

# BWRVIP NDE Update



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NRC-Industry NDE Technical Exchange Meeting  
January 24, 2024



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# 2023 BWRVIP Membership

## North America

- Comisión Federal de Electricidad (CFE)
- Constellation
- DTE Energy
- Duke Energy
- Energy Northwest
- Entergy
- Vistra
- Nebraska Public Power District
- PSEG Nuclear
- Southern Nuclear Company
- Talen Energy
- TVA
- Xcel Energy

## Europe & Asia

- Chubu Electric Power Company
- Chugoku Electric Power Company
- Forsmarks Kraftgrupp AB
- Iberdrola Generation
- Japan Atomic Power Company (JAPC)
- Kernkraftwerk Leibstadt
- OKG Aktiebolag
- Tokyo Electric Power Company (TEPCO)

### ***21 BWRVIP Members Representing:***

- **29 nuclear power plant sites operating in 6 countries**
- **52 individual units + 1 ABWR under construction**
- **9 different reactor models**  
*GE BWR/2-6 & ABWR + ABB-ATOM BWR-69, BWR-75, and BWR-3000*
- **GE & ABB-ATOM nuclear power plant designs**
- **~55,321 MWe (combined)**
- **2049 licensed operating years (combined)**
- ***Average age of a BWRVIP Member unit? ~40.2 years***



The background of the slide is a solid blue color. In the center, there is a faint, semi-transparent image of a pair of hands holding a globe. The hands are positioned as if they are supporting the globe from below. The globe shows some landmasses and is surrounded by a field of small, white, star-like specks, giving the impression of a night sky or a celestial theme.

# **Water Level Instrument Penetration Mockups for Roll-Expansion Repairs**



# BWRVIP Instrument Penetration Roll-Expansion Mockups

- NDE mockups being fabricated to support planned roll-expansion repair technique
  - Compressed EDM notches like PWR CRDM mockups
- BWR CRDH and BWR ICMH roll-expansion repair Code Cases used for design inputs
  - N-730-1\*; *Roll Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs*
  - N-769-2\*; *Roll Expansion of Class 1 In-Core Housing Bottom Head Penetrations in BWRs*

