

# Achieving Excellence in Operations Through Risk Informed Safety Enhancements

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Together, Building  
a Better California

# Integrated Risk Management Model

INPO 15-011 - Principles for Excellence in Integrated Risk Management



### Enterprise Risk

- Management of two (2) Nuclear Gen Enterprise Risks
- Risk and Compliance committee (RCC) Management
- Enterprise and Operational Risk Management (EORM) Governance



### Asset Risk Monitoring

- Degraded and non-conforming condition (DUNC) assessment
- Regulatory Risk
- Emerging Plant Issue Process



### Corrective Action Program

- Issue Identification and Resolution
- Trending of Performance
- Risk Significant Trends



### Project Risk

- Risk Identification Process
- Project Risk Registers
- Risk Integration – RCC
- INPO L1 14-20 IER Technical Conscience and Enterprise Risk



### Compliance and Independent Oversight

- Compliance Controls, Processes and Programs
- Independent oversight provided by Nuclear Safety Oversight (NSOC), Diablo Canyon Independent Safety Committee (DCISC) and PG&E Internal Audit
- Quality Verification (QV) Oversight
- Compliance Maturity Controls Testing



### People & Organizational Effectiveness

- Employee Focus Monitoring Report
- People Committee
- Facilitative Leadership model
- Risk Awareness Culture
- INPO 12-012 - Traits of a Healthy Nuclear Safety Culture
- INPO 15-005 - Leadership and Team Effectiveness Attributes
- INPO 19-003 - Staying on Top Advancing a Culture of Continuous Improvement



### Effective Communication

- Daily Briefing on Plant Risk
- Risk Related Decisions Communicated
- Risk Awareness Communication Tools



### Processes

- Probabilistic Risk Assessment (PRA)
- Risk Informed Completion Time (RICT)
- Surveillance Test Interval Extension
- Work Mgmt Risk Process
- On-Line Risk Mgmt
- Outage Planning Process
- Outage Safety Plan



