NDE Research Focus Areas

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Senior Program Manager
NDE Reliability

2026 NRC-Industry NDE Technical Information Exchange
January 21st – 22nd

Plant Support Research Strategy

Workforce Development & Skill Proficiency

- Support for growth & development of people
- Provide various platforms for skill development

Energy Supply R&D

- Foundational Research for Inspection & Repair for Energy Supply Current Fleet
- Development of research for advanced energy solutions including advanced Nuclear Technology and Fusion
- Guidance for all systems & components

Industry Support & Technology Transfer

- Support ongoing or emergent issues at power plants to help correct
- Networking with peers in the Energy Industry Globally for support

Advanced Technology & Digital Solutions

- R&D of new technologies for NDE techniques & applications
- Technology implementation for streamlining processes
- Digital Tools for New Workforce

Global Regulatory Guidance & Support

- Informing regulations and supporting compliance
- Technical bases of Code and Regulatory acceptance and optimization
- Support streamlined implementation

NDE Research Focus Areas

RFA 1 - Digital Technology Innovation

- Advanced NDE Methods & Technologies
- AI/Machine Learning
- Digital Tools

RFA 2 - Advanced Energy Solutions

- ANT Collaboration
- Real-Time NDE/Structural Health Monitoring
- High Temperature & Quantum Sensors

RFA 3 – Operational NDE Solutions

- PRR Collaboration
- BOP Components
- Long Term Operation
- Inspection Issue Support
- Optimization and Efficiency

RFA 4 - Materials Inspection & Analysis

- Cast Stainless Steel
- Advanced Materials/ Characterization
- Concrete and Structural NDE

RFA 5 -Workforce Development & Training

- NDE Training
- Energy Fleet Proficiency

RFA 6 -Global Regulatory Implementation

- Codes & Standards
- Performance Demonstration
- Regulatory guidance and execution
- Risk Informed Methodologies

Digital Technology Innovation

Research Focus Area RFA-1

EPRI Leads:
Thiago Seuaciuc-Osorio
Chris Joffe

NDE RIC Champion
Ignacio Real: Iberdrola

RFA 1: Digital Technology Innovation

VISION: the WHY

Support the development and drive the implementation of innovative digital solutions to improve NDE

EFFICIENCY

and

RELIABILITY

RFA1: Digital Technology Innovation

Scope & Research Strategy:

- Support & enable development
- Drive field implementation
- Assess & monitor performance
- Engage, inform & connect

Member Value:

- Increased Efficiency
- Increased Reliability
- Effective tools to assist members and examiners

Key Project Deliverables:

- Data analysis tools
- Field trials
- Technical reports & justifications
- Training workshops

Collaboration:

- Industry Focus Groups
- Regulatory and qualification bodies
- BWRVIP and MRP
- Inspection Vendors

Support the development and **DRIVE THE IMPLEMENTATION** of innovative digital solutions to improve NDE **EFFICIENCY** and **RELIABILITY**

RFA1: Digital Technology Innovation

Assisted Data Analysis

- Development of Automated Analysis for UT
- Automated Analysis of Visual Inspections
- Graphical User Interface For Post Inspection Analysis
- AI Analysis for Core Shroud and Core Barrel
- Rule-Based Assisted Analysis of UT Data
- AI-Assisted Analysis for UT Inspections of In-Vessel Piping Components
- Harnessing ML to Improve ET Flaw Characterization and Depth Sizing with Bobbin and Array Coils

Advanced NDE Technologies

- Leveraging Advanced UT for Machine Learning
- Use Cases for Full Matrix Capture/Total Focusing Method

Digital Tools

- EPRI UT Simulator Update - Phased Array
- EPRI NDE Assistant and NDE Website
- UT Data Cataloging Tool
- ➢ **Artificial Intelligence for Legacy NDE Data Digitalization**

