How a focus on gas flaring at COP26 can accelerate decarbonisation

A thought piece by capterio

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Mark Davis and John-Henry Charles

Executive summary

- **The IPCC 6th assessment report highlights that we must act decisively to have a chance to limit global heating to less than 1.5 degrees. It also sharpened the focus on methane, a highly potent greenhouse gas.**

- **The oil and gas industry is a significant source of emissions of both CO2 and methane. But gas flaring reduction is often overlooked and underestimated as part of the solution. Yet, by solving flaring (which is a major source of methane, and represents 2% of global emissions), the world can not only quickly reduce emissions, but can also create value and accelerate the energy transition to a low-carbon society.**

- **COP26, therefore, needs to put more focus on flaring as an enabler of environmental and economic progress. But the world needs more than just ambitions and commitments. Especially so given that in this paper, we demonstrate that the commitments made on flaring in 2015 have been largely undelivered. Countries that made *specific commitments* to reduce gas flaring in their Nationally Determined Contributions (NDCs) have increased flaring by 5% (whereas the world average flaring has reduced by 5% over this period).**

- **The current situation is unsustainable, and consuming countries must share some of the accountability. The world needs to be much more proactive to help countries deliver their ambitions, supported by data to help measure improvement. We need to step up diplomatic efforts and need better coordination between climate and foreign policies.**

- **The voices of producing countries must be heard. Success for flaring at COP means that transparency around flaring is dramatically increased, clear *and actionable* commitments are made. But countries also need the world to mobilise investment, promote policy reform, deepen market mechanisms and support change by speeding emissions certification.**

Why flaring must be a focus of COP26

The IPCC 6th assessment report highlighted, as the UN's Secretary-General put it, "a code red for humanity", and that we must act decisively to have a chance to limit global heating to less 1.5 degrees. COP26 is a key opportunity not only to raise ambitions and commitments but also to facilitate real action.

And gas flaring reduction can help the world to accelerate action. The latest data for 2020 highlights that gas flaring (at 142 BCM per year) is large enough that, if "gas flaring" were a country, it would be the 5th largest gas consumer worldwide. Whilst 2019 was marginally better than 2020 (due to lower production), the fundamentals are heading in the wrong direction (see "*new data confirms we are off track*").

But with record carbon prices in Europe (of €60 per tonne), natural gas prices in Asia at a record high (of $33 per mmbtu, the equivalent of $190 per barrel) and prices in Europe as high as $17 per mmbtu, this is a major economic loss. Even at more conservative prices ($3 per mmbtu and $60 per barrel), gas flaring represents an additional annual sales potential of $20-30 billion.

We discuss three key issues around flaring:

1. **The impact of flaring is underestimated** (especially regarding methane);
2. **Flaring is under-recognised quick win decarbonisation lever**;
3. **Despite many commitments, countries have not delivered on promises** made in Paris in 2015 or to the World Bank to reduce gas flaring.

We explore each of these issues further below. We also discuss why flaring still happens today and some actions to deliver the change we need.

Issue 1: flaring's impact is often underestimated

We argue that flaring is not enough on the global radar to date. The IPCC's latest report, for example, only has 12 mentions of "flaring" (or "flare"), yet "aviation" and "shipping" (which both are of a similar scale, some 2-3% of emissions) have 82 and 43 for mentions respectively[1]. Similarly, we have found that flaring is "not on the radar" of operators sufficiently; flaring is mostly not metered, is frequently underestimated, ignored and sometimes denied. And additionally, and perhaps more concerningly, most estimates of gas flaring ignore the issue of methane.

Almost all flares emit significantly more CO2-equivalent emissions as methane (CH4) than they do as CO2. Firstly because all flares have some degree of "inefficient combustion" (otherwise known as "methane slip"), and secondly, because methane is 84x more potential (on a mass basis) than CO2 in terms of its climate-forcing potential

[1] The same report has 1400 mentions of "methane" (or "CH4") and 5002 mentions of "carbon dioxide" (or "CO2").

