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# Pressurizer Dissimilar Metal Butt Weld Inspections

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# Background

- Knowledge of degradation of nickel base alloys since 1980s
- Cracking in Alloy 82/182 butt welds has been experienced at multiple plants since 2000
- MRP-139 dissimilar metal butt weld inspection guidelines
- In October 2006, extensive circumferential flaws were identified in pressurizer nozzle welds at Wolf Creek

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# Wolf Creek Analyses

- Commitments to implement enhanced leakage monitoring and shut down by end of 2007 to mitigate/inspect
  - Confirmatory action letters
- Advanced Finite Element Analyses (AFEA)
  - Plant specific information obtained to do analyses
  - NRC analyses encompassed all 9 plants
  - NRC performed analyses of over thirty cases
    - Purpose to review, critique and extend industry analyses
  - Industry analyses independent from NRC staff analyses
  - Most comprehensive, state of the art analyses of flaw growth in weld ever undertaken; thousands of hours of work
  - Involved highest level of expertise in the US
  - Results predicted acceptable margins between potential flaw growth to detectable leakage and a rupture condition
- Decision to allow operation of 9 plants until June 2008

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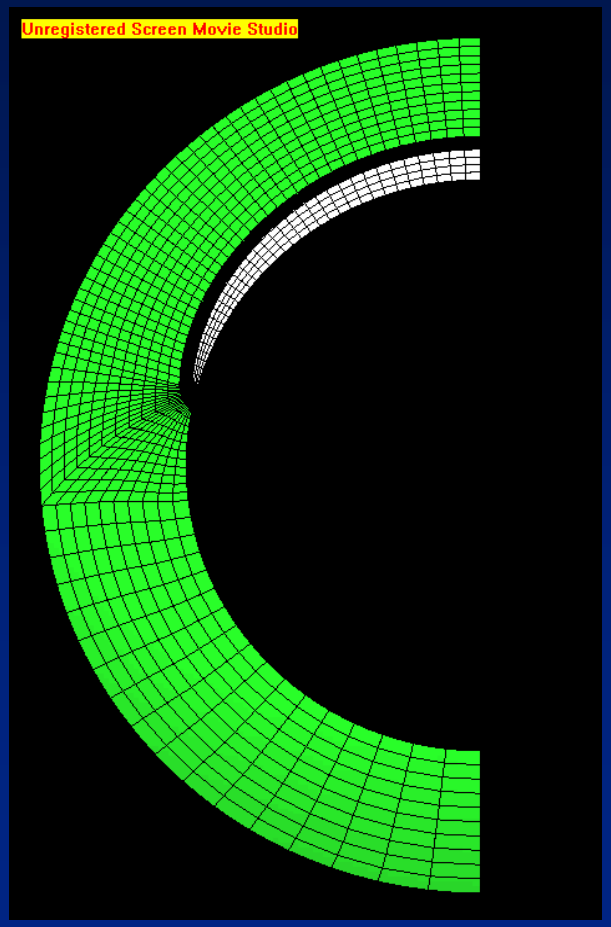
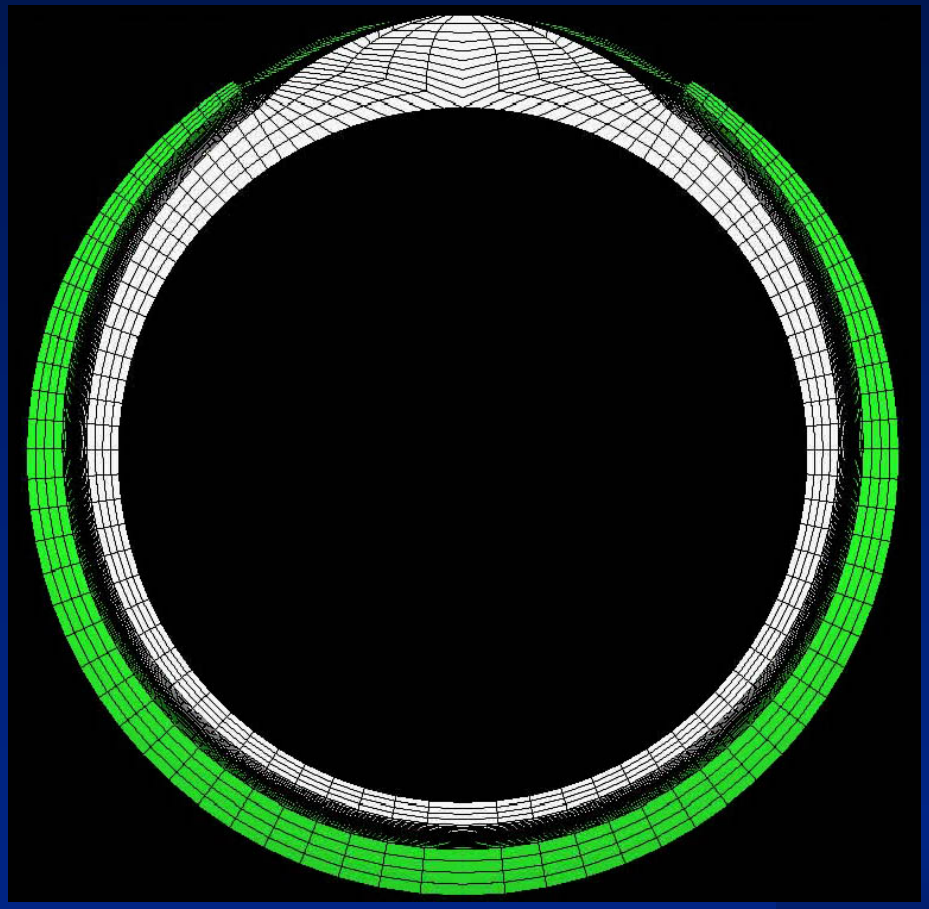
# NRC AFEA Surge Nozzle Case



