
# Presentations for February 1, 2018 Public Meeting
# Regulatory Improvements for Advanced Reactors

In order of discussion, the meeting included the following topics and presentations:

1) NRC Slides
   - Opening Outline
   - Future Meetings

2) NRC Slides - Advanced Reactor Program Status

3) NRC Slides - Environmental Reviews

4) Licensing Modernization Project (LMP) Defense in Depth
   - NRC comments/questions available in ADAMS – Acc. No. ML18024A595
   - LMP Slides (Defense in depth, Path Forward, & Functional Containment)

5) NEI Slides – Streamlined/Predictable Licensing Pathway

6) NRC Slides – Functional Containment Performance Criteria

7) NRC non-LWR Policy Table – Acc. No. ML18010A484

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# Public Meeting on Possible Regulatory Process Improvements for Advanced Reactor Designs

February 1, 2018

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# Public Meeting

- Telephone Bridge

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Opportunities for public comments and questions at designated times

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# Outline

- ❑ Introductions
- ❑ Advanced Reactor Program Status (SECY Paper)
- ❑ Environmental Reviews
- ❑ Defense in Depth
  - NRC Staff Comments
  - Licensing Modernization Project

- ❑ Streamlined/Predictable Licensing Pathway
- ❑ Functional Containment Performance Criteria
- ❑ Path Forward on Licensing Guidance
- ❑ Policy Table & Future Meetings

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# Advanced Reactor Program Status

SECY-18-0011
ADAMS Acc. No. ML17334B217
Publicly Available on February 9th, 2018

Status SECY

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# Environmental Reviews

Env. Reviews

Advanced Reactor Program

# Defense in Depth

ADAMS Acc No. ML18024A595

Staff Feedback

LMP Slides

# Streamlined/Predictable Licensing Pathway

ADAMS Acc No. ML18024A742

Slides → Letter

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# Functional Containment Performance Criteria


Redline/Strikeout Version:
ADAMS Acc. No. ML18031A721

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# Path Forward

LMP Slides

# Policy Table


ADAMS Acc. No. ML18010A484

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# Future Stakeholder Meetings

| | |
|---|---|
| March 14 | Public Meeting - Licensing Modernization |
| Mar 22<br>?? | |
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| | |
| May 3 | |
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| | |
| Jun 14 | |
| | |

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# ACRS Schedule (tentative)

| Date | Committee | Topic |
|---|---|---|
| Feb 7 | Sub | ARDC |
| Feb 22 | Sub | Functional Containment |
| March | Full | ARDC |
| Apr | Full | Functional Containment |
| Jun 19 | Sub | RIPB Guidance |
| Aug 22 | Sub | EP Rulemaking |
| Oct | Full | EP Rulemaking |
| Oct 30 | Sub | RIPB Guidance |

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# Public Comments / Questions

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# NRC Advanced Reactor Program Status Summary

Lucieann Vechioli
Project Manager
February 1st, 2018

# Outline

- Advanced Reactor Program Status SECY Paper
- Vision and Strategy
- Implementation Action Plans
  - Strategies
- Advanced Reactor Landscape

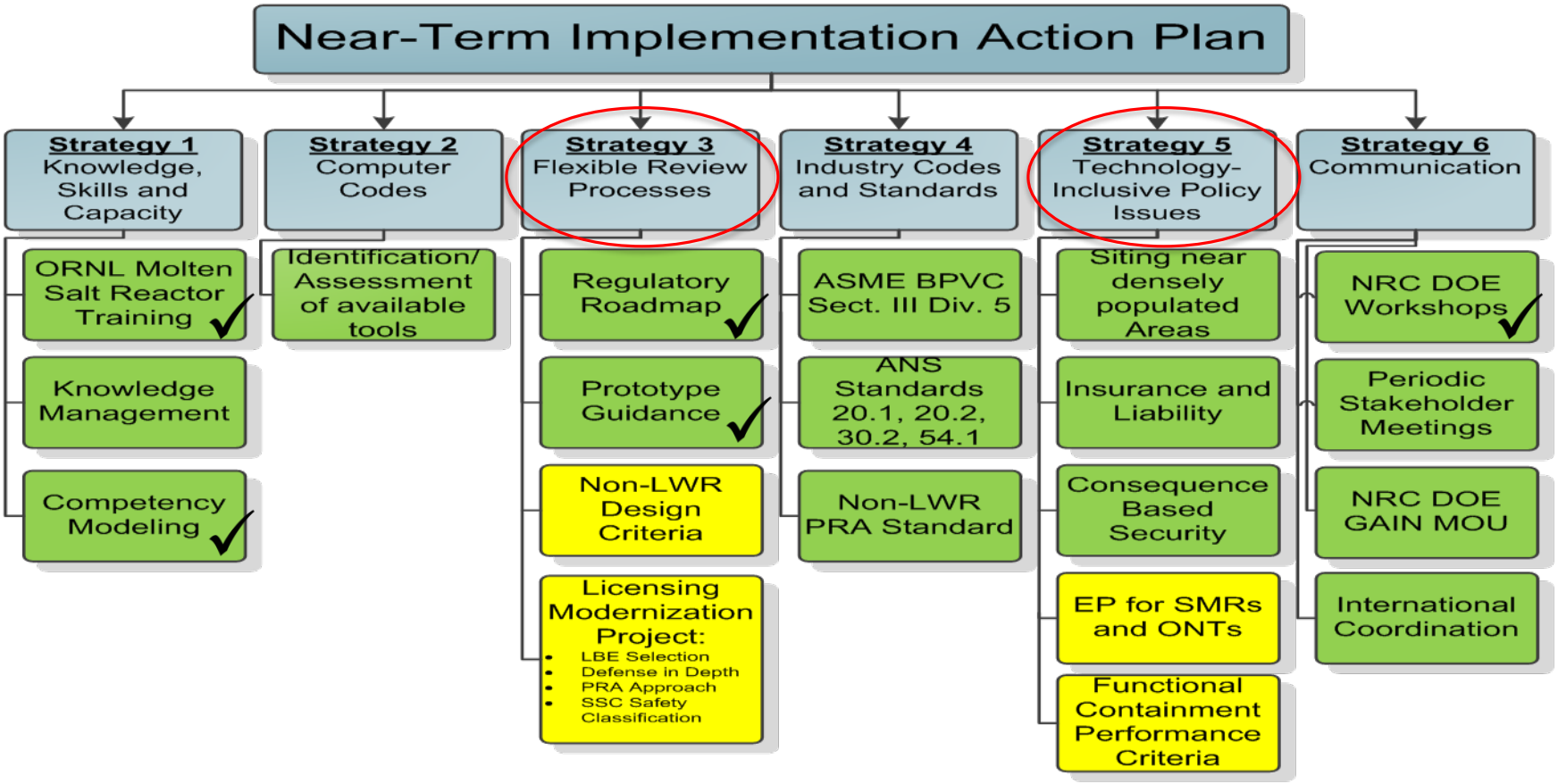
# Advanced Reactor Program Status SECY Paper

- Info paper discuss FY2017 accomplishments and activities planned for FY2018.
  - Enclosure 1 - Implementation Action Plan Strategies Progress and Future Plan
  - Enclosure 2 - Landscape
- SECY-18-0011 ML17334B217 – Public Available on February 9th, 2018

# Vision and Strategy and Implementation Action Plans (IAPs)

- NRC Vision and Strategy: "Safely Achieving Effective and Efficient Non-LWR Mission Readiness" - December 2016
- Implementation Action Plans (IAPs)
  - Near-term (within 5 years)
  - Mid-term (5-10 years)
  - Long-term (beyond 10 years)

# IAPs – Making Progress in the Near-Term



# Strategy 1 – Knowledge, Technical Skills, and Capacity

- Molten Salt Reactor (MSR) Training
- Knowledge Management
- Additional Training

# Strategy 2 – Computer Codes and Tools

- Accomplishments:
  - Initial screening of analysis codes for design-basis and beyond design-basis event simulation
  - MSR Phenomena Identification and Ranking Table (PIRT) exercise
  - Probabilistic Risk Assessment (PRA) report
- Strategy 2 Near-term Implementation Action Plan Progress Report for FY2017" issued in Nov, 2017 - ML17319A550

