

Probabilistic Analysis as a Regulatory Tool for Risk-Informed Decision Guidance (PARTRIDGE)

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Historical Background

- May 2003 - Battelle began developing PRO-LOCA PFM code for NRC
- February 2006 – MERIT program begins
 - International cooperative program: US NRC, EPRI, Sweden, United Kingdom, Canada, South Korea
 - Major focus was continued development of PRO-LOCA
 - Existing version (3.5.32) delivered in July 2009
- January 2008 – NRC holds international conference on LBB
 - Introduces plans for PFM code for entire pressure boundary – Modular Code
 - xLPR (eXtremely Low Probability of Rupture): piping branch of Code
- March 2009 – PARTRIDGE presented to MERIT members
 - Key goals and objectives identified
- October 2009 – PARTRIDGE proposal sent to MERIT members

PRO-LOCA

- Probabilistic fracture mechanics (PFM) code
 - Incorporates advancements in technology since development of earlier PFM codes (e.g., PRAISE)
 - Stability, leak rate, crack initiation/crack growth, etc.
 - Includes new degradation mechanisms not included in earlier codes, e.g. PWSCC
- Tool for re-evaluating technical basis for 10CFR50.46a transition break size on periodic basis
- PRO-LOCA improvements made as part of MERIT
 - Added flexibility with both default and user inputs for crack initiation/growth, material properties, WRS distributions, inspection/POD
 - New models, e.g., probabilistic WRS distribution, arrival rate model
 - New features, e.g., new inspection routines, advanced simulation routines, GUI

NRC's Motivation for xLPR

- NRC SRP 3.6.3 for LBB stipulates active degradation mechanisms (e.g., PWSCC) not allowed
 - PWSCC occurring in systems that have been granted LBB exemptions to remove pipe-whip restraints
 - Systems no longer strictly satisfy SRP 3.6.3
 - SRP 3.6.3 is deterministic, yet 10CFR50 Appendix A, GDC-4 requires that an extremely low probability of failure should exist
- xLPR is a probabilistic tool being developed to directly satisfy GDC-4 requirement

PARTRIDGE Objectives

1. Participate in xLPR development
 - Provide mechanism international involvement
 - Enhance QA and technical basis documentation for modules within xLPR

2. Improve PRO-LOCA
 - Enhance QA basis and technical basis documentation
 - Estimate very low probability events in a timely manner
 - Incorporate new deterministic modules being developed as part of xLPR into PRO-LOCA (e.g., new leak rate code)
 - Improve PRO-LOCA GUI

3. Provide additional user support for PRO-LOCA and xLPR

Participating in PARTRIDGE: Motivation



- Gain early access to state of the art codes (xLPR and PRO-LOCA) for estimating very low probability events (10^{-8})
- Receive more rigorous technical basis and enhanced QA for xLPR and PRO-LOCA
 - Documented technical basis for models, inputs, and code structure
 - Verification and validation for models and code
- Receive more comprehensive user support and code documentation
 - “Help Desk” for PRO-LOCA and xLPR users
 - xLPR technical basis document and Users Manual
 - Updated PRO-LOCA Users Manual
- Use basic code framework for developing code for member specific applications (e.g., CANDU applications)

Cost and Schedule

- Cost for non-MERIT members - \$390,000 (\$130,000/year for 3 years)
 - MERIT members will join at reduced rate (\$300,000) to recognized significant investment to date
- Work can start as soon as two members join; scope will expand with additional memberships
- Current status
 - Proposal being reviewed
 - Positive feedback to date from Canada, Sweden, NRC (waiting to hear from others)

Participation in PARTRIDGE: Point of Contact



For questions or to request a formal proposal/agreements contact :

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