the Energy to Lead

Program Overview

Residential Methane Detectors and Asset Lifecycle Tracking & Traceability

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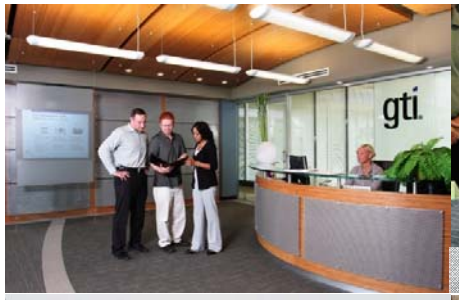
GTI Overview

ESTABLISHED 1941

- Independent, not-for-profit company established by natural gas industry
- Providing natural gas research, development and technology deployment services to industry and government clients and gas consumers
- Performing contract research, program management, consulting, and training
- Facilities
  - 18 acre laboratory near Chicago
  - 200,000 ft^2 with 28 labs
- Staff of 250
- Wellhead to the burner tip including energy conversion technologies



Training

Office & Labs

Pilot-Scale Gasification Campus

Energy & Environmental Technology Center

Residential Methane Detector Background

Safety is Priority #1

- **Customer behavior** suggests that odorant alone is not enough for customers to report leaks
- Recent events have heightened the focus on how unreported leaks can result in tragic outcomes
- The natural gas industry has an **opportunity** to augment existing safety programs and be more proactive in regards to the detection of our product in homes
- Having an alert system such as a **residential methane detector** benefits both the customer and the utility

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Strategy for Adoption of Residential Methane Detectors

Residential Methane Detectors are Commercially Available…

- Can be purchased at home improvement stores
- International products are also available
- Prices range from $40 - $100+
- But product availability and price do not make a market
  - Concerns with performance
  - Framework doesn't exist to promote the installation of residential methane detectors
  - Lack of public awareness

Low customer adoption

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Product Performance Issues

- **2010 Testing** - OTD project performed baseline testing and evaluation of commercially available, domestic residential methane detectors
  - Concerns exist with performance – False positives to common household agents; level of detection; humidity range, battery backup
- **Repeat baseline testing** and evaluation of commercially available, domestic & international detectors (current OTD project)
- Conduct a comprehensive **pilot program** for those most promising detectors to gain real-world experience in a controlled environment
- **Technology development**
  - New sensors have promise to address false positives and lower sensitivity levels, but will take time to develop?
  - Efforts underway with ARPA-E, GTI, NYSEARCH, PRCI

Action: Complete baseline testing, initiate pilot program, monitor sensor development efforts, validate new technology as it becomes available

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Level of Detection Issue

- What is the appropriate **"fit for purpose" detection level**?
  - **Current detectors alarm at 25% LEL,** but this is too high. Odorant detection code requirements are less (20% LEL federal; some states are lower - NY 10%, MA 3%). Should there be alignment between odor detection and alarm points? What is appropriate for this application?
  - **Instantaneous or Integrated?** Initial alarm could be based on an integration of readings over a defined period of time (similar to CO) in the 5% LEL range with a steady alarm warning of 10% LEL. But this technology doesn't exist, yet
- Evaluate the **appropriateness of current UL standards** (1434 and 1484)
  - 1434: Standard for Thermistor Type Devices (includes sensing devices)
  - 1484: Standard for Safety Residential Gas Detectors (25% LEL)
  - Develop and incorporate installation guidelines
  - Develop new "fit-for-purpose" UL standard with lower detection point

Action: Need consensus on "fit for purpose" detection level and strategy to address UL standards. "It all starts with an appropriate standard."

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Consumer Behavior Issues

- **Need to understand behavior** – why aren't gas odors being reported? In order to address issues appropriately for both odor and alarms
- Public Awareness
  - Ensure messaging is clear that the public should call if they smell gas **OR** if an alarm goes off – potential confusion and unintended consequences
  - Educate customers on why they should use these detectors, potential consequences and what to do if they alarm
- Coordinate public awareness strategy and campaigns
  - Establish stakeholder groups (e.g., utilities, AGA, APGA, regional trade associations, safety officials, state and local governments)

Action: Expand market research data on consumer behavior, develop key points and concise messaging for public awareness campaigns and coordinate with all stakeholders

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Alarm Reporting Issues

- Is an audible alarm sufficient? Precedent established with smoke and CO alarms
- Do we want automated alarm reporting? Who would get notified and respond (e.g., utility, fire department, home monitoring service)? Is this appropriate for certain building types (multi-family)?
- Are interconnected alarms for multi-unit buildings warranted?
- Combination CO/Methane detectors are preferred? Do we need to distinguish which threat is present?

