Cryptocurrency Mining

The Voracious Digital Parasite on the Grid

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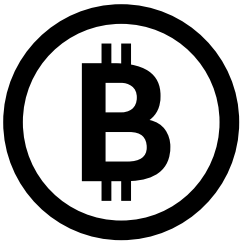
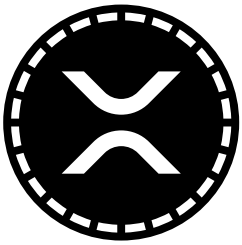
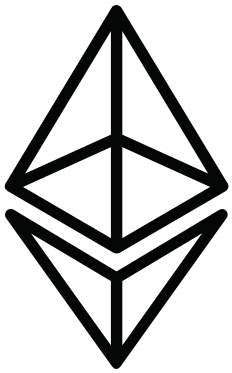


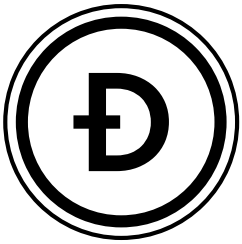
WHAT IS CRYPTOCURRENCY?

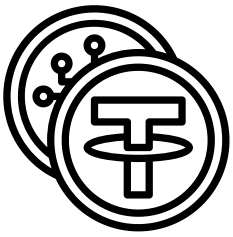


Cryptocurrencies are digital tokens that store value and can be traded in exchange for goods and services. Bitcoin is the most popular cryptocurrency in circulation.

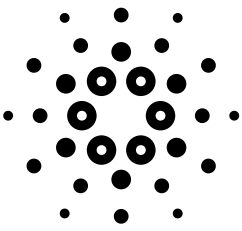


Bitcoins and other cryptocurrency tokens originate from computing structures called blockchains. A blockchain is maintained by an online network of computers around the world that compete to solve complex mathematical equations. In exchange for solving increasingly complex problems in the blockchain, one can earn a digital token, i.e. a Bitcoin. At the time of this writing, one Bitcoin is worth $36,055.





Every time a Bitcoin is created and new computers come onto the network, the cryptographical problems become more difficult to solve. Solving the problems requires a lot of computing power, which requires a lot of energy. The energy used to obtain one Bitcoin is about as much energy as an average household uses over 13 years.



"MINING" CRYPTOCURRENCY

The process of obtaining cryptocurrency is known as "crypto mining."

Far from unearthing minerals from the ground, crypto "mines" are buildings full of computers optimized to solve blockchain cryptography puzzles. They work by inputting huge amounts of energy to solve equations and spitting out Bitcoin as a reward. As long as the cost of the energy to produce a Bitcoin is less than the price of Bitcoin, the facility owners profit.

These industrial facilities do not employ many people to mine currency. Rather, the "miners" are the computers. Crypto mines can often run with few staffers to manage them.

Proof of Work mining explained

Blocks
Bitcoin transactions are pooled together in a "block".

Solving the Block
Once a block is formed, miners compete to solve a puzzle. The puzzle is difficult to solve, yet simple to verify (think like sudoku).

Verifying the Block
Once a miner solves the puzzle for a block, the transactions in that block are "verified" by the network. The new block of verified transactions is attached to a chain of prior blocks, hence "blockchain".

Block Reward
For solving the puzzle, a miner is rewarded with bitcoin. The current block reward is 6.25 BTC per block. Blocks are solved, on average, every 10 minutes.

ENVIRONMENTAL ISSUES WITH CRYPTOCURRENCY

Nearly all crypto mines use *a lot* of energy. They can get the electricity in a couple ways, with some sources being more problematic than others:

1. **The facility connects to the grid. Often mines will interconnect in rural places where energy is cheap. Increased demand for energy makes it more expensive for other people on the grid, especially if the additional demand creates need for grid upgrades.**

