U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Advanced Reactor Stakeholder Public Meeting

June 7, 2023

Microsoft Teams Meeting
Bridgeline: 301-576-2978
Conference ID: 856 640 616#

Time	Agenda	Speaker
10:00 am – 10:10 am	Opening Remarks / Advanced Reactor Integrated Schedule	NRC
10:10 am – 11:40 am	Guidance for Reviewing Facility Training Programs	NRC
11:40 am – 12:45 pm	Lunch Break	All
12:45 pm – 1:15 pm	Regulatory Treatment of Potential High Temperature Fluid Releases in Advanced Reactor Designs	Argonne National Laboratory
1:15 pm – 1:45 pm	Regulatory Treatment of Non-Core Sources of Radioactivity Associated with Advanced Reactor Designs	Argonne National Laboratory
1:45 pm – 2:00 pm	Break	All

Time	Agenda (continued)	Speaker
2:00 pm – 2:30 pm	Electronic Submittal of Advanced Reactor Applications	NRC
2:30 pm – 3:00 pm	Overview of the Advanced Reactor Construction Oversight Program (ARCOP) Recently Issued SECY Paper	NRC
3:00 pm – 3:15 pm	Break	All
3:15 pm – 4:35 pm	Advanced Reactor Content of Application Project (ARCAP)/Technology Inclusive Content of Application Project (TICAP) Guidance Documents	NRC
4:35 pm – 4:40 pm	Future Meeting Planning and Concluding Remarks	NRC

Advanced Reactor Integrated Schedule of Activities

The updated Advanced Reactor Integrated Schedule

is publicly available on NRC Advanced Reactors website at:

https://www.nrc.gov/reactors/new-reactors/advanced/integrated-review-schedule.html

Advanced Reactor Integrated Schedule of Activities

Strategy 1	Knowledge, Skills, and Capability
Strategy 2	Computer Codes and Review Tools
Strategy 3	Guidance
Strategy 4	Consensus Codes and Standards
Strategy 5	Policy and Key Technical Issues
Strategy 6	Communication

Legend

Concurrence (Division/Interoffice)	• EDO Concurrence Period
Federal Register Publication	Commission Review Period**
Public Comment Period	▼ ACRS SC/FC (Scheduled or Planned)
Draft Issuance of Deliverable	External Stakeholder Interactions
Final Issuance of Deliverable	↓ Public Meeting (Scheduled or Planned)

Version 5/30/23

Present Day

Strategy	Regulatory Activity	Commission Papers	Guidance	Rulemaking	NEIMA	Complete	2022 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2023 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Development of non-Light Water Reactor (LWR) Training for Advanced Reactors (Adv. Rxs) (NEIMA Section 103(a)(5))					x																								
	FAST Reactor Technology				x	x																								
	High Temperature Gas-cooled Reactor (HTGR) Technology				x	x																								
	Molten Salt Reactor (MSR) Technology				x	x																								
	Competency Modeling to ensure adequate workforce skillset					x																								
	Identification and Assessment of Available Codes					x																								
	Development of Non-LWR Computer Models and Analytical Tools																													
	Reference plant model for Heat Pipe-Cooled Micro Reactor					x																								
	*Reference plant model for Sodium-Cooled Fast Reactor (update from version 1 to 2)****																						■							
	*Reference plant model for Molten-Salt-Cooled Pebble Bed Reactor (update from version 1 to 2)****					x						■																		
	Reference plant model for Monolith-type Micro-Reactor																								■					
	*Reference plant model for Gas-Cooled Pebble Bed Reactor (update from version 1 to 2)****					x										■														
	*Reference plant model for Molten-Salt-Fueled Thermal Reactor (update from version 1 to 2)****																					■								
	Code Assessment Reports Volume 2 (Fuel Perf. Anaylsis)					x									■															
	FAST code assessment for metallic fuel					x																								
	FAST code assessment for TRISO fuel					x																								
	Code Assessment Reports Volume 3 (Source Term Analysis)					x																								
	Non-LWR MELCOR (Source Term) Demonstration Project					x									↓															
	Reference SCALE/MELCOR plant model for Heat Pipe-					x																								

https://www.nrc.gov/reactors/new-reactors/advanced/integrated-review-schedule.html

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White Paper on Facility Training Programs Draft Review Guidance

Jeff Correll
NRR/DRO/IOLB
June 7, 2023

Facility Training Program Guidance

- This staff white paper has been prepared and is being released to support ongoing public discussions. This white paper uses a draft interim staff guidance (ISG) format because the staff is considering using this format to provide staff guidance in the near future to support the review of advanced reactor applications.
- This paper has not been subject to NRC management and legal reviews and approvals, and its contents are subject to change and should not be interpreted as official agency positions.
- The paper is publicly available at ADAMS ML23017A130

Facility Training Program Guidance

- This white paper is intended to support both applications under the proposed Part 53 as well as near-term applications under Parts 50 and 52.
- The guidance supports the NRC staff review of the portion of an application associated with the training program for plant personnel, including licensed operator initial and requalification training programs.
- This guidance also facilitates the review of non-accredited training programs at commercial nuclear plants. This guidance may also be used to support training program inspection needs as currently specified in NUREG-1220.
- This guidance covers:
  - The 5 phases of the systems approach to training (SAT)
  - Scope of facility training programs

Background

- 10 CFR Part 53 is currently with the Commission for review pending issuance as a proposed rule for public comment
  - Guidance in this ISG is subject to change based on rulemaking
- Key documents for Part 53 rulemaking can be found at Regulations.gov under Docket ID NRC-2019-0062

Goals

- Establish reliable guidelines for training program developments based on current best practices from research and expertise on the Systems Approach to Training (SAT) Process

ISG Layout

- Section A defines the five phases of SAT
  - Evaluation criteria are provided for initial training program approval, and for ongoing training program inspections.
- Section B outlines basic Training Program Guidance
  - Defines the basic requirements that the staff would expect to see in a training program guide.

Section 1.0
Analysis Phase - Overview

- Defines the three methods of Analysis:

  Section 1.1 - Needs Analysis

  Section 1.2 - Job Analysis

  Section 1.3 - Task Analysis

Section 1.1

Analysis Phase – Needs Analysis

1.1 Conducting Training Needs Analysis

1.1.1 Needs Analysis is a process that includes training and line personnel.

1.1.2 Needs Analysis process is used to analyze internal and external factors.

.1 Initial Training Programs

.2 Existing Training Programs

.3 Needs Analysis process utilizes Job and Task Analysis process when applicable.

Section 1.1
Analysis Phase – Needs Analysis

1.1.3 Changes to the Task List and associated KSAs

.1 Changes to non-Commission approved training programs.

.2 Changes to Commission approved training programs

.3 Changes to the objectives and lesson plan material does not always require changes to the Task and KSA list

Section 1.1
Analysis Phase – Needs Analysis

1.1.4 Needs Analysis process maintains the initial and continuing training programs

1.1.5 Needs Analysis Process includes analyzing performance gaps

1.1.6 Training Exemptions are analyzed and documented

1.1.7 Needs Analysis Documentation

Section 1.2
Analysis Phase – Job Analysis

1.2 Conducting Job Analysis

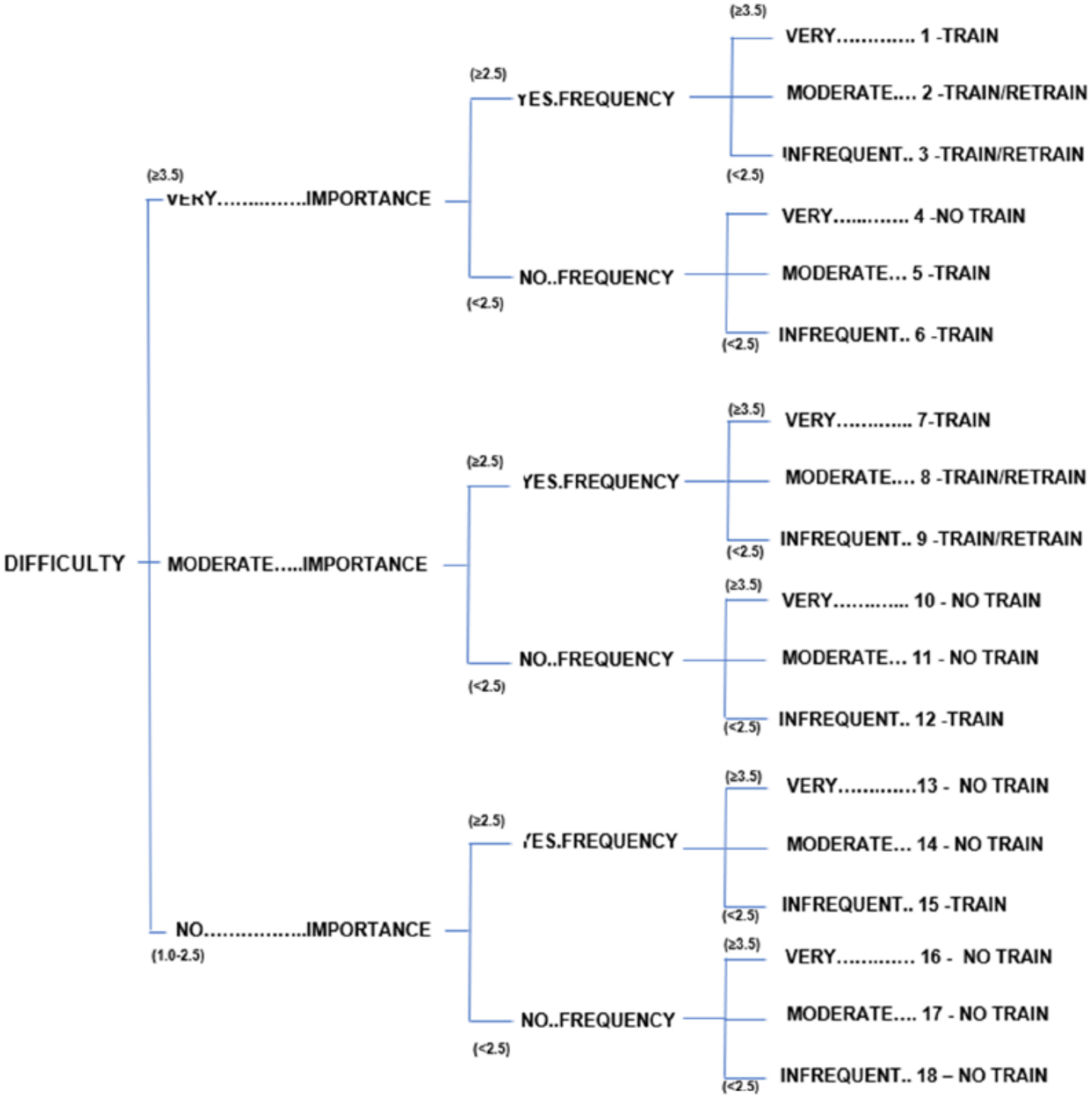
- 1.2.1 Job Analysis is a process that includes training and line personnel
- 1.2.2 Job Analysis process groups tasks into Position/Role/Duty Areas
- 1.2.3 Job Analysis process produces a task list
  - 1.2.3.1 Initial Training Job Analysis
    - 1.2.3.1.1 Initial Job Analysis Considerations
  - 1.2.3.2 Existing Training Job Analysis

Section 1.2
Analysis Phase – Job Analysis

1.2.4 Tasks are systematically selected for training

- 1.2.4.1 Licensed Operator Training includes items important to safe plant operation
- 1.2.4.2 Licensed Operator Retrain periodicity

