LDC Challenges, Needs and R&D

Addressing Damage Prevention and Pipe Location

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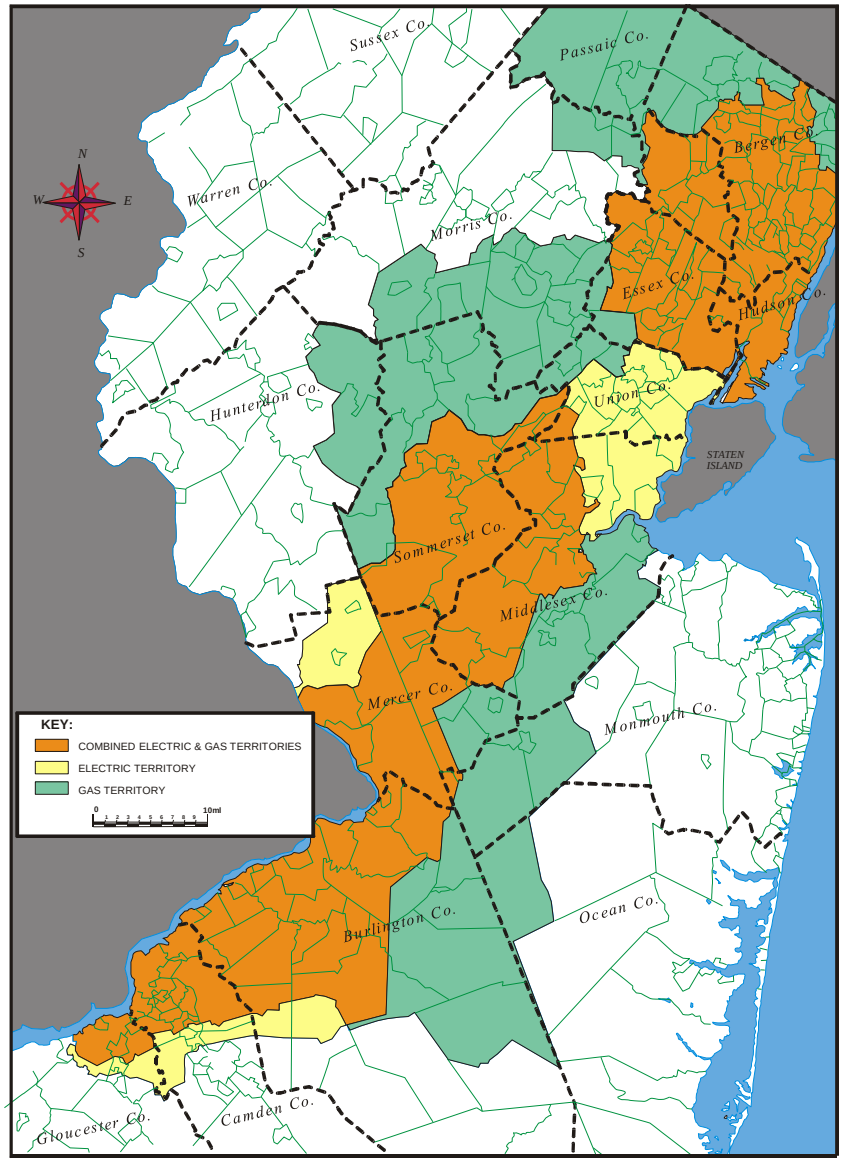
PSE&G Overview

- PSE&G currently serves nearly three quarters of NJ's population.
- Service area: 2,600-square-mile diagonal corridor across the state from Bergen to Gloucester Counties.
- Largest provider of gas and electric service
  - 1.8 million gas customers
  - 2.2 million electric customers
  - 300+ urban, suburban and rural communities, including NJ’s six largest cities.



Technology Solutions from the Past
Challenges to 3rd Party Damage Prevention

- Minimal false positives
- 24/7 availability
- Sensing in dense, noisy and highly populated environments
- Minimal excavation frequency and size
- Economically feasible
- Critical facility priority
  - Safety
  - Risk
- Education/Enforcement key

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Technology Solutions from the Past
Challenges to 3rd Party Damage Prevention

- No negative impact to operations
- Wireless communications need to be reliable and secure
- Sensors need to filter out benign conditions
  - Repeatability
  - Reliability
- Wide varieties of frequency signatures
  - Various soil types
  - Weather
  - Wave propagation
- Dependence on straight runs of pipe; sometimes limited in footage which has shown to make some solutions uneconomical

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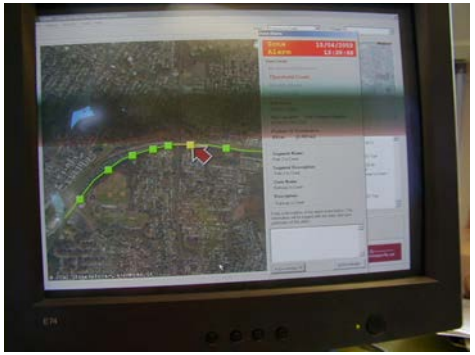
Types of Sensors and Systems Studied and Developed in Past R&D programs

- Fiber optic systems transferred from security applications
- Low frequency acoustic point sensors
- Camera systems with analytics specific to excavation events



- Advanced fiber optic systems for long distances
- Advanced fiber optic systems customized for short distances
- Construction equipment mounted automatic shutoff
  - Cost
  - Incentive?

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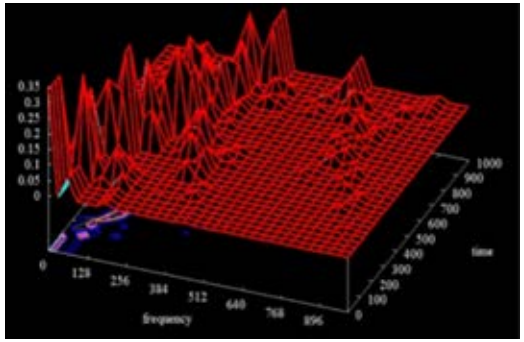
LDC Damage Prevention Efforts

Sample Specs Used in Last 15 Years

- Requirement to detect working construction equipment from ROW as far away as possible to maximize response time (200’-300’)
- False Alarm Rate: <1%
- Foreign excavation location accuracy based on pipeline segment zone
- Maximum time to detect: 2 mins
- Solutions vary based on type of system



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LDC Plastic Pipe Location Needs

- Utilized by gas construction crews in dense environments
  - Poor maps/geography changes
  - Broken/missing tracer wire
- Trace pipe location analogous to direct locating of ferrous pipes
- Providing pipe depths

- Locate to 10’ depth
- ½” – 12” diameter capabilities
- Lightweight, portable and ease of use
- THE HOLY GRAIL

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Challenges Experienced in past Pipe Location R & D Efforts

- GPR and other active signal (transmit and receive) techniques have difficulties with certain soil types (clays, dense soils, water in soil) and dense environments
- Accurate prediction of pipe depth and lateral position varies based on technologies
- Training and interpretation requirements
- Technologies that address dense/complex underground environments tend to be large and/or expensive

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Challenges Experienced in Past Pipe Location R&D Efforts

- Failure to trace the pipe out
  - Signal distinction from nearby facilities?
  - False positives
    - Tree roots
    - Miscellaneous objects
- Time consuming

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QUESTIONS??