



10 CFR Part 53 “Licensing and Regulation of Advanced Nuclear Reactors”

Part 5X Supplement, "Technology-Inclusive Alternative
Requirements For Commercial Nuclear Plants"

October 28, 2021

Agenda

- | | |
|-------------------------|--|
| 1:00pm – 1:15pm | Welcome / Introductions / Logistics / Goals |
| 1:15pm – 3:30 pm | Overview and Discussion of Technology-inclusive
Alternative Requirements for Commercial Nuclear
Plants |
| 3:30pm – 3:45pm | Break |
| 3:45pm – 4:45pm | Open Discussion of Other Part 53 Sections and
Subparts |
| 4:45pm – 5:00pm | Additional Public Comments/Closing Remarks |

Welcome/Introductions

Welcome:

- Opening Remarks

Speakers/Presenters:

- Bob, Beall, Office of Nuclear Materials Safety and Safeguards – Meeting Facilitator
- Boyce Travis, Office of Nuclear Reactor Regulation – Technical Lead

Public Meeting Slides: ADAMS Accession No. ML21295A245

Purpose of Today's Meeting

- Review preliminary proposed rule language for the Part 5X Supplement, “Technology-inclusive alternative requirements for commercial nuclear plants”
- Open discussion of other Part 53 sections and subparts
- Today's meeting is a “Comment-Gathering” meeting, which means that public participation is actively sought in the discussion of the regulatory issues during the meeting.
 - This meeting is being held in a “workshop” format to facilitate the discussion of today's topics.
 - The meeting is being transcribed and the transcription will be available with the meeting summary by November 26, 2021.
- No regulatory decisions will be made at today's meeting.

Part 5X Supplement, “Technology-inclusive alternative requirements for commercial nuclear plants”

Part 5X Supplement, “Technology-inclusive alternative requirements for commercial nuclear plants”

- NRC staff have received comments from stakeholders suggesting that a probabilistic risk assessment (PRA) should not be required in a leading role for licensing.
- Some stakeholders have also expressed a desire for a streamlined application for US/international designs.
- As a result, the staff have developed initial rule language for deterministic licensing framework for advanced reactors.
- This framework aims to be technology-inclusive with PRA used in a supporting role, and leverage Parts 50 and 52 regulations while aligning with IAEA standards.

Part 5X Supplement, “Technology-inclusive alternative requirements for commercial nuclear plants”

- Including a traditional, deterministic option for advanced reactors includes:
 - Plan to leverage flexibility by considering dose-oriented emergency preparedness/siting/security (similar to ongoing rulemakings and what is being considered in Part 53)
 - Shared Parts 50 and 53 aspects: enable flexibility in meeting codes and standards (including those related to quality assurance requirements); addition of functional containment concept to make technology inclusive

Part 5X Supplement, “Technology-inclusive alternative requirements for commercial nuclear plants”

- General Layout:
 - § 5X.210 Applicability
 - § 5X.220 Definitions
 - § 5X.230 Requirements
 - § 5X.240 Principal design criteria
 - § 5X.250 Anticipated Operational Occurrences and Design Basis Accidents
 - § 5X.260 Regulated very unlikely event sequences
 - § 5X.270 Severe accidents
 - § 5X.280 Functional containment
 - § 5X.290 Design requirements
- Looking for feedback on the appropriate location for this preliminary proposed rule language (e.g., Part 50, Part 53, new Part).

Part 5X Supplement, “Technology-inclusive alternative requirements for commercial nuclear plants”

- § 5X.210 Applicability
- § 5X.220 Definitions
 - New definition of “reactor coolant pressure boundary”; alternative definition of “safety related” for non-light water reactors (non-LWRs)
- § 5X.230 Requirements
 - Overarching elements in line with existing requirements, identified separately in this section due to conflicts with existing language or for emphasis.
 - Consistent with the Commission policy, it is expected that the any plant under this section will reflect through its design, construction, and operation an extremely low probability for accidents that could result in the release of significant quantities of radioactive fission products.

Part 5X Supplement, “Technology-inclusive alternative requirements for commercial nuclear plants”

- § 5X.240 Principal design criteria
 - This section more directly calls out principal design criteria and their role. Use of a deterministic approach is likely to rely more on top level design goals in the form of design criteria as opposed to a more integrated assessment.
 - This language would allow for the use of the criteria in IAEA SSR 2/1 - the applicable standards envisioned for use include, but are not limited to: the existing general design criteria, Regulatory Guide 1.232, and IAEA SSR 2/1.
 - Staff is still evaluating how to include light water reactors (LWRs) in applying this section

Part 5X Supplement, “Technology-inclusive alternative requirements for commercial nuclear plants”

- § 5X.250 Anticipated Operational Occurrences and Design Basis Accidents
 - (b)(1): These requirements are consistent in concept with existing regulations and international standards for these classes of events. Applicants should provide analysis for anticipated operational occurrences (AOOs) and design basis accidents (DBAs), and features used to mitigate and prevent these events should be safety related.
 - (b)(5)-(7) The requirements provide an avenue for an applicant to provide bounding analyses for some or all of the analytical requirements for this part.
 - To some extent, this is consistent with existing practice – a single analysis to cover a category of event (e.g., overcooling) is often provided as part of a safety analysis. This would go a step further and allow for bounding analyses (potentially involving non-realistic assumptions) to be provided to cover larger portions of the AOO and DBA analytical space, provided the analysis envelopes the full range of conditions it is stated to bound.
 - This section incorporates requirements adapted from § 50.46 - applicants are required to identify surrogate safety acceptance criteria, akin to peak cladding temperature for LWRs, and track and report errors in the analysis for these acceptance criteria. For LWRs, staff expects § 50.46 criteria will be the ones chosen.