PROJECTS

Reliability / Acceptance

- Assessing the Reliability of AI-Assisted Inspections
- Authenticating NDE Data

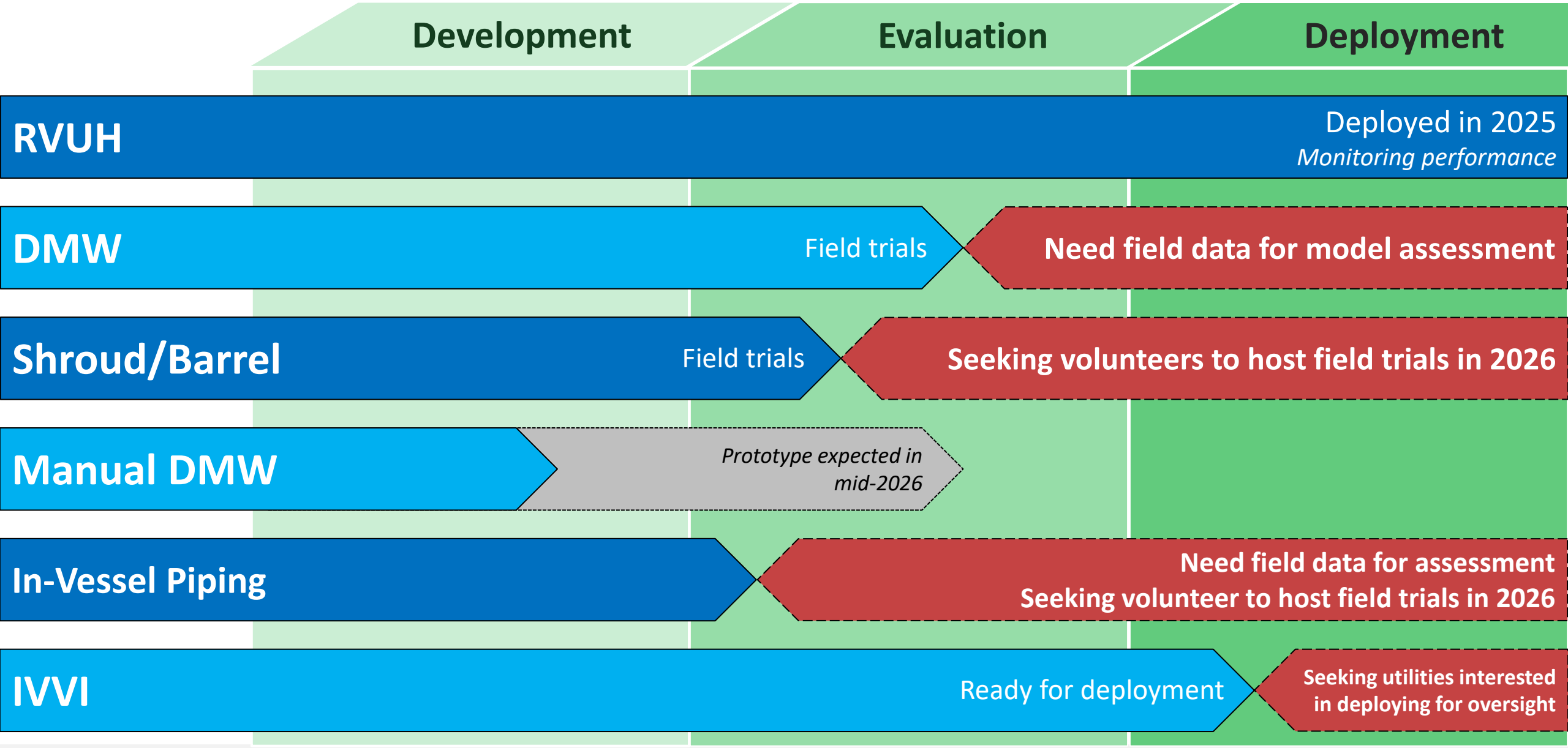
Benchmarking

- Benchmarking Tool for AI Solutions

Strategic / Enablers

- Guidelines for Developing an Open NDE Format
- ➢ **Hardware Development for Advanced NDE Applications**
- ➢ **Case Studies For Enabling Wireless Digital NDE Technologies**

