



NDE reliability issues

Industry perspective and action plan

Joe Donahue; Progress Energy;
Chairman EPRI NDE APC

NRC Public Meeting May 30, 2012 White Flint

Summary points

- Our expectation is for the process and examiners to find flaws within the capabilities of the qualified techniques
- DM UT examinations since 2000 have illustrated reliability issues
- DM qualified UT examination in 2012 missed five deep flaws
 - Industry recognizes this as a watershed event – requires change
- The industry plans to look broadly at the learning from Dominion
- Industry has responded rapidly to understand full impact and determine appropriate industry-wide corrective actions
- Executive Oversight Committees for Materials Programs take this very seriously and are dedicated to timely actions
- NDE Implementation Focus Group (NIFG) assigned in early May to lead industry solutions
- Mark Huting, NDE Integration Committee Chairman is leading the group and will present current plans



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Mark Huting, Xcel Energy
Chairman, EPRI NDE Integration Committee

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Summary points

- Five flaws of significant size were not identified during a manual ultrasonic examination using qualified Appendix VIII, Supplement 10 qualified procedures and personnel
- Industry rapidly formed response team NDE Implementation Focus Group (NIFG) with executive oversight process
- NIFG will use North Anna as a data point but will not limit its evaluation and action to this event
- Initial focus is on manual DM examinations; manual weld examination is a necessary tool for DM weld examination but must be enhanced for some applications
- Lessons learned will be evaluated for other NDE applicability

Summary points

- Detailed action plan is being developed
- Meaningful changes are anticipated and supported at executive level
- Regulatory concern is recognized
 - Regulatory communication plan in place at technical and executive levels
 - Regular briefs will be conducted

Industry response actions to date

- March 24 Initial discovery
- March 30 Technical/Executive leadership telecom
- March 30 NDE Integration Committee (IC) meeting
- April 18 Executive leadership webcast
- May 1 Root Cause Evaluation (RCE) released
- May 2 Summary letter and Dominion RCE sent to all NDE IC members summarizing issue and providing recommended actions
- May 2 Executive oversight group webcast
- May 3 NDE Implementation Focus Group formed

Industry response actions to date

- May 7-8 First NIFG meeting (face to face)
 - Near-term action plan developed
 - Long-term action plan outlined
- Today Industry NDE Alert letter is completed and being reviewed for issue to utilities, vendors, issue program committees, and supplement 10 qualified UT examiners
 - Will require each qualified supplement 10 examiner to sign attestation of required reading and return document to EPRI for filing with qualification records
 - With executives for approval now
- Today Execution of the action plan is proceeding

Industry response structure formed for this issue

- Executive oversight provided jointly by:
 - NDE APC (Action Plan Committee)
 - PMMP EOC (Executive Oversight Committee)
 - BWRVIP EOC
- NDE Implementation Focus Group (NIFG)
 - Chairman and Vice Chairman, NDE APC
 - Chairman and Vice Chairman, NDE IC (Integration Committee)
 - 2 additional members NDE APC
 - Chairman, PDI
 - Chairman, MRP examination TAC (Technical Advisory Committee)
 - Chairman, BWRVIP IC
 - Materials APC member not connected to NDE
 - Chairman, ASME Committee on Certification of Nondestructive Examination Personnel and Quality Control Technicians
- EPRI leadership
 - Director, NDE
 - Director, Materials

Industry action plan

- NIFG has developed an initial list of areas for potential improvement
- These areas were divided into 6 categories (next slide)
- The first step will be to evaluate the items in each category and determine the extent of the issue and best solution
- Proposed changes will be processed through NEI 03-08 and/or ASME Code
- Both long (> 1 year) and short term (< 1 year) projects will likely be part of the improvement scope

Industry action plan

- Categories being evaluated for improvement (preliminary)
 1. Appendix VIII manual DM UT qualification process
 2. Implementation of examinations at the site
 3. Oversight of examinations at the site
 4. Examiner proficiency
 5. Fleet extent of condition
 6. Communication with xLPR project

