Global Energy Monitor

BRIEFING: NOVEMBER 2022

Methane Corporates

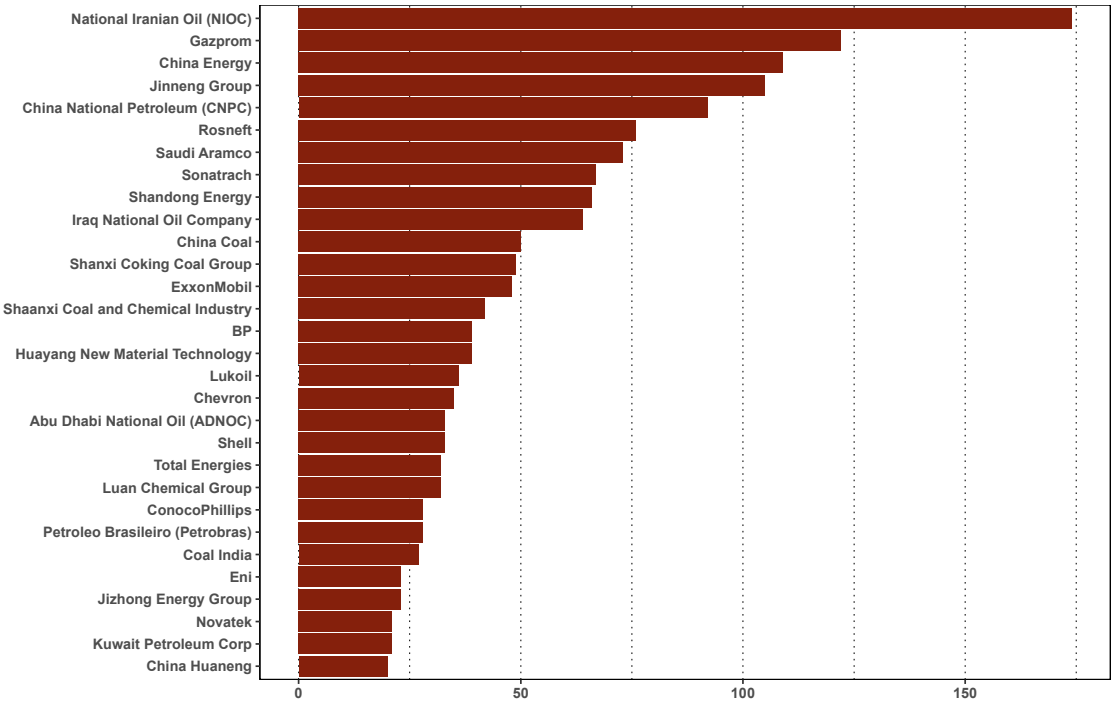
30 COMPANIES RESPONSIBLE FOR NEARLY HALF OF THE ENERGY SECTOR'S METHANE EMISSIONS

Just 30 fossil fuel companies are responsible for nearly half (43%) of the industry's global methane emissions, according to a new estimate by Global Energy Monitor (GEM). The International Energy Agency (IEA)'s Methane Tracker has estimated that coal, oil and gas operations emitted 126 million metric tons of methane last year, and GEM's analysis suggests that 19 oil and gas companies and 11 coal companies were responsible for 54 million tons of those methane emissions.

GEM modeled coal mine methane emissions using data from its Global Coal Mine Tracker, and oil and gas methane emissions using data from IEA's Methane Tracker and corporate annual reports. For each fuel (coal or oil/gas), we ranked the top ten national and state-owned enterprises, and top ten international and investor-owned companies for each sector (see methodology at the end of this report).

We found that the 30 fossil fuel companies with the highest estimated emissions included national and investor-owned oil and gas companies headquartered in over a dozen countries and state-owned coal companies in China and India.

Figure 1: Fossil fuel company methane emissions



Sources: GEM calculations from IEA's Methane Tracker Database, the Natural Resources Governance Institute's National Oil Company Database, and the Carbon Accountability Institute's Carbon Majors 2020 report; Global Coal Mine Tracker, Global Energy Monitor.

Background

Global methane emissions are the second-largest contributor to global warming after carbon dioxide (CO_2). The gas is a short-lived climate pollutant with an average atmospheric lifespan of roughly 12 years, yet it has a much stronger warming potential in that timeframe. In the latest estimates from the Intergovernmental Panel on Climate Change (IPCC), compared with CO_2, methane traps 82.5 times more heat when averaged over 20 years, and 29.8 times more when averaged over 100 years (referred to as CO_2e100). In 2021, a team of scientists led by the Environmental Defense Fund (EDF) concluded that slashing methane emissions would "immediately slow" global warming by 30%, averting 0.5 degrees C of warming before the end of the century.

