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**ASME Non-Destructive Examination (ANDE) Personnel Qualification and Certification Initiative**

U.S. Nuclear Regulatory Commission  
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**Problem Statement**

Industry events, 30 years of round robin studies and recent operating experience indicates the performance and reliability of non-destructive examination and inspection can be improved.



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### Issue Overview

- Decline in qualified workforce due to attrition
- Increasing demand of qualified workforce due to aging plant issues and planned new construction
- Variations in owner qualification and certification
- Human performance issues
- Existing personnel qualification and certification (PQ&C) processes do not align with INPO guidelines and best practices used for other nuclear power plant workers



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### Round Robin Studies Show Opportunities for Improvement(See EPRI Report 1016969)

- Pressure Vessel Research Committee 1971
- US Airforce 1974-78
- PNNL-Piping Inspection Round-Robin (PIRR) 1981-82
- EPRI Round Robin for Depth Sizing 1983
- PNNL-Mini Round Robin (MRR) 1986
- European Base Problem for Inspection of Steel Components (PISC 1, 2 & 3) 1985-94
- United Kingdom Program for the Assessment of NDT in Industry (PANI) 1999



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### Industry Experience

- Introduction of Intergranular Stress Corrosion Cracking (IGSCC) in 1982 at Nine Mile Point  
EPRI/NRC/BWROG introduced Three-Party Agreement for IGSCC performance demonstration exams
- Thermo Fatigue Cracking in Steam Generator Feed Water Nozzles in Late 1980's and Early 1990's  
Practice Mock-up developed
- Primary Water Stress Corrosion Cracking in Steam Generator Tubing in late 1980's early 1990's  
EPRI Guideline NP-6201 first introduced in 1992 with NEI 9706 required in 2000 for Eddy Current Testing Qualified Data Analyst (QDA)



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## Industry Experience con't

- Implementation of ASME Section XI, Appendix 8 (Published in 1989) As Performance Demonstration Initiative (PDI) in 1999
- Stress Corrosion Cracking in Alloy 600/82/182 Materials Starting in Early 2000-NDE Human Performance Issues  
V C Summer, Susquehanna, DC Cook, Millstone, Farley, Pilgrim, Duane Arnold, Crystal River, St Lucie, Calvert Cliffs



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## What Have We Learned?

- Complex certification process-no single all inclusive standard
- Multiple sources of nuclear requirements, i.e., ASME Section XI requires ASNT CP-189 plus considerable additional requirements in Section XI IWA-2300 including Appendices VI, VII and VIII
- Different requirements for non-nuclear code and balance-of-plant, i.e., SNT-TC-1A, ETC
- Each outage season vendors assemble and submit PQ&C records for redundant review to utilities, ANIIs and NRC (On site inspections and NIS-1 reports)
- Significant man-hours and dollars are spent annually moving the same paper around with no value or benefit in improving personnel performance (See Round Robin Studies/OE)
- Every employer, utility and vendor, has their own PQ&C program including non-standard training, experience, written and practical exams. Upon acceptance of these qualifications which varies across the industry, each employer issues a non-portable certification



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## Current NDE Personnel Q&C Process Does Not Align With INPO Guidelines and Best Practices Used for Other Nuclear Power Plant Workers

Employer Based Training, Experience, and Certification:

- Non-Std varies from Employer to Employer
- Training-Minimum hours only required, No Std, No industry evaluation, No Accreditation
- Experience-Time Based Only No Criteria or Attribute Req'd.
- Written Examinations-Only Minimum # of Questions Req'd., No psychometric process
- Practical-Costly with limited sample sets, typically does not address many conditions expected in the field
- No Job Task Analysis (JTA), No Std Level of Difficulty, No Way to Evaluate Effectiveness and Quality of either written or practical exam

No Effective way to incorporate operating experience (OE) into decentralized process



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## Solution

An industry initiative is needed to develop a new Standard designed to improve NDE performance through standardization including Training and experience requirements with Centralized examinations and certification.