Action: Develop stakeholder group to reach industry consensus.
"Start with the basics, let the market drive the bells & whistles."

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Market Channel Strategy

> Assess pros/cons of various market channel approaches in achieving desired results

- **Building Codes –** should building codes be developed that mandates the use of residential methane detectors (similar to smoke alarms)?
- **Utilities** – Should utilities encourage the use of residential methane detectors? Should they provide financial incentives? Should there be targets established? And cost recovery?
- One size fits all or should the strategy be dependent on the environment (urban, cast iron, multi-family, higher risk)?

Action: Develop deployment and distribution strategy to achieve desired customer adoption rate.

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Economic and Market Issues

- **Price Implications**
  - Existing detectors are in the $40 - $100+ range
  - Is this target price achievable given the desire to lower the detection limit?
  - Is this target price achievable with remote reporting functionality?
  - What is the consumer willing to pay and how will this impact adoption rates? Are subsidies warranted?
- Should utilities pursue **cost recovery mechanisms** (similar to energy efficiency programs)?
- What are the **economics associated with advanced features?**
- Determine target adoption rate and projections under various scenarios; compare to adoption rates for CO and smoke detectors

Action: Develop scope for economic and market analysis

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Pathways to Address Issues

- **Standards development** – define “fit-for-purpose” product performance criteria
- **Technology development and validation** – ensure reliable and effective products are readily available
- **Stakeholder engagement** – ensure industry alignment on critical issues such as market channels, consumer behavior and public awareness to enable full market adoption

Asset Lifecycle Tracking & Traceability

Information	Mfg. Values
Lot Number	1234567
Production Date	1/4/2010
Material Type	PE2708
Component Type	Electrofusion tapping tee with a stab outlet
Component Size	2" IPS SDR 11 x 1" IPS SDR11

Create GIS Features in the Field

Post to Enterprise GIS

Integrate Data into GIS System of Record

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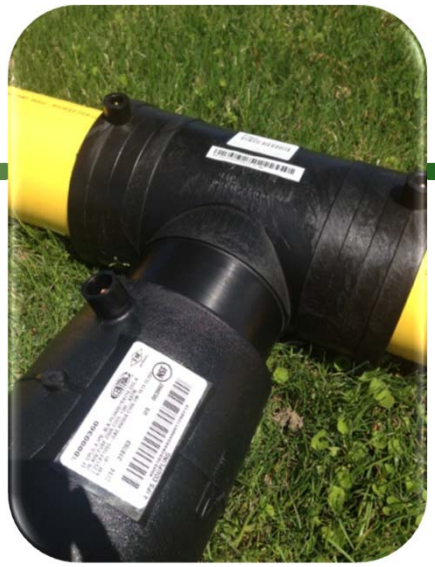
Mobile GIS for Mapping and T&T



> Objectives

- Develop **mobile GIS** technology that creates **digital as-builts** with complete **tracking and traceability** information of pipes, fittings, and fusions
- **Eliminate back-office** post-processing and GIS integration as well as traditional mapping functions
- Utilize recent advances in GIS, tablet computers, GPS, barcode scanning, and cloud computing to **improve the quality and efficiency** of data collection

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GTI's Mobile GIS Technology

- **Technology features:**
  - Tablet with mobile GIS data collection software
  - High accuracy GPS receiver (connected via Bluetooth)
  - Barcode scanner (connected via Bluetooth)
  - Application to convert barcodes into asset attributes to auto populate the GIS
  - Fusion tracking and traceability system that captures information directly from leading fusion machines
  - Labels with 50 year life in underground conditions
  - Disconnected editing capability

Supporting Implementation

MOBILE GIS FOR THE INTELLIGENT UTILITY
LOCUS VIEW SOLUTIONS

- GTI spinout, LocusView Solutions, created to provide implementation services for advanced geospatial technologies
- Provides field tested, customer validated, commercial products
- Turn-key implementation services including hardware, software, hosting, training, and IT support

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Results in Action

- Mobile GIS software with barcode scanning and high accuracy GPS **commercially released in October 2013** and available through LocusView Solutions
- **Integration with leading fusion equipment** manufactures complete in 2014
- **Five pilot projects complete**
  - Integrys, Avista, National Grid, NiSource, Dominion
- **Five new pilot projects in 2014**
  - ConEd, Colorado Springs, MLGW, NSTAR, Piedmont
- Production implementations in Q1 2015

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Thank you!

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