1.2.5 Job Analysis Documentation



Appendix 2
Task Selection for Training Process Example (Ref 7)
DIF Flowchart

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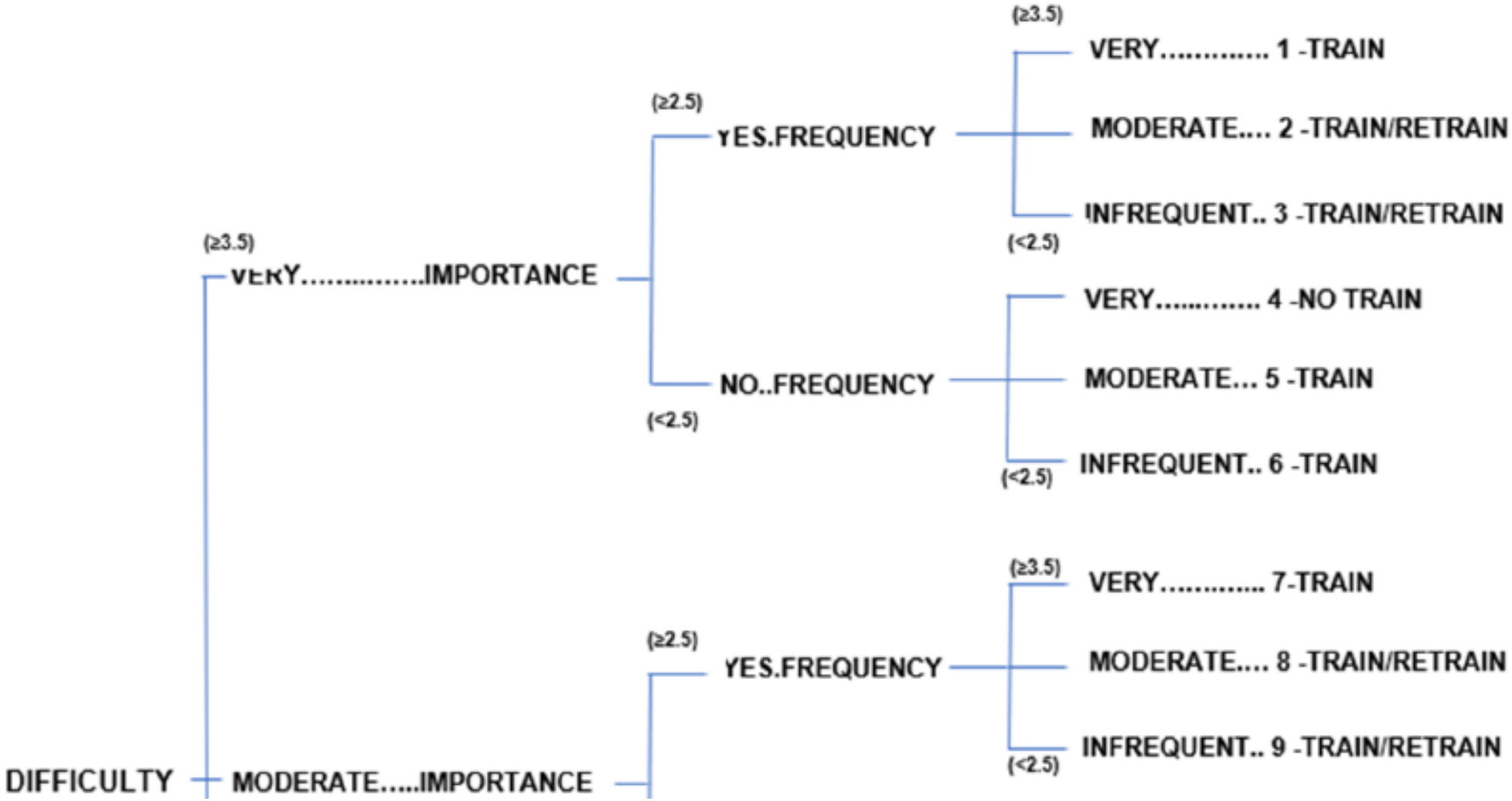
Task Selection for Training Process Example (Ref 7)
DIF Flowchart



Section 1.3
Analysis Phase – Task Analysis

1.3 Conducting Task Analysis

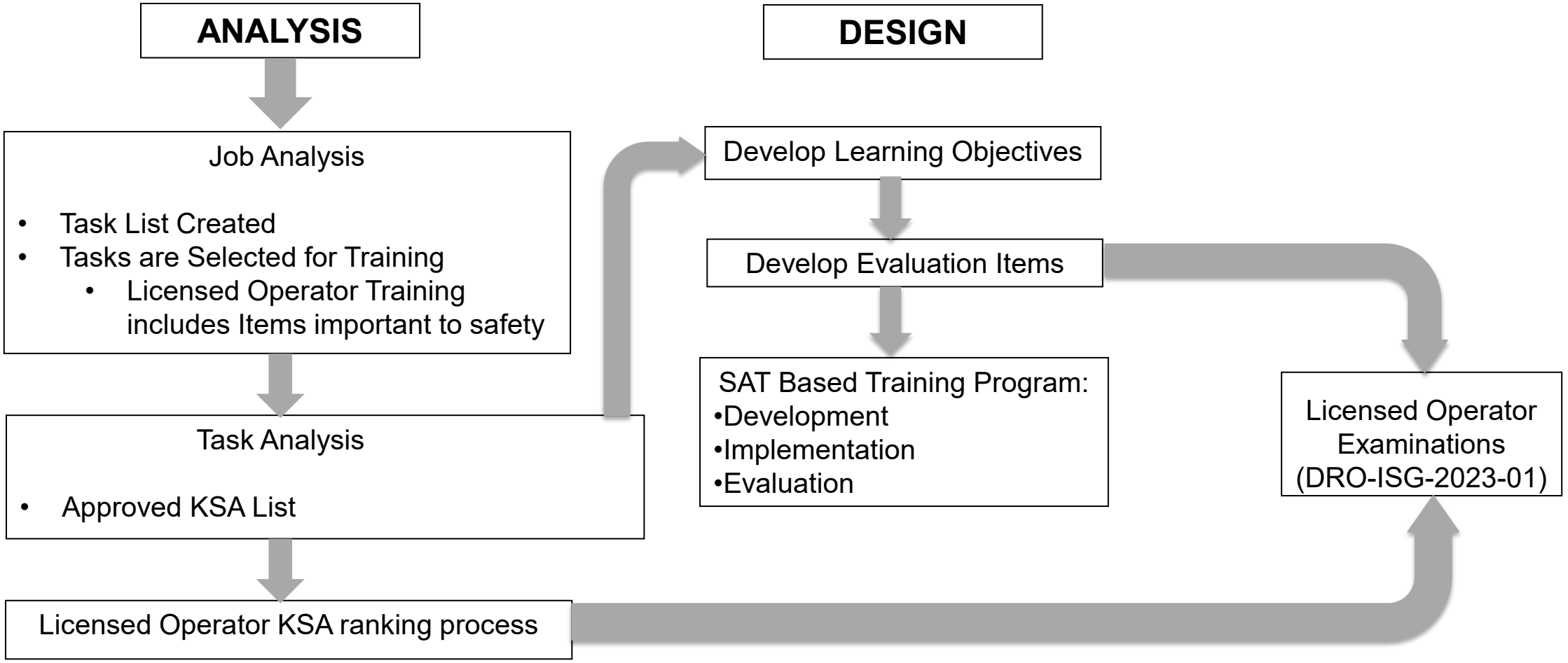
1.3.1 Task Analysis is an iterative process that includes training and line personnel

1.3.2 Task Analysis produces task characteristics for further training development

1.3.2.1 Operator Licensing Programs produce a comprehensive KSA list for Commission approval

1.3.3 Task Analysis Documentation

SAT and Licensed Operator Examinations



Section 2.0
Design Phase - Overview

- Defines:
  - Target student population
  - Objectives
  - Evaluation instruments
  - Instructional settings

Sections 2.1-2.2

Design Phase –Students and Learning Objectives

2.1 Define Target Student Population

2.2 Develop Learning Objectives (LO)

- 2.2.1 LO's contain Conditions, an Action, and Standards
- 2.2.2 LOs focus on desired results the trainee is expected to achieve
- 2.2.3 Lesson plans includes Terminal Objectives
- 2.2.4 Lesson Plans include enabling objectives to support the terminal objective goal.
- 2.2.5 Enabling objectives are organized to facilitate student learning
- 2.2.6 Performance Objectives maximize the use of performance opportunity
- 2.2.7 Learning Objectives are reviewed and approved by Training and Line Supervision

Section 2.3
Design Phase – Evaluation Items

2.3 Develop Evaluation Items

1. Evaluation items evaluate the topic of the objective
2. Evaluation items are leveled to the objective
3. Test item conditions and standards match the learning objective's conditions and standards
4. Test item construction is appropriate method of evaluation for the objective
5. Pass/fail criteria
6. Evaluation items must be plausible
7. Performance Objectives written for individual trainee evaluation
8. Test item creation includes review and approval by Training and Line Supervision

Section 3.0
Development Phase - Overview

- Defines the following:

  Section 3.1 - Training Material Development

  Section 3.2 - Exam Development

Section 3.1
Development Phase – Training Material

3.1.1 Training Material Development Standards:

.1 Training material development is rooted in the plants SAT Analysis

.2 Training Material Content and Consistency

.3 Method of delivery ensures effective objective mastery.

3.1.2 Training Material Content:

.1 Lesson Plan Content

3.1.3 Training Material review, approval, and accuracy:

3.1.4 Curriculum Organization

.1 Delivery Timeframe

.2 Curriculum Sequencing

Section 3.2
Development Phase – Exams

3.2 Exam Development Standards

3.2.1 Cognitive Evaluations

.1 Objective Sampling

.2 Multiple exams are created with >40% differing questions.

.3 An exam question selection process exists.

.4 Clear pass/fail standards exist.

.5 Clear grading methods exist.

3.2.2 Performance Evaluations

.1 Individual performance and evaluation of performance objectives

.2 Clear pass/fail standards to allow consistent evaluation

.3 Guidance provides reproducible consistency between evaluators

3.2.3 Evaluation Item review, validation, and approval

Section 4.0
Implementation Phase - Overview

- Defines the following:

  Section 4.1 – Preparation and Scheduling

  Section 4.2 – Delivery of Training

  Section 4.3 – Exam Administration and Remediation

  Section 4.4 – Post Training Activities

Sections 4.1-4.2

Implementation Phase – Preparation and Delivery

4.1 Preparation and Scheduling:

- 4.1.1 Fixed vs Flexible Scheduling
- 4.1.2 Schedules approved by training and line

4.2 Delivery of Training:

- 4.2.1 Instructors are trained and qualified
- 4.2.2 Deliver effective training

Sections 4.3-4.4

Implementation Phase – Exams and Follow-up

4.3 Exam Administration and Remediation:

- 4.3.1 Exam Administration Standards – all formal training requires evaluation
- 4.3.2 Exam security standards
- 4.3.3 Exam administration
- 4.3.4 Exam process to include test review with trainees
- 4.3.5 Exam Remediation process
- 4.3.6 Exam Remediation standards

4.4 Post Training Activities:

- 4.4.1 Student feedback solicited post training for evaluation
- 4.4.2 Document the training occurrence
  - .1 Update training records and qualifications

Section 5.0
Evaluation Phase - Overview

- Defines the following:
  - Section 5.1 – Evaluation Intake
  - Section 5.2 – Assess Information
  - Section 5.3 – Initiate Corrective Actions
  - Section 5.4 – Conclusion

Section 5.1
Evaluation Phase - Intake

5.1. Evaluation Intake

- 5.1.1 Collect and Analyze Incumbent and Management Feedback
  - .1 Training Feedback Analysis
  - .2 Management Observations of Training
  - .3 Exam Item Analysis
  - .4 Post Training Performance Review
- 5.1.2 Facility Issues and Events
- 5.1.3 Inspection/Assessment/Evaluation reports
- 5.1.4 Facility modifications and procedure changes
- 5.1.5 Industry Regulatory and Operating Experience

Sections 5.2 – 5.4
Evaluation Phase – Assess and Initiate Actions

5.2 Assess Information
- 5.2.1 Assessing the approved training program effectiveness
- 5.2.2 Assessing the approved training program scope

5.3 Initiate Corrective Actions
- 5.3.1 Appropriate Actions are taken to improve the training program
  - .1 Actions that initiate Training Needs Analysis
  - .2 Actions that do not initiate a Training Needs Analysis
- 5.3.2 Performance Gaps produce Training Effectiveness Metrics
- 5.3.3 Training Evaluation documentation and Approval

5.4 Conclusion

Section B
Facility Training Programs

- Includes guidance for the following sections:
  - Section 1 – Program Description
  - Section 2 – Program Eligibility
  - Section 3 – Initial Training Programs
  - Section 4 – Requalification Programs

Section 1
Program Description

1.1 General Requirements:

a. The purpose of the program

b. Job positions credited towards each role, as defined by the job and task analysis

c. Training organization teaching the course or supervising instruction of the course material.

d. The qualification requirements of the training staff personnel.

e. The course curriculum

Section 1
Program Description

1.2 Licensed Operator Programs:

a. The course curriculum and scheduling for each course required to achieve a license (RO and SRO), as identified in the SAT analysis.

b. A chart showing the proposed schedule for licensing personnel prior to criticality. The schedule should be relative to the expected fuel load date and should also display the preoperational test period.

Section 2
Program Eligibility

2.1 General Requirements:

2.2 Licensed Operator Requirements:

- 2.2.1 – Procedures:
- 2.2.2 – Educational and Experience Requirements

Section 3
Initial Training Programs

3.1 General Requirements

3.2 Licensed Operator Requirements:

3.2.1 – Foundational theory of plant operations are included in the task list and KSA development for training program design

3.2.2 – Included in the timeline of the training program design should include:

- classroom training
- hands on training (OJT/TPE, simulator, or equivalent)
- proficiency training (under instruction watches)
- program exams

Section 4
Requalification Programs

4.1 General Requirements:

a. Task list requiring retraining
b. Retraining schedule according to retrain periodicity requirements
c. Scope of required training

4.2 Licensed Operator Requirements:

4.2.1 Requal program must include training for performance and cognitive based tasks as identified in the job and task analysis for tasks selected for retrain.