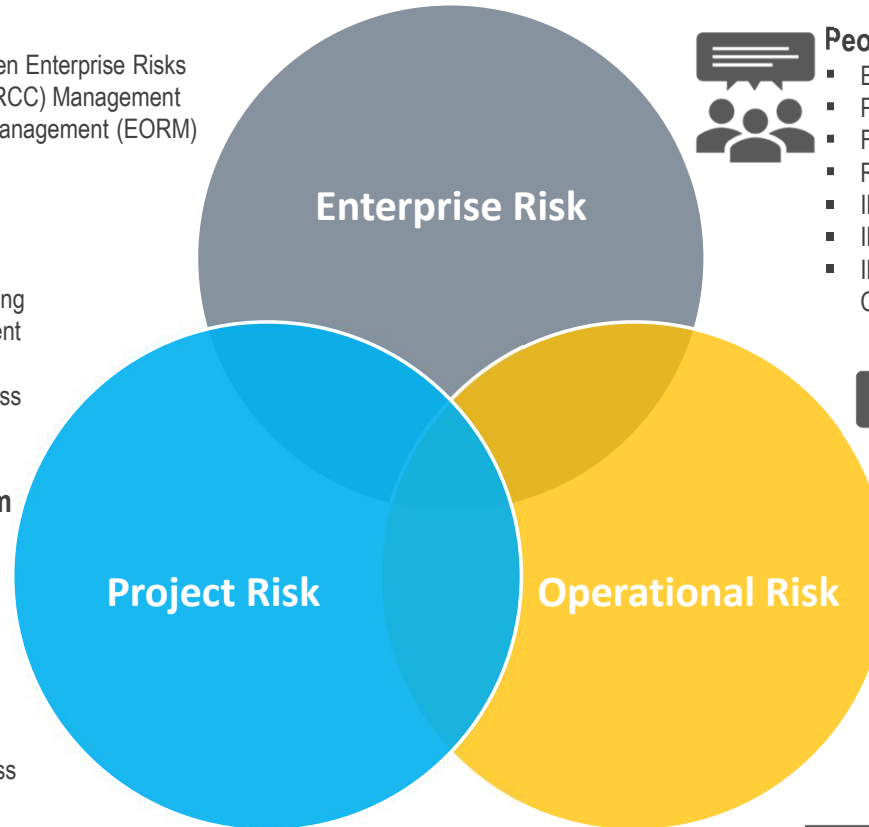
### Policies and Procedures

- Assessment of Integrated Risk
- On-Line Maintenance Risk Mgmt
- Probabilistic Risk Assessment
- Project Management



### Industry and Operating Experience

- Monitoring for Industry Events for Assessment
- Operating Experience Database
- Industry Horizon Scanning



### Governance & Oversight

**PG&E Safety and Nuclear Oversight (SNO)**  
Board of Directors

ENTERPRISE RISK OVERSIGHT

**Nuclear Generation Risk & Compliance Committee (RCC)**

**PG&E Enterprise Risk Command Center (ERCC)**

**Key Risk Indicators**  
Monitoring & Reporting Enterprise

OPERATIONAL RISK MANAGEMENT

**Risk Modeling / PRA**

**Online Maintenance Risk Management**

**Risk Informed Project and Budget Prioritization**

**Enterprise Risk Register and Mitigations**

**Nuclear Generation Horizon Scanning Register**

**Data Informed Analysis / Plant Reliability**



## RCC Quorum

- CNO, PG&E Chief Audit Officer, DCPD Site VP, Director of Nuclear Risk and Compliance, PG&E Chief Risk Officer, DCPD VP of Business and Technical Services

## Typical RCC Agenda Topics

- Regulatory Performance Updates
- Risk mitigation status (examples below)

Mitigation	Issue Description	Next Action	Action Owner	Due Date	RAG	Mitigation Status	Planned Closure
3. Nuclear Fuel Management	NEW FUEL - The sole fuel fabricator for Diablo Canyon Power Plant (DCPP), Westinghouse Columbia Fuel Fabrication Facility (CFFF), has experienced several supply interruptions, quality problems and equipment issues since 2014 having potential risks to security of supply	PG&E SLT CFFF site visit and assessment Forecast completion October 21st, 2024; monitoring corrective actions from recent CFFF manufacturing event	owner	11/27/24	Green		12/31/2024
		Perform Advanced Fuel Features (AFF) risk assessment to identify if additional mitigations are necessary.	owner	11/21/24	Green		
		Execute Contract to perform engineering/licensing efforts allowing the purchase of advanced fuel features:	owner	Complete	Blue		
9. Long Range Plan - Project Execution	Due to focus on continued operations, a new Project Management department is required to manage the strategic projects challenge at DCPD.	Monitor major projects (e.g., Feedwater Heater, HP turbine replacement) Perform Risk Assessment- Organizational capacity, New Project Management Department, Strategic projects, Organizational proficiency	owner	6/2027	Green		6/2027

## Horizon Scanning

Area	Overview	Category	Risk Type
230KV/500KV System Health	Need to evaluate impact on plant risk from health of 230KV and 500KV systems	Risk	Safety Financial
Attrition Risk due to Advanced Nuclear Startups	With the acceleration of advanced nuclear startups and renewed interested in advanced nuclear technology, nuclear generation employees may be more likely to leave PG&E. This could present retention problems in the remaining years of operation.	Risk	Safety Financial



**PG&E Goal:** Drive an integrated approach to assessing risk to inform enterprise, Operational, and compliance risk that form the basis of work execution and risk mitigation plans. Drive to achieve event-free operations

**Strategic Action:** Work as a team to proactively assess and mitigate our asset operational risks to public health and safety

## Major Risk Informed Applications

- **Risk informed Completion Time (RICT)** – Allows for flexibility in operations and maintenance commensurate with risk level and avoids unnecessary plant shutdowns.

