New England Conference of Public Utilities Commissioners
68th Annual Symposium

METHANE EMISSIONS AND SOLUTIONS IN THE NATURAL GAS INDUSTRY

Newport, RI
June 8, 2015

Paul J. Roberti
Commissioner, Rhode Island Public Utilities Commission
The Synergistic Trilogy of Pipeline Modernization

- Safety (Reduced Risk)
- Efficiency (Lost Gas)
- Environment (Methane Emissions)
“In 2010, there were 34 serious pipeline incidents in which 19 people were killed, 104 were injured. In 2011, another 12 people were killed and 55 injured in 34 serious pipeline incidents. Overall, the number of serious incidents has declined since 1992, but the consequences when something does go wrong are far too large to fail to improve pipeline safety.”

Assessment of National Transportation Safety Board
CAST IRON REMAINS ON PHMSA’S “WATCH LIST”

• **10.5 percent** of the incidents occurring on gas distribution mains involved cast iron mains. However, **only 2.5 percent** of distribution mains are cast iron.

• In proportion to overall cast iron main mileage, the frequency of incidents on mains made of cast iron is more than **four times that of** mains made of other materials.

• **38 percent** of the cast/wrought iron main incidents caused a fatality or injury, compared to only 20 percent of the incidents on other types of mains.

• **12 percent of all fatalities** and **8 percent of all injuries** on gas distribution facilities involved cast or wrought iron pipelines.

Source: USDOT PHMSA
Total Incidents, Injuries, and Fatalities Associated with U.S. Natural Gas Pipelines (PHMSA, 2014)
2013 SYSTEM INTEGRITY REPORT
US-NGrid

2013 TOTAL MAIN LEAKS REPAIRS

TOTAL MAIN INVENTORY
BY MATERIAL
34,821 MILES

- PLASTIC 42%
- OTHER 0%
- PROT'D STEEL 26%
- UNPROT'D STEEL 16%
- CAST IRON 16%

TOTAL MAIN LEAK REPAIRS
BY MATERIAL
9,266 LEAKS (including damages)

- CAST IRON* 70%
- PLASTIC 4%
- ALL STEEL 26%

NOTE: (*) CI Leaks include Other material Leaks.
Leak Count Totals Individual Repairs
• 2011: NARUC establishes Pipeline Safety Task Force after San Bruno, CA and Allentown, PA incidents (13 fatalities)
• April 2013: Task Force converted into permanent Subcommittee on Pipeline Safety
• Congress Enacts Pipeline Safety, Regulatory Certainty and Job Creation Act of 2011
• PHMSA issues “Report to America” and NOPRs
• Close coordination between NAPSR and NARUC
• Efforts include education, technology, surveys and close coordination with PHMSA
"RESOLVED, That the Board of Directors of the National Association of Regulatory Utility Commissioners... *encourages regulators and industry to consider sensible programs aimed at replacing the most vulnerable pipelines as quickly as possible along with the adoption of rate recovery mechanisms that reflect the financial realities of the particular utility in question*; and be it further;

RESOLVED, That State commissions should explore, examine, and *consider adopting alternative rate recovery mechanisms as necessary to accelerate the modernization, replacement and expansion of the nation’s natural gas pipeline systems.*"
States with Accelerated Infrastructure Replacement Programs

Source: American Gas Association
Cast Iron Pipeline Attrition 1990—2013

Now Makes Up Less than 3% of the Distribution

SOURCE: U.S. Department of Transportation, PHMSA, Distribution Annual Data
## Preliminary 2014 Gas Distribution Annual Report Mileage for Eastern Region