4.2.2 Licensed Operator requalification training shall include the following:

- A retrain periodicity not to exceed 24 months for specifically licensed operator training programs
- A process for review and maintenance of the program

Questions

Advanced Reactor Stakeholder Public Meeting

Lunch Break

Meeting will resume at 12:45 pm EST

Microsoft Teams Meeting
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REGULATORY CONSIDERATIONS REGARDING POTENTIAL HIGH-TEMPERATURE FLUID RELEASES

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U.S. DEPARTMENT OF ENERGY
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DOE REGULATORY DEVELOPMENT EFFORTS

- **DOE's Advanced Reactor Demonstration Program**
  - Demonstration 1 (X-Energy)
  - Demonstration 2 (Natrium)
  - Risk Reduction for Future Demonstration
  - National Reactor Innovation Center
  - **Regulatory Development**
  - Advanced Reactor Safeguards

Four elements within Regulatory Development:
- MSR Regulatory Development R&D
- FR Regulatory Development R&D
- GCR Regulatory Development R&D
- **Regulatory Framework Modernization**

- **Key Industry Interfaces and Inputs Includes:**
  - Nuclear Energy Institute
  - Industry Technology Working Groups
  - Electric Power Research Institute
  - Insights from other program National Technical Directors & DOE Federal Managers
  - Participation in NRC public meeting interactions (incl. NRC Integrated Schedule)

CURRENT PROGRAM EFFORTS IN THIS AREA

Regulatory Treatment of Non-Core Sources of Radioactivity

Emergency Planning Under the LMP Approach

Regulatory Treatment of High Temperature Fluid Releases

Regulatory Treatment of Low Frequency External Events

Assessment of Fast Reactor Consensus Safety Standards

- Reviewed in current meeting
- Reviewed in upcoming NRC meetings
- Ongoing effort

REGULATORY CONSIDERATIONS REGARDING POTENTIAL HIGH-TEMPERATURE FLUID RELEASES

HIGH-TEMPERATURE FLUID RELEASES

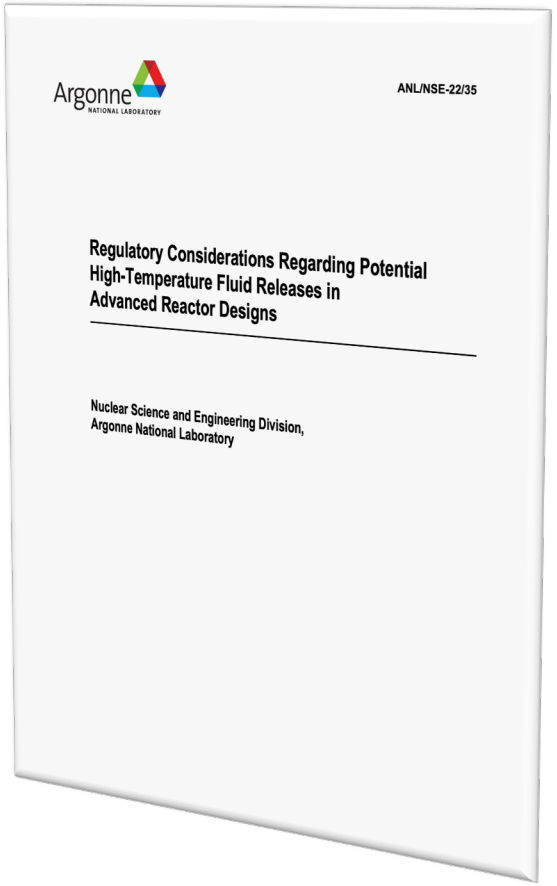
- **Motivation**
  - "New" internal hazards
  - The potential consequences associated with liquid metals, molten salt, and high-temperature gas releases require design and licensing consideration.
  - Two aspects:
    - Assessment of hazard as part of licensing
    - Response if an event were to occur during operation
- **Objectives**
  - Examine the applicability (or non-applicability) of new and existing regulatory requirements and guidance regarding internal fire and internal flood.
  - ***Identify key regulatory considerations during licensing and operation regarding high-temperature fluid release events to ensure an appropriate regulatory treatment.***

HIGH-TEMPERATURE FLUID RELEASES

- **Project Report**
  - A report was developed that reviews potential high-temperature fluid releases for advanced reactor designs, including the following factors:
    - Phenomena
    - Prevention/mitigation features
    - Past regulatory experience
    - Applicability of existing internal hazard guidance
    - Design criteria considerations
  - Report uses:
    - Reference document for regulatory interactions
    - Educational material for regulator and industry staff new to advanced reactor designs
    - Collection of key reference material

ANL/NSE-22/35

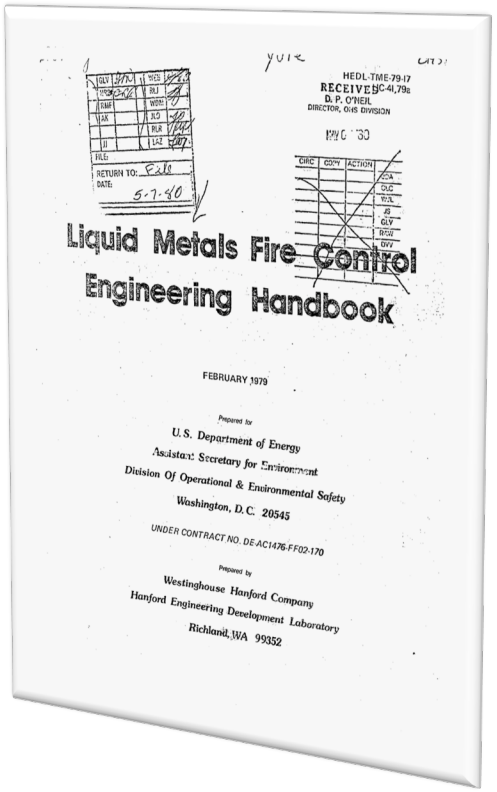
OSTI:1972285



EXAMPLE: SODIUM

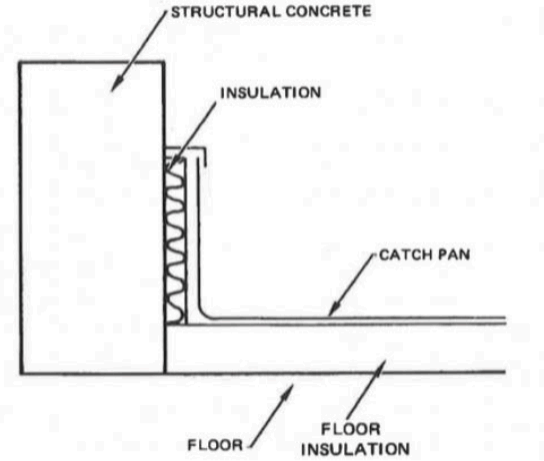
- **Phenomena**
  - Liquid sodium at operating temperatures of an SFR will burn when exposed to air and react energetically when in contact with water.

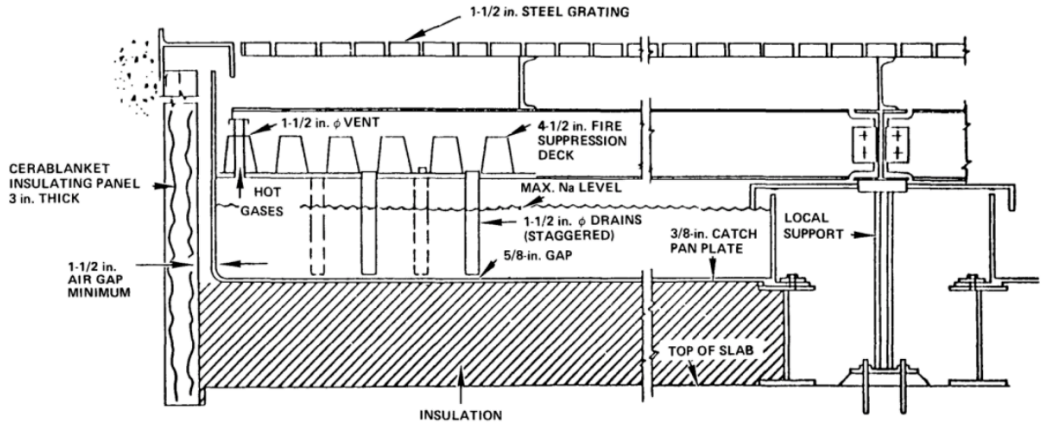
- **Major Considerations:**
  1) Preservation of sodium inventory to prevent core uncovery and ensure a heat removal pathway.
  2) Prevention and mitigation of the consequences of a sodium release, such as the impact on structure, system, and component (SSC) functionality, etc.

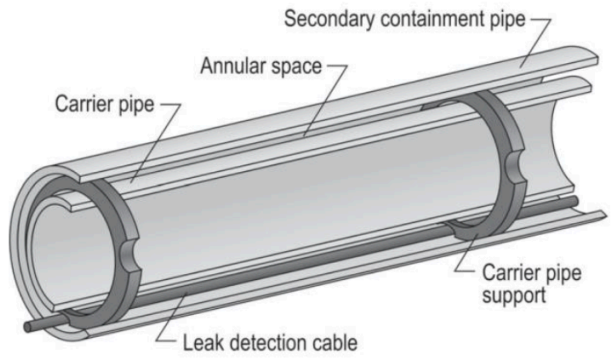


EXAMPLE: SODIUM

- **Sodium Release Prevention/Mitigation:**
  - **Objectives:**
    1) Protect important SSCs from the resultant pressure, heat, aerosol, and chemical effects of a sodium release
    2) Prevent the release of retained radionuclides (design dependent)
    3) Protect workers and the public from radiological and chemical effects
  - **Strategies:**
    1) Careful consideration of sodium piping routing, SSC co-location, room sizing, etc.
    2) Sodium leak prevention (double-wall piping, guard piping, leak detection, etc.)
    3) Sodium leak mitigation (catch pans, drain tanks, compartment inerting, concrete insulation, etc.)







EXAMPLE: SODIUM

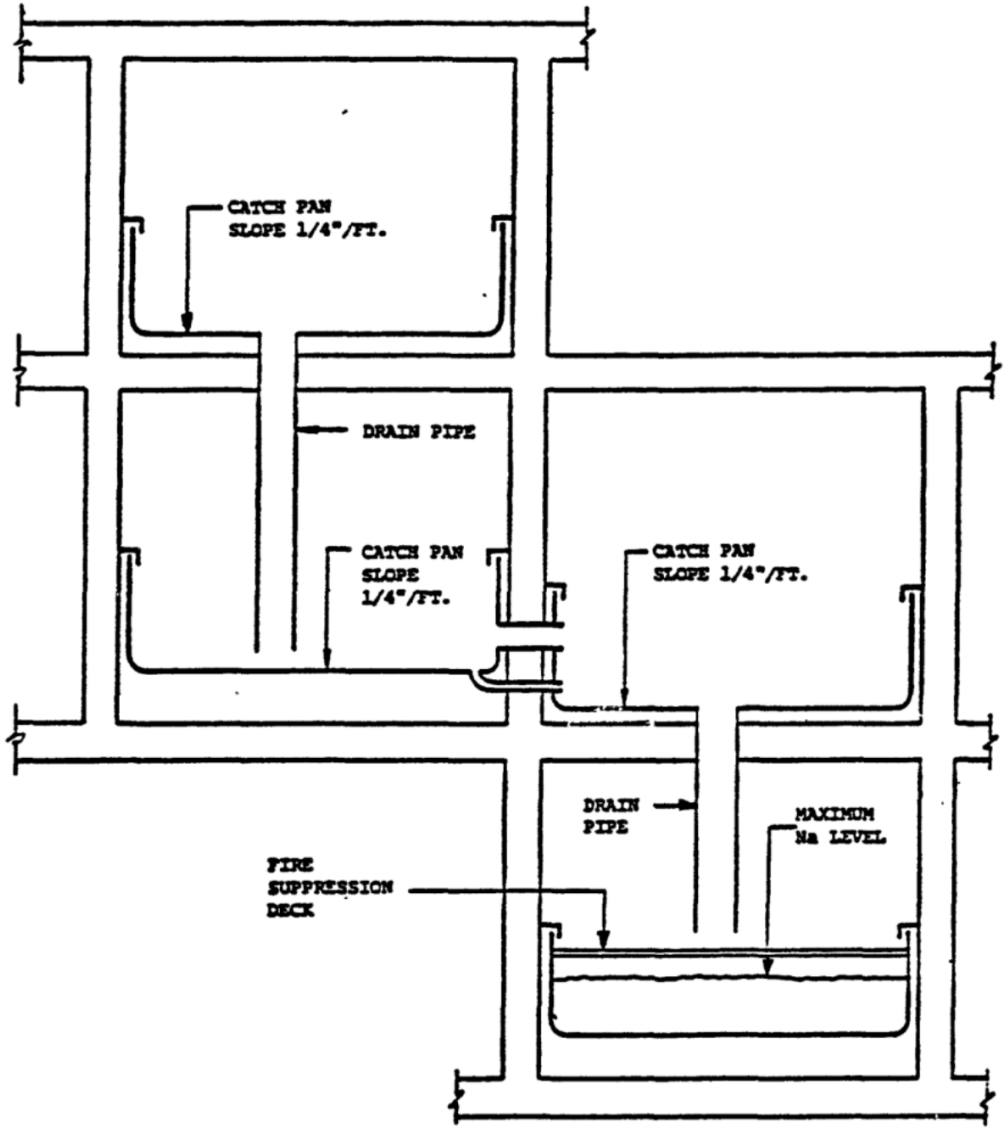
- **Past Regulatory Experience:**
  - Review of past regulatory interactions:

Reactor	MWth/MWe	Coolant	Operated	Plant Type	Spectrum
EBR-I	1.4/0.2	NaK	1950-1964	Loop	Fast
Sodium Reactor Experiment (SRE)	20/6.5	Na	1957-1964	Loop	Thermal
HNPF	254/75	Na	1963-1964	Loop	Thermal
Fermi-1	200/66	Na	1963-1972	Loop	Fast
EBR-II	62.5/19	Na	1963-1994	Pool	Fast
SEFOR	20/NA	Na	1969-1972	Loop	Fast
FFTF	400/NA	Na	1980-1992	Loop	Fast
CRBR	1000/350	Na	Design	Loop	Fast
PRISM	471/155[1]	Na	Design	Pool	Fast
SAFR	900/377	Na	Design	Pool	Fast