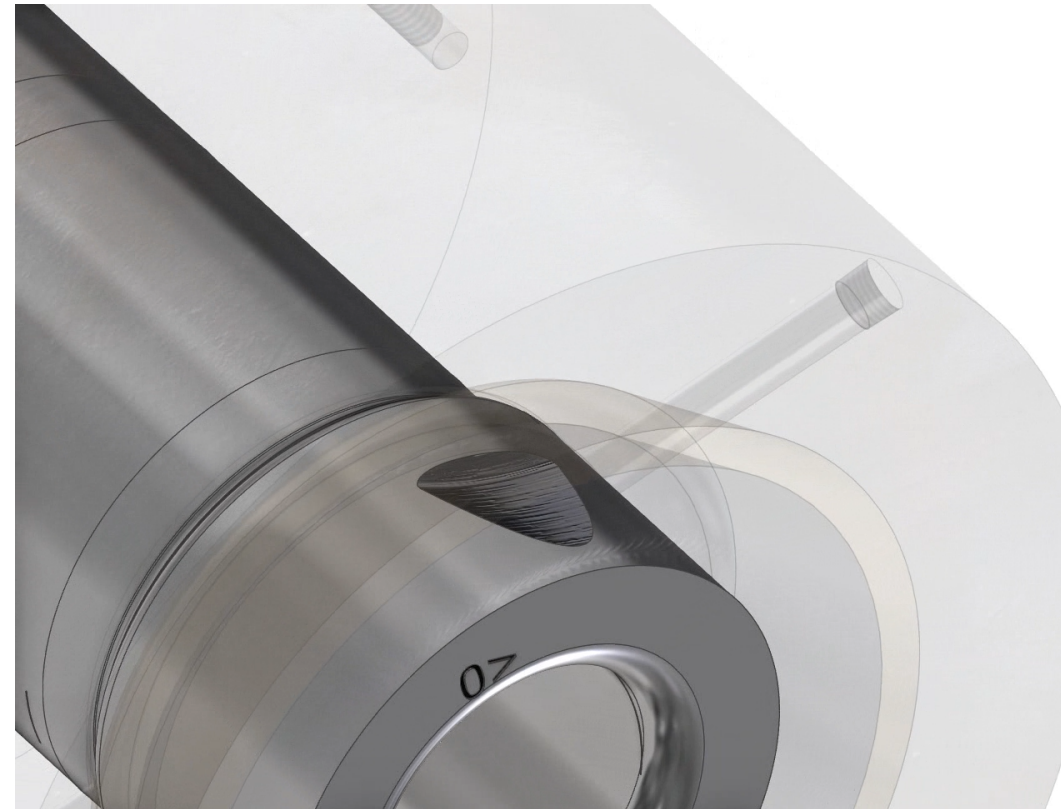
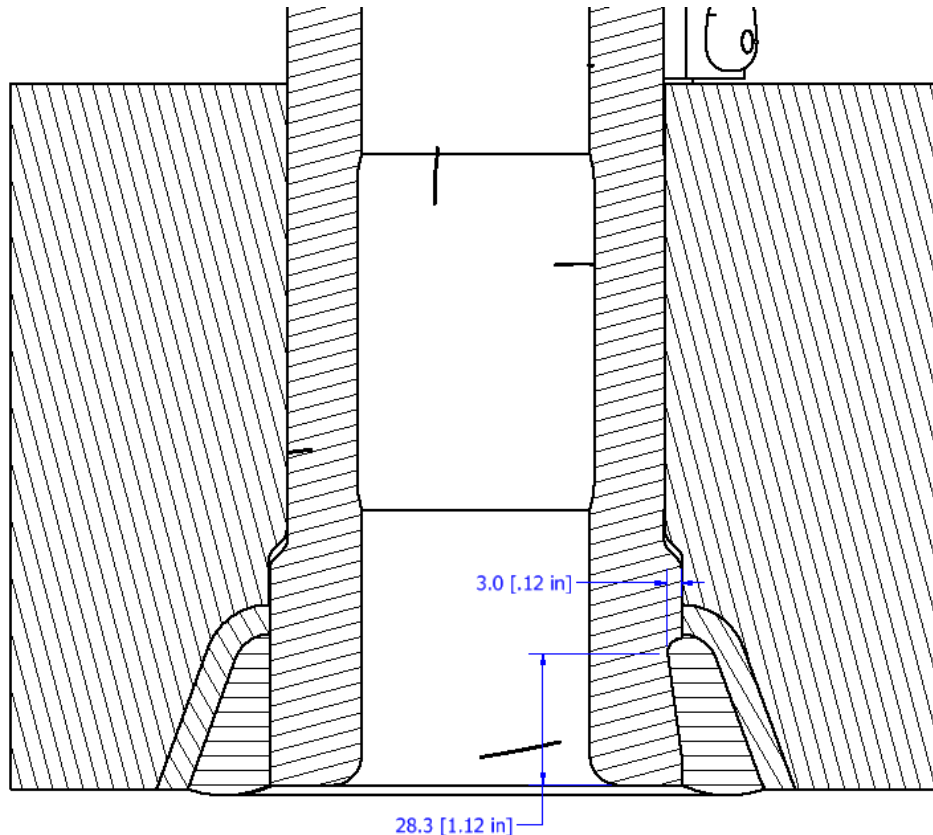
*\*Included in U.S. NRC Regulatory Guide 1.147 R20 without conditions*





# Weld excavation repairs

- Intentional weld excavation repairs included in the BWRVIP water level roll expansion repair mockups
  - Construction-era weld excavation repairs were a source of false calls during initial UT examinations of PWR RVUH CRDM/CEDM and bottom head BMI penetration tubes





# Roll-Expansion Mockup Flaws

- Includes intentional weld fabrication flaws included along J-groove weld – to – penetration tube interface
- Includes cracks within the J-groove weld that propagate partially into the penetration tube
- Penetration tube cracks (compressed notches) located throughout weld and roll-expansion geometry
- Supports BWRVIP Members considering roll-expansions as pre-emptive or emergent repairs
  - *Inspection vendor demonstration planned for Spring or early summer 2024*