# Strategy 3 – Regulatory Framework

- Staged Licensing Process –
  - Draft "Regulatory Review Roadmap for Non-LWR"
    - Prototype Guidance
- Non-LWR Design Criteria

- Licensing Modernization Project
  - LBE Selection Process paper
  - PRA Approach Paper
  - Safety Classification and Performance Criteria for SSCs
  - RIPB Evaluation of Defense-in-Depth Adequacy Paper

# Strategy 3 – Regulatory Framework

- Additional Guidance Development Activities Planned for FY2018
  - High Assay Low Enriched Uranium (HALEU)
  - RTR Guidance
  - Fuel Qualification

# Strategy 4 Consensus Codes and Standards

- ASME Section III Division 5
- ASME/ANS Non-LWR PRA Standard
- Standards Forum
  - 2nd Annual Standards Forum - September 26, 2017
  - Workshop -May 2nd, 2018 Non-LWR codes and standards priorities

# Strategy 4 – Codes and Standards Cont.

| American Nuclear Society Standards: Standard /Committee |
| --- |
| Research and Advanced Reactor Consensus Committee |
| Risk-informed , Performance-based, Principles and Policy Committee |
| ANS 53.1 “Nuclear Safety Design Process for Modular Helium-Cooled Reactor Plants |
| ANS 54.1 “Nuclear Safety Criteria and Design Process for Liquid-Sodium-Cooled Nuclear Power Plants” |
| ANS 20.1 “Nuclear Safety Criteria and Design Process for Fluoride Salt-Cooled High-Temperature Reactor Nuclear Power Plants” |
| ANS 20.2 “Nuclear Safety Design Criteria and Functional Performance Requirements for Liquid-Fuel Molten Salt Reactor Nuclear Power Plants” |
| ANS 30.1 “Integrating Risk and Performance Objectives into New Reactor Nuclear Safety Designs” (proposed) |
| ANS 30.2 “Categorization and Classification of Structures, Systems, and Components for New Nuclear Power Plants” (proposed) |

# Strategy 5 – Policy Issues

- Siting in populated areas
- Emergency Preparedness
- Security
- Containment Functional Performance

# Strategy 6 – Communications

- NRC/DOE Workshops – Periodic Stakeholders meetings
- Advanced Reactor Program SECY paper
- Coordination with Department of Energy
- Upcoming briefings and meetings
- External working groups and meetings
  - International

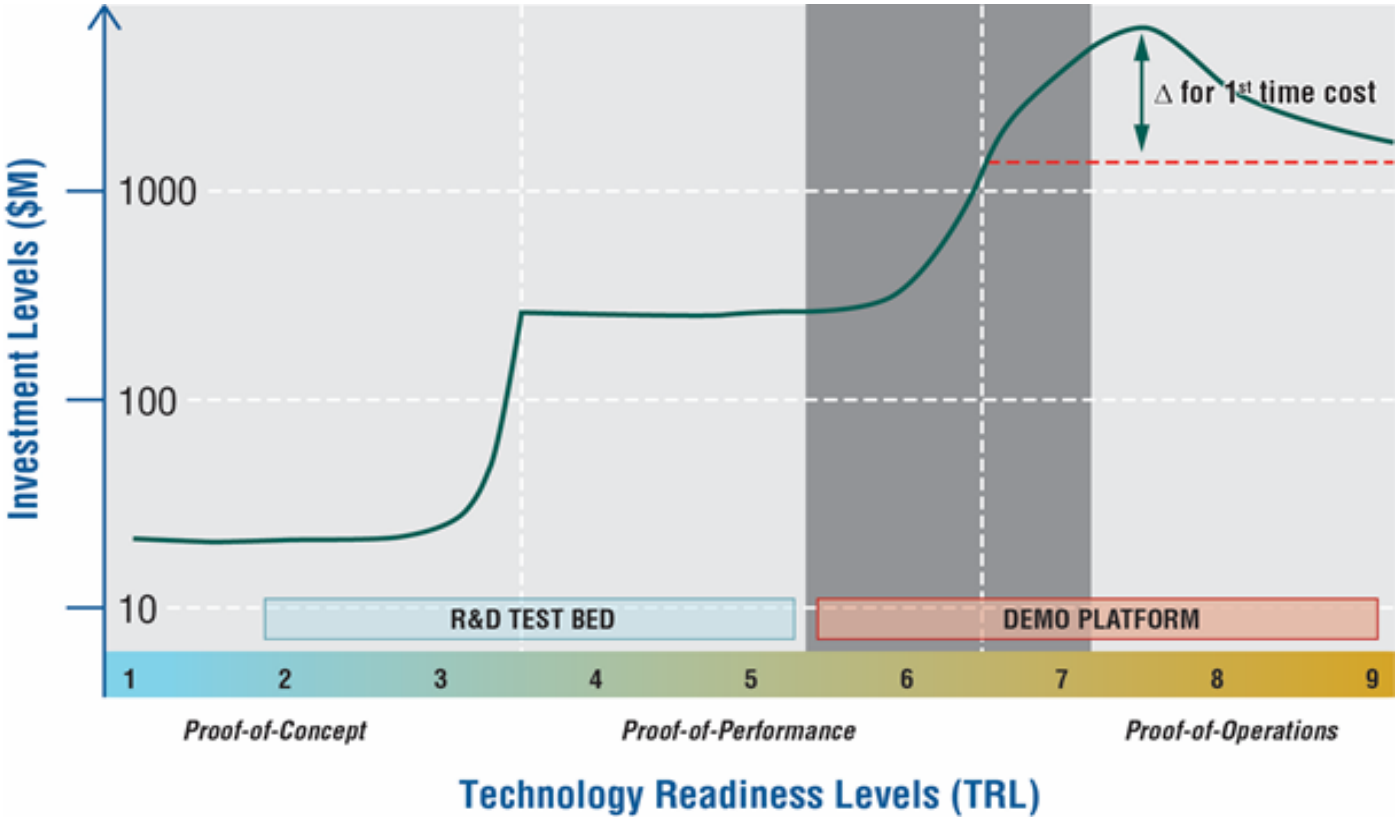
# Strategy 6 – Communications Cont.

- 2018 ACRS Interactions for Non-LWRs
  - Non-LWR Design Criteria – Regulatory Guide 1.232
    - 2/7/18 – Future Plant Design Subcommittee
    - March 2018 – Full Committee
  - Functional Containment performance SECY Paper
    - 2/22/18 – Future Plant Design Subcommittee
    - April 2018 – Full Committee
  - Licensing Modernization Project
    - 6/19/2018 – Future Plant Design Subcommittee
    - 10/30/2018 – Future Plant Design Subcommittee
    - December 2018 – Full Committee
  - EP Rule
    - 8/22/18 - Future Plant Design Subcommittee
    - October 2018 – Full Committee

# Landscape – Technology Inclusive

- DOE
  - Gateway for Accelerated Innovation in Nuclear (GAIN)
  - Advanced Reactor Technologies (ART) Program
  - Funding Opportunity Announcements (FOAs)
  - Nuclear Energy University Program (NEUP)
  - Nuclear Energy Enabling Technologies Program (NEET)
  - Nuclear Energy Advanced Modeling and Simulation (NEAMS)
  - Advanced Research Projects Agency – Energy (ARPE-E)
- Industry Efforts, NGOs, and International Organizations

