

## Gas Flaring: Why does it happen and what can stop it?

When natural gas is brought to the surface but cannot easily be used, it is burned for disposal or “flared.” Flaring mainly happens when gas is produced as a byproduct of oil extraction. If there is no infrastructure to put this “associated gas” to productive use, it is simply burned off.

### Flaring is a Serious Environmental Problem

- CO<sub>2</sub> from flaring represents around 0.6% of anthropogenic greenhouse gas emissions.<sup>1</sup>
- Directly venting the gas as methane would be even worse.
- Flaring creates local air and noise pollution.

### Flaring is a Serious Economic Loss Too

- According to the World Bank, 140.6 bcm (5 billion MMBtu) of gas was flared in 2017.<sup>2</sup>
- Productive use of this gas would represent over \$20 billion of value at current prices.

### Where and Why?

The seven countries that flared the most gas in 2017 were, in order, Russia, Iraq, Iran, the United States, Algeria, Nigeria, and Venezuela.<sup>2</sup> Countries with high rates of gas flaring almost always share two characteristics:

1. **Geology:** Oil fields have significant quantities of associated gas where re-injection is not a viable option.
2. **Markets:** Local markets for natural gas are underdeveloped and/or pay low prices for gas. (Even if a country has a robust gas market overall, flaring can occur if oil fields are far from population centers and infrastructure to take associated gas isn’t available.)

For example:

- ◆ In the United States, production of oil from the Bakken formation in North Dakota has outpaced construction of natural gas processing plants and pipelines to handle associated gas, leading to appreciable flaring.<sup>3</sup>
- ◆ In Russia and Iran, oil fields are mostly remote, and low, subsidized gas prices reduce the incentive to bring associated gas to market.<sup>4,5</sup>
- ◆ In Iraq, Algeria, Nigeria, and Venezuela, gas markets and infrastructure are underdeveloped, and there are limited financial incentives to exploit associated gas.

### Flaring bans don’t work

In practice, bans on gas flaring have been ineffective. For example, flaring has been illegal in Nigeria since 1984—and repeated deadlines for ending the practice have passed unmet ever since.<sup>6</sup> (The current deadline is 2020.<sup>7</sup>) The problem is the following: The domestic gas market

in Nigeria is underdeveloped, due largely to dysfunctional pricing and other institutional issues in both electricity and natural gas markets. Oil sales supply a majority of government revenue, and a high share of Nigeria's oil fields have associated gas. The only way to enforce a flaring ban would be to shut in these fields and cut off the income they provide. Because the government needs that revenue, flaring will continue until there is a viable outlet for the associated gas.

### Flaring Solution 1: Develop deep, economically-viable gas markets

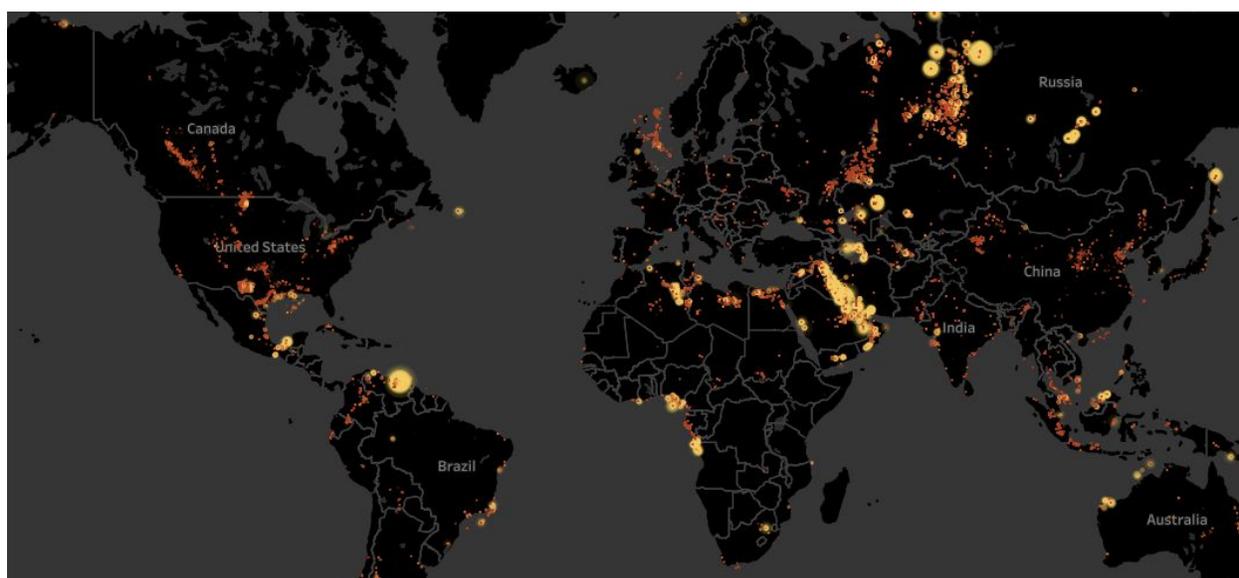
- ◆ Gas markets need an end-use application, the most obvious of which is **power generation**. For example, Iraq plans to fuel a rehabilitated power grid with the associated gas in the south that is now being flared.<sup>8</sup> But the challenge of developing economically-viable gas markets goes beyond building power plants and electricity grids. Electricity market structures must allow power companies to recover from their customers the costs of procuring market-priced gas and running gas-fired power plants.<sup>9</sup> Otherwise, the result may be gas-fired power plants that are chronically offline because they can't procure enough gas, as occurs, for example, in Nigeria.
- ◆ Instead of tackling power sector dysfunction head-on, it may be easier to build out domestic gas use by **focusing on large-scale industrial applications**—for example, manufacturing of petrochemicals, cement, or ceramics. In many of these applications, market-priced gas may already be competitive against alternative feedstocks.
- ◆ Natural gas also offers environmental advantages against alternatives like coal. Policies to mitigate the social costs of pollution thus tend to support gas market development.

