How will the FERC Develop its RIDM Program?

Guiding Principles

- Methodologies and Procedures
- Risk-Informed Decision-Making
- Tolerable Risk Guidelines
- Dam Safety Risk Management

Guiding Principles
Methodologies & Procedures

- Transition to a Risk-Informed Dam Safety Program
- Level of Rigor for Risk Analyses
- Consistency With Other Federal Agencies

Transition to a Risk-Informed Dam Safety Program

- The Program will need to accommodate both RIDM and traditional approaches to dam safety due to the wide variation of risk associated with FERC jurisdictional projects.
- Accordingly, the Engineering Guidelines and Operations Manual must be written to encompass both methodologies.

Transition to a Risk-Informed Dam Safety Program

- Although deterministic technical guidelines will be included in the risk-informed dam safety program, they do not constitute a "pass – no pass" criteria. Similarly, tolerable risk guidelines do not constitute a "pass – no pass" criteria.
- RIDM combines information from both traditional analyses and the results of risk assessments and risk analyses.

Transition to a Risk-Informed Dam Safety Program

- It should be recognized that other non-quantitative factors will influence practical decision making for the dam safety program.

Level of Rigor for Risk Analyses

- The level of effort and scope of risk assessments should be scaled to provide an appropriate level of confidence considering the purpose of the risk management decision.
- A model of scaled levels of rigor is detailed in the publication "Recommendations for Probabilistic Seismic Hazard Analysis: Guidance on Uncertainty and Use of Experts" (commonly called the SSHAC report.)

Table 3-1 Degrees of PSHA Issues and Levels of Study

ISSUE DEGREE	DECISION FACTORS	STUDY LEVEL
A Non-controversial; and/or insignificant to hazard	•Regulatory concern •Resources available •Public perception	**1** **TI** evaluates/weights models based on literature review and experience; estimates community distribution
B Significant uncertainty and diversity; controversial; and complex		**2** **TI** interacts with proponents & resource experts to identify issues and interpretations; estimates community distribution
C Highly contentious; significant to hazard; and highly complex		**3** **TI** brings together proponents & resource experts for debate and interaction; TI focuses debate and evaluates alternative interpretations; estimates community distribution
		4 **TFI** organizes panel of experts to interpret and evaluate; focuses discussions; avoids inappropriate behavior on part of evaluators; draws picture of evaluators' estimate of the community's composite distribution; has ultimate responsibility for project

Consistency With Other Federal Agencies

- To the extent possible the methodologies and procedures used in D2SI's RIDM program will be consistent with those of other Federal dam owning and regulating agencies.
- This is important in order to ensure a nationwide consistent and defensible dam safety process.

Guiding Principles
Risk-Informed Decision-Making

- Public Trust Responsibility
- Policy

Public Trust Responsibility

- The Federal Power Act charges the FERC with protection of life, health, and property.
- Decision-making to accomplish the objectives of the Federal Power Act is a complex process and must consider risk to the public as well as economic, environmental, social, and cultural impacts.

Public Trust Responsibility

- While the technical analysis of risks associated with a dam cannot become the sole decision-making factor, it must be recognized that addressing these risks in a technically consistent and timely fashion is an important part of sustaining the public's trust in FERC to regulate these facilities in the best interest of the nation.
- Life safety is the paramount consideration in D2SI's decision-making process

Policy

- Risk-informed decision-making for dam safety integrates the analytical methods of traditional engineering analyses and risk analyses along with the sound professional judgment of engineers, review boards, and decision-makers in determining reasonable actions to reduce risk at FERC jurisdictional projects.

Policy

- The risk framework serves as a tool for aiding decision-makers in the determination of needs for risk reduction actions as well as the evaluation of different risk reduction actions that could be taken to address the identified issues.

Policy

- D2SI staff will participate in all risk assessments submitted to D2SI.
- The results of the risk assessment will be documented in a report that describes the process and results of the risk analysis and makes the case for the recommended action(s).

Policy

- It is anticipated that risk assessments submitted to D2SI will be peer reviewed by a panel of experts that will include at least one D2SI representative.
- The panel of experts will prepare a document that either; 1) concurs with the conclusions of the risk assessment or; 2) details items that need further analysis or clarification before the assessment can be accepted.

