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Risk-Informed PSI / ISI

September 4, 2008
Rockville, MD

Introduction

- Project Description
- Overview of Existing RI-ISI methodology
- PRA Technical Adequacy
- Implementation Considerations
- Summary

RI- PSI / ISI

Background:

- New plants are required to:
 - define and conduct preservice inspections (PSI) prior to operation, and
 - define and conduct inservice inspections (ISI) throughout plant lifetime
 - COL applicants stating PSI/ISI program to Edition/Addenda effective 12 months prior to fuel load

- Existing rules for new construction are deterministically based

- Operating plants have transitioned to a risk-informed approach

RI- PSI / ISI

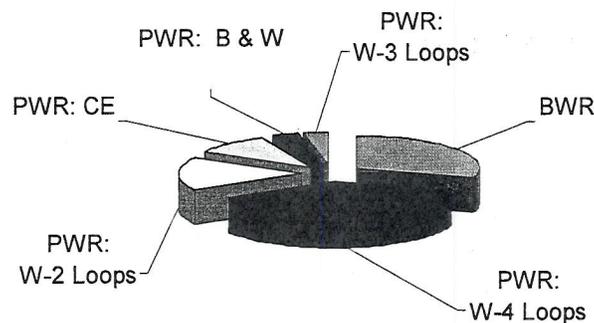
Project Description:

- Develop a RI-PSI and RI-ISI methodology for new construction
 - Assess existing RI-ISI process for applicability to new plants
 - Take advantage of lessons learned from existing plants
 - Take advantage of new plant designs (e.g. similar/identical construction)
 - Assess need for augmented programs (e.g. BER, FAC)
 - Regulatory approval strategy

EPRI RI-ISI Mission

- Develop a RI-ISI Expert Process that is:
 - Technically Robust
 - Can Be Consistently Applied
 - plant to plant
 - plant type to plant type
 - Minimize Impact on Plant Resources by
 - providing prescriptive guidance and criteria,
 - embedding technical basis into process structure, and
 - incorporate / coordinate operating experience

