Working Group 1 – Threat Prevention
Gov/Industry Pipeline R&D Forum

July 18, 2012
Threat Prevention Research

- Stakeholder input sought/generated for Threat Prevention research at 4 Pipeline R&D Forums
- Solicited for related topics in 8 research solicitations including coatings since 2002
  - However not all solicited topics successful in becoming new research
- Related Investment: 28 technology development, product development and process improvement projects using $7.1M (PHMSA)
Broad Agency Announcement #7
Threat Prevention 11/09

Damage to pipe by excavation, during construction or by outside force continues to be a leading cause of pipeline failure. Preventing or reducing such damage to pipelines would dramatically improve pipeline safety. Topics of interest identified as:

- Topic 1 – Technology Development – Early Warning Damage Prevention Monitoring Systems
- Topic 2 – General Knowledge – Advanced Risk Assessment Tools for Distribution Integrity Management
- Topic 3 – Technology Development – Pipe Location Detection for Metallic and Non-Metallic Materials

Notable Outputs/Impacts

Successful deployment of digging triggers on backhoes & integration into the VA Pilot Program

General knowledge documenting threats to plastic pipe

Commercial improvements to ground probing radar for subsurface mapping
Notable Outputs/Impacts

General knowledge on the effectiveness of back fill methods

General knowledge on preventing threats from ground movements
Current Research

PIGPEN is an autonomous real-time intruder warning system that detects and reports right-of-way encroachment and excavation activity near a pipeline enabling response in time to prevent pipeline damage. It comprises an underground network of discrete and unattended, smart sensor packages deployed around (but not in contact with) an underground pipeline or similar protected area.

<table>
<thead>
<tr>
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<th>Status</th>
<th>Goal</th>
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</thead>
<tbody>
<tr>
<td>Probability of detecting threat within protected area</td>
<td>86%</td>
<td>&gt;95%</td>
</tr>
<tr>
<td>False alarms</td>
<td>&lt;7%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>for threats slightly outside protected area</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0% for non-threats</td>
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</tbody>
</table>
Current Research

The objective is to transform the PipeGuard™ technology from a general purpose seismic sensor into an operational tool for gas utility operators. The new platform will provide early warning alarms of excavating activity via wireless communications for short length pipeline sections. The system will be managed remotely, including use by mobile operators with wireless devices. Installation will allow for permanent and semi-permanent options.
## Threat Prevention Research

<table>
<thead>
<tr>
<th>Status</th>
<th>Contractor</th>
<th>Project Title</th>
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<tbody>
<tr>
<td>Closed</td>
<td>Witten Technologies, Inc.</td>
<td>Digital Mapping of Buried Pipelines with a Dual Array System</td>
</tr>
<tr>
<td>Closed</td>
<td>Gas Technology Institute</td>
<td>Pipeline Damage Prevention Through the Use of Locatable Magnetic Plastic Pipe and a Universal Locator</td>
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<tr>
<td>Cancelled</td>
<td>Electricore, Inc.</td>
<td>Use of Unmanned Air Vehicle (UAV) for Pipeline Surveillance to Improve Safety and Lower Cost</td>
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<tr>
<td>Closed</td>
<td>Northeast Gas Association</td>
<td>Infrasonic frequency seismic sensor system for preventing third party damage to gas pipelines</td>
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<tr>
<td>Closed</td>
<td>PRCI</td>
<td>Pipeline Integrity Management for Ground Movement Hazards</td>
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<tr>
<td>Closed</td>
<td>University of Alberta</td>
<td>Achieving Maximum Crack Remediation Effect from Optimized Hydrotesting</td>
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<tr>
<td>Closed</td>
<td>Gas Technology Institute</td>
<td>GPS-Based Excavation Encroachment Notification</td>
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<tr>
<td>Active</td>
<td>Northeast Gas Association</td>
<td>Advanced Development of Proactive Infrasonic Gas Pipeline Evaluation Network</td>
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<tr>
<td>Active</td>
<td>Northeast Gas Association</td>
<td>Advanced Development of PipeGuard Proactive Pipeline Damage Prevention System</td>
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<tr>
<td>Active</td>
<td>Physical Sciences Inc.</td>
<td>Advanced Learning Algorithms for the Proactive Infrasonic Pipeline Evaluation Network (PIGPEN) Pipeline Encroachment Warning System</td>
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Pipeline Safety R&D Contacts

Jeff Gilliam
Department of Transportation
Pipeline & Hazardous Materials Safety Administration
Office of Pipeline Safety
P(202) 366-0568
Email jeffery.gilliam@dot.gov

Jim Merritt
Department of Transportation
Pipeline & Hazardous Materials Safety Administration
Office of Pipeline Safety
P(303) 683-3117
Email james.merritt@dot.gov

Robert Smith
Department of Transportation
Pipeline & Hazardous Materials Safety Administration
Office of Pipeline Safety
P(919) 238-4759
Email robert.w.smith@dot.gov

Max Kieba
Department of Transportation
Pipeline & Hazardous Materials Safety Administration
Office of Pipeline Safety
P(202) 493-0595
Email max.kieba@dot.gov

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