AI-Assisted Analysis: Status & Needs @ at Glance



Advanced Energy Solutions

RFA #2

EPRI Leads:
Sal Villalobos
Mike Mouchet

NDE RIC Champion
Damon Priestley: TVA

Advanced Energy Solutions RFA-2

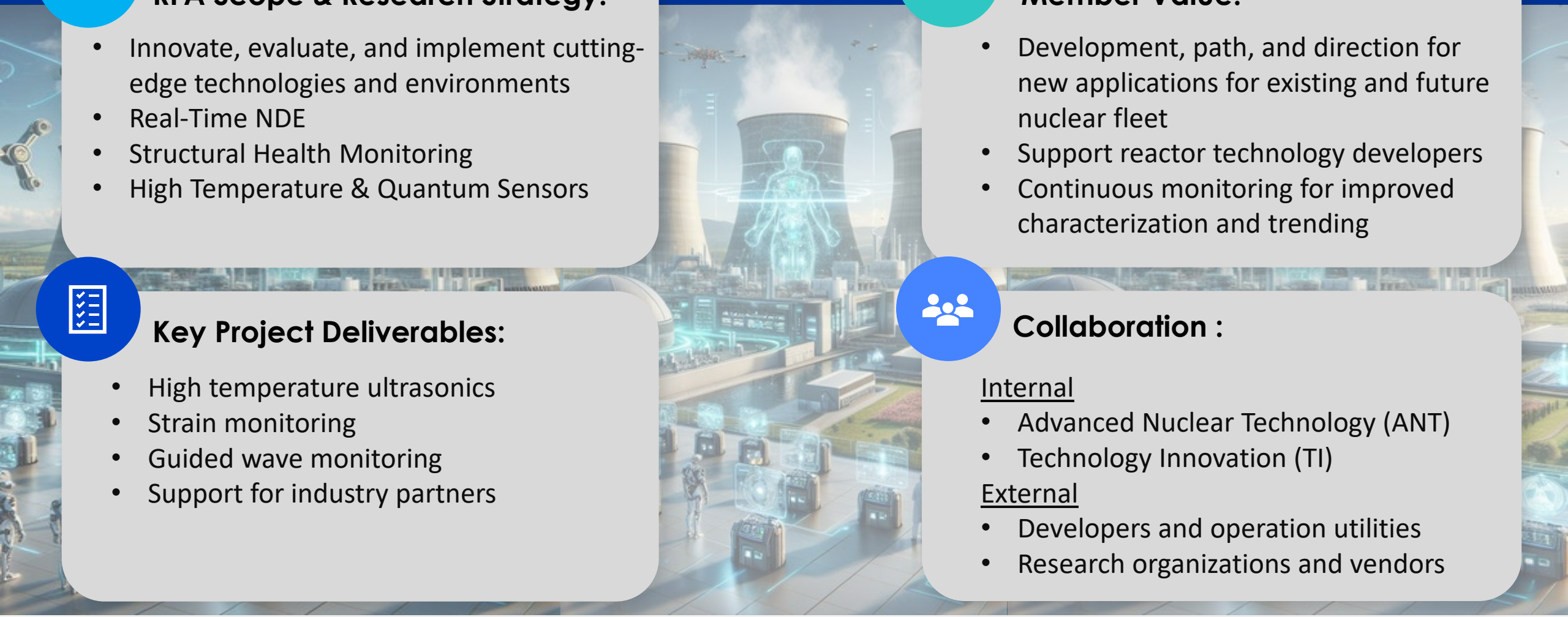
VISION and SCOPE

Innovate, evaluate, and implement cutting-edge technologies in energy systems

Enhance efficiency, safety, and sustainability through:

- NDE technologies
- Structural health monitoring and real-time NDE
- Existing and new reactor Technologies
- Quantum sensors

Advanced Energy Solutions RFA-2



RFA Scope & Research Strategy:

- Innovate, evaluate, and implement cutting-edge technologies and environments
- Real-Time NDE
- Structural Health Monitoring
- High Temperature & Quantum Sensors

Member Value:

- Development, path, and direction for new applications for existing and future nuclear fleet
- Support reactor technology developers
- Continuous monitoring for improved characterization and trending