  - Review of the evolution of design strategies for the prevention and mitigation of sodium releases that occurred in response to ***lessons learned*** from operating experience and regulatory interactions

EXAMPLE: SODIUM

- **Lessons Learned** (example):
  - The sodium fire mitigation strategy for the Fast Flux Test Facility (FFTF) utilized an active nitrogen injection system to isolate and deprive sodium fires of oxygen
  - Although approved during reactor authorization, difficulties were encountered with the system in practical application
  - Subsequent SFR designs, such as the Clinch River Breeder Reactor, utilized alternative strategies:
    - Transition to completely passive systems
    - Novel catch pan and suppression deck designs



Clinch River Breeder Reactor:
Cascading Catch Pan Design

EXAMPLE: SODIUM

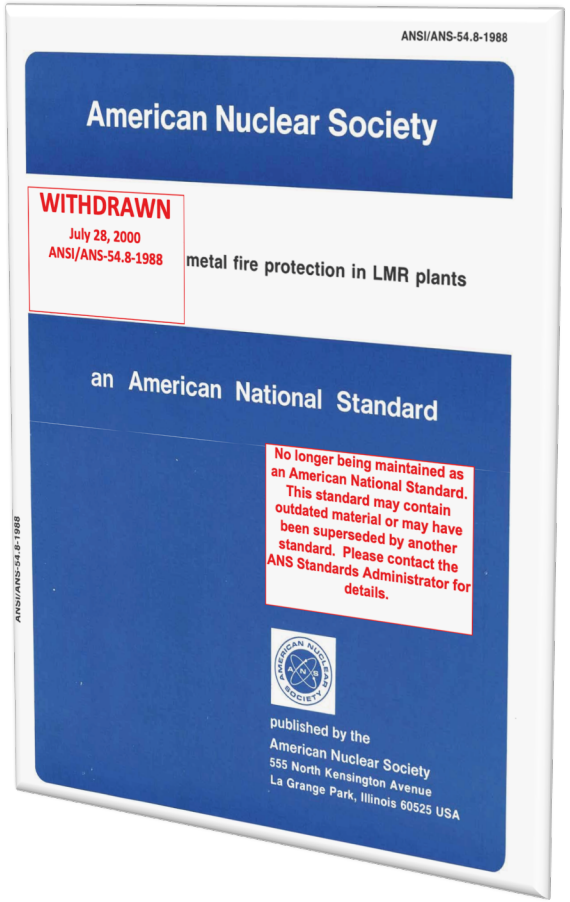
- **Applicability of Current Guidance:**
  - Many similarities with the deterministic and risk-informed internal fire protection strategies associated with Appendix R and NFPA 805.
  - Applicability of leak-before-break (LBB) methodology?
  - Applicability of guidance regarding hazardous substance releases.

- **Design Criteria Considerations:**
  - Reviewed the SFR-DCs in RG 1.232 and highlighted criteria that have relevancy to potential sodium releases and included specific considerations:
    - **SFR-DCs 3 and 73**: Fire protection and sodium leaks
    - **SFR-DCs 14,15,30-33,71,78,79**: Primary coolant boundary integrity
    - **SFR-DCs 75-77**: Intermediate coolant boundary integrity
    - **SFR-DCs 23,34,35**: Preservation of safety functions

      .
      .
      .

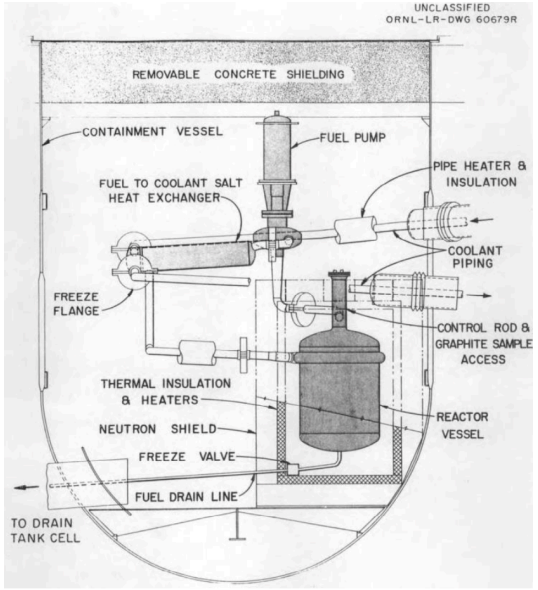
EXAMPLE: SODIUM

- **Open Issues:**
  - Applicability of LBB method:
    - Previous SFR applications have utilized the LBB method to limit the size of potential sodium releases
    - These approaches differ from the current application of the LBB method for LWRs, as currently defined in SRP 3.6.3
  - Withdrawal of ANS 54.8: *Liquid Metal Fire Protection in LMR Plants*
    - Published in 1988
    - Withdrawn in 2000
    - Previous SFR applicants referred to the standard in the regulatory submittals
    - Parallel program effort currently in progress to further explore and identify necessary safety standard development



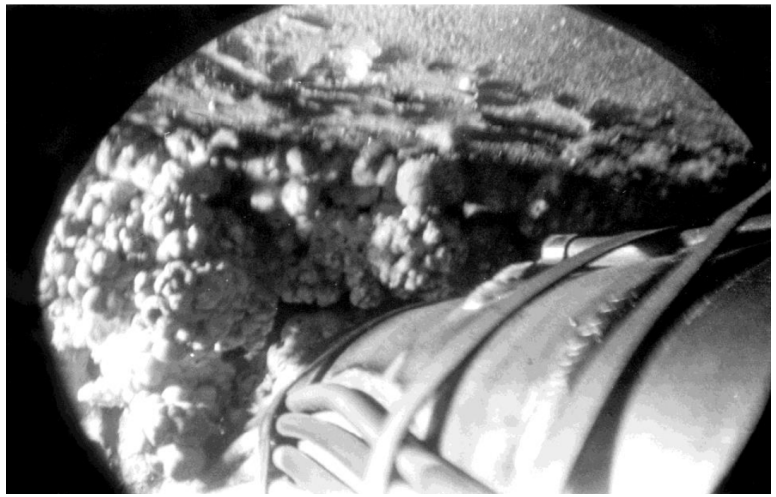
HIGH-TEMPERATURE FLUID RELEASES

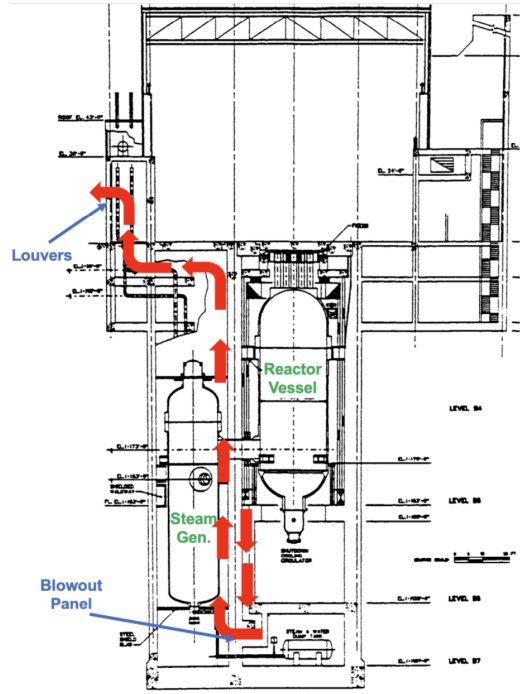
- **Other Fluid Types:**
  - Molten salt release (both fuel-salt and coolant-salts)
  - High-temperature gases



MSRE Reactor Cell Layout

MSRE Final Shutdown Valve Leak





MHTGR Pressure Mitigation Pathway

QUESTIONS

REGULATORY TREATMENT OF NON-CORE SOURCES OF RADIOACTIVITY

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Ben Chen
Argonne National Laboratory

Scott Ferrara, Jason Christensen, Jason Andrus
Idaho National Laboratory

NON-CORE SOURCES

- **Motivation**
  - The ASME/ANS Non-LWR PRA Standard permits the inclusion of any source of radioactivity within the plant PRA.
  - Using a risk-informed performance-based (RIPB) licensing strategy for non-core sources may have advantages:
    - Uniform, consistent methodology for the entire plant
    - Application simplification
    - Flexibility in licensing decision-making
    - Use of risk information as part of plant oversight
  - For certain advanced reactor designs, the distinction between “core” and “non-core” is less straightforward.
  - Certain advanced reactor designs may include onsite facilities with characteristics close to fuel cycle facilities.

Examples:

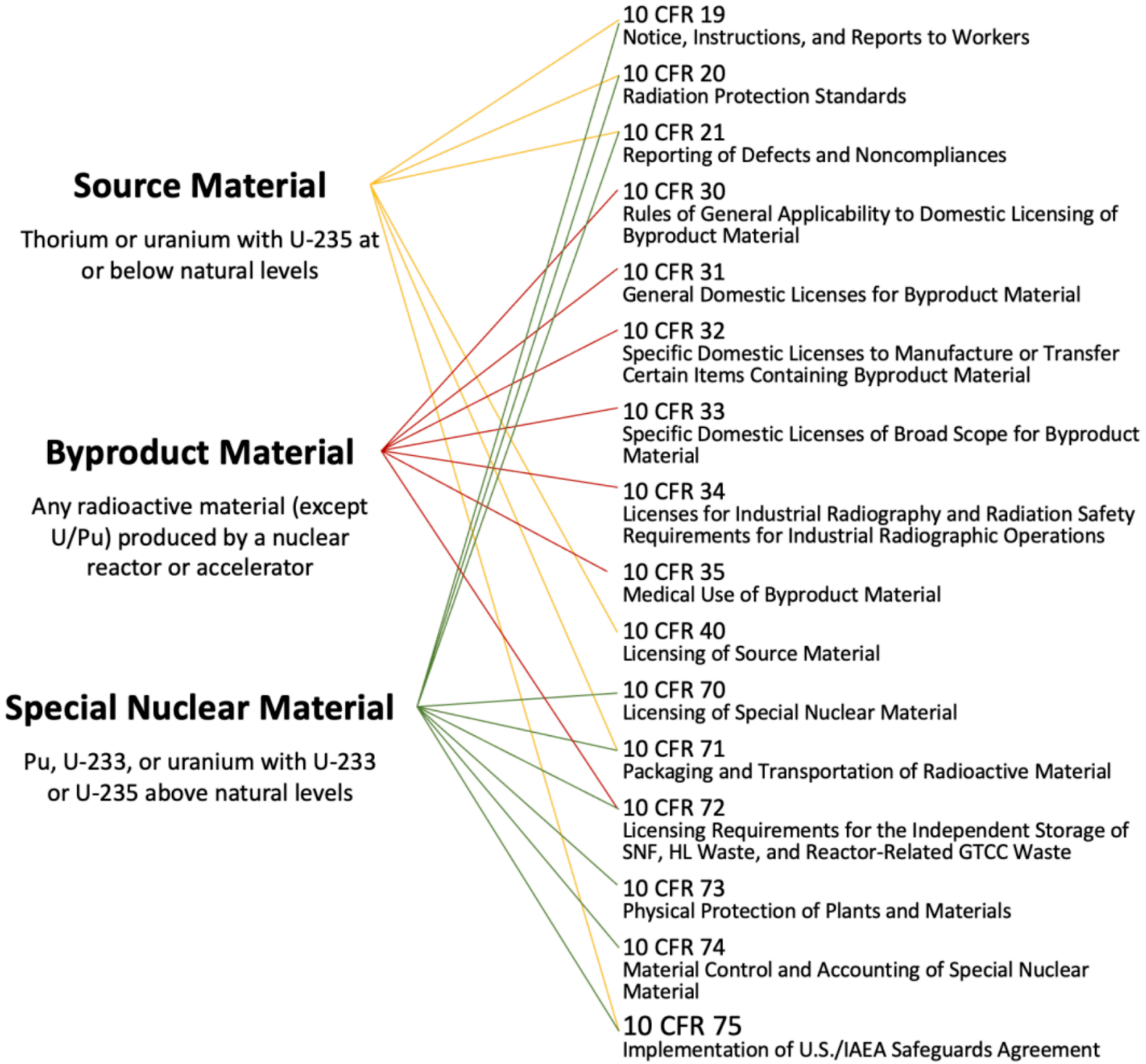
Spent fuel storage
Purification systems
Fuel processing systems
Fuel movement

NON-CORE SOURCES

- **Objectives:**
  - Identify the potential non-core sources of radioactivity for advanced reactors designs.
  - Identify the category of ***regulated material*** for each non-core source of radioactivity and the associated regulatory requirements and guidance.
  - Compare the RIPB treatment of non-core sources of radioactivity to the current regulatory requirements and associated guidance.
  - Identify potential gaps/discrepancies between current regulation & guidance associated with the licensing of non-core sources of radioactivity and a RIPB approach.
  - Provide recommendations regarding avenues to address or resolve identified gaps or discrepancies.

