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United States Nuclear Regulatory Commission
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Advanced Reactor Stakeholder Public Meeting

May 7, 2020

Telephone Bridgeline: (888) 390-0788
Passcode: 4560771#

Time	Agenda	Speaker
10:00 - 10:10 am	Opening Remarks	NRC
10:10 - 10:25 am	Promoting Preapplication Participation	B. Beasley, NRC
10:25 - 10:40 am	Introduction to Annual Fee Regulations for Non-Light-Water Reactors	A. Cubbage, NRC
10:40 - 10:50 am	Update on Status of NRC draft Interim Staff Guidance (ISG) for Micro Reactors and Advanced Nuclear Reactor Generic Environmental Impact Statement (GEIS)	M. Sutton, NRC
10:50 - 11:00 am	NEI Feedback Regarding PNNL Reports on Approach to Determine the Environmental Data for Table S-3 of 10 CFR 51.51 and Table S-4 of 10 CFR 51.52 for Non-LWRs	K. Austgen, NEI
11:00 - 12:00 pm	Advanced Reactor Fuel Qualification Guidance - Outline and Evaluation Criteria	T. Drzeweicki, NRC
12:00 - 12:30 pm	Break	All
12:30 - 1:00 pm	Overview of Proposed Rulemaking on Spent Fuel Reprocessing	Y. Faraz, NRC
1:00 - 1:30 pm	Discussion of Category II Fuel Cycle Facility Security	T. Harris, NRC
1:30 - 1:45 pm	Discussion of Review and Potential Endorsement of ASME Section XI Division 2 (a.k.a., Reliability Integrity Management or RIM)	T. Lupold, NRC
1:45 - 2:00 pm	Advanced Reactor Inspection and Oversight Contract Development	M. Khan and J. Sebrosky, NRC
2:00 - 2:15 pm	Closing Remarks and Future Meeting Planning	NRC/All

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Promoting Preapplication Participation

Ben Beasley, Chief

Advanced Reactor Licensing Branch

- Pre-application interaction:
  - White paper, audit
  - Topical report, Preliminary Safety Information Document

No SER

Write SER

- Value
  - Reliable regulatory findings early
  - More efficient permit or license review
  - More visibility for public on key topics

Current Generic Schedules

Time to issue final safety evaluation		
	LWR	Non-LWR
DC	42 months	36 months
COL referencing DC	30 months	30 months
Custom COL	42 months	36 months
CP	36 months	36 months
OL	42 months	36 months

What and Why?

- Add definition
  - Specify key activities
- Promote use
  - Offer clear strategies
- Caveats
  - No substantive design changes
  - Timely RAI responses

Key Interactions – Topical Reports

- Principle design criteria
- Classification of SSCs
- Fuel qualification
- Source term development
- QA Program
- Safeguards Information Plan
- Accident analysis method

Key Interactions – Papers and Meetings

- Overview of environmental (NEPA) preparations
- Meet with other agencies on endangered species and cultural resources affected
- PRA
- Regulatory exemptions
- Policy issues
- Novel design features or approaches
- Consensus codes and standards
- Engineering computer codes
- Readiness assessment

Strategies

What would be meaningful?

References

- Policy Statement on the Regulation of Advanced Reactors (73 FR 60612; October 14, 2008)
- A Regulatory Review Roadmap for Non-Light Water Reactors, ML17312B567
- Generic schedules are found at https://www.nrc.gov/about-nrc/generic-schedules.html

Annual Fees for Non-LWRs

May 7, 2020

Amy Cubbage, NRR

Jo Jacobs, OCFO

NRC Fee Requirements

- **Hourly Fees under 10 CFR Part 170**
  - Fee for services
  - Billed as hours expended times NRC professional hourly rate
  - Billed to pre-applicants, applicants, and licensees

- **Annual Fees under 10 CFR Part 171**
  - Collect approximately 90% of budget authority by end of fiscal year (FY)
  - Excludes certain activities such as advanced reactor regulatory infrastructure, nuclear waste fund, etc.
  - Recover through annual fees
    - Research costs
    - Rulemaking costs
    - Other agency costs not recovered under IOAA
  - Billed to licensees only

Annual Fees for SMRs

- Variable annual fee structure was established for light-water SMRs in June 2016 (81 FR 45963).

- The SMR fee structure has three parts:
  - a minimum fee for bundled units less than 250 MWt
  - a variable fee for bundled units between 250 and 2,000 MWt
  - a maximum fee equivalent to the flat annual fee charged to current operating fleet reactors for bundles units between 2,000 and 4,500 MWt

Considerations for Non-LWRs

- Status Quo?
- Variable annual fee similar to current SMR fee rule?
- Evaluate new annual fee policy for all non-LWRs?
- Evaluate micro reactors separately?
- Other considerations?

Next Steps

- Discuss in more detail in future stakeholder meetings
  - Industry proposals?
  - Address in FY2022 fee rule?
  - Conduct separate rulemaking?

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Advanced Reactor Preparations for Environmental Reviews

Mallecia Sutton

Senior Project Manager

Division of Advanced Reactors and Non-Power Production and Utilization Facilities

Status on Environmental Activities

- Status update on:
  - Interim Staff Guidance (ISG) for the environmental review of micro-reactors
  - Generic Impact Statement (GEIS) for Advanced Reactors

Interim Staff Guidance

- ISG issued:
  - Public Comment on February 21, 2020
  - Comment period ends May 11, 2020
    - Comment on regulations.gov at https://www.regulations.gov/docket?D=NRC-2020-0051

GEIS for Advanced Reactors

- GEIS
  - Federal Register Notice Issued-April 30, 2020
  - Scoping Meeting-5/28/2020
  - Scoping Period ends-6/30/2020
- Scoping Meeting
  - May 28,2020 1-4pm Webinar
  - Meeting Notice ADAMS Accession Number: ML20122A049
- Additional Information on the GEIS
  - advanced reactor web page
  - https://www.regulations.gov/document?D=NRC-2020-0101-0001

Questions

NEI Feedback on draft non-LWR Fuel Cycle Environmental PNNL reports

May 7, 2020

NUCLEAR ENERGY INSTITUTE

Fuel Cycle Environmental Topics

- NRC should not assume that a different fuel form results in a substantially different environmental impact
  - Staff should conduct an evaluation to demonstrate non-LWR fuels are adequately characterized by analysis of LWR fuel
- Should be addressed generically
  - Update, or parallel, Tables S-3 and S-4
  - If needed, GEIS on mining, milling, and enrichment
- Provide clarity on appropriate level of detail requested of applicants

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Fuel Qualification (FQ) for Advanced Reactors

Advanced Reactor Stakeholder Meeting

May 7, 2020

Outline

- Background/Motivation
- Activity affecting FQ guidance
- FQ report/FQ assessment framework
- Next steps/stakeholder input

NEIMA

- SEC. 103. ADVANCED NUCLEAR REACTOR PROGRAM
  - (c) REPORT TO INCREASE THE USE OF RISK-INFORMED AND PERFORMANCE-BASED EVALUATION TECHNIQUES AND REGULATORY GUIDACNE

(4) REQUIRED EVALUATIONS.—Consistent with the role of the Commission in protecting public health and safety and common defense and security, the report shall evaluate—

(A) the ability of the Commission to develop and implement, where appropriate, risk-informed and performance-based licensing evaluation techniques and guidance for commercial advanced nuclear reactors within existing regulatory frameworks not later than 2 years after the date of enactment of this Act, including policies and guidance for the resolution of—

(i) issues relating to—

(I) licensing basis event selection and evaluation;

(II) use of mechanistic source terms;

(III) containment performance;

(IV) emergency preparedness; and

(V) the qualification of advanced nuclear reactor fuel; and

(ii) other policy issues previously identified; and

Regulatory Aspects of Nuclear Fuel Qualification

- Regulations
  - No requirements specific to nuclear fuel qualification
  - Requirements on fuel qualification are provided by top level requirements attributed to the facility
    - 10 CFR 50.43(e)
    - GDC/ARDC 2, *Design bases for protection against natural phenomena*
    - GDC/ARDC 10, *Reactor design*

Regulatory Aspects of Nuclear Fuel Qualification

- Guidance
  - NUREG-0800, Standard Review Plan
    - Section 4.2, Fuel System Design
      - Identifies acceptance criteria derived from know fuel failure/degradation mechanisms for light water reactor fuel
  - ATF-ISG-2020-01
    - Significant changes to fuel design must be assessed for potentially new failure/degradation mechanisms

Outline

- Background/Motivation
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FQ Activity

- NRC reviewed the Electric Power Research Institute (EPRI) TRISO fuel qualification report (ACRS subcommittee meeting on May 6, 2020 - yesterday)
- NRC reviewed and approved the quality assurance program for legacy metallic fuel data, ANL/NE-16/17 (i.e., EBR-II data)
- MSR fuel qualification work with Oak Ridge National Lab
- Accelerated fuel qualification reports (General Atomics and TerraPower)
- *NEA – Working Group on the Safety of Advanced Reactors (WGSAR)*
  - Fuel Qualification Report (Draft)
  - Work going on in parallel to with NRC effort to address NEIMA requirement

Outline

- Background/Motivation
- Activity affecting FQ guidance
- FQ report/FQ assessment framework
- Next steps/stakeholder input

FQ Framework - Literature

- JNM 2007 Paper

ELSEVIER

Available online at www.sciencedirect.com
ScienceDirect
Journal of Nuclear Materials 371 (2007) 232–242

journal of nuclear materials
www.elsevier.com/locate/jnucmat

An approach to fuel development and qualification

Douglas C. Crawford *, Douglas L. Porter, Steven L. Hayes, Mitchell K. Meyer, David A. Petti, Kemal Pasamehmetoglu

Idaho National Laboratory, Idaho Falls, ID 83415-6140, USA

- Accelerated FQ Paper (Unpublished)

Accelerating Nuclear Fuel Development and Qualification: Engineering-Scale Modeling and Simulation Integrated with Separate-Effects Testing*

Kurt A. Terrani[1,†], Nathan A. Capps[1], Matthew J. Kerr[2], Christina A. Back[3], Andrew T. Nelson[1], Brian D. Wirth[1,4], Steven L. Hayes[2], Chris R. Stanek[5]

FQ Framework - Scope

- Broad interpretation of fuel qualification (many aspects of nuclear safety are impacted by the fuel)
  - Neutronic performance
  - Thermal-fluid performance (e.g., margin to critical heat flux limits)
  - Seismic behavior
  - Fuel transportation and storage
- Need to restrict the scope of the report

