Methane Emissions from the Oil & Gas Industry

CEO Roundtable White Paper

The Abdullah Bin Hamad Al Attiyah International Foundation
for Energy & Sustainable Development

EXECUTIVE SUMMARY

Methane Emissions from the Oil and Gas Industry

In March 2019, the Abdullah bin Hamad Al-Attiyah International Foundation for Energy and Sustainable Development hosted the CEO Roundtable Series on methane emissions from the oil and gas industry. Tackling the issue is crucial for natural gas to play a major role in a successful transition to a low carbon economy.

The regular quarterly roundtable in Qatar's capital of Doha brought together international and local experts to discuss challenges and opportunities for the industry on the road to what is seen as the golden age for natural gas.

There is an enormous opportunity for the natural gas industry to enhance its sustainability credentials and its market potential by addressing the challenge of methane, which is responsible for 25% of global warming. If not tackled, methane emissions can become an existential threat for the whole sector.

Despite a lack of unified measurement and conflicting data about methane emissions, gas producers should not wait for local or global regulation and push ahead with mitigating measures that will not only boost credibility of the whole industry, but likely also their bottom line.

Public commitments by companies to methane emissions reduction targets and carbon footprint of their product can trigger more initiative across the industry.

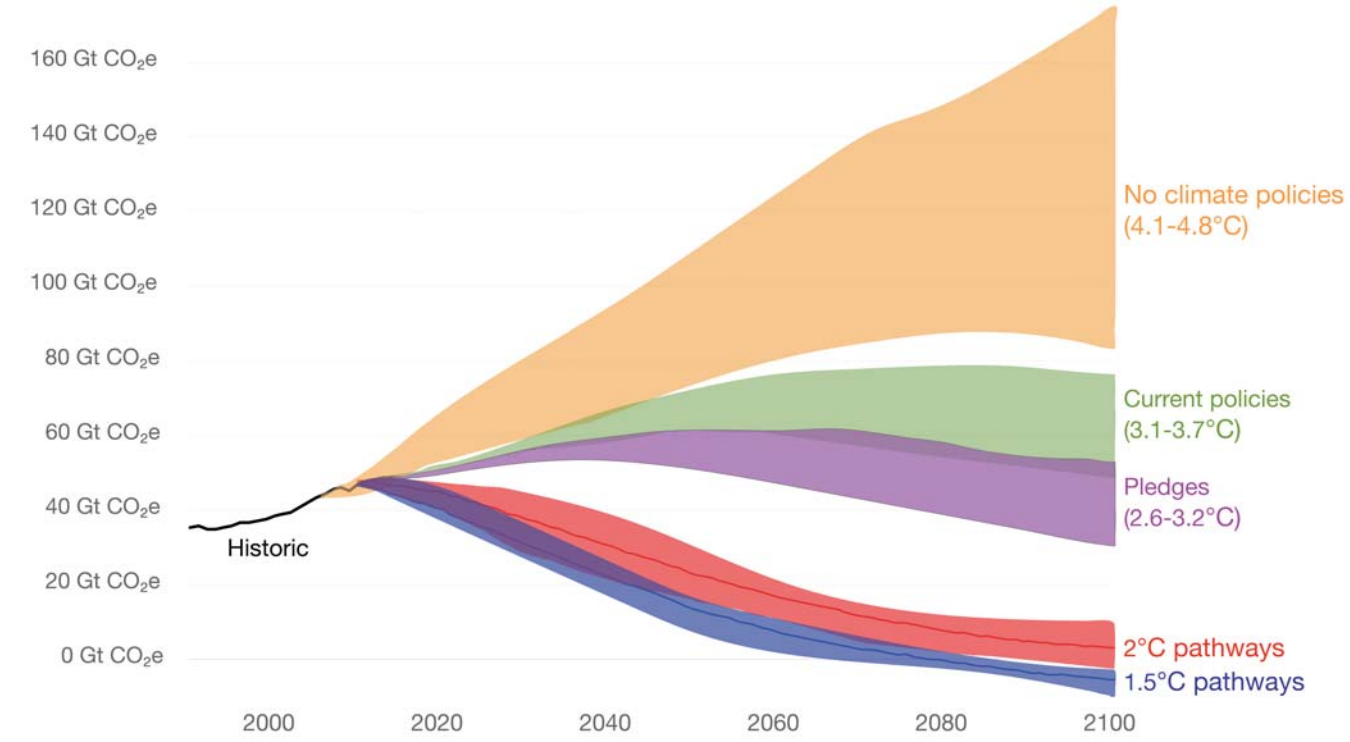
At the same time, educating and spreading the awareness across the whole value chain, as well as to smaller producers and facility operators, are key to containing reputation damage from careless emitters in countries with laxer regulatory framework.

