



**Discussion of Draft Commission Paper on
Risk-informing the Reactor Oversight Process
(ROP) for New Reactors**

**Public Meeting
August 5, 2013**

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Meeting Purpose

- To summarize the draft Commission paper regarding risk-informing the ROP for new reactors
- To solicit and discuss feedback from the public, industry, and other stakeholders regarding the staff's conclusions and recommended approach



Status/Milestones

- Topic discussed during 3 public meetings and multiple internal meetings – general alignment
 - February 5
 - March 25
 - April 15
 - Numerous ROP Working Group meetings
- Draft SECY sent to ACRS and made public on June 24
- Held ACRS Subcommittee meeting on July 22 to discuss draft SECY



Background

- SECY-12-0081, “Risk-Informed Regulatory Framework for New Reactors,” issued June 2012 to provide staff recommendations on both licensing and oversight processes
- Tabletop exercises indicated that current risk thresholds are appropriate for ROP; however, a few changes may be warranted consistent with integrated risk-informed principles in RG 1.174
- Staff recommended Option 3B; to augment existing risk-informed ROP tools with deterministic backstops to ensure an appropriate regulatory response for the new reactor designs



Commission SRM Dated October 22, 2012

- The SRM states, in part, that the Commission has disapproved the staff's recommendation (Option 3B) related to the ROP
- The staff should give additional consideration to the use of relative risk metrics, or if the staff believes that this is not a viable option for new reactor oversight, it should provide a technical basis for its conclusions.
- The staff should provide the Commission with a notation vote paper that provides:
 1. A technical basis for the staff's proposal for the use of deterministic backstops, including examples
 2. A technical evaluation of the use of relative risk measures, including a reexamination of the pros and cons
 3. A discussion of the appropriateness of the existing performance indicators and the related thresholds for new reactors



Staff Approach

- Deliverable is a Notation Vote SECY for EDO signature in October 2013
- Involve internal and external stakeholders, including NRR/DIRS, NRO/DSRA, NRR/DRA, RES, NRO/DCIP, Regions, Industry, ACRS, and public
- Stay within scope of the request (provide technical basis and discussion) and do not try to fully develop the backstops, relative risk approach, etc.
- Provide a crisp paper with enough detail to provide the Commission the information they need to direct the staff appropriately, with supporting details in 4 enclosures
- The LRF history and independent review portions of SRM are not within the scope of this paper



Draft SECY Outline

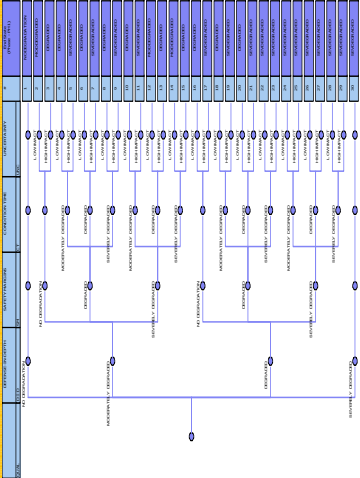
- “Recommendations for Risk-Informing the ROP for New Reactors” – Summary, Conclusions, and Recommendations (ML13169A406)
- Encl. 1 - Background and History of Correspondence
- Encl. 2 - Technical Basis and Examples of Integrated Risk-Informed Approach Using Qualitative Measures
- Encl. 3 - Technical Evaluation of Relative Risk Measures and Reexamination of Pros and Cons
- Encl. 4 - Discussion of Appropriateness of Existing Performance Indicators and Thresholds



