ELECTRIC POWER RESEARCH INSTITUTE

Nondestructive Evaluation (NDE)

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October 24, 2006

NDE Program Product Areas

- NDE Technology
  - Vessels
    - Shell
    - Nozzles
    - Head penetrations
  - Piping and Bolting
  - Steam Generator
  - Reactor Internals
  - BOP Heat Exchanger
  - Containment
  - Turbine Generator
- NDE Performance Demonstration Technology
  - USA
  - International
- NDE Support for Materials Issue Programs
  - MRP
  - BWRVIP
  - SGMP
  - FRP
- ISI Program Assessment
- Risk Informed ISI
- Training
- Subscriber Requested Assistance (NDE Program member support)

NDE Center Products

- Advanced NDE technology via collaborative research and development
- Computer modeling and simulation of NDE processes
- Inspection Guidance
- Procedure, equipment and personnel performance demonstration
- Training & Qualifications
- Risk-informed inspection methodology (RI-ISI)
- Assistance with meeting Code and regulatory obligations
- Mockup library and mockup fabrication expertise
- Site support

Delivery of the NDE Program Products

Products

- *Advanced NDE technology*
- *Computer modeling and simulation of NDE processes*
- *Inspection Guidance*
- *Risk-informed inspection methodology*
- *Assistance with meeting Code and regulatory obligations*
- *Training & Qualifications*
- *Mockup library and mockup fabrication expertise*
- *Procedure, equipment and personnel qualification*
- *Site support*

Delivery

- **35 NDE Experts**
- **Technical Reports and Guidance Documents**
- **On-site Technical Support**
- **NDE Applications Software**
- **ASME Code Representation & Development**
- **Conferences, Workshops, and NDE Training**
- **Shared Resources, such as Equipment and Test Facilities**

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Major Focus Areas 2006-2008

- Alloy 600 / 182 / 82

"*Cracking in Piping butt welds, Head penetrations, bottom mounted instrumentation penetrations (BMIs), etc*"

  - Inspection Technology development and demonstration
    - Advanced ultrasonics
    - Electromagnetic methods
    - Digital radiography
    - CRDM Qualification program
  - Implementation of MRP-139 for PWR Alloy 600/182 piping welds
    - Configuration and coverage assessment
    - Weld overlay repair guidance
      - Welding
      - NDE
      - Relief request templates

Major Focus Areas 2006-2008

- Implementation of 10CFR 50.55a rule pertaining to inspection qualification

"Regulatory requirements for NDE qualification continue to emerge and challenge the nuclear industry throughout the world"

  - Dissimilar metal welds inspection (PWR & BWR)
  - Vessel nozzle inspection
  - Site support

- Phased Array ultrasonic development & application

  "*Phased Array technology can provide the nuclear industry with improvements in the efficiency and reliability of Ultrasonic NDE"*

  - Application of phased array to vessels, piping, DM welds, internals, head penetrations

Major Focus Areas 2006-2008

- Implementation of Risk Informed inspection methodology

"80-90 % of US plants have or plan to implement RI-ISI. The majority (75%) of plants utilize the EPRI developed RI-ISI methodology "

  - Section XI
  - Augmented programs (e.g., IGSCC, PWSCC)
  - Other components
  - International involvement (RISMET)

- Workforce Issues

"*A declining NDE workforce has been identified as being a future challenge to nuclear plant operations and maintenance"*

  - Identification and monitoring of gap between supply and need
  - Integration of human performance technology to address issue
  - Coordination with community colleges, utilities, and vendors

Major Focus Areas 2006-2008

- NDE of Buried Components

" Condition assessment of buried plant piping was not considered during design and for license renewal operators are challenged with difficult access and in some cases "un-inspectable" conditions".

- Objective is to develop NDE technology and a field deployable tool
  - External corrosion
  - Internal corrosion
  - Circumferential weld corrosion
  - Remote field/ Low frequency ET

- High speed - Multi-directional steam generator tubing ISI technology

  "Examination of SG tubes using Ultrasonic requires data acquisition > than traditional methods"

  - Develop a multi-element UT probe without the need for rotation
  - Achieve similar detection and sizing results that can be obtained with rotating technology at much faster examination speed.

MRP NDE Research

- "improved NDE to address the materials degradation issues"
  - Vessel Internals
    - Bolting
    - Visual inspection; VT-1 & enhanced VT-1
  - RPV flaw distribution for PTS issues
  - Lessons learned for CRDM data analysis
  - Stress relaxation of bolting (MEOG proposal)
  - Head penetrations
    - CRDM, BMN, ICI, etc.
    - Qualification program
  - Coordination with MRP committees