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Probabilistic Fracture Mechanics Assessment for Leak-Before-Break

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An International Workshop

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Leak-Before-Break

- Requirements set by GDC-4
  - Probability of rupture is extremely low
  - Implemented by deterministic analyses
    - Conservative inputs and calculations
    - Add margins
    - Engineering judgment

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Deterministic LBB Approach

- Challenges
  - Assessing uncertainties and stochastic processes
    - Residual stresses
    - Degradation
    - Etc.
  - Assessing mitigation techniques

Use conservative inputs, conservative calculations and add margins to the inputs, calculations and results

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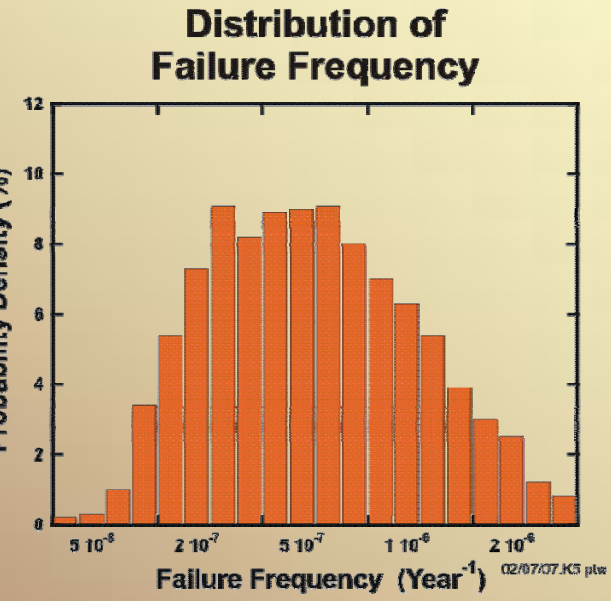
Medium Term Objective of the Workshop and Project

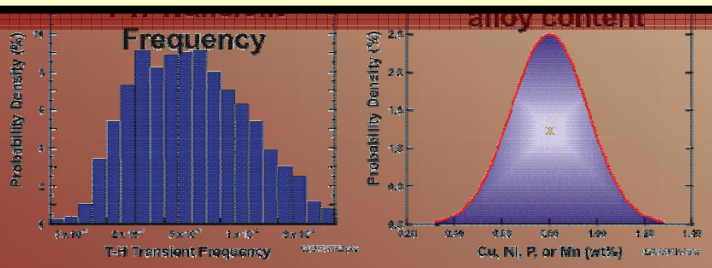
- Produce a probabilistic fracture mechanics tool for leak-before-break analysis
  - Considering:
    - Active degradation mechanisms
    - Mitigating activities

Use best-estimate analyses combined with uncertainty assessments.

Sample on input parameters to calculate the distribution for frequency of failure.

Probabilistic approach propagates uncertainties of input variables through to the solution.





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Lessons Learned

- Broad and frequent communication helps identify and resolve challenges
- Certain administrative processes should be in the plan, e.g. IT, QA, V&V
- Single use codes are inefficient

Long Term Objective of the Project and the Workshop:

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

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Lessons Learned

- Create and maintain a process map
  - Identify how models fit together
    - coding plan
  - Identify what inputs, models and relationships require further development
    - research plan

Short Term Objective of the Project and the Workshop:

Introduce the process map concept and identify all of the code, model or input owners. Plan to complete the detailed process map.

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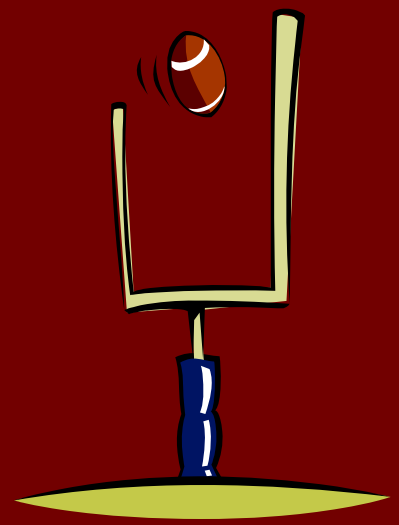
Our Goals



- Long Term
  - **Generic probabilistic fracture mechanics tool for evaluating degradation of pressure boundary components**
- Medium Term
  - **Probabilistic fracture mechanics tool for LBB**
- Short Term
  - **Develop a detailed process map**