



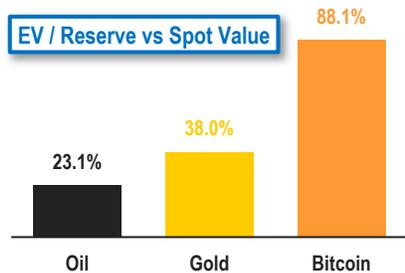
Bitcoin and the Public Miners

Valuation Focus: The Framework Driving Our Bitcoin Reserve Approach to Miners

We focus attention this week on how we view our Bitcoin Mining Reserve framework translating into a valuation heuristic for Bitcoin miners. We point to a generic / anonymized miner with a \$1billion market cap as an example. The intent is not to single out a particular miner but to develop our thought process further.

As we assessed previously, a Petahash/s of hashing capacity is projected to mine 1.424BTC in 2022 and 0.808BTC in 2023 (slide 4). From 1/1/2023 through 12/31/2030, our model projects 1PH/s to mine a total of 2.129BTC. 2023 represents ~38% of this 2.129 BTC, in part because of the impact of the 2024 halving.

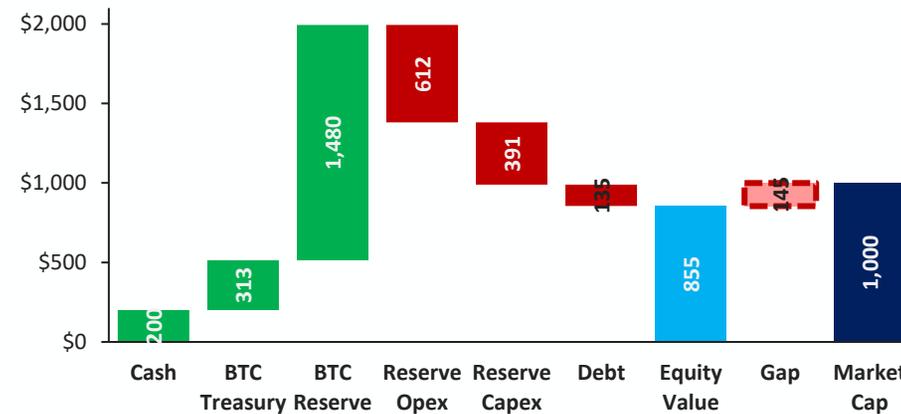
We then used this “reserve” to show that Bitcoin miners traded at 96% (now 87%) of the value of their reserve, which is expensive compared with the oil producers (which trade at 23% of spot value of oil reserves) and gold miners (38% of spot value of gold reserves).



With a set of guidelines about the evolution of the technology / efficiency of state-of-the-art rigs, one can develop a rough estimate of power consumption required to generate 1 PH/s of hashpower in any given year, giving us a very approximate operating cost to run 1PH/s over a decade to extract Bitcoin from the “reserve”. We

also assume an incremental capital cost of \$30 per TH/s to upgrade / replace failures over the decade, not including upfront capex to get from current Hashrate to planned year-end 2022 Hashrate.

The valuation waterfall developed below illustrates our framework for a public miner:



Miner Valuation Waterfall

This public miner has about \$200mm in cash and \$313mm in mark-to-market value of treasury Bitcoin. Based on their current and projected YE 2022 Hashrate, compared with our long-term network projections, they should produce a further 36000 BTC, which would be worth \$1.5billion at current spot value. However, our model suggests that it would take \$612mm in operating expenses, as well as \$390mm in capex to run the Hashrate and to upgrade / replace rigs as needed to keep the company’s Hashrate flat. This “extraction cost” reduces the value of the Bitcoin reserve to the company enterprise value. Subtracting out any

debt the company has leads to a hypothetical equity value of \$855mm, a 14% discount to the current market cap of the company. Note that we have not discounted this future BTC revenue / expense to get to a present value, which would tend to further reduce fair market value.