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# Plants Addressed by AFEA

- Braidwood 2
- Comanche Peak 2
- (Diablo Canyon 2)
- Palo Verde 2
- Seabrook
- South Texas 1
- V.C. Summer
- Vogtle 1
- Waterford 3

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# Retired Pressurizer Inspection

- Donated to NRC for research program
- Inspections performed to determine the research value of the welds
- Indications found by dye penetrant (PT) & manual phase array ultrasonic examination (UT)
- 5 of 6 Nozzles had circumferential & axial indications
- Spray & surge nozzles had linear circ indications
- Safety nozzles had 360º indications with non-uniform depths around circumference with deepest:
  - 80% on the “A” Safety nozzle
  - 75% on the “B” Safety nozzle
  - 69% on the “C” Safety nozzle

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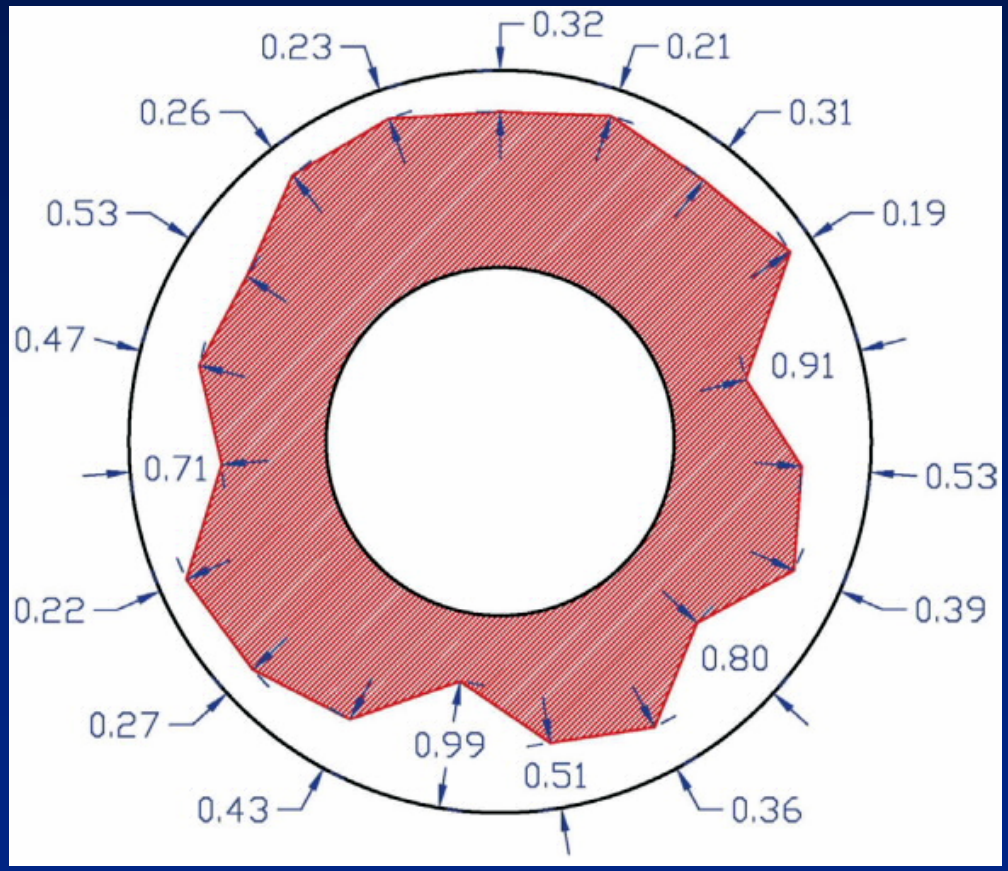
# Retired Pressurizer Inspection

- Details received late on March 4, 2008 contained a flaw profile and UT images at measurement locations

# Flaw Profile in March 4th report: "A" Safety Nozzle Weld



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# Actions Taken

- Report reviewed by NRC in-house and contracted experts
- Inspection results led to staff questions concerning the severity of the indications represented by the profile and the cause of the UT signals
- Profile raised questions about the basis to allow the remaining 8 plants to operate until the spring 2008 outages