Use of PRA/PSA Risk Insights for Operations and Maintenance

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PRA/PSA Uses - Operations & Maintenance

• Operations
  – Operational Decision-Making Meetings
  – Prioritization
  – Equipment out-of-service times
  – Functional vs OPERABLE
PRA/PSA Uses - Operations & Maintenance

• Maintenance
  – Preventive Maintenance Activities - Key Failure modes
  – Effectiveness of Maintenance

• Engineering Programs
  – Testing
  – Procurement
  – Design
EXAMPLES
Configuration Risk Management

“On-Line Maintenance”

Risk Profiles
South Texas Project Actual Core Damage Frequency
Due to On-Line Maintenance

CDF, events per year
1.40E-05
1.20E-05
1.00E-05
9.00E-06
8.00E-06
7.00E-06
6.00E-06
5.00E-06
4.00E-06
3.00E-06
2.00E-06
1.00E-06
0.00E+00

Date
12/01/96 03/01/97 06/01/97 09/01/97 12/01/97 03/01/98 06/01/98 09/01/98 12/01/98 03/01/99 06/01/99 09/01/99 12/01/99 03/01/00

- Unit 1 Actual Core Damage Frequency
- Unit 2 Actual Core Damage Frequency
- Calculated Annual Average Core Damage Frequency (1.30E-05)
10CFR50.69
Exemption from Special Treatment Requirements

Risk Significance Categorization
# 50.69 Categorization

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<tr>
<th>RISC-1</th>
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Graded Quality Assurance Concept

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<td>High</td>
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Example Programmatic Activities
- Testing Programs
- Prioritization Processes
- Equipment Reliability Programs
- PM Optimization
- Procurement

Deterministic Margin
Risk Managed Technical Specifications

“Risk Informed Completion Times”
RISK MANAGEMENT ACTION TIME (RMAT)

RISK INFORMED COMPLETION TIME (RICT)

INCREMENTAL CORE DAMAGE PROB. (ICDP)

FRONTSTOP CT

BACKSTOP CT – max of 30 days

TIME
Owner Controlled Surveillance Test Program

“Risk Informed Surveillance Test Intervals”
RITS 5(b) Benefits

• Safety Benefit
  – By reducing the number of surveillance performances, the amount of time the Station is exposed to higher risk conditions is reduced
  – Testing is focused more on safety significant equipment

• Operational Benefit
  – Reductions in equipment manipulations – less wear-and-tear
  – Reductions in dose exposures
  – Places the ownership of surveillance test intervals (and adjusting those intervals) onto the licensee where it belongs

• Financial Benefit
  – Reductions in Ops/Maint manpower requirements – real dollars
  – Reductions in administrative burdens to support Surveillance Testing
  – May provide benefits in managing the new work hour rules as well as staff reductions due to retirements
Risk Informed Asset Management
Long Term Asset Management

Risk Analysis Methods can be used to weigh investment options and provide predictions for long lead, capital items:

- The objective is to deliver a predictive tool that will efficiently achieve and maximize station objectives relative to plant safety and reliability
- Owner Value
  - Safety
  - Culture
Conclusions

• **PRA/PSA is used at operating plants to satisfy regulatory requirements such as Maintenance Rule and Reactor Oversight Program**

• **PRA/PSA analyses provide important data and information for testing and maintenance programs for monitoring and improving system/function/component reliability and availability**

• **PRA/PSA insights should be incorporated in the design evaluation phase for plant modifications and for new builds, as applicable.**

• **ASME Codes & Standards consensus committees are working on incorporating risk informed, performance based approaches through the BNCS Task Group on Risk Management**
SURVEILLANCE TEST INTERVAL EVALUATION PROCESS

Risk Informed Surveillance Test Interval Evaluation Process

Identify surveillances that are candidates for review

Select a surveillance test for review and identify a proposed surveillance test interval (STI) change

Can commitment be changed (NEI 99-04 process)?

Change Commitment Document that the surveillance cannot be changed

Identify components (SSCs) tested by surveillance

SSC explicitly modeled in PRA?

SSC implicitly modeled in PRA?

Perform qualitative analysis

Perform bounding analysis

Acceptable?

Calculate new failure probability by changing existing probability by ratio of new STI over current STI

Calculate change to CDF & LERF (time to 1E-6)

Changes < than 1E-06/yr for CDF and < 1E-07/yr for LERF?

Calculate cumulative change to CDF & LERF from all previous STI changes

Change Commitment

Decide if it is new STI change desirable?

Perform Deterministic eval. of proposed change

• Data from selection criteria
• PRA issues (uncertainty, not explicitly modeled, etc).
• Vendor-Specified maintenance frequency
• Past industry and plant-specific experience changes
• Benefits of detection at an early stage
• Degree to which surveillance provides a conditioning exercise to maintain equipment operability
• Test intervals specified in appl. industry codes & stds
• Risk (economic and regulatory) to station from impact of a failed future surveillance extended under this program (STP factor, not in NEI 04-10)

Working Group evaluates PRA analysis & deterministic evaluation & makes a decision as to acceptability of STI change

Acceptable?

Expert Panel review & approval.

Approved?

Document basis for STI change

Testing

Incorporate STI Change

Periodic review & monitoring incl. PRA updates

Go to beginning

Z = 0PGP02-ZA-0063, R = RMG-7