(over a 20-year basis[2]). See our article "*flaring's billion-tonne secret*") for more details. Additionally, many flares have considerable C2+ components and burn liquids, leading to particulates.

Whilst this is an area of active research, we estimate that the weighted average combustion efficiency is 90% (and this is probably optimistic), meaning that the CO2-equivalent emissions from flaring are 1.2 billion tonnes (some 2% of all CO2-equivalent emissions). Interestingly, most groups (including the World Bank, the bp Statistical Review of World Energy, the IEA and companies including Chevron and Total) currently assume that all flares operate at world-class combustion efficiencies (around 97-98%, see our article "*why we need clearer ESG metrics around gas flaring*"), whereas a recent report by EDF clearly shows deficiencies against this best practice, even in the US. The rest of the world almost certainly has much poorer combustion efficiencies – we argue, quite likely with at least 2.6x times greater emissions (see Figure 1).

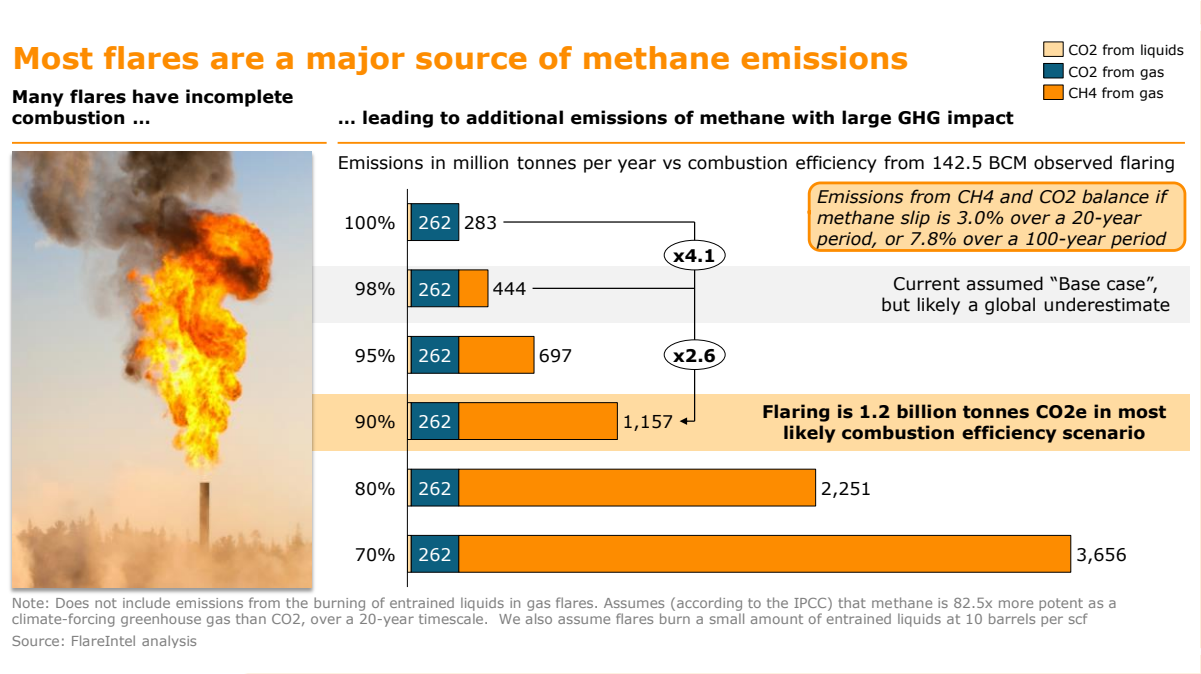

Figure 1: Impact of combustion efficiency on the CO2-equivalent emissions from gas flaring. If 100% of the world's flaring were combusted, flaring would drive 283 million tonnes of emissions per year. A flare operating at "best practice" combustion efficiency would emit almost double this, at 444 million CO2-equivalent tonnes per year. But given that many flares have been measured to have substantially lower combustion efficiencies, we use 90% as an estimate of the weighted average combustion efficiency and include the entrained liquids associated with flaring – leading to 1.2 billion CO2-equivalent tonnes of emissions per year (2% of the world's 50 billion CO2-equivalent tonnes) – some 2.6x higher than is commonly assumed.

