Methane emissions from oil and gas

Tracking Clean Energy Progress

Not on track

Methane emissions from the oil and gas sector reached close to 80 Mt (or 2.4 billion tonnes of CO_2 equivalent) in 2017. This is equal to 6% of global energy sector GHG emissions. Emissions remain high despite initial industry-led initiatives and government policies announced recently. Implementing abatement options quickly and at scale remains a real challenge. Policies will be critical to achieve the 75% emissions reduction by 2030 demonstrated in the SDS. Further innovation is needed both to increase understanding of emissions levels and to help reduce the cost of emissions mitigation strategies such as leak detection and repair.

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Global methane emissions from oil and gas operations

HistoricalSustainable Development ScenarioMtCH420002010202020300100204060801EA. All rights reserved.2014● Methane emissions: 75.4 MtCH4

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Tracking progress

Evaluating emissions trends

The concentration of methane in the atmosphere is currently 2.5 times higher than pre-industrial levels. Methane has important implications for climate change, particularly in the near term.

Although it has a much shorter atmospheric lifetime than CO_2 – around 12 years, compared with centuries for CO_2 – it absorbs much more energy while it exists in the atmosphere (one tonne of methane absorbs 84 to 87 times more energy than one tonne of CO_2 for the first 20 years after being emitted to the atmosphere.)

The energy sector was responsible for 130 Mt of methane emissions in 2012, (Saunois at al., 2016). Although emissions occur during coal and biofuel production and consumption, oil and gas operations are likely the largest source of emissions from the energy sector. Global oil- and gas-related methane emissions in 2017 were estimated to be 80 Mt.

There is considerable uncertainty about oil and gas methane emissions levels, however, as estimates are based on sparse and sometimes conflicting data, and there is wide divergence in estimates at the global, regional and country levels.

Nevertheless, enough is known to conclude that these emissions cannot be ignored and that they represent a clear risk to the environmental credentials of natural gas.

Technology performance

A wide variety of technologies and measures is available to reduce methane emissions from oil and gas operations: these are generally well known and well understood.

Devices such as vapour recovery units and plunger lifts can be installed, while existing devices can be replaced with lower-emitting alternatives such as instrument air systems, pneumatic pumps and electric motors.

Another cost-effective mitigation option is leak detection and repair (see Innovation section below), which is critical to detect and mitigate fugitive (or accidental) methane leaks.

Since methane is a valuable product, and in many cases can be sold if it is captured, the IEA estimates that around 45% of the 80 Mt of methane emissions that occur today could be avoided with measures that would have no net cost.

In spite of this, methane emissions from oil and gas operations appear to remain stubbornly high.

Trends are diverging strongly from those of the Sustainable Development Scenario (SDS). In the SDS, all technology options are quickly deployed across the oil and gas value chains – even if those measures cannot pay for themselves – leading to a 75% fall in emissions from current levels by 2030.

Industry-led initiatives and policy actions

Multiple international oil companies (IOCs) have set targets to restrict emissions or the emissions intensity of production. There are also a number of voluntary, industry-led efforts to reduce methane emissions from oil and gas operations:

- The Methane Guiding Principles (MGP) established in 2017 is a multi-stakeholder collaborative platform incorporating over 20 institutions from industry, intergovernmental organisations (including the IEA), academia, and civil society. The principles aim to advance understanding and best practices for methane emissions reduction and to develop and implement methane policy and regulation.
- The Oil and Gas Climate Initiative (OGCI) aims to improve methane data collection and develop and deploy cost-effective methane management technologies; it consists of thirteen major international oil and gas companies. In 2018, OGCI members announced a target to reduce the collective average methane intensity of its aggregated upstream gas and oil operations to below 0.25% by 2025 (from 0.32% today), with an ambition to ultimately achieve a level of 0.2%.
- The Oil & Gas Methane Partnership (an initiative of the Climate and Clean Air Coalition) provides protocols for companies to survey and address emissions and a platform for them to demonstrate results. It consists of group of ten oil and gas companies, governments, UN Environment, World Bank, and the Environmental Defence Fund.

