Inline Inspection & Lessons Learned
NGA Fall Conference - Saratoga Springs, NY

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Vermont Gas Transmission

- Vermont Gas
  - 10” Mainline – MAOP 605
  - 16” Looping – MAOP 1440
  - 4” & 6” Sheldon Lateral – MAOP 605
  - 8” North Burlington Lateral – MAOP 605
  - 12” ANGP Pipeline – MAOP 1440
### National Grid Transmission - US

<table>
<thead>
<tr>
<th>NGRID TOTAL</th>
<th>489 Total Miles of DOT Main (&gt;20% SMYS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>301 Total Miles of DOT Pipe in an HCA</td>
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<tr>
<td></td>
<td>661 Total Miles of Local Transmission (&gt; 124 psi; &lt;20% SMYS)</td>
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<tr>
<td></td>
<td>436 Total Miles of Local Transmission (&gt; 200 psi; &lt;20% SMYS)</td>
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<tr>
<td></td>
<td>1149.96 1150 Total Miles of Transmission Main &gt; 124psi</td>
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</tbody>
</table>

![Map of US National Grid Territory](image-url)
### National Grid Transmission
#### New York Regions

<table>
<thead>
<tr>
<th>Region</th>
<th>Total Miles</th>
<th>DOT Main (&gt;20% SMYS)</th>
<th>DOT Pipe in an HCA</th>
<th>Local Transmission (&gt; 124 psi; &lt;20% SMYS)</th>
<th>Local Transmission (&gt; 200 psi; &lt;20% SMYS)</th>
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<tbody>
<tr>
<td>KEDLI</td>
<td>248.86</td>
<td>135.70</td>
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<td>KEDNY</td>
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<td>NMPC</td>
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<td>82.83</td>
<td>310.63</td>
<td>252.03</td>
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</table>
# National Grid Transmission
## New England Regions

<table>
<thead>
<tr>
<th>Region</th>
<th>Description</th>
<th>DOT Main (&gt;20% SMYS)</th>
<th>DOT Pipe in an HCA</th>
<th>Local Transmission (&gt; 124 psi; &lt;20% SMYS)</th>
<th>Local Transmission (&gt; 200 psi; &lt;20% SMYS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGC</td>
<td>97.19 Miles in Boston Gas - BGC</td>
<td>6.31</td>
<td>6.31</td>
<td>90.88</td>
<td>5.47</td>
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<td>EGC</td>
<td>5.99 Miles in Essex - EGC</td>
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<td>0.20</td>
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<td>CCC</td>
<td>88.20 Miles in Colonial Cape - CCC</td>
<td>0.19</td>
<td>0.19</td>
<td>88.01</td>
<td>35.10</td>
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<td>CLW</td>
<td>20.61 Miles in Colonial Lowell - CGC</td>
<td>6.73</td>
<td>6.73</td>
<td>13.88</td>
<td>1.11</td>
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<td>NGC</td>
<td>9.40 Miles in Narragansett - NGC (RI)</td>
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<td>0.00</td>
<td>9.40</td>
<td>0.59</td>
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</tbody>
</table>
• Introduction of Audiences
• Expectation
• Contribution
Design Considerations

- Pipeline pig-ability
- Launching & Receiving Sites
- Launcher & Receiver configurations
- Elbows
- Offset Configurations
- Tees & Off Takes
- Valve Design
- Flow Consideration
- Other design considerations?
Launcher & Receiver Design

- Must Be Long Enough For Inspection Tool
  - Think Long Term!
- Location of Nozzles
- Equalization Line ---- With Valve
- Blow Offs / Drains / Gauges
- Pig Signal
- Size of Bypass/Kicker Line
  - At Least 0.5 D for Line Size
- New Requirement For Relief Valve
Launching & Receiving Sites

- Permanent Sites Are Required
  - Temporary Only If Absolutely Possible (With Approval)
  - Temp Costs Almost As Much As Permanent
  - It’s a Logistical Nightmare
- Layout Room Behind Trap Door?
- Lifting Point – Room For Crane?
- Can We Blow / Bleed Down To Lower Pressure System
Offset Configurations

- Offsets Should Be Kept To Minimum
- Minimum Spacing Between Elbows
- Back To Back Fittings Are a Challenge
- Field Sweeps Preferred
- Must Build As It Was Designed
Speed / Flow Consideration

- Speed Of Pig (Flow) Is Critical
  - Cleaning / Gauging – 5 to 7 MPH
  - Caliper – 5 MPH
  - MFL – 4 to 5 MPH
  - UT – 1.5 to 3 MPH

- For MFL Speed Controls Magnetic Saturation
- Low Speed = Frequent Starts & Stops
- High Speed = Poor Data & Damage (Pig Or Pipe)
- Always Run In The Highest Pressure Possible
- Which Way Does Flow Go
- Do We Have Enough Flow To Run A Pig?
ILI Operational Considerations

- Review Previous ILIs performed on pipeline (if available)
- Ensure pipeline pig-ability (review piping drawings, valves, design, etc.)
- Model system flow with engineering
- System constraints (keep customers in mind)
- Other operational considerations?
ILI Vendor Considerations

- **Vendor Selection**
  - Tool specification / sensitivity / capability

- **Vendor Availability**

- **Previous experience with vendor**

- **Develop a multi-year contract and initiate Purchase Order(s)**

- **Schedule with vendor well in advance (1 year if possible)**

- **Other vendor considerations?**
Which Technology Do I Use?

Depends on what you are looking for:

- Corrosion
- Dents
- Gouges
- Cracks

- internal axial crack along weld seam
- external circumferential crack
- buried axial crack
Data & Analysis

- Tabulate Data
- Magnetic Signature Data
- Viewing Software
- National Grid Standard Data Format
- Handling Large Amounts of Data
- Excavation Prioritization
- Data Verification In The Field
- Remaining Strength Of Defects
- Repairs

- Making Sure The Gas Stays In The Pipe
How Can I Locate An Anomaly

- Dig Sheets
- Conventional Chainage
- GPS Location
- Known Features
- Measure Twice
- Pipe Distance
- Overland Distance
What Happens With A Bad Design

- Pipeline Can not Be Inspected
- Speed Excursions
- Stuck Pigs
- Pipe Line Damage
- Pig Damage
- Incidents

What issues have you seen?
Where Do We Go In The Future

- Make As Much Of The Transmission System ILI Enabled As Possible
- Be Responsive To New Rule Making
- Use New Technologies As They Become Available
  - EMAT
  - Spiral MFL
  - Multi Data Tools
  - Low Field Tools
  - IVP – Through ILI
- Develop Baseline Of Long Seam On Pipelines
- Final thoughts?