The details of what was discussed during the event are covered in this white paper.

INTRODUCTION

Global greenhouse gas emissions scenarios

Potential future emissions pathways of global greenhouse gas emissions (measured in gigatonnes of carbon dioxide equivalents) in the case of no climate policies, current implemented policies, national pledges within the Paris Agreement, and 2°C and 1.5°C consistent pathways. High, median and low pathways represent ranges for a given scenario. Temperature figures represent the estimated average global temperature increase from pre-industrial, by 2100.



Based on data from the Climate Action Tracker (CAT).
The data visualization is available at OurWorldinData.org. There you find research and more visualizations on this topic.

Global emissions of greenhouse gases, including methane, have risen steadily over the past decades to an estimated 60 gigatonnes of carbon dioxide equivalent per year (Gt CO2e) today, up from 50 Gt CO2e nine years ago. That is as many as five times the number seen when World War II ended in 1945, leading to increasing global temperatures, occurrence of more extreme weather and heightened risk of natural disasters.

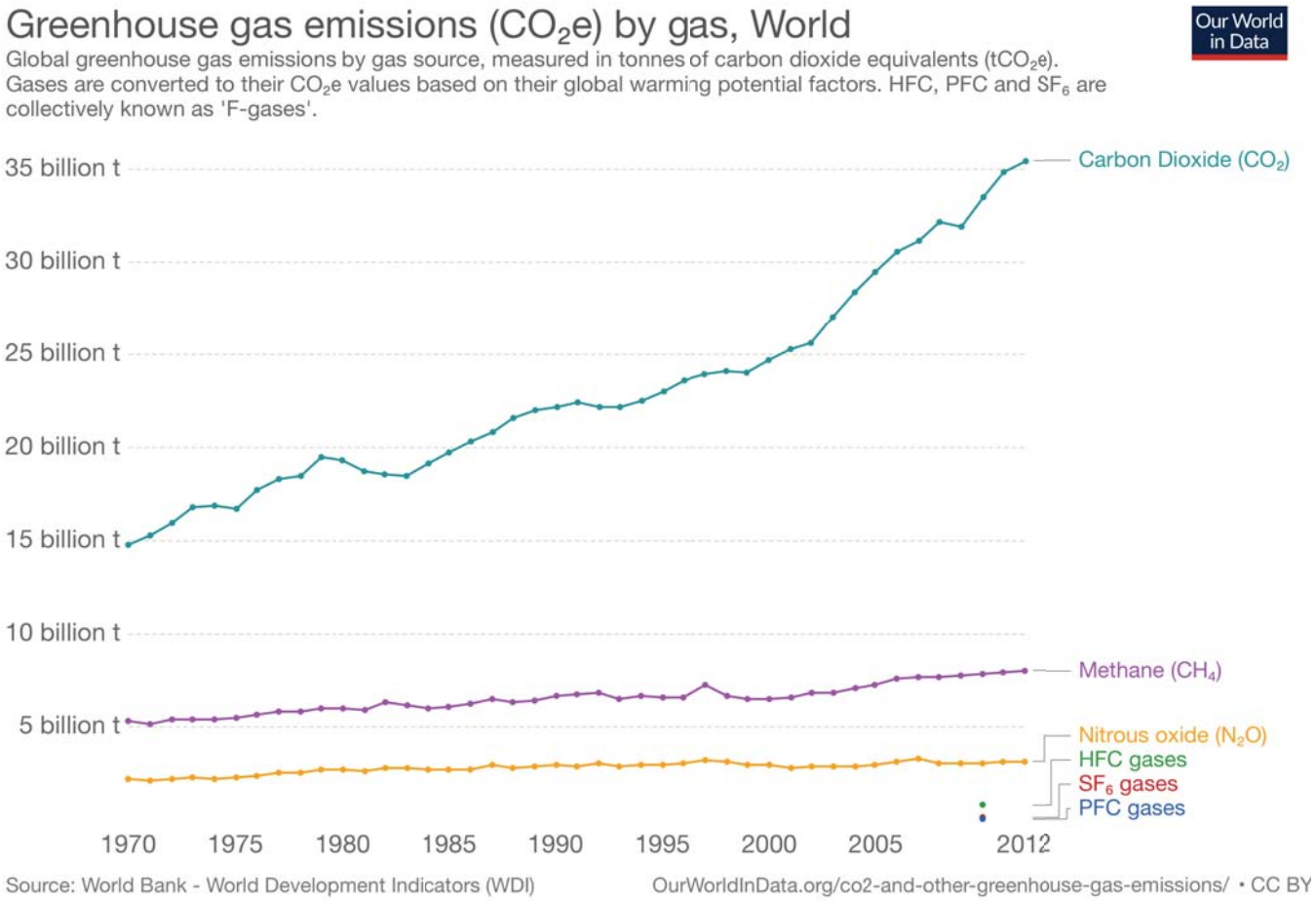
As for methane (CH4), which is released from oil, gas and coal activities, agriculture, waste and other sources, its atmospheric concentrations have roughly doubled during the industrial era, with emissions estimated to have increased to around 7 to 8 billion tonnes of CO2 from some 5 billion tonnes in 1990.