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## ASME Non-Destructive Examination Initiative

- Develop a new criteria document (standard) detailing NDE PQ&C req'ts
- Develop detail training req'ts through job task analysis (JTA) with subject matter experts (SME)
- Based on JTA, develop descriptive experience requirements specifying activity and repetition
- Based on JTA Develop centralized examination data base through psychometrics
- Based on JTA Develop standard performance based practical examinations with realistic flawed samples simulating field conditions
- Written and practical examinations will be administered by ASME as an independent third party establishing a standard process of evaluation while assuring program integrity
- Program can easily be updated based on OE
- Through NANTeL or other web based options, deliver written and ship practical (test kits) to utility or vendor locations with oversight by authorized nuclear in-service inspection agencies (ANII)

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## ASME Non-Destructive Examination Initiative con't

- The program including individual qualification and certification documentation will be maintained centrally eliminating costly redundant reviews, audits, maintenance and storage across the industry (Program review by INPO and audited by NUPIC)
- Required validation of qualification and certification will be accessible via a secured web site. This cost savings will eliminate approximately 150 hours of utility staff time reviewing vendor certification packages prior to each outage including redundant cost for each employer maintaining written examinations, costly practical test samples, and experiencing multiple annual program audits.
- The resulting cost savings and performance improvements fall in line with the newly introduced EPRI/INPO Portable Qualification Process for Supplemental Workers (See EPRI Report 1021072, November 2010-Plant Support Engineering: Administration Protocol for Portable Practicals (AP3) in Standardized Task Evaluations)

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## Program Summary

- New criteria document and program features will be consistent with personnel certification best practices
- Intended applicable to nuclear in-service inspection, new nuclear fabrication and construction
- Will comply with Third Party NDE Certification Organization requirements of Section XI code case 04-365
- Will apply applicable requirements of NQA-1 to the program
- Training program will be developed independent of certification based on JTA's
- Provisions for Credential Transfer

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## Finances

- Funding will be required for expedited program development
  - Develop program/administrative procedures
  - Populate question data banks/psychometrics
  - Practical/demonstration specimens
  - Review/validation by subject matter experts
- Financials estimated:
  - Program development costs
  - Annual operations: self-sustaining through certification fees
- Funding:
  - Pursuing grants (NRC,NSF,DOE,DOL,etc.)
  - Utility/Vendor contributions

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## Status

- ASME endorsed concept and set up project team to build business plan-October 2009
- ASME Board of Directors unanimously approved project team proposal-March 2010
- ASME Section XI Code Case 04-365 was approved accepting stand-a-lone third party NDE Personnel Certification-April 2010
- ASME NDE (ANDE) committee established to develop new PQ&C standard, program, JTAs, examinations, performance based practical examinations and process for implementation-May 2010
- NRC awards grant to help fund the program-September 2010
- ANDE committee progressing on schedule in developing criteria document and JTAs
- By September the project plan shows remaining funding will be needed to complete development and purchase practical test samples

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## Conclusions

- Improved Training and Experience followed by Performance Demonstration in Accordance with INPO Guidelines and Industry Best Practices Will Result In High Performance and Reliability
- Consolidates Multiple Qualification Requirements into a Single Process Recognized by Code and Regulator
- Establishes a Consistent Level of Performance Expectation with Examinations Effectively and Efficiently Delivered to Any Utility or Vendor Facility
- A Single All Inclusive Web Based Credential Will Simplify Recognition of Certification for Vendors, Utilities, Inspection Agencies, and Regulators by Eliminating Costly Redundant Documentation That Adds No Value
- Centralized Certification Provides a Means to Incorporate OE and Monitor Probability of Detection (POD) That is Otherwise Not Possible With Conventional Employer Based Programs

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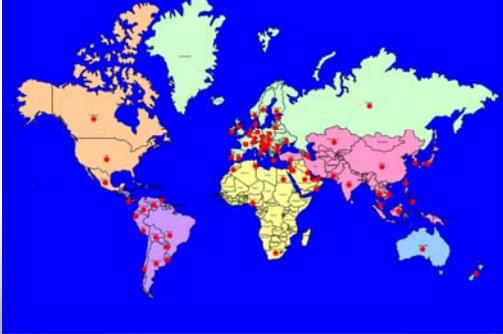
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## Why ASME?

Countries Implementing The ASME Code for the Fabrication and Installation of Boilers and Pressure Vessels



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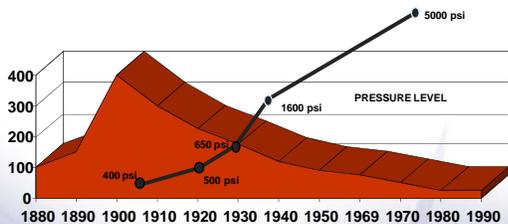
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## TREND FOR BOILER EXPLOSIONS IN THE U.S.



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## Potential New Nuclear Plants



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## Discussion

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