Integrated Risk-Informed Approach Using Qualitative Measures

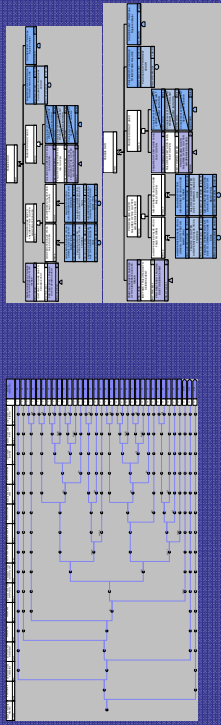
Jeff Circle

Framework of Integrated Approach



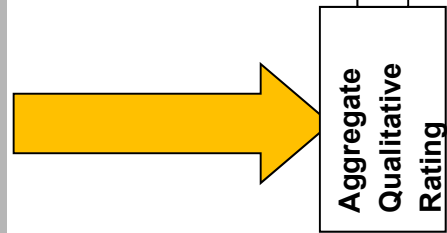
Qualitative Risk Evaluation

A flowchart diagram showing the process of qualitative risk evaluation. It starts with a 'Qualitative Risk Evaluation' box, which leads to a 'Qualitative Risk Evaluation' box, which then leads to a 'Qualitative Risk Evaluation' box. The diagram is complex, with many boxes and arrows, representing a detailed process flow.



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Final Determination Table

ΔCDF (CCDP normalized to 1 year)	$\Delta CDF < 10^{-6}$	$10^{-6} \leq \Delta CDF < 10^{-5}$	$10^{-5} \leq \Delta CDF < 10^{-4}$	$\Delta CDF \geq 10^{-4}$
ALERF (CLERP normalized to 1 year)	$\Delta LERF < 10^{-7}$	$10^{-7} \leq \Delta LERF < 10^{-6}$	$10^{-6} \leq \Delta LERF < 10^{-5}$	$\Delta LERF \geq 10^{-5}$
Qualitative Rating	Green	Green	White	Yellow
Negligibly Degraded	Green	White	White	Yellow
Moderately Degraded	White	White	Yellow	Red
Degraded	White	Yellow	Red	Red
Significantly Degraded	Yellow	Red	Red	Red



Summary of Conceptual Integrated Approach

- Use of “qualitative measures” in lieu of “deterministic backstops”
- Follows principles of good regulation and the goals of the Reactor Oversight Process (ROP).
- Maintains the Significance Determination Process (SDP) as a risk-informed process.
- Provides a framework for arriving at a risk-informed decision of SDP color threshold.



Consistency

- **The concept needs to also follow..**

Principles of Good Regulation	ROP Goals
Independence	Objectivity
Openness	Risk-informed
Efficiency	Predictability
Clarity	Understandability
Reliability	



Qualitative Measures Considered

- Defense-in-depth
- Safety Margins
- Condition Time
- Qualitative Credit



Future Developmental Considerations

- Avoid double counting the qualitative measures with respect to the quantitative analysis
- Develop guidelines for application of qualitative credit
- The number of qualitative elements and impact ratings to define and use
- Accounting for scoping changes of SSCs in and out of technical specifications
- Develop framework for the impact and overall qualitative ratings
- Accounting for uncertainty