# Advanced Reactor Landscape




MSRs

SFRs
HTGRs



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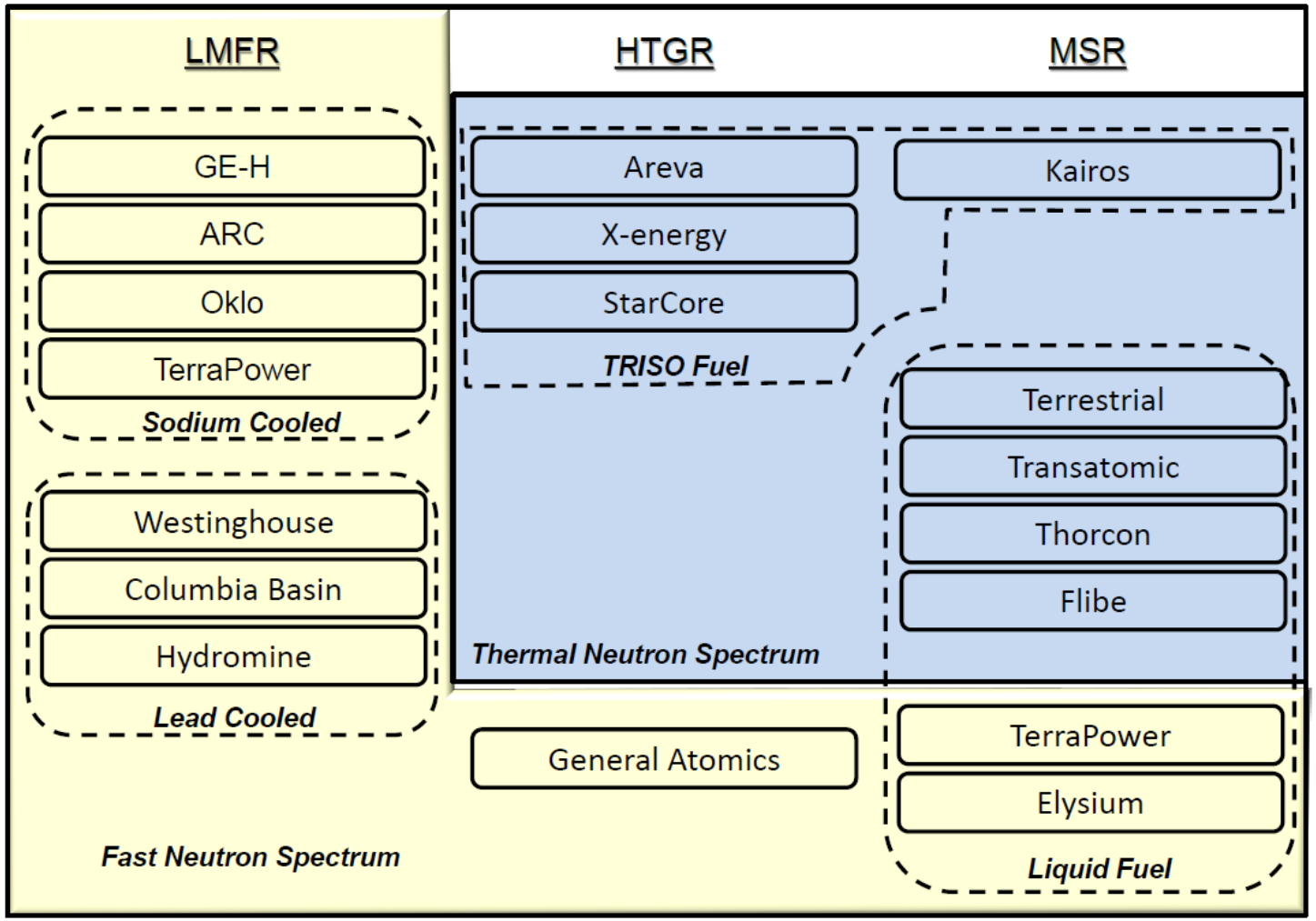
# Advanced Reactor Landscape



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# Summary

- NRC is executing its Vision and Strategy
  - Transitioned from strategic planning to execution of implementation action plans to prepare for anticipated applications
- Near term-priority is on advancing risk-informed and performance-based approaches and resolution of key policy issues
- Significant outreach and close coordination with external stakeholders

# References

- Advanced Reactor Program Status SECY Paper ML17334B217
- Vision and Strategy (ML16356A670)
- Implementation Action Plans
  - Near-Term (ML17165A069)
  - Mid- and Long-Term (ML17164A173)
- Near-term Implementation Action Plan Progress Report for FY2017 (ML17319A550)
- Regulatory Review Roadmap for Non-LWR (ML17312B567)
- Draft Regulatory Guide DG-1330, "Guidance for Developing Principal Design Criteria for Non-Light Water Reactors" (ML16301A307)
- LBE Selection Process paper (ML17104A254)
- PRA Approach Paper (ML17158B543)
- Safety Classification and Performance Criteria for SSCs(ML17290A463)
- Risk -informed Performance-based (RIPB) Evaluation of Defense-in-Depth Adequacy Paper (ML17354B174)
- Siting in populated areas (ML17333B158)
- Emergency Preparedness (ML17206A265)
- Draft Physical Security White Paper (ML17333A524)
- Containment Functional Performance (ML17334A155)

# Questions?

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# NRC'S Environmental Review Advanced Reactors

Jack Cushing
Senior Project Manager
Office of New Reactors

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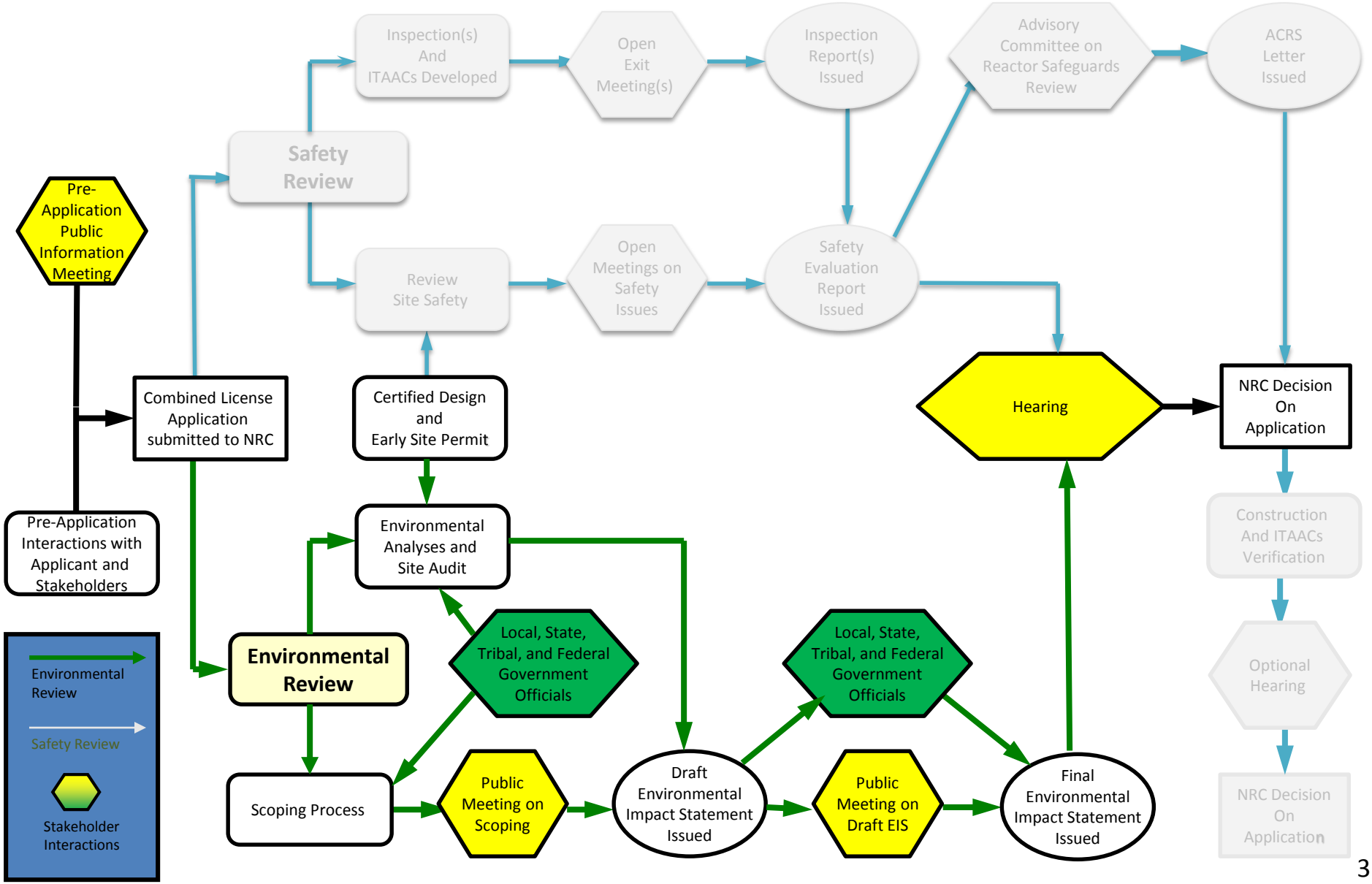
# Regulatory Structure for Environmental COL Review

