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# **WOG - NRC Meeting PWR Reactor Vessel ISI Interval Extension Program**

**April 29, 2004**



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## **Agenda**

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- Meeting Objectives
- Overview of WOG Program and WCAP-16168-NP
- Comparison of WCAP-16168-NP and Draft PTS NUREG
- Comparison of PTS Risk Analysis Methods
- Additional Technical Aspects Addressed in WCAP-16168-NP
- Plant Specific Implementation
- Summary and Conclusions
- NRC Review Schedule



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## Meeting Objectives

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- Licensing
- Technical
  - Comparison of PTS Risk Analysis Methods in WCAP-16168-NP and Draft PTS NUREG
  - Use of Probabilistic Risk Assessment (PRA)
  - Plant Specific Implementation
- Identify Pending Submittals to NRC
- Discuss NRC Review Schedule for WCAP-16168-NP



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## Overview of WOG Program and WCAP-16168-NP

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- Develop a methodology to justify extending the RPV ISI interval from 10 years to 20 years
- Support implementation of the methodology with ASME Code Case and supporting technical basis document
- Apply the methodology to pilot plants in conjunction with the NRC Program on PTS Risk Re-evaluation.
- Obtain NRC review and SE on the topical report.
- Demonstrate the applicability of pilot plant analyses to non-pilot lead plants



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## Comparison of WCAP-16168-NP and Draft PTS NUREG

- Utilizes the same PRA, TH and PFM methodology that was used for PTS risk re-evaluation program
- WCAP-16168-NP uses a small subset of NRC results
- NRC PFM methodology does not consider fatigue crack growth or in-service inspection in its PFM code FAVOR
- WCAP-16168-NP shows that the change in PTS risk due to fatigue crack growth and in-service inspection is insignificant



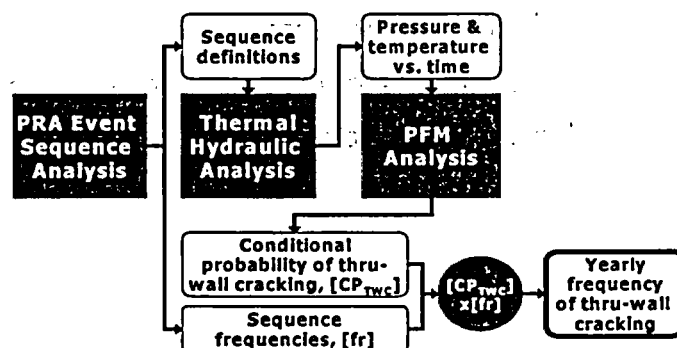
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## PTS Risk Analysis Methodology

Figure 2.1 of Draft PTS NUREG



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## WCAP-16168-NP Overview

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- WCAP-16168-NP, "Risk-Informed Extension of Reactor Vessel In-Service Inspection Interval," submitted in October 2003.
  - Satisfies requirements of ASME Section XI Code Case N-691
  - Utilizes methodology for calculating RPV failure frequency and LERF from the NRC PTS Risk Study with one exception:
    - Developed new surface flaw distribution to account for effects of possible fatigue crack growth and ISI
  - PTS risk analyses performed for Westinghouse (Beaver Valley Unit 1) and CE (Palisades) pilot plants at 60 EFPY (80 years)



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## Relationship to ASME Code Case

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- ASME Section XI Code Case N-691
  - Provided the technical justification to extend the RV ISI interval from 10 to 20 years
  - Provided requirements for pilot-plant applications
  - Approved by ASME in November 2003



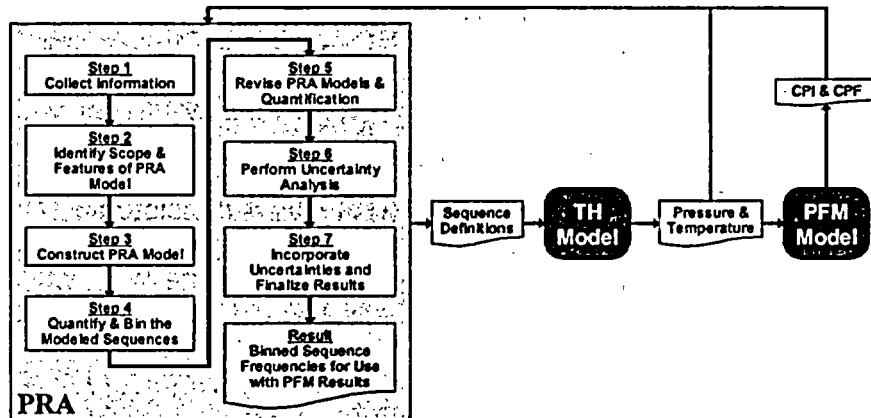
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## Use of PRA for PTS Initiating Event Frequencies

Figure 2.2 of Draft PTS NUREG



## PTS Transients Considered in WCAP-16168-NP

- The dominant PTS transients (each contributing  $\geq 1\%$  to total risk) were considered for the evaluation of Westinghouse and CE pilot plants
- PTS transient sequences and frequency distributions were taken directly from NRC PTS Risk Study in the following categories:
  - Loss of Coolant Accidents,
  - Stuck-open Relief Valves,
  - Large Main Steam Line Breaks