Part 5X Supplement, “Technology-inclusive alternative requirements for commercial nuclear plants”

- § 5X.260 Beyond design basis events
 - This section replaces station blackout and anticipated transient without scram regulations with a broader category of events, and draws on the international concept of defense-in-depth (DID) level 3b or 4a.
 - Requires applicants to evaluate and provide prevention/mitigation features (non-safety related) against events more severe than DBAs based on operating experience, engineering judgement, and sequence-based assessment. These structures, systems and components (SSCs) that are credited should have quality treatments in accordance with their function.
 - (c): The bounding analyses that may be used for AOO or DBA requirements may be expanded for use by applicants here.

Part 5X Supplement, “Technology-inclusive alternative requirements for commercial nuclear plants”

- § 5X.270 Severe accidents
 - These requirements replace existing severe accident requirements. This section borrows from the international concept of DID level 4 or 4b.
 - Severe accidents for non-LWRs are not defined to the same degree as LWRs; events evaluated in this section should involve some level of fuel or core damage, based on the event criteria outlined in this section.
 - (b): Requires applicants consider DID (no reliance on a single SSC/barrier) and mitigate against more severe potential scenarios. Provides avenues for crediting barrier mitigation and excluding some events. Staff expects there would be a frequency threshold for this exclusion for applicants leveraging a PRA. The “residual risk” portion is subject to change.

Part 5X Supplement, “Technology-inclusive alternative requirements for commercial nuclear plants”

- § 5X.280 Functional containment
 - These requirements replace containment-related regulatory requirements. They establish what constitutes a functional containment and makes functional containment SSC qualification commensurate with the purpose of the component (safety related for AOOs/DBAs, special treatment for beyond design basis events)
- § 5X.290 Design requirements
 - Limiting condition for operation (LCO) criteria (A) relates to the reactor coolant pressure boundary; LCO criteria (D) is based on PRA and operating experience. This provision would drop those, provided barrier requirements are captured.
 - (b) – This serves to catch additional Part 50 regulations that conflict with this section and could change as the Part 53 provisions are added.

Part 5X Supplement, “Technology-inclusive alternative requirements for commercial nuclear plants”

Additional areas being explored for use from Part 53:

- Special treatment – In addressing the requirements associated with paragraph (e) of this section, applicants are required to identify appropriate treatments for SSCs relied on to mitigate these events. In identifying these treatments, applicants may use the framework set forth in 53.YYY.
- Siting considerations – In lieu of (*identify full set of 50/52 siting requirements*), applicants may apply § 53.5XX to determine site boundary areas and populations considerations.
- Emergency preparedness (EP) requirements – In lieu of §§ 50.54(q), 50.54(t) (*identify full set of 50/52 EP requirements*), applicants may apply § 53.5XX to determine EP requirements.
- Security requirements – As an alternative to the requirements set forth in §§ 50.34(c), 52.79(a)(35), and (*identify other appropriate requirements here*), applicants may apply § 73.YY in lieu of the requirements necessary to satisfy the cited physical security requirements.

Part 5X Supplement, “Technology-inclusive alternative requirements for commercial nuclear plants”

- Next steps on the preliminary proposed deterministic option include:
 - Engaging stakeholders, management, and the Commission on the most appropriate approach.
 - Assessing the placement of the traditional, deterministic option within the NRC’s regulations.
 - Reviewing the impact of the required work to develop the framework on the NRC’s schedule and resources.

U.S. Nuclear Industry Council Comments for NRC Part 53 Public Meeting: Alternative Requirements for Commercial Nuclear Plants

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Overall thoughts based on preliminary text for Alternative Requirements for Commercial Nuclear Plants

- Question-- What to call this risk-informed approach? (Note: accurate agreed upon term may avoid creating confusion when multiple organizations share similar goals)
 - NRC: “traditional, deterministic technology-inclusive alternative”
 - NRC: “Alternative design/licensing approach supporting more traditional methodologies (e.g., Deterministic selection of postulated initiating events, inclusion of single failure criterion)”
 - NRC: “Technology-inclusive alternative requirements for commercial nuclear plants”
 - NRC: Part 5X (released 2021-10-18)
- USNIC: A risk-informed approach using PRA in supporting LMP-like role
- CNSC: complementary role of probabilistic safety analysis to deterministic safety analysis

Overall thoughts based on preliminary text

- Good NRC is considering ways of improving current Part 53 preliminary language
 - We appreciate NRC's effort to address this issue
 - Industry requested alternatives to current Part 53 language that has PRA-based requirements baked into the rule, to allow suitably flexible alternative approaches
- USNIC will provide overall initial thoughts and some more detailed comments and questions on preliminary language [