NON-CORE SOURCES

- **Scope:**
  - A first step, focusing on regulatory criteria and associated high-level guidance
  - Focus is on advanced reactor designs with non-core sources and “monolithic” advanced reactor plant sites that may include fuel facilities or similar
  - Study utilized Licensing Modernization Project (LMP) and the Technology Inclusive Content of Applications (TICAP) as the RIPB approach for comparison, although other RIPB approaches are possible, potentially including simplified risk-informed approaches
  - Study did not examine requirements associated with safeguards, security, offsite transportation, and final disposable of radioactive material
  - Study did not explore the feasibility of risk-informing the treatment of non-core sources in terms of adequacy of PRA technology (*i.e.*, are analysis methods and supporting data available)
  - Study focused on using RIPB approaches to satisfy existing regulatory requirements for non-core sources and not to increase the expectations regarding the fidelity of supporting analyses for such sources


Source Material
Thorium or uranium with U-235 at or below natural levels
Byproduct Material
Any radioactive material (except U/Pu) produced by a nuclear reactor or accelerator
Special Nuclear Material
Pu, U-233, or uranium with U-233 or U-235 above natural levels
10 CFR 19
Notice, Instructions, and Reports to Workers
10 CFR 20
Radiation Protection Standards
10 CFR 21
Reporting of Defects and Noncompliances
10 CFR 30
Rules of General Applicability to Domestic Licensing of Byproduct Material
10 CFR 31
General Domestic Licenses for Byproduct Material
10 CFR 32
Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing Byproduct Material
10 CFR 33
Specific Domestic Licenses of Broad Scope for Byproduct Material
10 CFR 34
Licenses for Industrial Radiography and Radiation Safety Requirements for Industrial Radiographic Operations
10 CFR 35
Medical Use of Byproduct Material
10 CFR 40
Licensing of Source Material
10 CFR 70
Licensing of Special Nuclear Material
10 CFR 71
Packaging and Transportation of Radioactive Material
10 CFR 72
Licensing Requirements for the Independent Storage of SNF, HL Waste, and Reactor-Related GTCC Waste
10 CFR 73
Physical Protection of Plants and Materials
10 CFR 74
Material Control and Accounting of Special Nuclear Material
10 CFR 75
Implementation of U.S./IAEA Safeguards Agreement

NON-CORE SOURCES

- **Regulatory Requirements Review:**
  - Reviewed the safety-relevant portions of the following:
    - **Byproduct Material**: Parts 30-35
    - **Source Material**: Part 40
    - **Special Nuclear Material**: Part 70
    - **Interim storage**: Part 72

  - Reviewed associated guidance:
    - NUREG-1557: Consolidated Guidance about Material Licenses
    - NUREG-1513: Integrated Safety Analysis Guidance
    - NUREG-1520: Standard Review Plan for Fuel Cycle Facilities
    - NUREG-2215: Standard Review Plan for Spent Fuel Dry Storage Systems and Facilities
    - RG 3.67: Standard Format and Content for Emergency Plans for Fuel Cycle and Material Facilities
    - Others…

NON-CORE SOURCES

- **Analysis Areas:**
  - Assessment focused on main areas associated with LMP and TICAP

Event Classification and Criteria

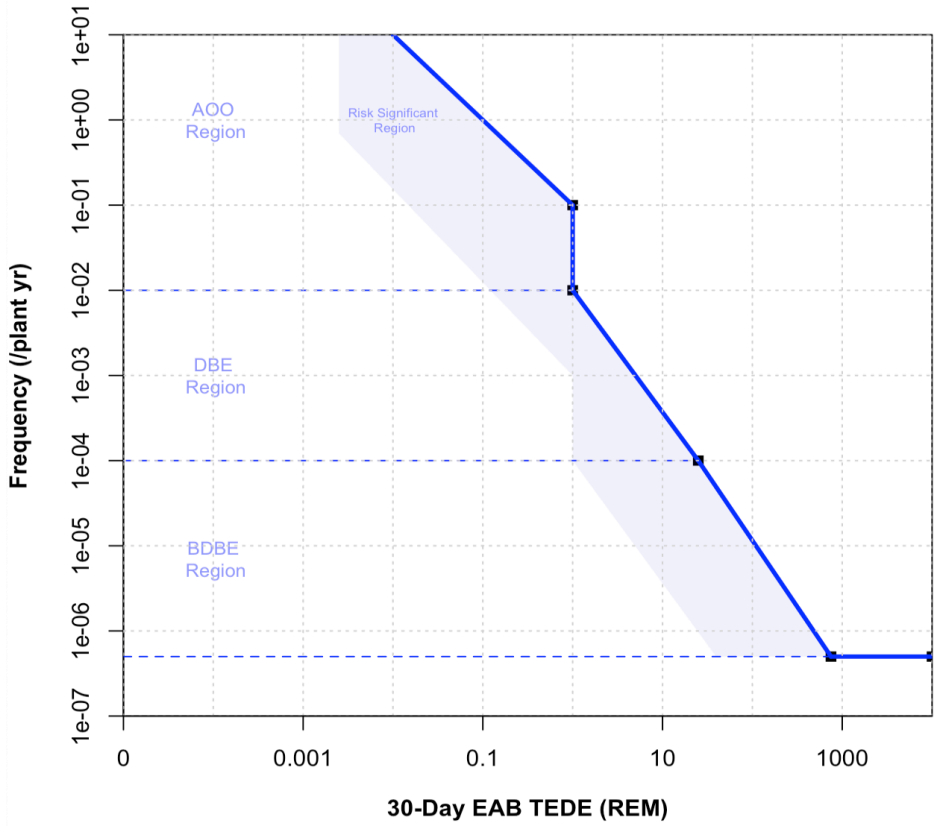
SSC Classification

Emergency Planning

Content of Applications

FINDINGS AND RECOMMENDATIONS

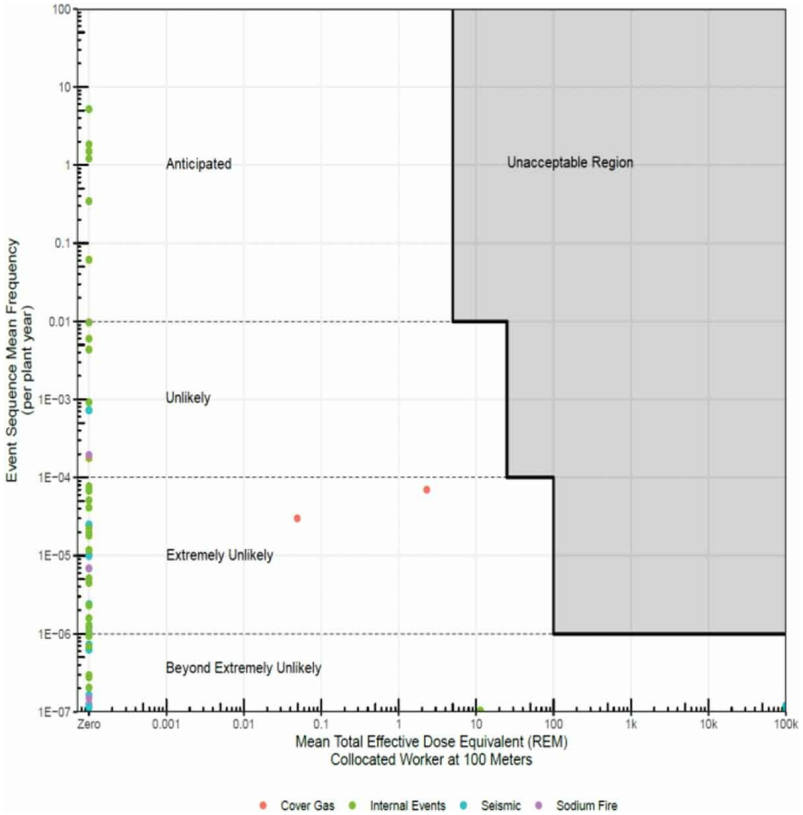
- **Event Classification and Criteria**
  - 10 CFR Part 20 applicable to all.
  - Only Part 70 and 72 contain dose requirements for off-normal or accident scenarios.
    - Recommended event classification available in guidance, but up to applicant to propose for NRC approval.
  - No QHOs for regulated material, although NRC-proposed Quantitative Health Guidelines (QHGs) are similar.
  - Part 70 definition of *credible* defers from LMP.
    - LMP is more conservative
  - Inclusion of worker dose in Part 70.
  - Inclusion of chemical hazard considerations.



FINDINGS AND RECOMMENDATIONS

- **Event Classification and Criteria**
  1) Preemptively seek NRC approval of LMP event classification for Part 70 and 72 event classification requirements.

  2) Explore supplemental worker dose and chemical hazard considerations under the LMP framework.
     - The application of the LMP approach for VTR included these factors using supplemental criteria. The strategy was approved by the authorization body (DOE).



VTR Collocated Worker F-C Curve

Part of VTR SSC Classification Requirements

Safety Significant (SS)	• SSC is necessary to protect public or workers from a chemical hazard above DOE limits.

FINDINGS AND RECOMMENDATIONS

SSC Classification

- Only Parts 70 and 72 have SSC classification requirements:
  - **Part 70**: Items relied on for safety (IROFS)
  - **Part 72**: SSCs important to safety
- The LMP approach for SSC identification and establishment of design basis likely sufficient to meet these requirements.
- Further detailed assessment needed to clarify expectations regarding special treatments for SSCs.
  - The potential SSC special treatments outlined in NEI 18-04 likely beyond what is required under Part 70 and 72.

FINDINGS AND RECOMMENDATIONS

- **Content of Applications**
  - The LMP approach and TICAP guidance likely provide the necessary information to fulfill safety-relevant application requirements under Parts 30, 40, 70, and 72.
  - Part 70 requires an Integrated Safety Assessment (ISA).
    - The ISA is an integrated analysis regarding potential radiological and chemical hazards, including possible accident sequences and consequences.
  - Only Part 72 requires a formal SAR.
  - A crosswalk of the required Part 70 ISA and Part 72 SAR content with TICAP guidance would be useful for expediting future licensing efforts.

FINDINGS AND RECOMMENDATIONS

- **Emergency Plan**
  - Parts 30, 40, 70 and 72 have nearly identical requirements regarding emergency plans
  - LMP approach can provide the information necessary to fulfill most requirements
  - In general, additional guidance needed regarding the use of LMP information in the formulation of emergency planning (including meeting Part 50 requirements)
  - Program effort currently underway to develop guidance for emergency plans based on the LMP approach and outputs

Parts 30, 40, 70 and 72
Emergency Plan Elements

(i) Facility description

(ii) Types of accidents

(iii) Classification of accidents

(iv) Detection of accidents

(v) Mitigation of consequences

(vi) Assessment of releases

(vii) Responsibilities.

(viii) Notification and coordination.

(ix) Information to be communicated.

(x) Training.

(xi) Safe shutdown.

(xii) Exercises.

(xiii) Hazardous chemicals

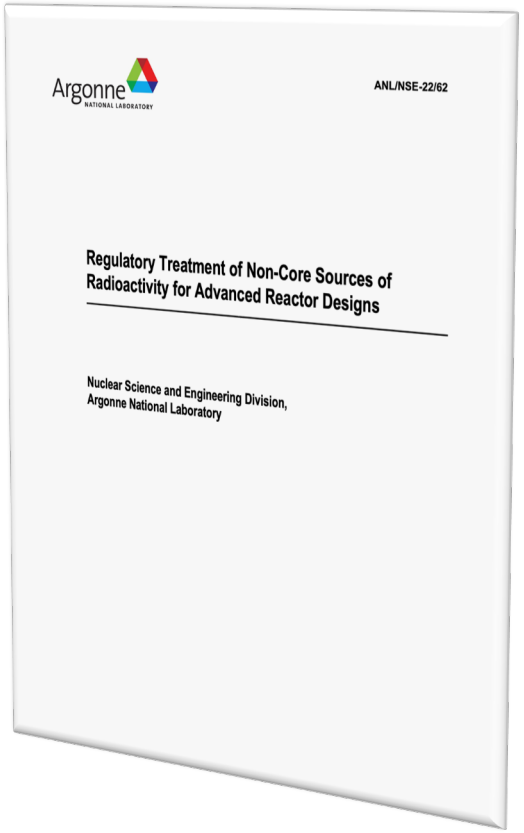
OVERALL CONCLUSIONS

- **No Show-Stoppers**
  - Utilizing a RIPB pathway for the licensing of non-core sources associated with advanced reactors seems possible (from a safety perspective).

- **Recommended Next Steps**
  1) Pursuit of regulatory clarity
     - Alternative event category definitions under Part 70 and 72
     - Utilization of supplemental worker dose and chemical hazard criteria as part of LMP
     - SSC special treatments under Part 70 and 72
  2) Part 72 SAR crosswalk
     - Comparing TICAP content and necessary Part 72 SAR content
  3) Guidance regarding emergency planning using the LMP approach (ongoing parallel effort)

ANL/NSE-22/62

OSTI: TBD



QUANTITATIVE HEALTH OBJECTIVES

- **Observation**
  - Current draft 10 CFR Part 53 includes the QHOs as explicit regulatory requirements.
  - If an applicant is including non-core sources of radioactivity within their plant PRA, the impact of these events may be included when determining satisfaction of the QHOs.
  - Such an approach may introduce inconsistencies when compared to the current application of the QHOs to LWRs, when utilizing the surrogates of CDF and LERF*.
  - May be particularly important for external hazard scenarios that impact multiple sources of radioactivity at the plant simultaneously.