  *The scope of this report focuses on the identification and evaluation of **safety relevant phenomena for fuel performance** including the understanding of **fuel life limiting failure and degradation mechanisms** which occur as a result of **irradiation** during reactor operation.*

FQ Framework - Other Considerations

- Definition of fuel qualification (from JNM 2007)

  The objective of nuclear fuel qualification is ***the demonstration that a fuel product fabricated in accordance with a specification behaves as assumed or described in the applicable licensing safety case****, and with the reliability necessary for economic operation of the reactor plant*

- Clarify "safety case"
  - The role of nuclear fuel in the safety case can vary significantly between different reactor designs (e.g. TRISO fuel contains fission product barriers within the fuel itself)

FQ Framework

- Development of a generic assessment framework for fuel qualification:
  - Top-down approach used to decompose the top level goal of “fuel is qualified” into lower level supporting goals
  - Lower level supporting goals are further decomposed until clear objective goals are identified that can be satisfied with direct evidence

FQ Assessment Framework: Intro and Nomenclature

- **This is a top down approach that attempts identify specific goals that can be directly supported by evidence**
- A high level or abstract goal is given by an empty rectangle

- A concrete goal that is broken down no further is given by a shaded rectangle

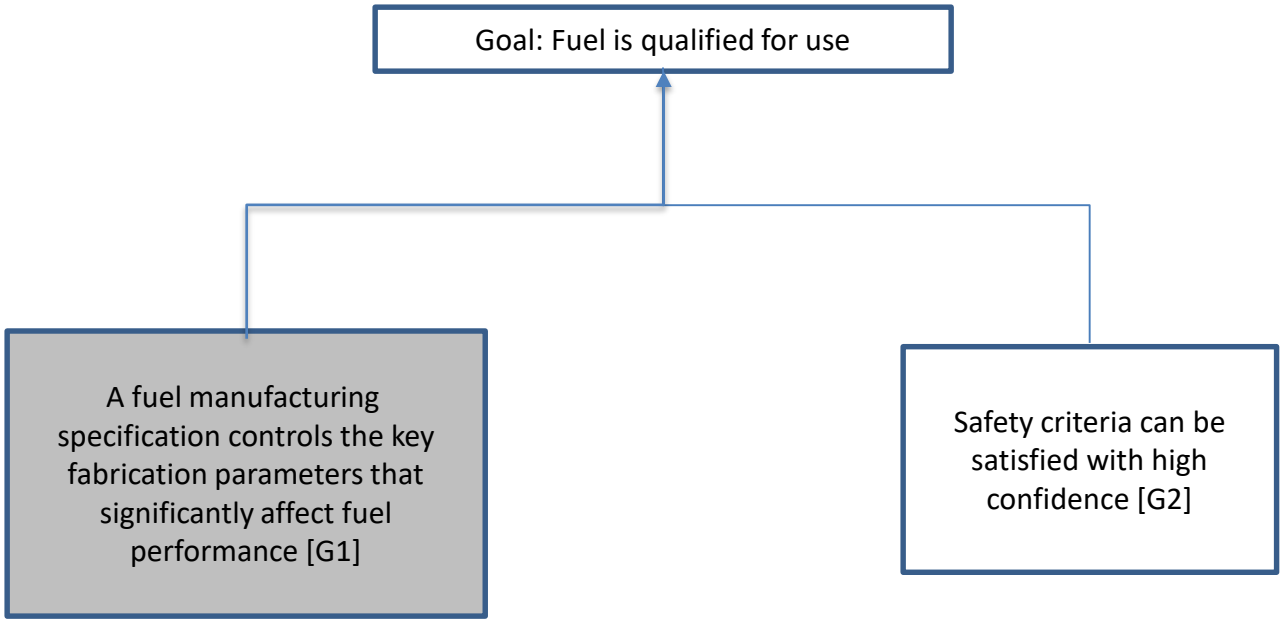
- A goal that leads to the use of a separate framework. The framework will be identified directly under the goal.

- Clarifying notes are provided in rounded rectangles

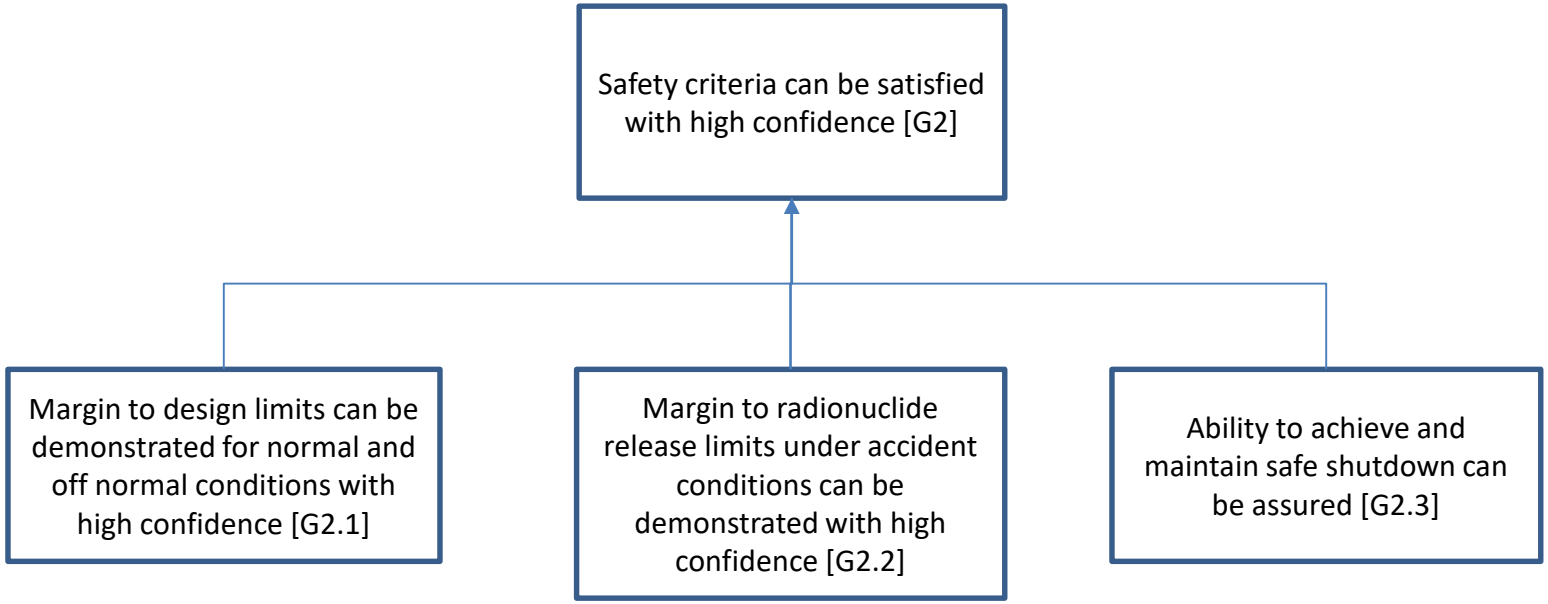
FQ Assessment Framework: Goal

- Goal: Fuel is qualified for use

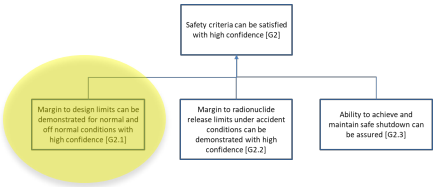
  = High confidence exists that the fuel **fabricated in accordance its specification** will **perform as described in the applicable licensing safety case**



G2: Safety Criteria



G2.1: Design Limits for Normal and Off-Normal Operation



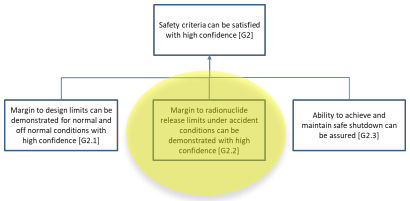
Margin to design limits can be demonstrated for normal operations and off-normal conditions with high confidence [G2.1]

The fuel performance envelope is defined [G2.1.1]

An evaluation model is available to assess fuel performance against design limits to protect against fuel failure and degradation (i.e., life-limiting) mechanisms [G2.1.2]

Note: The fuel performance envelope specifies the environmental conditions and radiation exposure that the fuel is expected to encounter. The envelope is typically specified by fuel designers and provides constraints on the design of the reactor and associated systems.

G2.2: Radionuclide Release Limits



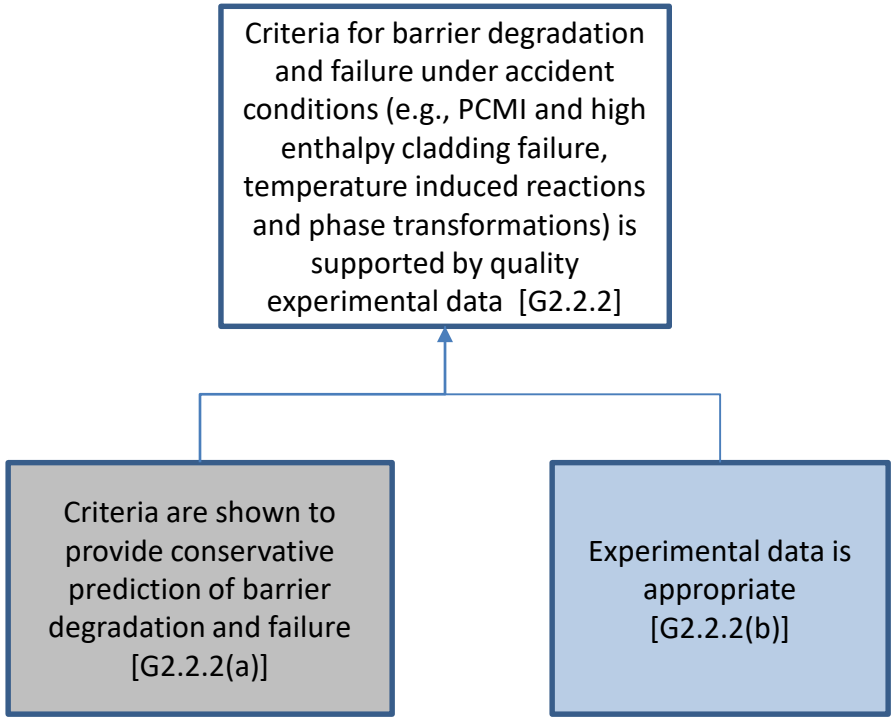
Margin to radionuclide release limits under accident conditions can be demonstrated with high confidence [G2.2]