Overall thoughts based on preliminary text

- Part 5X draft provides a sound framework for regulatory language that is high level and flexible. The PRA requirement is much more flexible and the pathway to use bounding assessments is a positive.
- Part 5X does not yet stand on its own due to the uncertainty over which requirements from Part 50 (or Part 53) are being replaced.
 - Some ambiguity on whether BDBE/severe accident analysis can be excluded from the design basis due to the uncertainty around the “non plausible” language.
- Binary thinking between “Part 53/TICAP fully risk-informed” or “Part 5X deterministic” is increasingly counter-productive because future applicants rarely will have a fully risk-informed or fully deterministic approach.
- Preferred solution is to bring the good parts of Part 5X into Part 53 and shed the prescriptive Part 53 requirements around QHOs and event sequence frequencies (and use guidance if necessary).

Overall thoughts on alternative way

- Alternative way of addressing is possible and probably preferable, rather than using NRC preliminary language for Part 5X framework in Part 53.
 - NEI September 28, 2021 letter stated that “with relatively straight forward changes to the NRC staff’s Part 53 preliminary rule language, primarily by removal of unnecessarily prescriptive details usually found in guidance, the NRC can establish a Part 53 rule that allows the variety of risk-informed licensing approaches that industry plans to use for advanced reactors and this can be accomplished on the Commission directed schedule.”
 - Therefore with only some Part 53 requirement and conforming changes, all risk-informed approaches could be allowed
 - Expending substantial resources on Part 5X as standalone alternative could be distraction from fixing Part 53 preliminary language (unless NRC thought it was necessary for Parts 50 or 52)

Overall thoughts on alternative way

- specific changes that could be made in Part 53

- Two main requirements in preliminary Part 53 language (and other items such as the change process) lead to outcome of excluding all but one risk-informed licensing approach-- 53.450 Analysis Requirements and 53.220 Safety Criteria for LBEs other than DBAs
- Changes to these requirements (and re-examination of other items) to remove detail (typically found in guidance, or the NRC Policy Statements), would enable Part 53 to be used by all risk-informed licensing approaches.
 - For 53.450, remove mandate that PRA must be used as the primary basis for (rather than complement, as directed in the PRA Policy Statement) specific activities
 - This would allow PRA to serve a more balanced role in establishing safety.
 - For 53.220, remove the QHOs from the rule language and to continue to apply it through the Safety Goal Policy Statement.
 - Guidance can be used to the extent that alternative integral risk criteria to the Quantitative Health Objectives (QHOs) are needed for a specific type of technology.

Specific comments/questions on language

50.200/50.210

- Section introduces alternative for licensing facilities under Part 50, with the term “commercial nuclear plant” as an attempt to limit the scope of applicability to some perceived set of facilities not currently within the scope of Part 50 or to a subset of facilities governed by the scope of Part 50.
 - To be inclusive, language could say: “technology inclusive alternative technical and licensing requirements for utilization facilities”

50.200/50.210

- Part 50: If the advanced reactors still have to seek exemptions to the other rules in Part 50, it would defeat the purpose (and could even add burden) of inserting the Part 5X requirements.
 - If these requirements are incorporated into Part 50, there would be complexity of language that firewalls it from the other Part 50 requirements
- Part 53: Preferred approach may be a modified Part 53 that does not prescribe an approach, but rather is flexible in the extent to which PRA is included.
 - That would avoid having to describe how developer would follow this text vs. text in current Part 53 language. (e.g. What would need to get added to 50.290(b) to explain how this language would work for applicants).

Specific comments/questions on language

50.220 Definitions

- AOO (Anticipated Operational occurrences):
 - Definition seems to be added because AOOs are not required in Part 50; could restrict to the PDCs or leave out of the rule language
 - Wording indicates that “Applications should provide analysis for AOOs... and features used to mitigate these events should be safety related.” Some developers do not include analysis for AOOs, and do not consider equipment responding to AOOs as Safety Related.
 - AOOs must be assessed, but would like to see justification for elevating their analyses to a Rule.
- DBE/DBA
 - Q: Are revised definitions of DBEs vs DBAs. needed? They are used interchangeably, and if this is the alternative requirements for someone not strictly following LMP, these terms should be defined.
 - Q: Would definitions be much different of a concept from the LMP use (DBAs are DBEs that only credit SR SSCs)?
 - Non-LWRs usually operate at atmospheric or low pressures. Maintaining the pressure component in the definition suggests still having to consider the hazards associated with large pressurized releases.
 - Safety related DBA: Important to distinguish DBAs – later on beyond design basis accidents are discussed, that do not require SR SSCs

Specific comments/questions on language

50.220 Definitions

- Definition of safety-related in the preliminary rule text is more technology-inclusive than the current definition in 50.2. However, it still reflects common elements that could be specific to a technology. This definition should be revisited more broadly based on what is necessary to assure adequate protection of public health and safety, which is established dose criteria.
 - For example, fast reactors may not require an active shutdown function to be safety-related to assure safe operation, relying on inherent design characteristics to arrest and stabilize transients.
 - This current definition is still overly prescriptive and not fully performance-based. The NRC should consider the broad scope of technologies when developing this definition.
- It is unclear why this definition differs from the more performance-based Part 53 definition of safety-related.