**Past NRC studies have examined the risk of spent fuel pools and comparison to the QHOs (NUREG-1738)*

QUESTIONS


Argonne
NATIONAL LABORATORY
1946
75
2021

Advanced Reactor Stakeholder Public Meeting

Break

Meeting will resume at 2:00 pm EST

Microsoft Teams Meeting
Bridgeline: 301-576-2978
Conference ID: 856 640 616#

Advanced Reactor Program

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Electronic Submittal of Advanced Reactor Applications

NRR/DANU/UARP

Advanced Reactor Stakeholder Meeting

June 7, 2023

Electronic Submittals of Advanced Reactor Applications

Purpose: To Provide Insights Regarding Submittals for Advanced Reactor Applications

Outcome: Insights lead to efficient submittal and processing of advanced reactor applications

Electronic Submittals of Advanced Reactor Applications

- History
  - Because of past limitations for processing of large documents in ADAMS, NRC staff developed a process that included use of a packing slip
    - Previous presentation on use of packing slips available at: ML14071A344
    - Bellefonte combined license application had over 750 individual files
- Current Guidance
  - Electronic Submittal webpage has been updated to remove the mention of packing slips (see: https://www.nrc.gov/site-help/e-submittals.html)

Electronic Submittal of Advanced Reactor Applications

- Current Guidance
  - Electronic Submittal Guidance Document is available at: ML13031A056
    - Link to guidance document can also be found on NRC webpage: https://www.nrc.gov/site-help/electronic-sub-ref-mat.html
    - Defines individual file requirements
      - Current limitation on file size is provided in this document and it is substantially greater than the file size limitation in 2007 time frame of 25 megabytes
      - Increase in allowed individual file size could lead to less individual files being submitted

Electronic Submittal of Advanced Reactor Applications

- Current Guidance
  - Recent examples of large electronic submittals include:
    - –Vogtle 3 and 4 updated final safety analysis report, Tier 1, Technical Requirement Manual, and Technical Specifications Bases Submittal (see: https://www.nrc.gov/docs/ML2217/ML22179A121.html
    - –North Anna Updated Final Safety Analysis Report (see: ML22283A023)

Electronic Submittal of Advanced Reactor Applications

- Current Guidance
  - Treatment of Sensitive Information
    - Documents containing safeguards information may not be submitted via the electronic information exchange (EIE) process
      - Documents with Safeguards Information (SGI) may be transmitted on optical storage media (OSM)
      - The mailing package containing optical storage media with safeguards information must be processed, marked and transmitted in accordance with the requirements set forth in 10 C.F.R. § 73.22(e), (g), (h), and (f), as appropriate.

Electronic Submittal of Advanced Reactor Applications

- Current Guidance
  - Treatment of Sensitive Information
    - Sensitive Unclassified Non-Safeguards Information (SUNSI) may be electronically submitted through the EIE process or on OSM.
      - Transmittal documents used to transmit one or more documents containing SUNSI must be marked to show SUNSI is contained in the documents being transmitted. A header marking must be placed on each page of the transmittal document showing the type of SUNSI (i.e., "Security-Related Information—Withhold under 10 C.F.R. § 2.390," or "Proprietary Information—Withhold under 10 C.F.R. § 2.390.")
      - Preferred approach is to have a redacted publicly available portion of the application and an unredacted non-publicly available portion of the application

Electronic Submittal of Advanced Reactor Applications

- Current Guidance
  - Options
    - Option 1 – application documents can be broken into manageable number of files (around 25 files) and total file size for the combined files is also manageable (around 1 gigabyte or less)
      - » Electronic Information Exchange could be used
    - Option 2 – application documents can be broken into manageable number of files (around 25 files) and total file size for the combined files is large (greater than 1 gigabyte)
      - » Recommend that the submittal be provided to the document control desk via optical storage media such as compact disc (CD)/digital visual disc (DVD) or thumb drive
        - Concern is transfer speed capabilities via (EIE)
          - Could take a lengthy amount of time during which potential interruptions during the transfer could cause issues
  - Both above options assume major portions of the application will be submitted initially and in subsequent revisions (i.e., subsequent revisions will not be on a page replacement basis). In addition, as discussed above applicants are cautioned to ensure appropriate steps are taken to protect SUNSI and that SGI is not to be processed in ADAMS.

Electronic Submittal of Advanced Reactor Applications

Questions?

Advanced Reactor Construction Oversight Program (ARCOP)

PENDING INFORMATION SECY (ARCOP INFO SECY)

Jon Greives

Deputy Director, DANU/NRR

Topics

Purpose of the ARCOP INFO SECY

ARCOP Focus

Monitoring Quality

Enforcing Noncompliances

Assessing Results

Next Steps

ARCOP INFO SECY

"Vision for the NRC's Advanced Reactor Construction Oversight Program (ARCOP)"

ARCOP Focus

Establish reasonable assurance that facilities are built and will operate in accordance with their approved design and licensing bases

Quality

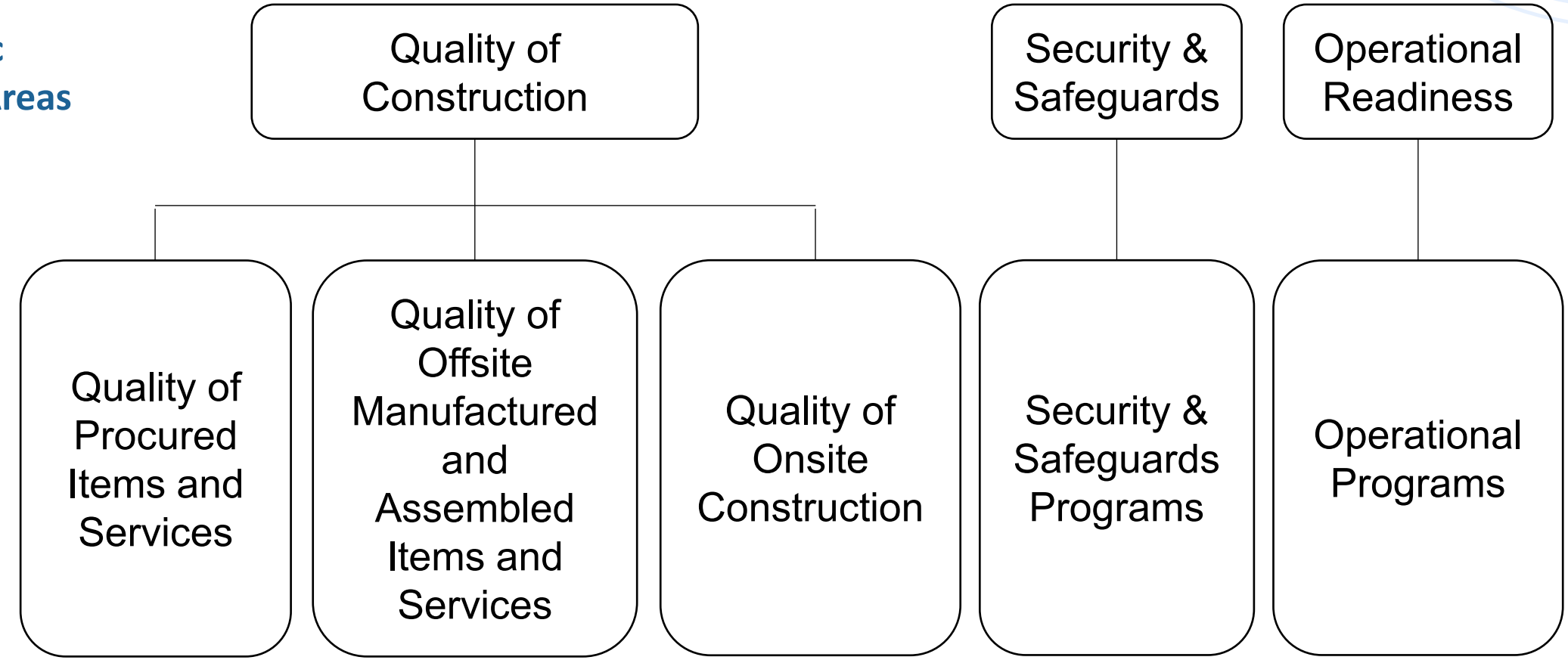
provides confidence that SSCs will perform satisfactorily in service

- Suppliers
- Manufacturers
- On-Site Construction

ARCOP Cornerstones of Safety

Three Strategic Performance Areas

Five Cornerstones of Safety



Areas of NRC Oversight

- Performance Monitoring (Quality Monitoring)
- Enforcing Noncompliance (including significance determination)
- Assessing Results

Performance Monitoring
Inspecting Quality

Facility-specific baseline inspection plans based on the potential of different construction activities to impact Fundamental Safety Functions

- Site-specific inspection plans for licensees
- Design-specific baseline inspection plans for manufacturers and vendors

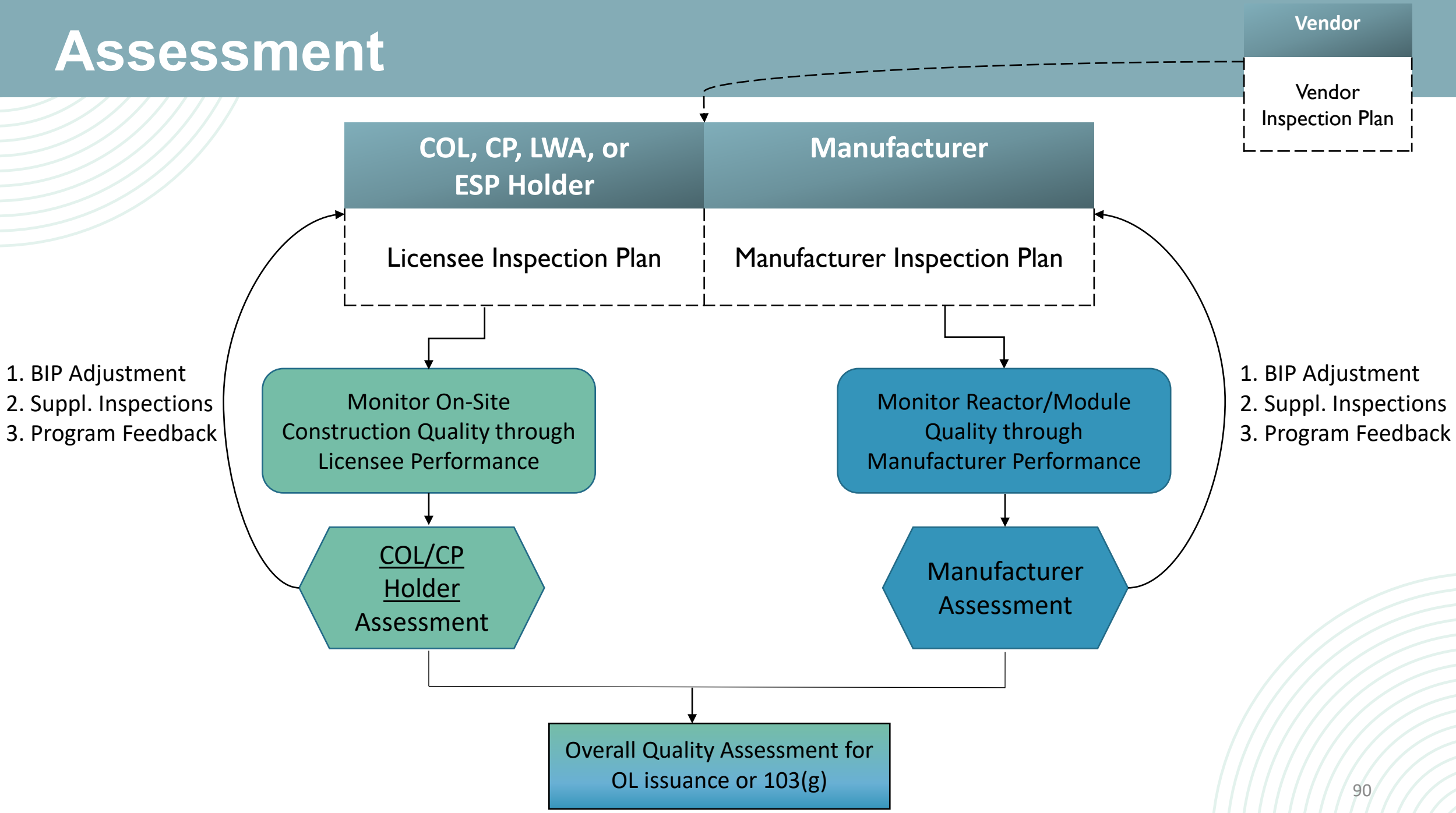
Enforcing Noncompliance / Significance Determination

- Significance determination based on impact to fundamental safety functions.

- Additional minor violation criteria including self-identification and correction credit

- Results in significance of noncompliance being appropriately aligned with potential risk of construction activities.

Assessment


Vendor
Vendor Inspection Plan
COL, CP, LWA, or ESP Holder
Manufacturer
Licensee Inspection Plan
Manufacturer Inspection Plan
1. BIP Adjustment
2. Suppl. Inspections
3. Program Feedback
Monitor On-Site Construction Quality through Licensee Performance
Monitor Reactor/Module Quality through Manufacturer Performance
1. BIP Adjustment
2. Suppl. Inspections
3. Program Feedback
COL/CP Holder Assessment
Manufacturer Assessment
Overall Quality Assessment for OL issuance or 103(g)

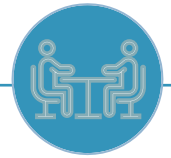
Next steps

IMC DRAFT COMPLETION

New IMCs are being developed for ARCOP.