Source: Bloomberg, BitOoda, Coinmetrics

Key Takeaways

- We suggest a new valuation framework to evaluate investments in Bitcoin miners
- We assess that miners in general appear moderately expensive...
- ...But a paucity of investable alternatives that fit within the investment mandate for many fund managers helps support miner valuations
- Our thesis would be wrong if accelerating power efficiency of rigs reduced “extraction cost” or opex to extract reserve, closing the gap identified in the chart above

Research

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BTC Price \$40,705
 (4/11 at 12 pm ET)

Obs Hashrate 187 EH/s



Bitcoin Network Rewards Slowly Tx Fee Centric

- Our projections call for total daily mining rewards to slowly transition toward more Transaction Fee centric rather than Block Reward centric
- However, Tx Fees are currently tracking below our prior estimates
- We assess this is driven by the shift of many exchanges to settling inter-exchange transactions via stablecoins rather than BTC, reducing network congestion and thus fees
- Secondly, we assess more BTC is held on-exchange in western countries than in Asia, so the shift of trading activity to the west from (especially) China leads to lower on-chain Tx volumes; and – although still early days – the growing adoption of the Lightning Network also reduces on-chain volumes
- **Thus, there may be downside risk to our Tx Fee projections, but current estimates suffice for the present analysis**

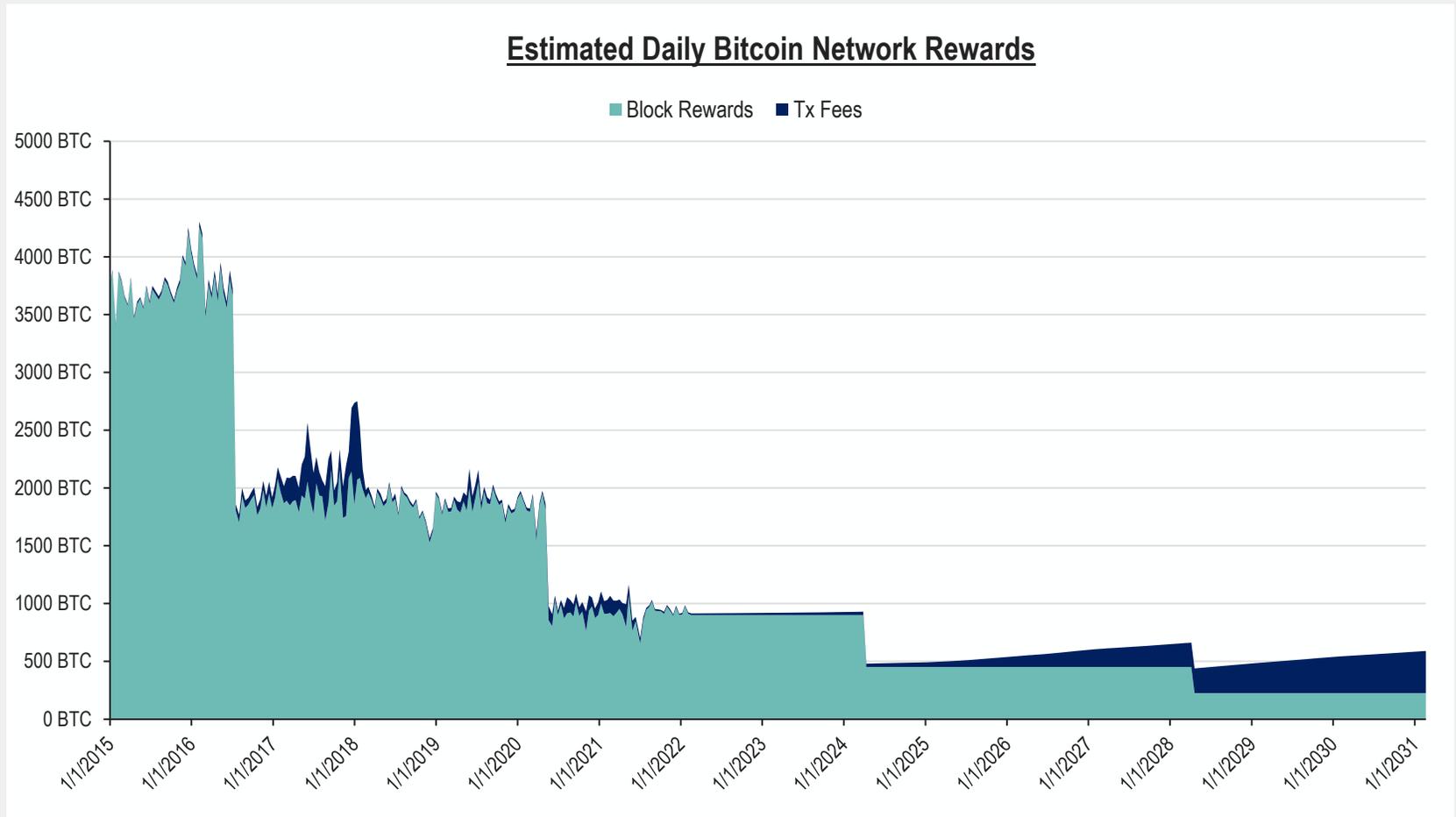


Figure: Historical and Estimated daily rewards to Bitcoin mining network, 1/1/2015 through 2031
Historical as of 4/4/22