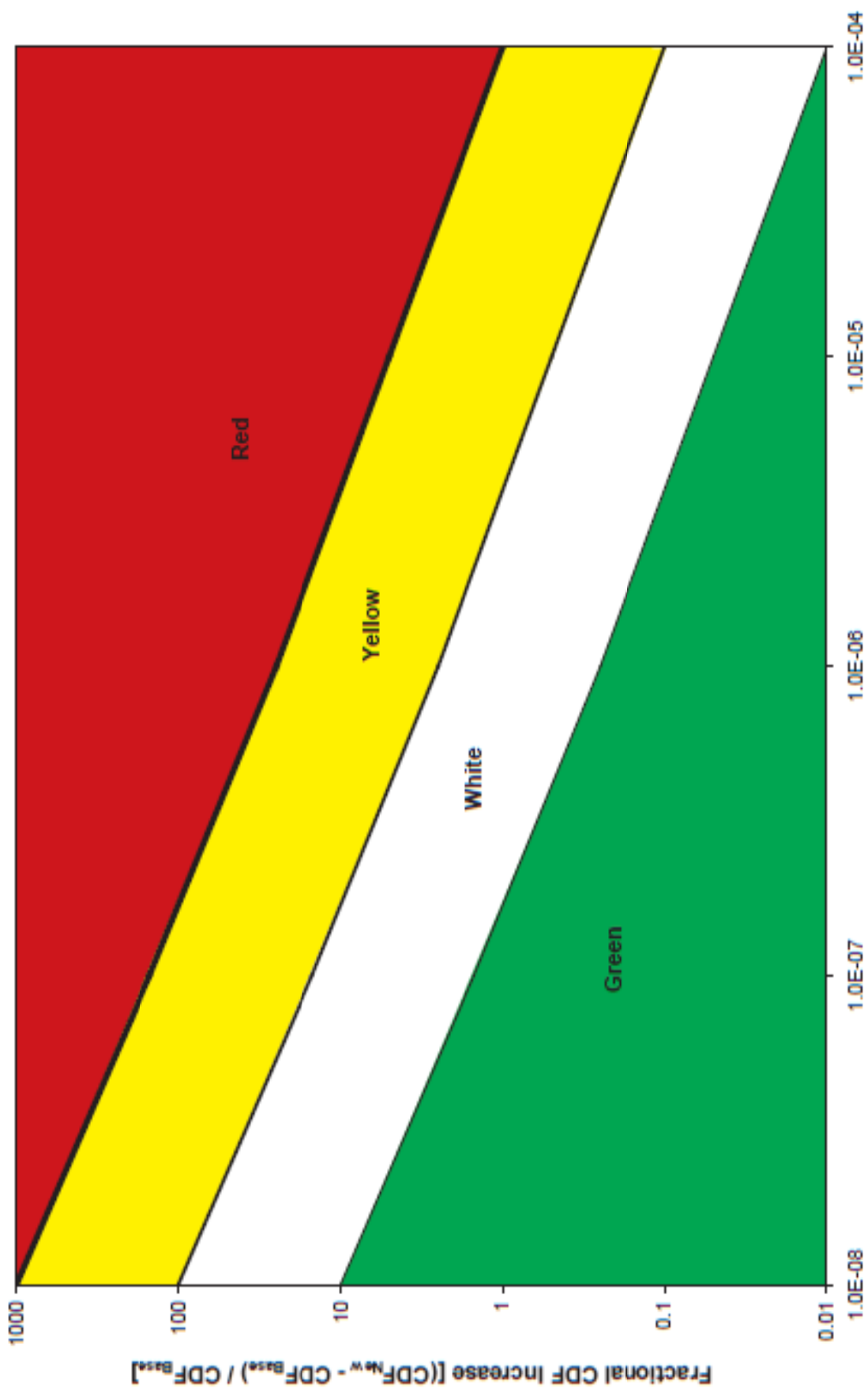


Relative Risk Approach

Eric Powell