Issue 2: Flaring is under-recognised quick-win decarbonisation lever

[2] Whilst there is no "right answer", we evaluate the potency of methane vs CO2 over a 20-year period (with an 82.5x multiplier) as opposed to over a 20-year period (with a 29.8x multiplier) since we believe the shorter time period is more relevant to the urgency of our climate crisis. The longer time period arguably underestimates the urgency of solving the methane challenge.

The second issue is that flaring is often overlooked as a quick decarbonisation lever. Solving flaring can reduce emissions by up to 73% (see Figure 2), create real commercial value, and accelerate the energy transition.

We appreciate that investing in fossil fuels (especially gas) is politically sensitive in today's world, and many institutions have made policy decisions to exit the sector. We fully agree that the world must transition quickly to a low carbon society. But we also recognise that many oil states that flare also have a comparative advantage resulting from having some of the lowest cost of supplies and the largest production volumes. These countries will probably produce oil for as long as there is demand (possibly for decades) and be the "last man standing". We must support – rather than shun – gas flaring investment opportunities – provided that they also deliver material decarbonisation. Fatih Birol and Ali Allawi's article "*without help for oil-producing countries, net zero is a distant dream*" in the Guardian supports this argument.

Whilst most monetisation options lead to the gas being burned (with associated CO2 emissions, unless they are sequestered), they deliver two advantages. Firstly, the end product (which is often gas-fired power) will often end up displacing lower-quality power sources, such as coal. Secondly, total emissions are dramatically lowered by eliminating methane emissions at inefficient flares (offset by marginally increased CO2 emissions from more efficient combustion).

Let's work through an example, say the flaring at Hassi Messaoud field in Algeria (which currently flares 223 million scf/day, or 2.3 BCM per year). Assuming a 90% combustion efficiency (in reality, it is likely poorer), emissions from the "as is" situation are 28 million CO2-equivalent tonnes per year. By transporting the gas to the market, burning it in efficient combined-cycle gas turbines (including 2% methane loss in the process), and displacing coal, the system emissions drop by over 20 million CO2-e tonnes per year. At carbon prices of €50 per tonne, the carbon value is notionally worth €0.5-1 billion per year (the higher figure assumes that markets value not just CO2 reductions but also of methane).