Radionuclide retention requirements of the fuel under accident conditions is specified [G2.2.1]

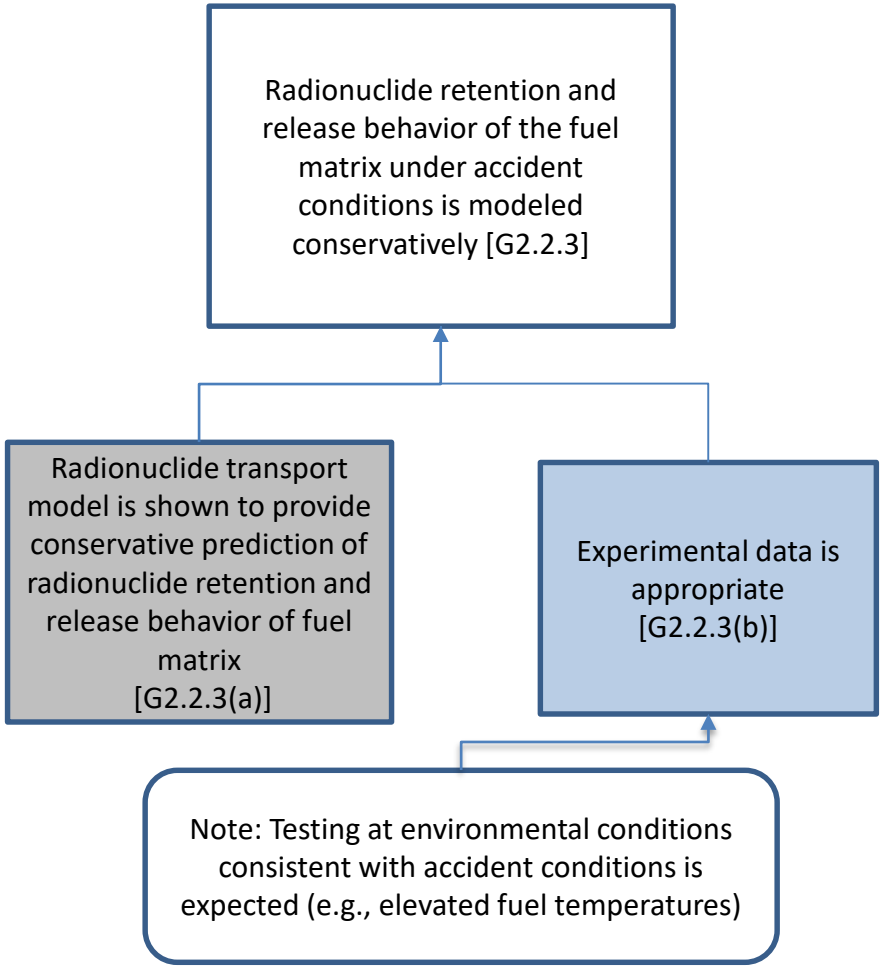
Criteria for barrier degradation and failure under accident conditions (e.g., PCMI and high enthalpy cladding failure, temperature induced reactions and phase transformations) is supported by quality experimental data [G2.2.2]

Radionuclide retention and release behavior of the fuel matrix under accident conditions is modeled conservatively [G2.2.3]

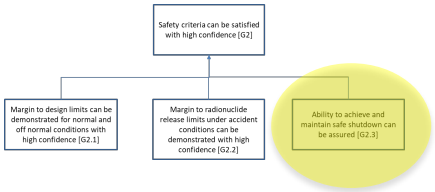
G2.2.2: Criteria for Barrier Degradation



G2.2.3: Conservative Modeling



G2.3: Safe Shutdown

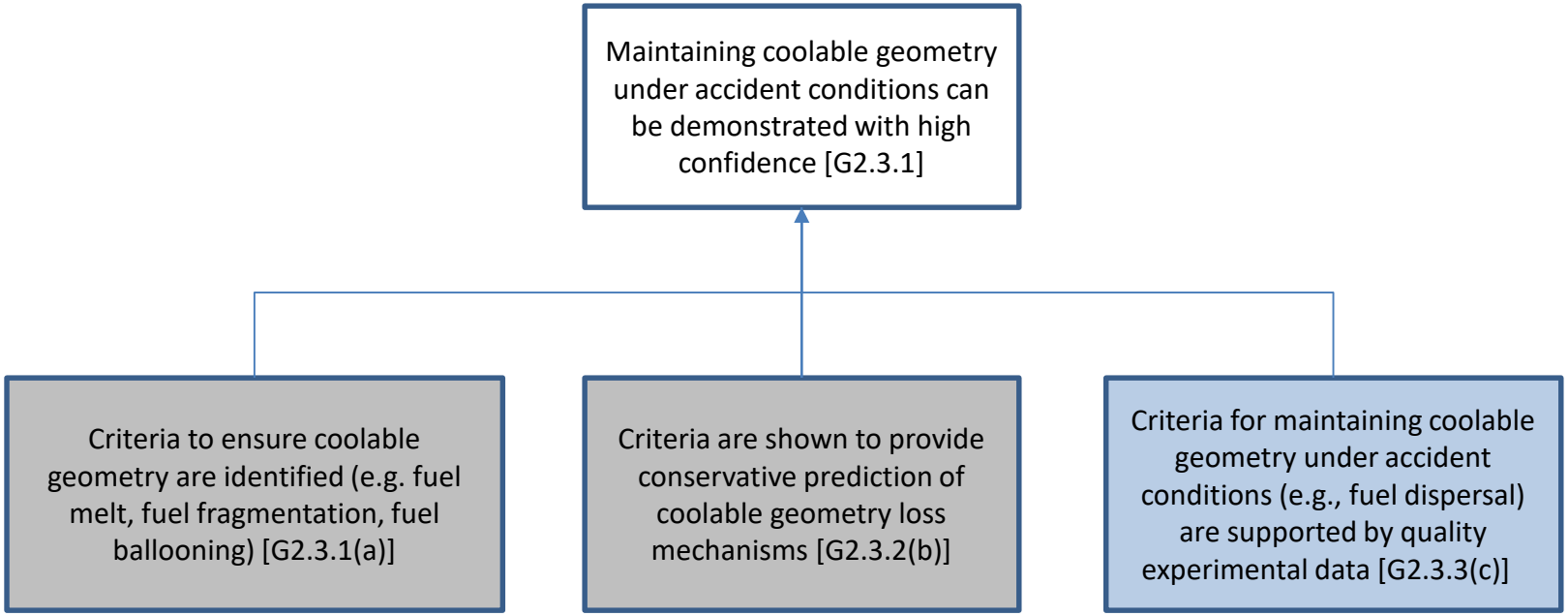


Ability to achieve and maintain safe shutdown can be assured [G2.3]

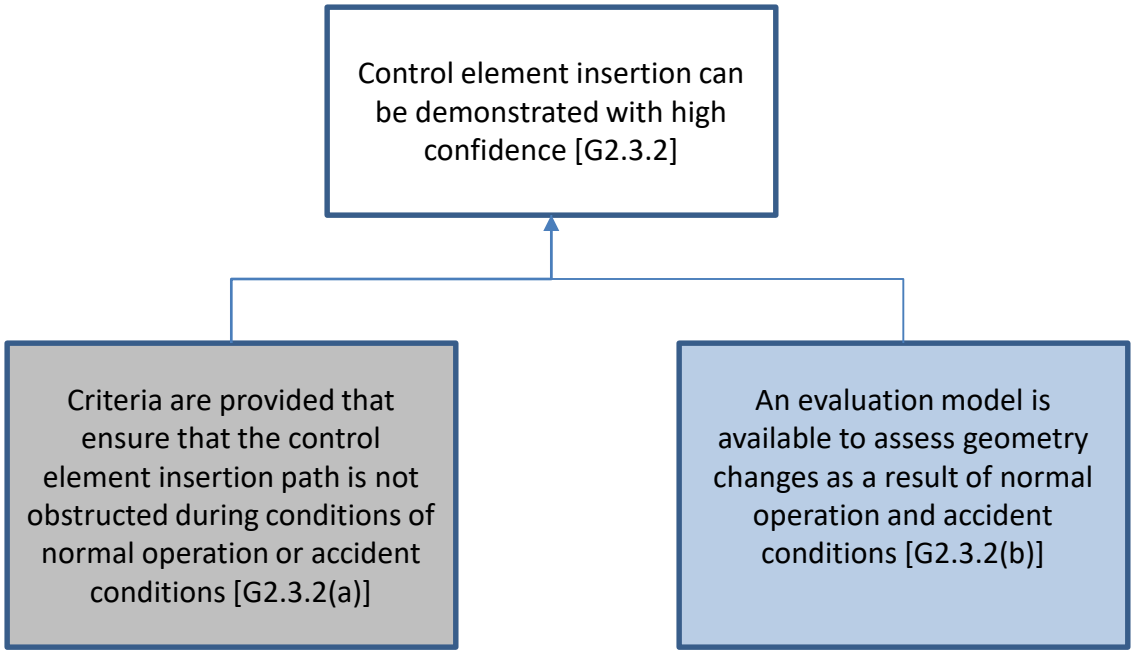
Maintaining coolable geometry under accident conditions can be demonstrated with high confidence [G2.3.1]

Control element insertion can be demonstrated with high confidence [G2.3.2]