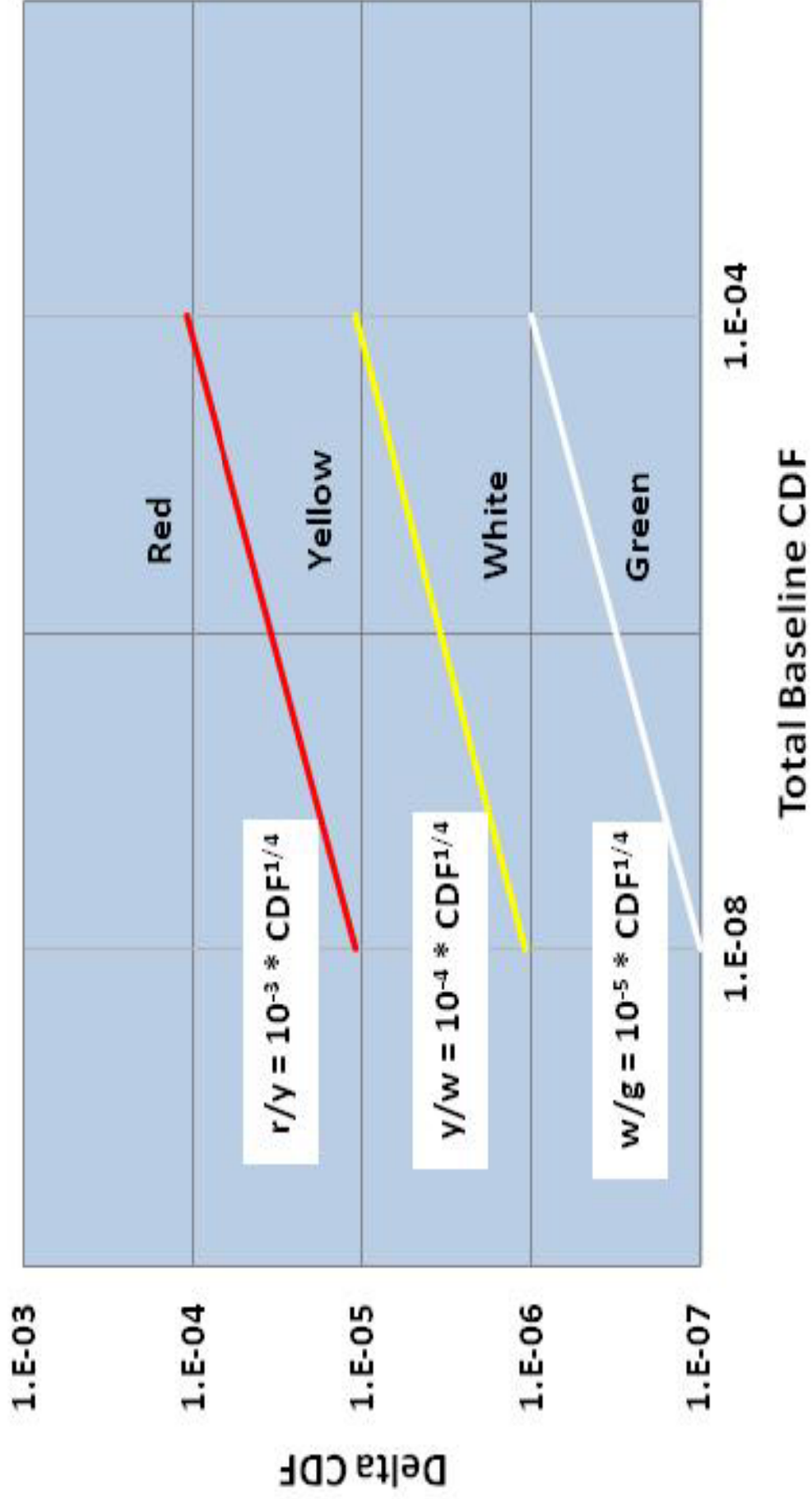
Relative Risk Approach – ACRS Recommendation



