

A stylized graphic of an atomic symbol, consisting of a central sphere and three elliptical orbits, rendered in shades of blue and white. It is positioned on the left side of the slide, partially overlapping the blue background and the orange banner.

Fukushima Near Term Task Force (NTTF) Recommendation 1: Improved Regulatory Framework

NRC Staff Presentation

June 5, 2013 Public Meeting - NTTF Recommendation 1

Acronyms

ANS	American Nuclear Society
ASME	American Society of Mechanical Engineers
ATWS	Anticipated Transients without SCRAM
BWR MKI	Boiling Water Reactor Mark I
BWR VIP	Boiling Water Reactor Vessel and Internals Program
CCFP	Conditional Containment Failure Probability
CDF	Core Damage Frequency
CTA	Commission Technical Assistants
BDBE	Beyond Design Basis Event
DBA	Design Basis Accident
DBE	Design Basis Event
DID	Defense-in-Depth
DOE	Department of Energy

EDMGs	Extensive Damage Mitigation Guidelines
EOF	Emergency Offsite Facility
EOPs	Emergency Operating Procedures
EPA	Environmental Protection Agency
FLEX	Industry Proposal for Enhanced SBO Mitigating Systems
FSAR	Final Safety Analysis Report
FSME	Office of Federal State Materials and Environmental Management Programs
GSI	Generic Safety Issue
H ₂	Hydrogen
IPE	Independent Plant Evaluation
IPEEE	Independent Plant Evaluation – External Events
ISG	Interim Staff Guidance

Acronyms

JLD Japan Lessons Learned
Directorate

NGNP Next Generation Nuclear Plant

NPP Nuclear Power Plant

NTTF Near Term Task Force

OGC Office of General Council

PRA Probabilistic Risk Assessment

PWRMRP Pressurized Water Reactor
Materials Reliability Program

QA Quality Assurance

QC Quality Control

RES Office of Nuclear Regulatory
Research

RMRF Risk Management Regulatory
Framework

RMTF Risk Management Task Force

ROP Reactor Oversight (Inspection)
Program

SAMGs Severe Accident Mitigation
Guidelines

SBO Station Blackout

SECY Commission paper

SRM Staff Requirements
Memorandum

TSC Technical Support Center

WG Working Group

Outline of Presentations

- Overview of Recommendation 1
 - Review actions taken and planned
- Improvement Activity 1 – Establish a design basis extension category of events and associated regulatory requirements
- Improvement Activity 2 – Establish Commission expectations for defense-in-depth
- Improvement Activity 3 – Clarify the role of voluntary industry initiatives in the NRC regulatory process

Evolution of NRC Approach

- In November 8 public meeting - Four options
 - Described in Nov. 2 white paper (ADAMS Accession no. ML12296A096)
- Today we will discuss three improvement activities
 - February 2013 white paper describing different ways to implement improvement activities (ML13053A108)
 - May 15, 2013 updated white paper with working group's recommended approach (ML13135A125)

Status and Next Steps

- Public comment period on NRC's May 15, 2013 white paper (www.regulations.gov) opened on May 16, 2013 – closes on August 15, 2013 (Docket NRC-2012-0173)
- 3rd public meeting on June 5, 2013
- Staff will evaluate feedback from ACRS and external stakeholders (including written comments)
- Brief NRC managers (JLD Steering Committee)
- ACRS subcommittee meetings on Sept. 3 and Oct. 18, 2013
- ACRS full committee meeting on Nov. 7 or 8, 2013
- Receive ACRS letter
- Evaluate ACRS comments, modify SECY as appropriate, and provide paper to Commission on Dec. 2, 2013



Improvement Activity 1

Establish Design Basis Extension Category

Improvement Activity 1

Establish a design basis extension category of events and associated regulatory requirements

- NTTF & RMTF recommended rulemaking to establish a new category for beyond design-basis requirements
- Staff Working Group (WG) evaluated 3 approaches to establish new category
 - Approach #1 - Plant-specific approach with required PRA
 - Approach #2 - Plant-specific approach without required PRA
 - Approach #3 - Generic approach (without required PRA)
- WG recommends modified version of Approach #3

Categorization Approach Involves 2 Activities

- 1. Define category**
- 2. Identify requirements** (rules and orders) that go into the category

Working Group Recommendation

- Define a generic design basis extension category in internal staff guidance
- Populate the category – forward-fit only
 - New issues/information/rules

Activity 1 – Establish New Design Basis Extension Category

- NRC regulations already include a de-facto design extension category
 - e.g., SBO, ATWS, 50.44, 50.54(hh)
 - 50.46a, risk-informed GSI-191 rule, & Fukushima rules
- Rulemaking is not required to establish a new category of events (although recommended by NTF and RMTF)