- National Environmental Policy Act (NEPA) – EIS is the basis for the Federal Agency to make an informed decision
- NRC framework for implementing NEPA includes 10 CFR Part 51; Regulatory Guides 1.206, 4.2, 4.7; Environmental Standard Review Plan (NUREG-1555); and Interim Staff Guidance (ISG)-26 and 27
- Resource agency vs. Regulatory agency
  - Under some statues, NRC has limited responsibilities; e.g., Endangered Species Act, National Historic Preservation Act,
  - Other resource agencies have primary responsibility for implementing most environmental laws; e.g., Clean Water Act, Clean Air Act

# COL Environmental Review



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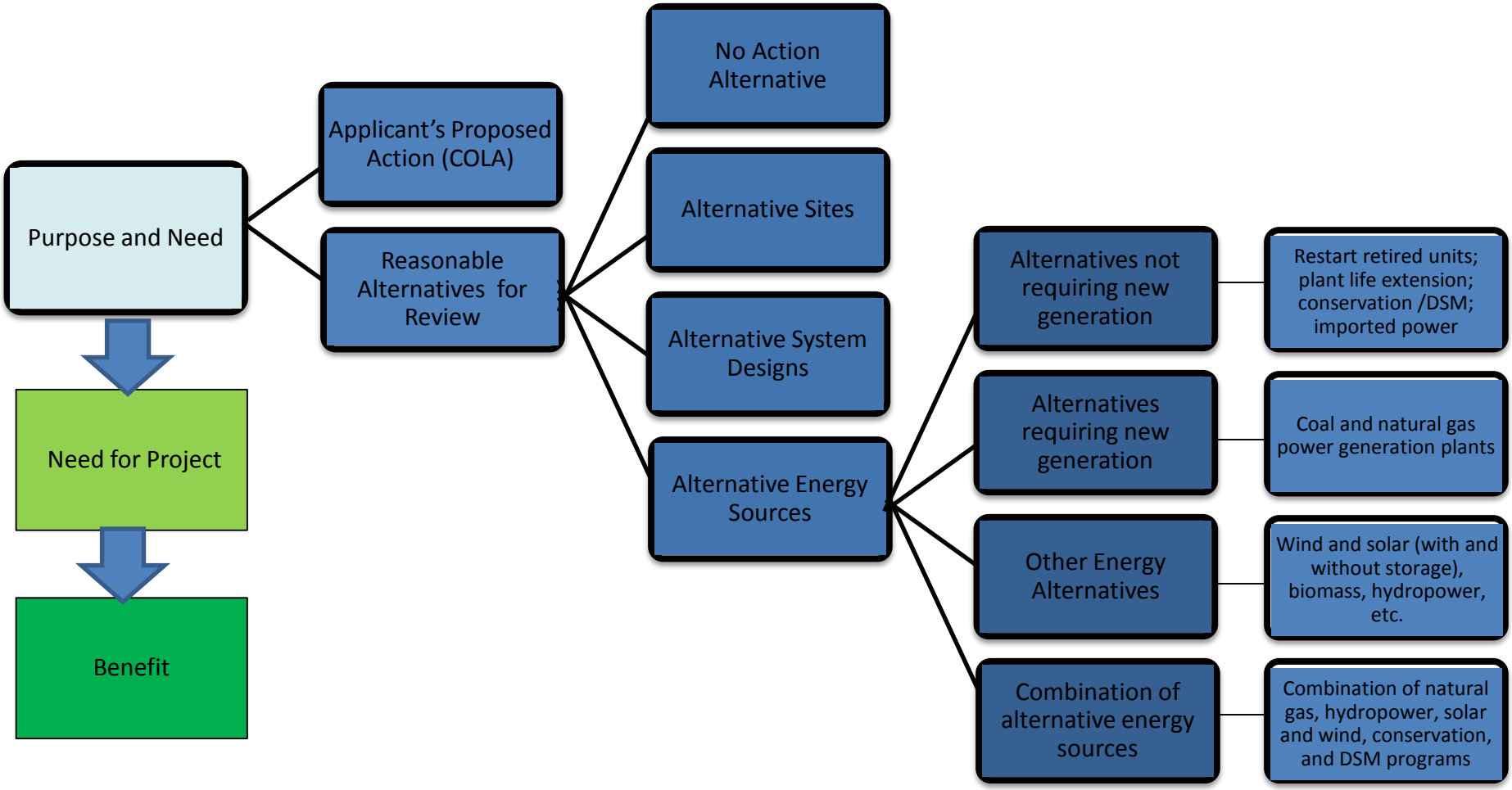
# Pre-Application Interaction

- Encouraged by regulations - 10 CFR 51.40, Early Consultation-Voluntary
  - Staged engagement starting 18 months before application. Increasing engagement with additional subject matter experts.
  - Prepare by engaging State and Federal permitting agencies (NEI 10-7)
  - Know the details of how you plan to build and operate the plant

- Goal high quality application. More efficient review.

# Purpose and Need for a Large LWR:

## Determines reasonable alternatives, need for project, benefit part of cost benefit comparison



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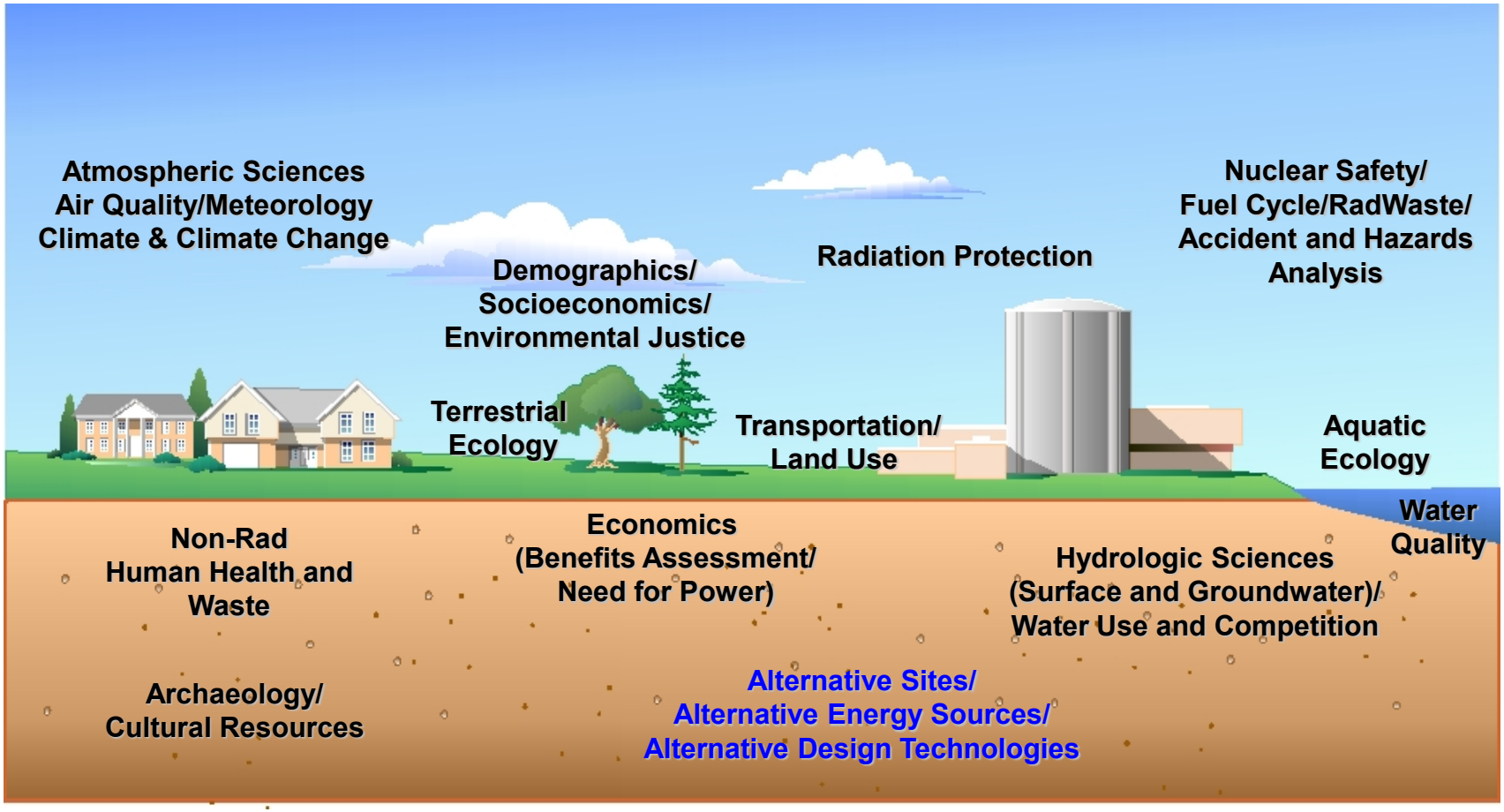
# Resource Areas

