Use it, don't lose it!
Minimising flaring near existing demand centres

Flaring, onshore Mexico

A thought piece by capterio

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Executive summary

- **Flaring is major source of economic and environmental waste. Yet our research highlights that at least 7% of total worldwide flare volumes (11 BCM per year) is within 10 km of gas demand centres (e.g. gas powerplants, chemicals plant, LNG terminals).**

- **When this insight is integrated with data on the proximity of each flare to existing gas pipelines, we find that 57% of flared volumes (86 BCM per year) is within 20 km of either a gas demand centre or pipeline. Considerable flared volumes are, therefore, by definition, close to a well-established market.**

- **We urgently need to reduce the waste of critical natural resources and reduce emissions. That data suggests that many flares may well have "ready-made solutions" (see our worked example in Mexico). Governments and the oil and gas industry need to work more collaboratively to find and deliver solutions that capture flared gas.**

- **A data-led approach, coupled with creative solutions and third-party access to existing infrastructure, will enable the oil and gas industry to reduce flaring, lower emissions, create value and accelerate the energy transition. With COP26 coming up, the moment to act is now.**

Gas flaring often happens, we are told, because of a lack of market. Whilst flares can sometimes be "stranded" with limited local markets (especially in West Africa, or offshore at FPSOs: see our article "*out of sight but not out of mind*"), it is less true than most think. We showed in our article "*we must minimise flaring near existing pipelines*" that 54% of all flared gas is within 20 km of a gas pipeline. This article is the sequel and explores how close flares are to potential "demand centres" – and the results are equally surprising and thought-provoking.

Our global analysis compares the location of every gas flare (using data from our "Global Flaring Intelligence Tool", GFIT), with the location of key gas "demand centres" (gas and oil powerplants, LNG terminals, LPG plants, petrochemicals plants). Specially, we mapped all 7500 flares monitored in 2019 to over 6500 demand centres. The data (which is granular to the specific field name and operator of each flare, plus other key information, such as the local pipeline) is available from us on request.

Our key finding is that at least 11 BCM of gas (7% of the global flare volumes) is within 10 km of a current gas demand centre (see figure 1). That's an additional 7 GW of

continuous power. In today's ESG-focussed world, flaring valuable gas so close to a potential solution – especially when it can be profitably recovered – is unsustainable.

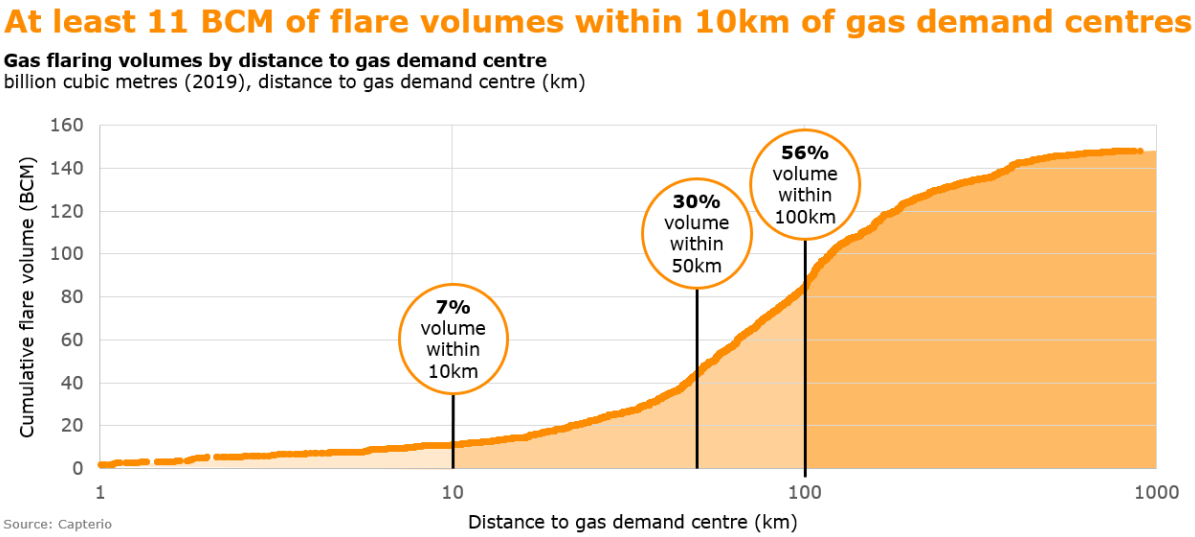


Figure 1: Breakdown of minimum distance to the most proximal gas powerplant for all flares worldwide. We find that 11 BCM, 7% total flare volume, is less than 10 km from a gas demand centre (e.g. gas and oil powerplants, LNG terminals, LPG plants, petrochemicals plants)

