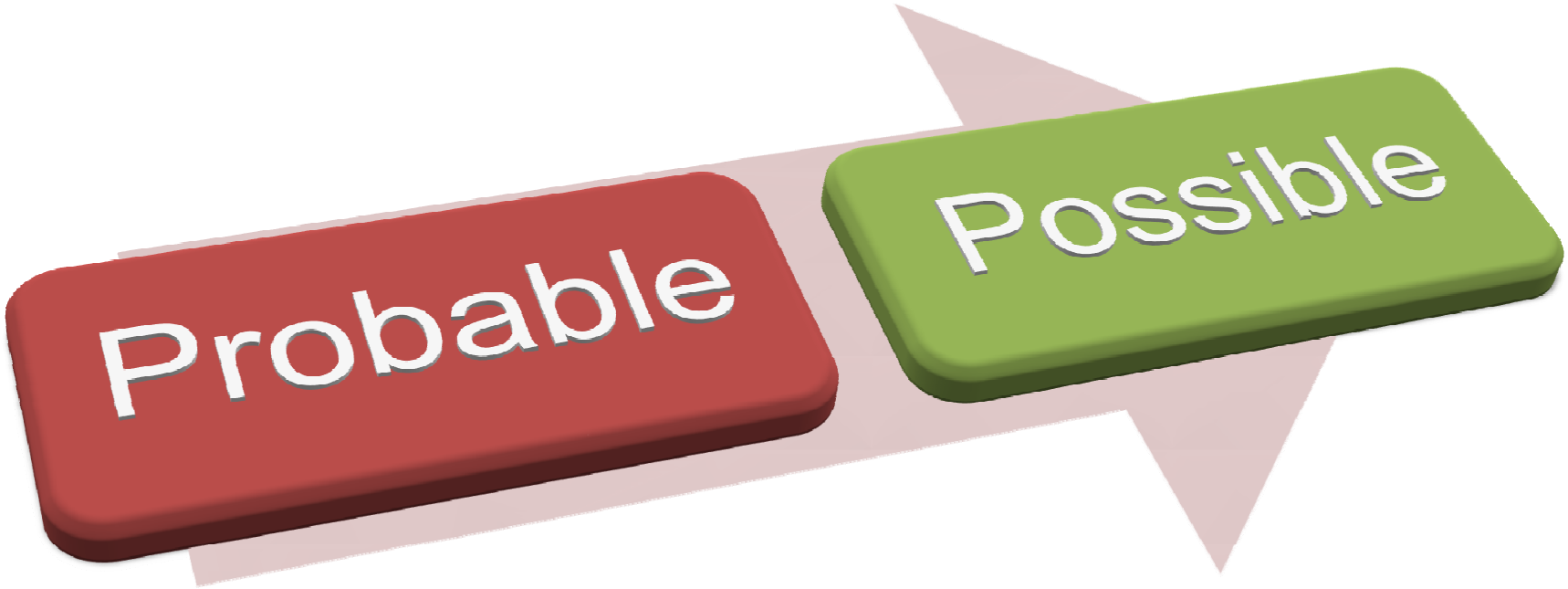
U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Other Relevant Research Activities

- Advanced Nuclear Power Concepts
  - Advanced Instrumentation
  - Advanced Controls
- Operating Experience Analysis
- Standards Development, Regulatory Guidance, and Review Guidance
- Collaborative and Cooperative Research
- Organization of Regulatory Guidance Knowledge
- Survey of Emerging Technologies

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

Paradigm Shift



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

Physical Security

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

Cyber Security

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

Questions