Source: BitOoda estimates, CoinMetrics



BTC Revenue per PH/s per Day Decaying With Rising Hashrate

- We model out the decline in daily revenue per 1PH/s unit of Hashrate as the network expands
- The number stabilizes after the 2028 halving on the assumption that Tx Fees continue to grow and outweigh the further network Hashrate growth
- However, this is predicated on increasing network congestion, which is by no means certain
- **Thus, there may be downside risk to the Tx Fee component of revenue projections**

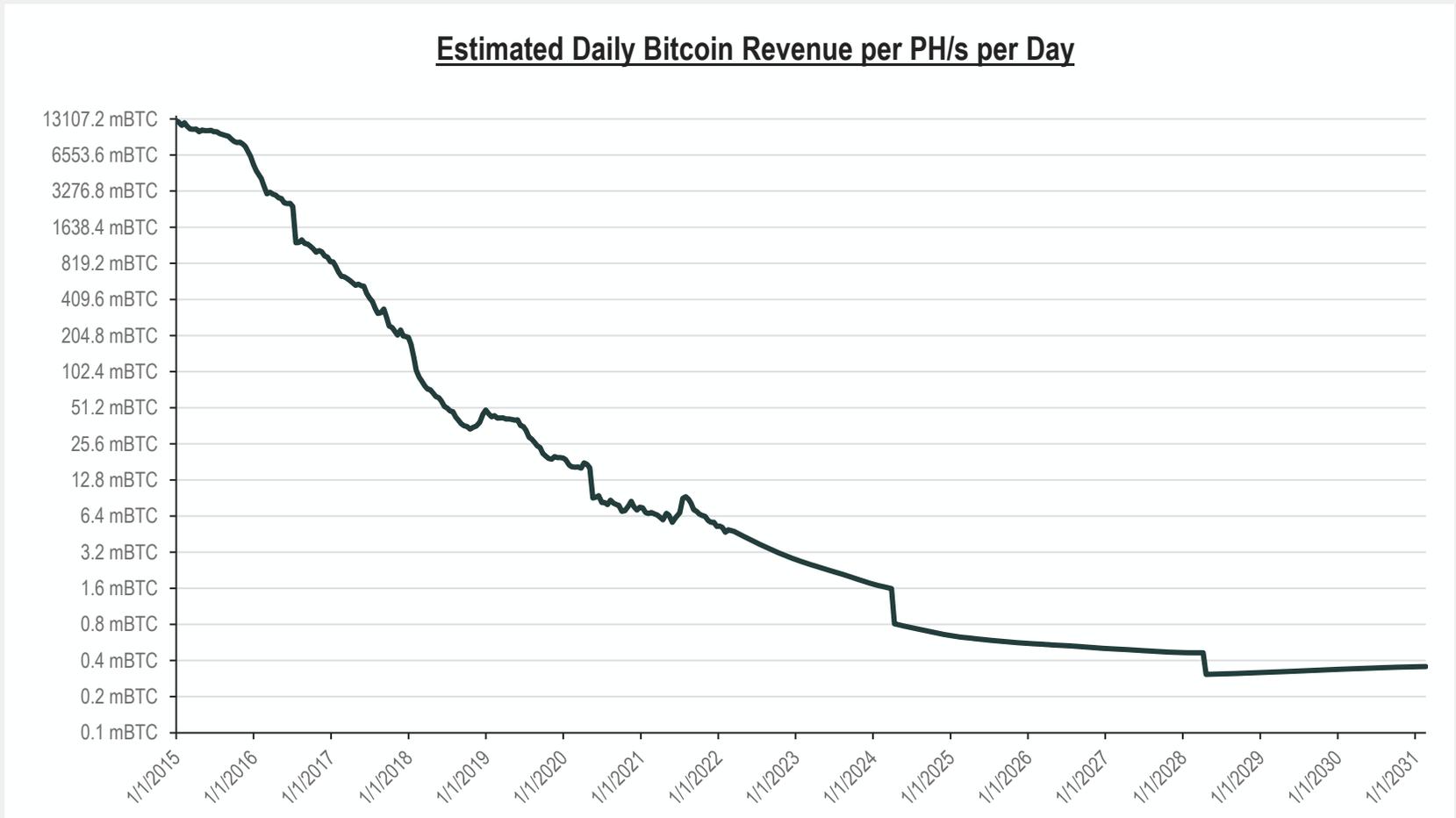


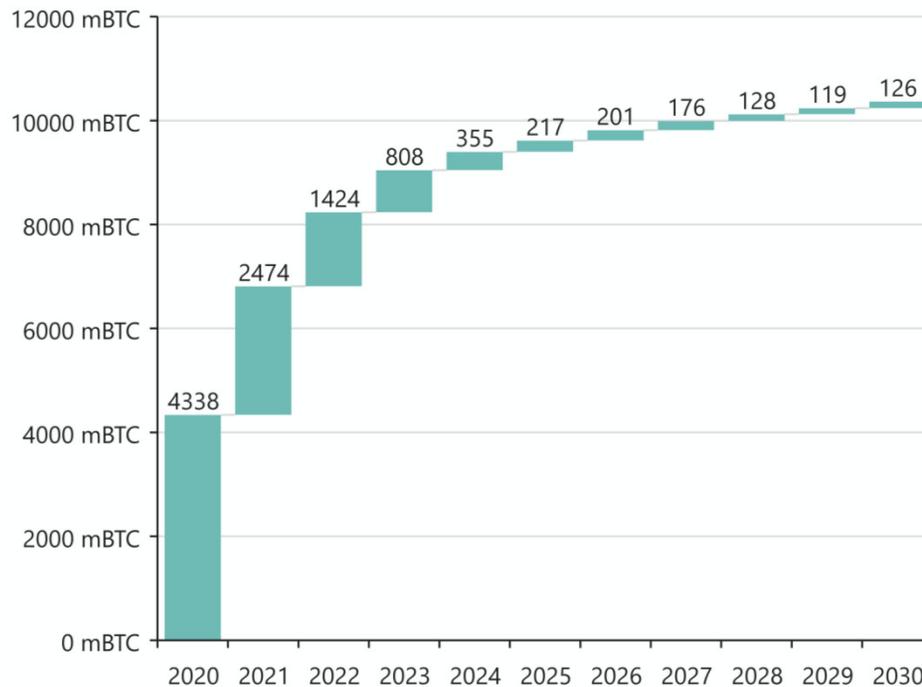
Figure: Historical and Estimated daily rewards per PH/s per day, in Milli BTC (1/1000 BTC), 1/1/2015 through 2031
Historical as of 4/4/22

Source: BitOoda estimates, CoinMetrics

BTC Mining Reserve per PH/s Declining Rapidly With Rising Hashrate

- The chart below shows our estimate of annual BTC earned per PH/s operating continuously for each full year
- The chart shows that there is a real cost to delaying production: running a PH/s per day for all of 2020 would have earned 4338 milli BTC or 4.3 BTC. The same PH/s running from 1/1/2023 to 12/31/2023 would earn just 808mBTC or 0.8BTC
- A facility coming online on 1/1/2023 will earn 2.129BTC for every PH/s they operate through 2030 *assuming no downside to our Tx fee projections*

Total Annual BTC Earned per PH/s per Day, in mBTC



