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Nuclear Regulatory Commission New Reactor Topics

2013 NEI Radiation Protection Forum
The Westin River walk
San Antonio, TX
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Overview

- Radiation Protection & Accident Consequences (RPAC) Branch/Current Work
- Current / Planned License Applications
- Advanced Reactors
- Lessons Learned
- Emergent Areas of Review
- Looking Forward
- Summary

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RPAC Branch Focus

- In 2011 combined RP, Accident Analysis, and Man-made External Hazards into one branch.
- DCD / COL Reviews of SRP Chapters/Sections:
  - 2, 3, 6,11,12 & 15
- RG, NUREG, Inspection Procedures, Generic Communications, etc.
- Support infrastructure development of Advanced Reactor in addition to enhancing the Large LWR program.

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Current Work

- Large LWR COL & DC Reviews
  - Amendments / Exemptions
  - Construction inspection procedures
- Advanced Reactor infrastructure
  - SRP and DSRS update/development
  - Pre-application meeting support
- Part 50 Appendix I, Rulemaking
- RG/NUREG reviews
- GALE Code 12 and iPWR version development
- RG 1.143 Rev. 3 & RIS for Rev. 2
- Responsibility for licensed material control during new construction

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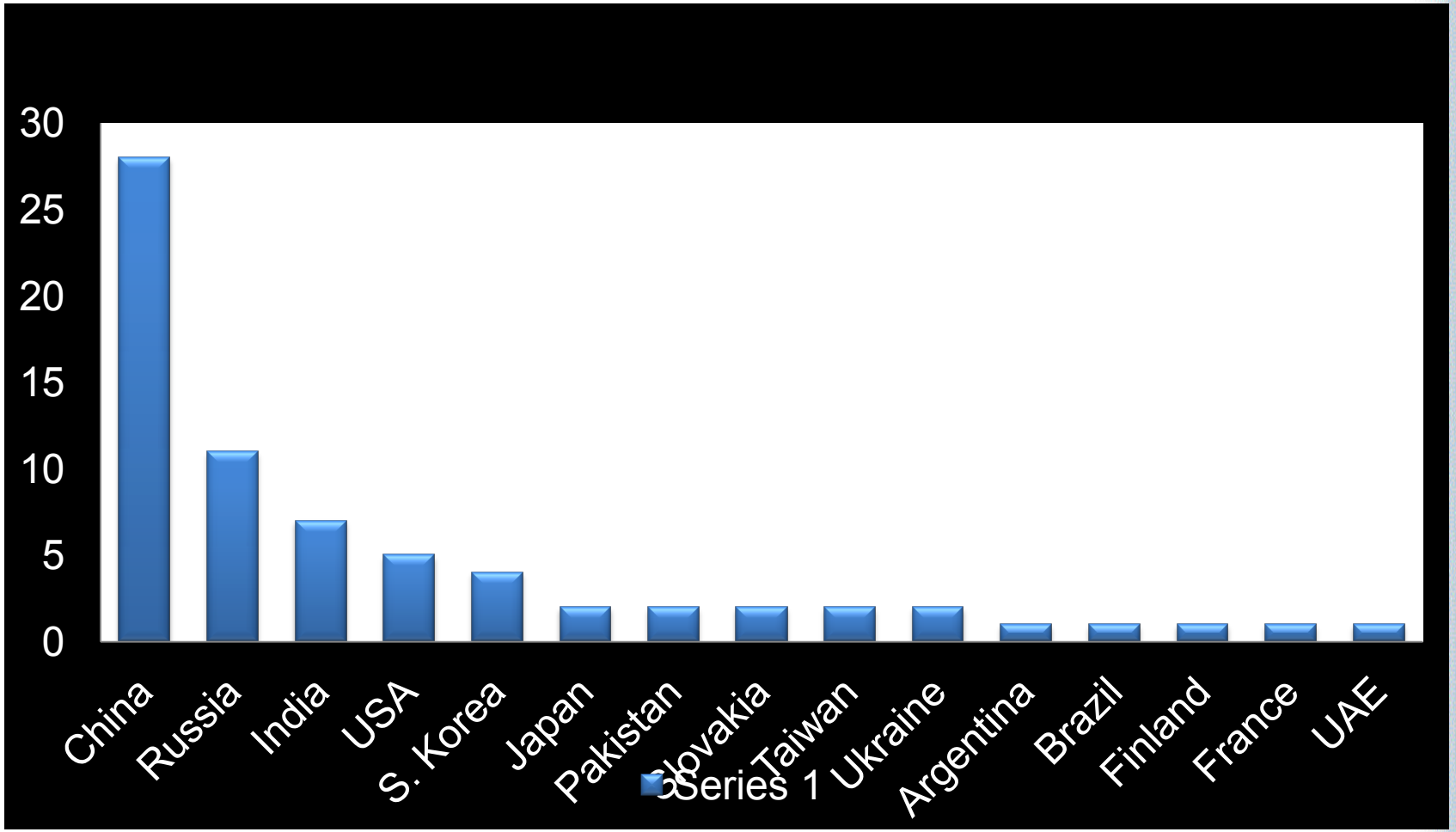
New Large Light Water Reactor Construction World Wide