  - Recent application of RICT for Auxiliary Salt Water (ASW) pump motor swap reduced organization stress and enhanced operational flexibility
- **Risk Informed Surveillance Frequency Control Program** – Know as Surveillance Test Risk Informed Documented Evaluation (STRIDE); allows a risk informed approach to prioritize surveillance testing

  - Reduce potential test-induced Reactor Trips, Plant Transients and safety system actuations, along with reduced wear on standby systems (e.g., EDGs, etc.)
- **Online Maintenance Risk assessment.** Risk assessment includes contribution from fire, seismic, internal events and flooding. Utilizes quantitative risk insights to plan and perform online maintenance while minimizes risk impact

  - In addition to quantitative risk, risk associated with industrial and radiological safety, security and regulatory/compliance is considered as part of the integrated risk assessment process.
- **10 CFR 50.69 – Risk informed Categorization (Pending Implementation)** – NRC approved approach to risk inform classification of systems and components, supporting prioritization of work and operational focus

## Interpretations of Risk Acceptance Guidelines (RG 1.174)

- Diablo Canyon has not experienced a case where a submitted risk informed application presented results outside of Region II (Baseline CDF < 1E-04)
- Sensitivity analysis can be used when results are close to region boundaries
  - Sensitivities provide insights into how changes in analysis assumptions could impact risk results
- During the initial RICT application (2015), CDF results were initially less than 1E-05/yr from the Region III boundary.
  - This can be a concern since full utilization of RICT could increase baseline risk by 1E-05/yr
  - DCPD performed extensive PRA model reviews and margin improvements to reduce CDF results
  - DCPD 2023 RICT application results in improved CDF results and margin to support program sustainability