The fossil fuel industry is responsible for 35% of human-induced methane emissions, according to the International Energy Agency, totaling 126 million metric tons of methane in 2021.

Ranking corporate methane emissions

GEM estimated oil and gas sector and coal sector methane emissions at the corporate level and found that 30 fossil fuel companies are responsible for 43% of the fossil fuel industry's emissions (Table 1).

Table 1: Fossil fuel company methane emissions

Company	Headquarters	Fuel Sector	Annual CH_4 emissions (million tons)	Annual CH_4 emissions (million tons CO_2e100)
National Iranian Oil Company (NIOC)	Iran	Oil and Gas	5.9	174
Gazprom	Russia	Oil and Gas	4.1	122
China Energy	China	Coal	3.6	109
Jinneng Group	China	Coal	3.5	105
China National Petroleum Corporation	China	Oil and Gas	3.1	92
Rosneft	Russia	Oil and Gas	2.5	76
Saudi Aramco	Saudi Arabia	Oil and Gas	2.4	73
Sonatrach	Algeria	Oil and Gas	2.2	67
Shandong Energy	China	Coal	2.2	66
Iraq National Oil Company	Iraq	Oil and Gas	2.1	64
China Coal	China	Coal	1.7	50
Shanxi Coking Coal Group	China	Coal	1.6	49
ExxonMobil	United States	Oil and Gas	1.6	48

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Table 1: Fossil fuel company methane emissions *(continued)*

Company	Headquarters	Fuel Sector	Annual CH_4 emissions (million tons)	Annual CH_4 emissions (million tons CO_2e100)
Shaanxi Coal and Chemical Industry Group	China	Coal	1.4	42
BP	United Kingdom	Oil and Gas	1.3	39
Huayang New Material Technology Group	China	Coal	1.3	39
Lukoil	Russia	Oil and Gas	1.2	36
Chevron	United States	Oil and Gas	1.2	35
Abu Dhabi National Oil (ADNOC)	United Arab Emirates	Oil and Gas	1.1	33
Shell	United Kingdom	Oil and Gas	1.1	33
Total Energies	France	Oil and Gas	1.1	32
Lu'an Chemical Group	China	Coal	1.1	32
ConocoPhillips	United States	Oil and Gas	1.0	28
Petroleo Brasileiro (Petrobras)	Brazil	Oil and Gas	0.9	28
Coal India	India	Coal	0.9	27
Eni	Italy	Oil and Gas	0.8	23
Jizhong Energy Group	China	Coal	0.8	23
Novatek	Russia	Oil and Gas	0.7	21
Kuwait Petroleum Corp.	Kuwait	Oil and Gas	0.7	21
China Huaneng	China	Coal	0.7	20
Top 30 Total			**54**	**1,160**

Sources: GEM calculations from IEA's Methane Tracker Database, the Natural Resources Governance Institute's National Oil Company Database, and the Carbon Accountability Institute's Carbon Majors 2020 report; Global Coal Mine Tracker, Global Energy Monitor.

Oil and gas methane emissions

Top 10 national and international companies

The IEA's Methane Tracker estimates that methane emissions from oil and gas need to be reduced by 77% by 2030, with annual emissions falling from 80 million tons in 2020 to 18 million tons in 2030. According to IEA estimates, measures to reduce these emissions could be implemented at no net cost, given recent prices for natural gas; if instead natural gas prices fall to the historical average over the past five years, then over 40% of methane emissions from oil and gas could still be avoided at no net cost.

The methane emissions rates from oil and gas production vary a great deal between countries, according to IEA estimates. The variance is due to differences in the age of infrastructure, type of operator, and degree of flaring of natural gas (in which gas is mostly burnt off rather than captured and piped for consumption). Countries with the highest methane emissions rates—including Syria, Turkmenistan, and Venezuela—are releasing more than 200 times as much methane per unit of oil and gas produced as countries with the lowest emissions rates, such as the Netherlands and Norway. As a result, variation in methane emissions among companies is based not only on how much oil and gas they extract, but also on where they extract it and how they extract it.

National oil and gas companies

GEM ranked the world's national oil and gas companies with the highest methane emissions (Table 2). We estimated that the top ten largest national oil and gas companies annually emit 25 million tons of methane, or 750 CO_2e100. In 2021, the IEA estimated global oil and gas methane emissions at 79 million tons of methane, making these 10 producers responsible for one-third of oil and gas methane emissions globally.