## (Addressed by Staff, Contractor, and Sister Agencies under MOUs)



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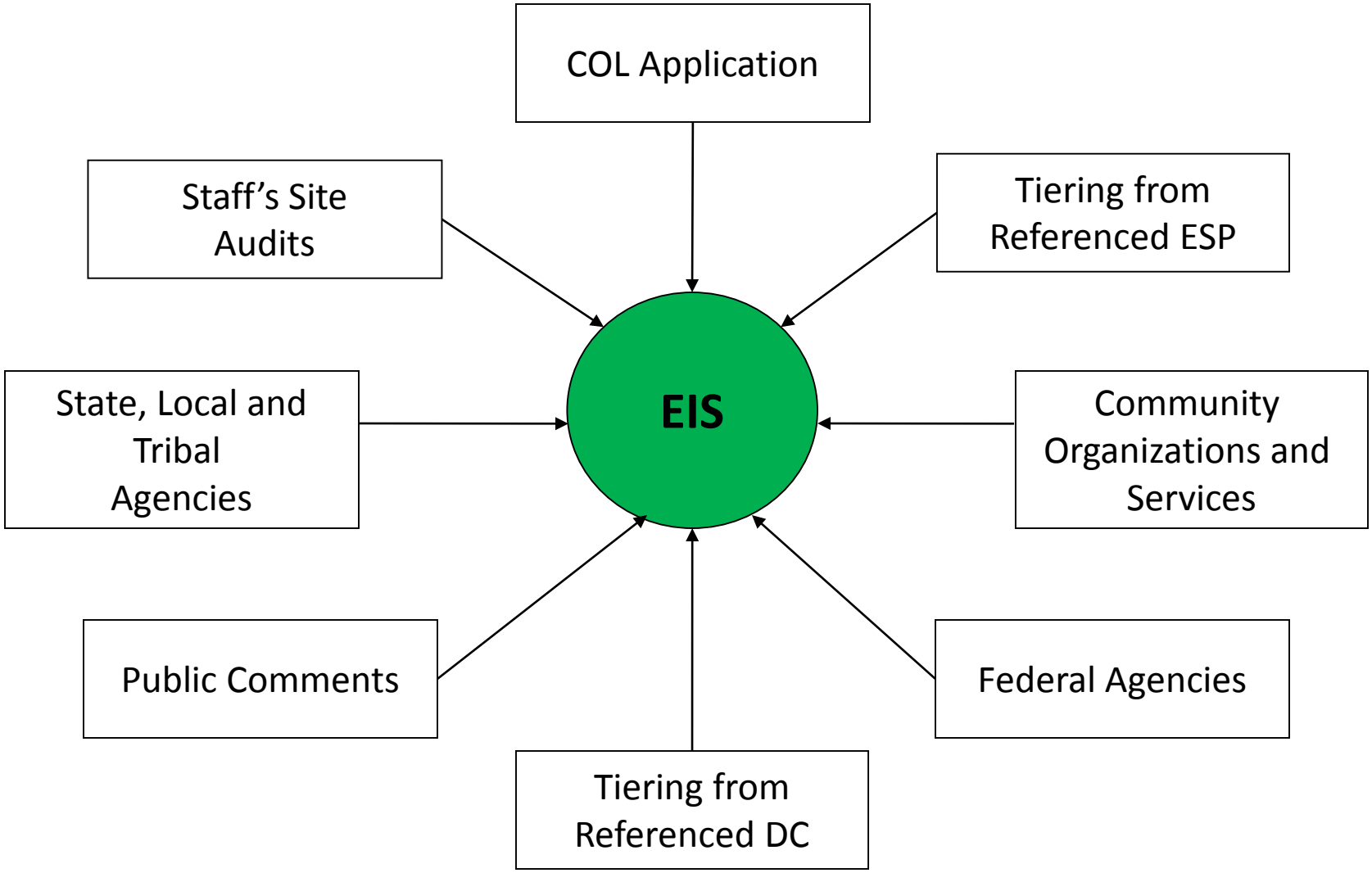
# EIS Information Sources



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# Non-light Water Reactor differences

- Purpose and Need
- Alternatives
- Need for Project
- Benefit of Project
- Level of detail for resource areas

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# Non-light Water Reactor differences(continued)

- Radiological Portion of the Review
  - Radiological Effluents
  - Radwaste
  - Design Basis Accident
  - Severe Accidents and SAMA
  - Fuel Cycle Impacts

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# Guidance

- Regulatory Guides:
  - Draft RG 4.2 Preparation of Environmental Reports for Nuclear Power Stations (being revised)
  - RG 4.7 General Site Suitability Criteria for Nuclear Power Stations
  - RG 4.11 Terrestrial Environmental Studies for Nuclear Power Stations
  - RG 4.24 Aquatic Environmental Studies for Nuclear Power Stations

- NUREG 1555 Environmental Standard Review Plan (being revised)
- Interim Staff Guidance (ISG):
  - ISG-26 Environmental Issues Associated with New Reactors
  - ISG-27 Specific Environmental Guidance for Light Water Small Modular Reactor

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# Questions?

## Contact Information:

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# Licensing Modernization Project