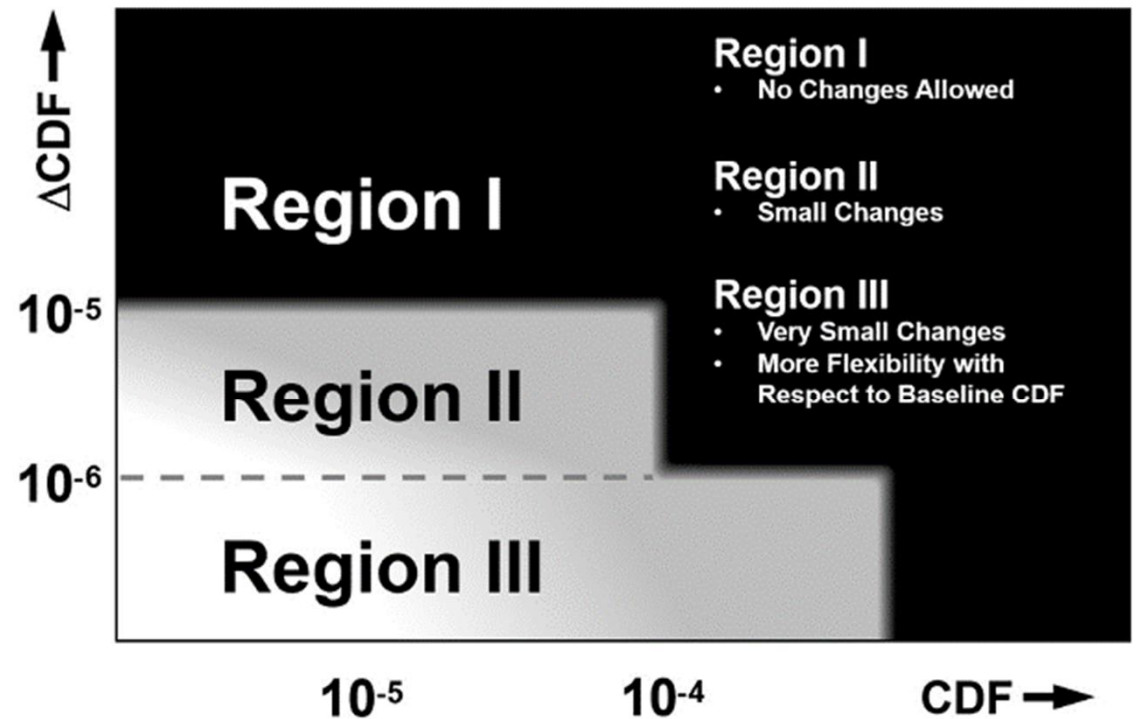
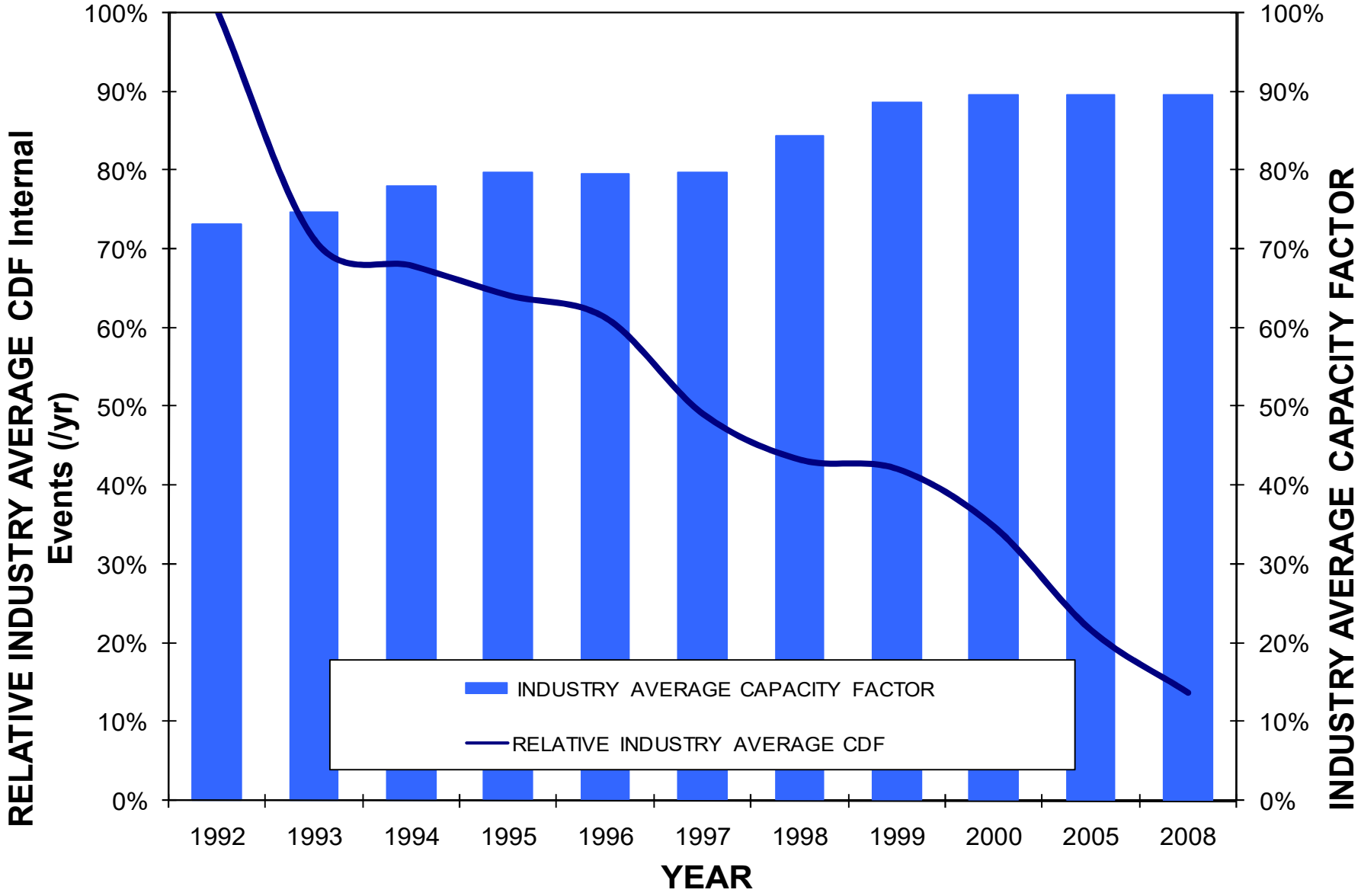