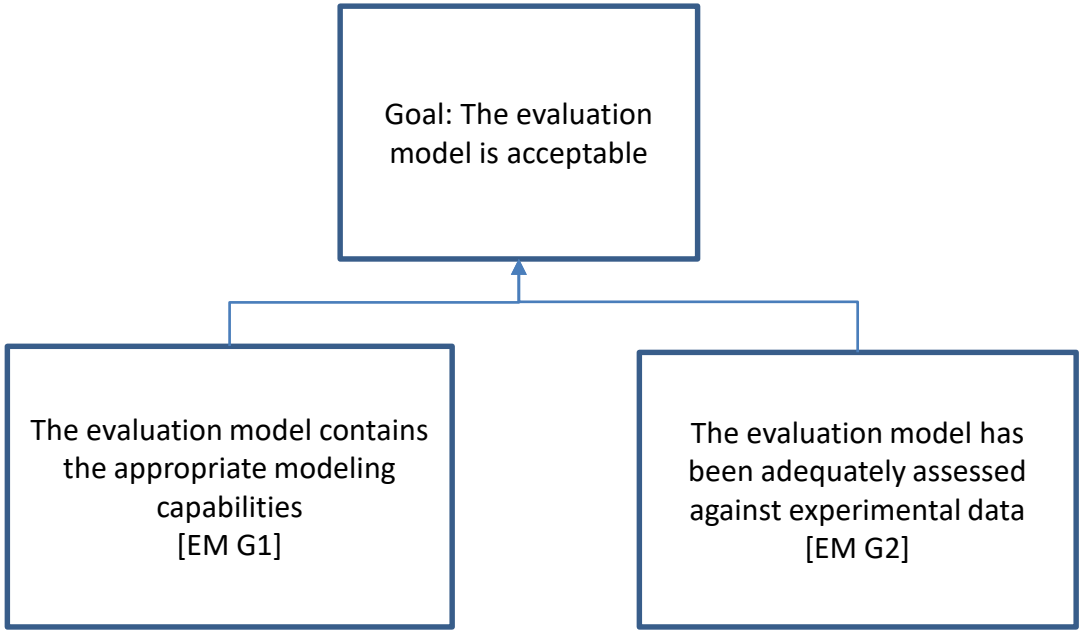
G2.3.1: Maintaining Coolable Geometry



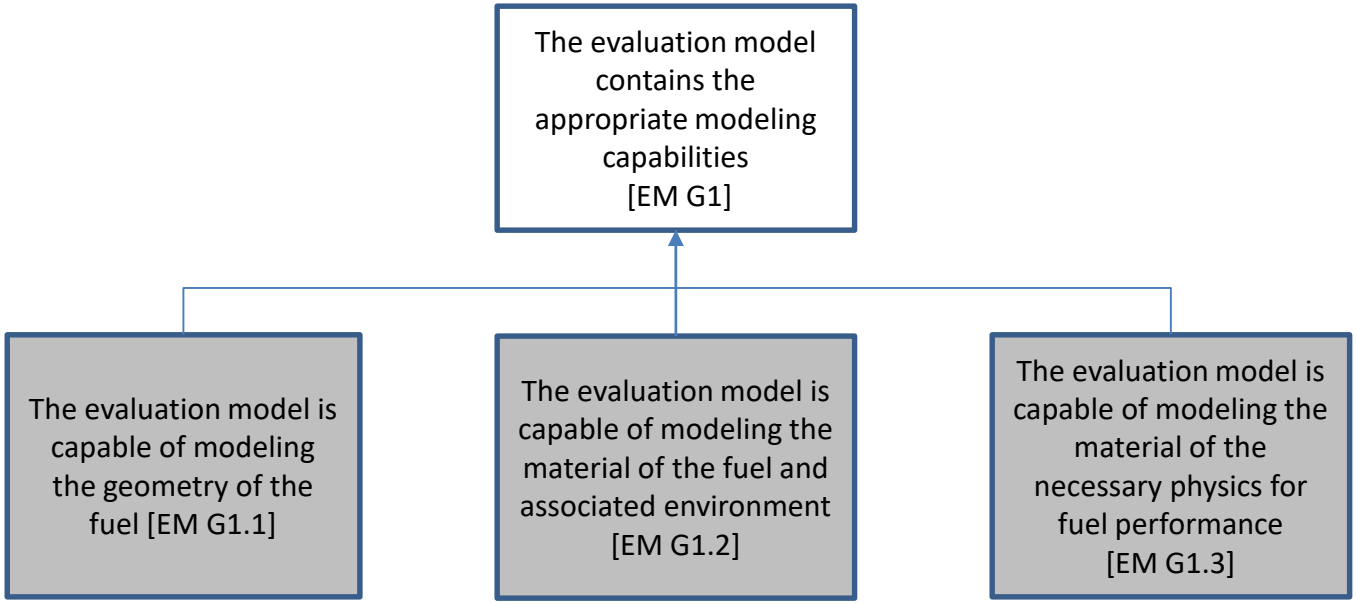
G2.3.2: Control Element Insertion



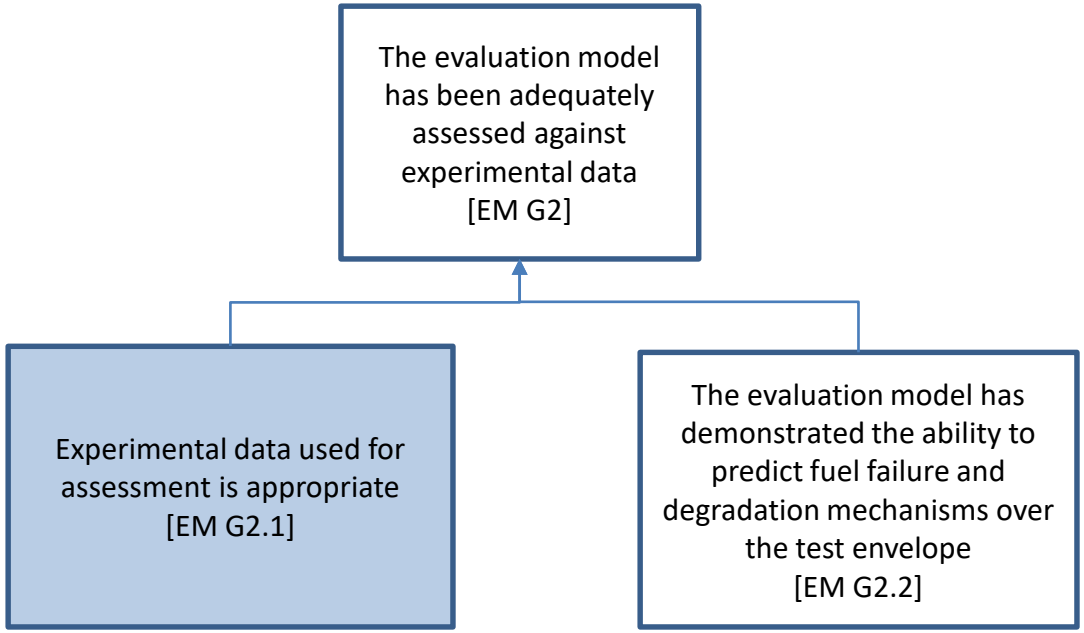
Evaluation Model (EM) Assessment Framework