Specific comments/questions on language

50.230

- DID: Defense in depth is built into the rule language already, making it unnecessary to have a separate DID evaluation. The areas that effectively implement DID are:
 - Principal design criteria
 - Single active failure criteria
 - Evaluation of BDBEs and Severe Accidents in addition to AOOs and DBAs
- Defense in depth language needs clarification – prevention and mitigation does not appear to apply to all design basis events but only to the smaller subset of AOO and DBA.
- Requirements for beyond design basis events are unclear. This language could be read to permit the use of FLEX equipment as an appropriate strategy for “addressing” beyond design basis events

Specific comments/questions on language

50.240

- PDC scope and definition being discussed in TICAP and is not yet resolved
- The language would eliminate the need to request exemptions from the GDC referenced in Part 50 – which is beneficial
- Need for and purpose of paragraph b is unclear.
 - Please clarify clear need for and purpose of paragraph b (or delete it).

Specific comments/questions on language

50.250

- Some of the complexity of this could be avoided if current Part 53 was modified to avoid confusion
 - (a). How would this language be met at the CP stage? important to ensure that the full analysis requirements that follow are not expected to be completed at the CP stage– and only preliminary analysis required for CP
 - “SSCs required to mitigate against anticipated operational occurrences and design basis accidents must be classified as safety-related” can be confusing because the progression of AOOs does include the performance of non safety related SSCs.
 - LCOs provide the conditions that preserve margins of safety during normal operations, not necessarily analysis of mitigating SSCs.
 - PIE seems to limit the discussion only to AOOs and DBAs. (BDBE not include)
 - Q: what the licensing basis under these provisions and what is subject to change control processes?
 - (b) 5. Requires an analysis and evaluation of the design with the objective of assess the risk to public health and safety, including margins of safety and adequacy of SSCs
 - the reference for this requirement is 50.34(a)(4). However, the new requirement for the development of a PRA and the language of assessing the risk could change the interpretation of this provision to something that is beyond the current practice.
 - Additional clarification of this requirement is needed to understand the scope of the requirement

Specific comments/questions on language

50.250 continued

- The complexity of this could be avoided if current Part 53 was modified to avoid confusion
 - (b) 6. Permits use of bounding analysis and requires use of limiting parameters as safety acceptance criteria.
 - The requirement for use of limiting parameters in the analysis is consistent with current LWR practice. The language in the rule about the evaluation may not be realistic, and raises the question about how non-realistic an applicant would have to be to satisfy the staff. That language should be deleted.
 - Introduces new reporting requirements for a change to or error discovered in an acceptable model or in the application of that model that affects the safety acceptance criteria.
 - New requirement (modeled after 50.46 language). The scope here is ambiguous and the requirement to report “EACH” change and its estimated effect in a separate report annually seems excessive. Potential for major burden addition.
 - Additional clarification about the scope of this requirement is required OR it should be deleted and let the regulated change process deal with the reporting requirement (Part 21 or license amendments)

Specific comments/questions on language

50.260 BDBE

- Why are BDBE analyzed in design?
- For “must perform additional assessments and analyses” preliminary language add “using best-estimate methodology including consideration of uncertainties” to identify design features
- Requirement that BDBEs meet dose criteria or provide some basis why a BDBE scenario is not physically possible is too open ended to determine the level of review and information required to meet this provision.

50.270 Severe accidents

- (ii) a 1 iv: Disagree that following is a requirement [*“Analyses of these accidents must show that the design demonstrates adequate defense-in-depth such that acceptable dose consequence criteria - including those in § 50.270(a)(2)(iv) below - are met even in circumstances with fuel or core damage or potential for large radiological releases from other sources in the facility.”*], because the footnote in Part 50, Part 52, and Part 100 25 rem requirement lists what is generally done, without a requirement to analyze core damage.
- (iii) a 2 v A: For “*would not receive a radiation dose in excess of 25 rem total effective dose equivalent (TEDE)*,” would like to see further justification of why this is included.

Specific comments/questions on language

50.270 Severe Accidents

- In general, these sections appear to be more restrictive than analytical requirements in preliminary Part 53.
- Specifics:
 - Set of PIE and scenarios that are more severe than design basis accidents would be identified. The challenge here is where do you stop the assessment.
 - Requirement to meet the dose criteria for beyond design basis events is even more restrictive than preliminary Part 53 proposal. BDBEs in Part 53 are not constrained to meeting the 25-rem criterion and could have consequences of several hundreds of rem. This is regulatory burden increase.
 - Descriptions of safety features engineered in the facility should probably be required somewhere else because they are not unique to just severe accidents.
 - How can it be demonstrated that dose calculations would not be required?
 - Seems to be in conflict with earlier requirement to use mechanistic source term (see (a) (2) (iii)).