We identify flaring hotspots close to demand centres in Algeria, Russia, Iraq, Mexico and Saudi Arabia. Ironically, many of these countries are expecting strong demand growth and have unreliable power. Since these flares are already close to demand centres it should be possible to hook them up relatively quickly and at low cost (after all, it is also often cheaper to upgrade or add capacity to or near an existing plant). It's great to see that there are "mega" flare capture projects (such as Iraq's Basrah Gas Company), but our findings show that these are generally hugely complex and smaller projects can yield immediate environmental and economic benefits.

Figure 2 illustrates the data (flares in green are those that are closest to a potential solution).

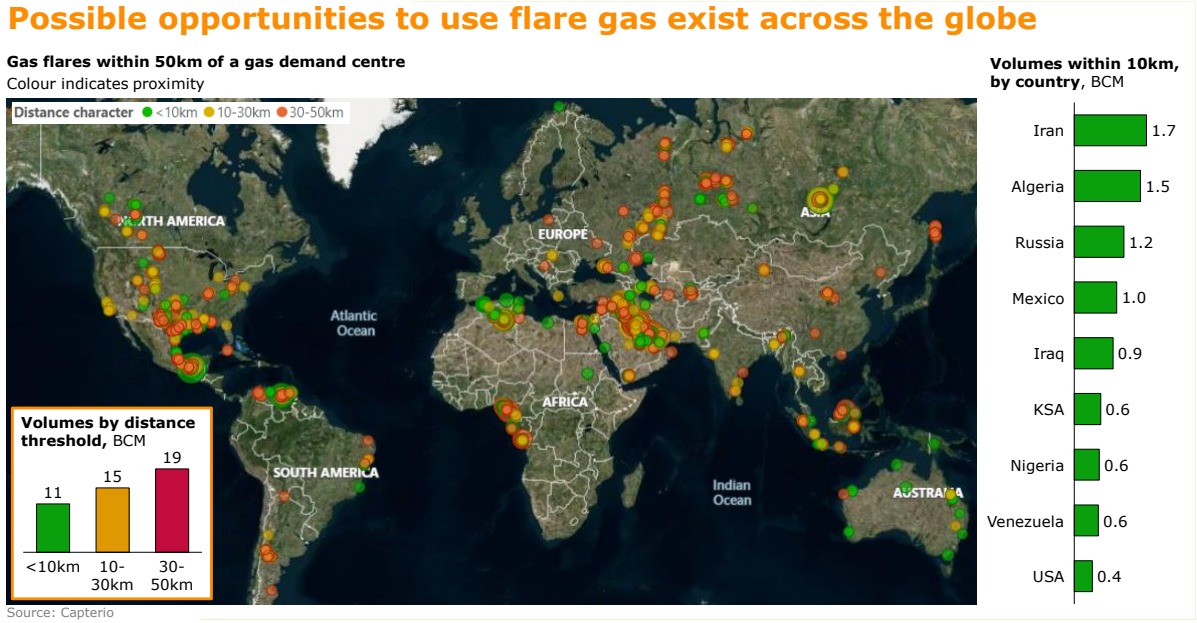


Figure 2: Breakdown of gas flares proximal to gas demand centres, by country. Flares that are greater than 50 km from a known gas demand centre are excluded from this plot.

To bring this to life, we highlight an example of flaring close to a demand centre in Mexico. Mexico (the world's 9th largest flaring country) has frequently suffered from power outages, which have only been exacerbated by the recent reductions of imports of gas from the USA following the recent Texan power cuts.

Our data highlights that many of Mexico's flares are indeed close to existing power demand centres. Figure 3 highlights that two major flares (at the Cactus and Nuevo complexes) are not only at gas processing facilities, but also are within 5 km of the city of Reforma, with over 40,000 people. Both sites have been flaring materially, wasting around $150 million over the last two years (assuming a gas price of $3 per mmbtu). A $650M investment to deliver a 550MW power plant at Cactus, which was planned in 2014, appears to have stalled.

