Public Meeting on Advanced, Non-light water Reactor Regulatory Reviews

Office of New Reactors

July 27, 2016
• Bridge Number  Pass Code
   (888) 570-6344  3222936

• Webinar
   https://attendee.gotowebinar.com/register/5274661119593408002
Agenda

- Introductions and Meeting Objectives
- NRC Background and Status
- Industry Background and Status
- Discussions
- Plans and Goals for Future Interactions
Public Meeting on Advanced, Non-light water Reactor Regulatory Reviews

Office of New Reactors

July 27, 2016
Regulatory Flexibilities

• Goal is to better align regulatory processes with related plans for developing non-LWR technologies
  • Design process
  • Research and Development
  • Business/Financial
  • Public policy/Fuel cycle
  • Deployment/Market conditions
Regulatory Background

• NRC Regulations
  – Procedural Requirements
  – Technical Requirements

• Related References
  – Commission Policy Statements
  – Consensus Codes and Standards
  – Regulatory Guides
  – Industry/Vendor Documents & related NRC safety evaluations
Event Selection/Modeling

Design Basis Events (DBEs)
- Design Basis – Normal Ops
- Design Basis - AOO
- Design Basis - DBAs
- Design Basis - External
- Other Adequate Protection

Beyond DBEs
- Enhancements - Internal
- Enhancements - External
- Other Enhancements

Residual
- Residual Risk - Internal
- Residual Risk - External

Design Features
Barriers
- Security
- Fire Prot
- MBDBE

Support Systems
- Testing & Surveillance
- Monitoring
- Operating Experience

Alarms & Actuations
- Redundancy
- Independence
- Diversity
- Common Cause

Quality Assurance
- Maintenance

Controls
- Staffing
- Training
- Procedures
- Operator Actions
- Human errors

Personnel
- EP
- Security
- Fire Prot
- MBDBE

HAZARD
- Radioactive Material
- Internal Hazards
- External Hazards

Ensure risks from failures are maintained acceptably low

Reactivity Heat Removal Limit Release

Human Performance

ASSOCIATED UNCERTAINTIES

Worker - Public
NGNP Licensing Topics

Figure 1. Relationship of NGNP licensing topics.
Vision and Strategy

STRATEGIC OBJECTIVES & STRATEGIES

**Strategic Objectives**
- Technical Readiness
- Regulatory Readiness
- Communication

**Strategies & Contributing Activities**
- Near-Term (0-5 Years)
- Mid-Term (5-10 Years)
- Long-Term (Beyond 10 Years)
Regulatory Readiness

**Short Term**

- Establish a more flexible, risk-informed, performance-based, non-LWR regulatory review process within the bounds of existing regulations, including the use of conceptual design reviews and staged-review processes. This flexibility will accommodate potential applicants having a range of financial, technical, and regulatory maturity, and a range of application readiness.
Regulatory Readiness

Contributing Activities

• Establish the criteria necessary to reach a safety, security, or environmental finding for non-LWR technologies

• Determine appropriate licensing bases and accident sets for non-LWR technologies

• Identify and resolve gaps in current regulatory framework

• Develop a regulatory review “roadmap” reflecting design development lifecycle and appropriate interactions
  – Possible research and test reactors

• Update prototype reactor guidance

• Engage on technology- or design-specific licensing project plans and develop regulatory approaches commensurate with the risks posed by the technology
Regulatory Readiness

Mid Term

• Initiate and develop a new non-LWR regulatory framework that is risk-informed, performance-based, and that features staff review efforts commensurate with the demonstrated safety performance of non-LWR designs

Long Term

• Continue development, finalize, and promulgate a new non-LWR regulatory framework (if needed) that is risk-informed, performance-based, and that features staff review efforts commensurate with the demonstrated safety performance of non-LWR designs
Technical Readiness

- Acquire/develop sufficient knowledge, technical skills, and capacity to perform non-LWR regulatory reviews
- Acquire/develop sufficient computer codes and tools to perform non-LWR regulatory reviews
- Facilitate industry codes and standards needed to support the non-LWR life cycle (including fuels and materials)
- Identify and resolve generic policy issues (near term) and technology-specific policy issues (mid term)
Licensing and Design Review Regulations

• Design:
  – Standard design certifications (Pt 52, Subpart E)
  – Standard design approvals (Pt 52, Subpart B)
  – Manufacturing licenses (Pt 52, Subpart F)

• Siting:
  – Preapplication early review of site suitability issues (Pt 50, App Q)
  – Limited Work Authorization (Pt 52)
  – Early site permit (Pt 52, Subpart A)

• Design, Siting, Construction and Operation (NPPs, Research Reactors, Test Facilities, Prototype reactors)
  – Construction permit / Operating license (Pt 50)
  – Combined licenses (Pt 52)
  – Fuel Fabrication Facility construction and operation license (Pt 70)
Licensing Approaches

- Construction Permit (siting & amendments)
- Operating License (siting & amendments)
- Preliminary or Conceptual Design
- PreApp SAR Sections
- Standardized Design Approval
- Standardized Design Certification
- Design Certification
- Early Site Permit
- Important Reference Documents (topical reports, consensus codes and standards, etc.)
- Combined License (COL) (siting & amendments)
- Flexibility for First Unit and Standardization Benefits for Subsequent Units
Preapplication Activities