Specific comments/questions on language

50.280

- Redefines what containment integrity means with respect to events such as aircraft impact, or loss of large areas, etc. Benefit because otherwise exemptions would be required. However, adds additional requirements that all functional containment features are now safety-related – could be additional burden for some designs
- 3. this provision seems unnecessary if requiring the features to be safety-related-- requirement to specify special treatments seems redundant.

50.900

- could be a burden reduction when final language is developed.

Overall comments based on preliminary rule text-Placement

- Should this be in Part 53, or Part 50, or is it not needed if Part 53 was changed?
 - NEIMA wanted Part 53 to be risk-informed and technology-inclusive, so leaving this alternative out of Part 53 seems very inconsistent with NEIMA
 - Intent of the Part 53 rule language and guidance is to be technology-inclusive and performance-based, and should ensure that even primarily deterministic based approaches are performance-based
 - Best to modify preliminary Part 53 language to allow this approach so separate section not needed

Context for alternative approaches: USNIC Advanced Nuclear Survey Comment on Part 53 issues – PRA (presented at 26 August 2021 NRC Stakeholders meeting)

Based on responses from Advanced Nuclear Developers who are USNIC & non USNIC members

We plan on using significant PRA input (similar to LMP)	35%	6
We plan on using medium PRA input (similar to existing regulatory framework)	24%	4
We plan on using minor PRA input (similar to maximum credible accident approach)	29%	5
We plan on taking another licensing methodology approach	12%	<u>2</u>

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Note: (a) Only 35% plan on using significant PRA input; 65% plan to use medium/minor/no PRA input.

(b) Parenthetical similarities present an example– a developer using LMP may use PRA consistent with existing regulatory framework in terms of what goes into the application.

(c) Future discussion will be required as NRC presents Graded PRA approach, recognizing only a minimal PRA may be appropriate at the Construction Phase.



Thoughts on other approach (MCA)

- Conservative bounding approach with maximum credible accident (MCA) or maximum hypothetical accident (MHA)
 - PRA only in minor role; more simplified approach with integrated safety assessments (especially for small simple designs)
 - 29% of developers in USNIC survey (see prior slide) indicated they might use this approach
 - no NRC preliminary language
- Best to modify current Part 53 language (as discussed earlier), to also allow this approach so separate section/alternative path not needed
 - Guidance could be written as needed

Additional thoughts

- Should this be in Part 50 or Part 53? Or not needed?
 - NEIMA wanted Part 53 to be risk-informed and technology-inclusive, so leaving it out of Part 53 seems very inconsistent with NEIMA
 - Best to modify preliminary Part 53 language to allow this approach so separate section not needed
 - Intent of the Part 53 rule language and guidance is to be technology-inclusive and performance-based, and should ensure that even primarily deterministic based approaches are performance-based

Part 5X Supplement, “Technology-inclusive alternative requirements for commercial nuclear plants”

Discussion

Discussion of Other Part 53 Sections and Subparts

Other Part 53 Sections and Subparts

- Subpart B – Technology-Inclusive Safety Requirements (3rd iteration) (ML21202A162)
- Subpart C – Requirements for Design and Analysis (3rd iteration) (ML21202A162)
- Subpart H – Licenses, Certifications, and Approvals (ML21267A004)
- Subpart I – Maintaining and Revising Licensing Basis Information (ML21202A175)
- Subpart J – Reporting and Other Administrative Requirements (ML21225A224)

Other Part 53 Sections and Subparts

Discussion

Final Discussion and Questions



Part 53 Rulemaking Schedule

Milestone Schedule	
Major Rulemaking Activities/Milestones	Schedule
Public Outreach, ACRS Interactions and Generation of Proposed Rule Package	Present to April 2022 (6 months)
Submit Draft Proposed Rule Package to Commission	May 2022
Publish Proposed Rule and Draft Key Guidance	October 2022
Public Comment Period – 60 days	November and December 2022
Public Outreach and Generation of Final Rule Package	January 2023 to February 2024 (14 months)
Submit Draft Final Rule Package to Commission	March 2024
Office of Management and Budget and Office of the Federal Register Processing	July 2024 to September 2024
Publish Final Rule and Key Guidance	October 2024

Future Public Meetings

- The NRC staff will continue to announce public meetings to discuss and receive feedback on various regulatory topics and preliminary proposed rule text.
 - A topical public meeting on Part 26, Fitness for Duty Requirements, is tentatively scheduled for November 16, 2021.
 - Preliminary proposed rule language will be posted on regulations.gov under docket ID [NRC-2019-0062](#) before the public meetings.
- The NRC staff is scheduled to meet with the ACRS Future Plants Subcommittee on November 18, 2021.
 - Part 5X Supplement, Technology-inclusive alternative requirements for commercial nuclear plants
 - Subpart H, Licenses, Certifications, and Approvals
 - Subpart F, Requirements for Operations

Closing Remarks

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Regulations.gov docket ID: **NRC-2019-0062**

Please provide feedback on this public meeting using this link:

<https://www.nrc.gov/public-involve/public-meetings/contactus.html>

Acronyms and Abbreviations

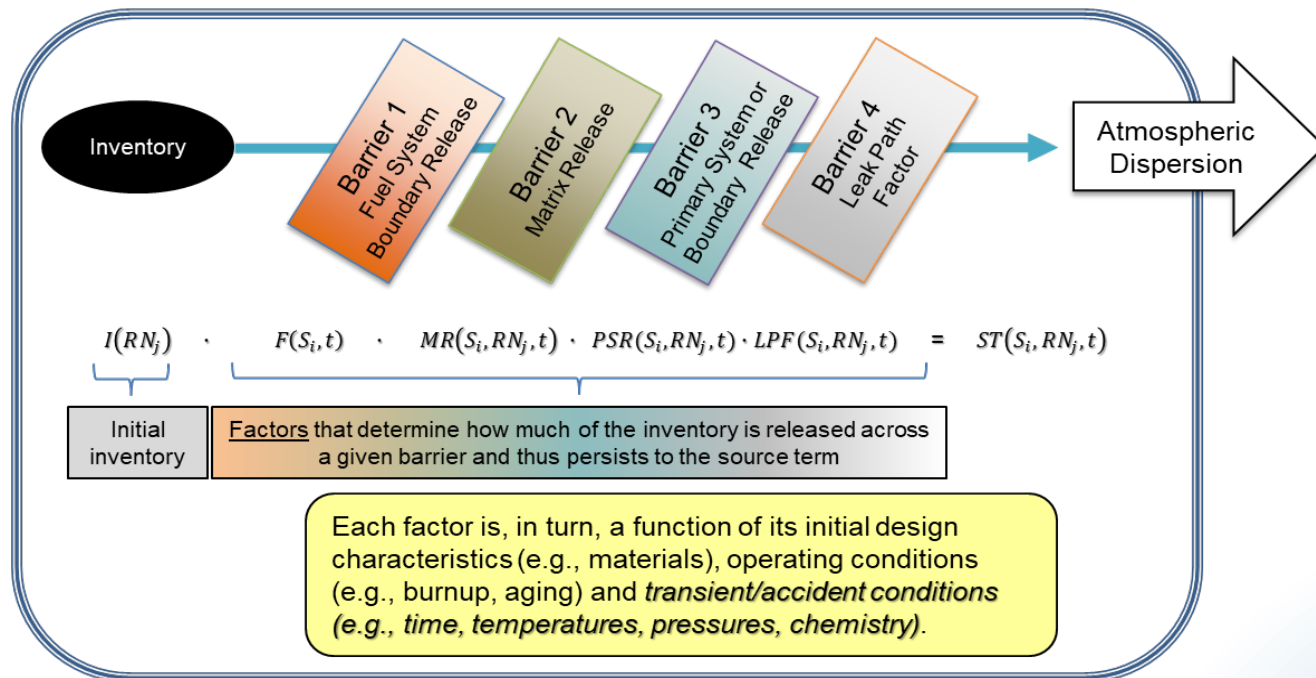
ACRS	Advisory Committee on Reactor Safeguards
ADAMS	Agencywide Document Access Management System
AOO	Anticipated operational occurrence
BDBE	Beyond design basis event
CFR	Code of Federal Regulations
CNSC	Canadian Nuclear Safety Commission
CP	Construction permit
DBA	Design basis accident
DBE	Design basis event
DID	Defense-in-depth
EP	Emergency preparedness
FLEX	Diverse and Flexible Mitigation Capability
GDC	General design criteria
IAEA	International Atomic Energy Agency
LBE	Licensing basis event

LCO	Limiting condition for operation
LMP	Licensing Modernization Project
LWR	Light water reactor
NEI	Nuclear Energy Institute
NEIMA	Nuclear Energy Innovation and Modernization Act
non-LWR	Non-light water reactor
NRC	U.S. Nuclear Regulatory Commission
PDC	Principal design criteria
PIE	Postulated initiating event
PRA	Probabilistic risk assessment
QHO	Quantitative Health Objective
Rem	Roentgen equivalent man
SR	Safety-related
SSCs	Structures, systems, and components
TICAP	Technology Inclusive Content of Application Project
USNIC	U.S. Nuclear Industry Council