Table 2: Oil and gas methane emissions from national oil and gas companies

Company	Headquarters	Annual CH_4 emissions (million tons)	Annual CH_4 emissions (million tons CO_2e100)
National Iranian Oil Company (NIOC)	Iran	5.9	174
Gazprom	Russia	4.1	122
China National Petroleum Company (CNPC)	China	3.1	92
Rosneft	Russia	2.5	76
Saudi Aramco	Saudi Arabia	2.4	73
Sonatrach	Algeria	2.2	67
Iraq National Oil Company	Iraq	2.1	64
Abu Dhabi National Oil (ADNOC)	United Arab Emirates	1.1	33
Petroleo Brasileiro (Petrobras)	Brazil	0.9	28
Kuwait Petroleum Corp.	Kuwait	0.7	21
Total		**25**	**750**

Sources: GEM calculations from IEA's Methane Tracker Database, the Natural Resources Governance Institute's National Oil Company Database, and the Carbon Accountability Institute's Carbon Majors 2020 report.

The industry's major emitters came from large producers in the Middle East, Russia, China, and Brazil. The location of operations made a large difference in emissions, since the conditions of infrastructure and other variables factored into the methodology. For example, the National Iranian Oil Company, which is estimated to have the highest methane emissions from oil and gas production of any company, is the third-ranking company in terms of total volume of oil and gas extracted (in barrels of oil equivalent).

International oil and gas companies

GEM's analysis of oil and gas methane emissions also included the major international oil and gas companies, which are investor-owned (Table 3). We found that the top 10 international oil and gas companies emitted 10 million tons of methane per year or 307 million tons CO_2e100, making these 10 producers responsible for 13% of oil and gas methane emissions globally, under IEA estimates. The ten major methane emitters among investor-owned companies were headquartered in North America, Europe, and Russia, but most had operations in a wide variety of countries.

Table 3: Oil and gas methane emissions from international oil and gas companies

Company	Headquarters	Annual CH_4 emissions (million tons)	Annual CH_4 emissions (million tons CO_2e100)
ExxonMobil	United States	1.6	48
BP	United Kingdom	1.3	39
Lukoil	Russia	1.2	36
Chevron	United States	1.2	35
Shell	United Kingdom	1.1	33
Total Energies	France	1.1	32
ConocoPhillips	United States	1.0	28
Eni	Italy	0.8	23
Novatek	Russia	0.7	21
Canadian Natural Resources	Canada	0.3	9
Total		**10**	**307**

Sources: GEM calculations from IEA's Methane Tracker Database, the Carbon Accountability Institute's Carbon Majors 2020 report, and companies' annual reports.

Coal mine methane emissions

Top 10 state-owned and private coal companies

Coal mining releases methane gas trapped in underground seams and surrounding rock strata in active operation and after abandonment. The latest Global Methane Budget found that coal mining's methane emissions rose throughout the 2010s because of the global increase in coal production. The IEA's Methane Tracker estimates that coal producers need to reduce coal mine methane emissions 75%, or 31 million tons, by 2030. But according to IEA analysis, country pledges to phase out coal power will only get us halfway there (15 million tons), with nearly half the amount (7 million tons) coming from countries that have yet to commit to such policies. The IEA anticipates that mitigation actions, such as "minimising methane leaks" and supporting "well-managed mine closures," will reduce emissions a further 8 million tons.

Coal's state-owned enterprises

GEM ranked the world's state-owned enterprises (SOEs) with the highest methane emissions (Table 4). Unsurprisingly, all firms were located in China and India, the two largest coal producing countries, where SOEs account for the bulk of production. Our analysis found that 9 out of the top 10 worst emitters were headquartered in China, including the country's major producers—China Energy, Jinnah Group, Shandong Energy, China Coal, and Shanxi Coking Coal Group, among others.

The only non-Chinese firm in the top 10 was Coal India, the world's biggest coal producer, which ranked 8th in methane emissions. As in oil and gas, coal production volumes are not the sole determinant of mining methane emissions. The methane gas content of the particular coal seams and the depth of mining activity each play a major factor in methane emissions, as GEM has discussed in its previous coal mine methane report.