CONCEPTUAL DRAFT – FOR DISCUSSION PURPOSES ONLY

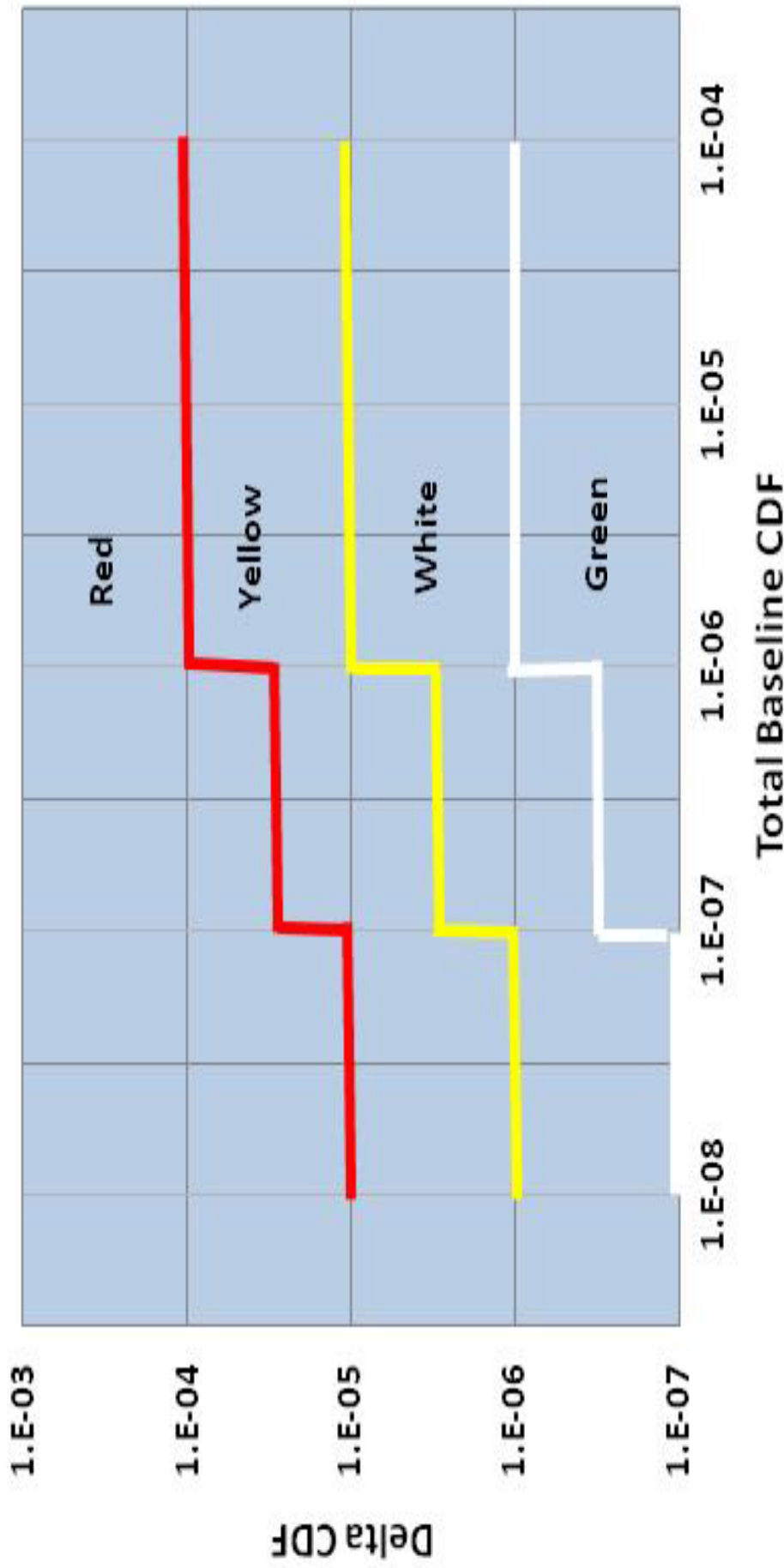


Relative Risk Approach – ACRS Recommendation Converted to ΔCDF (y-axis)



