



GENERIC LICENSING TOPICS & POLICY ISSUES RELATED TO SMALL MODULAR REACTORS

November 4, 2010



United States Nuclear Regulatory Commission

Protecting People and the Environment

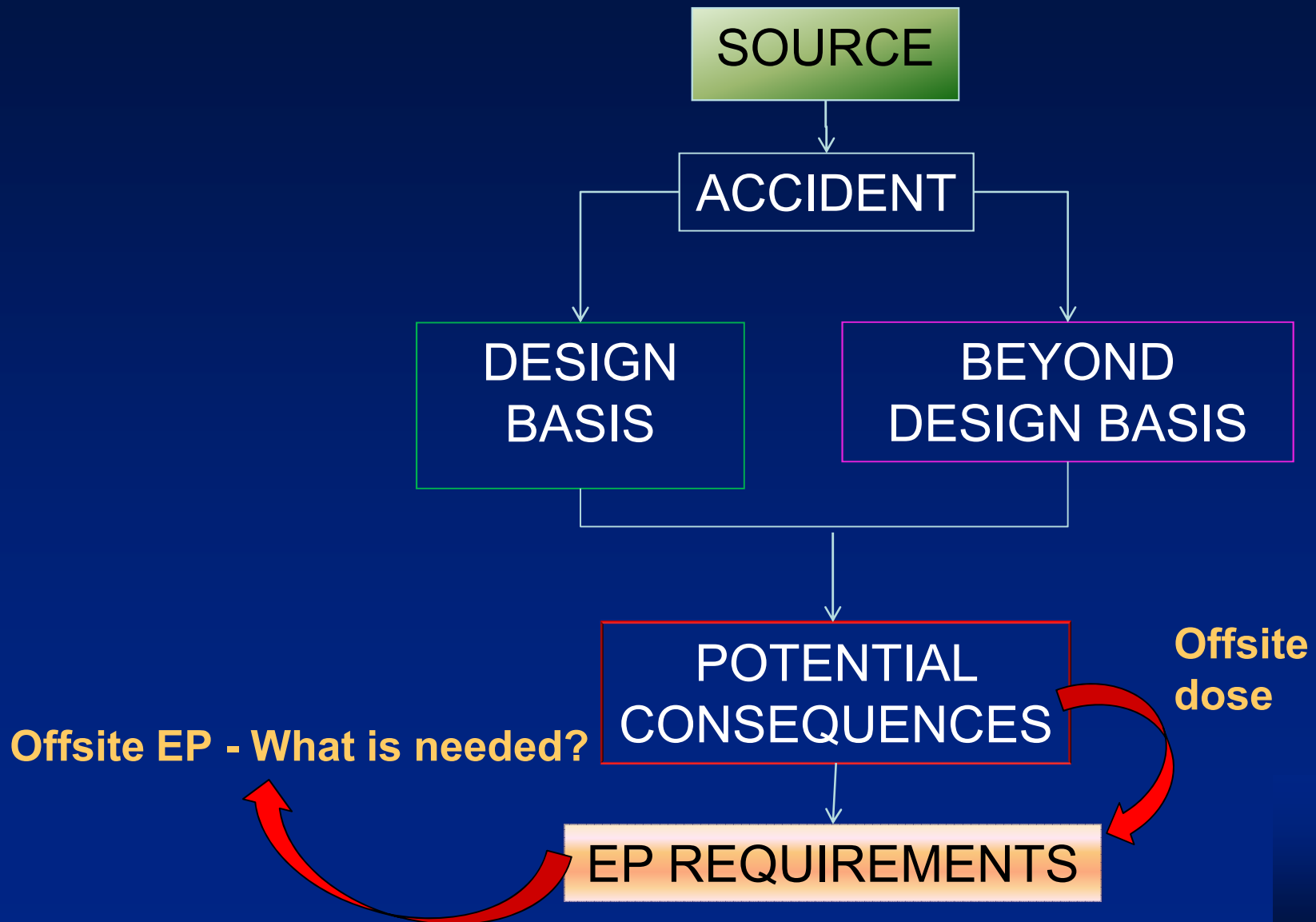
Emergency Preparedness for Small Modular Reactor (SMR) Designs

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SMR Emergency Preparedness





SMR Emergency Preparedness

- Should SMR EP requirements be scaled based on: offsite consequences? Power? Source term? Modularity? Transient times? Shift staffing? Public acceptance? Onsite-offsite interface?
- What would such an SMR EP framework resemble?
- Risk informed EP
 - STAFF REQUIREMENTS – COMGBJ-10-0004/COMGEA-10-0001 – USE OF RISK INSIGHTS TO ENHANCE SAFETY FOCUS OF SMALL MODULAR REACTOR REVIEWS

