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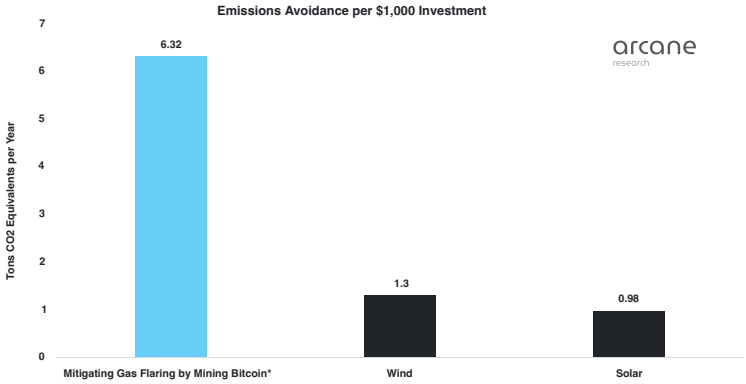
Energy Mining Bitcoin

Bitcoin mining using stranded natural gas is the most cost-effective way to reduce emissions

Mitigating natural gas flaring by mining bitcoin is a more cost-effective way of reducing greenhouse gas emissions than building wind or solar plants. This article explains the problem of gas flaring and shows how bitcoin mining is a solution.



Source: Crusoe Energy's Digital Flare Mitigation System

This article is an excerpt from our research report titled "How Bitcoin Mining Can Transform the Energy Industry". Click here to access the full report.

Natural gas is produced as a byproduct of oil drilling

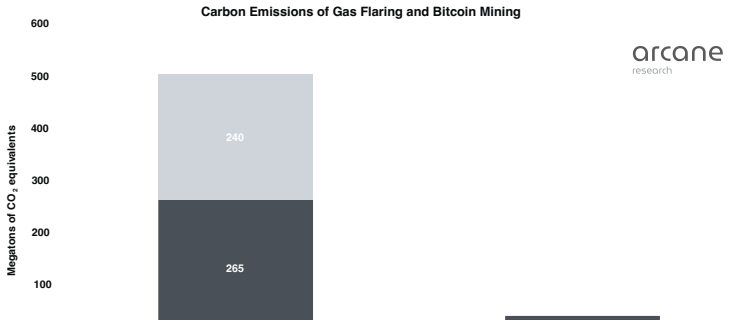
Natural gas is produced as a byproduct of oil drilling. Harnessing this gas for consumption is not always economically viable for oil producers. In these cases, the oil producer burns the gas on-site in a process called flaring.

Gas flaring creates emissions without deriving any utility. In addition, the flaring process releases higher amounts of methane into the air than using the gas to generate electricity.

Gas flaring is a significant polluter

Oil depressurizes on the surface into liquids and gas (primarily methane) in oil extraction. Gas is worth less than oil by volume and is more difficult to transport, so most oil companies consider the gas a cost center. If the oilfield is located close to population centers, it might be economically feasible to build pipelines and transport the gas for usage as electricity or heating. But in many oil drilling locations, this is not the case. The oil producer then chooses to dispatch the gas in the most cost-effective way, which is simply burning the gas in a process called gas flaring.

Gas flaring emitted more than 500 megatons of CO2 equivalents in 2020.35 Assuming a typical car emits about 4.6 tons of carbon dioxide per year, emissions from gas flaring equate to that of more than 100 million cars. In comparison, generating the electricity used by the Bitcoin mining industry emitted 41 megaton CO2 in 2021 – only 8% that of gas flaring.



Source: The World Bank, CoinShares

If instead utilized, the flared gas could produce almost 700 TWh a year, which is more than the electricity consumption of all but five countries in the world.

Gas flaring occurs on oil production sites and is hence geographically concentrated. The most flaring intense oil regions are found in the U.S., the Middle East, Russian Siberia, and Africa. By country, Russia is the biggest gas flarer, flaring about 25 billion cubic meters of gas each year.