Background Slides

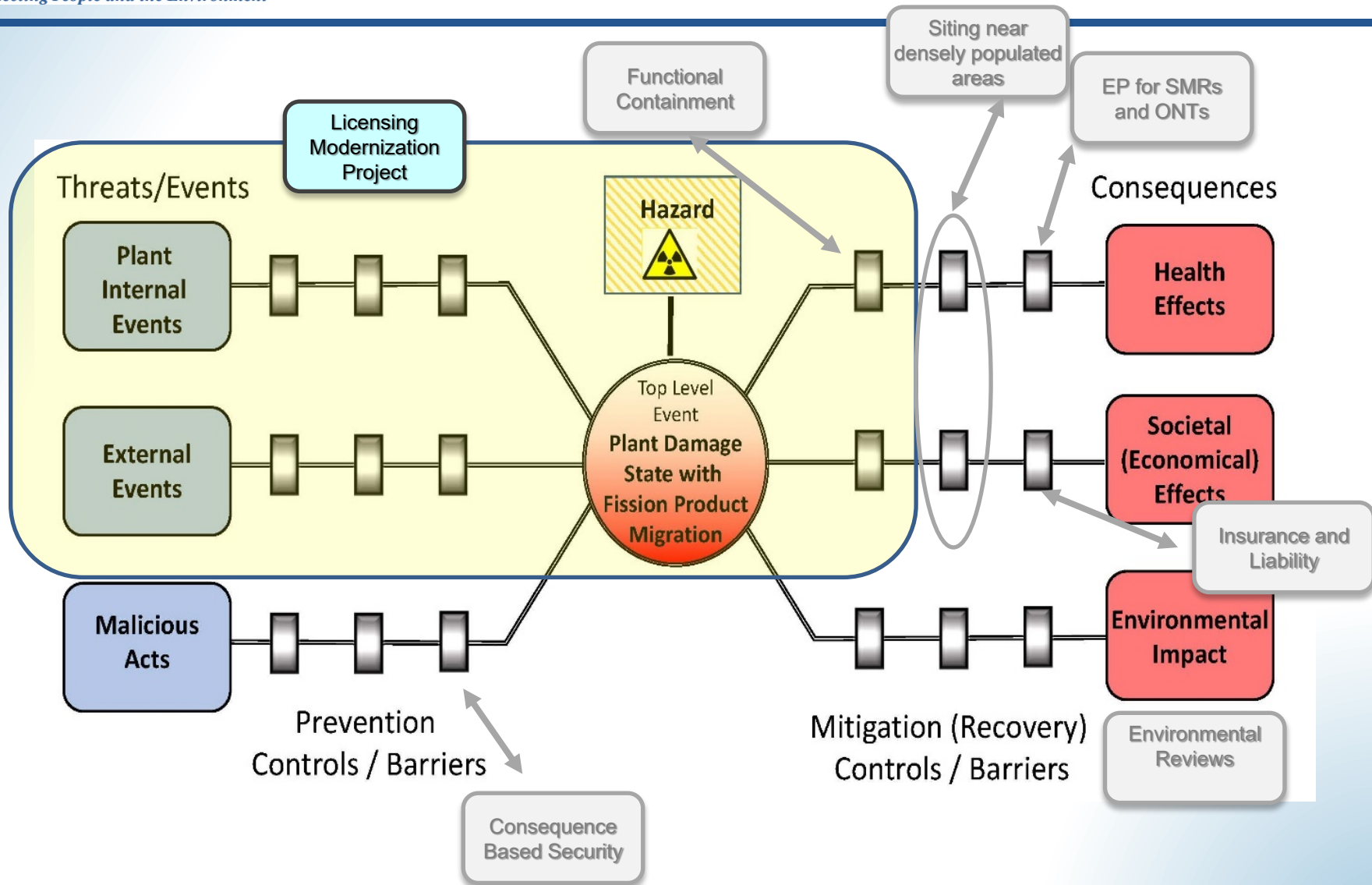
First Principles

Recent NRC activities related to advanced reactors (e.g., functional containment performance criteria, possible changes to emergency planning & security, and DG-1353) recognize the limitations of existing LWR-related guidance, which requires a return to first principles such as fundamental safety functions supporting the retention of radionuclides