INTERNAL TABLETOPS

Evaluate IMCs with data and experience



EXTERNAL WORKSHOPS

Engage AR stakeholders

INTERNATIONAL COOPERATION

Explore expanded cooperation for construction oversight

INSPECTION TECHNOLOGY

Explore use of new technologies to further improve inspection efficiency

TIMELINE

SUMMER 2023	FALL 2023	2024	2025
Draft and tabletop IMCs	Conduct external workshops	Finalize ARCOP procedures	AR construction oversight program ready for use

Follow-up questions can be addressed to:

Jon Greives
Deputy Director, NRR/DANU
jonathan.greives@nrc.gov

OR

Phil O'Bryan
Senior Reactor Operations Engineer and
ARCOP Project Lead
phil.obryan@nrc.gov

questions

Advanced Reactor Stakeholder Public Meeting

Break

Meeting will resume at 3:15 pm EST

Microsoft Teams Meeting
Bridgeline: 301-576-2978
Conference ID: 856 640 616#

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Updates on Advanced Reactor Content of Application Project (ARCAP) Interim Staff Guidance (ISG) Documents and Technology Inclusive Content of Application Project (TICAP) Draft Guide

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Purpose

- Facilitate stakeholder understanding of the ARCAP interim staff guidance (ISG) documents and the TICAP draft regulatory guide (DG) 1404

- Provide guidance on how to submit written comments. Comments on the documents will not be taken in today's meeting. Please submit your comments in accordance with the instruction in the *Federal Register* notices.

- Comment period ends on **July 10, 2023**

Note: ARCAP = Advanced Reactor Content of Application Project
TICAP = Technology Inclusive Content of Application Project

ARCAP/TICAP Background

- Guidance for developing and reviewing technology-inclusive, risk-informed, and performance-based non-light water (non-LWR) applications

- Being developed to support 10 CFR Part 50 and 10 CFR Part 52 applications
  - Needed to support expected near-term non-LWR Part 50/52 applications using the licensing modernization project (LMP) process in NEI 18-04, Revision 1

- The NRC staff intends to revise the guidance per the final Part 53 rulemaking language

TICAP Background

- TICAP scope is governed by the LMP-based process
  - LMP uses risk-informed, performance-based approach to select licensing basis events, develop structures, systems, and components (SSC) categorization, and ensure that defense-in-depth is considered
- Industry developed key portions of TICAP guidance
  - See NEI 21-07, Revision 1, "Technology Inclusive Guidance for Non-Light Water Reactors Safety Analysis Report Content for Applicants Utilizing NEI 18-04 Methodology," (ADAMS Accession No. ML22060A190)
- DG 1404 proposes to endorse NEI 21-07, Revision 1, with clarifications and additions

ARCAP Background

- Broad in nature and intended to cover guidance for non-LWR applications for:
  - combined licenses
  - construction permits
  - operating licenses
  - design certifications
  - standard design approvals
  - manufacturing licenses

- Encompasses TICAP
  - TICAP is guidance for off-normal reactor states only. ARCAP encompasses everything needed for a license application.

ARCAP and TICAP - Nexus

Outline Safety Analysis Report (SAR) – Based on TICAP Guidance

1. General Plant Information, Site Description, and Overview
2. Methodologies and Analyses and Site Information*
3. Licensing Basis Event (LBE) Analysis
4. Integrated Evaluations
5. Safety Functions, Design Criteria, and SSC Safety Classification
6. Safety Related SSC Criteria and Capabilities
7. Non-safety related with special treatment SSC Criteria and Capabilities
8. Plant Programs

Additional SAR Content –Outside the Scope of TICAP

9. Control of Routine Plant Radioactive Effluents, Plant Contamination, and Solid Waste
10. Control of Occupational Doses
11. Organization and Human-System Considerations
12. Post-construction Inspection, Testing and Analysis Programs

Audit/inspection of Applicant Records

- Calculations
- Analyses
- P&IDs
- System Descriptions
- Design Drawings
- Design Specs
- Procurement Specs
- Probabilistic Risk Assessment

Additional Portions of Application

- Technical Specifications
- Technical Requirements Manual
- Quality Assurance Plan (design)
- Fire Protection Program (design)
- Quality Assurance Plan (construction and operations)
- Emergency Plan
- Security Plan
- Cyber Security Plan
- SNM physical protection program
- SNM material control and accounting
- Fire Protection Program (operational)
- Radiation Protection Program
- Offsite Dose Calculation Manual
- Inservice inspection/Inservice testing (ISI/IST) Program
- Environmental Report and Site Redress Plan
- Financial Qualification and Insurance and Liability
- Fitness for Duty Program
- Aircraft Impact Assessment
- Performance Demonstration Requirements
- Nuclear Waste Policy Act
- Operational Programs
- Exemptions, Departures, and Variances)

* SAR Chapter 2 derived from TICAP guidance as supplemented by ARCAP interim staff guidance Chapter 2, “Site Information”

- Safety Analysis Report (SAR) structure based on clean sheet approach
- Additional contents of application may exist only in the SAR, may be in a separate document incorporated into the SAR, or may exist only outside the SAR.
- The above list is for illustration purposes only.

ARCAP/TICAP Background

- Ten draft documents were publicly released in 2021 to encourage early stakeholder feedback
  - Nine ARCAP draft ISGs (released as White Papers)
  - One TICAP (DG 1404)

Draft Document Subject	ADAMS Accession No.	Date Most Recent Version Released
Review of Risk-Informed, Technology-Inclusive Advanced Reactor Applications - Roadmap	ML21336A702	12/2/21
Chapter 2, "Site Information"	ML21189A031	7/6/21
Chapter 9, "Control of Routine Plant Radioactive Effluents, Plant Contamination and Solid Waste	ML21189A033	7/6/21
Chapter 10, "Control of Occupational Doses"	ML21189A035	7/6/21
Chapter 11, "Organization and Human-System Consideration"	ML21309A020	11/5/21
Chapter 12, "Post Construction Inspection, Testing and Analysis Program"	ML21294A266	10/21/21
"Risk-Informed ISI/IST Programs"	ML21216A051	8/4/21
"Licensing Modernization Project-based Approach for Developing Technical Specifications"	ML21133A490	5/10/21
"Risk-Informed, Performance-Based Fire Protection Program (for Operations)"	ML21294A266	10/21/21
Draft Regulatory Guide 1404, "Guidance for a Technology Inclusive Content of Application Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Advanced Reactors"	ML21336A697	12/2/21

Revised ARCAP/TICAP Documents

- All ten documents were reissued in May of 2023 (ADAMS Package No. ML23044A038). The 45-day formal public comment period started on May 25, 2023, and ends on July 10, 2023.
- The NRC's "Documents for Comment" website https://www.nrc.gov/public-involve/doc-comment.html provides guidance on how to submit comments and provides links to the regulations.gov docket IDs.

ARCAP ISG Title	ADAMS Accession #	*Federal Register* #	Regulations.gov Docket ID No.
DANU-ISG-2022-01, Review of Risk-Informed, Technology-Inclusive Advanced Reactor Applications - Roadmap	ML22048B546	88 FR 33924	NRC-2022-0074
DANU-ISG-2022-02, Chapter 2, "Site Information"	ML22048B541	88 FR 33940	NRC-2022-0075
DANU-ISG-2022-03, Chapter 9, "Control of Routine Plant Radioactive Effluents, Plant Contamination and Solid Waste	ML22048B543	88 FR 33930	NRC-2022-0076
DANU-ISG-2022-04, Chapter 10, "Control of Occupational Doses"	ML22048B544	88 FR 33936	NRC-2022-0077
DANU-ISG-2022-05, Chapter 11, "Organization and Human-System Consideration"	ML22048B542	88 FR 33928	NRC-2022-0078
DANU-ISG-2022-06, Chapter 12, "Post Construction Inspection, Testing and Analysis Program"	ML22048B545	88 FR 33920	NRC-2022-0079
DANU-ISG-2022-07, "Risk-Informed ISI/IST Programs"	ML22048B549	88 FR 33938	NRC-2022-0080
DANU-ISG-2022-08, "Licensing Modernization Project-based Approach for Developing Technical Specifications"	ML22048B548	88 FR 33926	NRC-2022-0081
DANU-ISG-2022-09, "Risk-Informed, Performance-Based Fire Protection Program (for Operations)"	ML22048B547	88 FR 33922	NRC-2022-0082
Draft Regulatory Guide 1404, "Guidance for a Technology Inclusive Content of Application Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Advanced Reactors"	ML22076A003	88 FR 33846	NRC-2022-0073

Common Changes for all ISGs and DG 1404

- Applicability is now only for non-LWRs
  - Recommends that light-water reactor applicants wanting to use ARCAP/TICAP guidance engage in pre-application discussions
- All ISGs provide applicant guidance and NRC staff review guidance in separate sections
- Removed references that did not have complete NRC staff review
  - Appendices added to several ISGs to list in-development guidance documents that could affect future revision of those ISGs
- Common ISG sections now contain uniform text and added two short sections to account for the Paperwork Reduction Act

Roadmap ISG Changes

- Removed the definition of “advanced reactor”
- Provides a listing of references that are associated with the ARCAP roadmap ISG guidance and includes references from other ISGs and TICAP DG
  - Purpose is to aid applicants and the NRC staff in the development and review of the application
- Added guidance regarding “Design of Structures, Components, Equipment, and Systems”
- Expanded discussion regarding site evaluation guidance

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Roadmap ISG Changes (continued)

- Added guidance regarding principal design criteria (PDC) development for those portions of a design outside the scope of TICAP
- Revised guidance regarding the Technical Requirements Manual
- Added guidance regarding special nuclear material (SNM) control and accountability
- Added cyber security guidance

Roadmap ISG Changes (continued)

- Added guidance regarding Financial Qualification and Insurance and Liability
- Added Fitness for Duty section
  - Including referencing requirements for construction permits
- Added guidance regarding Aircraft Impact Assessment
- Added guidance for performance demonstration requirements in accordance with 10 CFR 50.43(e) requirements

Roadmap ISG Changes (continued)

- Added discussion of Nuclear Waste Policy Act contractual requirements
- Added discussion of operational programs required by regulations
- Minor changes made to Appendix A, “Pre-Application Engagement Guidance”
  - Added a discussion related to material qualification

Roadmap ISG Changes (continued)

- Added Appendix B, “Analysis of Applicability of NRC Regulations to Non-Light-Water Power Reactors”
  - Appendix B corrects errors in previous versions and clarifies certain matters
  - Noted that aircraft impact assessments are applicable for Construction Permits (CPs)
  - Added guidance in footnotes regarding the use of 10 CFR 50.69 and mitigation of beyond-design-basis-events for Part 52

- Revised CP guidance in Appendix C
  - Many miscellaneous changes
  - Updated portions of the guidance copied from the final issuance of the LWR construction permit ISG (see: November 14, 2022 LWR CP ISG Federal Register Notice)

- Added Appendix D, “Draft ARCAP guidance documents under development as of May 2023”

Chapter 2 ISG "Site Information" Changes

- Added reference to the Commission's July 13, 2022, Staff Requirements Memorandum on SECY-00-0045 regarding a revision of Regulatory Guide 4.7 incorporating a risk informed assessment of population related issues in determining site suitability

- Added Section 2.7.1 on volcanic hazards and Section 2.7.2 on a screening approach to identify other external hazards beyond design basis hazard levels (DBHLs)

- Added reference to NUREG-0800, Section 3.5.1.6, "Aircraft Hazards", to Section 2.3.2, "review Guidance-Acceptance Criteria"

Chapter 9 ISG "Routine Effluents" Changes

- Clarified the use of an alternative performance monitoring system
- Clarified the use of exemptions
- Added guidance and conditions for situations where a design does not generate any normal radioactive effluent releases
- Added that a summary of the estimated doses to the public should be included in an application

Chapter 10 ISG "Occupational Dose" Changes

- Added guidance for Standard Design Approvals and CPs
- Added guidance regarding Combined License (COL) action items

Chapter 11 ISG "Organization and Human-System Considerations" Changes

- Clarified guidance for applicants wanting approval of a licensed operator staffing plan that does not meet 10 CFR 50.54
- Clarified guidance regarding situations where control room design details are not complete at the time of a COL application
- Removed reference to remote operations white paper

Chapter 12 ISG "Post-construction Inspection, Testing, and Analysis Program" Changes

- Clarified guidance regarding the scope of PITAP and the regulatory basis for post construction inspection requirements
- Clarified the applicability of 10 CFR Part 50, Appendix B, Criterion III, Design Control, as a basis for PITAP Phase I requirements
- Removed references to ASME Section VIII because Section III is the governing Code for SSCs addressed by this ISG
- Added staff guidance regarding test description content

Technical Specifications (TS) ISG Changes

- Clarified that design certifications (DCs) should have proposed generic TSs
- Added that Manufacturing Licenses (MLs) must have final operational information
- Added that applications referencing a DC or ML should replace bracketed information with site specific information.