Total Rewards / PH/s in mBTC	
2020	4338
2021	2474
2022	1424
2023	808
2024	355
2025	217
2026	201
2027	176
2028	128
2029	119
2030	126

Figure: Historical and Estimated total annual earnings per PH/s per day, in Milli BTC (1/1000 BTC) Historical as of 4/4/22

Source: BitOoda estimates, CoinMetrics

Rig Class Assumptions

Driving Hashrate / MW and Revenue per MWh

- We assess the Hashrate per MW could more than triple over the next decade compared to the current S19-class Hashrate per MW
- This is still a slowing rate of improvement, which might prove conservative
- However, our assessment is the actual linewidth and feature shrink will lag behind the nominal process shrink
- We assess die sizes may shrink modestly to enhance yields, resulting in more chips per device
- This does not account for changing design paradigms around direct immersion of hashboards, which may develop sooner than later

BitOoda Efficiency Gain Framework

Class	Release Date	Hashrate	Power Consumption	Watts/ TH/s	Hashrate / MW
S9	9/1/2016	14 TH/s	1400 W	100.0 W	8.9 PH/s
S17	4/1/2019	50 TH/s	2385 W	47.7 W	18.7 PH/s
S19	5/11/2020	90 TH/s	3100 W	34.4 W	25.9 PH/s
S19XP	8/1/2022	140 TH/s	3010 W	21.5 W	41.5 PH/s
5nm+	10/1/2022	162 TH/s	2919 W	18.0 W	49.7 PH/s
3nm	9/1/2023	188 TH/s	2865 W	15.2 W	58.7 PH/s
2nm	9/1/2026	212 TH/s	2752 W	13.0 W	68.7 PH/s
1nm	9/1/2029	244 TH/s	2757 W	11.3 W	78.9 PH/s

