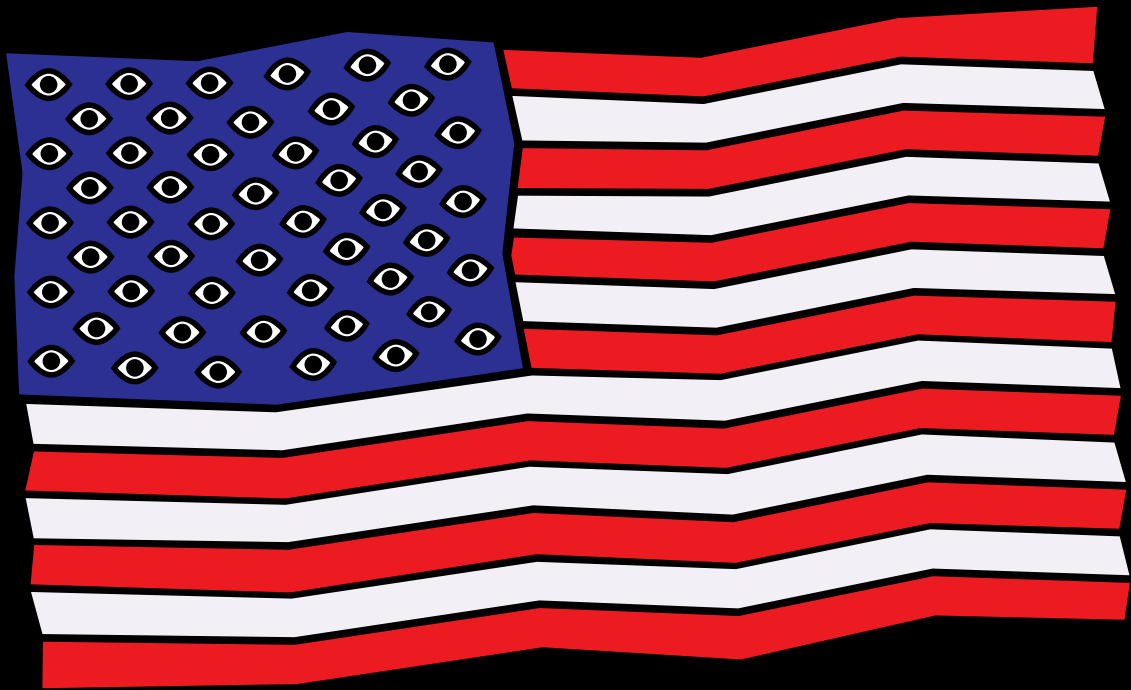


BITCOIN

MAGAZINE®



THE **PRIVACY** ISSUE

BITCOIN MINING ECONOMICS

SIMPLIFIED

sponsored by

HIVE

UNDERSTANDING HASH COST AND HASHPRICE

BY JOE RODGERS

Bitcoin mining is a competitive industry where profitability hinges on understanding and managing various factors including power cost, hashprice, BTCUSD, network hashrate, hardware costs, efficiency, and more. One of the simplest yet most crucial metrics miners use to gauge their efficiency and profitability is hash cost.

We've seen this industry change over the years and most recently victors have been decided by razor-thin margins; understanding a path to profit is a critical success factor. In this article, we explore the basics of hash cost, how to calculate it, and why it's a critical number for miners to keep in their back pockets. We'll also delve into the concept of hash price and provide an illustration to see hash profitability across various scenarios.

Bitcoin mining has evolved significantly since the network's inception in 2009. Initially, mining could be performed using standard CPUs, but as the network grew, miners transitioned to GPUs and eventually specialized ASICs (application-specific integrated circuits). Each advancement brought about improvements in efficiency and reductions in hash cost. Understanding this evolution is key to appreciating the current state of mining and its future direction. You can see how hashrate and efficiency have radically changed over time.

BITCOIN MINING HARDWARE EVOLUTION

YEAR	MINING HARDWARE	MODEL	HASHRATE (TH/S)	POWER CONSUMPTION (WATTS)	EFFICIENCY (W/TH)
2009	CPU	Intel Core i7	0.000005	130	26,000,000
2010	GPU	ATI Radeon HD 5970	0.00075	300	400,000
2011	FPGA	Xilinx Spartan-6 LX150	0.0015	15	10,000
2012	ASIC	Avalon Generation 1	0.0045	600	133,333
2013	ASIC	Bitmain Antminer S1	0.18	360	2,000
2014	ASIC	Bitmain Antminer S3	0.44	390	886
2015	ASIC	Bitmain Antminer S5	1.15	590	513
2016	ASIC	Bitmain Antminer S7	4.73	1,290	273
2017	ASIC	Bitmain Antminer S9	14.0	1,372	98
2018	ASIC	Bitmain Antminer S15	28.0	1,596	57
2019	ASIC	Bitmain Antminer S17 Pro	53.0	2,100	40
2020	ASIC	Bitmain Antminer S19 Pro	110.0	3,250	29.5
2021	ASIC	Bitmain Antminer S19j Pro	96.0	2,850	29.6875
2022	ASIC	Bitmain Antminer S19 XP	140.0	3,010	21.5
2023	ASIC	Bitmain Antminer S19j XP	151.0	3,350	22.2

WHAT IS HASH COST?

