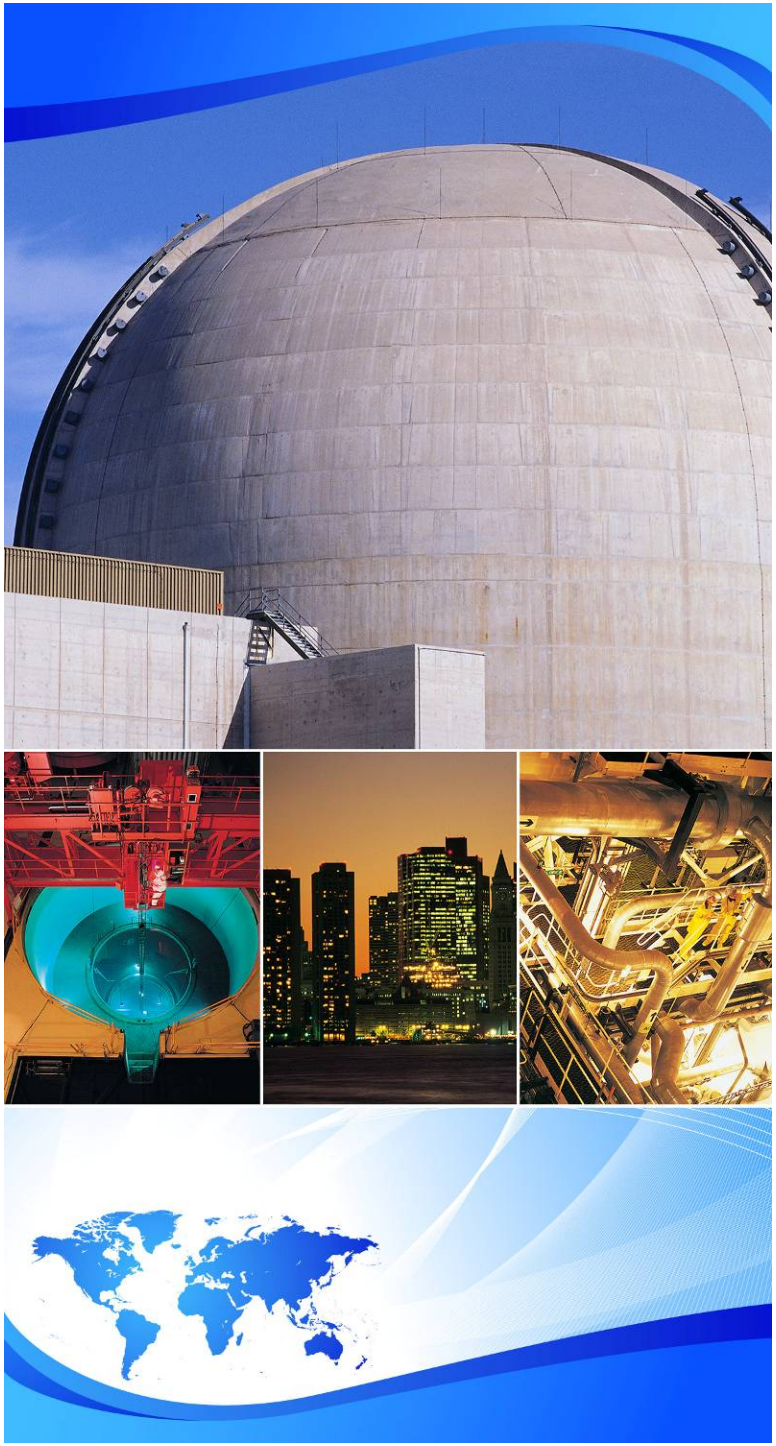

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xLPR PIB Meeting

October 27, 2009

Project Status

Memorandum of Understanding

- Develop a probabilistic assessment tool that can be
  - Purpose
  - Objectives
  - Period of Performance
  - Project Direction and Coordination
  - Project Plan
  - Independence
  - Cost
  - Dispute
  - Completion