Figure: Chip parameters for key generations

Source: BitOoda estimates, CoinMetrics, Bitmain, MicroBT



Opex per BTC Growing With Rising Hashrate, Despite Improving Fleet Efficiency

- The charts below show our estimated fleet-wide improvements in the amount of Hashrate generated per BTC, based on our preceding “guesstimate” of improving chip power efficiency
- This leads to a falling MWh needed to run 1 PH/s for a full year
- The preceding analysis leads to an increasing MWh per BTC, because we see declining BTC produced per MWh – with large declines associated with the halving and modest improvements between halvings if Tx Fees continue to tick up
- **Based on a \$50 / MWh operating cost, this leads to an 8x increase in operating cost per BTC produced between 2020 and 2030 – and this needs sustained capex to capture PH/s per MW improvements**

Operating Cost Per BTC Produced

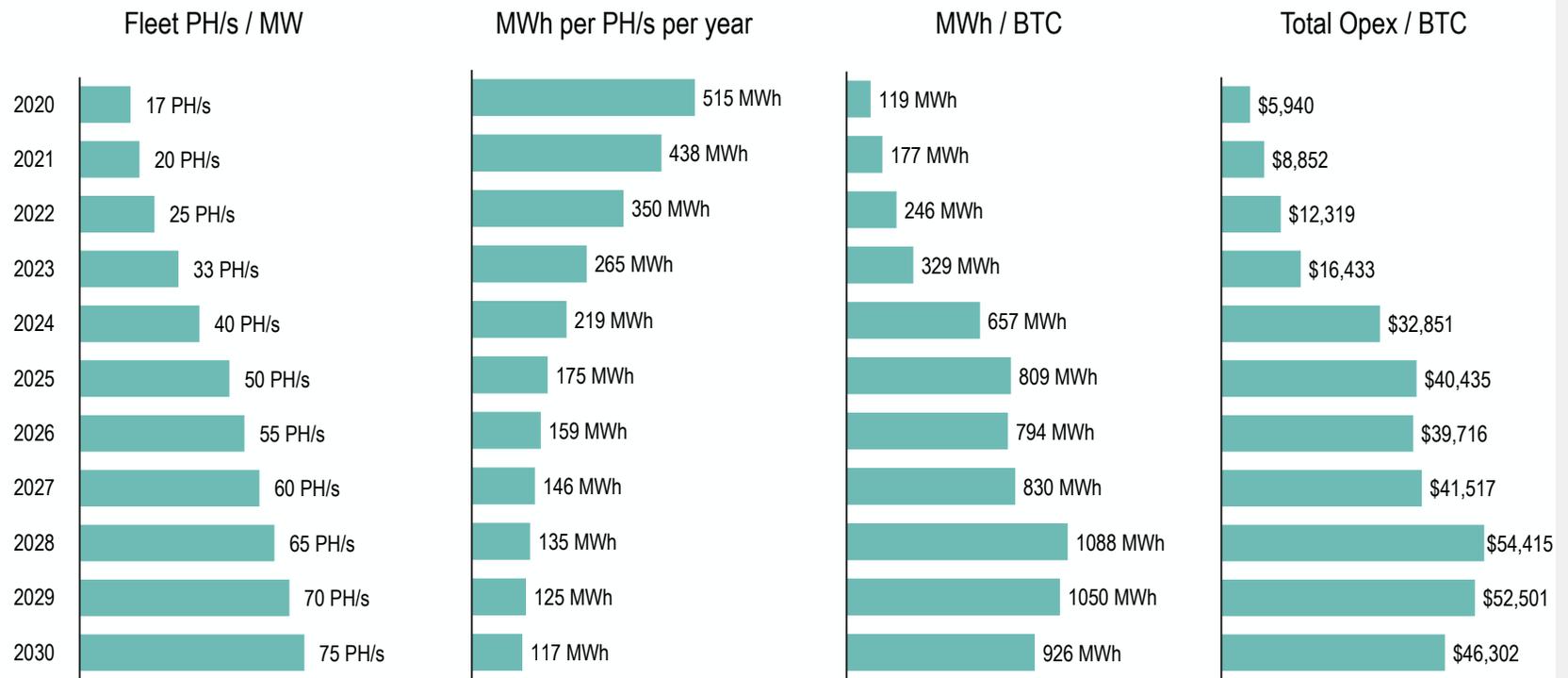


Figure: Historical and Estimated Bitcoin Operating Stats
Assuming \$50 / MWh operating costs

Source: BitOoda estimates, CoinMetrics





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