



# Licensing Review of Instrumentation and Controls (I&C) for the mPower™ Small Modular Reactor Design

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# Outline

- Background
- NRO's Lessons Learned
- DSRS Chapter 7 Structure
- DSRS Status and Schedule
- Summary and Next Steps

# DSRS Chapter 7 Goals

Apply lessons learned in a timely manner to:

1. Enhance the safety focus of staff reviews,
2. Improve review efficiency.

# Background

- Licensing reviews of I&C have been a significant challenge from the perspective of both safety demonstration and schedule/resources for all new large light water reactor design centers.
- I&C licensing certainty has been consistently expressed by industry as a high priority for new reactor reviews.
- Lessons learned were identified by NRO I&C staff and improvements were incorporated to support the DSRS Chapter 7 goals.

# Background (continued)

- The DSRS Chapter 7 approach applies the concept of system engineering principles (under the current regulatory framework):
  - Design principles,
  - Simplicity attribute,
  - Integrated hazards.
- Structural changes enhanced the guidance for clarity and efficiency.

# Incorporation of NRO Lessons Learned from LLWRs

Reorganize review guidance to separate design principles from specific system requirements

Provide guidance on Fundamental Design Principles at system level

Remove redundant and non-applicable information

Eliminate the use of DAC

Introduce Simplicity and Hazard Analysis in Review Guidance

Ensure adequate coverage of regulatory requirements and applicable guidance

# Review Guidance Structure

- Existing SRP Guidance
  - 7.0 Overall Review Process
  - 7.1 Introduction
  - 7.2 Reactor Trip System
  - 7.3 ESF Systems
  - 7.4 Safe Shutdown Systems
  - 7.5 Information Systems
  - 7.6 Interlock Systems
  - 7.7 Control Systems
  - 7.8 Diverse Systems
  - 7.9 Data Communication Systems
  - BTPs (7-1 to 7-21 & 8-5)
  - ISGs
- DSRS Chapter 7
  - 7.0 Overview of Review Process
  - 7.1 Fundamental Design Principles
    - Design Basis
    - Independence
    - Redundancy
    - Predictability and Repeatability
    - Diversity and Defense-in-Depth
  - 7.2 System Characteristics
  - Appendix A, Hazards Analysis
  - Appendix B, I&C System Architecture
  - Appendix C, Simplicity
  - Appendix D, References

# DSRS Chapter 7 Structure

Areas Of Review	7.0 – Introduction and Overview	7.1 – Fundamental Design Principles	7.2 – System Characteristics
	<ul style="list-style-type: none"> <li>• Review objectives</li> <li>• Review interfaces</li> <li>• Review process</li> <li>• Mapping of regulatory requirement to DSRS location</li> </ul>	<ul style="list-style-type: none"> <li>• Safety system design basis</li> <li>• Independence</li> <li>• Redundancy</li> <li>• Predictability and Repeatability</li> <li>• Diversity / Defense-in-Depth</li> </ul>	<ul style="list-style-type: none"> <li>• Quality</li> <li>• Equipment qualification</li> <li>• Reliability, Integrity , and completion of protective action</li> <li>• Operating and maint. bypasses</li> <li>• Interlocks</li> <li>• Derivation of system inputs</li> <li>• Setpoints</li> <li>• Auxiliary features</li> <li>• Control of access, identification, and repair</li> <li>• Interaction between sense and command features and other systems</li> <li>• Multi-unit stations</li> <li>• Automatic and manual control</li> <li>• Displays and monitoring</li> <li>• Human factors considerations</li> <li>• Test and calibration</li> </ul>



# Next Steps

- Public Comments have been received on the DSRS
- Staff will be reviewing and resolving comments over the next several months
  - Comments internal to Chapter 7
  - Maintaining awareness of any changes to other DSRS Chapters that may impact Chapter 7