



## BITCOIN ELECTRICITY CONSUMPTION

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According to a White House September 8, 2022 fact sheet, the cryptocurrency mining community is using somewhere between 0.4% and 0.9% of the global electricity production, based on a usage estimate of 120 to 240 terawatt hours per year.<sup>1</sup> The largest element of that community is Bitcoin. Using the midpoint of the White House estimate, cryptocurrency mining uses about 0.65% of 28,466TWh of global gross electricity generation.

We know that 328,500 Bitcoin were produced in 2022. This is worth \$7.555 billion if we use a price of \$23,000 for the calculation, which would be a rough average for the year. Logically, since a substantial amount of money must be spent on mining equipment, the industry could not survive if it spent anywhere close to \$7.555 billion on electricity.

The government's assumption of cryptocurrency mining accounting for 0.65% of global electricity consumption, would mean 0.65% of 28,466 terawatt hours, the global usage figure.<sup>2</sup> This equals 185 terawatt hours, which is the same – to put it on a common scale with per-kilowatt-hour electricity pricing – as 185 billion KWh. Based on a price of \$0.08/KWh, it would cost \$14.8 billion. This is twice the breakeven operating cost determined above, which itself unrealistically presumed no physical capital costs or other operating expenses or even a return-on-capital allowance. The nationwide average is about \$0.125/KWh, about 50% higher. The industrial sector, as the government categorizes it, pays the lowest rate on average, \$0.086/KWh, while the commercial and transportation sectors pay about 11¢. Interestingly, both the Bitcoin Mining Council<sup>3</sup> and the White House use the BP (British Petroleum) Statistical Review of World Energy's figure for the estimate of global power production.

### **How can Bitcoin be produced at an affordable cost?**

There are two factors.

First, Bitcoin can use intermittent power, unlike almost any other industry. There is no requirement that Bitcoin mining rigs operate on a 24/7 basis, so mining operations purchase renewable power during non-peak hours when demand for power is low. Also, according to the Bitcoin Mining Council, 59.5% of the power purchased by the Bitcoin Mining Operators is renewable, green energy.<sup>4</sup> Bitcoin miners, unlike almost any other business, can wait for periods of high wind or sunlight.

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<sup>1</sup> "Fact Sheet: Climate and Energy Implication of Crypto-Assets in the United States," September 8, 2022, <https://www.whitehouse.gov/ostp/news-updates/2022/09/08/fact-sheet-climate-and-energy-implications-of-crypto-assets-in-the-united-states/>

<sup>2</sup> BP (British Petroleum) Statistical Review of World Energy

<sup>3</sup> [www.bitcoinminingcouncil.com](http://www.bitcoinminingcouncil.com). The Bitcoin Mining Council is a voluntary and open forum of Bitcoin miners committed to the network and its core principles. We promote transparency, share best practices, and educate the public on the benefits of Bitcoin and Bitcoin mining. Horizon Kinetics is a Bitcoin Mining Council Advisory Member.

<sup>4</sup> <https://bitcoinminingcouncil.com/bitcoin-mining-electricity-mix-increased-to-59-5-sustainable-in-q2-2022/>



Second, to the extent that conventional power is purchased, miners purchase it from the utility spinning reserve. This reserve is just supplemental power that is always available (and consuming fuel) but rarely used except in brief peaking situations. The purchase of the spinning reserve provides revenue to utilities that they would not otherwise receive, and hence, it contributes to lower power prices for the entire community.

The power prices make it clear that Bitcoin miners could not possibly be using 240 terawatts of power annually. If a total of \$7.5 billion worth of Bitcoin is produced, and we take into consideration the cost of the mining rigs, which is a substantial portion of the all-in operating costs, some labor, and some other costs, obviously the industry cannot spend \$15 billion on electric power. Incidentally, the White House uses the same numbers that many periodicals use and the same numbers that many university studies use; those numbers are just not possible.

As a matter of logic, there is no way that Bitcoin could be using even as much as a half of 1% of the world's power. If that were the case, not one single bitcoin would be mined, since it would be at an economic loss to the miner. Mining rigs are routinely shut off at a moment's notice when the operating cost exceeds the expected revenue. This number has to be lower. The only other logical way out of that dilemma would have to be at a significantly higher bitcoin price, but we know the bitcoin price.

Another irony are the claims that Bitcoin uses more power than entire countries—this has become a matter of general acceptance. Here are the facts. The Bitcoin Mining Council reports that bitcoin uses 253 terawatts of power annually, which is much the same as the government's figure. However, miners are not paying \$0.08/KWh. The major difference is that bitcoin miners use alternative or green energy, which is intermittent. All of these electric power business figures are verifiable if someone chooses to go to the original sources and verify them.

Most businesses cannot run on intermittent power, but one *can* run a Bitcoin mining operation on intermittent power. The mining equipment does not have to be on and in use all the time; one can turn it on intermittently when power is available and less expensive. For example, if it gets windy late at night and incremental power is produced by windmills, no one needs it because overnight power demand is the low point and that power has almost no market value, so bitcoin mining operations buy that power, which is also a direct benefit to those producers. Similarly, when it is sunny, it can be sunny over an entire continent that may have a large number of solar installations. All of those facilities will be generating a maximum rate of power at midday, but that power might not be needed at midday. If a bitcoin mine is content with intermittent power, because unlike a commercial or industrial business it can turn off its rigs or power them up at a moment's notice, it can buy that power for virtually nothing. This can be an financially important, even critical source of revenue for renewable power installations.

The irony is that the enterprises with the best ability and the best incentive to buy what we would refer to as green energy are the cryptocurrency miners. They are the ones who buy it. Most businesses cannot function on green, intermittent power. On certain days, it is rainy, and there is just not a lot of sunlight, ergo there is not a lot of power, but you might have a lot of customers that day. In this situation, in the converse of the supportive buying of excess power just mentioned, the crypto miner can likewise support the local utility by shutting down temporarily to help the utility meet peak demand.



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