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Project Status

Memorandum of Understanding

- Objectives
  - This addendum addresses cooperative research on probabilistic evaluation methods and development of a computational software tool for nuclear plant primary piping systems. The objectives of this effort are to:
    - Develop a robust analysis methodology for evaluating reactor coolant system piping rupture probabilities.
    - Select appropriate, technically sound input data and models to produce best-estimate output results with quantified uncertainties.
    - Develop a computational software tool that applies the input data and models and appropriately treats epistemic and aleatory uncertainties.
    - Verify, validate, benchmark, and document the software tool to enable its use in support of licensing, rulemaking, design, and regulatory decisions by both industry and NRC.

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Project Status

Memorandum of Understanding

- Independence
  - Throughout this project, appropriate independence between NRC and industry shall be maintained via the following means:
    - Active participation and input by a diverse team of technical experts representing many points of view.
    - A flexible computational framework allowing alternatives to be included when all parties may not agree.
    - Periodic review by an outside board.
    - Open access to the final product allowing vetting by the larger technical community.
    - Independent determination by all parties in the user community (industry and NRC) of appropriate final acceptance criteria

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Project Status

NRC & MRP Support

- Overall contracting status
  - MRP
  - NRC
- Funding review
  - NRC
  - MRP

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Project Goal – from January 2009 SOW document

Overall goal

– Develop a probabilistic assessment tool that can be used to *directly* demonstrate compliance with 10CFR50 App-A GDC-4, and would properly model the effects of relevant active degradation mechanisms and the mitigation activities that are being undertaken to combat this degradation.

General requirements

- Comprehensive with respect to known challenges,
- Vetted with respect to scientific adequacy of models & inputs,
- Flexible to permit analysis of a variety of in-service situations
- Adaptable to accommodate evolving and improving knowledge

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Scope Statements

Short Term – Pilot Study scope

- Demonstrate the feasibility of the NRC/Industry cooperative process for developing a probabilistic code to address degradation mechanisms in piping system safety assessments

Medium Term – Full Piping scope

- Develop a probabilistic fracture mechanics tool to analytically demonstrate that the probability of pipe rupture remains extremely low
  - Initially for evaluating LBB for DM A82/182 buttwelds in the presence of PWSCC as well as common mitigating activities
  - Expand to a generic probabilistic fracture mechanics tool for evaluating degradation of RCS piping

Longer Term – Pressure Boundary Scope

- Develop a generic probabilistic fracture mechanics tool for evaluating degradation of pressure boundary components

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Version 1.0 – Pilot Study

Milestones

- Develop basic code framework reflecting the conceptual methodology
  - Alpha version - Employ proxy model modules and inputs
  - Beta version – Incorporate Models TG model selection input
  - Version 1.0 – Tested, functional pilot code
- Exercise Version 1.0
  - Preliminary probability-of-failure estimate
  - Limited sensitivity study capability of key analytical drivers
- Define Version 2.0 scope and schedule

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Version 1.0 – Pilot Study

Objectives

- Exercise the proposed code development process
  - Enlighten the open vs. closed source framework code decision
  - Identify technical issues where research or information is required
- Exercise the technical & management organizational structure
  - Identify and resolve interface & communication issues
  - Populate the teams with needed expertise
  - Gain team experience w/ decision processes
- Develop framework & exercise basic code on the sample problem
  - Demonstrate consistent characterization and propagation of uncertainty
  - Preliminary probability-of-failure estimate to compare with existing deterministic results
    - xLPR functional viability demonstration
    - xLPR credibility check
  - Provide limited sensitivity study capability of key analytical drivers

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Version 2.0 – Piping scope

Milestone – Initial Scope: LBB - PWSCC

- Develop the probabilistic assessment capability to *directly* demonstrate compliance with 10CFR50 App-A GDC-4 for A/82/182 DM butt welds:
  - Located in lines previously licensed for LBB
  - Properly accounting for:
    - Effects of relevant active degradation mechanisms (e.g., PWSCC)
    - Mitigation activities being undertaken to combat this degradation
    - Risk impact of inspections
- Verify and benchmark the computational tools to a sufficient degree to support NRC – Industry evaluation and resolution of LBB – PWSCC licensing issue