EPRI RI-ISI Experience By Plant Type

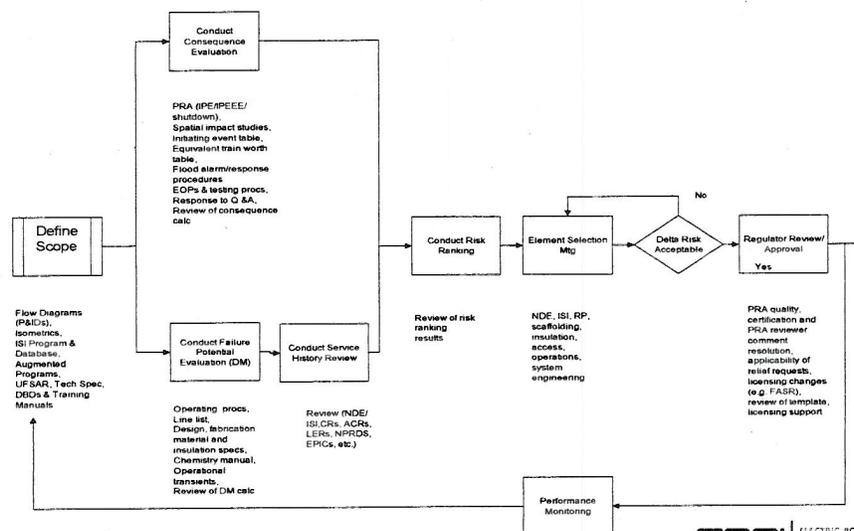


76 units domestically
12 international, including VVER

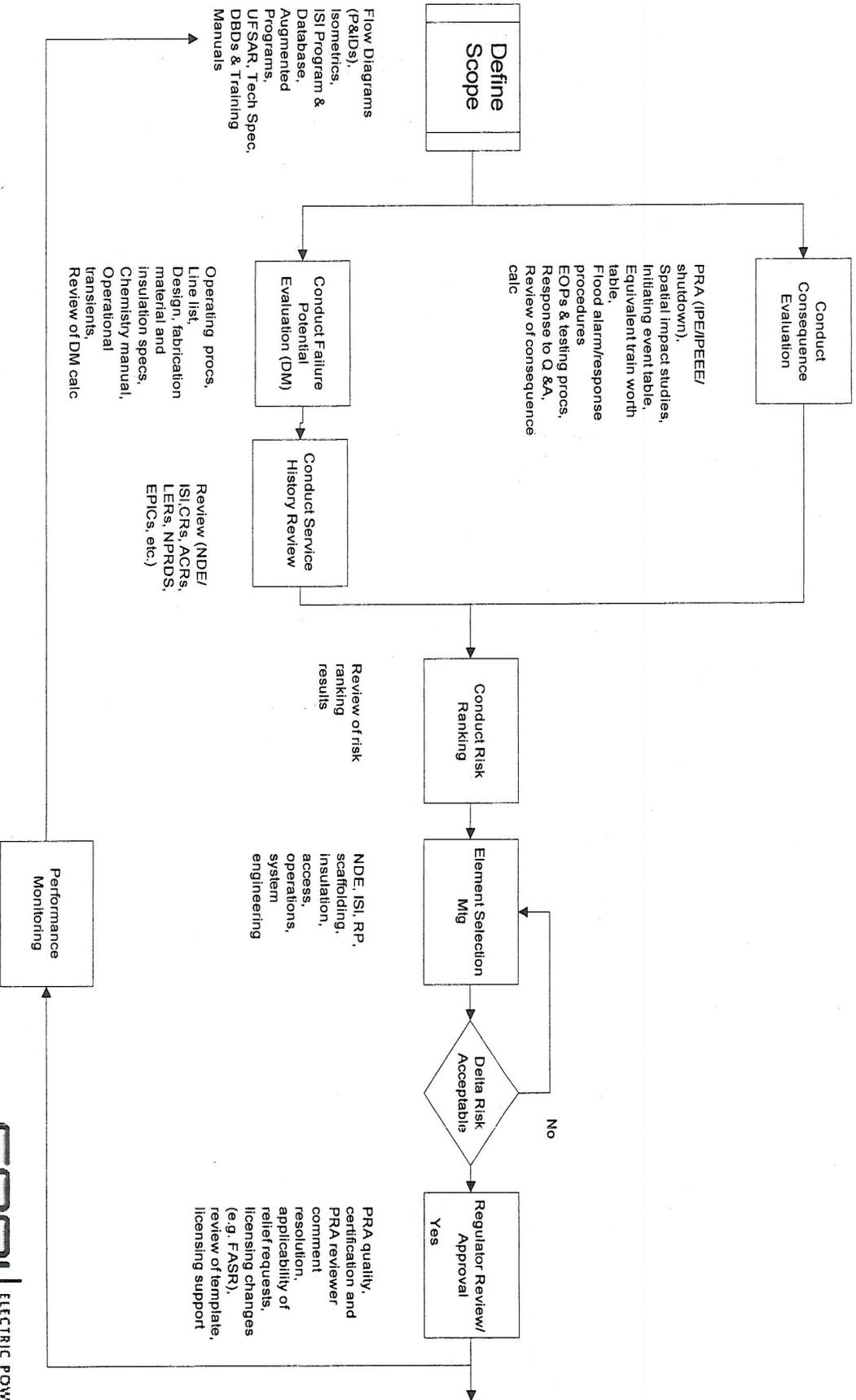
EPRI RI-ISI Methods

- Traditional Approach
 - EPRI Report TR-112657 (N560, N578, Appendix R)
 - EPRI Report 1006937 (Break exclusion region)
- Streamlined Approach
 - ASME Code Case N716
- Surface Exams
 - ASME Code Case N663