Defense in depth

★ **Target 2012**

- ★ • OE
- Training
- Qualification
- ★ • Pre-job brief
- ★ • Oversight of practice, utility engagement in preparation
- ★ • Oversight of the examination
- ★ • Post-job debrief
- Development of new technology



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EPRI NDE Engagement

- EPRI has been engaged closely
 - Participated in the first executive decision making meetings
 - Two members of Dominion root cause team
 - Supporting industry response groups
 - Management of NIFG
 - Coordination of industry communication
 - Evaluation of technical and administrative improvements to processes associated with DM weld examination
 - Technical research and development of new products to improve examination quality
 - Revisions to DM weld examination guideline as necessary



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Response to NRC Concerns

NRC Concern 1

- *The first issue is the probe design. Specifically, as indicated by modeling and responses observed during site visits by NRC and PNNL staff, the probe design was not optimized to insonify the volumes of interest.*

Response to NRC Concerns

- Industry Response to Concern 1
 - All flaws were detected in both mock-ups using these search units
- Actions
 - EPRI is working with the search unit manufacturer in an effort to model the search unit characteristics and determine if improvements can be realized

Response to NRC Concerns

- NRC Concern 2

- *The second issue is possible variable quality probes. Neither the qualification process, nor the site specific mock up have provisions for acceptance testing or evaluation of purchased probes. Additionally, the probes were designed to be used in one scanning direction only, but a lack of prominent warnings or ergonomic indicators provided an error trap for inspectors who might not recognize that they are applying the probe contrary to the intent of probe design.*

Response to NRC Concerns

- Industry Response to Concern 2
 - Current industry procedures require that the search unit angle be within 3° of what is specified
 - The ability to detect and correctly position the flaws within the site specific mock-up is a additional verification that the search units are within the design parameters
 - The documentation provided by the manufacturer clearly denotes which scan direction the search units were designed for
 - Actions
 - Additional guidance for verifying critical parameters during the receipt inspection and calibration of complex search units
 - Industry guidance documents will be revised to include recommended practices with regards to use of complex search units including the use of indicators to potentially reduce human error

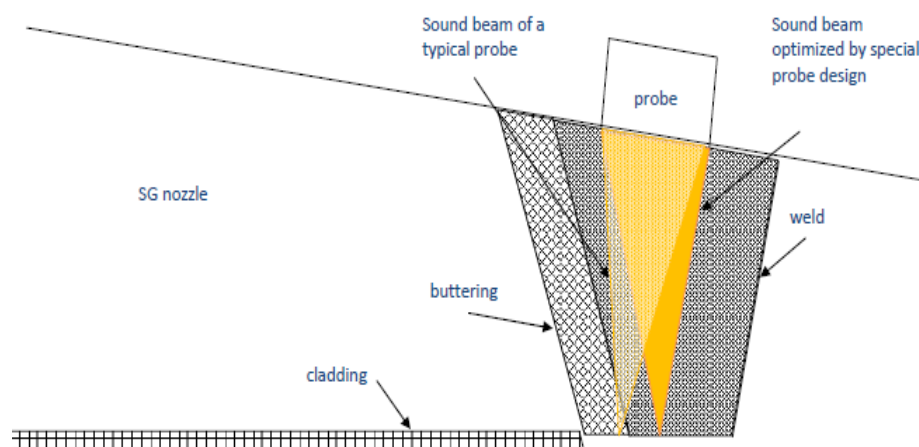
Response to NRC Concerns

- NRC Concern 3

- *The third issue involves the potential use of unqualified probes. Through the current process, probes can be used that are not qualified according to PDI-UT-10. Significantly, probes can be used that never pass a blind personnel performance demonstration.*