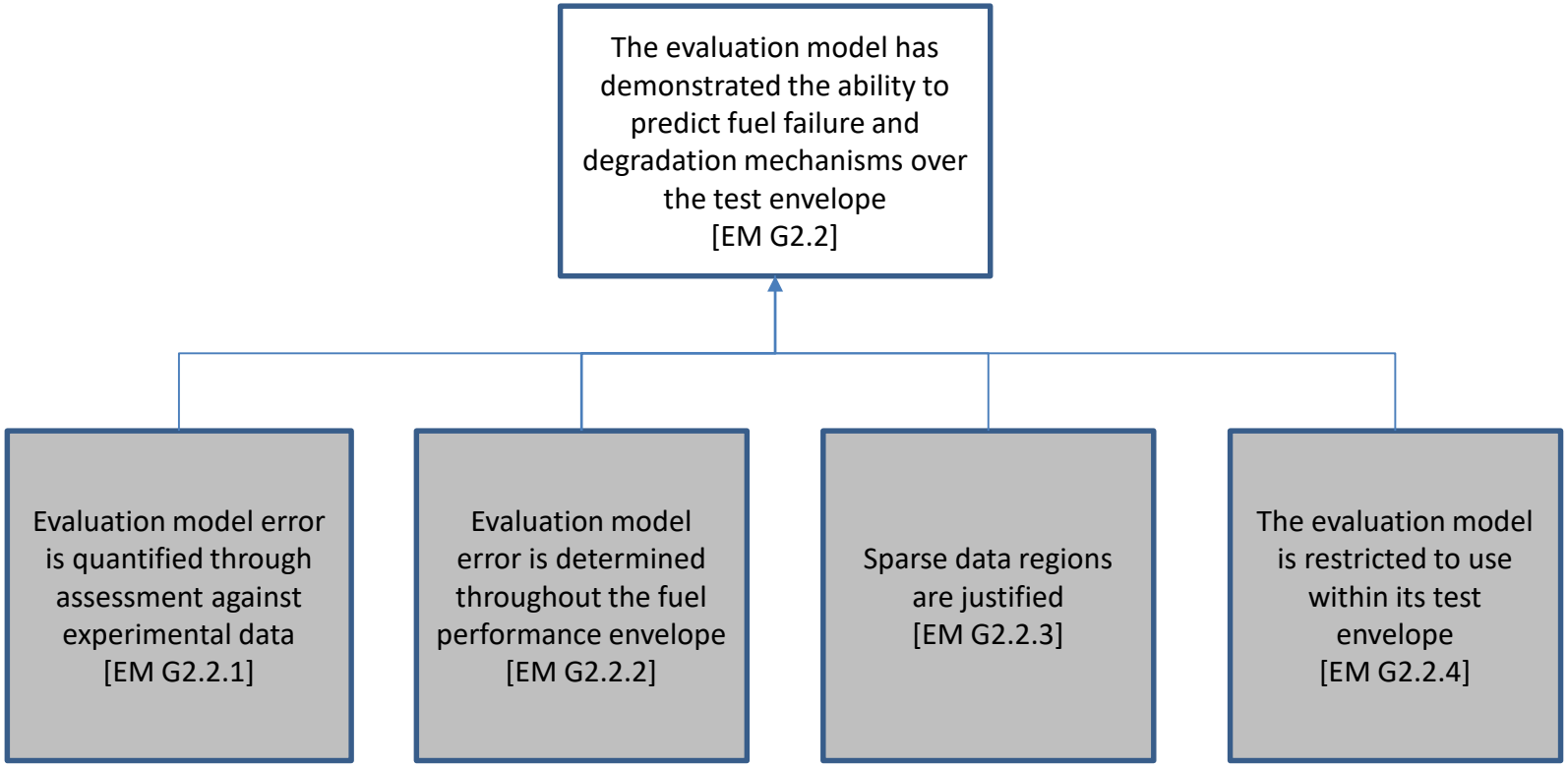
EM G1: EM Capabilities



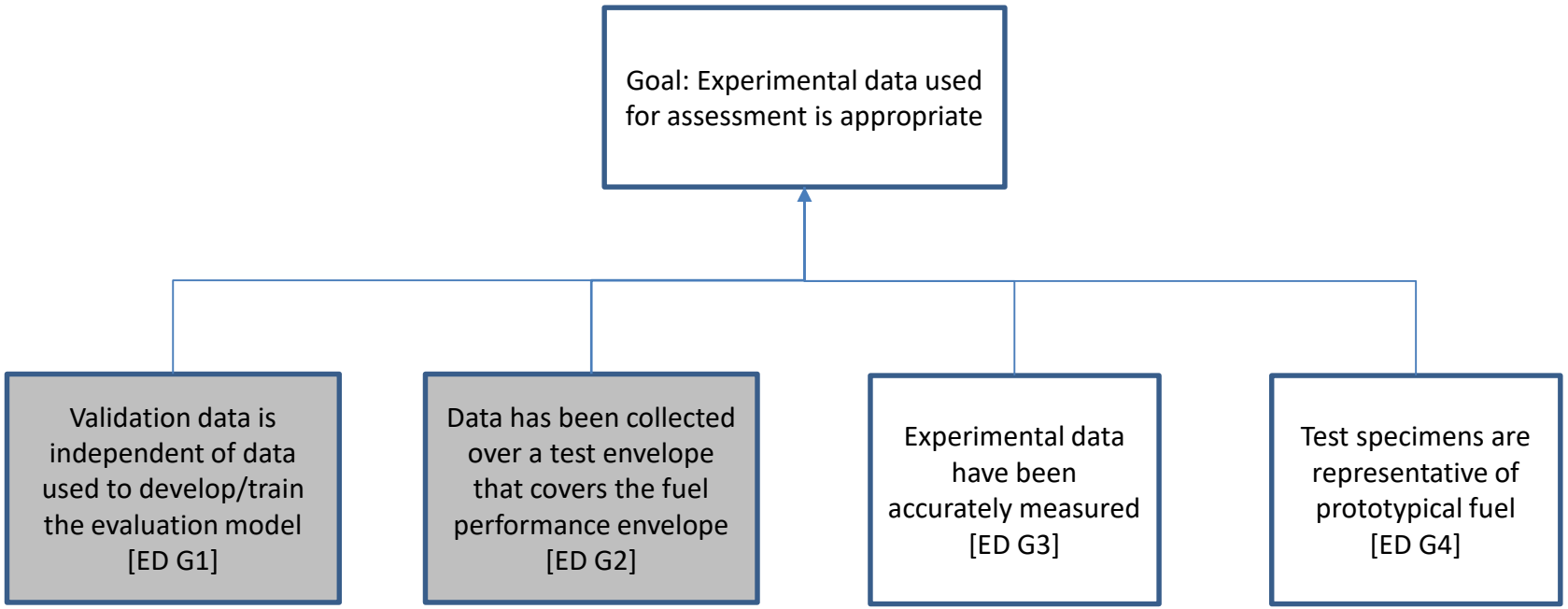
EM G2: EM Assessment



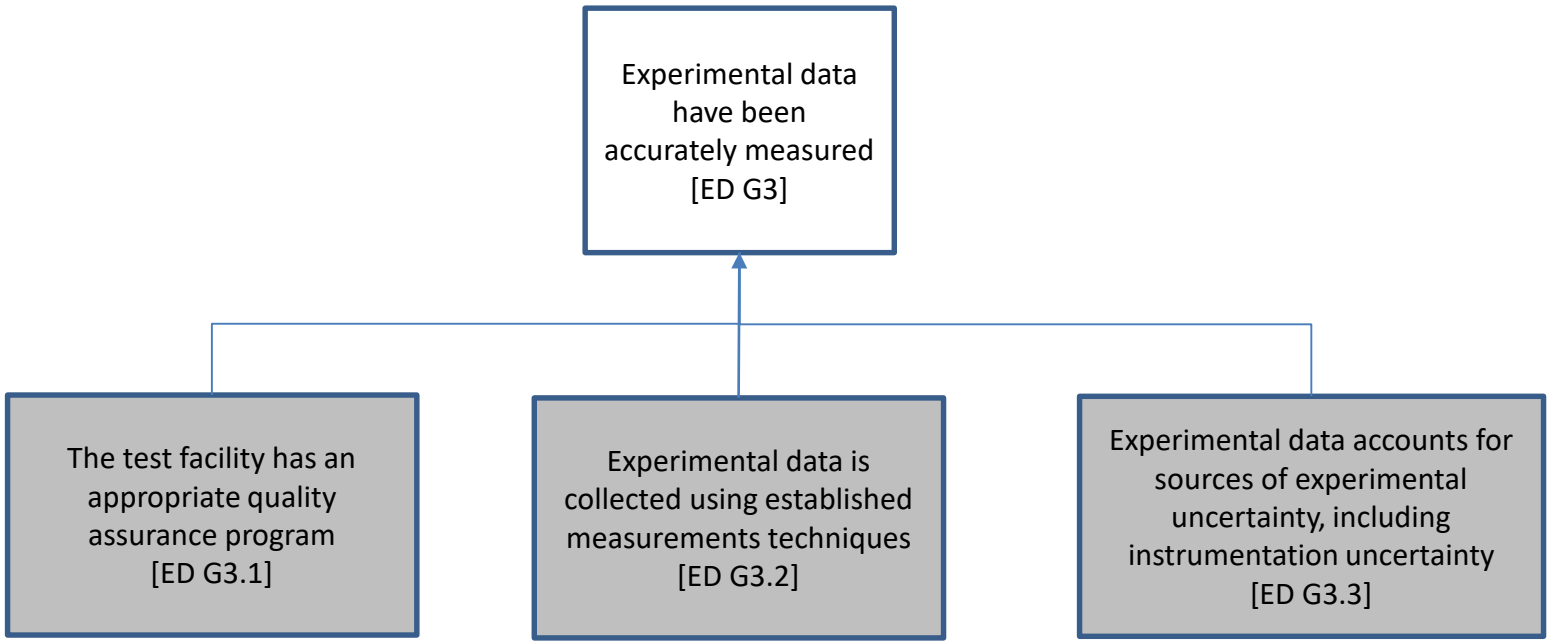
EM G2.2: Demonstrated Ability over Test Envelope



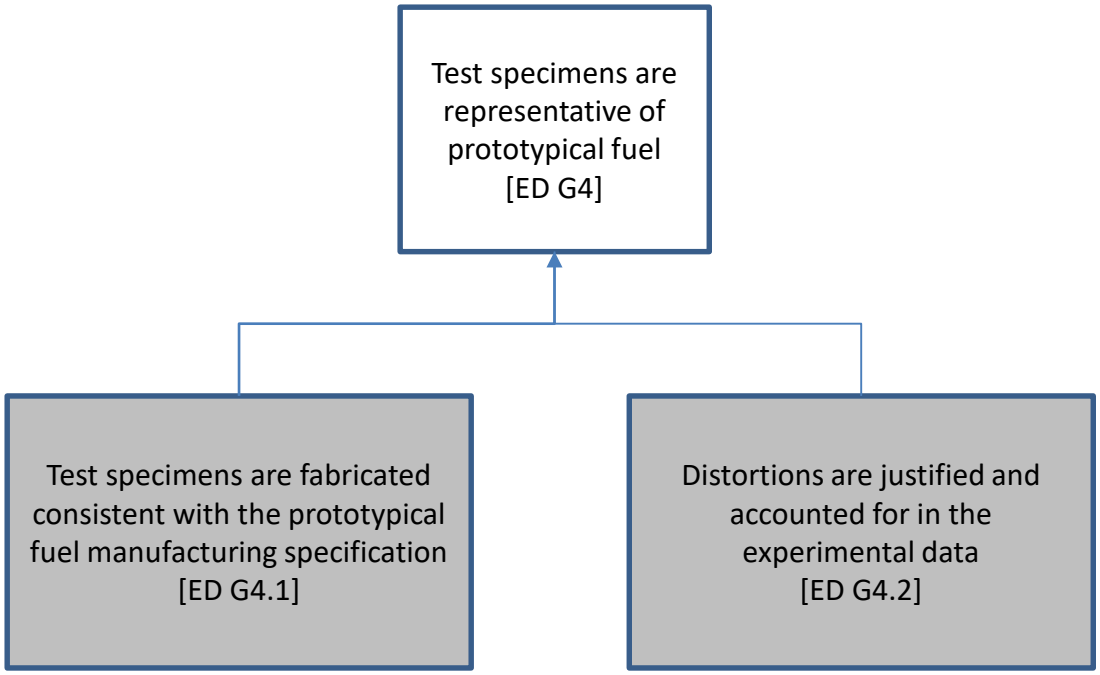
Experimental Data (ED) Assessment Framework



ED G3: Data Measurement



ED G4: Test Specimens



Outline

- Background/Motivation
- Activity affecting FQ guidance
- FQ report/FQ assessment framework
- Next steps/stakeholder input

Current Status

- An Assessment Framework has been developed
  - Based on current review guidance, literature, WGSAR member input, and additional NRC input
  - Multiple iterations with NRC working group
  - Beginning to share with advanced reactor stakeholders

Next Steps/Stakeholder Input

- Need further writing to provide:
  - Supporting/clarifying language
  - Standards for evidence with clarifying examples
- Completed draft expected August 2020
- To be placed on stakeholder meeting agenda one month after draft release (planning on September stakeholder meeting)

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Break

Meeting/Webinar will begin shortly

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Status of Spent Fuel Reprocessing Rulemaking

Periodic Advanced Reactor Stakeholders Meeting

May 7, 2020

Historical Perspective

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- 2006 Global Nuclear Energy Partnership (GNEP) launched which included
  - establishing domestic reprocessing and burner reactor capability
  - take-back of spent fuel from foreign countries
- 2007/2008 Congress reduced GNEP funding
- 2009 domestic aspect of GNEP ended, but DOE moved ahead with reprocessing R&D and industry remained interested in domestic reprocessing

Historical Perspective (cont.)

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- 2008 - 2013 NRC received letters from four companies supporting update of reprocessing regulatory framework
- 2009 NRC conducted a gap analysis of the reprocessing regulation (reprocessing regs to be in Part 70)
  - 23 gaps identified (14 high priority, 5 medium priority)
- 2011 Draft Regulatory Basis
  - 19 high and medium priority gaps addressed
  - Part 7x recommended for reprocessing

Historical Perspective (cont.)

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- 2013 (Aug) staff provided the Commission its resource estimate for completing Part 7x rulemaking activities
- 2013 (Nov) Commission directed staff to complete the regulatory basis for Gap 5 only
- 2016 (Oct) NRC suspended work on Part 7x rulemaking
  - budgetary constraints
  - apparent lack of industry interest in constructing and operating a commercial spent fuel reprocessing facility in the United States

Recent Public Engagement

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- NRC held a public meeting on March 4, 2020, to seek stakeholder input on rulemaking

- Posed two discussion questions to participants:
  - Should the NRC discontinue Part 7x rulemaking?
  - What is the intention of industry with regard to the construction, licensing and operation of spent fuel reprocessing facilities?