Key Project Deliverables:

- High temperature ultrasonics
- Strain monitoring
- Guided wave monitoring
- Support for industry partners

Collaboration :

Internal

- Advanced Nuclear Technology (ANT)
- Technology Innovation (TI)

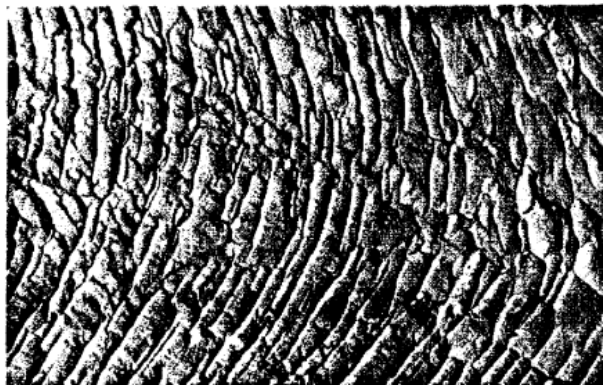
External

- Developers and operation utilities
- Research organizations and vendors

NDE Challenges

Understanding New Build Configurations and Material

- Proprietary Information
- First use of ASME Division 2 (RIM Programs)
- No OE of Critical Components



Developing NDE Solutions (New and Existing Fleet)

- Inaccessible Areas (Physically / ALARA)
- Unique Configurations and Materials
- High Temp Applications
- Online Monitoring
- Pre-Flaw Detection – Structural Health Monitoring Micro-or-Atomic Level

Striving for Solutions

Establish Focus Group(s) with Collaboration between New Nuclear Project Management and NDE Members

- Understand Configurations of Components with Critical Functions
- Propose R&D Needs to Proper Working Groups & RICs (EPRI, ASME, ASNT, etc.)
- Oversee Training Development for Future NDE Methods/Techniques

Online Monitoring Systems

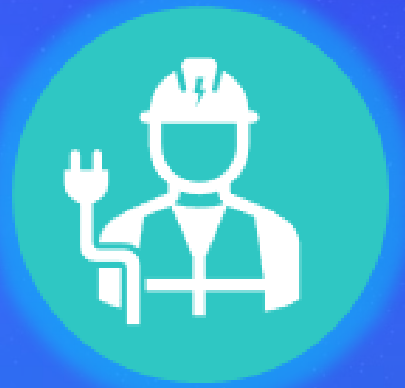
- Designed into the Construction – Work with Fleet Dx Group
- Simplify NDE Output to Minimize Complex Qualifications

Explore Code Efficiencies

- PSI Exam also Serves as Construction Code Exam
- UT in Lieu of RT

Operational NDE Solutions

RFA #3



EPRI Leads:
Leif Esp
Sam Johnson

NDE RIC Champion

Key Drivers for RFA

Operational Experience:

- Fleet Issues
  - Core Barrel Cracking
  - SCC of Piping
- Inspection Issue Support

Long Term Operations:

- Inspection Scope Increase
- Time-based degradation
- Modernization and Efficiency opportunities

Technology Transfer:

- Develop tools for implementation
  - Technology Capability Studies
  - Technology Pilots
  - Cost Benefit Analysis
  - Common Design Change Packages
  - Generic Procedures

RFA 3 – Operational NDE Solutions

VISION

Driving implementable NDE solutions and tools for the operating fleet to ensure safety and reliability for the life of the plant

RFA 3 – Operational NDE Solutions

Scope & Research Strategy:

- Guidance on capabilities, limitations, and implementation of NDE Solutions
- Examination Optimization and Program Support
- Inspection Issue Support
- Target: Reliable/Efficient Asset Management

Key Project Deliverables:

- Technology Pilots
- Implementation Guidance Documents
- Generic Procedures
- Examination Program Tools

Member Value:

- Better informed decisions on NDE techniques for a given application
- Tools for examination optimization
- Inspection Issue Support
- Technology Transfer through pilot studies

Collaboration:

- Internal EPRI Collaboration
  - MRP, BWRVIP, PRR, Pressure Piping
- Inspection Vendors
- Technology Developers