RI-ISI Process

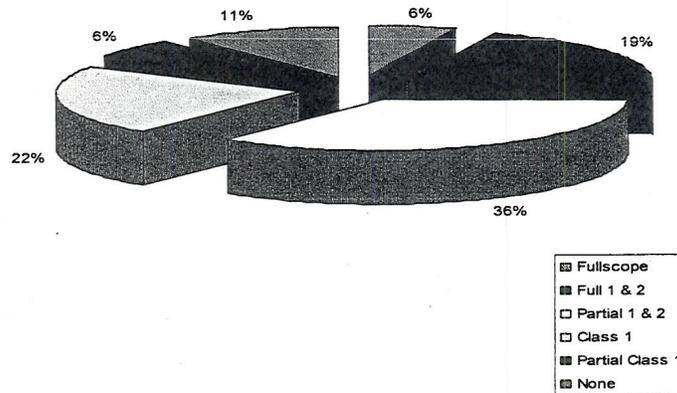


RI-ISI Process



Scope

103 Plants



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Failure Potential

Operating experience has shown:

- Cracks, leaks, or breaks are generally caused by corrosion or fatigue
 - Thermal Fatigue (Thermal Transient & TASCs)
 - Stress Corrosion Cracking (IGSCC, TGSCC, PWSCC, ECSCC)
 - Localized Corrosion (MIC, Pitting, Crevice Corrosion.)
 - Flow Sensitive Attack (FAC, Erosion/Cavitation)
 - High Cycle Mechanical Vibration Fatigue
- Failures do not correlate with stress or fatigue usage factor values contained in Design Reports
- New plant designs are factoring in lessons learned (e.g. FAC resistant material)

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Consequence of Failure

- New Plant Designs reporting low CDF values
- Spatial Impact Assessments (e.g. SRP 3.6.1, 3.6.2)
- Abnormal and Emergency Operating Procedures

RISK RANKING

Consequence Evaluation

Failure Potential Assessment (Degradation Mechanism)

		CONSEQUENCE CATEGORY CCDP and CLERP Potential			
		NONE	LOW	MEDIUM	HIGH
DEGRADATION CATEGORY Pipe Rupture Potential	HIGH	LOW (Cat. 7)	MEDIUM (Cat. 5)	HIGH (Cat. 3)	HIGH (Cat. 1)
	MEDIUM	LOW (Cat. 7)	LOW (Cat. 6)	MEDIUM (Cat. 5)	HIGH (Cat. 2)
	LOW	LOW (Cat. 7)	LOW (Cat. 7)	LOW (Cat. 6)	MEDIUM (Cat. 4)

Risk Impact Assessment

- Founded on Reg. Guide 1.174
- Only small increases allowed
 - System level : $< 1E-7$ (CDF) and $< 1E-08$ (LERF), and
 - Plant level: $< 1E-06$ (CDF) and $< 1E-07$ (LERF)

PRA Technical Adequacy

- For existing plants, RI-ISI applications after Jan 2008 have to address Reg. Guide 1.200, r1
- New plants have additional considerations, e.g. status of
 - Operating procedures,
 - Abnormal response procedures
 - As built configurations
- Timing / scheduling issue versus technical difficulty

PRA Technical Adequacy

- Work on existing plants (i.e. capability category per SR) appears appropriate for new plant designs
- See handout

Implementation Considerations

- DCDs and COLAs point to ASME Section XI, SRP 3.6.1 and 3.6.2 for PSI and ISI requirements
 - Existing plants approved via relief request process for SXI
 - Existing plant approved via 10CFR50.59 for SRP 3.6.1 / .2
- Traditional RI-ISI contained in non mandatory Appendix R
 - NRC approval of non mandatory appendix?
- Streamlined RI-ISI in Code Case N716
 - Approved via future revision to Reg. Guide 1.147?
 - Applicable to new plants?

Implementation Considerations

- New / revised Topical Report approved by NRC for use by
 - DC Applicant?
 - COL Applicant?
- PSI For Class 1 versus Class 2
 - Class 1: 100% even though only 25% receive ISI
 - Class 2: only those receiving ISI receive PSI

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