Table 4: Coal mine methane emissions from state-owned enterprises

Company	Headquarters	Annual CH_4 emissions (million tons)	Annual CH_4 emissions (million tons CO_2e100)
China Energy	China	3.6	109
Jinneng Group	China	3.5	105
Shandong Energy	China	2.2	66
China Coal	China	1.7	50
Shanxi Coking Coal Group	China	1.6	49
Shaanxi Coal and Chemical Industry Group	China	1.4	42
Huayang New Material Technology Group	China	1.3	39
Coal India	India	0.9	27
Jizhong Energy Group	China	0.8	23
China Huaneng	China	0.7	20
Total		**18**	**531**

Source: Global Coal Mine Tracker, Global Energy Monitor and GEM calculations.

Together, the ten largest state-owned coal enterprises are responsible for 18 million tons of methane emissions per year, or 531 Mt CO_2e100. In 2022, the IEA estimated global coal mine methane emissions at 44 million tons, making these operators responsible for 41% of coal mine methane globally.

Coal's investor-owned and privately owned enterprises

GEM's analysis of the coal industry's investor-owned and privately owned coal companies revealed that the 10 largest emitters included some of the biggest names in the industry: Lu'an Chemical Group, SUEK, Inner Mongolia Yitai Investment, Glencore, Murray Energy, Peabody Energy, Alliance Resource Partners, Evraz, SCM Holdings (DTEK Group), and Consol (Table 5). As in the oil and gas sector, annual production was not the sole determining factor for methane emissions.

The ten largest investor-owned or privately owned coal companies emit nearly 5 million tons of methane per year, or 137 Mt CO_2e100. That's nearly 11% of the coal industry's emissions, according to IEA estimates. Yet some investor-owned and privately owned coal companies, such as SUEK and Glencore, were estimated to emit more methane than several oil and gas giants, including Canadian Natural Resources.

Table 5: Coal mine methane emissions from investor-owned and privately owned enterprises

Company	Headquarters	Annual CH_4 emissions (million tons)	Annual CH_4 emissions (million tons CO_2e100)
Lu'an Chemical Group	China	1.1	32
Siberian Coal Energy Company	Russia	0.6	18
Inner Mongolia Yitai Investment	China	0.6	17
Glencore	Switzerland	0.5	15
American Consolidated Natural Resources	United States	0.5	14
Peabody Energy	United States	0.3	9
Alliance Resource Partners	United States	0.3	9
Evraz	United Kingdom	0.3	8
SCM Holdings	Ukraine	0.3	8
Consol Energy	United States	0.2	7
Total		**5**	**137**

Source: Global Coal Mine Tracker, Global Energy Monitor and GEM calculations.

Methodology

For coal, GEM used its Global Coal Mine Tracker—a database of operating and proposed coal mines worldwide—to model global methane emissions estimates at the individual mine level and aggregate it to the corporate level. We estimated methane gas content at each mine in our dataset based on the mine's depth and its rank of coal. The methodology follows that of the Model for Calculating Coal Mine Methane (MC2M), as detailed in our previous report Bigger than Oil or Gas? Sizing up coal mine methane.

For oil and gas, GEM identified the largest oil and gas producers using the Carbon Accountability Institute's Carbon Majors 2020 dataset, and reviewed corporate annual reports to find the most recent years of production data. National methane emissions rates were calculated using the IEA's Methane Tracker Database 2022, and U.S. Energy Information Administration's international (EIA) data for oil and gas production. IEA reports a total quantity of methane emissions for each country and for each type of activity—in particular, distinguishing methane emissions from oil production and gas production. Methane emissions from oil and gas production were calculated as the sum of the following categories from the IEA Methane Tracker Database: Offshore gas, Onshore gas, Offshore oil, Onshore oil.

For each oil and gas company, we applied methane emissions rates for the production in each country, calculating methane emissions for liquids production and for gas production separately. For NOCs, we assumed that all production was in the country where the company is based. Production data was obtained from the Natural Resource Governance Institute's National Oil Company Database whenever it had data newer than 2018 for the relevant companies; otherwise production data was obtained from the Carbon Accountability Institute's Carbon Majors 2020 report (with data for 2018). Values for China National Petroleum Corporation include PetroChina, the publicly listed portion of the company. We applied methane emissions rates calculated above for the company's production from each country or region. When production was stated by region, we calculated regional methane emissions rates based on the IEA Methane Tracker Database 2022; these were weighted averages based on the emissions data and production data available.

Background on Global Energy Monitor

Global Energy Monitor (GEM) is a nonprofit research organization developing information on fossil fuel projects worldwide. GEM data is used by the International Energy Agency (IEA), the OECD Environment Directorate, UN Environmental Programme, U.S. Treasury Department, and the World Bank, among other institutions.

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