Operational NDE Solutions RFA

Projects

Guidance for Implementation
- Electromagnetic Techniques for service water piping
- Tube Support Plate Degradation Evaluation with EC Array
- UT Development of WOL on Thermal Fatigue

NDE for Long Term Operations
- NDE of Carbon Fiber Reinforced Polymer
- Industry Database of Unique Examination
- NDE Socket Weld Program

Technology Pilots
- EVT-1 Efficiency Study
- Gridding, UT and Component Location using Augmented Reality
- NDE Technology for Pipes at Penetrations
- Remote Thickness Measurements

Inspection Issue Support
- Inspection Issue Support

Examination Optimization
- Identification and Assessment of Low-Value Inspections
- Successful Reduction in Scope, Frequency,
- Cost Benefit of UT in Lieu of RT

Enabling Technologies
- Coverage Estimation Tool
- Interactive Database Knowledge Visualization
- Degradation Mechanism Evaluation CBT
- Heat Exchanger Tubing Degradation Database
- Tank Inspection Reference Guide

RFA 3 – Operational NDE Solutions

PROJECTS

Remote Thickness Measurements
EVT-1 Efficiency Study
UT Development for WOL on Thermal Fatigue
NDE Socket Weld Program
Degradation Mechanism Evaluation
Coverage Estimation Tool
TSP Degradation Evaluation with AC Array
Update HX Tubing Degradation Database
NDE of Carbon Fiber Reinforced Polymer
Identification and Assessment of Low-Value Inspections
Interactive Database Knowledge Visualization Platform
Successful Reductions in Scope, Frequency
Inspection Issue Support Task
Gridding, UT and Component Location Using Augmented Reality
Tank Inspection Reference Guide
Electromagnetic Techniques for Service Water Piping
NDE Technologies for Pipes at Penetrations
NDE for Selective Leaching
UT in Lieu of RT Activities

RFA 3 – Operational NDE Solutions

Deliverables

Deliverable #	Title	Deliverable Date
3002032104	EVT-1 Efficiency Study	7/31/25
3002032184	U.S. Industry Performance Monitoring Inspection Plan for Select ASME Code Examination Items of PWR Steam Generators and Pressurizers	8/31/25
3002032156	Cost Benefit Analysis of Ultrasonic Testing in Lieu of Radiographic Testing for Repair Replacement Activities	8/31/25
3002032177	Assessment of Electromagnetic NDE Techniques for Raw Water Piping	9/19/25
3002032157	Technical Basis for Performing UT in Lieu of RT for New Construction	10/31/25
3002032154	NDE Performance Characteristics for Carbon Fiber Reinforced Polymer Repair Structures	12/19/25
3002032198	EPRI Ultrasonic Examination Coverage Estimation Tool	12/19/25
3002032254	Small Modular Reactor Digital Twin	12/23/25

Materials Inspection & Analysis

RFA #4

EPRI Leads:
Mark Dennis
Josh Stellakis

NDE RIC Champion
Tobias Kostner: Vistra Corp

RFA 4 - Materials Inspection & Analysis

VISION

Advance innovative NDE techniques and promote collaboration to improve the efficiency and reliability of materials inspection and analysis

RFA 4 - Materials Inspection & Analysis

Scope & Research Strategy:

- Research/Development of innovative NDE applications and materials characterization
- Engage, inform & connect the industry
  - Real-world NDE scenarios
    - New findings
  - Technological advancements
- Guidance on NDE capabilities, limitations, and implementation

Key Project Deliverables:

- Technical Reports
- Wikis/Web-based Applications
- Best Practice Implementation Guides
- Pilot Programs and Field Trials

Member Value:

- Increased NDE Efficiency and Reliability
- Cost-effective solutions for material inspection and analysis
- Latest advancements and research findings
- Collaborative Opportunities