- Several organizations and many public citizens opposed reprocessing on safety and environmental grounds

- Some industry representatives voiced support for continuing the rulemaking indicating that having a better framework of regulations would encourage companies to engage in reprocessing of spent fuel

- NuScale commented that potential customers in foreign nations have expressed interest in a U.S. fuel take-back option that involves reprocessing

Current Status

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- The Commission is expecting a final technical basis on the Gap 5 resolution and proposed path forward on Part 7x rulemaking in early 2021

- Pending NEI's letter to the NRC anticipated around the end of May 2020 regarding its position on reprocessing, the staff intends to inform the Commission in a COMSECY of its recommendation regarding reprocessing rulemaking

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Background Slides

References

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- SECY-06-0066, “Regulatory and Resource Implications of a Department of Energy Spent Nuclear Fuel Recycling Program,” dated March 22, 2006 (ADAMS Accession No. ML060370037).

- SECY-09-0082, “Update on Reprocessing Regulatory Framework - Summary of Gap Analysis,” dated May 28, 2009 (ADAMS Accession No. ML091520243).

- SECY-11-0163, “Reprocessing Rulemaking: Draft Regulatory Basis and Path Forward,” dated November 18, 2011 (ADAMS Accession No. ML113202350).

- SRM-SECY-11-0163, “Reprocessing Rulemaking: Draft Regulatory Basis and Path Forward,” dated August 30, 2012 (ADAMS Accession No. ML122430189).

References (cont.)

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- SECY-13-0093, “Reprocessing Regulatory Framework – Status and Next Steps,” dated August 30, 2013 (ADAMS Accession No. ML13178A243).

- SRM-SECY-13-0093, “Reprocessing Regulatory Framework – Status and Next Steps,” dated November 4, 2013 (ADAMS Accession No. ML13308A403).

Gap Summaries

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- Gap 1 - Licensing under Part 50 regulations could require many exemptions since these have always focused, for the most part, on reactors
- Gap 2 – The current Part 72 regulations do not provide for interim, commercial independent storage of solidified HLW from reprocessing facilities
- Gap 3 – The NRC lacks regulations defining waste incidental to reprocessing, since not all waste such as HLW tank residues, chopped and leached fuel hulls, irradiated fuel hardware, and reprocessing facility equipment is HLW. This would result in regulatory uncertainty for an applicant with regard to differentiating HLW from incidental wastes produced at its facility.
- Gap 4 - 10 CFR 74.51, currently excludes irradiated fuel reprocessing facilities from Category 1 MC&A requirements
- Gap 5 – Part 50 does not require risk assessment for reprocessing nor is there any associated guidance for conducting risk assessments for reprocessing such as an enhanced ISA or a PRA

Gap Summaries (cont.)

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- Gap 6 – The current regulations do not define terms such as reprocessing, recycling or vitrification
- Gap 7 – Part 55 does not require operator licensing for reprocessing facilities
- Gap 8 – The security categorization schemes in Part 73 and 74 may place an undue burden on licensees for portions of their reprocessing facilities
- Gap 9 – Part 50 does not contain any General Design Criteria for reprocessing facilities. The NRC staff identified 78 potential GDCs for reprocessing in its draft regulatory basis document.
- Gap 10 – Part 50 does not allow one-step licensing for reprocessing facilities
- Gap 11 – Part 50 does not contain criteria for identifying technical specifications for reprocessing facilities as it does for reactors

Gap Summaries (cont.)

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- Gap 12 - Price Anderson protection and indemnity fees and amounts for reprocessing facilities are currently not included in Part 140
- Gap 13 – The scope of Part 170 does not include reprocessing outside of Part 50
- Gap 14 – Part 171 does not address annual fees for a reprocessing facility
- Gap 15 – Potential long-term storage of HLW at a reprocessing facility will need to be addressed
- Gap 16 - The tables in 10 CFR 61.55, “Waste Classification,” do not include all reprocessing-related radionuclides. As a result, some waste streams may be considered Class A but may not be generally acceptable for near surface disposal.
- Gap 17 - There are no existing regulations for a diversion path analysis requirement for a reprocessing facility under Part 74

Gap Summaries (cont.)

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- Gap 18 – 10 CFR 74 does not appropriately address material accounting timeliness and goal quantities for a reprocessing facility
- Gap 19 – Part 70 does not adequately address effluent controls and monitoring for reprocessing facilities
- Gap 20 - Existing regulations do not address security risks for certain fissile material other than uranium and plutonium
- Gap 21 – Tables S-3 and S-4 of Part 51 do not address a closed fuel cycle involving reprocessing
- Gap 22 – Part 70 does not adequately address 1-step vs 2-step licensing
- Gap 23 – Part 110 Appendix I “Illustrative List of Reprocessing Plant Components under NRC Export Licensing Authority,” does not include equipment related to pyroprocessing or vitrification

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Category II Fuel Cycle Facility Security

Tim Harris, Senior Program Manager
Materials Security Branch
Division of Physical and Cyber Security Policy
Office of Nuclear Security and Incident Response

Topics

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- Current NRC Approach
- Pre-application Discussions
- Supplemental Security Measures

Current Approach

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- Use a risk-informed analysis on a case-by-case basis
- Use site-specific license conditions
- Ensure that requirements are fairly and reasonably applied
- Continue to interface with the interagency community

Pre-application Discussions

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- Applicant describes
  - Facility setting
  - Facility processes
  - Types of materials (physical/chemical forms, enrichment, quantity)
  - Facility Layout
  - Material flow (transportation, storage, use)

Regulatory Discussions

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- Applicable Regulatory Requirements
- Available Guidance
- Available Reference material
- Information protection

10 CFR 73.67(d) – Fixed Site

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- Use the material only within a controlled access area
- Store the material within a vault-type room
- Monitor controlled access area with an intrusion alarm
- Conduct screening of individuals with unescorted access
- Develop and maintain a controlled badging and lock system
- Establish a security organization of at least one watchman per shift able to assess and respond
- Provide a communication capability between the security organization and appropriate response force
- Search on a random basis vehicles and packages leaving the controlled access areas
- Establish and maintain written response procedures

Supplemental Measures

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- Discussions will be iterative and interactive
- Potential supplemental security measures will be site-specific
- Security could be zoned/partitioned
- Security can be achieved in multiple ways that balance the need to detect, assess, and delay potential adversaries and effectively respond to potential threats
- Applied fairly and reasonably

Questions

Additional Slides

Existing Requirements – In Transit

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- Provide advance notification
- Check the integrity of the container and locks or seals prior to shipment and upon receipt of the shipment
- Notify the shipper of receipt of the material
- Arrange for telephone or radio communications between the transport and the licensee
- Minimize the time that the material is in transit
- Conduct screening of all licensee employees involved in the transportation
- Establish and maintain written response procedures
- Initiate immediately a trace investigation of any shipment that is determined to be lost

Potential Supplemental Measures – Fixed Sites

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- Better defined access controls (background checks)
- Random entry searches
- Greater control over material during use
- Alarm station
- Maintenance program

Potential Supplemental Measures – Fixed Sites

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- For site with larger quantities, the following may also apply
  - Protected area
  - Armed guards
  - Expanded intrusion and detection

Potential Supplemental Measures – In Transit

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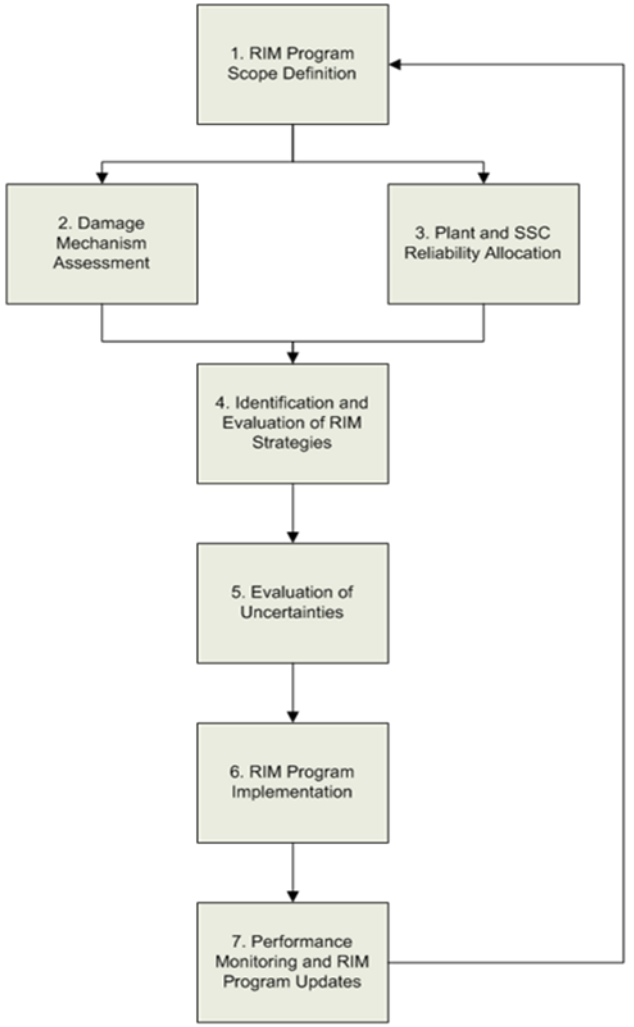
- Transfers occur in controlled access area
- Increased key control
- Transport in closed and locked conveyance
- Increased searches
- Increased custody verification

In-Service Inspection Programs for Advanced Reactors

- The American Society of Mechanical Engineers, Boiler & Pressure Vessel Code, Section XI, Division 2 has developed a probabilistic risk based approach for establishing inspection and monitoring activities for advanced reactors.
  - ASME Code, Section XI, Division 2
    - Reliability and Integrity Management (RIM)
- ASME has requested NRC review and endorse the code in 10 CFR 50.55a

RIM Process Overview

- Step 1 Determine Scope of SSCs for RIM Program
- Step 2 Evaluate SSC Damage Mechanisms
- Step 3 Determine Plant and SSC Level Reliability and Capability Requirements
- Step 4 Identify and Evaluate RIM Strategies to Achieve Reliability Targets
- Step 5 Evaluate Uncertainties in Reliability Performance
- Step 6 Implement RIM Program
- Step 7 Monitor SSC Reliability Performance and Update RIM Program



Interest in RIM Use

- The NRC is considering the ASME request. NRC management wants to understand the interest from potential vendors prior to expending resources and initiating a review.
- If there is interest in using RIM in a future application submittal, please contact one of the individuals below, preferably by May 22, 2020.
  - Tim Lupold: timothy.Lupold@nrc.gov
  - Bruce Lin: Bruce.Lin@nrc.gov

