



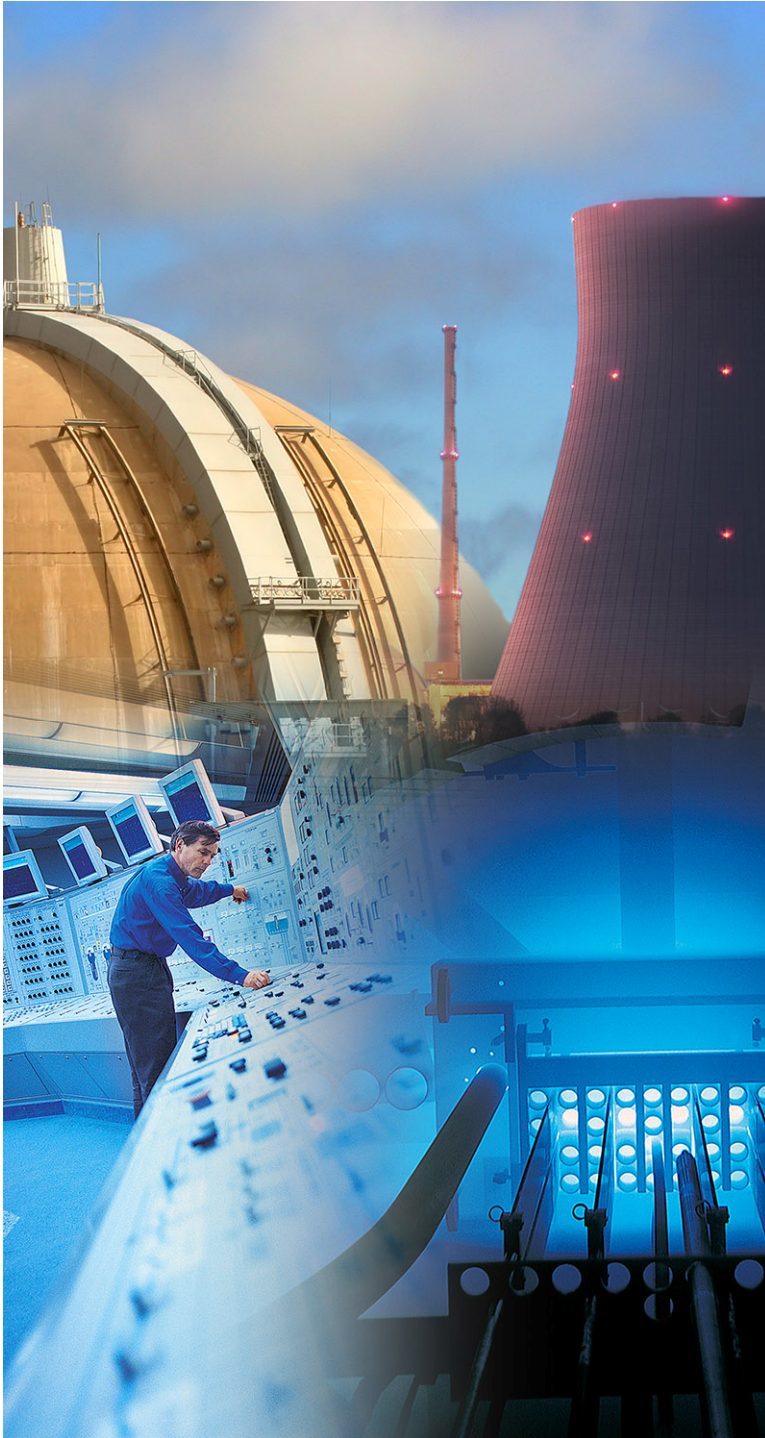
## Buried Pipe Integrity Initiative

## Inspection technology development

February 24, 2010

**Bo Clark**

Program Manager-Balance of Plant Corrosion, EPRI



# Perspective

- Inspection technology is a challenge
  - Configuration of buried piping at our sites does not allow use of many of the technologies utilized by other industries
  - Visible inspection by excavation is not reasonable in many situations
  - Guided wave is one of the developing technologies for condition assessment
    - Limitations apply
- Following slides provide overview of technology being investigated
  - Status will be reported periodically

## EPRI's Buried Pipe NDE Technology Roadmap

Category	Projects	Prior	2009	2010	2011	2012	2013	Beyond
Reference Material	Guided Wave Reference Document							
	Guided Wave Workshop							
	Buried Pipe NDE Reference Document							
Resources	Mock-ups							
	GW Equipment Procurement							
	GW Industry Support							
NDE Technology	Identification of Buried Pipe NDE Technology							
	Assess Electromagnetic Technology for Small Bore Piping							
	Develop Electromagnetic Inspection Vehicles							
	Assess / Develop Buried Pipe NDE Technology							
Guided wave	Technique Assesment & Development							
	Technology Assesment & Development							

# Guided Wave Reference Document

## EPRI Report 1019115 “Buried Pipe Guided Wave Examination Reference Document” (Published in 2009)

- Resource for utility when examining buried pipes with guided wave technology
- Provides basic guided wave theory
- Identifies critical data acquisition and analysis variables
- Identifies limitations
- Identify and provide guidance on variables effecting GW capabilities
- Literature study that identifies many key documents
- Document state of the art as well as gaps

# Guided Wave Workshop

## Purpose

- Lays basic foundation of buried pipe guided wave examination
- For utility buried pipe owners and NDE personnel responsible for implementing Guided Wave examination
- Based on EPRI Report 1019115 “Buried Pipe Guided Wave Examination Reference Document”

## Schedule

- 1<sup>st</sup> Workshop held in December 2009
  - Well attended by both buried pipe owners and NDE
- Plans for additional workshops in 2010 and 2011

# Buried Pipe NDE Reference Document – State of the Art Summary

## Project (In Progress)

- Document the state of the art in buried pipe NDE technology
- Provide utility personnel a reference document for planning and implementing NDE technology
  - Guidance on selecting and applying buried pipe NDE technologies
  - Identify capabilities and limitations to the extent known (does not assess capabilities)
  - Identify limiting piping conditions and configurations
  - Identification of gaps in inspection technology

## Schedule

- Initial version to be published in 2010
- Project proposed to provide updates

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## Resources – Equipment

- TeleTest guided wave system (Piezoelectric)
  - 2009 EPRI Capital purchase
  - Hardware and software
  - Various transducer assemblies
- SwRI MsSR 3030 System (Magnetostrictive)
  - Hardware and software
  - Various sensors
- EMAT Generated Guided Wave
  - Have some resources
  - Plans to purchase additional resources in 2010
- Modeling (Finite element modeling analytical tool)



# Pipe Mock-ups



# Resources – Mock-up



## EPRI's Buried Pipe NDE Technology Roadmap

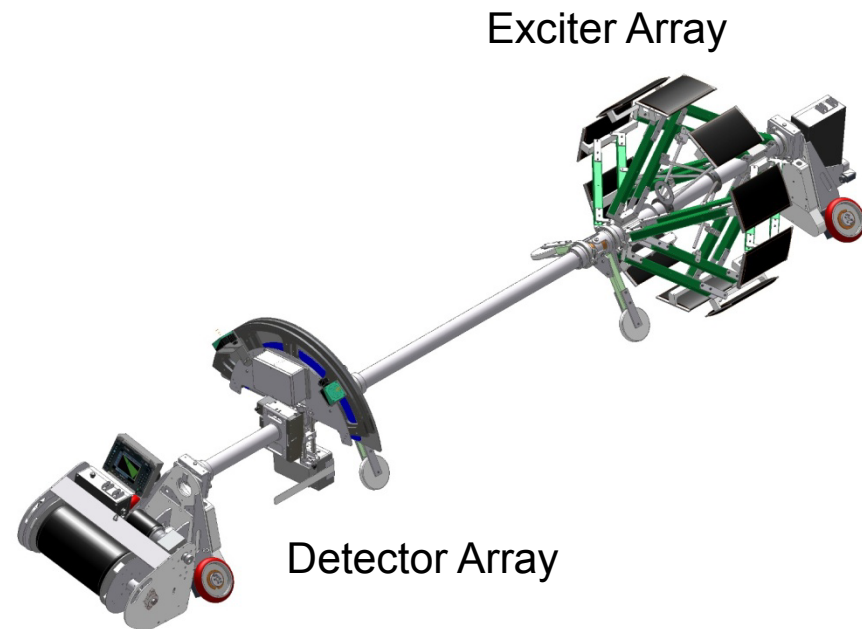
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# Identification and Assessment of Buried Pipe NDE Technology (In progress)

- Identify potential NDE technologies for inspection of buried pipe
  - Immediate use
  - Further development
- Examples:
  - EMATs generated ultrasonic
  - Remote Field Technology (RFT)
  - Acoustic Emission & Leak Detection
- Establishing relationships with other industries more experienced with buried pipe inspection
  - Petrochemical and gas industry
  - PRCI
  - Pipeline inspection vendors

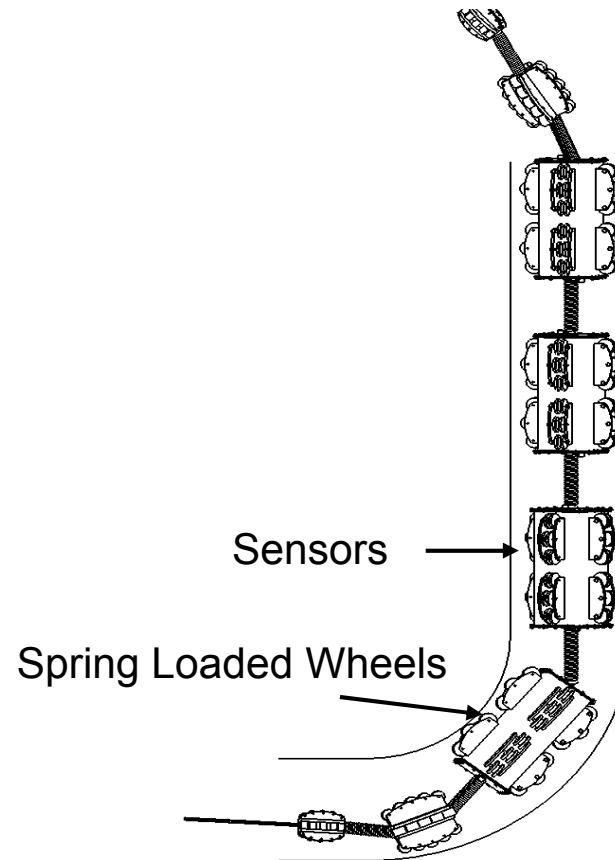
# Vehicle for Very Large Diameter Pipe

- Development and field testing of vehicle for very large diameter buried pipe ( $36'' \leq D \leq 12'$ ) was completed in 2008
- Detect
  - Internal and external pits
  - Circumferential weld degradation
  - Longitudinal weld degradation
- Install through 24" diameter manway
- Can disassemble to pass through elbows



# Vehicle for Medium Diameter Pipe

- Being developed to inspect pipes form 12” to 30” diameter
- Runs along a guide wire
- 1” of radial clearance to allow for mud, tubercles, coatings, etc
- Can traverse
  - Change of elevations
  - Branches, tees
  - Multiple elbows (at least 6)
- Retrieval safety – 2 levels
  - Cable pull
  - 2<sup>nd</sup> vehicle
- Field testing in 2011



**Commercialization inquiries  
received**

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# Guided Wave Applications

## Project Proposal

- Focused scanning to improve sensitivity and sizing capabilities
  - Develop and test guided wave routines
- Develop techniques for using guided wave in small “keyhole” digs
  - reduce excavation cost
- Evaluate guided wave’s effectiveness for assessing coating integrity
- Develop and assess techniques to perform on-line condition monitoring
- Develop a data base for the industry’s guided wave data





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