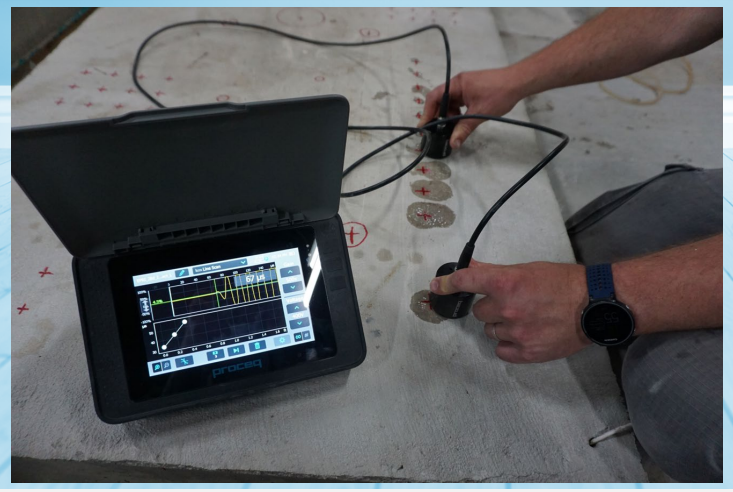
Collaboration:

- Industry Focus Groups
- Regulatory Agencies
- Materials Programs
- Inspection Vendors
- Pilot Utilities
- Research Facilities

RFA 4 - Materials Inspection & Analysis

R&D

- NDE Technology Innovation
- Pilot Programs



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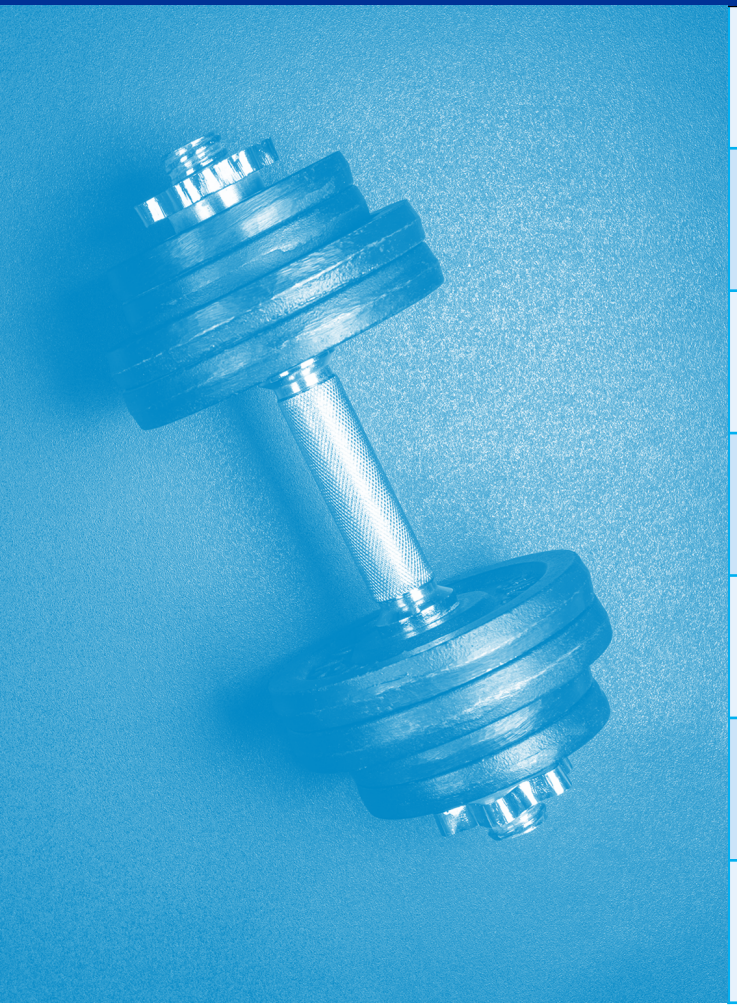
Support

- Materials and LTO NDE Inspections
- Concrete Research Technical Advisory Committee

RFA 4 - Materials Inspection & Analysis

CURRENT PROJECTS



Quantification of Corrosion in Piping with Guided Wave
(Michael Quarry)

Advanced Ultrasonics for Cast Austenitic Stainless Steel Examination*
(Mark Dennis)