Defense in Depth White Paper

&

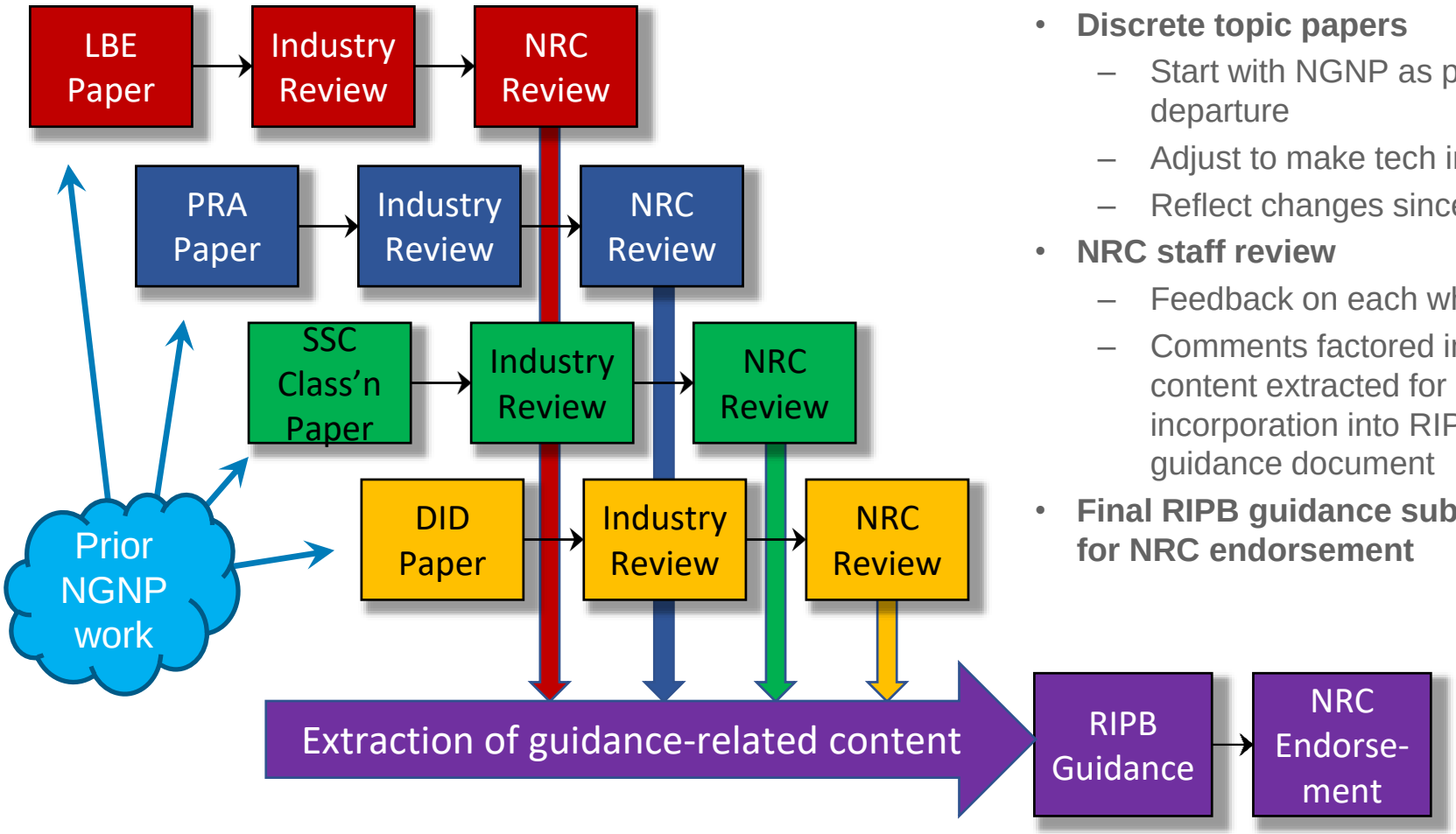
Status Update

February 01, 2018

# Preliminary Responses to NRC DID Paper Comments

- LMP appreciates constructive comments on DID paper
- NRC comment on prevention and mitigation definition
  - Acknowledged; will benefit from further discussion
- NRC comment on reasonable assurance of adequate protection
  - Agree; good to differentiate between SR and NSRST SSCs
  - DID paper attempts to define reproducible criteria
- NRC comment on design vs. licensing process focus
  - Acknowledged; guidance document to focus on licensing process
  - White paper also intended to help implementation by developers
- NRC comment on role of operator actions
  - Acknowledged; will benefit from further discussion
- NRC suggested wording changes
  - In general, changes viewed as improvements; will benefit from further discussion on specifics

# Reminder: Document Development Approach




- **Reflects successful Fukushima approach**
- **Discrete topic papers**
  - Start with NGNP as point of departure
  - Adjust to make tech inclusive
  - Reflect changes since NGNP
- **NRC staff review**
  - Feedback on each white paper
  - Comments factored into content extracted for incorporation into RIPB guidance document
- **Final RIPB guidance submitted for NRC endorsement**

# Project Status

| Activity | Status |
|---|---|
| LBE white paper | Incorporation of comments into white paper in progress; expect to review incorporation of white paper content into guidance document as part of upcoming NRC interactions |
| PRA white paper | |
| SSC white paper | |
| DID white paper | NRC comments under review |
| NRC interactions | Targeting 14 Feb for initial meeting:<br>• Overall structure, format, content<br>• Example inclusion of white paper content<br>• Relationship of related topics (e.g., ARDC) |
| Guidance Document | Sections being drafted based on NRC white paper comments, target Spring 2018 (depending on schedule for NRC interactions) |

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# LMP Comments on Functional Containment Draft SECY

February 01, 2018

# LMP Comments on Draft Functional Containment SECY

- Initial review of updated draft indicates excellent agreement on LMP comments
- Good alignment with LMP TI-RIPB approach
  - Purpose statement on use of TI-RIPB performance criteria applicable to many issues beyond functional containment
  - Event definitions consistent with LMP LBE definitions
  - Use of F-C target to guide design and evaluate risk significance
- Barriers and Levels of Defense
  - Generalization of barrier definition for non-LWRs
  - Level of defense approach recognizes elements of levels of defense beyond just physical barriers
- ARDCs and PDCs
  - Consider making draft SECY more explicit that ARDC-16 may be modified (to reflect limiting radionuclide release) as part of developing RIPB PDCs
- Other comments
  - “F-C target” vs. “F-C curve”
  - Clarification of role of SARRDLs in different LBEs
  - Criteria based on 24 hours after “core damage” problematic for non-LWRs

NUCLEAR ENERGY INSTITUTE

Michael Tschiltz

Senior Director

New Plant, SMR and Advanced Reactors

Nuclear Energy Institute

February 5, 2018

# *Ensuring the Future of U.S. Nuclear Energy*

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# VISION FOR THE FUTURE

- Modernized NRC licensing process
  - Efficient and timely reviews (safety-focused and predictable);
  - Enables development, licensing and deployment of more innovative, cost-competitive and safer nuclear reactor technologies;
  - Identifies a variety of licensing pathways to obtain NRC design approvals and achieve project milestones;
  - Regulatory changes that recognize the enhanced safety and security of advanced reactor designs



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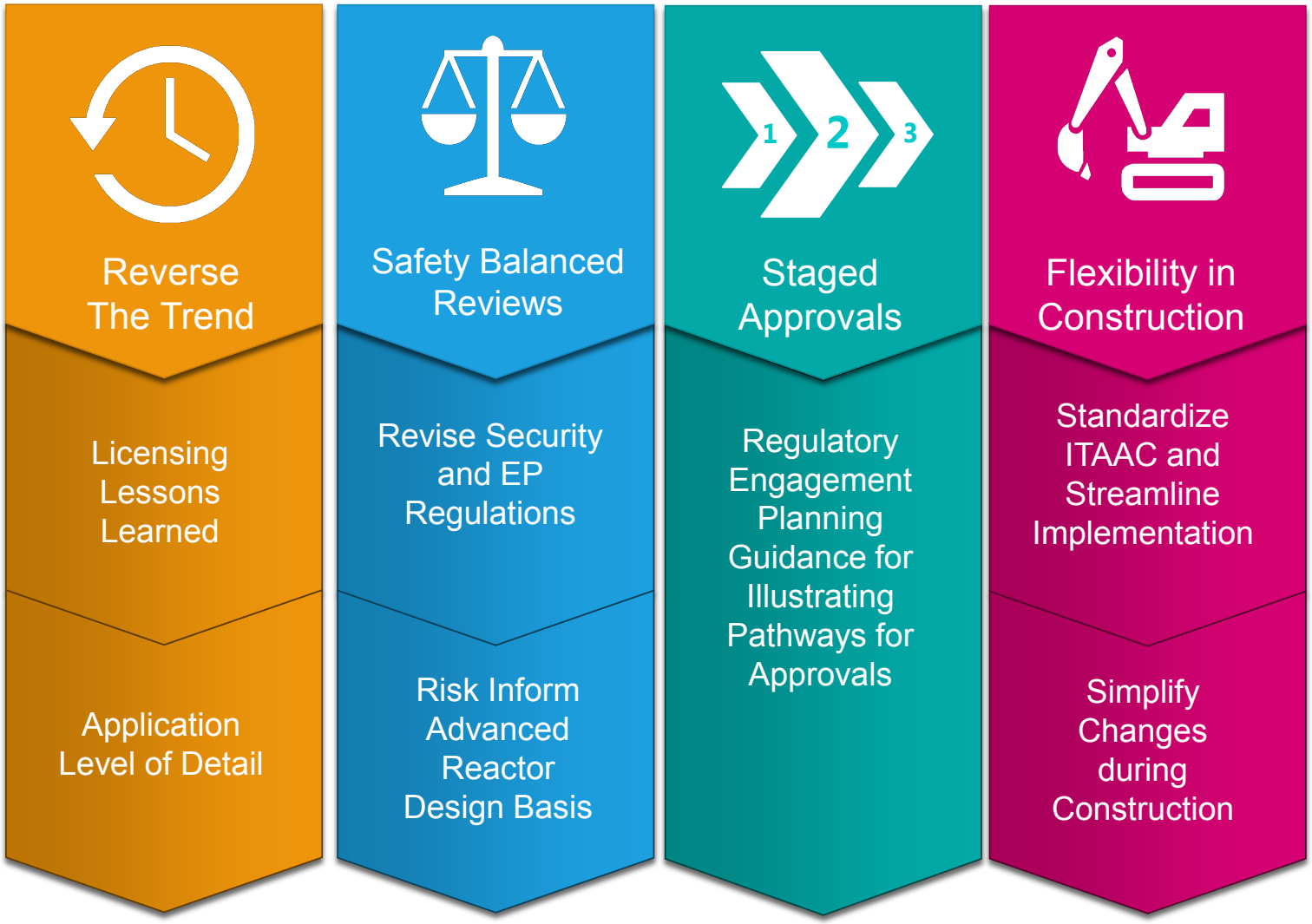
# ENSURING THE FUTURE OF NUCLEAR