*Data as of 03/23/2015*

<table>
<thead>
<tr>
<th>REPORT YEAR 2014</th>
<th>Unprotected Steel</th>
<th>Cast/Wrought Iron</th>
<th>Total Miles leak prone pipe</th>
<th>% leak prone pipe</th>
<th>Total Main Mileage</th>
</tr>
</thead>
<tbody>
<tr>
<td>WASHINGTON DC TOTALS</td>
<td>88</td>
<td>415</td>
<td>503</td>
<td>41.5%</td>
<td>1,212</td>
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<tr>
<td>RHODE ISLAND TOTALS</td>
<td>483</td>
<td>806</td>
<td>1,289</td>
<td>40.4%</td>
<td>3,188</td>
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<tr>
<td>MASSACHUSETTS TOTALS</td>
<td>2,604</td>
<td>3,413</td>
<td>6,037</td>
<td>28.0%</td>
<td>21,526</td>
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<tr>
<td>WEST VIRGINIA TOTALS</td>
<td>2,954</td>
<td>14</td>
<td>2,968</td>
<td>27.7%</td>
<td>10,717</td>
</tr>
<tr>
<td>PENNSYLVANIA TOTALS</td>
<td>8,405</td>
<td>3,007</td>
<td>11,412</td>
<td>24.0%</td>
<td>47,536</td>
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<tr>
<td>NEW YORK TOTALS</td>
<td>7,294</td>
<td>4,095</td>
<td>11,389</td>
<td>23.8%</td>
<td>47,782</td>
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<tr>
<td>CONNECTICUT TOTALS</td>
<td>218</td>
<td>1,381</td>
<td>1,599</td>
<td>20.3%</td>
<td>7,889</td>
</tr>
<tr>
<td>NEW JERSEY TOTALS</td>
<td>2,134</td>
<td>4,788</td>
<td>6,921</td>
<td>20.1%</td>
<td>34,436</td>
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<tr>
<td>MARYLAND TOTALS</td>
<td>367</td>
<td>1,350</td>
<td>1,717</td>
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<td>14,703</td>
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<tr>
<td>NEW HAMPSHIRE TOTALS</td>
<td>40</td>
<td>119</td>
<td>159</td>
<td>8.3%</td>
<td>1,904</td>
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<tr>
<td>MAINE TOTALS</td>
<td>15</td>
<td>48</td>
<td>64</td>
<td>5.7%</td>
<td>1,118</td>
</tr>
<tr>
<td>VIRGINIA TOTALS</td>
<td>708</td>
<td>293</td>
<td>1,001</td>
<td>4.7%</td>
<td>21,143</td>
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<tr>
<td>DELAWARE TOTALS</td>
<td>35</td>
<td>82</td>
<td>117</td>
<td>3.9%</td>
<td>3,034</td>
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<td>VERMONT TOTALS</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0%</td>
<td>757</td>
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<tr>
<td>EASTERN REGION TOTALS</td>
<td>25,345</td>
<td>19,831</td>
<td>45,176</td>
<td>216,945</td>
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</tr>
</tbody>
</table>
New England Pipeline Safety Statistics
MA has more than 6,300 miles of leak prone main (30%)
CT has more than 1,600 miles of leak prone main (21%)
RI has more than 1,300 miles of leak prone main (42%)
NH has more than 170 miles of leak prone main (9%)
ME has more than 60 miles of leak prone main (7%)

2014 DATA
Amount of Leak Prone Pipe (Mains) in New England

MA has more than 7,300 miles of leak prone main (34%)
CT has more than 1,750 miles of leak prone main (25%)
RI has more than 1,500 miles of leak prone main (50%)
NH has more than 200 miles of leak prone main (11%)
ME has more than 60 miles of leak prone main (10%)

2009 DATA
## Positive Trends in New England

### Overall Infrastructure is Increasing

<table>
<thead>
<tr>
<th></th>
<th>2009 (Base)</th>
<th>2012</th>
<th>2013</th>
<th>2012 Increase/Decrease</th>
<th>2013 Increase/Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Increase in Dist Pipelines New England (Miles)</td>
<td>58,972</td>
<td>60,281</td>
<td>61,514</td>
<td>2.2%</td>
<td>4.3%</td>
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<tr>
<td>% Increase in Gas Mains New England (Miles)</td>
<td>35,015</td>
<td>35,593</td>
<td>35,948</td>
<td>1.6%</td>
<td>2.7%</td>
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<tr>
<td>% Increase in Gas Services New England (Miles)</td>
<td>23,957</td>
<td>24,689</td>
<td>25,565</td>
<td>3.1%</td>
<td>6.7%</td>
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</tbody>
</table>

### Aged Infrastructure is Decreasing

<table>
<thead>
<tr>
<th></th>
<th>2009 (Base)</th>
<th>2012</th>
<th>2013</th>
<th>2012 Increase/Decrease</th>
<th>2013 Increase/Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Decrease in Cast Iron Gas Mains New England (Miles)</td>
<td>6,763</td>
<td>6,338</td>
<td>6,153</td>
<td>-6.3%</td>
<td>-9.0%</td>
</tr>
<tr>
<td>% Decrease in Bare Steel &amp; Unprotected Steel Mains (Miles)</td>
<td>4,252</td>
<td>3,626</td>
<td>3,484</td>
<td>-14.7%</td>
<td>-18.1%</td>
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<tr>
<td>% Decrease in Bare Steel &amp; Unprotected Steel Services (Miles)</td>
<td>5,107</td>
<td>4,516</td>
<td>4,454</td>
<td>-11.5%</td>
<td>-12.8%</td>
</tr>
</tbody>
</table>