Natural gas, composed mostly of methane, is considered the most climate-friendly of the three main fossil fuels, with only about half the carbon dioxide emissions of coal, making it the best choice currently available in the transition to a low-carbon economy.

But methane is a powerful and aggressive greenhouse gas with a much higher, if shorter, warming impact than CO2 and its leaks, coming mainly from small operators and malfunctioning equipment in developing economies, threaten to eliminate its low-carbon appeal for the public and put credibility of the whole natural gas industry in doubt.

Over a 100-year period, one tonne of methane is estimated to have as many as 28 times the warming impact of a tonne of carbon dioxide. Although its molecules are thought to reside in the atmosphere relatively short, at about 12 years.

Methane leakage, estimated at around 3% globally, weakens the environmental case for using gas instead of coal, and if not tackled, may lead to a growing opposition to gas-field development, pipelines, LNG terminals and all natural gas-fired power in general.



On a 20-year timescale, gas would still have a lower global warming impact per unit of useful energy than coal if leakage rates are less than around 8.4%.

Methane leakage – almost two thirds of which come from the so-called super-emitters – is hard to measure with estimates ranging from 1.4% of the amount produced seen by the US Environmental Protection Agency to 2.3% estimated by the Environmental Defense Fund, a US non-governmental organisation.

In the gas industry, it is technically feasible to eliminate some 75% of methane leaks and about 40% to 50% can be prevented at zero or negative cost, meaning the value of gas saved would more than pay for the measures taken.

While leading gas producers such as Qatar, UAE, Saudi Arabia, Australia and Norway have very low rates of reported leakage, the former Soviet Union countries – Russia, Uzbekistan, Azerbaijan, Ukraine and Kazakhstan – post unusually high rates. However, the overall data are inconsistent and indicate a potential under-reporting.

ROUNDTABLE DISCUSSION

Black Eye

The transition towards the low carbon economy may be called the 'Golden Age of Gas', but the issue of methane is perceived as an existential threat to the gas industry as its warming potential is enormous, estimated to be 28 or 34 times that of CO2 or even as high as 80 times, according to other estimates.

Methane is a huge liability for the gas industry, which cannot be underestimated as it puts the sector's credibility at stake. If the industry wants to propose gas as a transitional and even a destination fuel, getting this particular angle right is absolutely fundamental.

Emissions of methane are mostly the industry's internal problem, because they are released unintentionally or intentionally, usually during the production, not the usage of gas. That makes the case for fixing it even stronger. Tackling emissions is an opportunity to prove that gas is part of the solution to global warming, not part of the problem.

As the world is currently on the path towards a terrifying 4 to 6 degrees Celsius rise in global temperatures, the gas industry has an opportunity to take the leadership role in environmentalism.

Reducing methane emissions globally in the oil and gas industry by 45%, which is easily possible, is comparable to shutting down 1,000 coal-fired power plants. This is an impressive figure that can have a profound impact on the gas industry's efforts towards sustainability.

If the gas industry is able to handle this challenge, the use of natural gas will most likely expand further than what is seen today.

DATA PROBLEM

Data available on methane emissions are dreadful and inconsistent, with most emissions unaccounted for, which makes getting the measurement right a really important step.

There are problems in the way methane emissions are being estimated because their impact is thought to be much stronger than what is being calculated.
The United Nations, in its national inventories, estimates methane to have a global warming potential (GWP) of 25 years, which has already been replaced by the latest appraisal of between 28 and 34 years. Until last year, the accounting was done using GWP of 21 years.

That shows that methane emissions are clearly being underestimated. There are many issues related to the calculation of methane emissions that need to be tackled.

The best solution would be to appropriately determine the emissions in order to capture the whole value of reduction that may occur.

UNIFIED MEASUREMENT

Getting the common baseline methodology and reporting of methane emissions is absolutely fundamental for tackling the problem as there is currently no unified measurement or reporting technique.

That should not mean, however, that the gas industry will merely sit idly by and wait for the next two or three years before emissions measurement is sorted out.

There are many countries that are each taking a different approach to approving legislation dealing with this issue. A push from a respected global organisation seems to be necessary to unify the approach.

Self-regulating company initiatives appear to be the most practical, but they probably must also be pushed from the outside to be more effective.
At the moment, the US-based Environment Defense Fund (EDF) is working with the Oil and Gas Climate Initiative (OGCI) and its member companies to come up with a unified approach to measurement.

However, there is still a long way to go from having one system that works. It is difficult to assess when such system will be available, but it is estimated to be possible within two to three years. It is unlikely to take longer as everybody sees the urgency of the issue.

If we, as a society, cannot reach an agreement on measuring, reporting and reducing methane emissions where there is already so much consensus, then reaching an agreement on other issues is almost hopeless.

REGULATION

There are efforts to have a guideline or some kind of regulation in the future where the reporting process is mandatory. It would be a big step going forward as the lack of unified regulations is a weak point for the gas industry.

The UNECE is in the process of developing best practice guidance for the gas industry in terms of monitoring, verification and reporting of methane emissions. The first draft of this best practice guidance has already been developed and the UNECE will now seek comments from the industry.

At the moment, the global initiatives that are going on at the official level do not seem to be so prominent or bold as the ones being taken by private sector organisations, which are leading the discussions on methane emissions. It should be a combination of both.

What is holding back the overall reduction of methane seems to be a global consensus or treaty. This the area where the UN should come in and broker a treaty or a deal such as the Paris Agreement, but much more targeted in the area that is ripe for success.

There is already a consensus on reducing methane emissions and global standard can then go across not only among gas producers but the whole value chain.

However, gas companies should not wait for the UN. Getting the agreement on best practices is the first step on the path towards a global treaty.

There is the issue of regulating small shale producers, which do not have an international profile but the industry needs to prevent them from giving natural gas a bad reputation. That is a major task for big companies to take the leadership.

In addition, there is a number of countries where cold venting is still allowed, which is much worse than flaring in terms of methane emissions.

Even if gas producers have a perfect containment system for methane, the problem is growing markets such as Pakistan, India, China and South America, where the regulatory environment is much weaker and has a potential to damage the reputation of the industry.

We need to explore what can be done from an

industry-to-industry perspective and from a government-to-government perspective to help those countries create a regulatory framework that deals with methane emissions.

Another problem is that even if some kind of emissions regulation is in place, they are not followed in some countries as emitters would rather pay a fine, which is often very low.

The best incentive going forward in reducing methane emissions might be a business initiative rather than imposing government regulations because companies can demonstrate that they are delivering a better product than their competitors. That is a public commitment by gas producers on emissions, both in terms of absolute values and net carbon footprint.

The more public these commitments become, the more things will happen, which needs to be ultimately supported by regulation and legislation. Establishing the carbon footprint of your product and disclosing this information is a competitive advantage.

Some countries are analysing the idea of carbon tax as a way to limit emissions. While there is a need to establish a real price on carbon, there is no consensus about this issue. If emissions are taxed, there has to be a very robust and fair way to measure them.

At the moment, carbon pricing seems to be a long way down the road to being established.

MITIGATING ACTIONS

From the perspective of mitigating actions, a vast majority or almost 40% of emissions come either from flaring or venting, which is a problem that needs to be tackled on a global level.

That may not be an issue in countries like Qatar, which has a very efficient natural gas production and trade. But the overall reputation of the fuel comes from its global performance.

In other countries, substantial venting is used, which will damage the fuel's global reputation.

However, despite methane emissions being widely recognised as a serious problem, there is still no consensus on how they can be solved. This is an area where the industry should move faster.

Reducing methane emissions is not rocket science or expensive and, in many cases, it can even generate revenue, with some 60% of emission reduction measures making economic sense.