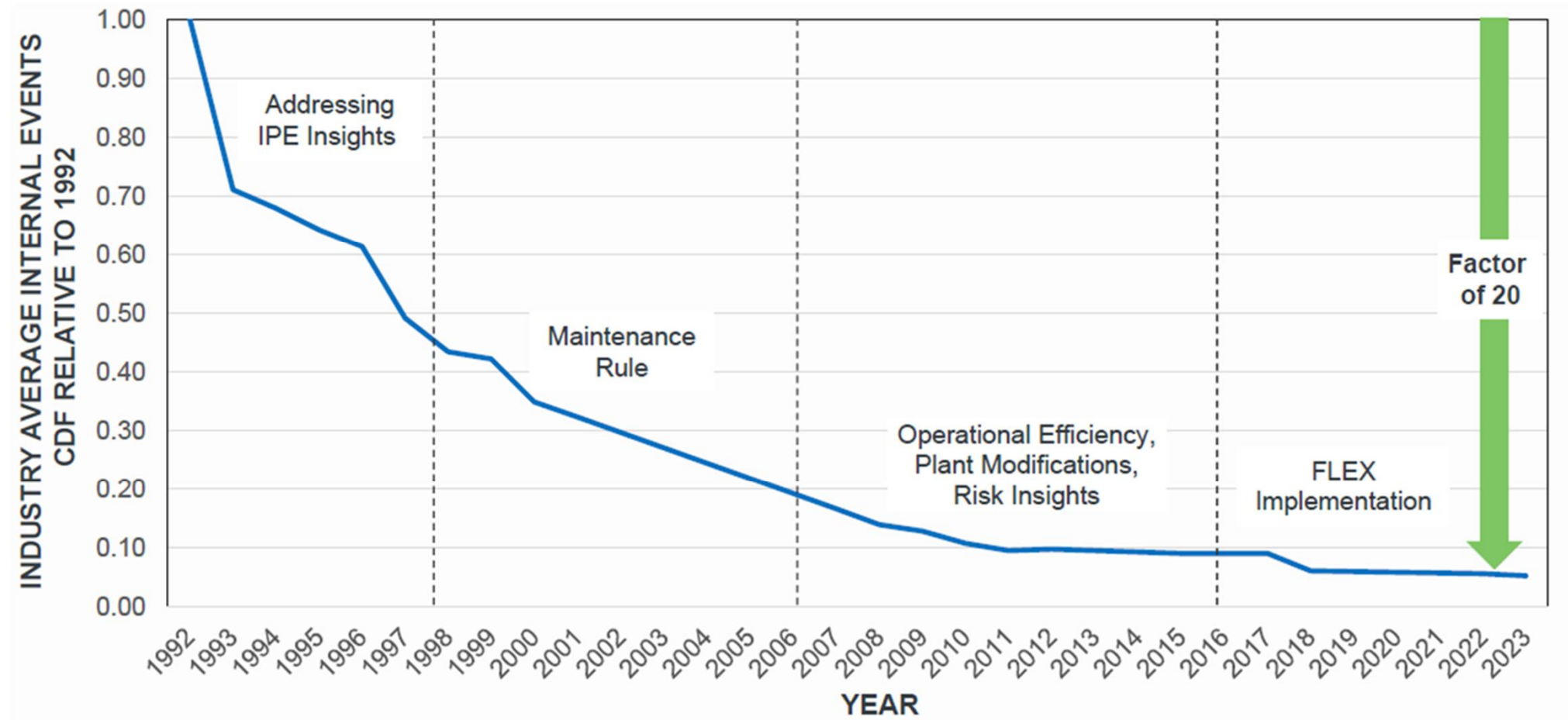