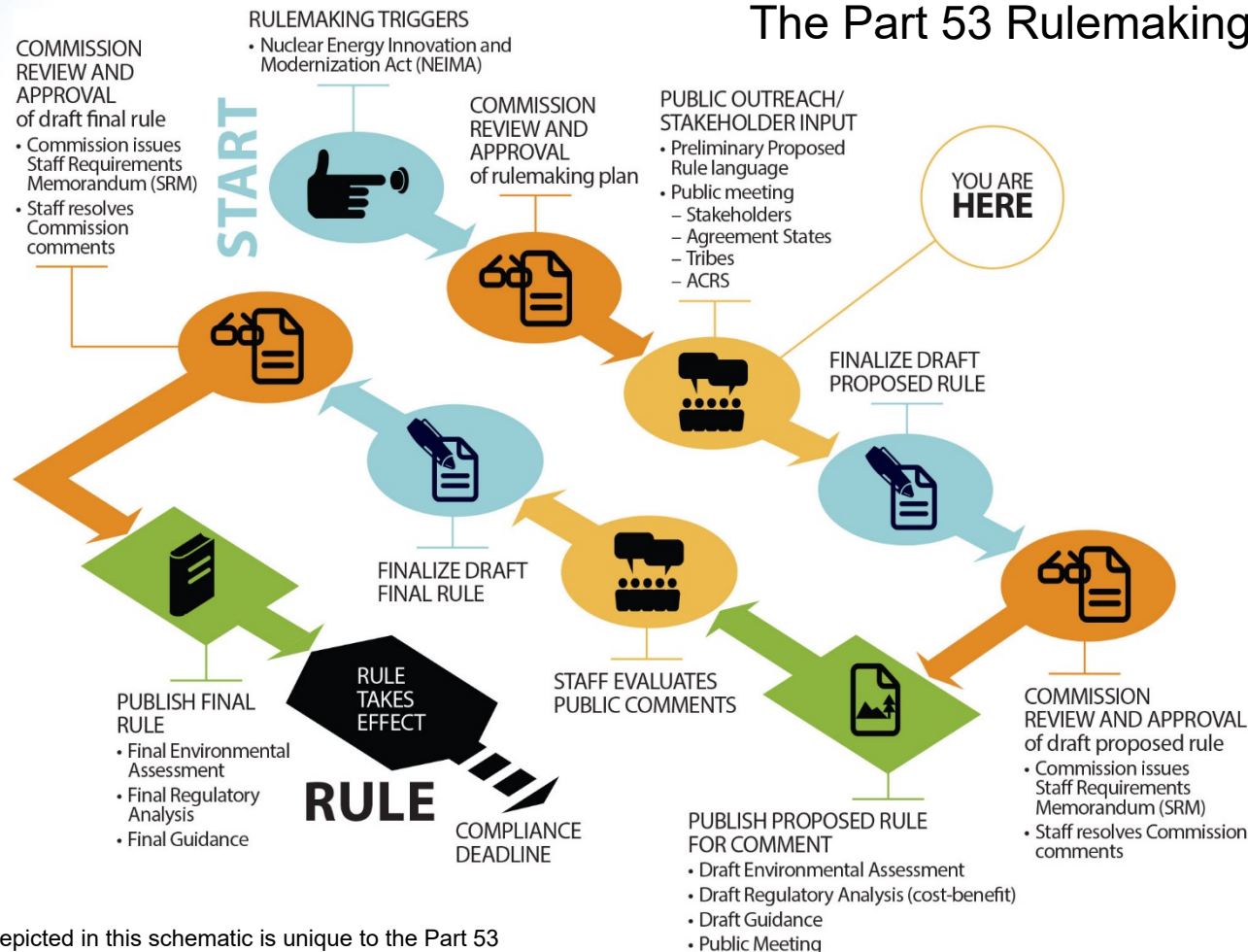
See: SECY-18-0096, "Functional Containment Performance Criteria for Non-Light-Water-Reactors," and INL/EXT-20-58717, "Technology-Inclusive Determination of Mechanistic Source Terms for Offsite Dose-Related Assessments for Advanced Nuclear Reactor Facilities"

Integrated Approach



Part 53 Rulemaking

The Part 53 Rulemaking Process*



*The process depicted in this schematic is unique to the Part 53 rulemaking and varies in some ways compared to a similar "A Typical Rulemaking Process" schematic available on the NRC's public website.

Background

- Nuclear Energy Innovation and Modernization Act (NEIMA; Public Law 115-439) signed into law in January 2019 requires the NRC to complete a rulemaking to establish a technology-inclusive, regulatory framework for optional use for commercial advanced nuclear reactors no later than December 2027
 - (1) **ADVANCED NUCLEAR REACTOR**—The term “advanced nuclear reactor” means a nuclear fission or fusion reactor, including a prototype plant... with significant improvements compared to commercial nuclear reactors under construction as of the date of enactment of this Act, ...

Severe Accidents

- Severe Accident Policy Statement
 - Although in the licensing of existing plants the Commission has determined that these plants pose no undue risk to public health and safety, this should not be viewed as implying a Commission policy that safety improvements in new plant designs should not be actively sought. The Commission fully expects that vendors engaged in designing new standard (or custom) plants will achieve a higher standard of severe accident safety performance than their prior designs.
- 10 CFR 52.47(a)(23)
 - For light-water reactor designs, a description and analysis of design features for the prevention and mitigation of severe accidents, e.g., challenges to containment integrity caused by core-concrete interaction, steam explosion, high-pressure core melt ejection, hydrogen combustion, and containment bypass
- NUREG-1226 (Development and Utilization of the NRC Policy Statement on the Regulation of Advanced Nuclear Power Plants; Executive Summary)
 - (4) While the Final Policy Statement encourages innovative reactor designs and safety criteria, the review of advanced reactor designs will still require satisfactory consideration of the Commission's regulations, regulatory guides and other guidelines, such established and developing criteria as the defense-in-depth philosophy, standardization, the Commission's safety goal and severe accident policies, and applicable industry codes and standards.

NRC Staff Plan to Develop Part 53

Subpart B

Subpart C

Subpart D

Subpart E

Subpart F

Subpart G

Project Life Cycle

Requirements Definition

- Safety Objectives
- Safety Criteria
- Safety Functions

Design and Analysis

System & Component Design

Analysis Requirements

Safety Categorization & Special Treatment

Siting

External Hazards

Site Characteristics

Environmental Considerations

Construction

Construction/Manufacturing

Ensuring Capabilities/Reliabilities

Change Control

Environmental Considerations

Operation

Facility Safety Program

Surveillance Maintenance

Configuration Control

Staffing & Human Factors

Programs Security, EP

Retirement

Other

Subpart A
General Provisions

Subpart J
Admin & Reporting

Other 10 CFR Parts

Plant/Site (Design, Construction, Configuration Control)

Analyses (Prevention, Mitigation, Compare to Criteria)

Plant Documents (Systems, Procedures, etc.)

LB Documents (Applications, SAR, TS, etc.)

Subparts H & I

Clarify Controls and Distinctions Between