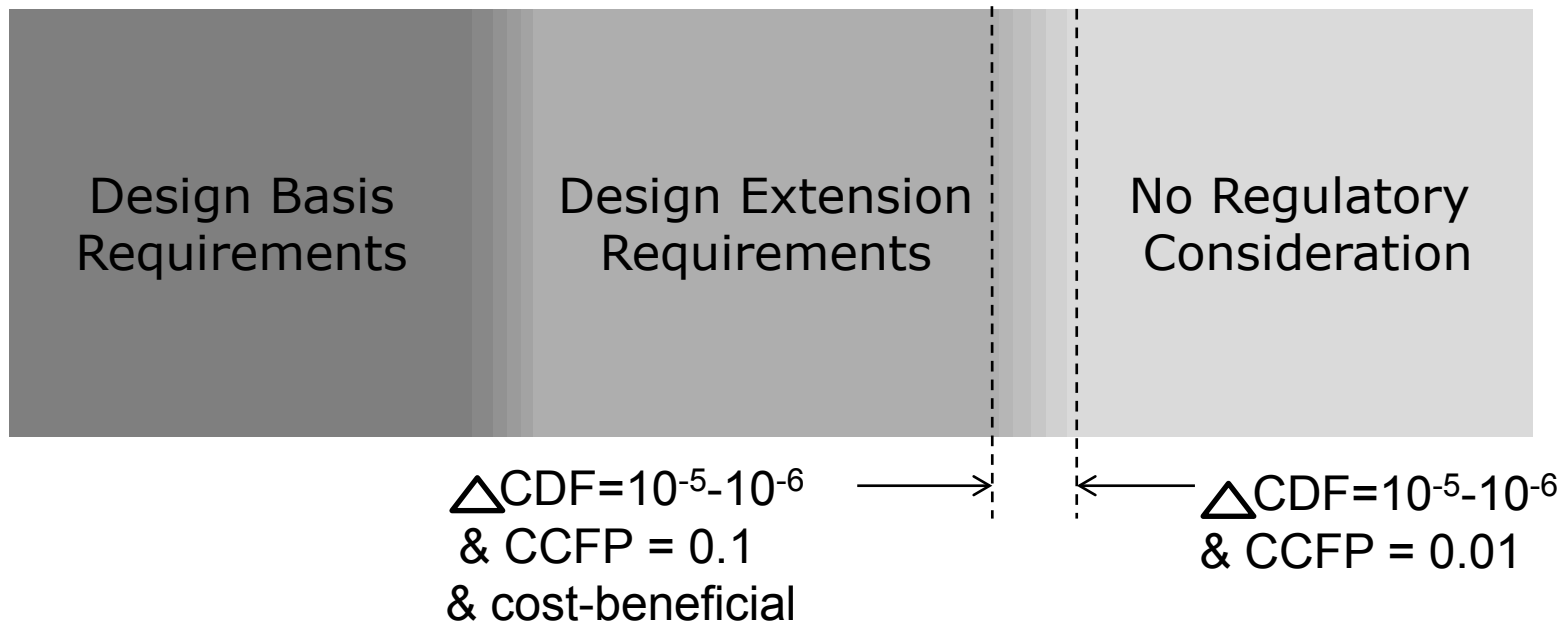
Contents of Staff Guidance

- Define “Design basis extension conditions (events and hazards)”
- Specify how to write future requirements (regulations and orders) to ensure they are consistent, coherent, and complete
 - Well-defined performance goals
 - Analysis methods & acceptance criteria
 - Treatment requirements
 - Design criteria, availability, testing requirements, QA/QC, training
 - Internal guidance would also provide general guidelines to assist staff in determining treatment requirements
 - Reporting requirements, including FSAR updating
 - Change process
 - Specify appropriate change processes (if § 50.59 not applicable) for licensee-initiated changes to equipment utilized to comply with design extension requirements

Recommended Criteria for Inclusion in Category

Criteria for including requirements in design basis extension category:

- Adequate protection (determination not affected by this category)
- Safety enhancement - Use existing criteria in Regulatory Analysis guidelines (NUREG/BR-0058, Figure 3.2)



Identify Design Basis Extension Requirements

- “Grandfather” SBO, ATWS, 50.44, 50.54(hh), etc. as design basis extension requirements
- Add ongoing/future design basis extension rules
 - 50.46a, risk-informed GSI-191 rule, Fukushima rules
- Working Group recommends not searching for additional events (NTTF Recommendation 1.4) because:
 - Ongoing rulemakings (mitigating strategies rule) and NTTF Recommendations 2 – 11 will address and investigate a wide range of safety concerns for needed safety improvements
 - NRC has processes that generically address new issues as they arise (generic issues program, ROP, petition for rulemaking process, etc.)
 - Existing plants have performed IPE and IPEEE studies
 - New reactors are required to have plant-specific PRAs
 - Current NRC resource limitations

Summary of Recommended Approach

Design basis extension category which:

- Is generic
- Addresses requirements needed for adequate protection and those justified as a cost-effective substantial safety enhancements
- Does not require a plant-specific PRA
- Is applicable to current and future licensees and applicants
- Specified existing requirements “grandfathered” without change
- Applies only to new/additional design basis extension requirements
- Can be implemented on ongoing Fukushima rulemakings
- Low cost for NRC and licensees



Improvement Activity 2

**Establish Commission
Expectations for
Defense-in-depth**

Purpose of Presentation

- To **illustrate the approach** to demonstrate there is a reasonable likelihood of success in developing policy statement on defense-in-depth and associated implementing guidance
- Not to debate the terminology or wording
 - Discussion on terminology and wording will be pursued once concept/approach is established
 - Examples are provided to clearly communicate the concept and approach

Basis for Addressing Defense-in-Depth as an Improvement Activity

- To achieve consistency in concept, approach and terminology in order to achieve a common understanding regarding defense-in-depth
- To have Commission approval regarding defense-in-depth concept, approach, and structure