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Version 2.0 – Piping scope

Milestone – Final Scope: Generic RCS Piping

- Develop the probabilistic assessment capability to *directly* demonstrate compliance with 10CFR50 App-A GDC-4 for all RCS lines
  - BWR
  - PWR
  - Relevant materials of construction
  - Relevant degradation mechanisms
  - Relevant pipe joint configurations
- Verify and benchmark the computational tools for release and use by competent technical experts in such analyses to support NRC and Industry in
  - Regulatory issue resolution
  - Flaw evaluation
  - Mitigation method deployment
  - Design analyses

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Version 3.0 – Pressure Boundary scope

Objectives – RCS Piping and Pressure Boundary Components

- Develop the probabilistic assessment capability to *directly* demonstrate compliance with 10CFR50 App-A GDC-4 for RCS piping and pressure boundary components
  - BWR
  - PWR
  - Relevant materials of construction
  - Relevant degradation mechanisms
  - Relevant pipe joint and component configurations
- Verify and benchmark the computational tools for release and use by competent technical experts in such analyses to support NRC and Industry in
  - Regulatory issue resolution
  - Flaw evaluation
  - Mitigation method deployment
  - Design analyses

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Program Plan

Separate presentation

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Development Process & Documentation

Version 1.0 of xLPR - definition of capabilities

- Program Plan & Process Mapping?
  - Identify and document:
    - Planned capabilities
    - Key open items from V1.0 development
    - Simplifying assumptions in V1.0
- Extent of additional documentation contemplated
  - Rudimentary users manual?
  - Project report (MRP or NRC?)
    - Code description
    - Result of sensitivity runs
    - Lessons learned for V2.0

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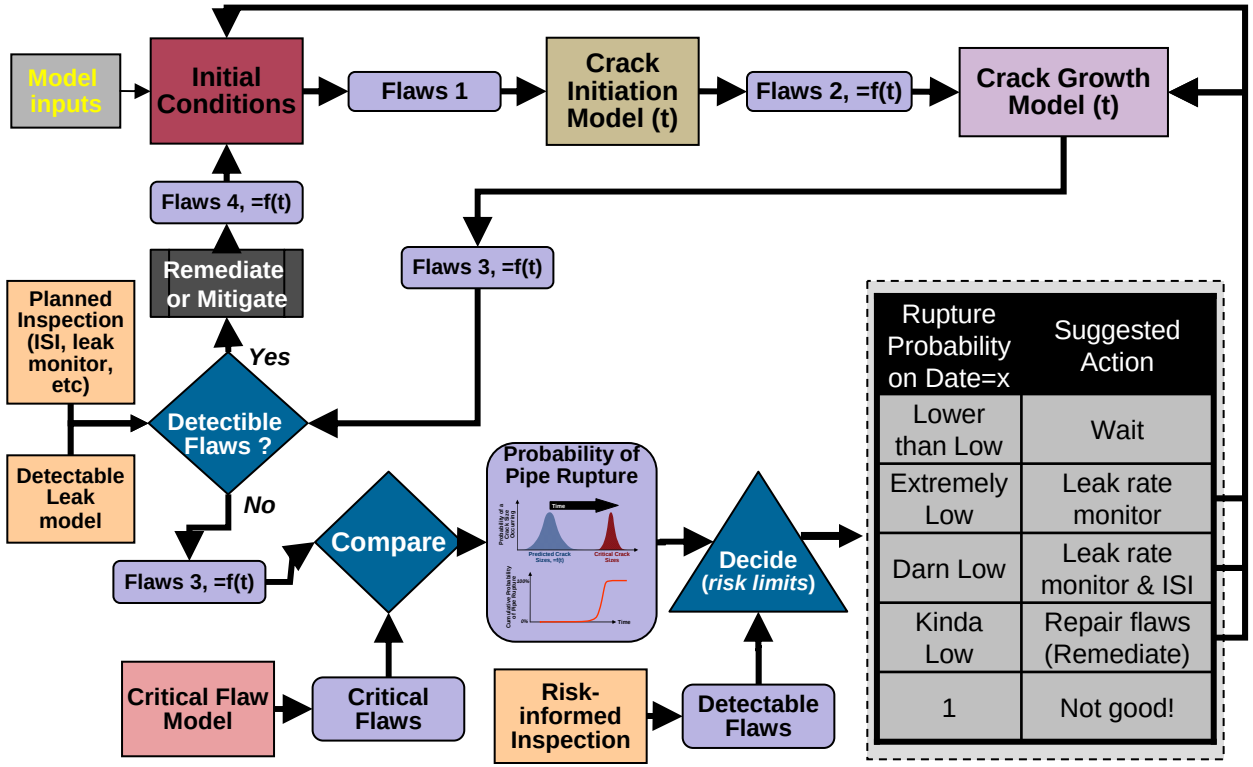
Development Process & Documentation