Policy

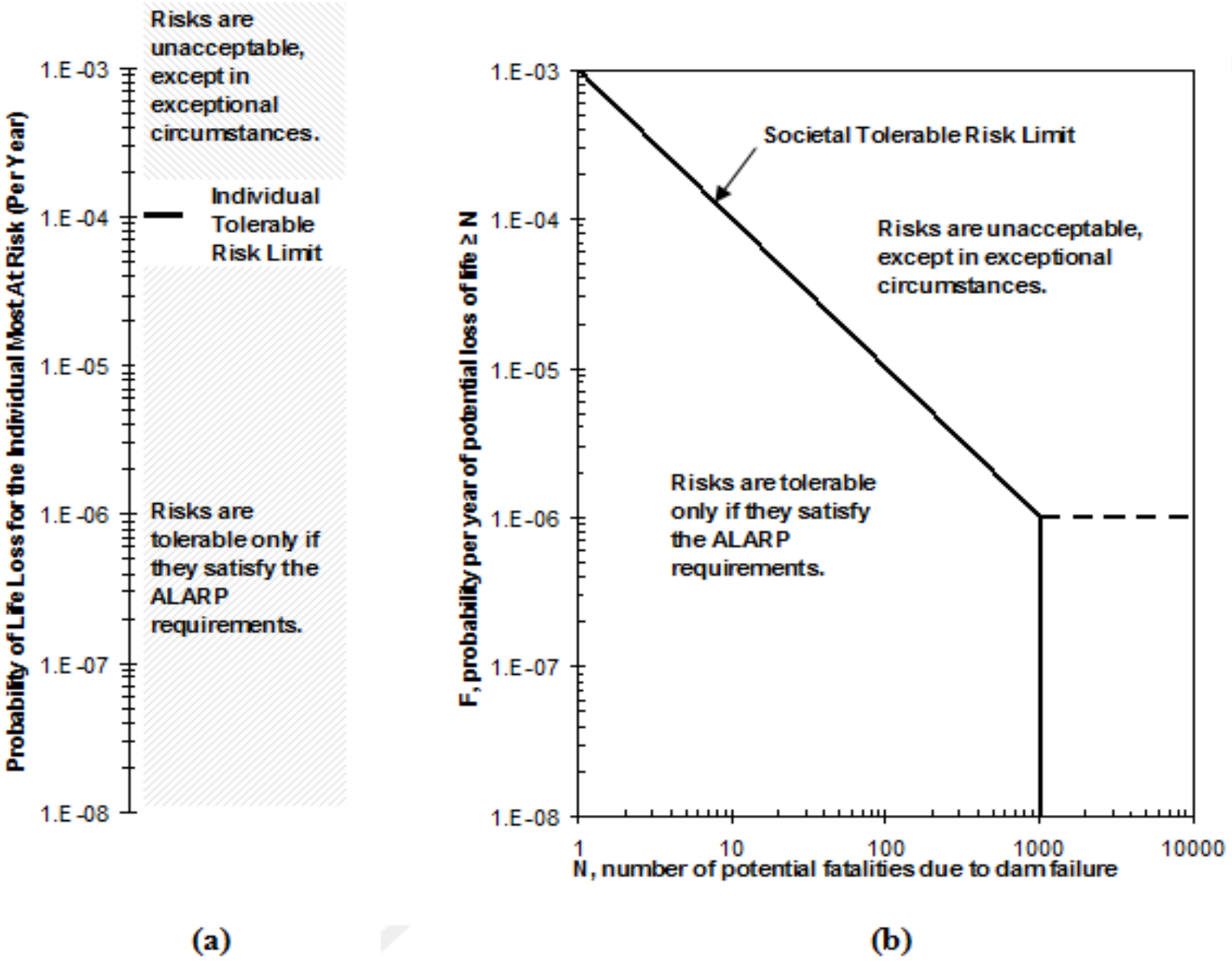
- In the near term, risk assessments will be an exception rather than the rule in assessing the safety of FERC jurisdictional dams.
- Accordingly, the final decision document accepting a risk analysis/risk assessment will be signed by the Director-D2SI