Background – A Sample of the History

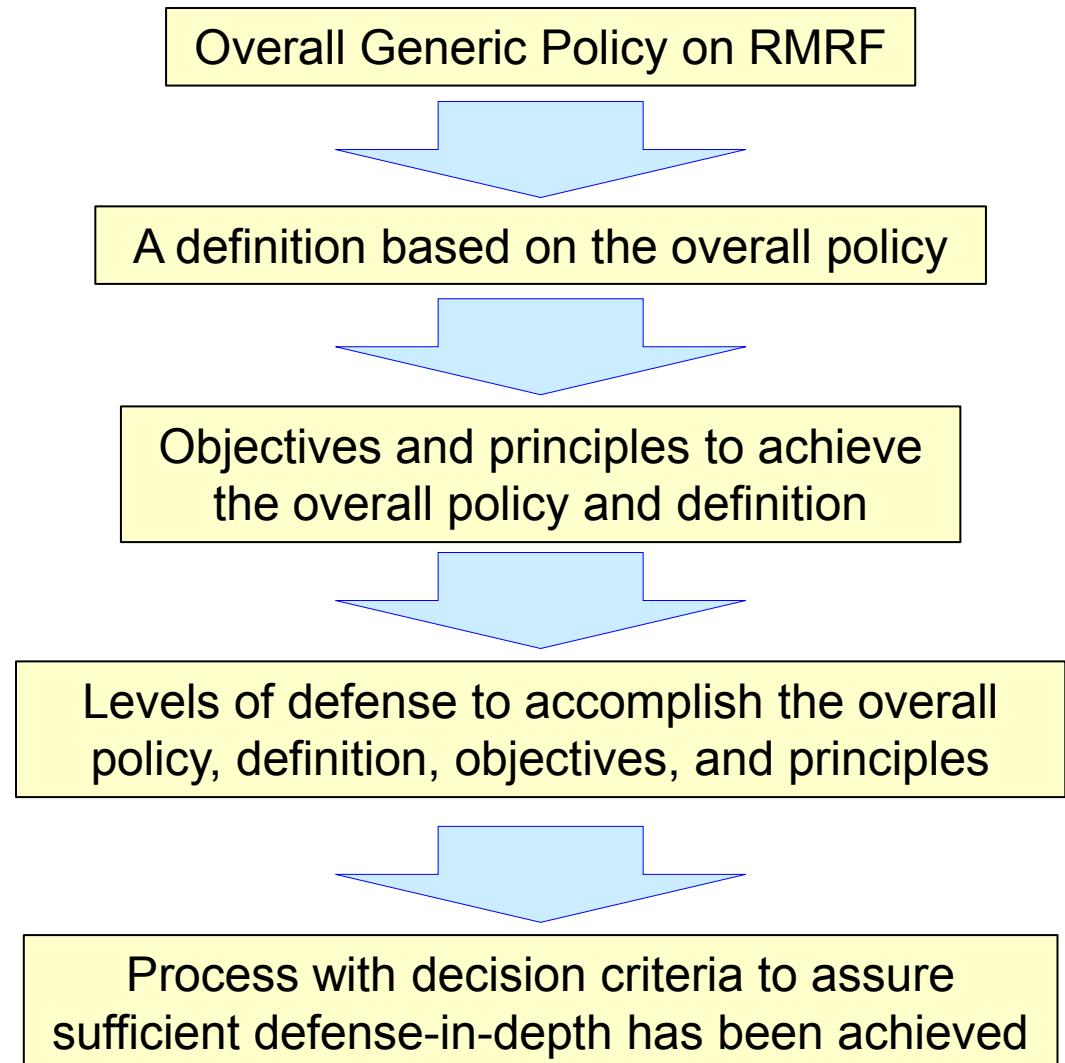
- WASH-740, 1957
- Joint Committee on Atomic Energy Hearings
- Internal Study Group
- ECCS Hearings
- WASH-1250
- 10 CFR Part 60
- Post TMI Definitions and Examples
- NUREG/CR-6042
- Commission Policy Statements
- NUREG-1537
- MIT Speech by Chairman Jackson
- Commission White Paper
- Some Thoughts on Defense-in-Depth by Tom Kress
- PSA '99 paper
- ACRS letters
- IAEA Documents (INSAG-3, 10, & 12, NP-T-2.2)
- 10 CFR Part 50, Appendix R
- Joint ACNW/ACRS Subcommittee
- A Risk-Informed Defense-in-Depth Framework for Existing and Advanced Reactors, Karl Fleming, Fred Silady
- 10 CFR 50.69
- NEI 02-02
- Petition on Davis Besse
- Remarks by Chairman Diaz
- Digital Instrumentation and Controls (NUREG/CR-6303, RG 1.152, NUREG-0800 BTP HICB-91, NUREG-0800 SRP BTP 7-19, DI&C-ISG-02)
- NUREG-1860
- INL NGNP report
- RG 1.174
- NRC glossary
- RMTF – NUREG-2150, 2012

