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Perspectives on Instrumentation and Controls for New Reactors

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Key Messages

- Modern Instrumentation and Control (I&C) systems have recently been licensed for large scale nuclear applications and are currently being constructed.
- Continuous improvement of licensing process through lessons learned
- Staff welcomes industry feedback

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New Reactor Instrumentation and Controls (I&C)

- Licensing basis is being established (e.g., Final Safety Analysis Report) based on modern, up-to-date technology and the latest applicable guidance and standards.
- Recent reviews have shown that new reactors have design features that are unique (e.g., control of safety equipment from non-safety operator workstations).
- I&C systems are almost fully digital and software-based from the outset.
- High levels of complexity and integration for both safety and non-safety I&C systems

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Licensing Challenges in New Reactors

- Challenges come from a wide variety of areas:
  - Evaluating Hazards in Non-Safety Digital I&C Design
  - Embedded Digital Devices
  - Differences in Use of Common Terminology
  - Incomplete or Inconsistent Design Information
- Challenges, generally, have been addressed through increased interaction between staff and applicants.

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Licensing Challenges = Improvement Opportunities

- Challenges in Licensing Reviews can lead to some of the following outcomes:
  - Requests for more detailed design information
  - Delays in project review schedules
  - Discontinued staff reviews
- Licensing challenges are opportunities for improvement as they reveal specific areas of concern in licensing.
- Utilizing lessons learned and industry feedback is key.

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Continuous Learning and Improvement

- Incorporating previous lessons learned to present and future reviews
- Interim Staff Guidance (ISGs) and Branch Technical Positions (BTPs)
- Development of the Small Modular Reactor (SMR) Design Specific Review Standard (DSRS)
- Working with industry to develop standard Inspections, Tests, Analysis and Acceptance Criteria (ITAAC)
- Placing more emphasis on pre-application and acceptance reviews such as with the recently docketed Korea Hydro and Nuclear Power Co. (KHNP) Advanced Power Reactor 1400 (APR1400) Standard Plant Design.
- Reasonable assurance of safety is the primary concern while striving to address licensing certainty concerns

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Recent Licensing Successes: ESBWR

Economic Simplified Boiling Water Reactor (ESBWR) Final Design Certification Rule became effective on November 14, 2014, as Appendix E to 10 CFR Part 52.

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Recent Licensing Successes: AP1000 Construction

- Nuclear plant units utilizing modern I&C technology are currently being constructed (e.g., Plant Vogtle Units 3&4 and Plant Summer Units 2&3).
- These will be the first plants in the country that will be nearly all modern, digital technology for I&C.
- These successes demonstrate that modern I&C technology can be designed, licensed, and implemented for nuclear power.

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In Conclusion….

- Modern I&C technology in New Reactors have been successfully licensed and are currently being constructed.
- Generally, licensing challenges in new reactors have been resolved through increased interactions.
- Maintaining consistent communications between staff and applicants is key in ensuring common understanding and expectations. Identifying challenges early in the review process is also key.
- There's still room for improvement for both the staff and industry in terms of the licensing process and application quality, respectively.
- Staff is looking for opportunities to demonstrate improvements and will continue to work with industry to address licensing concerns.

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