Hash cost is the cost of producing one terahash per second (TH/s) of bitcoin mining power. Miners with a lower efficiency (W/TH) will have a lower hash cost, which is precisely what you want. Knowing hash cost helps miners quickly determine their operating costs and profitability.

It provides a clear picture of how much it costs to operate a single miner, which is essential for tracking profitability against the revenue generated from that hashing power, known as hashprice.

CALCULATING HASH COST

For the purpose of this article we use one of the most commonly deployed miners, the Bitmain Antminer S19j Pro 96 model, which has a power consumption of 2,850 watts and a hashrate of 96 TH/s. We'll also use a power rate of \$0.075 per kWh. This model is now several years old but it's modern enough to benefit from aftermarket firmware and decent efficiency.

MINER EFFICIENCY

First, let's calculate the miner's efficiency:

$$\text{Efficiency} = \text{Watts} / \text{Hashrate (TH/s)}$$

For the Bitmain Antminer S19j Pro 96 model:

$$\text{Efficiency} = 2,850 \text{ watts} / 96 \text{ TH/s} = 29.6875 \text{ watts per TH/s}$$

POWER CONSUMPTION IN kWh

Next, we convert efficiency into kilowatt-hours (kWh) over a 24-hour period:

$$\text{Efficiency (kWh)} = 29.6875 \text{ watts per TH/s} / 1,000 = 0.0296875 \text{ kWh per TH/s}$$

HASH COST

Using the power rate, we can now calculate the hash cost:

$$\text{Hash Cost} = \text{Efficiency (kWh per TH/s)} \times \text{Power Rate} \times 24 \text{ hours}$$

$$\text{Hash Cost} = 0.0296875 \times \$0.075 \times 24 \text{ hours} = \$0.053/\text{TH/s/Day}$$

This means it costs approximately \$0.053 per TH/s per day to run the Bitmain Antminer S19j Pro 96 model at a power rate of \$0.075 per kWh.

WHY HASH COST MATTERS

Understanding your hash cost allows you to track your profitability against hashprice: Hashprice is the revenue generated from your hashrate. Knowing your hash cost helps you quickly determine if you are operating at a profit or a loss.

FOR REFERENCE THE FORMULA FOR HASHPRICE IS:

$$\text{Hashprice} = \text{BTCUSD} \times (1/(\text{Hashrate in EH/s} \times 0.01)) \times 450 \text{ btc mined per day} \times 0.00000001 \text{ sats}$$

Understanding hash cost and hashprice help miners make informed decisions. By comparing your hash cost to the hash price, you can decide whether to continue mining, scale your operations, or even shut down if the costs outweigh the benefits. This will help miners adjust their strategies based on market conditions. With hashprice hitting all-time lows after the halving, it's more important than ever to understand these metrics. For example, miners might put their machines in low power mode in order to increase their efficiency and mine profitably, and when hashprice increases they can return to normal power mode.

Your hash cost is pretty much locked in once you deploy the machines, but hashprice fluctuates based on network hashrate and the price of bitcoin. Based on our formulas for hash cost and hashprice, we can model out various scenarios to see how hashrate and price affect your hash profitability.

HASHRATE AND BTC PRICE SCENARIOS

EH/s	\$50,000	\$100,000	\$150,000	\$200,000	\$250,000
600	-\$0.016	\$0.022	\$0.059	\$0.097	\$0.134
700	-\$0.021	\$0.011	\$0.043	\$0.075	\$0.107
800	-\$0.025	\$0.003	\$0.031	\$0.059	\$0.087
900	-\$0.028	-\$0.003	\$0.022	\$0.047	\$0.072
1,000	-\$0.031	-\$0.008	\$0.014	\$0.037	\$0.059

This table illustrates the S19j Pro with \$0.075 kWh prices, as outlined in the earlier hash cost example. You can see the hash profit for this machine is a slim margin. Even at \$100,000 BTCUSD, the machine barely turns a profit when the network reaches 800 EH/s, which will happen sooner than any of us can imagine. The next key takeaway is that achieving a hash profit greater than \$0.10 on this machine is very challenging. It will require a very significant BTCUSD price increase and a slow rise in the network hash rate, which is never too far behind upward price swings.

For bitcoin miners, hash cost is one of the most simple yet important metrics that ensures they stay informed about their operational efficiency and profitability. By keeping an eye on both hash cost and hashprice, miners can navigate the ever-changing landscape of bitcoin mining, especially during periods of low hashprices. The key takeaway from this article would be this:

Calculate your hash cost and keep an eye on hashprice, and if you can't survive 80% drawdown in BTCUSD then don't mine bitcoin — just stack sats. Avoid the razor's edge if you can. 📉