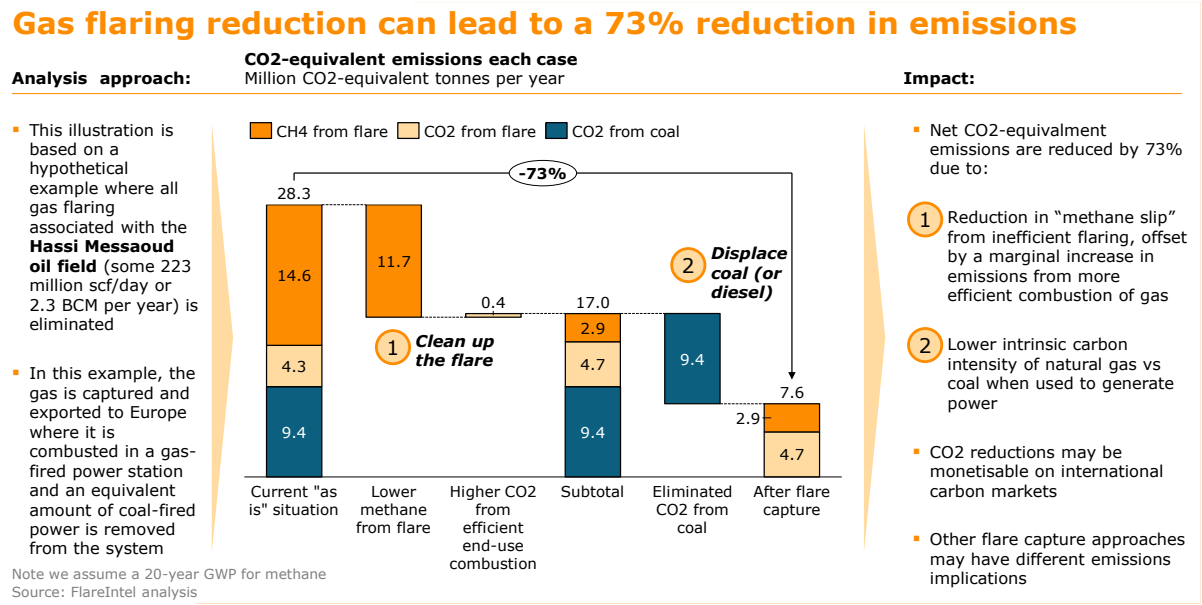

Figure 2: Emissions impact resulting from flaring at Algeria's giant oil field named Hassi Messaoud. CO2-equivalent emissions could be reduced by up to 73% through a combination of lowering the level of methane slip and substitution of coal with intrinsically cleaner-burning natural gas. Slightly lower emissions reduction may apply if the captured flare replaces, for example, diesel used to support oilfield operations. We calculate CO2-equivalent emissions of methane assuming over a 20-year basis.

In addition to the clear emissions reduction potential, our work in many counties has demonstrated that such projects are often intrinsically commercially attractive (pre-take IRRs are investment-grade), with additional upside achievable by monetising the emissions reductions on international carbon credit markets.

Issue 3: Despite many commitments, countries have not delivered on promises

Progress has been minimal:

At the COP21 in 2015, 194 states signed the Paris climate agreement and committed to so-called National Determined Contributions (NDCs). Of these, 11 countries have made specific NDC contributions from flared gas utilisation – and others refer to flare reduction in their LEDS ("Long-term low greenhouse gas Emission Development Strategies").

As the world prepares for COP26, it's worth taking stock of the progress and outlook for gas flaring reduction. We use data from the Earth Observation Group at the Colorado School of Mines (supplemented by analysis from Capterio's proprietary "FlareIntel" tool, which incorporates CSM's Nightfire algorithm). The data highlight that, since the Paris agreement in 2015, global gas flaring has decreased by 3% (from 146 BCM to 142 BCM in 2020). But flaring from the 11 countries *that specifically identified flaring in their NDCs* has increased by 5%, from 56 to 60 BCM per year. Gas flaring is therefore a classic example of the "free-rider" problem.