Evaluation of History

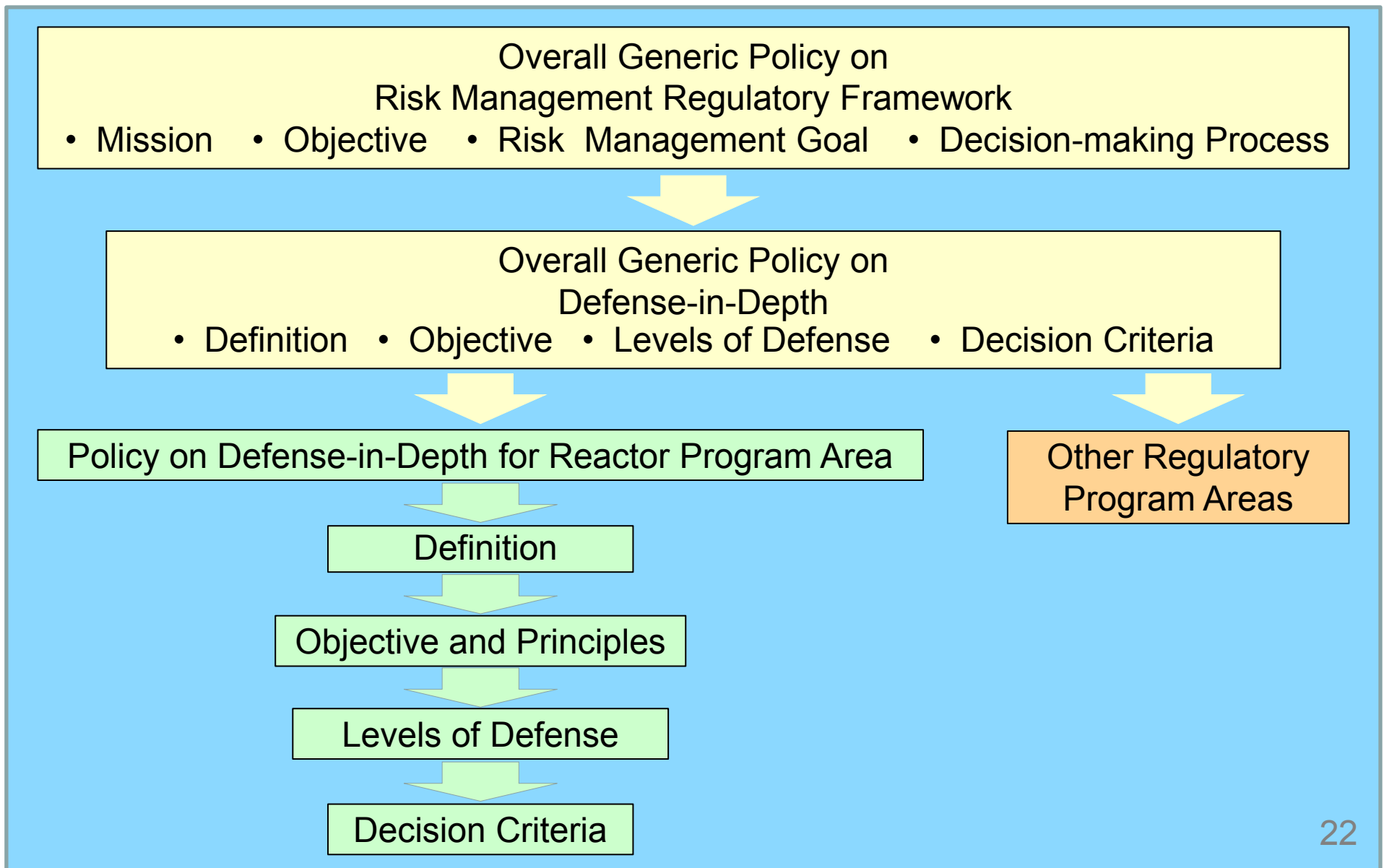
- Similar concepts and views regarding defense-in-depth
- Confusion and misunderstanding because of inconsistencies in terminology

Working Group Approach to Defense-in-Depth

- Policy on defense-in-depth will be developed in a logical, systematic manner to achieve consistency in the treatment of defense-in-depth across the agency
- Defense-in-depth approach will be based on a hierarchical structure



Example of RMRF Proposed Policy Statement



Example Policy and Definition for Reactor Safety Described in the Policy Statement

- **Example Policy**: A defense-in-depth approach is used to provide reasonable assurance of public health and safety from the operation of the reactor of a nuclear power plant.
- **Example Definition**: Defense-in-depth is a strategy that employs successive levels of defense and safety measures in the design, construction and operation of the nuclear power plant to ensure appropriate barriers, controls, and personnel are in place to prevent, contain, and mitigate exposure to radioactive material.

Example Objectives and Principles for Reactor Safety Described in the Policy Statement

Example Objectives and Principles: keep the risk to the public from the operation of the reactor of a nuclear power plant acceptably low by

- Compensating for uncertainties, including events and event sequences which are unexpected
- Making the nuclear power plant more tolerant of failures and external challenges

By implementing the following **example** principles:

- Key safety functions are not dependent upon a single element of design, construction, maintenance or operation
- Uncertainties in SSCs and human performance are accounted for in the safety analysis and appropriate safety margins are provided
- Application of conservative codes and standards
- High quality in the design, construction, and operation of the nuclear power plant
- System redundancy, independence, and diversity are part of the design and operation
- Defenses against potential common-cause failures are part of the design and operation

Example Levels of Defense and Decision Criteria for Reactor Safety Described in Policy Statement