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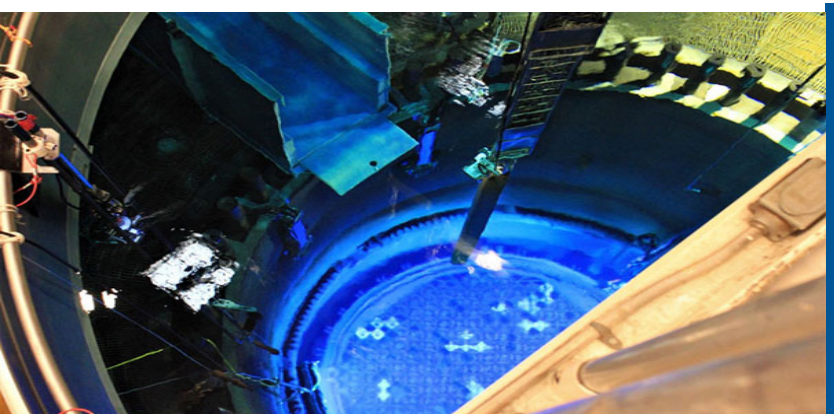
Development of a New Inspection and Oversight Framework Document to Support Construction and Operation of Advanced Reactors

NRR/DANU/UARP – Maryam Khan, Joe Sebrosky (PM)

May 7, 2020

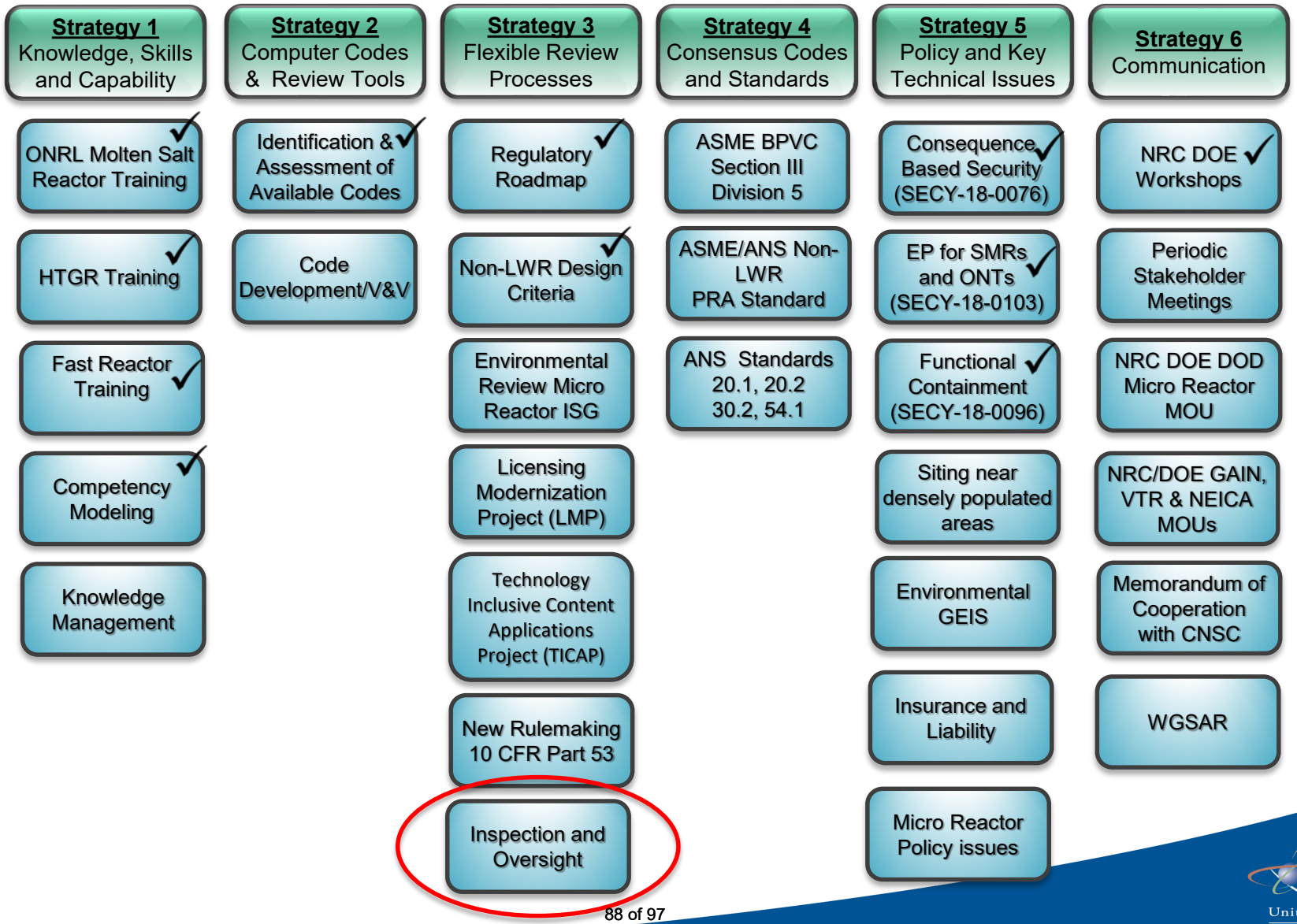


- Purpose
  - Brief Stakeholders on NRC staff's intention to place a contract in Fiscal Year 2021 to develop a new inspection and oversight framework document to support construction and operation of advanced reactors
- Outcome
  - Stakeholders have an understanding of the reason for a new framework and near-term path forward (issue contract)

Agenda

- Background
- Advanced Reactors within the Scope of the Work
- Examples of Issues to be Considered Under Contract
- Time Fame
- Questions
- Wrapup

Background – Implementation Action Plans



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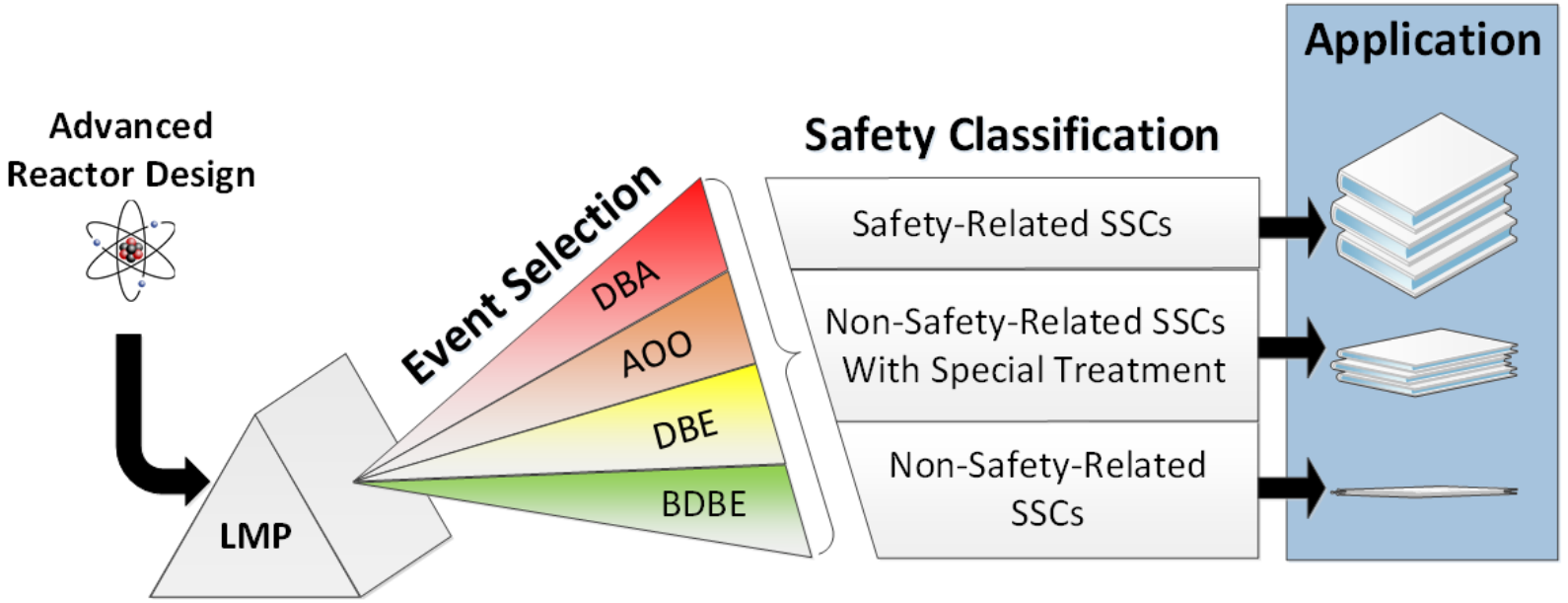
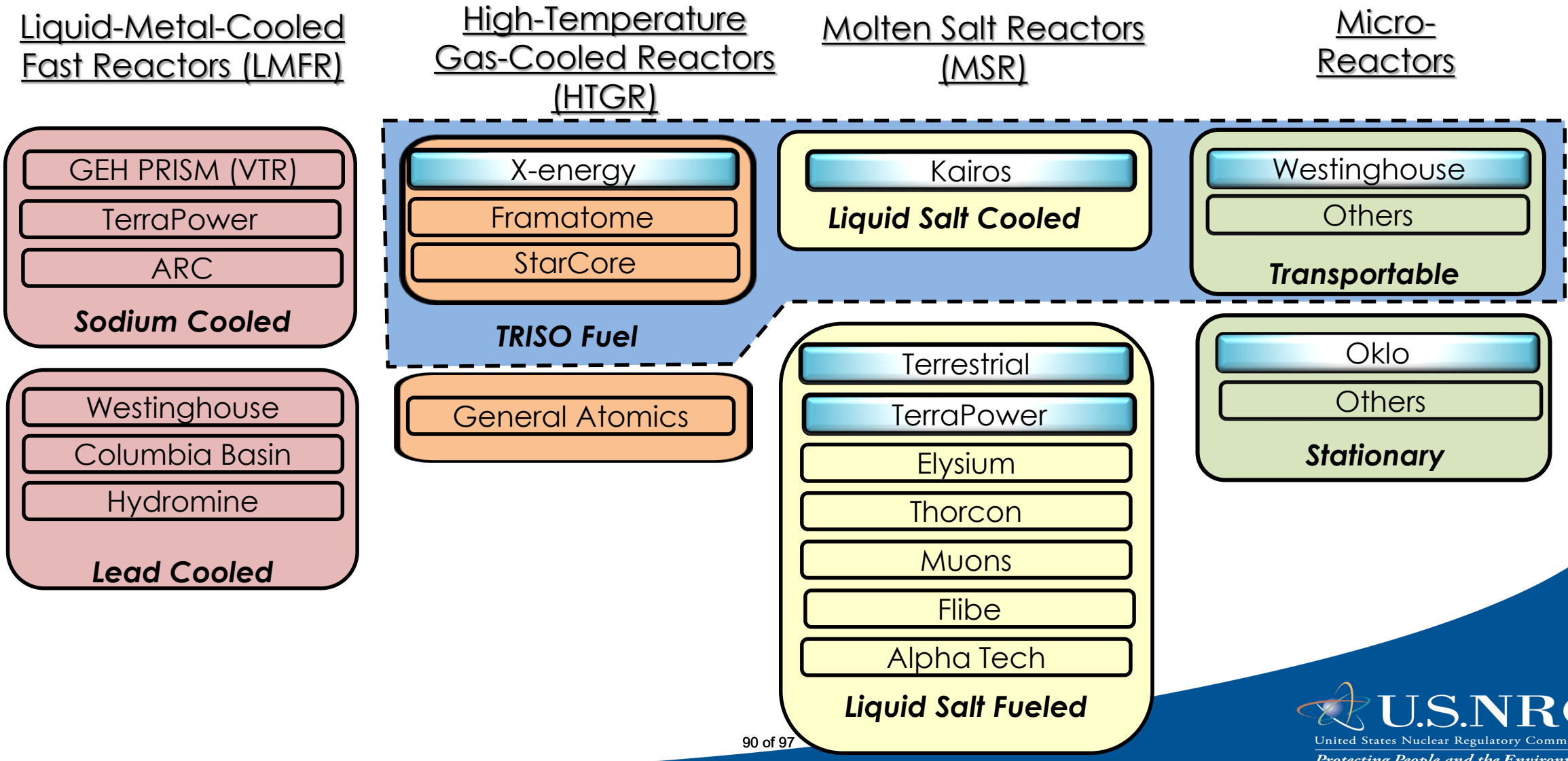
Background – Licensing Modernization Project