Tolerable Risk Guidelines

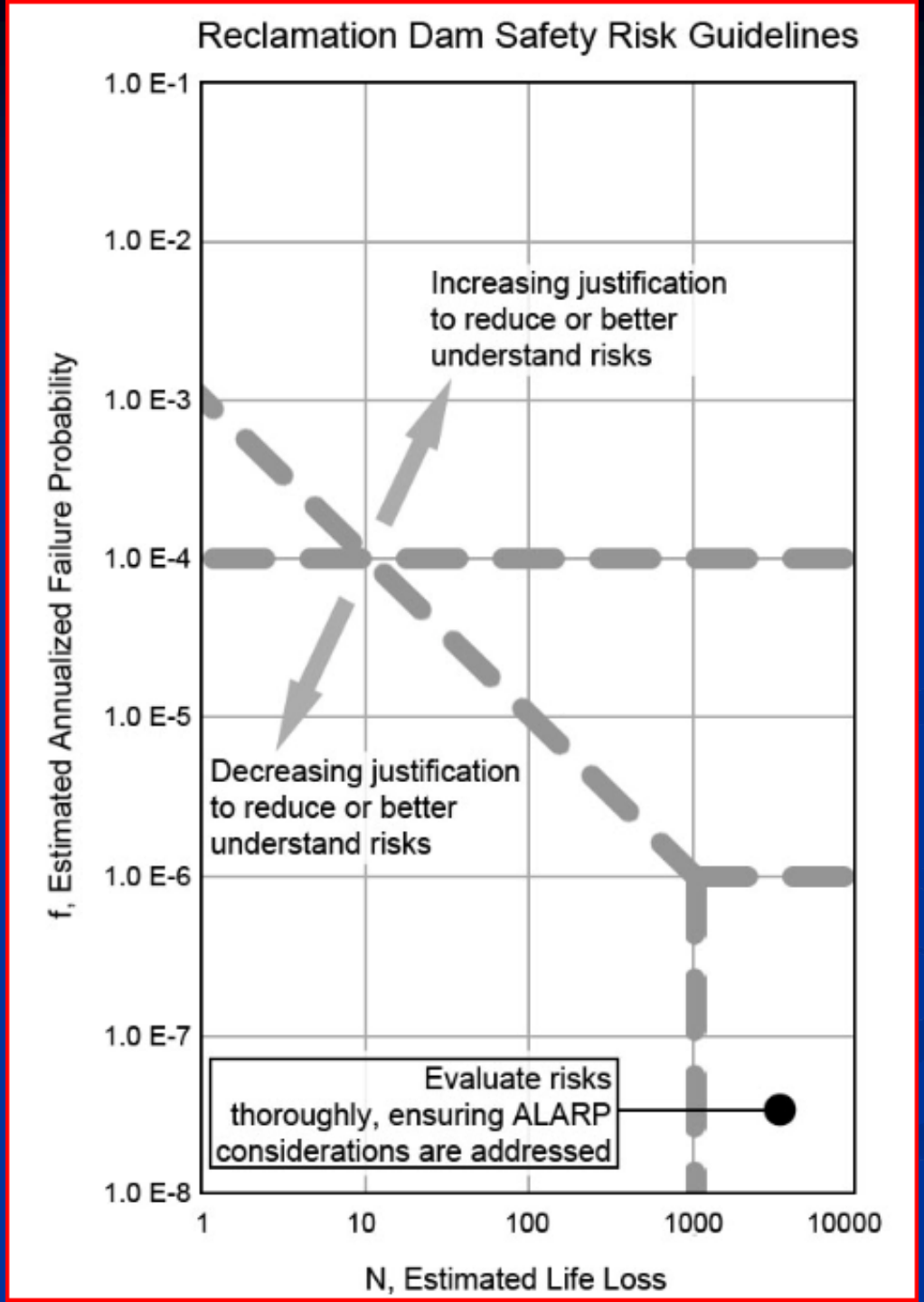
- Achieving a tolerable level of risk, including application of the ALARP principle, is the goal for all risk reduction measures including permanent and interim measures. Tolerable risk guidelines are used in risk management to guide the process of examining and judging the significance of estimated risks obtained using risk assessment.