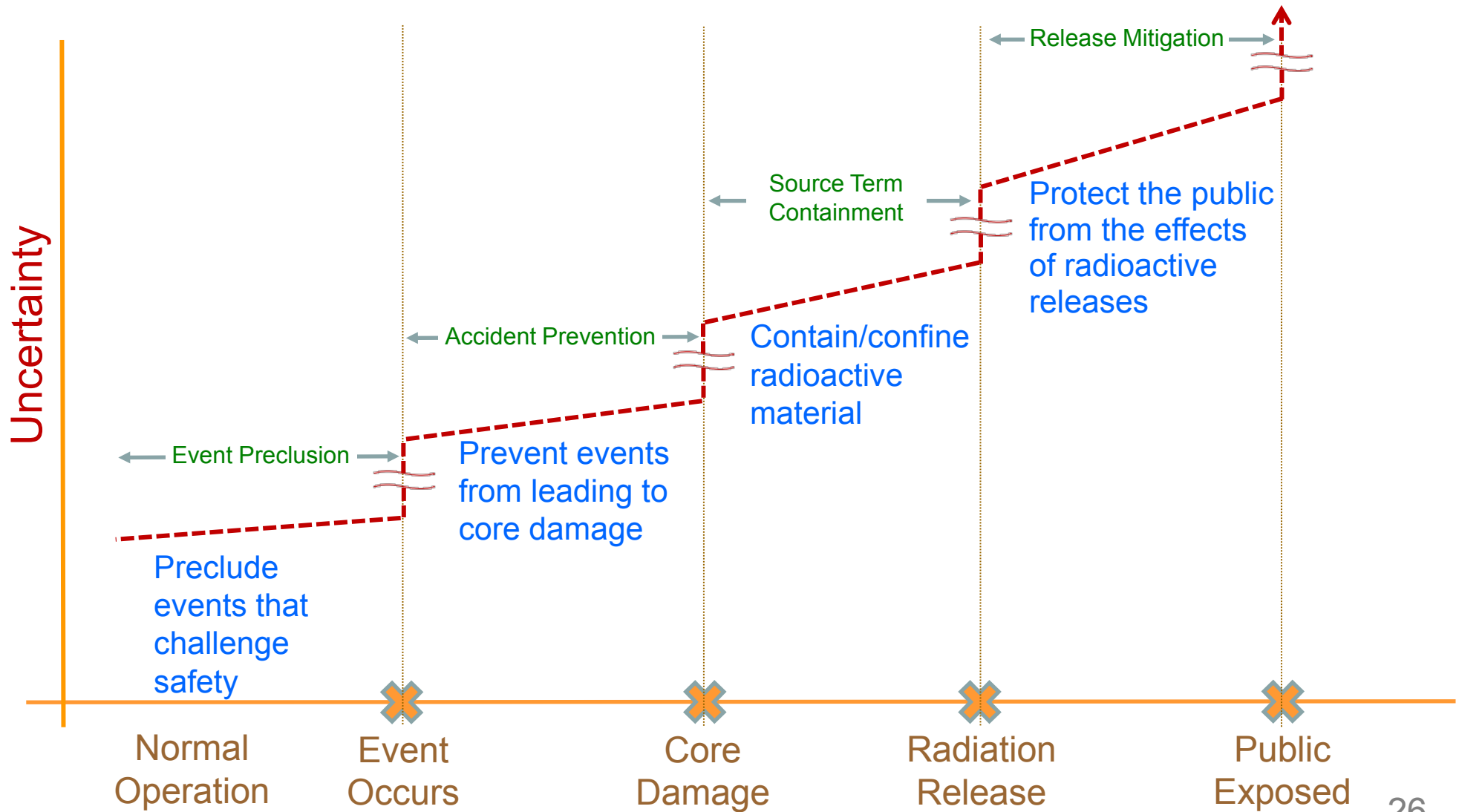
Example Levels of Defense: defense-in-depth is comprised of four successive levels of defense where each level's defense measures are applied if the previous level fails

- Event preclusion – safety measures that preclude events that could challenge safety
- Accident prevention – safety measures that prevent events from progressing to core damage
- Source term containment – safety measures that prevent radioactive release from the containment
- Release mitigation – safety measures that protect the public from the effects of radioactive releases

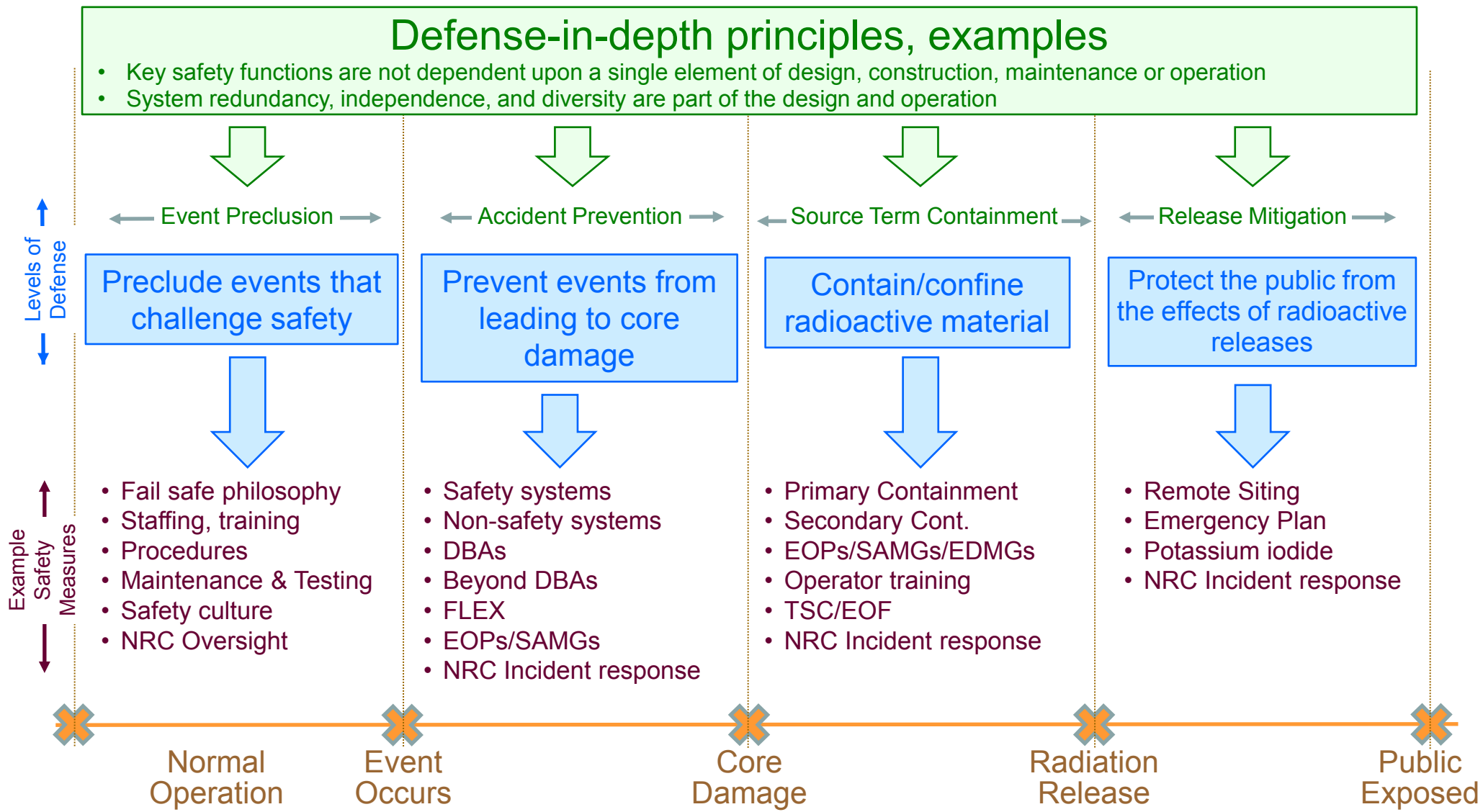
Example Decision Criteria:

- DID objective
- Safety margins
- Monitoring
- Overall risk
- Levels of defense
- DID principles
- Levels of defense safety measures
- Significance of uncertainties
- Quantitative acceptance guidelines

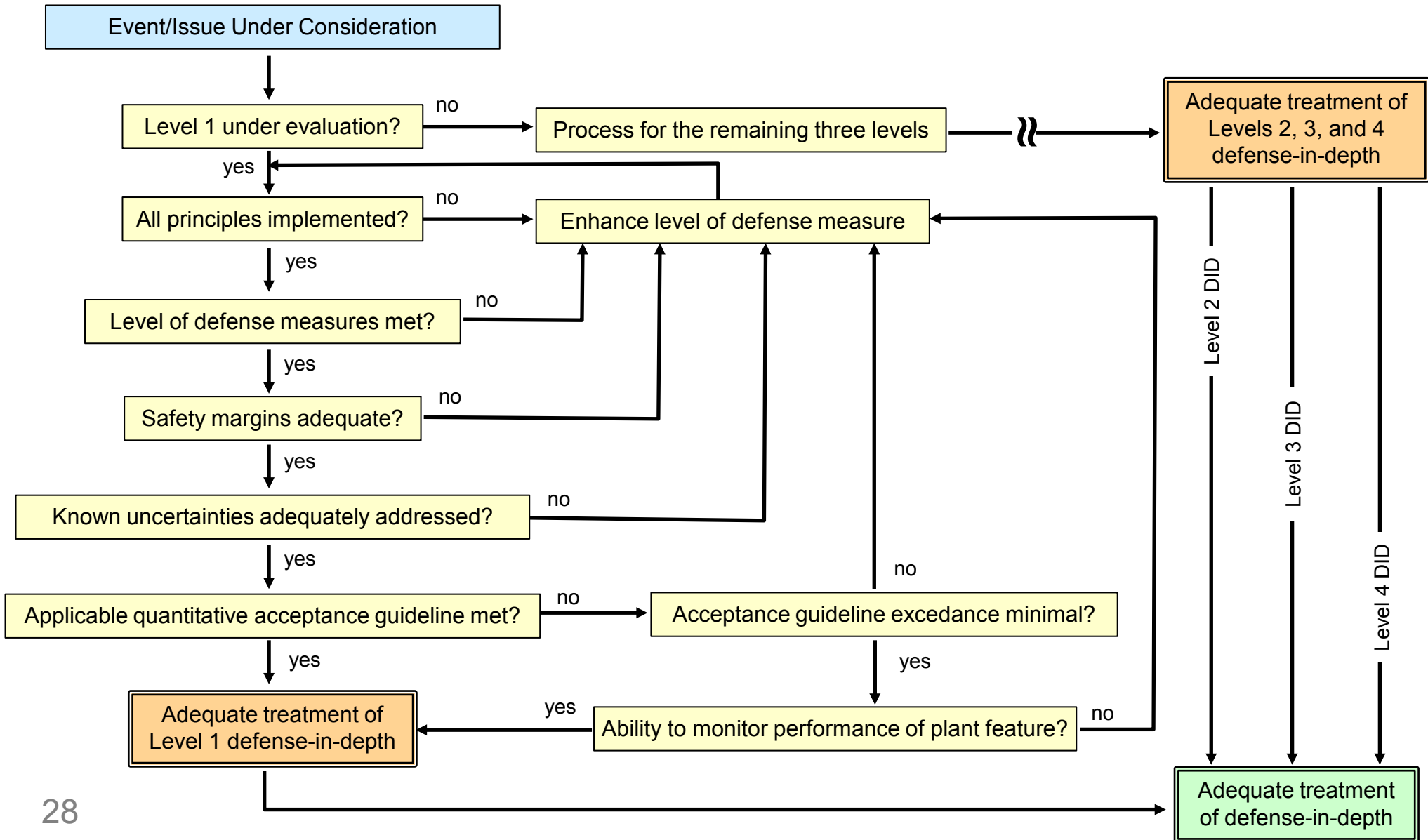
Nuclear Power Reactor Defense-in-Depth Consists of Four Levels, Defined by a Step Increase in the Uncertainty at Each Accident Sequence Stage