Beyond the economic waste, the human and environmental consequences are significant. We estimate these flare alone generate 2.7 million CO2-equivalent tonnes per year (with a significant volume from "methane slip", as noted in a recent paper in Environmental Science Letters). The same paper highlights that the people of Reforma are also heavily exposed to emissions from volatile organic compounds, carbon monoxides, sulfur and nitrogen oxides and soot associated with the flare. This situation would be unacceptable in Rome, Riga or Rio – and surely it cannot be acceptable in Reforma.

Mexico's onshore processing facilities flare significant volumes

- Two onshore processing facilities in Mexico, only 5km from town of Reforma, both flaring continuously since 2012
  - Cactus flared on average 20 mmscf/d since 2012
  - Nuevo flared more than 20 mmscf/d continuously since 2012, and since 2018 has been flaring more than 40 mmscf/d
- Significant HSE event in 1996 destroyed the (then) largest oil refinery
- A planned $650 million 550 MW gas-fired cogeneration plant was proposed in 2016 but appears to have been stalled

Source: Google maps; Capterio GFIT

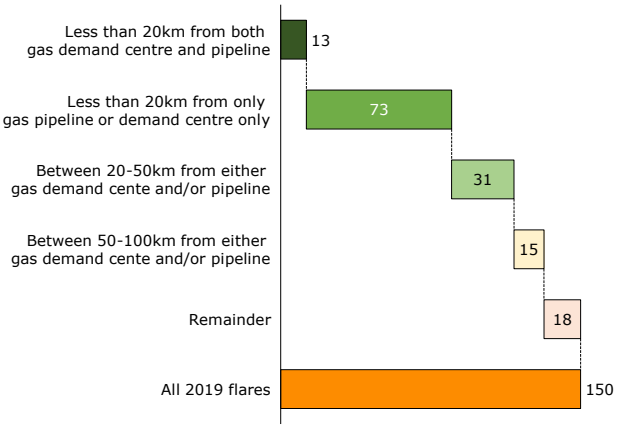
Figure 3: details on the gas flaring close to Reforma in Southern Mexico. Two large flares at the Nuevo and Cactus processing complexes are very close to existing obvious demand centres (and a town). Monetising the flare has an obvious cleaner air benefit for the local population.

More generally, demand centres for gas can also obviously be supplied if they are connected to a pipeline. When we combine our proximity to demand centres with proximity to pipeline, we find that 86 BCM, or 57% flare volumes are within 20 km of either demand centre (e.g. gas power plant) or a gas pipeline which could take it to market. This is outlined in further detail in figure 4. That provides a 3% boost to our existing analysis, looking at gas pipelines only.

86 BCM flare gas is <20km from gas demand centre or gas pipeline

Flare volume (BCM) by distance from gas pipeline or demand centre

Note: the figures in this chart track across to the matrix on the right



Matrix outlining flare volume (in BCM), by distance from gas pipeline or demand centre

Minimum distance to gas pipeline \ Minimum distance to gas demand centre	10	20	30	40	50	75	100	125	150	175	>175
10	7	2	3	3	5	10	7	8	3	2	10
20	2	2	1	1	2	4	2	3	1	0	3
30	0	2	2	1	1	2	2	1	0	1	2
40	0	1	0	1	0	1	1	1	0	0	2
50	0	0	0	0	0	2	1	1	0	0	2
75	0	0	0	0	1	2	1	1	1	1	2
100	0	0	0	0	1	1	1	0	1	1	1
125	0	0	0	0	0	1	1	2	0	0	2
150	0	0	0	0	0	0	0	1	0	1	1
175	0	0	0	0	0	0	0	0	0	0	2
>175	1	0	1	0	0	0	1	1	0	1	5

Source: Capterio

Figure 4: Flare volumes by distance from gas pipeline or demand centre, in waterfall chart (on left) and in a detailed matrix (on right) The right-hand figure is a matrix outlining flare volumes within particular distance thresholds from both gas demand centres and gas pipelines.

Why do operators flare gas close to existing demand centres?