Modernization of Single Source Cast Austenitic Stainless Steel Research Document*
(Michael Mouchet)

Eddy Current Array Technique Development for Control Blade Inspection
(Byungsik Yoon)

Fracture Property Assessment in RPV Steel
(Joe Wall)

Long Term Operation (LTO) Support
(Sam Johnson)

Eddy Current Array Testing for Ferritic Materials*
(Byungsik Yoon)

***Project has 2025 Deliverable**

Workforce Development and Training

RFA #5

EPRI Leads:
John Langevin
Nathan Muthu

NDE RIC Champion
Dale Brown: Southern Nuclear

Workforce Development and Training RFA

DRIVERS

Workforce Shortage of Skilled and Experienced NDE Personnel

Implementing Multimedia Tools for Technology Transfer of NDE Knowledge for Today's Learner

Prepare for New Technologies for Digital Fleet - Adapting to Change

Improved Career Opportunities

Foster Innovation and Build Confidence

Beyond just Nuclear: Adaptable Workforce

Workforce Development and Training RFA

VISION

The workforce of tomorrow hinges on training today's personnel by embracing and implementing emerging multimedia technologies. EPRI's focus is on a future where NDE personnel are equipped with the skills, knowledge, and confidence needed to succeed in a changing industry, while ensuring that industry partners have access to a skilled and adaptable workforce.

Workforce Development & Training RFA

RFA Scope & Research Strategy

- Scope
  - Develop/improve a workforce with a focus on understanding industry needs, evaluating effective training, and identifying best training methodologies
- Strategy
  - Align training initiatives with funder's needs/goals
  - Design/develop learner's pathways
  - Anticipate future workforce needs/gaps

Key Project Deliverables

- Instructor led classroom training
- Hands-on lab applications
- Computer-based training courses
- Leveraging VR/AR/XR technology to create fully immersive training environments
- Qualification examinations for NDE Level I, II and III technicians

Note: Training can be conducted at EPRI or client's location

Member Value

- Skilled, proficient, and confident workforce availability
- Safe and reliable operation of power plant components
- NDE Training provides effective training materials that develop, maintain or improve NDE technicians' proficiency (skills, knowledge, attitudes, and behaviors) for performance of NDE needed to ensure component reliability

Collaboration

- Global Regulatory Implementation
  - Performance Demonstration
- Digital Technology Innovation
- Advance NDE Methods and Technologies
- Traditional NDE Solutions
- Inspection Issues Support
- Heat Exchanger Performance User Group
- NDE for LTO Interest Group
- Generation Sector

Workforce Development and Training RFA

Development & Training

- Systematic Approach to Training (SAT) Methodology
- Modular Format
- Incorporate NDE Requirements of ASME Sections V & XI

- Reliability / Acceptance
- Technology Transfer
- In-Person/E-Learning/Distance Learning

NDE Training & Certification

Leading the Industry in Training & Certification Support

Training at all levels across the Industry

- ✓ Support Expanded knowledge for industry
- ✓ Rapid knowledge transfer for new workforce
- ✓ NDE Training developed for Non-NDE and Welding personnel

Qualification (People & Processes)

- ✓ Industry Leading Qualification Program
- ✓ Lead qualification processes for Advanced Nuclear Designs

Robust Training supporting Certification Program

- ✓ Certification up to Level III in numerous NDE Techniques
  - ✓ Ultrasonic Testing (UT)
  - ✓ Visual Testing (VT)

Options for Members' Training Needs

- ✓ Classroom Training at EPRI Charlotte Facility
- ✓ Onsite Training at Member location
- ✓ Self-paced Computer-based Training

Tools for the Future Workforce

- ✓ Virtual Reality Environment for NDE Inspections
- ✓ Virtual Flaw UT Inspection Platform
- ✓ Accelerate Skillset Proficiency