Response to NRC Concerns

- Industry Response to Concern 3
 - Search units used on site specific mock-up are designed specifically for the specific configuration to be examined, which is not included in the industry mock-up inventory
 - Attempting to demonstrate the effectiveness of these specialized search units on blind mock-ups they were not designed for is not practical or a valid evaluation of the search units capability



Response to NRC Concerns

- NRC Concern 4

- *The NRC staff has general and specific questions regarding the process by which essential variables are modified in PDI-qualified procedures based on demonstrations using open mock-ups. A concern is that open mock-ups may not be sufficiently challenging to identify potential problems. To help address these concerns the NRC staff is seeking to answer a number of questions, including:*
 1. *What is the process used by PDI to modify essential variables in PDI-qualified procedures?*
 2. *What are the acceptance criteria for the open demonstrations?*
 3. *Does the licensee send PDI the data on the mockups or does PDI staff use the specified probes on the site-specific mockups?*
 4. *What level of quality control is applied to the equipment and the site specific mockups?*

Response to NRC Concerns

- Industry Response to Concern 4 (Part 1)

(What is the process used by PDI to modify essential variables in PDI-qualified procedures?)

- This process is defined in PDI Site Specific Mock-up Criteria Document

- Allows essential variables to be changed or modified only to address a unique site specific configuration, provided it falls within the qualified thickness and diameter ranges of the procedure (e.g. angle to address tapered configuration)
 - Must be documented in technical justification (TJ) and demonstrated to be effective on the mock-up
- Criteria do not allow:
 - Altering or changing a previously qualified technique or essential parameter for a configuration covered within the PDI sample set
 - Expansion of the qualified thickness and diameter ranges

Response to NRC Concerns

- Industry Response to Concern 4 (Part 2)

(What are the acceptance criteria for the open demonstrations?)

- All flaws must be detected with a signal to noise ratio of at least 2 to 1
 - Generally higher signal to noise ratios are achieved, but there are some instances where 2 to 1 is the best achievable response

Response to NRC Concerns

- Industry Response to Concern 4 (Part 3)

(Does the licensee send PDI the data on the mockups or does PDI staff use the specified probes on the site-specific mockups?)

- Both processes have been used

- The licensee can perform these demonstrations themselves and are not required to send information to the Performance Demonstration Administrator (PDA) or to PDI
 - EPRI has assisted with ~23 site specific demonstrations
 - Tasks included
 - Design and fabrication of mock-ups
 - Search unit design, including modeling
 - Development of the TJ
 - Assistance with the demonstrations
 - Industry is not sure of the exact number of site specific demonstrations performed without EPRI engagement

Response to NRC Concerns

- Industry Response to Concern 4 (Part 4)

(What level of quality control is applied to the equipment and the site specific mockups?)

- Mock-ups shall be manufactured in accordance with Quality Assurance programs that at a minimum contain the following attributes:
 - Design Control
 - Procurement
 - Procedures and Drawings
 - Material Control
 - Welding
 - Controls for special processes (HIP, CIP)
 - Control of Measurement and Test Equipment
 - Examination Procedures
 - Non-conformance program
 - Document control procedures

Response to NRC Concerns

- Industry Response to Concern 4 (Part 4) (Continued)
 - Quality controls of equipment
 - See responses to Concern 2

Response to NRC Concerns

- NRC Concern 5
 - *The fifth issue involves records. Non-encoded exams make it significantly more challenging to diagnose issues and independently evaluate non-destructive examinations.*
- Industry Response to Concern 5
 - Manual UT will always be a necessary and acceptable tool for use in some DM weld examinations
 - Industry is evaluating enhancements to the decision making processes used to determine when the use of manual examination techniques are appropriate



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Closing Remarks

- Our expectation is for the process and examiners to find flaws within the capabilities of the qualified techniques
- Industry recognizes this as a watershed event – requires change
- NIFG and the executive oversight team are committed to deliver these improvements for utility implementation
- Lines of communication with the regulator will remain open to provide frequent status on progress
- Thank you for meeting with us today

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