Tolerable Risk Guidelines

- However, tolerable risk guidelines should not be used alone to prescribe decisions on “How safe is safe enough?" As noted under Guiding Principles for Risk-Informed Decision-Making, decision-makers must consider a broad range of issues before making a decision that a dam is “safe enough”.



Figures 5-4.a. Individual Risk Guidelines and 5.4.b Societal Risk Guidelines for Existing Dams.


Reclamation Dam Safety Risk Guidelines
1.0 E-1
1.0 E-2
1.0 E-3
1.0 E-4
1.0 E-5
1.0 E-6
1.0 E-7
1.0 E-8
f, Estimated Annualized Failure Probability
Increasing justification to reduce or better understand risks
Decreasing justification to reduce or better understand risks
Evaluate risks thoroughly, ensuring ALARP considerations are addressed
1
10
100
1000
10000
N, Estimated Life Loss

Tolerable Risk Guidelines

- FERC is working with Reclamation, TVA and USACE to develop common tolerable risk guidelines.

Guiding Principles
Dam Safety Risk Management

- Risk management may be understood as the work required to answer these questions:
  - What is the problem?
  - What can be done to reduce the likelihood or severity of the risk described?
  - What are the tradeoffs in terms of costs, benefits, and risks among the available options both now and in the future?
  - What is the best way to address the described risk?

- In sum, risk management is the process of problem finding and initiating action to identify, evaluate, select, implement, monitor and modify actions taken to alter levels of risk.

Revisions / Additions to FERC's Engineering Guidelines

RIDM Guidelines

Section A Introduction

Section B How Dams Fail

Section C Probabilistic Analysis

Section D Determining the Probability of Loading

Section E Consequences

Section F Risk Analysis - Risk Assessment

Section G Systems Analysis

Section H Risk Management - Risk Mitigation

Section I Other Guidelines

Section A
Introduction

A1 Introduction and General Requirements

A2 Key Terms and Definitions

Section B
How Dams Fail

B1 Potential Failure Mode Analysis

B2 Development of Event Trees

Section C
Probabilistic Analysis

C1 Arch Dam Analysis

C2 Concrete Gravity Dam Analysis

C3 Buttress Dam Analysis

C4 Embankment Dam Analysis

C5 Analysis of Other Dam Types

C6 Analysis of Gates and Other Water Outlet Works

C7 Water Conveyance Systems

C8 Piping – Internal Erosion

Section C
Probabilistic Analysis

C9 Erosion of Soil and Rock

C10 Extreme Storm Overtopping of Dams

C11 Reservoir Landslide Induced Overtopping

C12 Operational Issues

C13 Spillway Analysis

C14 SCADA Systems

C15 Construction Risks

C16 Dam Safety for New Projects

Section D
Determining the Probability of Loading

D1 Determining Reservoir Level Exceedance Curves

D2 Hydrologic Hazard Analysis

D3 Probabilistic Seismic Hazard Analysis

Section E
Consequences

E1 Estimation of Life Safety Consequences

E2 Estimation of Economic Consequences

Section F
Risk Analysis – Risk Assessment

F1 Facilitating Risk Analyses

F2 Subjective Probability and Expert Elicitation

F3 Combining and Portraying Risk

F4 Building the Case

F5 Qualitative Risk Analysis

F6 Quantitative Risk Analysis

Section G
Systems Analysis

G1 Systems Analysis

G2 Owner's Dam Safety Program

G3 Owner's Annual Dam Safety Report

Section H
Risk Management / Mitigation

H1 Surveillance and Monitoring

H2 Emergency Action Plans

H3 Interim Risk Reduction Measures

H4 Issue Evaluation Studies

H5 Dam Safety Modification Studies

H6 Reservoir Filling Plans

H7 Low-Level Outlets

Section I
Other Guidelines

I1 Part 12D Inspections

I2 Supporting Technical Information

I3 Standard Operating Procedures

I4 Geotechnical Investigations and Studies

I5 Construction Quality Control and Inspection Programs

I6 Incident Reporting

I7 Security

Get Involved