RFA 5 – Workforce Development and Training

PROJECTS

Project Title	Project Lead	Expected Completion
Advanced VT CBT	Chris Joffe	2026
UT Level I Course	Scott Hamel	2025
Workforce Knowledge Transfer on Interdependence of Welding/Fabrication and NDE	Brett Flesner	2026
BOP Eddy Current Tubing Data Analysis Training & Performance Qualification	Nathan Muthu	2025
Ultrasonic Testing Videos	Roy Salisbury	2025
CBT for ASME Section XI “Specific Course” for Level III Certification	John Langevin	2026
CBT Basic Course for Level III Certification	Scott Hamel	2026
Development of Time-of-Flight Diffraction (TOFD) CBT	John Langevin	2026
CBT for Through Wall Sizing Using Simulator	Scott Hamel	2025
Eddy Current Level I, II, III Training Course	Nathan Muthu	2027

Workforce Development and Training RFA

Available NDE Training Courses

Visual Examination Levels I, II, & III
Visual Examination for Boric Acid Corrosion Control (BACC)
Visual Examination of Concrete Containments (IWL)
Ultrasonic Examination Level I, II, & III
Ultrasonic Examination of Austenitic Stainless Steel Pipe Welds for Cracking
Introduction to Phased Array Ultrasonic Testing (PAUT)
ASME Section XI Flaw Evaluation
NDE for Engineers / Managers
Level III Basic and Specific
NDE Instructor Training
Advanced Ultrasonic Training ▪ *Detection of Intergranular Corrosion Cracking (IGSCC)* ▪ *Through wall sizing of IGSCC* ▪ *Weld Overlay Repair (WOR)*
Balance-of-Plant Eddy Current Manual Data Analysis Training for Bobbin Coils
Balance-of-Plant Eddy Current Manual Data Analysis Performance Qualification Exam

www.epri.com/training

Workforce Development and Training RFA

On-Going NDE Course Development

Eddy Current Level I CBT
Fundamental Application of NDE for Managers/Engineers CBT
Level III Basic CBT
Through-wall Flaw Sizing (compliments the UT Simulator)
Level III Specific (Visual and Ultrasonic) CBT
Advanced PAUT: Full Capture Matrix/Total Focusing Method (CBT)
Time of Flight Diffraction (TOFD) [CBT]
Note: Several classroom training materials are being updated to later Editions of the ASME Codes

Global Regulatory Implementation

RFA #6

EPRI Leads:
Bob Grizzi
Ronnie Swain

NDE RIC Champion

Global Regulatory Implementation RFA

VISION

Drive strategic industry collaboration fostering development and implementation of codes & standards necessary to satisfy global regulatory requirements

RFA 6: Global Regulatory Implementation

Scope & Strategy:

- Supporting Development, Improvement, and Compliance with NDE Codes and Standards and Regulatory Requirements

Member Value:

- Code Representation & Expertise
- Regulatory Advocacy
- Performance Demonstration
- RI-ISI Development/Support

Key Deliverables:

- ASME Section XI Development
- RI-ISI Tools and Guidance
- PD Program Reconciliation
- NEI 03-08 Guidelines

Collaboration:

- ASME and ENIQ Committees
- Regulatory Agencies
- Industry Focus Groups
- Project Piloting Opportunities

Global Regulatory Implementation RFA - Projects

Code & Regulatory Support

- ASME Code Development
  - Participation and leadership
  - Continuous improvement thru code cases and changes
- ENIQ Support
  - Meeting attendance/support for European implementation
- NRC/EPRI MOU Support
  - Research and industry meeting collaboration
- Engagement with International Regulators
  - Japan
  - France
  - UAE
  - Sweden

Supporting Code Compliance

- PD Program Reconciliation
- RI-Break Exclusion Region Methodology
- Guide for Conducting Lab Time for UT Experience
- Appendix VII/VIII Hands-on Practice via UT Simulator
- UT in Lieu of RT for Construction
- AI Qualification Protocol
- Cast Stainless Steel PD Program Development
- Spent Fuel Canister NDE

Implementation

- Code Case N-752 Application
- Modernizing RI-ISI Guidance
- Consequence of Failure Evaluation Process Tools
- Enhanced Categorization Methodology
- RPV Threads in Flange, New Configurations
- Industry Phased Array Procedure Enhancements
- Expansion and Refinement of Virtual Mockups

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