### Flaring Solution 2: Develop smaller-scale uses of gas at/near the source

- ◆ Build **local gas-fired power plants** to supply power for hydrocarbon operations, local industrial uses, residential electrification, or injection into the grid.
- ◆ **Pipe gas to local industrial enterprises** for heat and/or power generation.
- ◆ Build **compressed natural gas (CNG)** fueling stations for vehicles or other uses. For example, GE's "[CNG in a Box](#)" is one vision of a modular, mobile fueling station that could in theory be deployed anywhere there is flaring.<sup>10</sup>

These small-scale applications may struggle to achieve the economies of scale that could make them cost competitive, and often face issues of value chain coordination. In Mozambique, for example, the Vilankulo Gas Pilot tapped an exploration well to provide local residents with gas and gas-generated electricity. The project demonstrated the technical feasibility, but it was reliant on subsidies and never served a large customer base.

FIGURE 1: Worldwide Gas Flaring 2012-2018



Source: Collected from NOAA VIIRS instrument, via Skytruth.org

## Endnotes

1. [Christopher D. Elvidge, Morgan D. Bazilian, Mikhail Zhizhin, Tilottama Ghosh, Kimberly Baugh, and Feng-Chi Hsu, "The potential role of natural gas flaring in meeting greenhouse gas mitigation targets," \*Energy Strategy Reviews\* 20 \(2018\), 156-162.](#)
2. [Global Gas Flaring Reduction Partnership 2018](#)
3. [Amy Dalrymple, "North Dakota oil production, natural gas flaring reach new highs," \*Bismarck Tribune\*, December 14, 2018.](#)
4. [BP Statistical Review of World Energy 2018](#)
5. [IEA World Energy Outlook 2014 \(Paris: IEA/OECD\).](#)
6. [Mark C. Thurber, Ifeyinwa M. Emelife, and Patrick R.P. Heller, "NNPC and Nigeria's oil patronage ecosystem," in David G. Victor, David R. Hults, and Mark C. Thurber, \*Oil and Governance: State-owned Enterprises and the World Energy Supply\* \(Cambridge, UK: Cambridge University Press, 2012\), 701-752.](#)
7. Ed Reed, "Flares for sale: Nigeria is taking steps to tackle the wasteful process of flaring associated gas," *Africa Oil & Gas Monitor* 767, December 11, 2018.
8. [Jennifer Gnana, "Iraq could save \\$5.2bn in four years from flared gas reduction, says Siemens," \*The National\*, February 14, 2018.](#)
9. [Mark C. Thurber and Joseph Chang \(2011\), "The policy tightrope in gas-producing countries: Stimulating domestic demand without discouraging supply," \*National Bureau of Asian Research paper for Pacific Energy Summit, Jakarta, Indonesia, February 21-23, 2011.\*](#)
10. [GE/Baker Hughes, "CNG in a Box."](#)
11. [World Bank, "Flared Gas Utilization Strategy: Opportunities for Small-Scale Uses of Gas," \*Report #5, May 2004.\*](#)