Technical Specifications ISG Changes (continued)

- Removed reference to the possible need for exemptions
  - In the Federal Register Notice for this ISG, the NRC is requesting comments on whether the correlation between the 10 CFR 50.36 text and the LMP process outputs require the NRC to consider an exemption
- Revised the “Safety Limit” definition corresponding to NEI 18-04 output
- Added an administrative control regarding reactor coolant system temperature and pressure limits report, if applicable to the specific design

Technical Specifications ISG Changes (continued)

- Added staff recommendation that applicants use standard TS NUREGs for TS format
- Clarified guidance regarding situations where applicants propose to use risk criteria that are different from the NEI 18-04 Frequency-Consequence (F-C) Target
- Clarified text regarding the guidance for TS "Use and Application" information
- Added Acceptance Criteria that the requirements of 10 CFR 50.36a are met

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ISI/IST ISG Changes

- Added that the NRC staff assumes applicants will design and qualify their equipment to the latest NRC-accepted ASME Codes
- Clarified guidance on components that perform active safety functions, such as moving fluid or transferring heat without mechanically interacting with the fluid
- Identified that if components are safety significant and unique to a new design, additional examinations/testing may be necessary and sampling may not be sufficient

Fire Protection (Operations) ISG Changes

- Added that all analyses related to the program should be available for audit
- Clarified text regarding applicability of 10 CFR 50.48(c) and NFPA 805

TICAP DG Changes

- Removed “affirmative safety case,” “safety case,” and “licensing case” terminology that comes from NEI 21-07
- Added additional guidance for site evaluations with respect to external hazards and DBHLs and associated design requirements for SSCs
- Added guidance on options using LMP based approach to address 10 CFR 50.34(a)(1)(ii)(D) and 52.79(a)(1)(vi) dose criteria (see staff position C.3.c)
- Added guidance for the development of PDCs

TICAP DG Changes (continued)

- Added the application must describe the safety features and components that require research and development (R&D).
  - Notes the applicant will conduct an R&D program to resolve any associated safety questions

- Construction Permit Guidance Changes:
  - CP guidance moved from an appendix to main document
  - Added that the CP application should provide the necessary commitments to establish defense-in-depth adequacy
  - Added guidance regarding the scope of preliminary safety analysis descriptions in CP applications

TICAP DG Changes (continued)

Construction Permit Guidance Changes (continued)

- Added that the CP application should include commitments to confirm reliability and capability targets consistent with the probabilistic risk assessment (PRA) for SR [and NSRST] SSCs in the operating license application, if not provided in the CP application
  - In addition, the application should describe any planned testing, validation, and special treatment to be applied to the SSCs to confirm their performance

- Staff positions C.3.d (addition), C.3.e (clarification), and C.3.f (clarification) provide construction permit probabilistic risk assessment guidance

TICAP DG Changes (continued)

- Added Appendix A, “Draft ARCAP Guidance Documents Under Development as of May 2023,” that could affect DG-1404
  - Includes four item related to probabilistic risk assessment
  - Includes an item related to materials compatibility
- Potential future addition: List of generic safety issues that non-LWR applicants should address

Two Ways to Submit Comments

1. Federal Rulemaking Website: Go to https://www.regulations.gov/ and search for the following Docket IDs. Comments must be received by **July 10, 2023**.

ARCAP/TICAP Title	Regulations.gov Docket ID No.
DANU-ISG-2022-01, Review of Risk-Informed, Technology-Inclusive Advanced Reactor Applications - Roadmap	NRC-2022-0074
DANU-ISG-2022-02, Chapter 2, “Site Information”	NRC-2022-0075
DANU-ISG-2022-03, Chapter 9, “Control of Routine Plant Radioactive Effluents, Plant Contamination and Solid Waste	NRC-2022-0076
DANU-ISG-2022-04, Chapter 10, “Control of Occupational Doses”	NRC-2022-0077
DANU-ISG-2022-05, Chapter 11, “Organization and Human-System Consideration”	NRC-2022-0078
DANU-ISG-2022-06, Chapter 12, “Post Construction Inspection, Testing and Analysis Program”	NRC-2022-0079
DANU-ISG-2022-07, “Risk-Informed ISI/IST Programs”	NRC-2022-0080
DANU-ISG-2022-08, “Licensing Modernization Project-based Approach for Developing Technical Specifications”	NRC-2022-0081
DANU-ISG-2022-09, “Risk-Informed, Performance-Based Fire Protection Program (for Operations)”	NRC-2022-0082
Draft Regulatory Guide 1404, “Guidance for a Technology Inclusive Content of Application Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Advanced Reactors”	NRC-2022-0073

Two Ways to Submit Comments (continued)

1. **Federal Rulemaking Website:** Go to https://www.regulations.gov/ using Docket IDs (continued)

   - Address questions about Docket IDs in Regulations.gov to Stacy Schumann; telephone: 301-415-0624; email: Stacy.Schumann@nrc.gov

   - For technical questions, contact: Joseph Sebrosky, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, telephone: 301-415-1132, email: Joseph.Sebrosky@nrc.gov; or Michael Orenak, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, telephone: 301-415-3229, email: Michael.Orenak@nrc.gov

2. **Mail comments** to: Office of Administration, Mail Stop: TWFN-7-A60M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, ATTN: Program Management, Announcements and Editing Staff.

QUESTIONS?

(Note: The NRC is not taking comments on the ISGs or the TICAP DG in this Q&A session)

NUCLEAR ENERGY INSTITUTE

Advanced Reactor Stakeholder Meeting:

Initial Observations on Draft NRC Reg Guide DG-1404

June 7th, 2023

Introduction and Overview

- Following extensive interactions with the NRC throughout 2021, NEI submitted NEI 21-07 to the NRC for endorsement on March 1, 2022
  - NEI 21-07 is intended to be part of a streamlined and predictable licensing pathway to deployment for advanced reactors under 10 CFR Part 50 or 52
  - NEI 21-07 applies to designs that follow the methodology of NEI 18-04
- The NRC made draft Regulatory Guide DG-1404 on NEI 21-07 available on ADAMS on May 18, 2023, in conjunction with a number of interim staff guidance documents (ISGs) related to advanced reactors
  - Comments on DG-1404 and all of the ISGs are due July 10, 2023
- By our count, DG-1404 contains
  - 9 staff positions
  - 2 combined clarifications and additions
  - 8 clarifications
  - 17 additions

Initial General Feedback

- Requests for clarification of some information in DG-1404 is provided in this presentation, supported by initial feedback on some items
- The TICAP team intends to formally submit comments on DG-1404
  - If an addition or clarification is not addressed in this presentation, that does not mean the TICAP team does not have a comment
  - The TICAP team believes that a number of elements in DG-1404 would benefit from further discussions between the team and the NRC
  - This presentation is focused on items in DG-1404 for which clarification is needed

General Concerns (1 of 2)

- Cross-cutting concerns identified by the TICAP team in its initial review include:
  - Carryover of LWR “business as usual” where it is not beneficial but adds burden
  - New NRC requirements that were not raised during the extensive discussions held between the NRC and the TICAP team in 2020 through 2022
  - Language and guidance in DG-1404 that is redundant to guidance already in NEI 21-07
  - The use of DG-1404 to provide guidance on matters outside the scope of NEI 18-04 and NEI 21-07, rather than putting that information in ARCAP where it would be more appropriate

General Concerns (2 of 2)

- Having a regulatory guide with a large number of additions and clarifications is not desirable from the standpoint of providing clear, understandable guidance for applicants and regulators
- A “one and done” Federal Register comment process on the draft Reg Guide may not result in the quality of guidance needed to enable an “efficient and effective” regulatory review of advanced non-LWRs
- The TICAP team desires to work with the NRC to develop the best possible guidance

Request for Clarifications on DG-1404

- Clarification C.2.a:

  NRC objects to the term “LMP-based affirmative safety case” and other variations of it

  - NRC’s specific concern is unclear
  - NEI 21-07 defines the term “LMP-based affirmative safety case” so the meaning is not ambiguous

Request for Clarifications on DG-1404

- Addition C.2.e(2):

  The NRC requests a summary table of regulatory guides “directly applicable to the design”

  - What is the definition of “directly applicable to the design”
  - Should it not be “regulatory guides used in the design”?
    - Regulatory guides are not mandatory, so their use is up to the applicant

Request for Clarifications on DG-1404

- Addition C.3.c:

  The NRC requests additional information on radiological doses, referencing 10 CFR 50.34(a)(1)(ii)(D) or 10 CFR 52.79(a)(1)(vi)

  - How are these requirements related to NEI 18-04?
  - When would an exemption be needed for Option 1?
  - What are the meanings of the terms “bounding DBA” and “bounding DBE” in Option 2?

Request for Clarifications on DG-1404

- Addition C.3.h:

  The NRC wants applicants to identify and describe in Chapter 2 the non-PRA analysis and calculation methodologies used to establish their licensing bases

  - What is the definition of “analysis and calculation methodologies?”
    - This seems rather open-ended; many analyses and calculations do not appear in SARs for current light water reactors
    - Can the NRC provide examples?
  - Does NRC object to using Chapter 3 for documenting methodologies?
    - NEI 21-07 was written with the clear intent to allow applicants the option of documenting DBA analyses in Chapter 2 (if used in multiple applications) or in Chapter 3 with the associated DBA (if used only in that instance)

Request for Clarifications on DG-1404

- Addition C.4.a:
  The discussion of AOOs, DBEs, DBAs, and BDBEs in Chapter 3 of the SAR should include a description of the models, site characteristics, and supporting data associated with the calculation of the mechanistic source terms and radiological consequences (to the extent that such information does not appear in the discussions of methodologies and analyses in Chapter 2, the descriptions of systems and functions in Chapters 5–7, or other sections of the SAR).
- Clarification C.4.b:
  Section C.2.1.1 of NEI 21-07, Revision 1, contains adequate guidance on the level of detail in the SAR to describe non-DBA LBEs.
- Taken together, the TICAP team interprets this information to mean that the information specified in 2.1.1 should be adequate to address the NRC's desire for information on AOO, DBE, and BDBE dose calculations
  - Is that the correct interpretation?

Request for Clarifications on DG-1404

- Addition C.5.a:

  The CP application should provide a discussion in the SAR to establish DID adequacy. A discussion in the SAR to implement the DID adequacy assessment processes in RG 1.233 is considered acceptable for this purpose. Alternatively, the applicant should ensure that its DID process involves incorporating DID into design features, operating and emergency procedures, and other programmatic elements to ensure that performance requirements are maintained throughout the life of the plant. An applicant that chooses not to use the approach endorsed in RG 1.233 will need to explain its approach to DID and describe how it addresses DID in the application.

  - NEI 21-07 addresses DID needs for a CP – what is the purpose of the addition?
  - Why is there a "carve out" for applicants not following RG 1.233 here (for DID), but not in other areas covered by RG 1.233 (e.g., LBE identification)?
  - Did the NRC mean to state "The CP application should provide a discussion in the SAR *of the approach to establishing* DID adequacy.?"

Request for Clarifications on DG-1404

- Addition C.5.b:

  For each of the three plant performance metrics discussed above in Section 5 of this document (section C.4 of the application guidance), in addition to the results and margins, the SAR Chapter 4 should address the following (where different from the analysis performed for Chapter 3):

  - What is meant by “where different from the analysis performed for Chapter 3”?
  - The Chapter 3 AOO, DBE, and BDBE analyses and the quantitative integrated evaluations in Chapter 4 are performed by the same tool – the plant PRA

Request for Clarifications on DG-1404

- Addition C.5.c:

  The NRC states that applicants should address human factors considerations in Chapter 4 (Integrated Evaluations).

  - Given that the NRC established Chapter 11 of the SAR to deal with human factors, what is the rational for requiring human factors information in Chapter 4?
  - Substantial previous discussions with the NRC on human factors occurred prior to the submittal of NEI 21-07.
    - NRC never suggested Chapter 4 should include human factors information

Request for Clarifications on DG-1404

- Addition C.5.d:

  The NRC is asking for information on change control

  - Why is this request not addressed by the Technology Inclusive Risk Informed Change Evaluation (TIRICE) project, which is developing guidance on change control?
  - What is desired in SAR Chapter 4 above and beyond the TIRICE guidance?

Request for Clarifications on DG-1404

- Addition C.6.b:

  The NRC asks for an extensive discussion of fuel qualification in Chapter 5 of the SAR

  - This is a new requirement that was not raised during the extensive discussions on NEI 21-07
  - Why is Chapter 5 – Safety Functions, Design Criteria, and SSC Safety Classification – the appropriate location for such detailed information?
  - Isn't the information requested in Section (1) (a discussion of the role of the fuel in the safety analysis) already covered in Chapter 3?
  - Why is the guidance in (1) and (2) written like instructions for an NRC reviewer's findings rather than for an applicant?

Request for Clarifications on DG-1404

- Addition C.7.b and C.8.a:

  The NRC asks for additional information beyond what is in NEI 21-07, but only for instrumentation and control (I&C) SSCs, not all SSCs

  - Why is this expectation confined to I&C systems?

Duplicative Clarifications and Additions

- The TICAP team believes that it is important to minimize duplicative discussions between NEI 21-07 and the associated NRC guidance document
  - This will produce clarity and enhance usability and efficiency
- In a number of instances NRC clarifications and additions are unwarranted because NEI 21-07 already adequately addresses the issue

Additions	Clarifications	Clarification and Addition
C.2.c	C.2.b	C.7.a
C.3.g	C.3.e	
C.7.b(1)	C.4.a(2)	
C.8.a(1)	C.3.f	
	C.4.a(3)	
	C.3.a	
	C.4.a(4)	

Thank You for Your Time and Attention

Future Meeting Planning

- The next periodic stakeholder meetings are scheduled for July 20, 2023, and September 14, 2023.

- If you have suggested topics, please reach out to Steve Lynch at Steven.Lynch@nrc.gov

How Did We Do?

- Click link to NRC public meeting information:

https://www.nrc.gov/pmns/mtg?do=details&Code=20230269

- Then, click link to NRC public feedback form: