Advanced Nuclear Technology (ANT)

Buried Piping Webcast

Bo Clark, Program Manager
Steve Swilley, Program Manager
Ken Barry, Senior Project Manager

Webcast
October 12, 2010
Agenda

• Issue Background
• Underground Piping and Tank Integrity
• EPRI Initiative
  – Program Development
  – Diagnostics and monitoring
  – Arrest and prevention
  – Repair and replacement
• Underground Piping and Tank Integrity Strategic Roadmap
• ANT Current and Proposed Projects
Industry NEI Initiative on Groundwater Protection

- NEI 07-07 – Industry Ground Water Protection Initiative – Final Guidance Document
- Goal – To prevent radioactive materials from migrating off-site
- Mature initiative
- Next steps:
  - 5-year Cycle for review of site groundwater protection programs and peer assessments
  - 2007 implementation plants will require a program revisit and assessment of SSCs in 2012
  - Next round of peer assessments anticipated to begin in 2011-1012 timeframe
Industry Initiative on Buried Piping Integrity

• NEI 09-14 – Guideline for the Management of Buried Piping Integrity

• Initiative requires the following actions:
  – By June 30, 2010 – Implement Procedures and Oversight
  – By December 31, 2010 – Complete Risk Ranking of buried piping segments
  – By June 30, 2011 – Develop an Inspection plan to provide reasonable assurance of buried piping integrity
  – By June 30, 2013 – Complete a condition assessment
  – By December 31, 2013 – Asset Management Plan in place
Underground Piping and Tank Integrity

• Issue
  – Leaks resulting in costly inspections & repairs of our Buried Piping
    • Buried assets approaching 40 years of age

• Solution involves:
  – Establishing reasonable assurance of structural and leakage integrity of underground piping & tanks
Underground Piping and Tank Integrity

**ISSUE:**
- Degradation of underground pipe
- Potential for groundwater (GW) contamination

**DRIVERS:**
- Equipment Reliability
- Regulatory interest/Public confidence
- Industry Commitments (NSIAC)
- International applicability

**SCOPE:**
- Program Development
- Diagnostics/monitoring
- Arrest and prevention
- Repair/replacement

**RISKS:**
- Additional regulation/GALL revision
- Cost/commitment to Initiatives
- Availability/limitations of technology
- Timely Code Case endorsement

**2009 BP Initiative**

**Jun 2011 Insp. Plans in Place**

**Dec 2013 Asset Mgm’t plans in place**
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Number of Reported Leaks by Year

- 2000: 2
- 2001: 1
- 2002: 1
- 2003: 6
- 2004: 5
- 2005: 2
- 2006: 6
- 2007: 4
- 2008: 8
- 2009: 67
- 2010: 28

Increased industry reporting as a result of the Buried Piping Initiative.

Courtesy NEI  Source: EPIX
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Plant Impacts (Jan 2000 – June 2010)

- Miscellaneous Systems – 81 Reported Leaks
- Production or RW Systems – 45 Reported Leaks

Any Buried Pipe leak is an emergent impact on your site’s resources

Depicts U.S. industry data
Other “Drivers” shaping the response

• The ‘Regulatory Arena’
  – Public and congressional confidence in the NRC
    • Contributing to several NRC activities
  – International Regulators watching
• Limitations of existing NDE inspection technology & piping systems
• Industry commitments:

Underground Piping and Tanks Integrity Initiative
Underground Piping and Tank Integrity

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## Program Development

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<thead>
<tr>
<th>Topic</th>
<th>Tools in your toolbox</th>
<th>Tools under development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Guidance</td>
<td>- “Program Recommendations” document for Buried Pipe Aging Management</td>
<td>- Vaulted piping</td>
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<tr>
<td></td>
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<td>- PCCP</td>
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<tr>
<td>Risk Ranking</td>
<td>- BPWorks, V2.0</td>
<td>- Vaulted piping &amp; tanks</td>
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<td>- BP NDE State of the Art</td>
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<td>- GWUT Reference Guide</td>
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<tr>
<td>Training</td>
<td>- BP Program Management</td>
<td>- Buried Pipe Coatings Course</td>
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<td></td>
<td>- BPWorks</td>
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<td></td>
<td>- Cathodic Protection</td>
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<td>- GW Seminar</td>
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## Diagnostics and monitoring

<table>
<thead>
<tr>
<th>Topic</th>
<th>Tools in your toolbox</th>
<th>Tools under development</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID monitoring</td>
<td>- Proof-of-concept RFT pigs</td>
<td>- GWUT analysis guide (1Q2012)</td>
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<td></td>
<td>- Pigs from petrochemical</td>
<td>- GWUT permanently-mounted sensors (4Q2012)</td>
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<tr>
<td>OD monitoring</td>
<td>- GWUT training</td>
<td>- GWUT procedure std. (3Q2011)</td>
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<tr>
<td></td>
<td>- In-the-hole NDE (visual, radiography, direct UT)</td>
<td>- GWUT database (4Q2011)</td>
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<tr>
<td>Leak detection</td>
<td>- Continuous from OD</td>
<td>- Tethered ID pig</td>
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<tr>
<td></td>
<td>- ID pig</td>
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<tr>
<td>Assessment of capability</td>
<td>- Large-scale mockup</td>
<td>- Vendor demonstrations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Qualification?</td>
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<td></td>
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<td>- Acoustic leak detection</td>
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<td>Outreach</td>
<td>- PRCI participation</td>
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</table>
# Diagnostics and monitoring

<table>
<thead>
<tr>
<th>Topic</th>
<th>Gaps you will have</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID monitoring</td>
<td>- Access points</td>
</tr>
<tr>
<td></td>
<td>- Limited data in elbows</td>
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<tr>
<td></td>
<td>- Must drain the pipe</td>
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<td></td>
<td>- May require cleaning</td>
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<tr>
<td></td>
<td>- Proof-of-concept tools require reconfiguration before application to other diameters</td>
</tr>
<tr>
<td>OD monitoring</td>
<td>- GWUT has configuration applicability gaps</td>
</tr>
<tr>
<td></td>
<td>- You may not know the effectiveness of GWUT until you expose the pipe</td>
</tr>
<tr>
<td>Leak detection</td>
<td>- Less applicable to non-steel pipes</td>
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<td></td>
<td>- Pipe must be flooded</td>
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<td></td>
<td>- FME concern for untethered pig</td>
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</tbody>
</table>
## Arrest and prevention

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<tbody>
<tr>
<td>Coatings</td>
<td>-Indirect assessment technologies</td>
<td>-Improved above ground (remote) coatings condition assessment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Expansion of existing reference materials</td>
</tr>
<tr>
<td>Cathodic protection</td>
<td>-Indirect assessment technologies</td>
<td>-Expansion of reference materials</td>
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</table>
## Repair and replacement

<table>
<thead>
<tr>
<th>Topic</th>
<th>Tools in your toolbox</th>
<th>Tools under development</th>
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<tbody>
<tr>
<td>Pipe Liners</td>
<td>- Several vendors can install</td>
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<tr>
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<td>- EPRI report available</td>
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<tr>
<td>ASME Code &amp; Standards</td>
<td>- Existing codes and standards</td>
<td>- HDPE</td>
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<td></td>
<td></td>
<td>- Design Rules for BP</td>
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<td>- Fitness for Service Rules for BP</td>
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Underground Piping and Tank Integrity

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Underground Piping and Tank Integrity Strategic Roadmap

**ASME Code Case Development**
- 2009: High Density Polyethylene Materials ASME CC N-755 Rev. 1 Development
- 2010: Fitness for Service Rules for Buried Pipe (Code Case)
- 2011: Design Rules for Buried Pipe (Code Case)

**NRC**
- 2009: Chairman’s Tasking Memo
- 2010: NRR Action Plan on BP
- 2011: Ground Water Task Force Report Review
- 2012: Potential Policy/Regulation Updates
- 2013: GALL Revision

**INPO**
- 2009: Provide Operating Experience Sharing and Development of Performance Indicators
- 2010: Evaluation and Assistance for Groundwater Protection and Buried Pipe Programs

**NEI**
- 2009: NRC Initiative Support
- 2010: GALL Revision Interface
- 2011: Update to NEI 09-14, BP NEI Guidelines

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ANT Related Projects

Current Projects
• 2010-12: Technical Basis for HDPE Above-Ground Use

Proposed for 2011
• Task 2011-A: Double-walled Piping Evaluation
• Task 2011-B: Groundwater Protection Guidelines for New Nuclear Power Plants
• Task 2011-U: Protecting Buried Piping Asset
Task 2011-A: Double-walled Piping Evaluation

Doug Munson
Contractor
Task 2011-A: Double-walled Piping Evaluation

Summary of Issue

• Leaks from buried pipe have been a troublesome issue for current fleet; esp. triated lines and lines with environmentally sensitive fluids.

• One option for new builds is double-walled pipe.
Task 2011-A: Double-walled Piping Evaluation

Task Description

• Review new build designs to identify candidate systems/lines.
• Identify Code requirements and design conditions.
• On a system/line basis, evaluate double-wall against other options, including:
  – Above ground routing.
  – Pipe chases and vaults.
  – Resistant materials.
• Evaluate material options; e.g., carbon steel, HDPE, hybrid.
• Identify R&D needs.
• Identify Code and regulatory changes needed.
• Identify effects of NSIAC Initiative on Buried Pipe.
Task 2011-A: Double-walled Piping Evaluation

Potential Benefit of Project
• Double walls potentially offer:
  – Protection of the OD from soil side degradation.
  – Secondary containment.
  – Integral leak detection.

Approach to Work
• Review of new build designs and industry requirements.

Vendor Engagement
• RFP for project to be sent to Vendors.
Task 2011-A: Double-walled Piping Evaluation

Project Deliverables

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Planned Completion Date</th>
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Project Costs

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<tr>
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<tr>
<td>$155K</td>
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Task 2011-B: Groundwater Protection Guidelines for New Nuclear Power Plants

Karen Kim
Project Manager
Task 2011-B: Groundwater Protection Guidelines for New Nuclear Power Plants

Summary of Issue
- Recent experiences with groundwater contamination at operating nuclear power plants raising stakeholder & regulatory concerns regarding new plants
- Each new plant must implement strategies to minimize contamination per 10 CFR 20.1406.
- NEI 08-08 (Generic FSAR Template for 10 CFR 20.1406 Compliance) points to EPRI Groundwater Protection Guidelines as acceptable method for complying to 10 CFR 20.1406.

Task Description
- Develop an addendum to the EPRI Groundwater Protection Guidelines that provides technical guidance for the implementation of pre-construction and pre-operation tasks of a groundwater protection program.

Potential Benefits of Project
- Will close gap in the EPRI Groundwater Protection Guidelines that provides technical guidance for implementation of pre-construction and pre-operation tasks of a groundwater protection program per 10CFR20.1406, RG 4.21, and NEI 08-08.
- Will improve groundwater protection program performance for new plants, thus increasing stakeholder confidence that utilities are protecting public and environmental health and safety.
Task 2011-B: Groundwater Protection Guidelines for New Nuclear Power Plants

Approach to Work

• Develop an addendum to the EPRI Groundwater Protection Guidelines (1015118) for the pre-construction and pre-operation tasks of a groundwater protection program.
• Convene EPRI Groundwater Guidelines Committee to support development of new plant addendum.
• Ensure guidance for new plants are in line with 10CFR20.1406, RG 4.21, and NEI 08-08.
• Work with NEI to present addendum to NRC as an industry method for complying with 10 CFR 20.1406.

Vendor Engagement

• Vendors will be invited to participate in the Groundwater Guidelines Committee for the development of the new plant addendum.
  – Invite to participate as members of EPRI.
  – Invited to participate via Design Centered Working Groups (DCWG.)
**Project Deliverables**

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Task 2011-U: Protecting Buried Piping Assets

Ken Barry
Senior Project Manager
Task 2011-U: Protecting Buried Piping Assets

Summary of Issue
• Buried piping failures are an ongoing challenge in operating plants. Buried piping leaks have occurred at our plants and the Industry has recognized the importance of buried piping integrity for some time.

Task Description
• While most plants have a cathodic protection system installed – the proper operation when combined with the plant grounding system has been problematic. This project will capture the lessons learned over the past 30 years to allow the new build to take full advantage of the cathodic protection system.

Potential Benefit of Project
• Leaks from buried assets have the potential to be safety, radiological, environmental and financial concerns. It is important to address this condition in order to:
  – Minimize the possibility of significant leaks.
  – Maintain public confidence.
Task 2011-U: Protecting Buried Piping Assets

Approach to Work

• A Technical Advisory Group (TAG) consisting of experienced utility, reactor vendors, EPC and EPRI personnel will be tasked with creating an initial draft document table of contents covering the following topics:
  – Buried Pipe.
  – Underground Tanks / Bottoms of above ground tanks.
  – Improved Compatibility between Earth Ground and Cathodic Protection Systems.
  – Plant Security Features (that penetrate the ground – e.g. fences, ground motion detectors).
  – Lessons learned on sampling wells / drainage wells (from Ground Water Initiative).

• The project contractor will then develop the guidelines for review and approval by the TAG.

Vendor Engagement

• Vendors will be include in the TAG.
# Task 2011-U: Protecting Buried Piping Assets

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Issues to consider

• Avoid buried piping applications (especially for safety related piping)
• Use of pipe chases, pipe-in-a-pipe, and vaults to keep piping out of contact with soil
• Design in access points for pipe chases and vaults
• Design in PIG launch and retrieval stations for long underground buried pipe applications
• Control pipe installation procedures to minimize buried piping coating damage
• Use cathodic protection
• Consider alternative material selection (HDPE) where applicable
Issues to consider (cont.)

• Design and build for access and inspectability
• Make accurate 3-D records for all buried commodity locations
• Make accurate, detailed, as-built documentation for all buried components. In addition to component location, the documentation should include joint types and location, typical weld profiles, record of repairs, contact with other piping components or piping supports, backfill type, landmarks, and so forth. Any access points or locations should be clearly identified. Use RFID locators on piping runs.
• Include pictures of the entire system as well as special conditions
Next Steps

• How do we ensure that the new build does not add to the existing problem?
• Need volunteers to redefine and provide input to the Double Wall Piping project.
Together...Shaping the Future of Electricity