Potential preapplication discussions

• Preliminary/Conceptual design
• Basic safety case for reactor design
• **Licensing plan** and relationship with other project plans (e.g., research)
  – Fuel and materials qualification
  – Analytical code development and validation
  – Other research and confirmatory testing
  – Testing facilities (test loops, RTRs)
Preapplication Activities

Preapplication Interactions

• Meetings
• Preliminary design documents
• Correspondence, white papers, and technical reports
• Readiness reviews, audits
• Topical reports
• Guidance documents
  – Industry guidance documents (e.g., templates)
  – Consensus codes and standards

Preapplication activities help establish foundation, including important reference documents, for formal processes leading to licenses, certifications, and approvals
Preliminary/Conceptual Design Reviews

- Advanced Reactor Policy Statement
  - NUREG 1226
  - NUREGs 1338(draft), 1368, and 1369

- Goal to provide feedback on:
  - key safety features
  - potential policy issues
  - technical issues
  - research and testing
Staged Licensing

• Various approaches can be included in licensing plan
• Recent focus on Standard Design Approval (SDA);
  – Subpart E to 10 CFR Part 52
  – Addresses major portions of facility
  – Can support CP or DC/COL
  – Provides some measure of regulatory finality
    • NRC staff, Advisory Committee on Reactor Safeguards
  – Challenge to define accompanying levels of technology readiness and design details
Possible Staged Design Review Using Standard Design Approval

- Pre-Application Engagement
  - Letters
  - Meetings
  - White papers
  - Technical Reports
  - Topical Reports

- Optional Conceptual Design Assessment (CDA)

- SDA Application

- Staff Review

- ACRS Review

- SDA Approval Letter

Staged-Review SDA Submittals
Research Activities

• Recommend early discussions on research and testing plans
  – thermal-hydraulic test loops
  – fuel/materials qualification
  – operating experience
    • historical, international
  – Research and test reactors
    • major projects
    • siting/design reviews
NRC Licensing Pathways for Reactor Technologies

- 10 CFR part 50
  - AEA 103 or 104.c
- 10 CFR part 30 or 70
- 10 CFR part 50 or 52
- design
- integral test facilities (no SNM)
- separate effect facilities (no SNM)
- SNM experiments
- non-power reactor
- prototype
- power reactor

10 CFR part 50 or 52

10 CFR part 50 or 52
Discussion
NEI Staged Application Survey Results

Advanced Reactor Regulatory Task Force
July 27, 2016 • NRC
ARRTF Focus Areas

• Staged Application Review & Approval
• Technology Inclusive RI-PB Reg. Structure
• Policy
• Demonstration Reactor

• Focus areas have NOT been prioritized against each other, yet
Staged Application Review & Approval

• Problem Statement:

The existing NRC application review & approval process provides limited opportunity to clearly and meaningfully stage an application review into discrete activities with progressive levels of regulatory confidence and finality. Without such a staged alternative, many reactor developers face significant uncertainty throughout the entire application review process, regardless of the regulatory option they select.
Advanced Reactor Developer Feedback

• NEI survey to inform industry input to further development of staged application review and approval processes at NRC
• Sharing preliminary results today
• Continuing to assess specific feedback
What would be the most useful approach to defining “stages?”

- Desired Regulatory Outcome
- Degree of Detail Required
Generic Licensing Project Plan or Regulatory Engagement Plan (REP)

• Still weighing benefit of a generic REP
  - Generic set of suggested topics may be useful
• Most useful component would be protocols for issue assessment and resolution
• Elements from other plans necessary to commercialize a design would generally be considered when developing a REP
  - Those plans would NOT be formally included
Possible components of a REP

- Communication Protocol
- Roles & Responsibilities
- Accountability
- Issue Assessment & Resolution Protocol
- Project Description
- Project Schedule
- Milestones
- Testing Requirements
- Deliverables
- NRC Review Budget
Pre-application guidance – RG 1.206

- Generally useful
- Need more on:
  - How to minimize repeating work
  - Mechanisms for NRC to provide formal feedback on white papers & technical reports
  - Accountability to address and resolve issues identified
  - Possibility for a fixed price project with clear scope & deliverables
Conceptual Design Assessment

• Process: may be desirable
• Outcome: Limited value added if scope is open to re-review without sufficient basis
• Meaningful conclusions: targeted elements for NRC review, fundamental technology or regulatory barriers
• Could there be a Conceptual SER/SAR?
White Papers, Technical & Topical Reports

- Value is in documented NRC response
- Clear guidance to decide whether report is technical v. topical is desired
- Create efficiencies with guidance on expectations for “standard” topical report reviews
Standard Design Approval

- The time has come to develop guidance on “major portions”
  - Scope
  - Level of detail
  - “PPE-type” approach to describing interfacing systems
Other Staging Opportunities

• Transparent data on review costs across the application spectrum for benchmarking
• More reduced fee interactions during pre application for small businesses and startups
  - Small business license fee structure
• Further clarity on the need/basis for licensing a demonstration plant
Path Forward

- Survey responses indicate those interested in a staged process need it in ~2 years
- Refine the survey data to develop industry proposals
- Survey the investment community to understand their thoughts on staging