xLPR Mapping

- Graphical presentation of the methodology & logic
- Companion to Program Plan
- Aid to technical development team and programmers



Rupture Probability on Date=x	Suggested Action
Lower than Low	Wait
Extremely Low	Leak rate monitor
Darn Low	Leak rate monitor & ISI
Kinda Low	Repair flaws (Remediate)
1	Not good!

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Development Process & Documentation

Modeling Conf Call Action Items

- *We need to set up a framework within the PIB for doing cross task group communication of information.*
- *We need to start a document to keep track of what we want in the beta version that we are not really working on now! This needs to be part of the PIB agenda and we need a process for keeping track of this information.*
- *Everyone (in all task groups) needs to start writing down concerns and issues and keep track of simplifying assumptions being used in the alpha version that need to be beefed out in the beta version. We need a process for collecting this information and formally documenting it as we move forward.*

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Development Process & Documentation

Version 2.0 of xLPR definition of capabilities

- Establish process to identify and document:
  - Planned capabilities beyond V1.0
  - Open items from V1.0 development,
  - Simplifying assumptions in V1.0
  - Users documentation & QA - V&V
- Parallel development of:
  - Program Plans for V1.0 & 2.0?
  - Process mapping for V1.0 & V2.0?
  - Alternative?
- Program Plan maintenance
  - Assign responsibility to someone(s)

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Development Process & Documentation

Periodic formal project reports

- Scope / content of year-end project report (soft MRP commitment)
  - Project structure
  - MOU
  - Program Plan
  - ?
- V1.0 Major milestone report
- V2.0 alpha Program Plan?
- V2.0 LBB – PWSCC resolution tool (if full-scope pipe analysis lags)?
- V2.0 Users Manual and Code Documentation package

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Organization Issues

PIB Staffing

- Managing turnover and continuity
  - Denny Weakland retires in Feb 2010
  - Other changes?

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xLPR Review Board

Why Should We have Our Own Review Board?

- Helps keep us focused on our goals
- Ensures high technical quality
- Building review into project should streamline implementation of our recommendations at the end of the project

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xLPR Review Board

Review board organization

- # of positions (min / max, odd and not too many)
- Expertise required
- When should it be up an running?
- Need candidate nominations

Role	Name	Affiliation
NRC Management	???	NRC
EPRI Management	???	EPRI
Materials Expert	???	???
Programming Expert	???	???
Risk Assessment Expert	???	???

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xLPR Review Board

Next Steps

- Someone must “own” the review board
  - Must ensure independence
  - Must allow us to pay them
- Finalize candidate list
  - Brainstorm candidates
- Develop statement of responsibilities
  - Basic expectations
  - Incorporate into contract documents
- Approach candidates to assess their willingness to serve

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