

# **Safety Focused Review of Instrumentation and Control Systems**

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# Discussion Topics

- Background
- NuScale Enhance Safety Review
- NuScale Chapter 7 DCA Review
- Conclusion

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# Background

The staff embarked on an innovative approach for reviewing FSAR Chapter 7, “Instrumentation & Controls” for mPower (and beyond)

- Improve the safety focus of the review
- Adherence to fundamental safety design principles; independence, redundancy, deterministic performance, and D3
- Improve the efficiency of the review

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# NuScale Enhanced Safety Focus Review

- Safety-Significance
- Regulatory Compliance
- Novel Design
- Shared SSCs
- Licensing Approach
- Safety Margin
- Defense-in-Depth
- Operational Programs
- Adverse Interactions
- Additional Risk Insights
- Other Considerations

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# Review Considerations

## Safety-Significance

- NUREG-0800, Introduction - Part 2 defines safety-significance of an SSC or its associated function(s) using the A1, B1, A2, B2 safety classifications:
  - A1 – Safety-related and risk-significant
  - B1 – Nonsafety-related and risk-significant
  - A2 – Safety-related and not risk-significant
  - B2 – Nonsafety-related and not risk-significant

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# Review Considerations

## **Regulatory Compliance**

- Adequate review will always be conducted for compliance with applicable regulations with making findings of reasonable assurance of safety.

## **Novel Design**

- Identify any novel design features proposed by NuScale and associated importance to safety issues (e.g., passive safety design features)

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# Review Considerations (cont.)

## **Sharing of SSCs across modules**

- Identify extent of SSC sharing between modules and associated importance to safety issues (e.g., multi-module trip)

## **Licensing approach**

- Identify any unique licensing approaches and associated importance to safety issues

## **Defense-in-Depth**

- Identify any significant defense-in-depth considerations (e.g., active injection back up for passive emergency core cooling system)
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# Pre-Application Activities

## Early Interactions with the applicant

- Audits of conceptual designs and regulatory gaps
- Public Meetings
- Training

Through these interactions, the staff was able to learn about:

- Safety considerations
- Plant-Level I&C Architecture
- Safety-Related I&C Platform



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# NuScale Chapter 7 DCA Review

## Highly Integrated Protection Platform

- Module & plant protection systems architectures
- Software common-cause failures
- Anticipated transients without scram

## System Interfaces

- Nonsafety to safety systems interactions
- Human-machine interface

## First-of-a-Kind Sensor Applications

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# Conclusion

## **Challenges using a graded approach:**

- Approach review focus on safety significance with risk insights, without compromising safety
- Implementation

## **Benefits of using a graded approach:**

- Holistic plant safety review
- Early resolution of safety design concerns
- Increased effectiveness & efficiency

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# Acronyms

- CFR: code of federal regulations
  - DCA: design certification application
  - IEEE: Institute of Electrical and Electronics Engineer
  - I&C: instrumentation and controls
  - PE: professional engineer
  - NPIC&HMIT: Nuclear Plant Instrumentation, Control and Human Machine Interface Technologies
  - NRC: Nuclear Regulatory Commission
  - NuScale: NuScale Power, LLC
  - SSC: structures, systems, and components
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