We have the energy to make things work... for you.
Getting to know PSE&G

• Combined electric and gas utility
• 6th highest gas utility in US sales
• Serves 10 of the top 15 cities in NJ
• ~2,400 employees
• 17,955 miles of gas distribution main
• 57 miles of gas transmission main
• 1.2 million gas services
• 1.8 million gas customers
• Sales volume growth: ~1% per year
PSE&G’s Involvement with Mobile Mapping

• PSE&G currently operates and maintains one of the largest inventories of cast iron and unprotected steel gas distribution main at 4,440 miles.
• PSE&G filed multiple Gas System Modernization Program (GSMP) filings.
• Successful support of regulators and other stakeholders have enabled two large accelerated replacement programs.
• Supports DOT focus on replacing the highest risk, most leak prone facilities.
• Upgrades legacy low (utilization) pressure systems to medium pressure.
• Relocates inside meter sets to outside.
• Installs excess flow valve (EFV) safety devices.
• Total ~170 miles of main replacement per year over 8 years.
Prioritization of Cast Iron Main Replacement

- Hazard Index (HI) rankings used to express and compare relative hazard for main segments having a history of breaks.
- Mileage is based upon total low pressure cast iron mileage in grid
Incorporating Methane Mapping into Prioritization

- PSE&G partnered with the EDF, Google, and Colorado State University to perform methane mapping for GSMP I and with Picarro and EDF for GSMP II.
- A vehicle equipped with state of the art methane and meteorological sensors was driven repeatedly along streets with cast iron natural gas pipelines targeted for replacement to map emissions.
Methane Quantification Survey

- Areas generally require 3 passes on each side of the street over multiple nights for proper sampling.
- Indications are run through an algorithm with wind, vehicle speed, ethane content and other factors to determine leak rates.
- Heat maps can show areas of high emissions and calculated leak rates.
# Methane Mapping Results

<table>
<thead>
<tr>
<th>Program</th>
<th>Miles</th>
<th>Grids</th>
<th>Grids Accelerated</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSMP I</td>
<td>175</td>
<td>30</td>
<td>5 of 6</td>
</tr>
<tr>
<td>GSMP II</td>
<td>275</td>
<td>44</td>
<td>6 of 7</td>
</tr>
<tr>
<td>TOTAL</td>
<td>450</td>
<td>74</td>
<td></td>
</tr>
</tbody>
</table>

**GSMP I**

![Graph of GSMP I](image1)

**GSMP II**

![Graph of GSMP II](image2)
Methane Mapping Benefits

• Hybrid methodology allows a focus on risk reduction while maximizing methane emission reduction
• Mains retired earlier than originally planned stop emitting methane faster

• GSMP I
  • By accelerating higher emission grids, PSE&G captured a 37% reduction through the abandonment of 9% of the mileage surveyed.

• GSMP II
  • By accelerating higher emission grids, PSE&G will capture a 41% reduction through the abandonment of 16% of the mileage surveyed.
Overall Challenges

- Logistic issues with municipalities
  - Permitting, restoration requirements, other construction coordination, paving moratoriums
- Sequencing of the work
  - Disruptions to the public
  - System Integrity
- Delay in real-time emission data
Questions?