Examples of Reactor Safety DID Principles and Implementation Safety Measures for each Level of Defense



Draft Example Decision Process



Improvement Activity 2: Establish Commission Expectations for Defense-In-Depth

Key Decision	Options
Require Plant Specific PRA?	<input type="checkbox"/> Yes <input type="checkbox"/> No ✓ No, but use plant-specific risk insights as available
Applicability? (licensed entities)	<input type="checkbox"/> Future licensees and applicants ✓ Current and future licensees and applicants
Forward looking or retrospective (issues)?	✓ Forward looking: applies only to new issues <input type="checkbox"/> Forward looking and retrospective: applies to future issues and could also be used to identify need for additional defense-in-depth for currently operating plants

Relationship Between NTTF and RMRF

- NTTF working group (WG) providing recommendations for addressing:
 - Defense-in-depth for power reactor safety
 - Process addressing BDBEs
 - Voluntary initiatives
- RMRF WG providing recommendations for
 - A draft policy statement for a RMRF to be issued for formal public review and comment
 - addresses overall agency and each program area individually
 - defense-in-depth is a major piece
 - A detailed plan for implementing the recommendations in NUREG-2150 which include addressing Beyond Design Basis Events (BDBEs)
 - ***Voluntary initiatives not part of scope***
- RMRF WG will disposition RMRF recommendations for power reactors based on decisions made on NTTF Rec. 1 as guided by the Commission SRM
- Both groups working together, common staff on both groups to help ensure consistency and efficiency

RMRF Proposed Policy Statement

Overall Generic Policy Statement on Risk Management Regulatory Framework

- Mission
- Objective
- Defense-in-depth Approach
- Decisionmaking Process

Overall Generic Statement on Defense-in-Depth

- Definition
- Objectives and principles
- Levels of defense
- Decision Criteria

Overall Generic Policy Statement on Decision Process

- Identify Issue
- Identify Options
- Analyze
- Deliberate
- Implement Decision
- Monitor

Policy Statement on Defense-in-Depth for each Program Area

- Definition
- Objectives and Principles
- Levels of Defense
- Decision Criteria

Power Reactors		Non-pwr Rxs		Materials		Waste		Fuel Cycle		Uranium Recovery		Spent Fuel		Transportation	
Safety	Security	Safety	Security	Safety	Security	Safety	Security	Safety	Security	Safety	Security	Safety	Security	Safety	Security

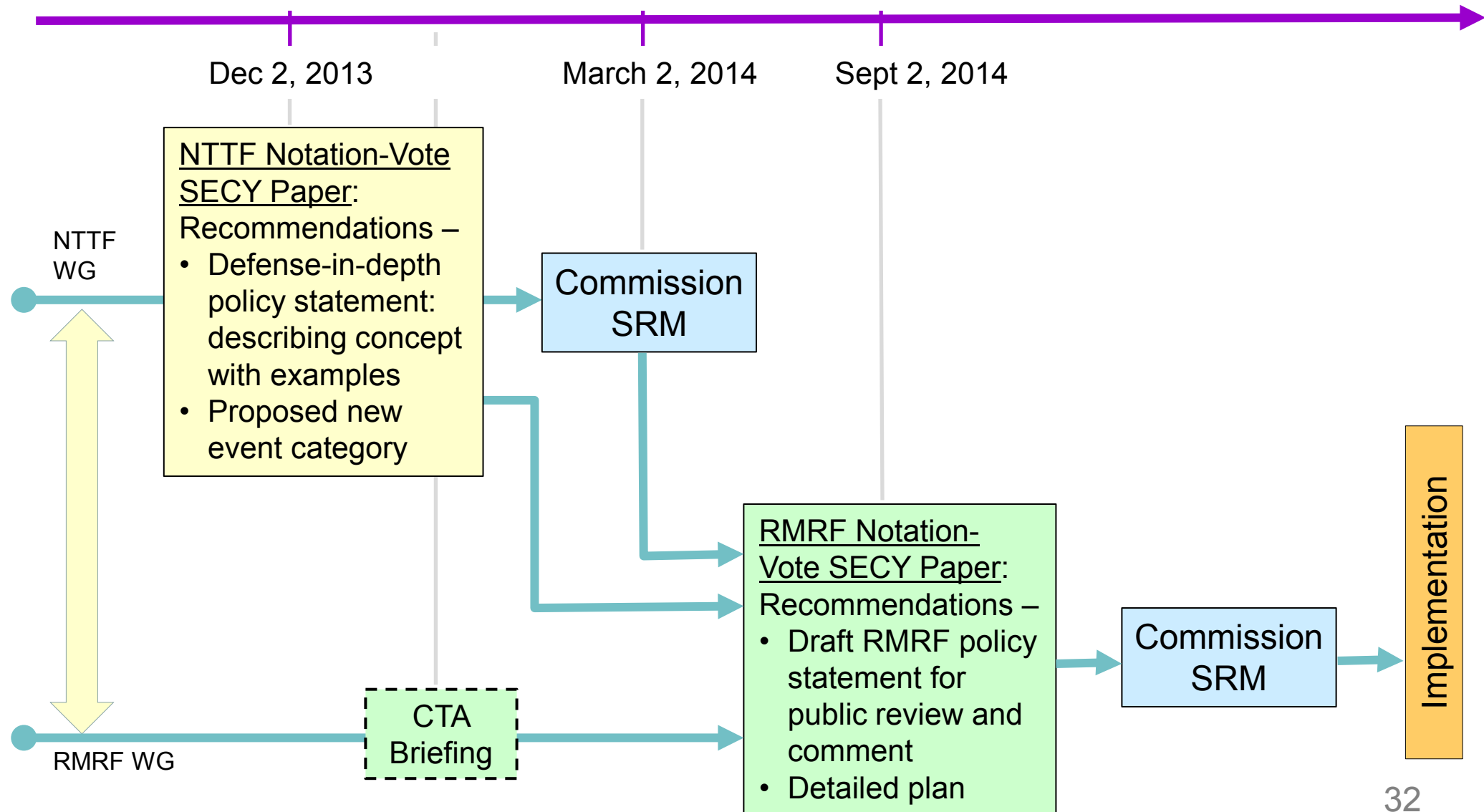
Implementation Guidance for Defense-in-Depth Adequacy of each Program Area