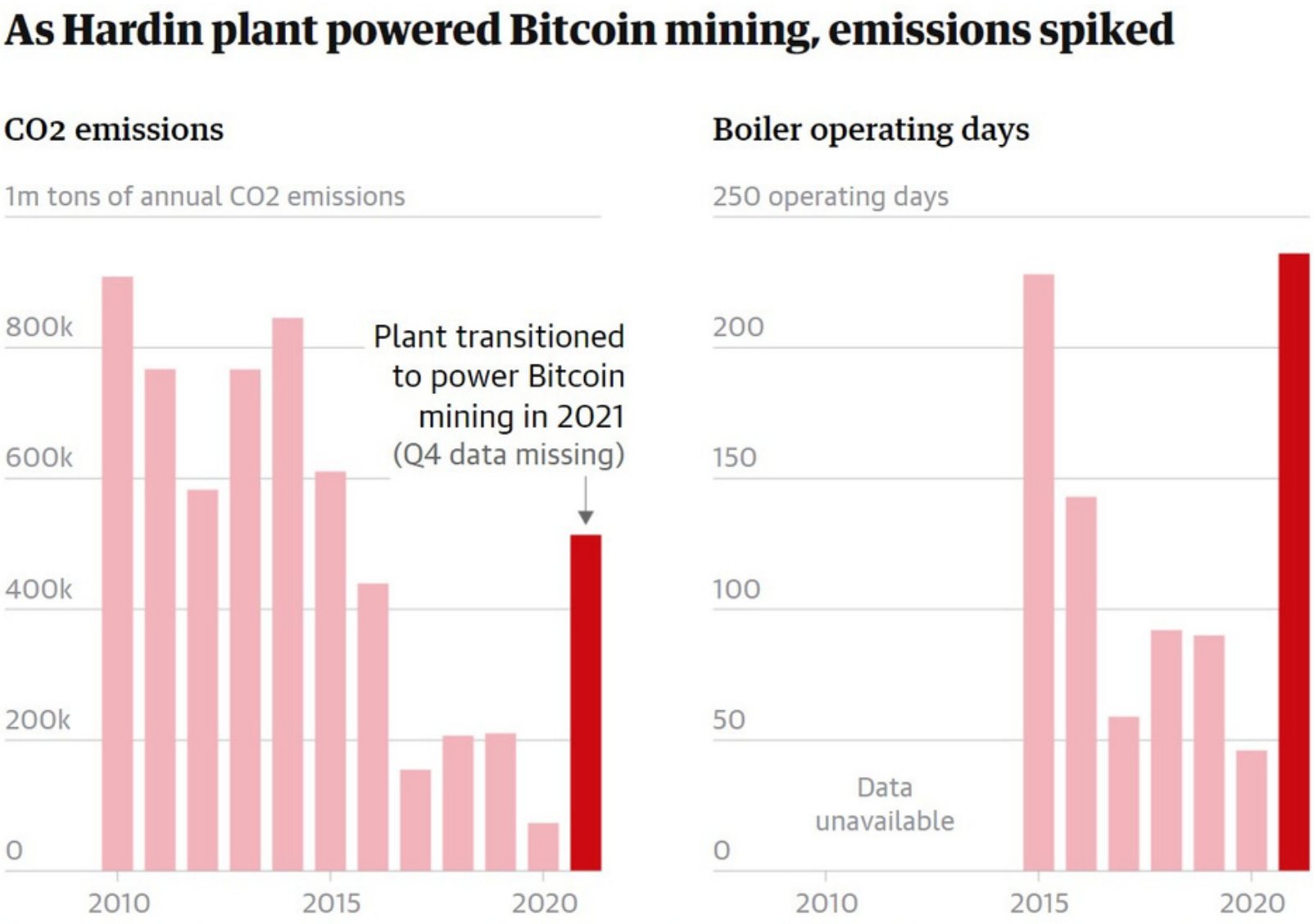
2. **The facility generates electricity on site. The facility can use renewable energy, but often they don't. Crypto mines across the country have been known to buy entire coal or fossil gas power plants and run them 24/7 to power the mining operation. By operating power plants and using the electricity on site, information regarding the plant's operations and energy use are less transparent.**

3. **Mobile crypto mines can plug into flared gas wells. In Montana and elsewhere, crypto mining operations are generating electricity from the flared methane gas at oil wells. This creates a perverse incentive to flare methane gas instead of reducing flaring and capturing the methane gas and using it for heating peoples' homes.**

A TROUBLING TREND IN MONTANA

The Hardin Generating Station is a 115 MW coal-fired power plant that was close to shutting down before a cryptocurrency mining company "rescued" it. The plant owner, Beowulf Energy, signed agreements with Marathon Digital Holdings, a crypto mining company, to sell electricity produced by the coal plant to Marathon for $0.028 per kWh. (This is substantially less than the average Montanan pays for power, about $0.10/kWh.) Estimated total energy costs to produce 1 Bitcoin is about $4,000.

Now, the Hardin plant is operating at full capacity again. Environmentalists are concerned that the owners of other dying coal plants are looking at cryptocurrency as a way to keep business afloat despite utilities moving away from fossil fuels.



Guardian graphic. Sources: Emissions from EPA, boiler activity compiled by the Montana Environmental Information Center from reports submitted by the plant operator to the Montana Department of Environmental Quality.

REGULATING CRYPTO

Countries around the globe are wrestling with how to address this emerging unregulated currency. A number of approaches have been attempted. Other ideas have been considered.

Here is a list of potential policy goals from most to least aggressive:

- Prevent cryptocurrency mining.
- Prevent cryptocurrency mining operations from emitting greenhouse gases.
- Prevent cryptocurrency mining from increasing electric system costs for ratepayers.

Policy Approaches from most to least aggressive:

- Ban large-scale, energy-intensive cryptocurrency mining.
- Ban behind-the-meter Proof of Work cryptocurrency mining powered by fossil fuels.
- Mandate development of sufficient renewable energy capacity to offset increases in system peaks due to additional load and establish firm demand response obligations.
- Ban BTM PoW crypto mining AND tax grid-powered mining.
- Significantly increase property taxes on crypto mines. Tie taxes to energy used or currency obtained.

INTERNATIONAL REGULATION

A number of nations have already banned or limited crypto mining in one form or another. Find a recent comprehensive list by the Global Legal Research Directorate, linked in the References.

China fully banned cryptocurrency mining and trading in September of 2021. China is committed to a centralized monetary policy, which many attribute as the impetus for the ban.

Scandinavian countries, namely Iceland, Sweden, and Norway, are claiming that the energy demand from crypto mines is preventing them from achieving clean energy goals.

- "Nobody would build a power plant for Bitcoin. There's a lot of uncertainty about its future," Icelandic power company CEO says. Bitcoin miners make the most money when they run their expensive machines 24/7. "They have absolutely no incentive to shut down in peak periods, or at all."

In Kosovo, crypto mining really took off. In response to an energy shortage in 2021, the government banned crypto mining to manage the crisis.

Iran was facing rolling blackouts in May 2021. Officials estimated that cryptocurrency mining was responsible for at least 3% of total energy demand in the country. The Iranian government instituted a ban on mining, similar to Kosovo, to free up electricity for households.

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