Source: IAEA and World Nuclear Organization

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Current New Reactor Licensing in U.S.

- Design Certifications in Process
  - ESBWR – awaiting rulemaking
  - U.S. EPR – developing Advanced SER (Phase 4)
  - US-APWR – developing SER with open items (Phase 2)
  - ABWR renewal – accepted for Toshiba and GE-Hitachi
- Combined Operating Licenses (COLs)
  - 9 active COL applications under review
- Early Site Permits
  - PSEG
- 2 DC Renewal Applications (ABWR)
  - GE-Hitachi
  - Toshiba
- Part 50 Construction
  - Watts Bar Unit 2

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Planned New Reactor Licensing in the U.S.

- Design Certifications
  - APR-1400 expected application CY2013
- Small Modular Reactors (SMR)
  - Westinghouse DC SMR – expected 2nd Quarter CY2014
  - B&W mPower DC – expected 3rd Quarter CY2014
  - NuScale DC – expected 3rd Quarter CY2015
  - Holtec DC – expected 4th Quarter CY2016
- Construction Permits/Combined Operating Licenses
  - TVA Clinch River – CP expected 2nd Quarter 2015
  - Ameren Callaway – COL expected 3rd Quarter 2015

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Advanced Reactor Program

- Significant domestic interest in the possible licensing, construction, and operation of small modular reactor designs
- The NRC is anticipating submittals of design certification applications for SMRs beginning the Spring of 2014
- The designs will likely propose unique features or approaches
- The Commission has directed the staff to think expansively and engage stakeholders early with respect to SMRs

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Advanced Reactor Program (cont'd)

- Current emphasis on preparation for review of integral pressurized water reactors (iPWRs)
  - Pre-application interactions & Design-specific review standards (DSRS)
- Resolving policy/technical issues
  - Engagement from potential applicants and stakeholders throughout the process is critical
    - Siting and source term, emergency planning, multi-module licensing
    - Security and safeguards, risk-informed licensing, insurance,
    - Operator staffing, decommissioning funds, etc.
- Developing Infrastructure / Continual Improvements of DSRS
- Revision of SRP (NUREG-0800)
  - New Part 2 of the Introduction to the SRP provides information specific to integral PWRs. It does not change NRC requirements for applications or applicants. It helps to assure the quality and uniformity of staff safety review

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Advanced Reactors Recent Progress

- Pre-application meetings with potential applicants
  - Topics have included PRA, fuel design, I&C, ***GALE code***, and regulatory gaps
- Topical meetings with NEI
  - Topics have included ***mechanistic source term and emergency preparedness***
- NGNP meetings with INL/DOE
  - Topics have included ***source term and EP***
- Meeting summaries and slides are at www.nrc.gov

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GALE Code

Based on the mPower design, staff identified code features that need to be incorporated in a new version of the GALE code