### 4 year period 2009 to 2013
Leak Prone Pipe Statistics in New England – as of Jan 2014

<table>
<thead>
<tr>
<th>Biggest Decreases in Aged Infrastructure Mains</th>
<th>2009 (Base)</th>
<th>2012</th>
<th>2013</th>
<th>2012 Increase/Decrease</th>
<th>2013 Increase/Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>1,855</td>
<td>1,716</td>
<td>1,659</td>
<td>-7.5%</td>
<td>-10.5%</td>
</tr>
<tr>
<td>MA</td>
<td>7,301</td>
<td>6,579</td>
<td>6,381</td>
<td>-9.9%</td>
<td>-12.6%</td>
</tr>
<tr>
<td>RI</td>
<td>1,576</td>
<td>1,409</td>
<td>1,355</td>
<td>-10.6%</td>
<td>-14.0%</td>
</tr>
<tr>
<td>NH</td>
<td>218</td>
<td>189</td>
<td>174</td>
<td>-13.3%</td>
<td>-20.0%</td>
</tr>
<tr>
<td>ME</td>
<td>65</td>
<td>72</td>
<td>67</td>
<td>10.9%</td>
<td>3.7%</td>
</tr>
<tr>
<td>VT</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Biggest Decreases in Aged Infrastructure Services</th>
<th>2009 (Base)</th>
<th>2012</th>
<th>2013</th>
<th>2012 Increase/Decrease</th>
<th>2013 Increase/Decrease</th>
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</thead>
<tbody>
<tr>
<td>CT</td>
<td>1,008</td>
<td>872</td>
<td>891</td>
<td>-13.5%</td>
<td>-11.7%</td>
</tr>
<tr>
<td>MA</td>
<td>3,178</td>
<td>2,865</td>
<td>2,814</td>
<td>-9.8%</td>
<td>-11.5%</td>
</tr>
<tr>
<td>RI</td>
<td>808</td>
<td>673</td>
<td>648</td>
<td>-16.7%</td>
<td>-19.8%</td>
</tr>
<tr>
<td>NH</td>
<td>125</td>
<td>118</td>
<td>114</td>
<td>-5.9%</td>
<td>-9.0%</td>
</tr>
<tr>
<td>ME</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>-17.8%</td>
<td>-35.6%</td>
</tr>
<tr>
<td>VT</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
It’s Not Just Aging Mains...

• NE Regulators realize Leak Prone Piping Programs must also address the smaller **Service** piping

• **Leak Prone Services** constitute an additional 32% of Leak Prone Piping in NE

• **Leak Prone Services** are equally important as a result of closer proximity to people and property

• **Leak Prone Services** have thinner walls

• **Leak Prone Services** have less cover and more susceptible to 3rd party excavation Damage
Rhode Island Gas Statistics

- National Grid
- 259,060 Customers
- 192,931 Services
- 3,179 miles of main
- 483 miles of unprotected steel mains
- 806 miles of cast iron mains
Company started in 1847
2013 TOTAL MAIN LEAKS REPAIRS

TOTAL MAIN INVENTORY
BY MATERIAL
3,179 MILES

PLASTIC 38%
OTHER 1%
PROT'D STEEL 19%
CAST IRON 26%
UNPROT'D STEEL 16%

TOTAL MAIN LEAK REPAIRS
BY MATERIAL
1,102 LEAKS (including damages)

CAST IRON* 72%
PLASTIC 2%
ALL STEEL 26%

NOTE: (*) CI Leaks include Other material Leaks. Leak Count Totals Individual Repairs.
• Accelerated Replacement Program (ARP)
  – ARP began as part of a 2008 Rate Case Settlement over the 2 year period, funded replacement of 70 miles of Leak Prone Pipe and 4,391 Bare Steel, high pressure services.