- Described in SECY-19-0117
  - Technology inclusive, risk informed performance based methodology
  - Major elements of the approach are:
    - identifying licensing basis events (LBEs);
    - classifying structures, systems, and components (SSCs);
    - and assessing the adequacy of defense in depth (DID).

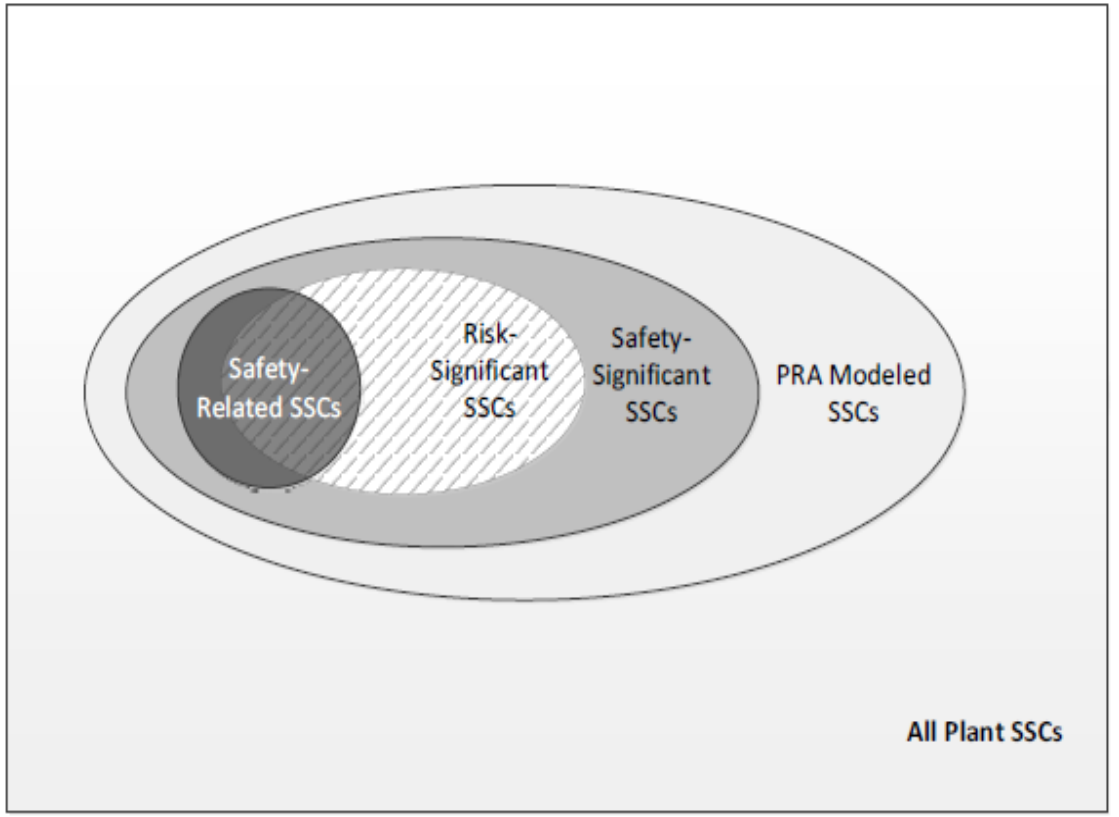


Background - Advanced Reactor Designs



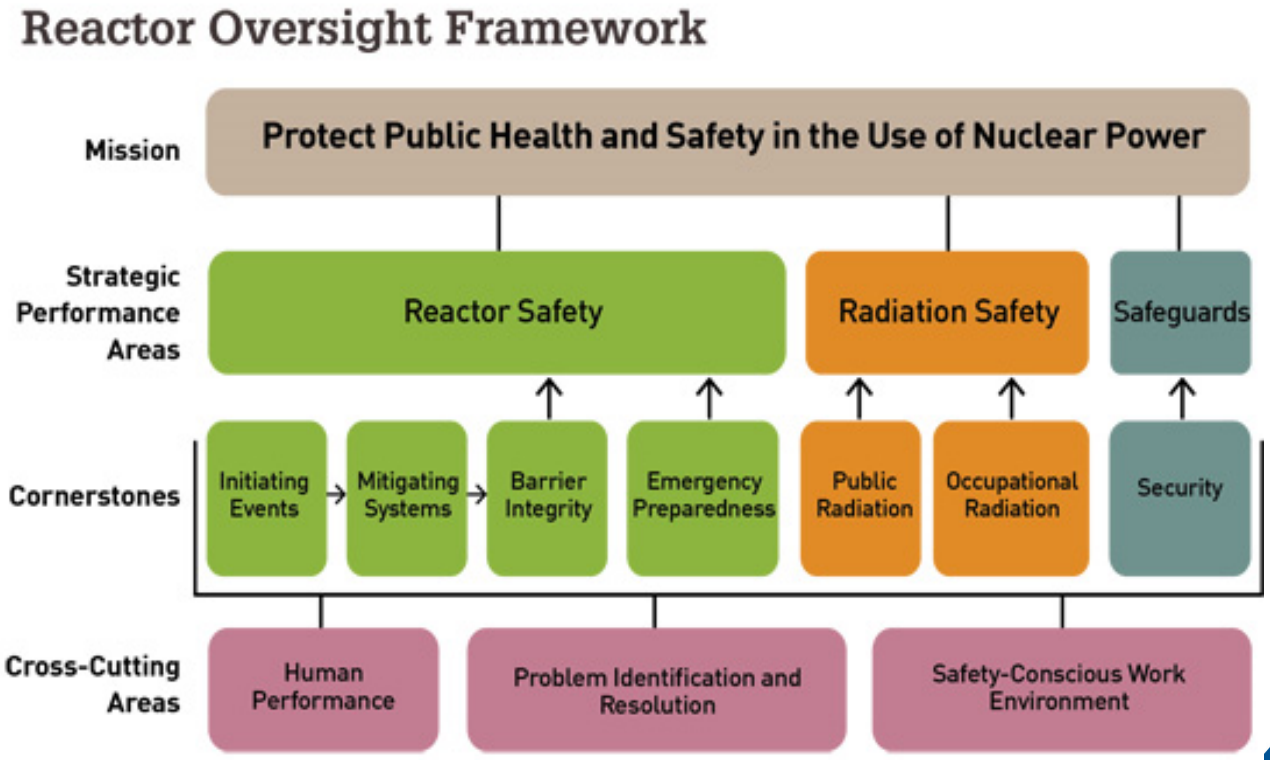
Background - Results of Advanced Reactor LMP Table Top Exercises

- Several Table Top Exercises Performed
  - Limited number of safety-related SSCs identified
  - Some Safety-related SSCs that have been identified do not have a nexus to SSCs found in large light water reactors
  - Non safety related SSCs with special treatment an outcome of the LMP approach



Background

- Challenges with Current Inspection and Oversight Programs (examples)
  - Micoreactor
    - Could have limited technical specifications and inspections tests analysis and acceptance criteria (ITAAC)
    - Oversight could be more like a Research and Test Reactor than a large light water reactor
  - Molten salt fueled reactors
    - There is not a traditional containment
    - Fission product inventory inside reactor and outside reactor in waste tanks
    - Complex waste tanks to ensure decay heat is removed and criticality is prevented



Advanced Reactors within the Scope of the Work

- Non light water reactors
- Small modular reactors (i.e., less than 300 MWe)
- Fusion Reactors

Examples of Issues to be Considered Under Contract

- Covers both construction inspection and oversight and operating plant inspection and oversight
- Prioritize development of microreactor guidance first
- Use of risk insights and concepts from LMP process
- Consideration of advanced reactor construction techniques including reactors being assembled in a factory and shipped to the site
- Flexible such that it can be used under Part 50 or Part 52 process
- Includes development of risk-informed performance indicators
- Includes consideration of “virtual inspections.”

Timeframe

- Spring 2020 – solicit request for proposals from commercial contractors interested in the work
- Summer 2020 – finalize statement of work, subject to the availability of funds
- October 1, 2020 – work begins
- Envision stakeholder interactions starting in Calendar Year 2021
- December 2021 – final version of framework document provided to NRC
- Inspection procedures and manual chapters (as appropriate) to be developed longer term based on concepts identified in framework document

Questions

Future Meeting Planning and Open Discussion

2020 Tentative Schedule for Periodic Stakeholder Meetings
June 18
August 6
September 24
November 5