SMR Emergency Preparedness

ISSUE	FUEL FACILITY	RESEARCH AND TEST REACTOR	SMALL MODULAR REACTOR	LIGHT WATER REACTOR
PLANNING STANDARDS	RG 3.67	10		16
SOURCE TERM	Well Defined	Well Defined		Well Defined
EP PLAN	Current Regulations	Current Regulations		Current Regulations
EPZ – Plume	N/A	CR to 800 meters		10 Miles
EPZ – Ingestion	N/A	N/A		50 Miles
OFFSITE - Response	Coordinated	Coordinated		Coordinated
Highest ECL	SAE	SAE		GE

Emergency Planning for Small Modular Reactors

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Emergency Planning Paper

- Content
 - Introduction
 - Scope of the Issue
 - Current Regulatory Framework
 - Special Considerations for SMRs
 - Supporting Analyses and Discussion
 - Recommended Regulatory Framework for SMRs
 - Conclusions and Recommendations

Purpose

- Promote discussion with NRC staff regarding opportunities to simplify emergency planning for SMRs.
- Apply a “graded approach” to implementing emergency planning and identify the information that will justify this approach.
- Adjustment of EPZ size is design-specific per current regulations
 - Beyond scope of paper
 - Parallel and follow-on efforts will address this

Scope of Issues

- Greater safety margins for SMR designs support consideration of simplifying emergency planning
- The area where early warning of the public is warranted can be revised
- State and local radiological emergency plans can be integrated into existing “all hazards” plans for consistency with the National Response Framework

Current Regulatory Framework

- NRC regulations
 - Siting
 - License Application
 - Emergency Planning
 - Source term
- NRC Policy and SECY Papers
- NRC Regulatory Guidance
- FEMA Regulations
- US EPA Protective Action Guidelines

Special Considerations for SMRs

- Industry EPZ Experience
- Small Modular Reactors

Supporting Analyses & Discussion

- Defense-in-Depth
- Source Term Impact
 - Severe Accident
 - Containment Functional Performance
 - Credit for Release Timing
 - Underground Construction
 - Fuel Enrichment

Supporting Analyses & Discussion

- Applying Emergency Planning Requirements
 - Emergency Planning Related to Risk
 - Evacuation Requirements
 - Prompt Notification
 - Emergency Response Facilities
- State and Local Impact

Future Discussion Points

- Recommendations regarding Regulatory Framework for SMRs may include:
 - Need for regulatory exemptions or rule changes
 - Incorporation of regulatory requirements in Design Certification
 - Need for flexibility in regulatory guidance
 - Incorporation of regulatory guidance in Design Certification
 - Identification of supporting documents and information needs

Open Discussion

- NRC Expectations
- Industry Expectations
- FEMA Expectations
- Path Forward
 - Paper submitted by end of year
 - Look forward to future engagement with NRC

Modularity

Peter Hastings
Pareez Golub
November 4, 2010



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Agenda

- Evolution of “Modularity” Issue
- Status/discussion of subissue – number of licenses
- Other sub-issues
- Schedule

Modularity-Related Issues

- SECY 2010-0034 item 2.2
 - Operation of one module while others are being built and installed
 - Duration of license
- SECY 2010-0034 item 4.3
 - Installation of modules during operation of other modules
- Other items related to multi-module designs include NRC fees, Price-Anderson, SMR source term, etc.
- Several “sub-issues” originally identified
 - License structure
 - Source Terms
 - Construction issues, including fitness for duty

Modularity-Related Issues (continued)

- “Number of licenses” sub-issue
 - Preliminary conclusion is one license per module, consistent with NGNP paper
- Work on other sub-issues underway
 - To be separated into separate discrete papers

“Roadmap” Paper

- NEI & ANS teams conferred re scope of parallel modularity papers
- Joint overarching modularity paper “roadmap”
 - Provide pointers to discrete issues being worked in other papers
 - Framework outlined in NRC public meeting

Modularity and License Structure

- Number of licenses for multi-module facilities
- ITAAC closure and 10 CFR 52.103(g) finding for each module
- Impact of planned, future modules on license structure
- Impact of modules used for non-power generation purposes (e.g., process heat) on license structure

Number of Licenses: Current Regulatory Framework

- 10 CFR Part 52.1, *Definitions*
- 10 CFR 52.8, *Combining Licenses; Elimination of Repetition*
- 10 CFR 52 Statements of Consideration
- 10 CFR 52.47, *Content of Applications; technical information in final safety analysis report*
- 10 CFR 52.79, *Content of Applications; technical information in final safety analysis report*
- 10 CFR 52.103, *Operation under a combined license*
- 10 CFR 52.103(g) SOC
- 10 CFR 52.104, *Duration of Combined License*