## *CREATING A STREAMLINED AND PREDICTABLE LICENSING PATHWAY TO DEPLOYMENT*

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# THE REGULATORY ENVIRONMENT & THE NEED FOR CHANGE

To ensure that advanced reactors are licensed and built in the U.S., near-term regulatory changes are needed.

- These changes should focus on achieving the following near-term objectives:
  - Reversing a trend of increasing regulatory costs and unnecessarily long reviews;
  - Aligning the regulatory framework for advanced reactors with their inherent enhanced safety and simplified design bases;
  - Defining licensing options clearly, including options for staged application and approval; and
  - Providing additional flexibility for changes during construction.



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# REVERSING A TREND OF INCREASING REGULATORY COSTS AND UNNECESSARILY LONG REVIEWS

- NRC accepts level of detail commensurate with safety of design in licensing basis
  - Safety focused reviews
  - More disciplined
  - More closely linked to “reasonable assurance” determination

- Eliminate Tier 2* and reduce the volume of information in licensing basis
- “First Principles” agreed upon for designation of Tier 1 information
- Standardized ITAAC



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# ALIGNING THE REGULATORY FRAMEWORK FOR ADVANCED REACTORS WITH THEIR INHERENT ENHANCED SAFETY AND SIMPLIFIED DESIGN BASES

- Establish emergency planning regulations applicable to advanced reactors
- Establish security regulations applicable to advanced reactors
- Enable safety-focused licensing of advanced reactors through use of NEI guidance developed from the licensing modernization plan white papers and endorsed by NRC.



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# DEFINING LICENSING OPTIONS CLEARLY, INCLUDING OPTIONS FOR STAGED APPLICATION AND APPROVAL

- Designers would benefit from a clearly defined, flexible, staged process for license application approval
  - provides a mechanism for licensing one portion of the design at a time.

- Reduces licensing risk, and enables developers to win customer support, incrementally.

- Options exist today
  - need to be further developed before they can be used with confidence that they are viable, and are unlikely to lead to significant disputes and costly delays.



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# PROVIDING ADDITIONAL FLEXIBILITY FOR CHANGES DURING CONSTRUCTION

- Flexibility to make changes during construction is essential to deployment of new technologies and “first of a kind” designs.

- Recent construction experiences demonstrate the need for greater flexibility to modify the licensing basis during construction.

- Reduce potential for delay if the license application were less detailed and more safety focused on performance outcomes.



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# Functional Containment Performance Criteria

February 1, 2018

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# Feedback

| |
|---|
| INL 1:<br>It is recommended that the basis for acceptance of the concept for modular HTGRs, including the more recent NGNP interactions, be discussed in the draft paper. This could form the starting point for developing technology-neutral performance requirements and criteria. |
| <u>Disposition</u><br>No Changes Made<br><br>Enclosure 1 includes quotes from and reference to NGNP "Summary Feedback on Four Key Licensing Issues." Unclear what additional references are being suggested. |

| |
|---|
| INL 2:<br>It would seem reasonable for the draft paper to point out that acceptance of functional containment will likely also require acceptance of a mechanistic source term and a demonstration of fuel and SSC performance consistent with the source term. |
| <u>Disposition</u><br>Added Paragraph to Enclosure 2 |

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# Mechanistic Source Term

Any evaluation of events, plant features and programs, and related uncertainties needs to address the state of knowledge related to the behavior of reactor systems, fuel, and how radionuclides may move within and be released from a facility. The established methods for addressing radiological source terms for LWRs have limited applicability to non-LWR designs and more mechanistic approaches have been proposed. The development of mechanistic source terms and the related matter of modeling behaviors of non-LWR technologies in safety analyses and computer simulations is an important element of the NRC staff's IAPs and activities of DOE, national laboratories, and reactor developers. The Commission approved in its SRM for SECY-93-092 the staff's recommendation that source terms for non-LWRs should be based upon a mechanistic analysis and will be based on the staff's assurance that the following items are met:

- The performance of the reactor and fuel under normal and off-normal conditions is sufficiently well understood to permit a mechanistic analysis. Sufficient data should exist on the reactor and fuel performance through the research, development, and testing programs to provide adequate confidence in the mechanistic approach.

- The transport of fission products can be adequately modeled for all barriers and pathways to the environs, including specific consideration of containment design. The calculations should be as realistic as possible so that the values and limitations of any mechanism or barrier are not obscured.

- The events considered in the analyses to develop the set of source terms for each design are selected to bound severe accidents and design-dependent uncertainties.

The design-specific source terms for each accident category would constitute one component for evaluating the acceptability of the design.

The above criteria remain valid for the current discussions of assessing functional containment performance criteria. The development of mechanistic source terms for designs and event categories is another element of an integrated, risk-informed, performance-based approach to design and licensing of non-LWRs

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# Feedback

INL 3:
Revise the phrase [such as core damage in a LWR or equivalent damage state for non-LWRs] as follows: "*…or equivalent damage state for non-LWRs, as applicable…*"

Disposition
Revised as follows (also for MSR TWG comment)

… prevent a top-level event such as core damage in a LWR or a damage state involving the unplanned migration of fission products for non- LWRs…

INL 4:
Correct this inconsistency by deleting "…and to provide input to the selection of DBAs" from the sentence in the BDBE description box of Table 1.

Disposition
Revised Table 1

BDBEs are evaluated to ensure that they do not pose an unacceptable risk to the public ~~and to provide input to the selection of DBAs~~.

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# Feedback

INL 5:
The language in the first paragraph (*Examples of acceptance criteria used for AOOs and DBEs include specified acceptable fuel design limits (SAFDLs) ..)* from page 9 of Encl. 2 should be revised to delete "and DBEs" to make it consistent with both the updated second paragraph and with GDC-10.