- Staff conducting similar comparisons for the W-SMR and NuScale reactor designs
- Staff is testing a beta version of the generic update the BWR and PWR-GALE codes (aka, GALE13 - not final designation)
- GALE13 will be used as the platform in developing a version of the GALE code for SMRs (aka, iPWR-GALE - not final designation)
- Given funding, code work will start in early CY2014
- iPWR-GALE code beta testing early CY2015
- NRC issues iPWR-GALE code and NUREG in mid-2015
- NRC/RES to manage code releases, tech support, and updates

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Lessons Learned-Part 52

- Complete and quality applications result in an effective and efficient review

- Technical challenges
  - Use current data and approved methodologies/models
  - Use appropriate parameters/safety margins with justification

- Communication and Coordination
  - Pre-application meetings are useful
  - Interact with each other, including international partners

- Quality Assurance
  - Configuration management (analyze impact of changes)
  - Appropriate oversight

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Lessons Learned-RP

- Applications Should Include:
  - Detailed description of source term, dose rates, and parameters needed for Environmental Qualification (EQ) review
  - Construction worker dose est. (multi-unit sites) should include all sources
    - Direct (incl. ISFSI, waste storage tanks), liquid gaseous doses
    - Doses to construction workers monitored by operating facility
  - Include all operational programs (OP) (w/ milestones) in FSAR Chapter 13.4
    - Radiation Protection Program to include 20.1406, groundwater monitoring
    - Other OP: REMP, 10 CFR 30, 40, 70, and 10 CFR Part 37

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Lessons Learned-RP (cont'd)

- Describe all areas where irradiated fuel or hardware may be located
  - i.e., sides of SFP, cask pit
- Identify any design features that could facilitate uncovering fuel or irradiated objects
- Design basis source term (0.25% FF) to be used for shield and ventilation design
- Identified inconsistencies between information in Chapter 12 and other FSAR chapters
  - Ch 3 (shield thickness), Section 3.11 (EQ doses)
  - Ch 4 (fuel content, irradiated objects)
  - Ch 5 (Cobalt content)
  - Ch 13 (milestones, programs), etc.

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Emergent Areas of Review

•Part 30, 40, 70 (Byproduct, Source, and Special Nuclear Material licenses)
- Applicant to provide listing of byproduct, source, and SNM in Chapter 12
- Applicant to describe training, facilities, RP program, procedures and their related implementation milestones associated with the use/storage of byproduct, source, and SNM

•Interim Waste Storage

•RG 1.143 Rev. 2 (Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in LWR NPPs)
- Described in next slide

•10 CFR Part 37 (Source Security Updates)

•10 CFR 20.1406 (Minimization of Contamination)
- Rule implemented in 1997 – first applied to the ESBWR and AP1000 DCD reviews
- Guidance provided in RG 4.21 and NEI 08-08A
- Groundwater Monitoring Program
- Systems/components affected by 20.1406 described throughout FSAR, not only in Chapters 11 and 12

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RG 1.143 Rev. 2

- Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants

- Background (purpose)
  - 2001 revision Rev. 2 used in new reactor radioactive waste facility design
  - Provides graded approach and options based on external hazards analysis and structural design
  - Current operating fleet designed under revision 1.

- Challenge-inconsistent interpretations of the Rev. 2 guidance

- Path Forward
  - Develop Regulatory Information Summary (RIS) for Revision 2
  - Development of Revision 3 for future applicants

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Looking Forward

- Contested and mandatory hearings
- Preparing for new Large LWR and SMR applications
- Addressing policy and technical issues for SMRs
- Addressing emerging lessons learned
- Preparing for ITAAC verification and closure
- Planning for an integrated transition of COLs to operations
- Conducting agency self-assessment of post-COL Part 52 implementation

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Summary

- New nuclear reactor licensing and construction alive and well around the world
- New innovations in design and licensing processes being introduced and used
- Learn lessons from prior new plant licensing and construction and those taking place now
- Communicate and coordinate to ensure success

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Thank You

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Off ice of New Reactors
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www.nrc.gov/reactors/new-reactors.html

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