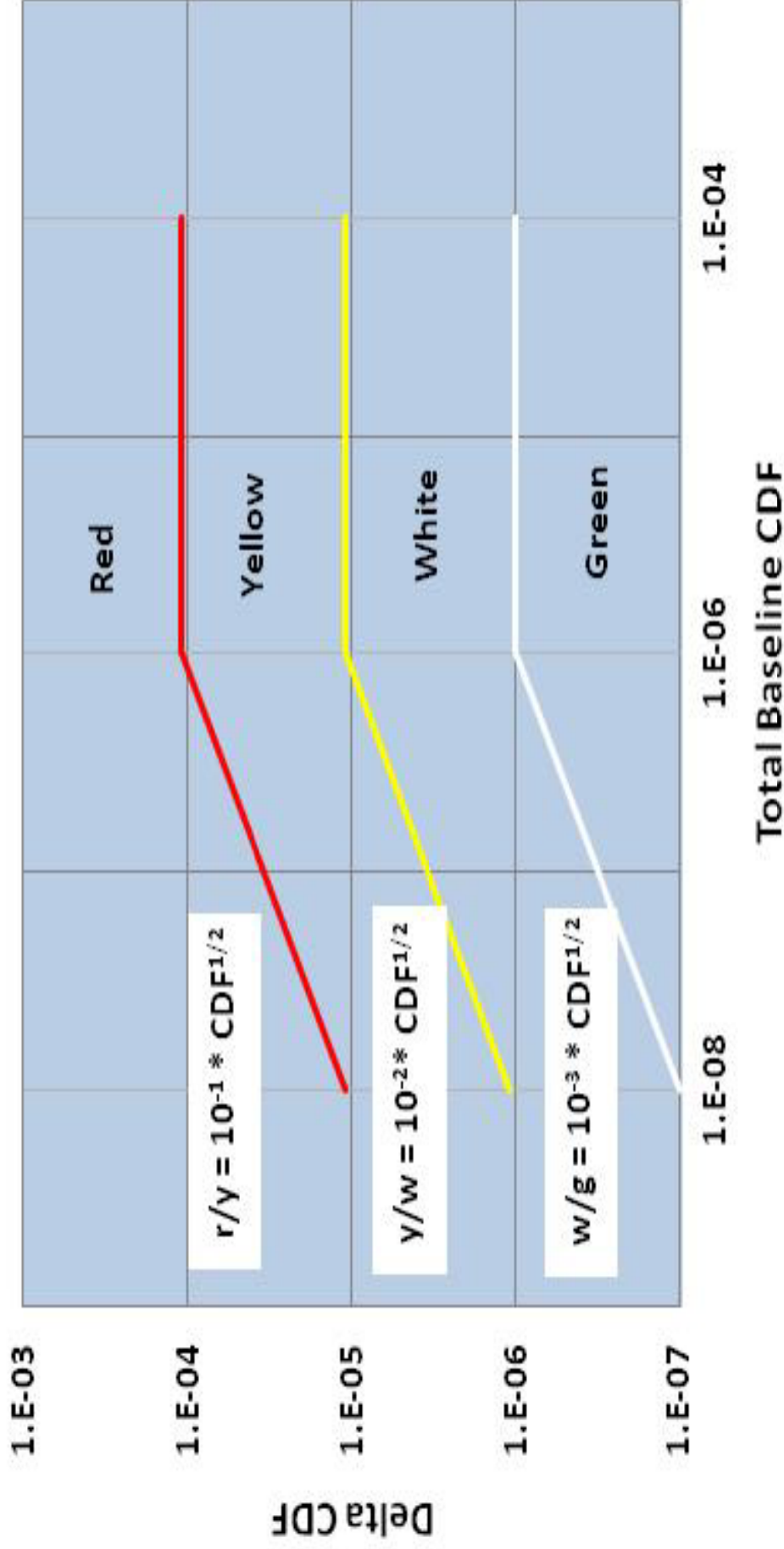


Staircase Thresholds Approach





Hybrid Thresholds Approach





Reexamination of the Pros and Cons

- Discussion and feedback on pros and cons
 - New ideas?
 - Thoughts?
 - Comments?