Figure 4. Acceptance guidelines\* for core damage frequency

# CDF vs. Capacity Factor



# U.S. Industry Internal Events CDF Trend



Source: EPRI based on multiple Sources including IPE submittals and ROP data for Mitigating System Performance Index





# Summary of Risk Informed Safety Enhancements Benefits

Operationalizing integrated risk management transforms organizations to risk-driven operations, reducing operational and public safety risk

- Integrated risk management with PRA as its core improves safety of operation, reducing risk to co-workers, community and company
- Risk reduction through prioritization of maintenance, compliance work and projects move beyond regulatory compliance to a risk-informed approach
- “Integrated risk management is the set of behaviors and processes used to identify and eliminate or to minimize risk associated with commercial nuclear power plant operation” – INPO 15-011

## Risk Tools

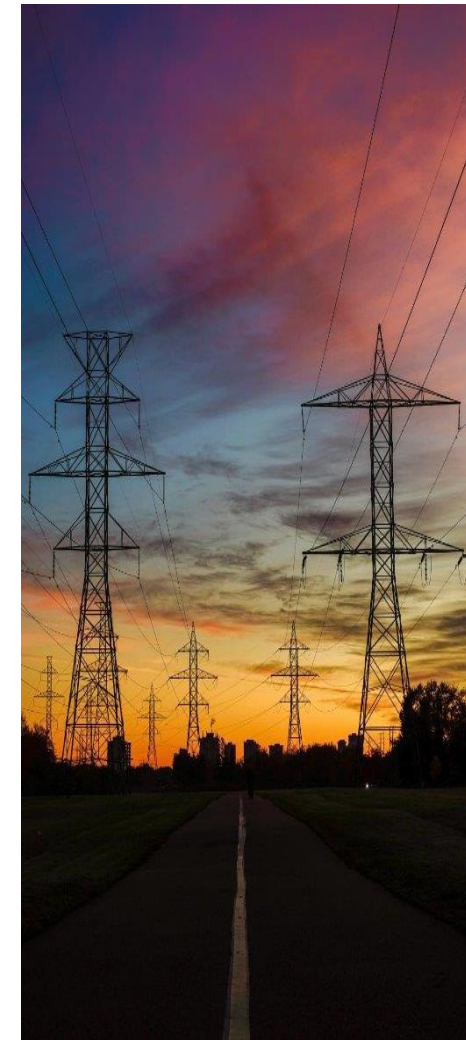
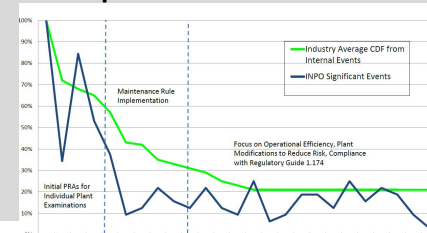
- **PRA Modeling**  
Asset Health and Data  
Event / Industry Failure Data  
Human Failure Probability
- **Regulatory Risk Informed Applications**  
10 CFR 50.69  
RICT  
STRIDES
- **Qualitative Risk Assessment**
- **Data & Analytics**
- **Enterprise Risk Model**

## Risk Informed Decision Making

- **Online / Offline Maintenance Risk Management**
- **Online Operational Risk Management**
- **Risk Prioritization - Project and Work Prioritization**
- **Regulatory Risk Management**
- **Enterprise Risk**

## Operational & Safety Excellence

- **Reduce Risk of Required Shutdowns (e.g., RICT)**
- **Reduce potential test-induced Trips / Transients, safety system actuations, etc.**
- **Reduce Project Induced Risk from Major Projects**
- **Prioritize Operational and Corporate Resources**
- **Manage Impact to Enterprise / Corporation**



## Integrated Risk Management