Source: The World Bank

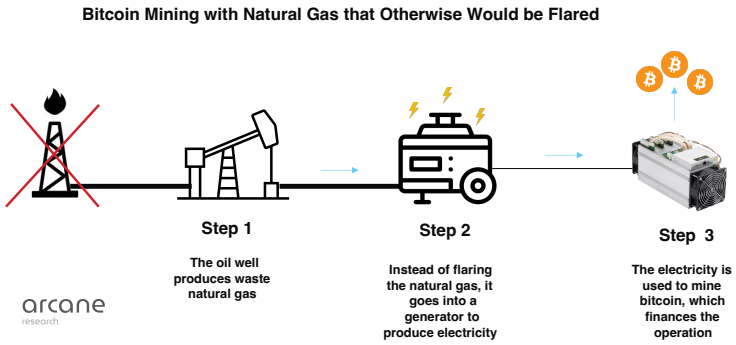
Iraq and Iran are the second and third largest countries by flaring volume, flaring close to 30 billion cubic meters of gas combined. The United States, where many smaller oil producers are unable to coordinate the building of pipelines, flares about 12 billion cubic meters of gas each year, while Algeria rounds out the top 5 countries by flaring volumes totaling close to 10 billion cubic meters a year.

Bitcoin mining can help mitigate natural gas

flaring

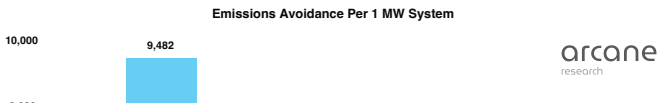
Bitcoin mining is emerging as the superior technology for reducing natural gas flaring. Flaring exists due to difficulties in taking natural gas to the market, but bitcoin mining solves this problem by taking the market to the natural gas. How does it work?

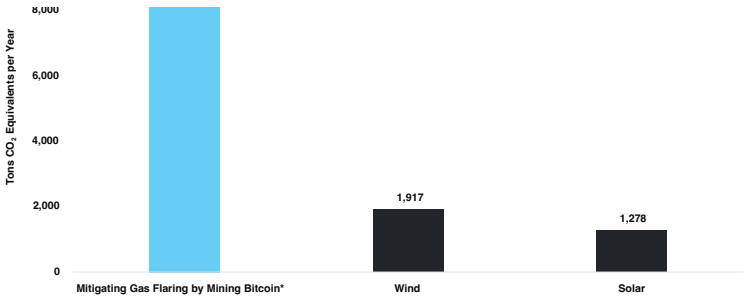
The previously flared natural gas is pumped into a generator, where it is burned inside a controlled environment to produce electricity. This electricity is then used to power machines that produce bitcoin. The income from the bitcoin mining operation is used to finance the infrastructure.



Source: Arcane Research

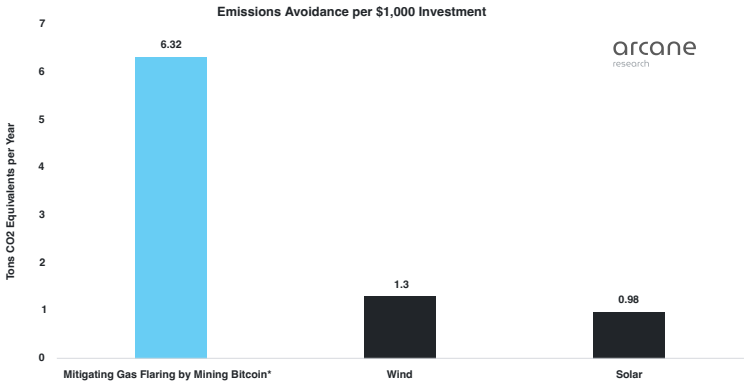
For example, by burning the natural gas in a controlled environment inside an electric generator, Crusoe Energy's Digital Flare Mitigation® technology can combust 99.89% of the methane, compared to only around 93% with flaring. This reduces CO2 equivalent emissions by about 63% compared to continued flaring. In addition to reducing emissions by preventing methane leaks, oil field bitcoin miners outcompete grid-connected bitcoin miners and thus offset their energy consumption.





Source: Crusoe Energy's Digital Flare Mitigation system

Numbers show that mitigating gas flaring by mining bitcoin is perhaps the most powerful tool in our toolbox for reducing greenhouse gas emissions. Per megawatt capacity installed, a bitcoin mining system can provide a yearly reduction of 9,482 tons of CO2 equivalent emissions, compared to 1,917 for wind and 1,278 for solar.