Number of Licenses: Preliminary Conclusions

- Single COL application for multiple modules
 - Consistent with process for large LWRs
- One license per module
 - Does not preclude individual vendor/applicant pursuing single license for multiple modules (discussed later)
- No identified fundamental changes in regulatory framework

Other Sub-Issues

- NEI SMR Licensing Task Force has determined that development of separate follow-on papers is best approach
- Source term issues
 - Under review for generic treatment
- Construction issues
 - Not necessarily unique to SMRs
 - Construction adjacent to operating module
 - Construction FFD/screening and/or other security-related issues
 - Working through interface with COL Task Force; will identify any SMR-specific issues/adjustments in future discrete paper

Schedule

- License structure
 - On target for submittal by year end
- Source term
 - Work to be conducted in 2011
- Construction issues
 - Work to be conducted in 2011



HOLISTIC RISK-INFORMED REVIEW FRAMEWORK (IPWRs)

Tom KeVERN, NRO/ARP

Background

Staff Requirements – COMGBJ-10-0004/COMGEA-10-0001 – Use of Risk Insights to Enhance Safety Focus of Small Modular Reactor Reviews (08/31/10)

- Paragraphs (a), (b), & (c) – iPWRs, “near-term”
 - ⊕ Risk insights framework / implementation strategy
 - ⊕ Review process efficiency – e.g., Standard Review Plan
 - ⊕ Risk-informed, design-specific review plans
- Paragraph (d)
 - ⊕ Other / neutral technology risk-informed framework
 - ⊕ “Longer-term”
- Paragraph (e) – other SECY-10-0034 issues
- Paragraph (f) – staff resources
- Paragraph (g) & (h) – engage industry & stakeholder

Holistic Risk-Informed Review Framework

Objective: Apply risk insights and risk-informed means to enhance efficiency of application review process

Approach:

- Framework consistent with current regulations and Commission Policy
- Safety Evaluation Report is documented basis of staff's "reasonable assurance" findings
- Standard Review Plan (NUREG-0800) is primary source of review guidance and Acceptance Criteria
- Risk-inform review process by considering risk significance of SSCs to determine the type and depth of review
- Modify review process by considering aggregate of regulatory controls pertaining to SSCs as part of the review
- Determining regulatory controls which may supplement or replace, as appropriate, part of technical analysis/evaluation
- Incorporate risk insights into the review process – passive LWR designs (ESBWR, AP1000), iPWR design features

Holistic Risk-Informed Review Framework

Regulatory Controls:

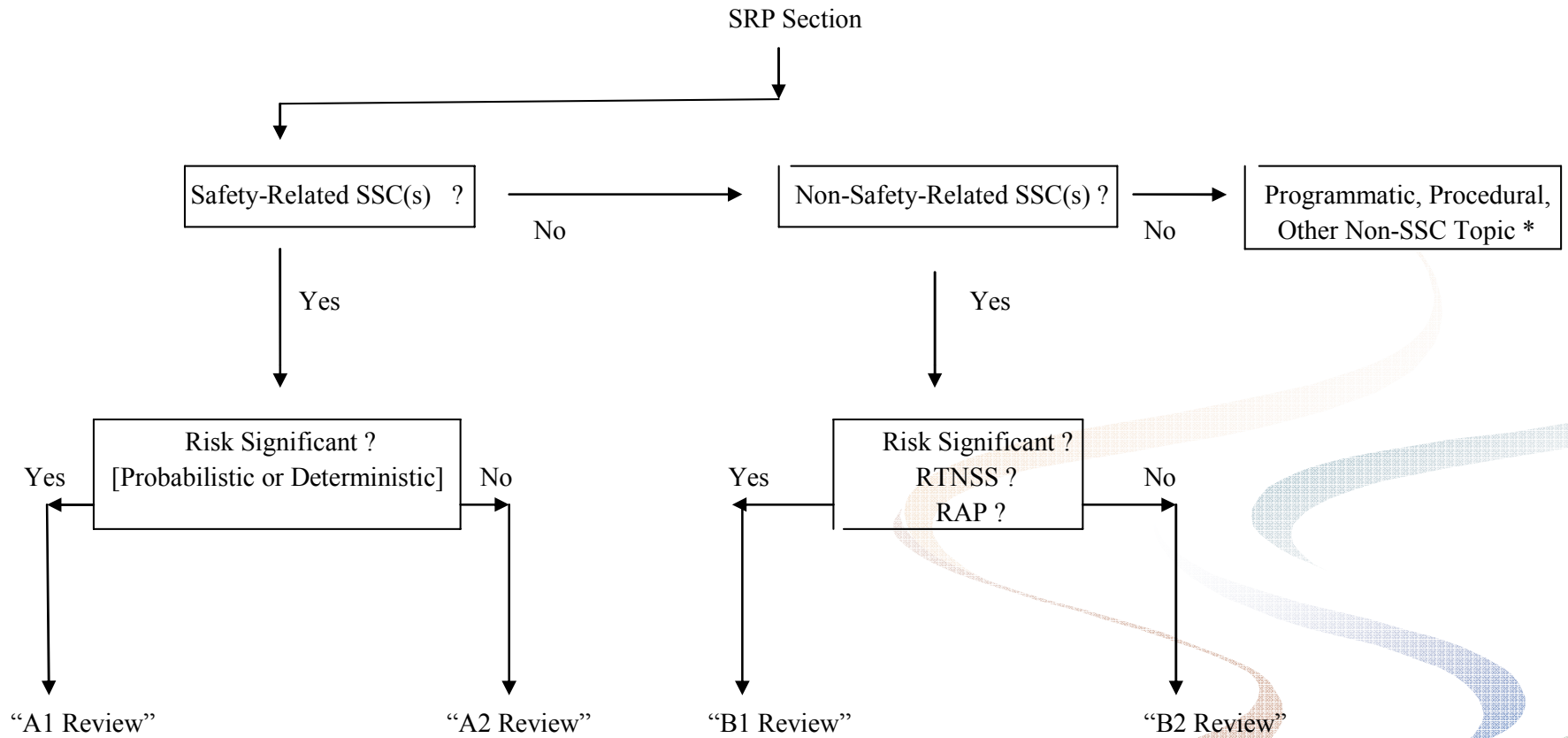
- Framework incorporates “regulatory controls” pertaining to SSCs
- Regulatory Controls include:
Technical Specifications, Availability Controls (e.g., RTNSS), ITAAC, Startup test program, Maintenance Rule, Reliability Assurance Program, Operational programs, AP1000/ESBWR regulatory position/decision, Standards/codes

