Methane Management in Extractive Industries (Upstream Oil and Gas / Downstream Gas)

-Joint UNECE/GMI Project

Torleif Haugland, Carbon Limits
Michal Drabik, UNECE

Geneva, March 2018
Outline

1. Data sources and emissions estimates
2. MRV
3. Mitigation and summary of gaps
1 Emission sources and levels

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Main sources of methane emissions in Oil and Gas operations

<table>
<thead>
<tr>
<th>OIL PRODUCTION</th>
<th>GAS PRODUCTION</th>
<th>GAS PROCESSING</th>
<th>GAS TRANSMISSION</th>
<th>GAS DISTRIBUTION</th>
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**OIL PRODUCTION**
- Associated Gas Venting and flaring
- Casing-head gas venting
- Storage tanks/loading
- Pneumatic devices
- Well completion

**GAS PRODUCTION**
- Compressors
- Dehydrators
- Pneumatic devices
- Liquid unloading
- Well completion

**GAS PROCESSING**
- Compressors
- Dehydrators
- Pneumatic devices
- Maintenance/blowdown

**GAS TRANSMISSION**
- Compressors
- Dehydrators
- Pneumatic devices
- Engines
- Maintenance/blowdown

**GAS DISTRIBUTION**
- Engines
- Maintenance/blowdown

**LEAKS / VENTS**
- Mishaps and blowdown

**UPSTREAM OIL AND GAS**

**DOWNSTREAM GAS**
ECE region accounts for half of global oil and gas methane emissions

...country specific estimated differs greatly by data source

* Data for 2015 for Annex I countries and latest reports for non-Annex I countries. US EPA estimate is used for total global methane emissions from the oil and gas sector.
Operational practices vary a lot between countries ... reflected in large differences in emissions by source/equipment

Differences in value chain emissions also reflect great variations in reporting practices

*Share of upstream and downstream methane emission in ECE per region - UNFCCC reporting*
A small share of emission points represents a large share of the emissions. And they are generally not well accounted for in the overall methane emission reporting.

Example from US and Canada: 5% of the emitting components represents about 50% of the emissions (based on a sample of 60,000 measurements).

Example from Europe: 11% of the emitting components is responsible for most of the emissions (based on a sample of 800,000 data points).


2 MRV

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MRV at three levels – serving different purposes
... but for the same broader objective

**International GHG inventories**
- Estimates according to UNFCCC & IPCC principles
- Estimates based on: Activity * Emission factor
- Uncertainty in estimates represented by Tiers
  - Tier 1: Top-down average emission factor approach
  - Tier 2: Country-specific emission factors
  - Tier 3: Rigorous bottom-up approach

**National data for policies and measures**
- How to obtain a knowledge base adequate for the design of cost-efficient measures
- Can good enough data be provided as a basis for use of economic policy instruments?
- How to estimate super-emitter sources?

**Facility data for corporate action**
- Can be part of LDAR’s
- Reporting of incidents - intermittent venting
  - How can it be estimated?
- Detection and measurements as a basis for “house-keeping” and investment programs
### ... more on MRV challenges

<table>
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<th>Regulator</th>
<th>Operator</th>
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<tbody>
<tr>
<td>Gap between bottom up and top down analyses</td>
<td>Quick and reliable quantification technologies</td>
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<tr>
<td>How to estimate super-emitters?</td>
<td>Cost effective detection of high emitters</td>
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<td>How to estimate (intermittent) venting?</td>
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3 Mitigation

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Low-hanging fruit

Abatement costs and Investment requirement in the “EBRD Region”

Investment required (in Billion USD/MtCH4)

Abatement Potential in Mt CH4

- Above 10 USD/tCO2eq
- Between 5 and 10 USD/tCO2eq
- Between 0 and 5 USD/tCO2eq
- Negative abatement cost

(2 billions USD)
(4.5 billions USD)

(5.4)
(2)
Mitigation options: some off-the-shelf technologies are available…

Some mature mitigation technologies are available but often not implemented, such as:

- Regular LDAR
- Storage tank venting - VRU
- Centrifugal compressor venting
  - Wet to dry seals
  - Reroute wet seal emissions
- Regular rod packing replacement
- Venting during pipeline maintenance - Mobile compressor stations

Cost and benefits of projects are **site specifics**

… but a large share of projects are **profitable**
Summary of gaps

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Summary of the gaps

Data sources and emissions estimates
- Different sources show large variations in estimates by country
- Specification by value chain components often poor
- Super-emitters & intermittent venting not fully accounted for
- Problematic that so much of estimates in ECE are Tier 1:
  - 75% upstream
  - 40% downstream

MRV
- Lack of transparency in estimates and reporting
- Quick & reliable quantification technologies needed, primarily at the plant level
- Much valuable site specific data is “lost” and not being used for mitigation and/or statistical purposes
- Some default emission factors show great variations

Mitigation
- Lack of awareness of negative cost options
- Societal vs company costs, lack of carbon pricing
- New approaches can help in spurring profitable emission reduction opportunities
- Knowledge base inadequate in order to design and implement effective and cost efficient policies and measures
5 UNECE and GMI Project

Michal Drabik, UNECE
Project Overview

➢ To assess methane emissions in Upstream Oil and Gas, and in Downstream Gas industries in the UNECE member States.

➢ To increase capacity of the UNECE Member States for MRV and reduce methane emissions in Upstream Oil and Gas, and in Downstream Gas industries.
Expected Project Deliverables

Preparation of two documents: (1) upstream oil and gas, and (2) downstream gas, that each contain:

1. A high-level assessment of methane emissions in UNECE member states;

2. Identification of best practices for MRV of methane emissions;

Expected Project Deliverables Continued…

1. Development of standard training modules on best practices for (1) MRV and (2) reduction of methane emissions;

2. Two capacity-building seminars to test and validate training modules;

3. Two capacity-building workshops on best practices for (1) MRV and (2) reduction of methane emissions
Project Stakeholders

- **Principal implementing body**: UNECE Group of Experts on Gas, in cooperation with Global Methane Initiative (GMI) Oil and Gas Subcommittee

- **Sponsored by the US EPA**

**Stakeholder Involvement:**

**Executive Steering Committee**: UNECE and GMI representatives

**Technical Experts Drafting Group**: Torleif Haugland (consultant)

**Stakeholder Advisory Board**: UNECE Group of Experts on Gas Bureau members + others (tbc)

**Peer Review Group**: UNECE Group of Experts on Gas members, GMI Oil and Gas Subcommittee members, CH4 Industry Meeting Group
Estimated Timeline

Reports on

1. Methane emissions and best practices for their MRV in Upstream Oil and Gas and Downstream Gas industries in the UNECE member States

2. Best practices for reducing methane emissions in Upstream Oil and Gas and Downstream Gas industries in the UNECE member States

- First Draft: 4 June 2018
- Second Draft: 1 October 2018
- Final Document: 17 December 2018
Estimated Timeline Continued…

1. Final Versions of:

- **Best Practice Guidance for Effective Methane Management: Upstream Oil and Gas Sectors**
  unifying in a consistent and a logical manner two substantive reports on:
  - methane emissions and best practices for their MRV in Upstream Oil and Gas industries in the UNECE member States;
  - best practices for reducing methane emissions in Upstream Oil and Gas industries;

- **Best Practice Guidance for Effective Methane Management: Downstream Gas Sector**
  unifying in a consistent and a logical manner two substantive reports on:
  - methane emissions and best practices for their MRV in Downstream Gas industry in the UNECE member States;
  - best practices for reducing methane emissions in Downstream Gas industry.

- **By 18 March 2019**
Thank you