Disposition
Revised as follows:

… Success criteria for AOOs and DBEs include a graded scale for potential offsite doses based on event frequencies (i.e., below a frequency/consequence (F/C) target) and demonstration that prevention ~~barriers~~ features such as cooling systems and fuel system boundaries limit the migration of fission products within the facility. Examples of acceptance criteria used for AOOs ~~and DBEs~~ include fuel design limits such as specified acceptable fuel design limits (SAFDLs) similar to LWRs and specified acceptable radionuclide release design limits (SARRDLs) used for HTGRs. …

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# Feedback

| |
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| INL 6:<br>The ending of the paper needs to more clearly summarize the framework that the Commission will be asked to approve. |
| <u>Disposition</u><br>Revised as follows:<br><br>The staff recommends that the Commission approve the integrated, technology-inclusive approach described in Enclosure 2 for establishing functional containment performance criteria. The approach consists of identifying event categories with associated performance requirements needed for fundamental safety functions, such as the retention of radionuclides within defined SSCs. The design of SSCs serving as part of functional containments would be determined based on aggregating the performance requirements for all event categories. Requirements on physical structures or enclosures would reflect their role, if any, as part of the functional containment and any separate purposes to meet regulations or design goals not specifically associated with radionuclide retention (e.g., protection from external events). |

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# Feedback

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| INL 7:<br>Please clarify where the non-radiological items related to function containment will be discussed. |
| <u>Disposition</u><br>Revised as follows:<br><br>… Performance criteria related to these functions (e.g., characteristics needed to address design basis flooding or wind loadings) would be added to requirements, if any, related to fulfilling the fundamental safety function of radionuclide retention (i.e., acting as part of a functional containment). In such cases, an aggregation of performance requirements would determine the final design for a building or other physical enclosure in terms of its role, if any, as part of the functional containment and any separate purposes to meet regulations or design goals not specifically associated with radionuclide retention. … |

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# Feedback

LMP 2
For consistency with the LMP framework the term "barrier" needs to be defined in a manner that includes any passive, inherent or active means to limit the release of radioactive material from its source including time delays that permits radioactive decay. The LMP approach to DID emphasizes the layers of defense approach that accomodates this broader definition of barrier. Suggest changing the language in the paper to "...need for an integrated and consistent approach to address both prevention and mitigation." See also Comment 13

Disposition
Revised as follows (also for MSR TWG comment)

The contributing activities for Strategy 3 within the staff's IAPs are intended to reduce such regulatory uncertainties facing developers of non-LWR designs, including fast reactors, HTGRs, and MSRs. The specific activities include interactions with stakeholders and recognize that an integrated approach is needed such that developers can effectively assess features to manage risks to the public and the associated costs of possible prevention or mitigation ~~barriers~~ measures.

Reviewed other uses of "barriers" and revised to SSCs or other terms to avoid confusion. Added following footnote in regard to bowtie figure:

The notion of barriers in Figure 1 can include controls, programs, or hardware serving the functions of preventing or mitigating the top-level event. The term "barriers" in many NRC discussions of defense in depth relate to physical features such as fuel cladding, reactor coolant piping, and a containment structure. The staff will attempt to address this and other challenges related to terminology in future guidance documents.

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# Feedback

LMP 5
The LMP approach is to use the F-C target and a set of three cumulative risk metrics as a target line for further evaluation of margins, uncertainties and DID acceptability. The relationships between the 50.34 limits and individual LBE performance results are applied differently. How each is used in the final licensing process should be reviewed so that consistent results are achieved re safety objectives. Likewise, the use of PAGs in the evaluation of LBE performance should be discussed with respect to how the PAGs are used differently than 10 CFR 34, i.e., design goals versus design limits to assure consistent application with the LMP process.

Disposition
No change made since referring to quoted material from NGNP feedback. Enclosure 2 discussion reflects differences in use between 50.34 and PAGs in terms of DBAs and BDBEs.

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# Feedback

LMP 6
This RG (RG 1.232 – ARDC) should be reviewed to make sure it does not preclude RIPB PDC from being developed as should be the case using the LMP process.

Disposition
No Change – the regulatory guide offers one acceptable approach and does not preclude proposals for alternate design criteria.

LMP 7
… Thus, further LMP discussion with the staff regarding using the LMP process applications, such as functional containment, to help advance the discussion of ARDCs as noted in the paper. …

Disposition
Acknowledge that future guidance will need to clarify role in relation to ARDC – clarifying, an alternative, or item to incorporate into a revision to the ARDC

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# Feedback

LMP 2
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Disposition
Revised as follows (also for MSR TWG comment)

The contributing activities for Strategy 3 within the staff's IAPs are intended to reduce such regulatory uncertainties facing developers of non-LWR designs, including fast reactors, HTGRs, and MSRs. The specific activities include interactions with stakeholders and recognize that an integrated approach is needed such that developers can effectively assess features to manage risks to the public and the associated costs of possible prevention or mitigation ~~barriers~~ measures.

Reviewed other uses of "barriers" and revised to SSCs or other terms to avoid confusion. Added following footnote in regard to bowtie figure:

The notion of barriers in Figure 1 can include controls, programs, or hardware serving the functions of preventing or mitigating the top-level event. The term "barriers" in many NRC discussions of defense in depth relate to physical features such as fuel cladding, reactor coolant piping, and a containment structure. The staff will attempt to address this and other challenges related to terminology in future guidance documents.

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# Feedback

LMP 8
A difficult issue with this criterion is the lack of a technical basis for defining what is the "core damage" equivalent for non-LWRs. In the development of the non-LWR PRA standard a consensus was reached that it is not feasible to define "core damage" for non-LWRs and that is why the term is not used in that standard. The language used in the center of Figure 1 is a more appropriate term in a technology inclusive context. Similiarly, the term "...containment leak rate.." may not be appropriate for some nonLWR designs. Risk significant event leak paths to the environment should all be considered in the LBE evaluation. In the paranthesis, recommend changing "...i.e.,... to "e.g.,

Disposition
No change – note that comment refers to part of criteria from SECY-93-092 related to containment performance (leak rate, etc.) and this is not proposed to be carried forward in Enclosure 2 methodology for functional containment performance criteria.

LMP 10
The LMP recommends using the term "F-C target" rather than "F-C curve" to better convey the design objective to stay inside the curve.

Disposition
Revised to F/C target

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# Feedback

LMP 12 (Fuel Design Limits)
in the discussion of fuel design limits, the generalized use of SARRDLs was advanced. The use of SARRDLs for NO, and AOO events is analogous to SAFDLs for LWRs. However, the discussion below the figure explains the "Fuel Design Limits" as applicable for AOO and DBE conditions. A clarification on the use of monitorable (and demonstrable) fuel performance capabilities and operational limits should be differentiated from DBE, DBA or BDBE fuel performance predictions. In a risk informed framework different fuel performance levels can be acceptable based on plant performance and event consequence limits that vary over the spectrum of event sets. Therefore, using a single SARRDL for both NO, AOO and DBE events woudl be overly conservative and inconsistent with the LMP approach.

Disposition
Revised – See INL 5

LMP 13
For better alignment with the LMP approach as articulated in both the SSC and DID papers, the term "barrier" should be replaced with "SSC".

Disposition
Revised – See INL 5 and LMP 2

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# Feedback

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| MSR TWG 1<br>Ensure discussions of technology-inclusive highlight the applicability to MSRs. |
| Disposition<br>Revised to include mention, such as<br>… non-LWR designs., including fast reactors, HTGRs, and MSRs.<br><br>Also added following footnote:<br>RG 1.232 acknowledges that characteristics of the coolants, fuels, and containments to be used in non-LWR designs such as MSRs could share common features with modular HTGRs and propose to use similar criteria for a functional containment. A purpose of this paper is to obtain affirmation by the Commission that decisions previously made for modular HTGRs and the further development of the approach described herein may be incorporated into technology-inclusive guidance for non-LWR technologies. |

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| MSR TWG 2<br>Mentions of fuel cladding or barriers may not apply to MSRs. |
| Disposition<br>Revised (e.g., integrity of fuel cladding, coatings, or other fuel system boundary. |

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# Feedback

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| MSR TWG 3<br>Maintaining fuel system boundaries is equivalent to meeting F/C target. |
| Disposition<br>Revised to include sentence:<br><br>Acceptance criteria could be defined in terms of limiting offsite radiological consequences or ensuring the integrity of SSCs serving to retain radionuclides within a facility. |

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| MSR TWG 4<br>References to core damage for LWRs or equivalent damage state for non-LWRs |
| Disposition<br>Revised – See INL 3 |