The Importance of Greenhouse Gas Mitigation in the Extractive Industries of UNECE Countries

Clark Talkington, Vice President
ADVANCED RESOURCES INTERNATIONAL, INC.
Arlington, VA

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Focus on Oil & Gas and Coal Industries

- Very important economic sectors in a number of ECE countries
- Key role in ending energy poverty
- Largest share of greenhouse gases among extractive industries
  - O&G ranks 2nd (23%) and coal mining ranks 4th (8%) among sources of anthropogenic methane emissions\(^1\)
  - CMM emissions in 2030 projected to be 784 MtCO2e
  - O&G emissions in 2030 projected to be 2,113 MtCO2e
- \(\text{CH}_4\) from venting and \(\text{CO}_2\) emissions are a growing concern\(^2\)
  - \(\text{CH}_4\) =16% of global GHG emissions
  - GWP of \(\text{CH}_4\) is 28-34 times greater than \(\text{CO}_2\) (AR5)
  - Flaring gas reduces \(\text{CH}_4\) emissions but can produce large volumes of \(\text{CO}_2\) and \(\text{N}_2\text{O}\)

Sources:
\(^1\) Global Methane Initiative. \textit{Global Methane Emissions and Mitigation Opportunities.} \url{https://www.globalmethane.org/documents/analysis_fs_en.pdf}
\(^2\) IPCC. \textit{5th Assessment Report (AR5)}
Oil & Gas: Emission sources throughout the value chain

Production

Gathering

Midstream

Transportation

Distribution

Production & Processing
1. Onshore Petroleum & Natural Gas Production
2. Offshore Petroleum & Natural Gas Production
3. Total Crude Oil to Refineries
4. Petroleum Refining
5. Gathering and Boosting
   "Data collection will begin in FY16"
6. Gas Processing Plant
   "May contain NGL fractionation equipment"
7. Natural Gas Liquids (NGL) Supply

Natural Gas Transmission & Storage
8. Transmission Compressor Stations
9. Underground Storage
10. Liquefied Natural Gas (LNG) Storage
11. LNG Import-Export Equipment
12. Natural Gas Transmission Pipeline
   "Data collection will begin in FY16"

Distribution
13. Large End Users
14. Natural Gas Distribution
15. Natural Gas & Petroleum Supply to Small End Users

Source: U.S. EPA’s Greenhouse Gas Reporting Program (GHGRP)
Coal Mining: Majority of emissions are production-related
Important distinctions between industries

<table>
<thead>
<tr>
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<th>Oil and Gas</th>
<th>Coal Mining</th>
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</thead>
<tbody>
<tr>
<td><strong>Principal Greenhouse Gases</strong></td>
<td>CH$_4$ (venting) CO$_2$ (flaring)</td>
<td>CH$_4$</td>
</tr>
<tr>
<td><strong>Industry segments</strong></td>
<td>Production thru Distribution</td>
<td>Production</td>
</tr>
<tr>
<td><strong>Impact to industry</strong></td>
<td>Loss of saleable product</td>
<td>Byproduct of mining</td>
</tr>
<tr>
<td><strong>Number of Emission Pathways</strong></td>
<td>Many</td>
<td>2</td>
</tr>
<tr>
<td><strong>Industry scope (# of facilities)</strong></td>
<td>Widely distributed</td>
<td>Very concentrated</td>
</tr>
<tr>
<td><strong>Impact of leaks</strong></td>
<td>Can be large</td>
<td>Virtually non-existent</td>
</tr>
<tr>
<td><strong>Potential for an “upset” event</strong></td>
<td>More likely</td>
<td>Less likely</td>
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GHG emissions by major CH$_4$ sector: U.S. example

**GHG Liberation by Sector**

- **Facilities**: 128, 2350, 1233
- **Emissions (Million tCO2e)**: 250, 225, 200, 175, 150, 125, 100, 75, 50, 25, 0

**Sector GHG Emissions per Facility**

- **Coal Mines**: 350 Thousand tCO2e
- **Oil and Gas**: 250 Thousand tCO2e
- **Municipal Landfills**: 150 Thousand tCO2e

Source: U.S GHGRP 2014
Comparison of emission sources by equipment counts: U.S. example

Underground Coal Mines:
- **Facilities**: 128
  - **Wells**: 476
  - **Shafts**: 649*

Onshore Oil & Gas Production:
- **Facilities**: 523
  - **Wells**: 499,023
  - **Atmospheric Tanks**: 275,532
  - **Pneumatic Pumps**: 79,881
  - **Pneumatic Devices**: 785,113
  - **Reciprocating Compressors**: 23,318
  - **Centrifugal Compressors**: 69

*Total shafts are believed to be lower because some reporters over-count: average is 3 shafts per mine

Source: (U.S. GHGRP 2014 Data)
Why reducing GHGs in the extractive is important

• Without intervention, these industries are likely to continue as major GHG emitting sectors.

• Technologies and best practices to reduce emissions are available, have been demonstrated and have been commercialized for both industries

• We have a unique opportunity to “green” these industries by reducing the carbon footprint of their value chains while potentially improving their bottom line
Challenges facing GHG mitigation efforts

- Industries are facing economic headwinds necessitating focus on core business
- Further R&D and wider deployment are necessary to reduce capex and opex for some technologies
- Economic benefits may be small relative to a facility’s total revenue stream
- Vertically integrated firms must align facility, local, regional, national, and international objectives
- Limited economic incentives (carbon markets, feed-in tariffs, other environmental commodities, attractive energy prices)
- Technical expertise may not be available
How can the UNECE play a role?

• Fill data gaps

• Engage stakeholders including the private sector

• Provide a forum for exchange of ideas, lessons learned, best practices

• Support development of norms and standards

• Technology transfer including establishment of International Centres of Excellence
Thank You

Clark Talkington
Vice President
ctalkington@adv-res.com

4501 Fairfax Drive, Suite 910
Arlington, VA 22203
Phone: (703) 528-8420
Fax: (703) 528-0439

Advanced Resources International
www.adv-res.com