# Automated UT of Cancelled NSSS DMWs for AI



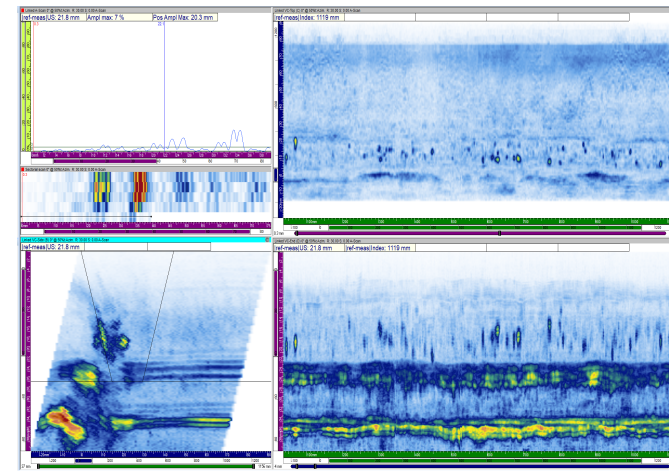
# Automated UT of NSSS-fabricated DMWs

- So far, 5 NSSS-fabricated DMWs were scanned
  - At least two different cancelled RPVs
  - N2 and N5 configurations
- Encoded phased array UT developed for prior study of MSIP for non-U.S. BWRVIP member
  - Dual 64-element matrix array probes
- UT data being used to train new AI models what actual NSSS-fabricated DMWs should look like
  - Identified need after 2023 DMW AI field trial
- Will also document fabrication indications for BWRVIP Members
  - Can supply UT data to BWRVIP Members or inspection vendors for training
- May scan additional NSSS-fabricated welds in 2024
  - Includes reactor internal components

River Bend Unit 2 RPV:



Embedded weld fabrication indications:



Weld repair area  
(1<sup>st</sup> identified with UT):







# **Modernization of NDE Development Reports**

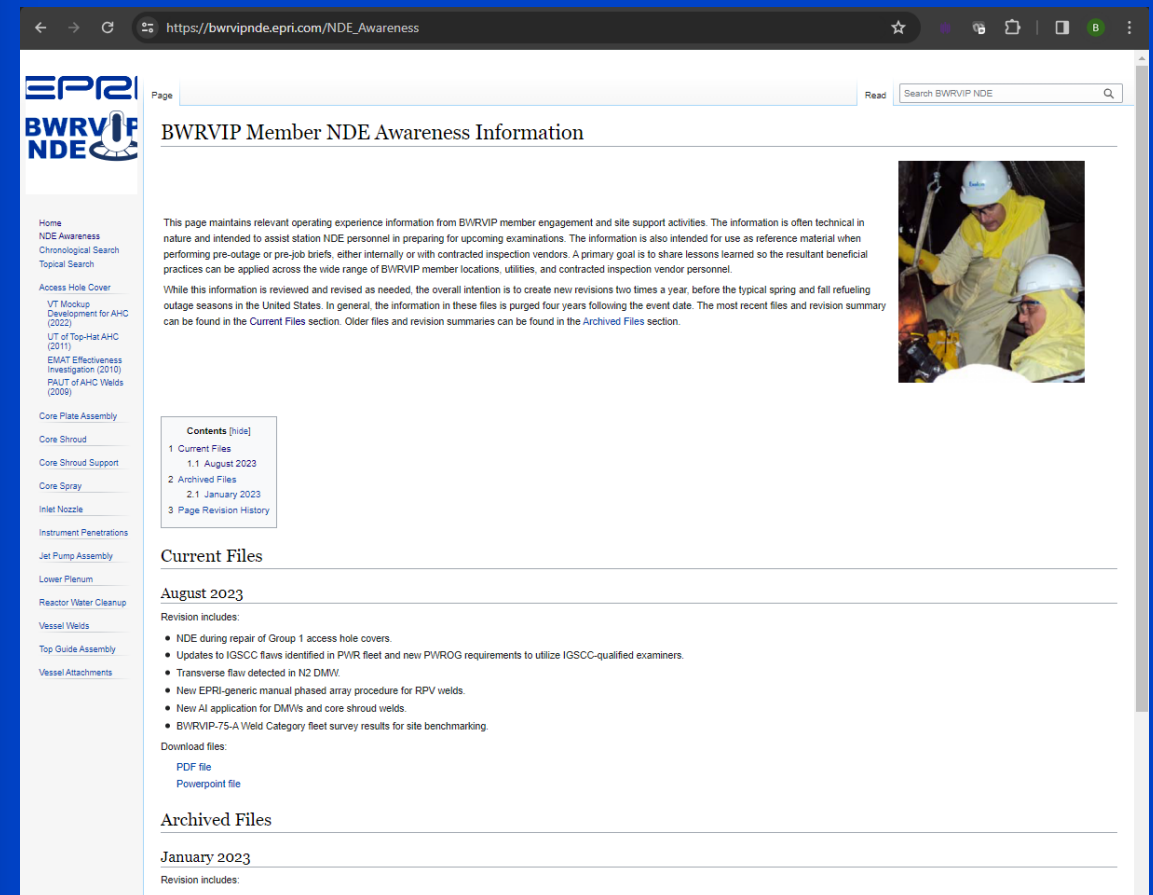
## ***BWRVIP NDE Wiki Tool (3002025595)***