Appropriateness of Existing Performance Indicators and Thresholds

Mike Balazik



Background

- Mitigating Systems Performance Index (MSPI) evaluated in SECY-12-0081, “Risk-Informed Regulatory Framework for New Reactors”
 - MSPI indicators are risk-informed
 - Determined to be ineffective in determining an appropriate regulatory response for active new reactor designs
- Remaining PIs not evaluated in SECY-12-0081
- SRM-SECY-12-0081 directed the staff to provide discussion of the appropriateness of existing performance indicators (PIs) and related thresholds for new reactors



Performance Indicator Program

- Provides a broad sample of objective data to assess reactor facilities performance in each cornerstone area
- Along with inspection findings, serve as inputs to ROP assessment process and additional inspection efforts
- Performance indicator data voluntarily collected by reactor facility, reported to NRC on a quarterly basis
- Objective thresholds establish the level of regulatory engagement appropriate to reactor facility performance in each cornerstone area
- Inspection to verify performance indicator data

- Many of PIs are not directly risk-informed, but based on regulations and standards that would also apply to new reactor designs
- PIs directly related to risk
 - Mitigating Systems Performance Index (5)
 - Unplanned Scrams per 7,000 Critical Hours
- Remaining PIs and thresholds are more deterministic
 - Thresholds based on industry performance and agreed upon by experts (industry and NRC)

Evaluation of PIs

- **Mitigating Systems Performance Index**
 - Application evaluated in SECY-12-0081, “Risk-Informed Regulatory Framework for New Reactors”
 - Ineffective in determining an appropriate regulatory response for active new reactor designs
 - Meaningful MSPI may not even be possible for passive systems using the current formulation of the indicator
- **Unplanned Scrams per 7,000 Critical Hours**
 - CDF sensitivity studies conducted to inform initial threshold setting
 - Conservative thresholds set for existing fleet
 - Existing thresholds of performance bound lower risk of new reactors



Conclusions

- **Mitigating Systems Performance Index**
 - Alternate PIs could be developed or additional inspection could be used for new reactors
- **Unplanned Scrams per 7,000 Critical Hours**
 - Can be applied to new reactor designs
 - Threshold values are set conservatively and will account for lower risk of new reactors
- **Unplanned Scrams with Complications**
 - Need to define complicated scram in PI reporting guidance
- **Remaining PIs can be applied to new reactor designs**
 - to determine an appropriate regulatory response



Conclusions, Recommendations, and Next Steps

Ron Frahm



Staff Conclusions

Integrated Risk-Informed Approach

- The conceptual integrated risk-informed approach using qualitative measures is an appropriate means to identify the potentially significant performance issues that would not otherwise be revealed solely by the risk calculations to ensure an appropriate regulatory response
- The proposed integrated risk-informed approach would provide a clear and efficient way of ensuring reliable and predictable regulatory responses within the existing ROP framework, consistent with the principles of good regulation



Staff Conclusions (cont.)

Relative Risk Approach

- The significant challenges in the development and implementation of a relative risk approach appear to significantly outweigh the benefits
- If the staff were to develop and implement a relative risk approach, the structured integrated risk-informed approach would likely still be needed to address
 - defense-in-depth (particularly barrier integrity)
 - degradation of passive components



Staff Conclusions (cont.)

Appropriateness of Performance Indicators

- Many of the PIs are based on regulations and standards that also apply to new reactor designs
- Some PIs in the Initiating Events and Mitigating Systems cornerstones warrant further analysis to fully develop appropriate PIs, thresholds, or guidance for new reactor applications



Staff Recommendations

- **Recommendation 1:** Commission approves the staff's plans to further develop the qualitative measures used to supplement the risk evaluations and the integrated risk-informed approach to ensure an appropriate regulatory response to performance issues for new reactor designs
- **Recommendation 2:** Commission approves the staff's plans to further analyze the current PIs and thresholds and develop appropriate PIs and thresholds for new reactor applications to address any shortfalls to ensure that all cornerstone objectives are adequately met



Next steps

- Solicit and discuss stakeholder feedback during public meeting on August 5
- Full ACRS meeting on September 5
- Revise and finalize Commission paper based on ACRS and stakeholder feedback
- SECY due to be issued in mid-October