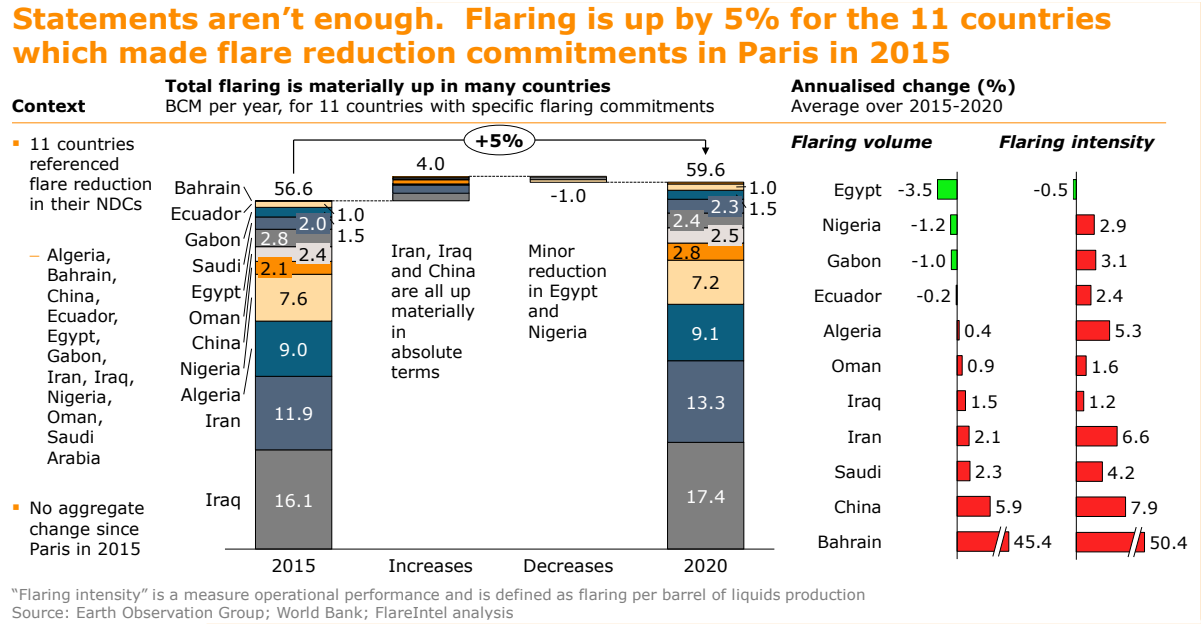

Figure 3: Illustration of the progress made by the 11 countries that specifically referenced flare gas capture as a key contribution to their 2015 NDCs at Paris COP21. Despite their commitments under Paris, these 11 countries have not delivered flared reduction in aggregate, rather flaring has increased by 5%. Whilst 4 countries show absolute reductions in flaring over this period, the underlying "flaring intensity" (flaring per barrel of liquids produced) has increased in all countries except Egypt.

More specifically, the gains seen from reductions in flaring in Egypt, Nigeria, Gabon and Ecuador (some 1 BCM per year) are offset by increased flaring in 7 countries (some 4 BCM per year). What's perhaps more concerning is that all of the countries except Egypt have also *increased flaring by more than oil production* – meaning that the underlying "flaring intensity" (a proxy for intrinsic operational performance) has become worse. Therefore, we expect that flaring will see a substantial uptick in many countries in 2021 vs 2020 as the oil markets recover and more oil is produced to meet global demand.

But flaring capture projects make money:

Despite the distinct lack of progress, gas flare capture is not only technically feasible with proven technology, but it also makes money. In our paper "*celebrating successful flare capture projects*" we highlight specific examples where solutions have been delivered for long-standing flares. These examples – either at a project or country level – should show others what is possible.

Project level: For example, DNO in 2020 reduced flaring by 20 million scf/day flare in Kurdistan through reinjection into their reservoir. Naftogaz's in 2019 recovered a 15 million scf/day flare in Egypt and sent the gas to the existing grid. Impala Energy in 2020 reduced diesel burn by recovering 8 million scf/day in a flare in Nigeria. And Pharos demonstrated in 2018 that even small-scale operations work in Egypt: they recovered a 1 million scf/day flare to generate power for local operations whilst reducing diesel burn.

Country level: On a larger scale, Saudi Arabia and UAE (both of which were major gas flarers in the 1970s) have shown what is possible with clear leadership and now have very low flaring per barrel of production. *How did they achieve this?* UAE established very large gas processing facilities and was the first LNG production company in the region. Saudi Arabia established a brand new petrochemicals industry from its waste gas and accelerated a shift from oil to gas for power.

To make progress on gas flaring critical first to understand why it is so pervasive and secondly to find solutions.

Four drivers of flaring today:

Our research has identified four reasons why companies flare today, specifically:

1. **Flaring is not sufficiently "on the radar"** or in focus of operators and governments (it is often underestimated, not reported/disclosed, ignored and sometimes denied);

2. **Regulators are ineffective** and often "fly blind" with poor quality data / no independent view of flaring, plus many fail to enforce existing flaring penalty legislation;

3. **Fixing flaring is perceived not to be economically attractive** because infrastructure is missing, inappropriate solutions are considered, government incentives/taxes are inappropriate) when in reality, many gas flaring solutions have attractive intrinsic returns;

4. **The industry lacks resources**: companies and governments struggle to allocate increasingly-scarce capital to flare projects which are often "non-core", and specialist flare capabilities are often not well developed.

