Observations on Select Emission Factors for Onshore Natural Gas Processing
Goals of Presentation

I. Provide a limited comparison of CH$_4$ emission factors derived from data reported to the Greenhouse Gas Reporting Program (GHGRP) to those used for the national GHG Inventory (GHGI)

II. Propose approaches to enhance utilization of GHGRP based information in order to improve the derivation of national CH$_4$ emissions from natural gas systems
Natural Gas Processing Segment

Equipment Leaks
# Methane Emissions Comparison

<table>
<thead>
<tr>
<th>Processing Sector Sources</th>
<th>2013 National GHGI (tonnes CH₄)</th>
<th>2013 Mandatory GHGRP (tonnes CH₄)</th>
<th>2014 Mandatory GHGRP (tonnes CH₄)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumatic Devices</td>
<td>1,812</td>
<td>Not included</td>
<td>Not included</td>
</tr>
<tr>
<td>Dehydrators (includes pumps)</td>
<td>9,167</td>
<td>14,474</td>
<td>11,887</td>
</tr>
<tr>
<td>Acid Gas Removal</td>
<td>12,379</td>
<td>CH₄ not included</td>
<td>CH₄ not included</td>
</tr>
<tr>
<td>Flare Stacks</td>
<td>Not included</td>
<td>11,785</td>
<td>11,317</td>
</tr>
<tr>
<td>Equipment Leaks</td>
<td>673,457</td>
<td>93,846</td>
<td>89,112</td>
</tr>
<tr>
<td>Engine Exhaust</td>
<td>165,028</td>
<td>Subpart C</td>
<td>Subpart C</td>
</tr>
<tr>
<td>Blowdowns</td>
<td>44,663</td>
<td>25,904</td>
<td>24,889</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>906,507</strong> (net emissions)</td>
<td><strong>146,008</strong></td>
<td><strong>137,206</strong></td>
</tr>
</tbody>
</table>
Comparison of Methane Emissions from Natural Gas Processing

- CH₄ emissions from Equipment Leaks from the Natural Gas processing segment are shown to be six times larger in the GHGI when compared to those reported under the GHGRP.

- The number of gas plants reporting to the GHGRP are different from the number included in the GHGI.
  - The difference in the number of plants does not fully account for the emission differences.
The table below compares the emission factors (Tonnes CH₄/Plant) from national GHGI and as reported under the GHGRP.

The GHGRP data are based on survey results to determine the number of leakers and applying the corresponding emission factor.

The GHGI data are based on a plant-wide emission factor from the 1996 EPA/GRI Study.

<table>
<thead>
<tr>
<th>Reporting Year</th>
<th>GHGI (Plant Potential Emissions)</th>
<th>GHGRP (Plant survey data)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># Plants</td>
<td>Tonnes CH₄</td>
</tr>
<tr>
<td>2014</td>
<td>Not Available</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>650</td>
<td>36,126</td>
</tr>
<tr>
<td>2012</td>
<td>606</td>
<td>33,685</td>
</tr>
</tbody>
</table>
Equipment Leaks Emissions

- Natural gas plant equipment leaks emission estimates for the GHGRP rely on facility surveys.

- The EF used for estimating plant equipment leaks in the 2013 GHGI is ~50% higher than the EF one derives based on plant screening and applying the “leaker” emission factor specified in the reporting rule.
  - GHGRP derivation provides a more representative estimate than the GHGI EF approach.

- This may partially account for the 6-fold difference between the emissions reported under the two programs.
### Processing Reciprocating Compressors

- Data below compares **equipment leaks** emission factors associated with compressor components in natural gas processing plants.
- Data does NOT include emissions due to venting or blowdown events.

<table>
<thead>
<tr>
<th>Year</th>
<th>GHGRP (leak survey) # of Compressors</th>
<th>CH₄ scfd/compressor</th>
<th>GHGI (potential to emit) # of Compressors</th>
<th>CH₄ scfd/compressor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>2,635</td>
<td>2,819</td>
<td>Not available</td>
<td>Not available</td>
</tr>
<tr>
<td>2013</td>
<td>2,514</td>
<td>3,341</td>
<td>5,679</td>
<td>9,741</td>
</tr>
<tr>
<td>2012</td>
<td>2,197</td>
<td>2,662</td>
<td>5,624</td>
<td>9,741</td>
</tr>
</tbody>
</table>
Processing Centrifugal Compressors

- Data below compares equipment leaks emission factors associated with compressor components in natural gas processing plants
- Data does NOT include emissions due to venting or blowdown events

<table>
<thead>
<tr>
<th></th>
<th>GHGRP (survey)</th>
<th>GHGI (potential to emit)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># of Compressors</td>
<td>CH₄ scfd/compressor</td>
</tr>
<tr>
<td><strong>Centrifugal Compressors (associated components no vents)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014 (Wet Seal)</td>
<td>275</td>
<td>9,943</td>
</tr>
<tr>
<td>2014 (Dry Seal)</td>
<td>186</td>
<td>679</td>
</tr>
<tr>
<td>2013 (Wet Seal)</td>
<td>277</td>
<td>9,288</td>
</tr>
<tr>
<td>2013 (Dry Seal)</td>
<td>183</td>
<td>1,914</td>
</tr>
<tr>
<td>2012 (Wet Seal)</td>
<td>275</td>
<td>11,737</td>
</tr>
<tr>
<td>2012 (Dry Seal)</td>
<td>158</td>
<td>1,252</td>
</tr>
</tbody>
</table>
Conclusions and Recommendations

- Data from GHGRP provide a better basis for emission estimates than the GHGI EF approach.
- A thorough examination of available GHGRP data is needed to update data for the GHGI that is decades old.
- Emerging research may provide new emission factors and independent evaluations of assumptions made for many key GHG sources.
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