Operators rarely flare because they lack capabilities. Instead, the challenges are often non-technical, and very similar to why operators flare near pipelines, and include:

1. **Other priorities take precedence**. In today's post-COVID capital- and resource-constrained environment, operators are often even more focussed on their core business (usually oil production). Typically, these companies prioritise delivering large projects and drilling wells over "non-core" activities such as capturing flares.

2. **Flared gas is less competitive (economically, or politically) than alternatives** and Ghana is a case in point. Ghana flares around 50 million scf/d, particularly from Tullow's offshore Jubilee and TEN fields. Yet in the coming weeks Shell will be delivering the first cargo to be imported into Africa to boost its "clean energy transition". LNG import capacity is 1.7 million tonnes per year, equivalent to 225 million scf/d. Add this to the cheap gas imported from Nigeria and initiatives to reduce flare gas get crowded out.

3. **Current contracts don't encourage "the right thing to be done".** This is frequently because either: (a) commercial structure have perverse fiscal incentives (for example, under a Production Sharing Contract (PSC), operators can be disincentivised to save costs from lower power generation from gas flares), or; (b) commercial contracts are so cumbersome that no party is incentivised to attempt any flare capture project that may potentially have unintended consequences for one party – even if the aggregate benefit is clear, or: (c) the government take is simply too high, killing otherwise sound commercial investments.

4. **Getting financing can be tricky** – either internally or externally, especially in today's world where investment into fossil fuels is not "politically correct". This is disappointing because: (i) flare capture projects are some of the "lowest hanging fruits" that offer quick decarbonisation, and; (b) they also create additional national revenues, jobs and value (see our article "Why flare capture projects make sound ESG investments"*).* Especially today, companies have tight capital allocation processes, so even positive NPV projects are declined. Equally, third-party financing (from local banks, development banks or others) can often take 6-12 months to arrange (or may be declined as projects are "too small").

5. **Economics are not (perceived to be) attractive, and limited incentives for upgrades**. Economics can sometimes be challenged by low perceived volumes, low pricing (for gas, power, or other products, often due to subsidies), inappropriate technology, suboptimal engineering design or costly internal

processes. Some operators struggle to justify the investment required to treat and compress low-pressure flares into high-pressure pipelines.

6. **Market is not efficient, with challenges around access**, meaning that operators do not always "play nice". Some pipeline operators fail to offer reasonable tariffs for tie-ins; instead, they hold operators, who often want to do the right thing, to ransom. This means gas may not reach powerplants at commercial rates.

7. **Nearby flaring is underestimated or ignored**. For some operators, flaring is an "inconvenient truth" which they would rather not acknowledge (or worse, ignore or deny). For some, flaring is simply not measured (many NOCs and IOCs, for example, do not routinely meter their flares in many countries, including in the US Permian), and flaring is often underestimated. Increasingly flaring is being made visible (including by Capterio, through our real-time Global Flaring Intelligence Tool – which brings data to life for every flare, therefore for every asset, company and country), so there really is nowhere to hide.

How can we capture flares close to existing demand centres?

Based on our discussions with gas producers and gas buyers, we see several practical options:

- **If gas flaring is near existing capacity, then we should, in the first instance, consider what upgrades (if any) are required to utilise this capacity**. It's clearly likely to be cheaper to add capacity to an existing plant than build a new one

- **If there is insufficient demand, promote the development of gas markets in country to improve local demand**, especially where they displace lower quality forms of power generation (e.g. diesel) or less-efficient sources of "final energy" (e.g. wood-burning for cooking).

- **Improve the incentives for upstream players to provide gas to their midstream counterparts** by improving regulatory oversight and imposing a carbon price on flaring (and venting).

- **Enable new businesses and operating models using agile and specialist companies to deliver flare capture projects.** Many flare capture projects require "small" investments and are "non-core", especially in a capital-constrained environment.

Flared gas can contribute towards meeting the growing energy needs of the developing world. Meeting energy demand whilst reducing global gas flaring, and taking better custodianship of our existing resource base therefore makes sense.

With COP26 coming up, countries and companies will need to not only raise their ambition, but have credible plans that actually decarbonise. Gas flaring reduction is that low-hanging fruit. Let's get innovative and make gas flaring solutions work for the industry and for wider society.