Power Reactors		Non-pwr Rxs		Materials		Waste		Fuel Cycle	
Safety	Security	Safety	Security	Safety	Security	Safety	Security	Safety	Security

Uranium Recovery		Spent Fuel Storage		Transportation	
Safety	Security	Safety	Security	Safety	Security

NTTF Recommendation on DID

Relationship Between NTTF and RMRF (cont'd)



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Improvement Activity 3

**Clarify the Role of
Voluntary Industry
Initiatives in the NRC
Regulatory Process**

Activity 3 – Introduction

- Activity 3 would clarify the role of certain industry initiatives in NRC's regulatory processes by:
 - Re-affirming the Commission's expectation that industry initiatives may not be used in lieu of NRC regulatory action on adequate protection issues.
 - Specifying when certain industry initiatives may be credited in the baseline case for regulatory analyses
 - Providing guidance regarding what level of NRC oversight is appropriate

Activity 3 – Background

- Direction-Setting Initiative 13 (SECY-97-303) resulted in decision to develop guidelines for using industry initiatives
- SRM-SECY-99-063 stated that regulatory framework allows voluntary initiatives **except in issues involving adequate protection**
- SRM-SECY-00-0116 – directed staff to publish guidelines for using voluntary initiatives (65 FR 53050; Aug. 31, 2000)
- SECY-01-0121- Responding to overwhelmingly negative comments from public and industry stakeholders, the NRC abandons voluntary initiative program
- Fukushima Near Term Task Force Report
- Risk Management Task Force Report (NUREG-2150)

Activity 3 – Relationship to NTTF and RMTF Reports

- Fukushima Near Term Task Force Report
 - Notes that "... voluntary industry initiatives should not serve as a substitute for regulatory requirements but as a mechanism for facilitating and standardizing implementation of such requirements." The NTTF further notes that "... NRC inspection and licensing programs give ... little attention to industry voluntary initiatives since there are no requirements to inspect against."
 - Examples include SAMGs and BWR hardened vents
- Risk Management Task Force Report (NUREG-2150)
 - "The extent to which licensee activities undertaken as part of voluntary industry initiatives can be credited has been a source of contention in the Reactor Oversight Process and has reduced the efficiency of that process."

Types of Industry Initiatives

from Regulatory Analysis Guidelines (NUREG/BR-0058, Rev 4)

- Type 1: those put in place in lieu of, or to complement, a regulatory action to ensure that existing requirements are met (e.g., BWRVIP, PWR MRP)
- Type 2: those used in lieu of, or to complement, a regulatory action in which a substantial increase in overall protection could be achieved with costs of implementation justifying the increased protection (e.g., SAMGs, BWR MK-I hardened vent, Backup power for H₂ igniters)
- Type 3: those that were initiated to address an issue of concern to the industry but that may or may not be of regulatory concern (e.g., groundwater monitoring)

Activity 3 – Description

- Implement with either a Commission Policy Statement or revisions to existing guidance:
 - Reaffirm that industry initiatives may not be used in lieu of NRC regulatory action on adequate protection issues
 - Modify inspection procedures to provide more oversight of the most significant Type 1 initiatives
 - Provide guidance to staff regarding Type 2 industry initiatives:
 - Industry initiatives may not be credited in the baseline case in the regulatory analysis unless there is a high likelihood that the industry will effectively implement and maintain the initiative over time
 - Revise oversight processes (inspections, audits) to verify the implementation and effectiveness of Type 2 initiatives which the NRC believes are important from both a safety and regulatory perspective

Activity 3 – Description

- NRC would take no actions regarding Type 3 initiatives
- In addition, the staff plans to review licensee commitments made as a result of IPE/IPEEE programs and verify that those with the highest safety significance were implemented and have been maintained

Activity 3 – Summary of Recommended Approach

- Develop policy statement or guidance on industry initiatives
 - Reaffirm that industry initiatives may not be used in lieu of NRC regulatory action on adequate protection issues
 - Modify inspection procedures to provide more oversight of certain Type 1 initiatives
 - Guidance on Type 2 initiatives:
 - When to credit in the baseline case of the regulatory analysis
 - Develop infrastructure and guidance for oversight of certain Type 2 initiatives
- Review certain IPE/IPEEE commitments

Existing Type 2 initiatives

- Low power/shutdown risk
- Severe Accident Management Guidelines
- Hydrogen igniter backup power for BWR MKIII and ice condenser containments
- Industry Initiative on Underground Piping and Tanks Integrity
- Heavy load lifts
- Motor Operated valves
- Substandard Non-Safety-Related Molded Case Circuit Breakers
- Piping Erosion/Corrosion
- Station Blackout (Diesel Reliability portion)
- Oil Loss in Rosemount Transmitters
- Design Basis Programs
- Fraudulent Flanges
- Comprehensive Procurement Initiative
- Managing Regulatory Commitments
- Safety culture initiative