



Untapped Potential

Reducing Global Methane Emissions from Oil and Natural Gas Systems

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Key Findings

SIGNIFICANT GLOBAL METHANE LEAKAGE

Based on the best currently available data, around 3.6 trillion cubic feet (Tcf) of natural gas escaped into the atmosphere in 2012 from global oil and gas operations. This wasted gas translates into roughly \$30 billion of lost revenue at average 2012 delivered prices, and about 3% of global natural gas production.

Because the primary component of natural gas, methane, is an extremely potent greenhouse gas (GHG), methane leakage has important climate implications. Methane escaping from oil and gas operations totaled approximately 1,680 million metric tons of carbon dioxide equivalent (MtCO₂e) in 2012, calculated based on methane's 100-year global warming potential (GWP). If it were a country, oil and gas methane emissions would rank as the world's seventh largest emitter, coming in just under Russia. Using methane's 20-year GWP – a measure of the short-term climate impact of different GHGs – increases the share of oil and gas methane to over 8% of global GHG (with emissions of 5,650 Mt CO₂e), the equivalent of about 40% of total CO₂ emissions from global coal combustion in 2012.

The 3.6 Tcf of lost natural gas across the world would rank as the world's seventh largest natural gas producer, with nearly as much escaped gas globally as Norway's total production in 2012.

The majority of oil and gas methane leakage comes from a handful of countries: the top seven emitting countries were responsible for over half of the global total in 2012; the top 30, including the EU, accounted for three-quarters.

The global methane emissions estimates included in this report, while more detailed and robust than anything currently available, are limited by the lack of credible, up-to-date estimates for most countries. Better national inventory practices and more regular reporting are critical to improve our understanding of the scale of the methane leakage challenge and to inform effective mitigation strategies.

A GROWING PROBLEM ABSENT NEW EFFORTS

Global oil and gas methane emissions will grow absent further efforts to reduce leakage. For example, in our central oil and gas production growth scenario (and

using currently available leakage data), emissions increase 23% between 2012 and 2030. A 23% increase would add over 380 MTCO₂e in 2030 (using a 100-year GWP), equivalent to Poland's total GHG emissions in 2012. By comparison, the International Energy Agency (IEA) projects global energy-related CO₂ emissions will grow by only 15% between 2012 and 2030.

COST-EFFECTIVE ABATEMENT OPPORTUNITIES

For oil and gas producing countries, controlling methane emissions can provide a significant and potentially low-cost opportunity to achieve additional GHG abatement in 2020 and beyond. If just the top 30 oil and gas methane emitting countries were to reduce those emissions 50% below 2012 levels by 2030, this would prevent the loss of 1.8 Tcf of natural gas supply worldwide. Additionally, a 50% decrease would reduce overall global emissions by roughly 700 MTCO₂e using a 100-year GWP, nearly the equivalent of total Canadian GHG emissions in 2012. Reductions of 75% below 2012 levels in 2030 would increase natural gas supply by 2.7 Tcf and achieve over 1,000 MTCO₂e of GHG abatement using a 100-year GWP, nearly the equivalent of Germany's total GHG emissions in 2012. Using a 20-year GWP for methane, the 50% goal would achieve reductions of over 2,300 MTCO₂e (the equivalent of India and the EU's combined CO₂ emissions from coal combustion in 2012) and the 75% goal would reduce emissions by around 3,400 MTCO₂e (nearly as much as all CO₂ emissions from coal combustion from OECD countries in 2012).

WHAT IT MEANS

Methane emissions from oil and gas operations worldwide represent a significant loss of natural gas resources and is a material contributor to total GHG emissions and global climate change. Despite its climate significance, very few countries have taken steps to regulate methane emissions from the oil and gas sector or set specific goals to reduce emissions in the future. This leaves a potentially cost-effective source of GHG abatement on the table, one that complements and reinforces other GHG reduction efforts. For many countries, tackling oil and gas methane emissions, including as a component of their Intended Nationally-Determined Contributions to the UN agreement to be adopted this year in Paris, could make a meaningful contribution to their overall GHG reductions by 2030.

Due to methane's short-term climate impact, reduction of methane leakage today can deliver immediate climate benefits while nations pursue longer-term strategies to reduce CO₂. However, unless methane emissions are taken into account, the overall GHG benefits of natural gas will be overestimated. It will be essential for countries to integrate better measurement and management of oil and gas methane emissions into the development, assessment and implementation of long-term GHG mitigation plans to maximize GHG reductions from those policies.

To do this, countries and their oil and gas industry partners need to significantly improve measurement and accounting of methane emissions from the sector. Improved estimation methods and more frequent reporting is critical both to improve our understanding of the magnitude of the oil and gas methane challenge and to enhance the effectiveness of GHG mitigation strategies.

Top 30 oil and gas methane emitting countries in 2012

Excluding major oil and gas producers for which no data is available

	100-year GWP			20-year GWP	
	MT CO ₂ e	% global o&g CH ₄	% country total GHG	MT CO ₂ e	% country total GHG
Russia	387	23%	21%	1301	39%
US	192	11%	3.4%	647	8.7%
Uzbekistan	97	5.8%	42%	326	65%
Canada	54	3.2%	7.1%	180	17%
Mexico	43	2.6%	5.4%	146	11%
Azerbaijan	43	2.6%	53%	145	72%
EU	43	2.5%	1.0%	143	2.6%
Iran	43	2.5%	7.2%	143	18%
Venezuela	38	2.3%	16%	128	32%
Turkmenistan	37	2.2%	33%	126	47%
Algeria	30	1.8%	19.3%	99	38%
UAE	29	1.7%	9.8%	98	25%
Ukraine	29	1.7%	7.4%	96	17%
Nigeria	27	1.6%	8.1%	91	14%
India	25	1.5%	1.1%	85	2.3%
Indonesia	16	0.9%	0.8%	53	1.9%
Malaysia	14	0.8%	3.0%	46	7.7%
Thailand	12	0.7%	3.6%	41	7.4%
Pakistan	10	0.6%	3.2%	35	5.7%
Egypt	10	0.6%	3.3%	34	7.9%
Argentina	10	0.6%	3.4%	34	6.2%
South Korea	10	0.6%	1.5%	33	4.4%
Saudi Arabia	10	0.6%	1.9%	32	5.3%
Kazakhstan	8.6	0.5%	3.2%	29	7.1%
Côte d'Ivoire	8.2	0.5%	3.1%	27	8.4%
Australia	7.4	0.4%	1.3%	25	2.7%
Colombia	7.2	0.4%	3.2%	24	6.0%
China	6.4	0.4%	0.1%	22	0.1%
Brazil	4.7	0.3%	0.2%	16	0.5%
Vietnam	4.6	0.3%	1.8%	16	3.2%
Total Top 30	1,251			4,205	
World Total	1,682		3.7%	5,650	8.8%