Methane is a product. Whatever the gas producer recovers, the value of emissions of methane revert into its net revenue. It is worthwhile to eliminate methane emissions because it means less greenhouse gases in the atmosphere and more products in the pipeline, which can replace coal and thus further reduce greenhouse gas emissions.

Cutting back methane emissions requires time and energy, but most of all it takes focus and commitment from organisations, with training and awareness as very important components.

The solutions available may include close completions, no venting during completions, reduced routine flaring, optimised compression and electrification of some facilities.

A lot of the focus is not just on the regular monitoring programme but also trying to prevent super-emitters from discharging as they are responsible for most of the global methane emissions. It is more than just fixing one facility; the whole value chain has to be addressed as there are components that are beyond the gas companies' control.

It is a strategic business discussion on whether to deliver natural gas to be consumed at a household level or if it is the best option to produce electricity outside cities, and then residents would use electric, instead of gas-powered, appliances and vehicles. In such a way, the gas industry would be much more efficient and able to get rid of the problem in the downstream.

What remains to be done is to develop a technology that would allow producers to capture gas and instead of venting it, flare it in an enclosed ground flare, which can make a significant difference.

By using an open flare, the efficiency level can be as low as 85% with the rest released directly into the atmosphere.

A crediting mechanism could provide incentives to companies and countries to stop using open flares and move to enclosed flares where the destruction efficiency will be 99.98%.

SPREADING AWARENESS

One of the big challenges in the gas industry is recognising that the value chain does not start or stop at production. Making sure that other parts of the chain, such as shipping, are part of the methane reduction conversation is absolutely fundamental.

The challenge is how to spread these ideas to smaller players and all the national companies around the world. The petroleum industry is ahead of the curve on this issue but other companies are way behind.

One of the responsibilities of an international company should be to help educate other firms so they understand that the issue affects all industry players. Joint ventures with small companies could be one of the options.

At a company level, boardrooms and executives have all embraced the issue, but at the facility level, people have yet to do so. There is huge and a relatively low-hanging fruit opportunity to train and create awareness on the facility floor and on the well sides that methane is a poisonous gas, which should not be in the atmosphere.

Companies should use training and awareness programmes for all the operators on how they should perform their tasks to prevent and reduce methane emissions in day-to-day operations.

Everybody agrees that the right approach to educating the industry is through centres of excellence.

EDUCATION CHALLENGE

The gas industry is facing an increasing challenge to recruit students because of the perception of oil and gas and its impact on global warming.

There is a declining number of petroleum engineers with graduates often lacking skills to understand the impact of technical decisions in a global context.

Universities need the gas industry to help produce new engineers with awareness of global environmental issues.

CONCLUSION

Participants agreed that tackling the issue of methane emissions was crucial for the oil and gas industry to successfully market natural gas as a cleaner fuel in transition to the low-carbon economy and vital to help battle the effects of greenhouse gases on the environment, as the issue of methane is a major credibility challenge.

However, leading international companies should ensure their knowledge, technology and best practices are shared not only with their day-to-day facility operators, but also with smaller industry players and across the whole value chain to reduce emissions of methane, which is a very potent greenhouse gas.

Failure to do so is not only a threat to the ongoing battle to contain global warming, but also to the success of gas companies as methane is a major black eye on the appeal of natural gas as a more climate-friendly alternative to coal.

There is also an urgent need to standardise emission calculation formulas as well as measuring, reporting and verifying protocols as the current data on methane emissions are often contradictory.

The industry's leading companies should help establish regulatory frameworks in developing countries to prevent lax rules and irresponsible environmental behaviour of some small producers and national companies from damaging prospects of the whole gas industry.

In the current absence of global limits and regulation of methane emissions, gas producers should not wait, but rather take self-regulating action themselves, as cutting emissions has not only a positive impact on their revenues by saving their product but also allows them to be more competitive through public disclosure of carbon footprint. It was emphasised that the gas industry needs to apply the same strict zero-tolerance approach on safety to the issue of reducing methane emissions.

Regular monitoring for and fixing of methane leaks, as well as training operators at a facility level in best practices to prevent leaks is relatively easy to do and has the potential to reduce emissions significantly.

Participants also suggested that academic centres should work closely together with the industry and explore ideas on how to expand the skillset of graduates beyond the technical knowledge to raise their awareness of global climate issues, which would translate into better environmental practices.

At the same time, centres of excellence can also help spread awareness through the role they play in the transfer of knowledge and technology.

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