Documentation:

- Standard Review Plan – revised guidance to reviewers
- Sections of SRP revised to reflect
 - ⊕ Applicable regulatory controls pertaining to Acceptance Criteria
 - ⊕ Risk insights from passive LWR designs (ESBWR, AP1000)
 - ⊕ Risk insights associated with iPWR design features
- Safety Evaluation Report (Design Certification) template

Review Framework (iPWRs) – draft 10/31/10

Risk-Informed Review Framework (iPWRs)



Levels of Review

Review Framework (iPWRs) – *draft 10/31/10*

“A1 Review”

- Level of review applicable to safety-related SSCs determined to be Risk Significant
- Review Acceptance Criteria incorporate risk insights from passive LWRs, iPWR design features
- Review documentation includes identification of regulatory controls

“A2 Review”

- Level of review applicable to safety-related SSCs determined to be Not Risk Significant
- Review focus is evaluation of specific safety-related function(s) of SSC(s)
- Review Acceptance Criteria incorporate risk insights from passive LWRs, iPWR design features
- Review documentation includes identification of regulatory controls

Levels of Review (cont)

Review Framework (iPWRs) – *draft 10/31/10*

“B1 Review”

- Non-safety-related SSCs – Risk Significant or RTNSS or RAP
- Review focus is identification and evaluation of regulatory controls that provide reasonable assurance of SSC reliability and availability; technical analysis/evaluation performed, as necessary, to address Acceptance Criteria not satisfied by regulatory controls
- Review Acceptance Criteria incorporate risk insights from passive LWRs, iPWR design features
- Documentation includes identification/evaluation of regulatory controls

“B2 Review”

- Non-safety-related SSCs determined to be Not Risk Significant
- Review consists of identification and evaluation of applicable regulatory controls that satisfy the Acceptance Criteria
- Review Acceptance Criteria incorporate risk insights from passive LWRs, iPWR design features
- Documentation of identification/evaluation of regulatory controls

Pre-application and Post-application

Framework to be implemented during “pre-application” period and continue throughout review of application

Pre-application activities include:

- ❖ Topical/technical reports – vendor submittal and staff review
- ❖ Staff audits of vendor information, programs, and processes
- ❖ Staff review of conceptual/draft/preliminary design information
- ❖ Staff determination (preliminary) of SSCs – safety-related or non-safety-related; risk significant or non-risk significant
- ❖ Requests for additional information (informal)
- ❖ Staff preparation of preliminary/draft SER

Post-application activities include:

- ❖ Application Acceptance Review (formal protocol)
- ❖ Requests for additional information (formal)
- ❖ Staff determination (final/confirmatory) of SSCs – safety-related or non-safety-related; risk significant or non-risk significant
- ❖ Staff review of completed/finalized application information
- ❖ Staff preparation of final SER

QUESTIONS ?

- Applications aligned with framework
- Vendor awareness
- Stakeholder feedback