# BWRVIP NDE Wiki Tool

## What is it?

- Modernized tool that digitizes all past and future NDE Development research information into one centralized location
- Creates an organized and efficient way to search and obtain NDE Development research information
- New options for interactive presentation of EPRI research
  - Replaces annual PDF reports





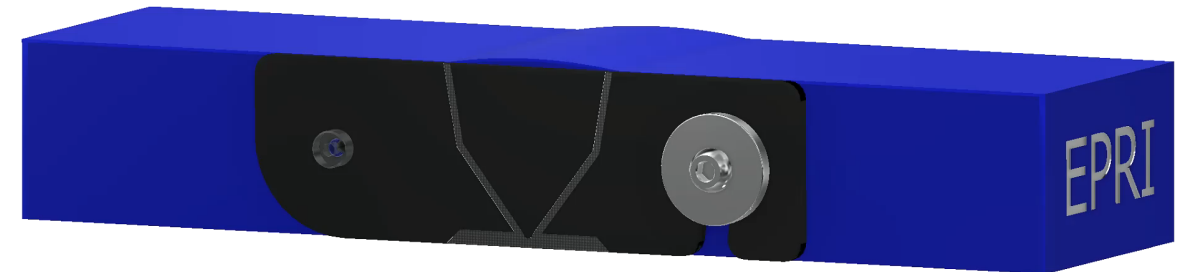
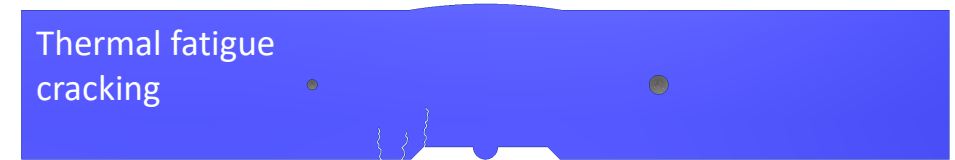
The background of the slide features a blue gradient with a subtle pattern of white stars and light trails, suggesting a cosmic or technological theme. In the center, a pair of hands is shown holding a transparent globe. The globe has a grid of latitude and longitude lines and is overlaid with a faint, glowing blue circuit-like pattern, possibly representing a network or a system. The hands are positioned as if they are carefully presenting or supporting the globe.

# **BWRVIP In-Vessel Inspection Training Course**



# BWRVIP-IVI Course UT Lab Exercise

- Welded mockup designed for inclusion in course in 2023 was found to be suitable for an “Advanced UT Course”; *had to shift gears*
  - Simulated IGSCC flaws in the welded mockups will be used to create an automated UT data analysis video demonstration for the course
- New plan for manual Phased Array UT hands-on lab exercise:
  - Small aluminum plates with wire EDM flaws being fabricated
  - Manual phased array UT will be used to match the applicable flaw drawing to the sample being scanned
  - When scanning complete, candidates provided with tool to flip open covers





# BWRVIP IVI Course General Info

- BWRVIP Members can attend for free
- 2.5 days
- @GE-H training facility in San Jose, CA
- 3 sessions offered each year
- 22.5 professional development hours
- **Considering “advanced” course offering**
  - Member feedback: *A course for personnel who attended the initial course, worked in their role for a couple years, and now have new questions*





# 2023 Review & 2024 Plans

- Always highly attended
- Continue to update course materials
- 3 courses held in 2023
  - One dedicated for Japan
- **3 course offerings in 2024**
  - January 9-11
  - June 11-13
  - August 13-15







# Questions?

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