• Infrastructure Safety and Reliability Plan (ISR)
  – Replaced existing ARP and legislatively mandated 5 year strategic plan.
  - The plan funds both replacement of leak prone mains and bare steel, high pressure services. The plan also includes funds for system reliability, mandated programs and special projects
  – The plan is expected to annually fund replacement of approximately 60 miles of Leak Prone Pipe and 2,125 Bare Steel, high-pressure inside services.
  – Implementation of a fully reconciling rate mechanism designed to recover actual and anticipated capital investments as reflected in the approved ISR spending plan.
# Rhode Island Leak Prone Pipe Replacement Program

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Spend (Millions of US$)</td>
<td>$18.7</td>
<td>$23.8</td>
<td>$29.3</td>
<td>$36.5</td>
<td>$45.2</td>
<td>$48.3</td>
<td>$50.9</td>
<td>$252.7</td>
</tr>
<tr>
<td>Miles of Main Installed</td>
<td>31.0</td>
<td>39.0</td>
<td>41.7</td>
<td>54.5</td>
<td>56.6</td>
<td>51.4</td>
<td>65.0</td>
<td>339.2</td>
</tr>
<tr>
<td>Annual Impact on Typical Residential Customer (US$)</td>
<td>$2.26</td>
<td>$3.05</td>
<td>$17.51</td>
<td>$27.83</td>
<td>$37.04</td>
<td>$47.70</td>
<td>$59.71</td>
<td></td>
</tr>
</tbody>
</table>

All financial data based on fiscal year (Apr 1 - Mar 31)
National Grid Rhode Island
Leak Prone Pipe Replacement Program

Capital Spend (Millions of US $)
Annual Miles Main Installed
Impact on Typical Residential Customer (US $)
Cost of Pipe Replacement as a Percentage of Total Bill for Residential Customers

FY 2010
- Pipe Replacement: 0%
- All Other Bill Components: 100%

FY 2016
- Pipe Replacement: 5%
- All Other Bill Components: 95%
MAIN LEAK “RATES”
COMPARISON BY MATERIAL

EXCLUDING Damages

LEAK REPAIRS PER MILE OF MAIN

COUNTING EACH INDIVIDUAL REPAIR AS A LEAK

MATERIAL

CAST IRON
ALL STEEL
PLASTIC
ALL MAINS

2004
2005
2006
2007
2008
2009
2010
At Current Pace of Replacement, It will take 20+ Years to Remove Remaining Leak-prone mains
WHAT LIES BENEATH = TIME AND $$$
This research makes apparent that the definitions of LAUF vary widely and that the methods for estimating the magnitude of various LAUF components are not well defined.
“A review of LAUF reports from 2008 to 2011 indicated large variability and inconsistency in reported values.”

*ICF International*

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**Table 1-3: Unaccounted for Gas as Reported to Different Agencies from the Same Company in 2012**

<table>
<thead>
<tr>
<th>Company</th>
<th>MA DPU Annual Return</th>
<th>PHMSA Form 7100</th>
<th>EIA Form 176(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.54%</td>
<td>1.45%</td>
<td>1.25%</td>
</tr>
<tr>
<td>B</td>
<td>2.60%</td>
<td>1.62%</td>
<td>2.2%</td>
</tr>
<tr>
<td>C</td>
<td>0.53%</td>
<td>0%</td>
<td>0.1%</td>
</tr>
<tr>
<td>D</td>
<td>4.55%</td>
<td>3.52%</td>
<td>-30.9%</td>
</tr>
<tr>
<td>E</td>
<td>1.35%</td>
<td>1.30%</td>
<td>9.2%</td>
</tr>
</tbody>
</table>

\(^1\) Percentage calculated by dividing Unaccounted for (Line 20) by Total Supply (Line 7)
Announced! The formation of a technical partnership between DOE and NARUC to enable investments in infrastructure modernization and repairs to natural gas distribution networks. Partnership will provide funding for research and technical workshops to bring together PHMSA and other federal agencies to help establish leak measurement protocols, to identify new technologies and cost-effective practices for enhancing pipeline safety, efficiency and deliverability.
$2.5 to 3.5 Billion competitive funding program to help LDC’s achieve the dual goals of enhanced safety and lower emissions through pipeline replacement, DI&M and other innovative approaches to improving the performance of natural gas distribution systems.

- Federal funding would provide rate-relief for low-income households to help leverage broader, accelerated investments in infrastructure modernization.
- To expedite projects and reduce costs, State governments would be encouraged to coordinate permitting processes between agencies.
- Goal is to support a “portfolio approach” to investments that are most cost-effective within each individual context. Quantifiable benefits could include a combination of gas conservation, avoided fatalities and injuries and reduced GHG emissions (accounting for Social Cost of Carbon).
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