



# **Update of NIFG Action Evaluation of North Anna Probes and Mockups**

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September 11, 2012

# Background

- Eight-action plan initiated to address NRC concerns raised by PNNL report and North Anna experience
  - Collaborative effort between NIFG and NRC Research
  - Agreed upon workplan
  - All scans will be encoded
  - Data collected by both organizations will be made available for review
  - Data to be gathered in a manner that allows NIFG and PNNL data sets to be directly compared
  - The analysis of data sets will be performed separately

# Objectives

- Determine if the North Anna mockups are adequate for assessing the flaw detection capabilities of the North Anna tandem probes for this specific component configuration
- Determine if the North Anna tandem probes are adequate for flaw detection for this specific component configuration
- Assess the information and data gathered on the probes and mockups with respect to the requirements/intent of Appendix VIII and PDI to determine if changes to the Code, procedures, or Owner-controlled processes are necessary

# Actions

- Characterize North Anna Tandem Probes
  - Determine exit point
  - Measure the refracted and skew angles
- North Anna Mockups (two flawed North Anna mockups and one non-flawed FlawTech mockup)
  - Scan mockups with zero degree probes to assess the quality of welding
  - Scan mockups with North Anna tandem probes
  - Utilize a receiver mounted on the inside surface of a mockup to assist in probe characterization

# Actions

- Collect data with a conventional, dual side-by-side RL probe from EPRI inventory to demonstrate effectiveness of standard demonstrated probes
- Collect phased array data recreating field application of phased array procedure (electronic skewing)
  - Demonstrate field procedure flaw detection capabilities on mockups
  - Compare phased array data from field flaws (non-encoded) to the data collected from the mockups to assess demonstration flaw characteristics
  - Compare field phased array data to data collected from the mockups to assess how well the mockup responses in ‘clean’ areas correlate with the responses of the weld in the field

# Actions

- Collect phased array data scanning with mechanically corrected wedges to compare with electronic skewing data
- Polish, etch, and photograph a cross section of one of the mockups to provide weld microstructure information
  - For input into modeling calculations
- Perform Beam Simulations
  - Obtain tandem probe waveforms for each transducer (RR and LR)
  - Perform ultrasonic beam simulations utilizing new input waveforms with CIVA
  - To the extent possible, use the microstructure information to simulate ultrasonic wave propagation through the weld

# Actions

- Perform Flaw Response Modeling
  - Using the actual tandem probe waveforms, simulate the expected axial flaw responses with CIVA. To the extent possible, the weld microstructure information will also be utilized during flaw response modeling
  - Perform comparisons of the CIVA simulated ultrasonic data with the experimental data

# Status

- Tandem probe characterization data has been collected and is being evaluated
- UT Data from the three mockups has been collected with the selected probes (zero degree, tandem, conventional dual side-by-side RL, phased array)
- Data currently being organized in preparation for analysis
- One mockup has been polished, etched, and photographed
- Tandem probe waveforms and microstructure photographs provided to the computer modeling team to begin beam simulations and flaw response modeling
- Mockups and tandem probes to be shipped to PNNL 9/10/12
- Data analysis of collected data to begin 9/10/12



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