What we want to see at COP26

Seven actions to accelerate change:

Each of the four reasons for flaring today can be overcome by combining data, creative thinking, additional resources and more committed leadership. COP26 is a key forcing mechanism to accelerate change. To do this, we must:

1. **Use data to recognise the true scale of gas flaring and its ability to accelerate decarbonisation and create value**. We need a renewed sense of global urgency. Yet, flaring is somewhat "out of sight and out of mind" for many countries and governments, yet increasing transparency on the data from tools such as FlareIntel are putting it firmly on the map – so it can no longer be ignored or denied;

2. **Encourage stronger commitments from major flaring countries**, including from a broader range of top-flaring countries. The COP ratchet mechanism should lead to higher ambitions (so far, 11 countries have submitted their NDCs, and Oman is the only one so far that references flaring). NDCs should be upgraded and also include methane reduction. Targets help, but we need less "talk-the-talk" and more "walk-the-walk";

3. **Assist countries (possibly partnering with them) in developing clear and actionable flaring reduction roadmaps**, which need to start with a data-led incentivisation of flaring, nearby infrastructure, commercial constructs, but follow with a set of tangible projects and independent performance metrics. Our analysis suggests that 1/3 of all flaring has strongly negative marginal abatement costs, 1/3 are roughly neutral, and 1/3 have significantly positive marginal abatement costs. But with a price on carbon, the cost curve would shift significantly, putting more flaring "in the money";

4. **Mobilise investment support (e.g. through grants and concessional financing) to make flaring reduction a reality**. We need a real-world conversation and acknowledge that without capital investment specifically into gas flaring projects, flaring will get worse. Some of the "retreat" from investing in fossil fuels is counterproductive, and policy exceptions must be made for projects that offer compelling decarbonisation opportunities. The world has committed $100 billion per year to developing countries to help transition, so it is time to deliver. Some of this money could be raised by (or directed from) Carbon Border Adjustment Mechanisms (CBAM) that are developing in the EU and US;

5. **Promote reform (and assist in its implementation) in major flaring countries around policies, mandates, regulation and its enforcement**. Establishing flaring penalties is a start (Nigeria, Algeria and Norway have penalties at $38, $48 and $61 per tonne CO2 respectively), but enforcement by credible and independent regulators is critical, especially as this is materially lacking in Nigeria and Algeria. Longer-term, subsidies should also be reformed to give clear commercial incentives for companies to act. Iraq is a good case in point: 17 BCM of cheap gas is flared whilst considerable volumes of expensive gas (and power) are imported from Iran – in part due to heavy subsidies on local power prices (some $0.02 per kWh), disincentivising players to capture gas). The public interest needs to prevail without distorted incentives;

6. **Accelerate and deepen market mechanisms to encourage clean investment.** Carbon credits are an effective mechanism to mobile capital to

the projects with the best decarbonisation opportunities. Carbon Border Price Adjustments (CBAM) as proposed by the EU can also heavily incentivise action in producing countries. But the markets need to account also for methane;

7. **Promote the adoption of certification markets** that differentiate between oil and gas associated with high levels of flaring (venting and leaking) vs those with low levels of supply-chain emissions. Organisations such as MiQ have developed standards already adopted by the voluntary markets to help differentiate gas on their supply chain quality.

COP26 is the moment for governments not only to raise ambitions but to accelerate real on-the-ground action. By sharpening our collective focus on gas flaring, with luck, some ground-breaking flare capture programmes can be announced in Glasgow in November. Let's together make it happen.

We are grateful for many discussions with NOCs, IOCs, regulators, the IEA, the World Bank, the UK FCDO, E3G, the CATF and the UNEP and others for thought-provoking discussions. Any errors and omissions are naturally our own.