However, there are limits to what can be achieved by voluntary action because the pool of those willing to take such action is limited, and because the actions themselves may fall short of what is desirable from a public policy perspective.

Policies and regulations are therefore essential to bring emissions more into line with the SDS. Emissions reduction policies are not as ubiquitous as they should be, but some progress has been made:

- Canada has introduced regulations to cut methane emissions 40-45% by 2025 from the 2012 baseline. The provinces of Alberta, British Columbia and Saskatchewan have additional regulatory measures in place to address venting and flaring from upstream oil and gas operations.
- The United States is in a similar position, and several states (including California, Colorado, Ohio, Pennsylvania, Utah and Wyoming) have their own regulation and standards on methane emissions that accompany or amplify obligations arising from federal rules. These vary in scope, but all require mandatory inspection of facilities at varying intervals.
- Many European countries have regulations on reporting and limiting emissions levels. In Norway, for example, each oil and gas facility estimates and reports methane emissions annually using a common estimation method that relies on standard emission factors; methane emissions from venting are taxed.

Recommended actions

Quantitative targets set by IOCs to restrict emissions are a welcome first step to help bring this subsector closer to SDS alignment.

For companies already claiming low emissions, seeking to continuously reduce emissions is as valuable as quantitative limits. Third-party verification and transparency on data and methods are also essential for credible reporting.

In addition, large volumes of methane are emitted from assets not operated by IOCs. A critical near-term step will be for IOCs to apply their leakage criteria to oil and gas produced from joint ventures and non-operated assets.

Along with these voluntary efforts, policies and regulations will be central to methane emissions reductions. Methane emissions reduction commitments can be an important addition to Nationally Determined Contributions in line with the Paris Agreement.

Although improving data gathering and reporting is a key first step, a lack of detailed information on emissions levels should not preclude the introduction of emission

abatement goals. Policies should concurrently seek to encourage operators to take advantage of abatement opportunities.

Some of the key considerations and principles that could inform methane emissions reduction strategies are set out below. They are likely to be most successful if carried out in stages to help maximise effectiveness and efficiency while shifting emissions trends.

Emphasise data gathering: uncertainty about current emissions levels is high, and reducing this through direct measurement is critical to improve understanding of the issue, to measure progress against goals, and to develop and refine objectives and targets. There are large data gaps that need to be addressed for multiple major gas producing and consuming regions, including Russia and the Middle East.

Set an overall emissions reduction goal: these can be expressed both in broad, qualitative terms and as specific, quantitative and time-bound targets.

Foster innovation: the lack of technological innovations to detect emissions and deliver reliable measurements at low cost is a key technology gap that needs to be a focus of both public support and private initiatives. Methane management can also be embedded in the oil and gas industry's ongoing digitalisation efforts.

Maximise transparency: measurement and analysis protocols (including existing datasets) could be shared within and among the industry and regulators to facilitate consistent approaches to quantification and abatement and to help spur implementation.

Ensure widespread engagement during the design of regulations: it is essential to explain why regulation is required, and then consult on how it is to be achieved, with the aim of securing support and buy-in from as broad a stakeholder group as possible.

Incentivise collaboration: industry partnerships between international and national oil companies can provide a powerful impetus for the adoption of best practices in regions where policy and regulatory frameworks are less developed. Oilfield service companies, technology firms and auditing firms can also be involved.

Establish enough enforcement: effective enforcement entails deciding how oversight and regulation should be carried out, determining which institution is to be charged with

regulation or enforcement, providing leadership and resources for that institution, and establishing meaningful disincentives that support behavioural change, such as penalties for non-compliance.

Incorporate flexibility into measurement and abatement policies: this might be done through various means, including allowing for adjustments to overall goals over time if interim milestones are either exceeded or not met.

Focus on outcomes: in deciding the specific practices, standards, technologies, certification systems and quantitative limits to be introduced, it is important to bear in mind the overarching emissions reduction goal and to focus on the outcomes to be achieved.

Encourage new corporate thinking on methane emissions reduction: while some companies view the minimisation of methane emissions as a central pillar of their operations, others appear to attach much less importance to it