## Comparison of PTS Risk Analysis Methods

- RPV failure assumed to result in large early release (TWCF = LERF) in the NRC PTS Risk Study and WCAP-16168-NP
- $\text{LERF} \leq 1.0\text{E-}6/\text{year}$  in NRC PTS Risk Study
- $\Delta\text{LERF} \leq 1.0\text{E-}7/\text{year}$  in WCAP-16168-NP
- $\Delta\text{LERF}$  limit used in WCAP-16168-NP is consistent with an "insignificant change in risk" as defined in NRC Regulatory Guide 1.174



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## Additional Technical Aspects Addressed in WCAP-16168-NP

- NRC feedback on draft WCAP-16168-NP identified in September 2003 meeting:
  - Provide detailed differences in PFM methodology
  - Identify the change in risk results for two limiting Pilot Plants
  - Identify the proposed regulatory process for WOG Plant implementation and provide a proposed NRC submittal
  - Demonstrate applicability of methodology across entire PWR fleet
- NRC feedback incorporated in WCAP-16168-NP and supplement (to be submitted)
- Implementation issues are being evaluated by follow-on WOG Programs



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## Plant Specific Implementation

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- Individual plant submittals will include a comparison of key plant-specific parameters to NSSS design pilot-plant parameters
- Additional evaluations will be provided if the pilot-plant parameters are not shown to be bounding
- Non-Pilot Lead Plants will demonstrate the application of the methodology for applying pilot-plant results to non-pilot plants
  - Wolf Creek (Westinghouse)
  - Waterford 3 (CE)
- Applicable to all PWR designs demonstrated through the application of the methodology to Oconee 1 for the B&W design and proposed supplement to WCAP-16168-NP



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## WOG Plant Implementation

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- WOG is determining the proposed plans for implementation of the methodology for the PWR fleet
- Defense in depth is maintained through continued inspection of all WOG Plant vessels and weld locations
- Approximately 50% of the WOG units have confirmed implementation plans for RPV ISI interval extension
- Multiple inspection scenarios summarized based on current results of a survey of CE, Westinghouse, and B&W plants



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## RPV Inspection Survey Summary

Summary of current survey results indicate:

- Current 10 year interval inspection plans will provide yearly inspection results
- Implementation of 20 year interval inspection plan provides inspection results at least every 2 years

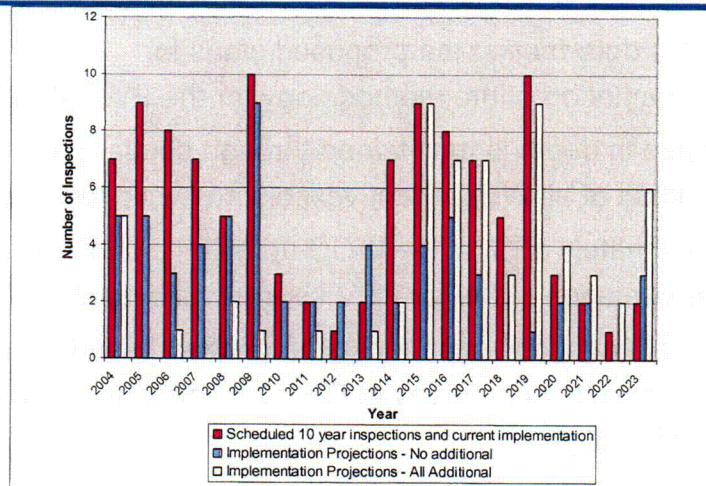


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## RPV Inspection Scenarios



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## Future Submittals to NRC

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- Supplement to WCAP for B&W Pilot-Plant implementation – May 2004
- 10CFR50.55a requests for Wolf Creek and Waterford 3 individual plant implementation – May 2004
- 10CFR50.55a requests to defer near term fleet inspections pending completion of NRC review of WCAP-16168-NP
  - Deferment 1 cycle only
  - Consistent with RI-ISI process



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## Summary and Conclusions

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- The PRA, TH and PFM analysis methods utilized for RPV failure frequency in WCAP-16168-NP are the same as those used in the NRC PTS Risk Study
- WCAP-16168-NP shows that the evaluation results that include the surface flaw distributions for Fatigue Crack Growth and extended ISI interval in PTS risk meet RG 1.174 guidelines for insignificant change
- NRC feedback received in the September 2003 WOG meeting incorporated in WCAP-16168-NP
- Fleet implementation issues are being addressed by follow-on WOG Programs
- Defense in Depth maintained through continued inspections of 100% of all locations



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## NRC Review Schedule

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- WOG letter WOG-03-562 dated October 31, 2003 submitted WCAP-16168-NP
- Letter WOG-04-075, dated February 13, 2004, agreed to pay NRC review fees
- Defer near term inspections
- Request NRC Safety Evaluation by September 30, 2004
- NRC acceptance letter and review schedule



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