Source: Crusoe Energy's Digital Flare Mitigation System

It's also by far the most cost-efficient way of reducing emissions. Per $1,000 investment, a bitcoin mining system reduces emissions of 6.32 tons of CO2 equivalents per year, compared to 1.3 for wind and 0.98 for solar.

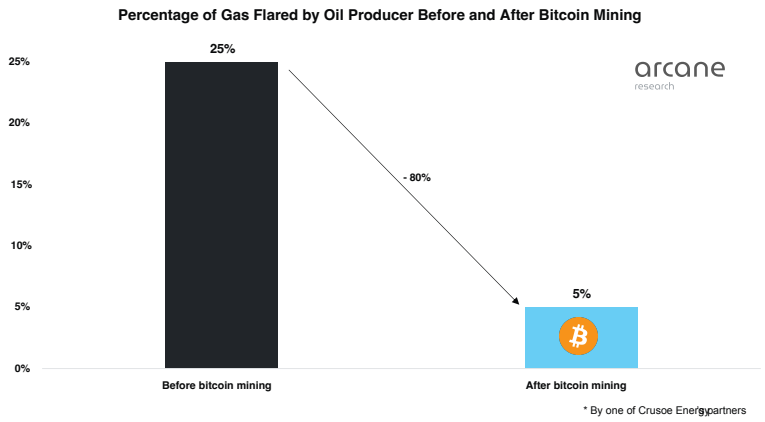
Bitcoin mining serves as a customer that can monetize the natural gas and help finance the required infrastructure to reduce emissions from flaring. At the

end of this article, we explain why bitcoin mining is the superior customer for this stranded natural gas.

We have seen massive oil field bitcoin mining growth over the past few years. The growth is concentrated in

problem, like Russia and the Middle East.

Both economic and environmental forces drive the rise of oil field bitcoin mining. Flaring natural gas on-site is a waste of an economic resource that the oil producer would instead want to sell for income. By mining bitcoin, either by themselves or through a third party, the oil producer can earn some money off the gas instead of letting it go to waste.



Source: Crusoe Energy

Environmental concerns and flaring regulations play the most prominent role in pushing oil producers to dip their toes into bitcoin mining. This is especially true in the United States, where state-specific regulations limit how much oil producers are allowed to flare as a percentage of their total production.

Several of the world's biggest oil-producing countries and companies have endorsed the World Bank's "Zero Routine Flaring by 2030" initiative and the "Global Methane Pledge." These initiatives are major drivers for

reducing flaring and will likely result in even more stringent regulation as we approach 2030.

Several companies and business models have emerged in this rapidly growing niche. The biggest company, Crusoe Energy, signs gas purchase agreements with major oil producers, installs its flare mitigation system close to the oil wells, and operates it. Crusoe Energy has termed the concept "Digital Flare Mitigation."

Crusoe has helped several oil companies reduce flaring from their United States operations, including ExxonMobil39 and Equinor. Crusoe plans to enter the Middle East through an office in Oman as part of its partnership with the Oman government.

Another leading company in this niche is Upstream Data, which pioneered the concept in 2017. This Canadian company's business model differs from Crusoe's in that instead of simply purchasing the gas, it sells equipment directly to oil producers so they can mine bitcoin themselves. Other companies with similar business models include E.Z. Blockchain, Giga Energy, and Jai Energy.

Which properties of bitcoin mining make the process a superior customer of stranded natural gas? Oil wells are often located in remote places where it is difficult to set up and operate other energy-intensive power-to-x operations. Because bitcoin mining is an unconstrained location-agnostic process, bitcoin miners can come directly to oil wells to eat up the excess natural gas. In addition, since oil sites typically produce declining amounts of excess natural gas as they mature, an offtaker must be able to scale down its operation modularly. Bitcoin mining is a modular process since you can combine different numbers of machines into varying energy usage levels. Also, when oil wells deplete, the consumer should be able to follow the oil producer to a new site. A bitcoin mining system can be built into a

container, making it highly portable.

Bitcoin mining's combination of location agnosticism, modularity, and portability makes it an ideal offtaker at scale for stranded natural gas. This makes it a valuable tool in our toolbox for mitigating gas flaring.

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