March 28, 2022

Bitooda

Bitcoin and the Public Markets

Valuation Focus: We Prefer Spot Bitcoin Over Miners

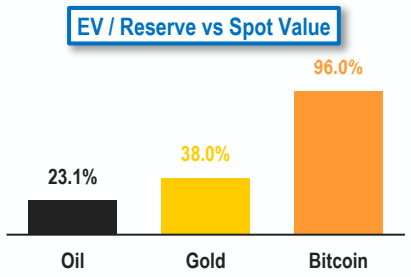
This report focuses on the valuation implications of the network Hashrate for the public miners.

By our assessment, a Petahash/s of hashing capacity is projected to mine 1.424BTC in 2022, and 0.808BTC in 2023 (slide 6). 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.

Commodity extracting industries, such as oil & gas and gold miners, trade at an EV / unit of reserve. The EV of Exxon Mobil, for example, is compared to the proven reserves in barrels of oil equivalent, or EV per oz of proven gold reserve in the case of gold miners. The oil group trades at an EV of $25 per BoE, or 23% of the current spot price of oil, while the gold group trades at $737 per oz gold reserves, or 38% of spot. The notion is that as an investor, I can buy 1 oz of gold or invest in the company to own 1 oz of future gold. The reason 1 oz equivalent of the company is cheaper than spot is because there are operating costs and future capital expenditures required to extract that gold.

We view an investment in a Bitcoin miner similarly: an investment in the miner gives us a proportional share of future bitcoin mined, with the need to account for future operating expenses to run the miners as well as "sustaining capex", the capex needed to support and upgrade the existing Hashrate. Thus, the price an investor should be willing to pay to own 1 Bitcoin "in the ether" by proxy through stock ownership should be less than the spot price of Bitcoin by the opex and capex required to mine it, with an additional time value component as well. For every Bitcoin that a miner will mine over the years, the valuation should be a modest fraction of the current spot price of BTC.

While Oil and Gold trade at at EV / Unit Reserve of 23 & 38% of Spot, BTC miners trade at a weighted 96% of spot.



The public miners are expected to mine 85,327 BTC in 2022, by our model, including YTD mined BTC. At the current spot rate of $47,700 per BTC, this would imply $4.07B in revenue. Bloomberg consensus revenue of $5.2B (for 15 of 18 stocks) (slide 17) thus implies that either analyst consensus expects less Hashrate growth or a higher average price vs spot. If Hashrate and thus mined BTC align with our model, BTC price would need to average $61k or more for the year to achieve this revenue.

This is rich for our taste, because the EV to BTC reserve valuation at 96% of spot leaves no margin for error – or even for opex / capex). We would rather hold spot BTC and selectively consider individual miners trading at a lower EV / BTC Reserve (see right) or with diversified revenue streams such as hosting.

Key Takeaways

- *Bitcoin miners trade at an adjusted EV per BTC in reserve of $47,872 vs a $ 47,700 spot price*
- *We assess that consensus estimates assume some combination of a $61k average Bitcoin price and/or significantly lower Hashrate than our model*
- *Given the rich value for miners vs their Bitcoin Reserve, layering on price appreciation or Hashrate downside is aggressive, in our assessment*
- *We would rather own spot Bitcoin than Bitcoin miners as a group, and selectively see opportunity in lower valued stocks and / or diversified stocks*

Research

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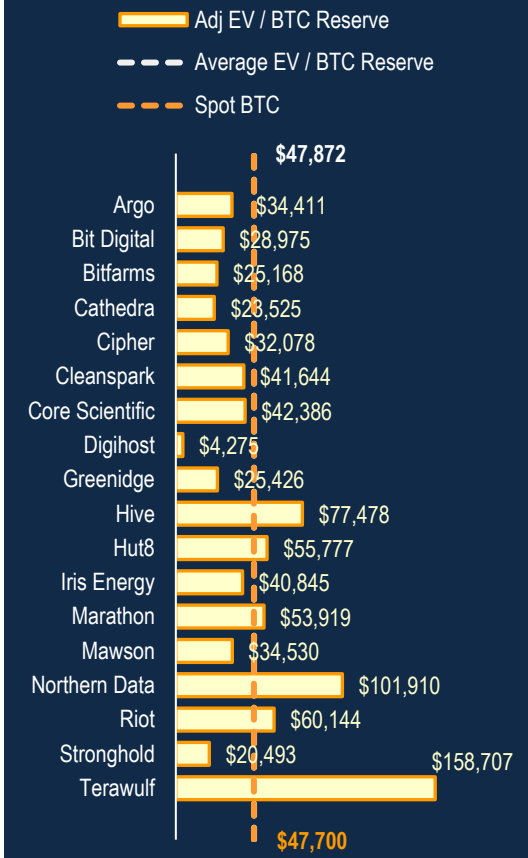
BTC Price (3/28 at 11 am ET)	$47,700
Obs Hashrate	202 EH/s



Bitcoin Mining Reserve

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BitOoda 2022 Hash Estimates
~327 EH/s by Year End

- Our projections call for a target Hashrate of ~327EH/s by year end 2022
- This is slightly below our most recent prior estimate of 334EH/s and represents 88% year-on-year growth vs. December 2021
- We expect power infrastructure to be the gating factor in mining expansion earlier in the year, but to start easing later in the year, with semiconductor availability the ultimate limiting issue
- **The Hashrate growth pace averages 12.8 EH/s per month, but we assess deployments will be somewhat back-end loaded**
- **However, Hashrate growth YTD has exceeded our model projections**

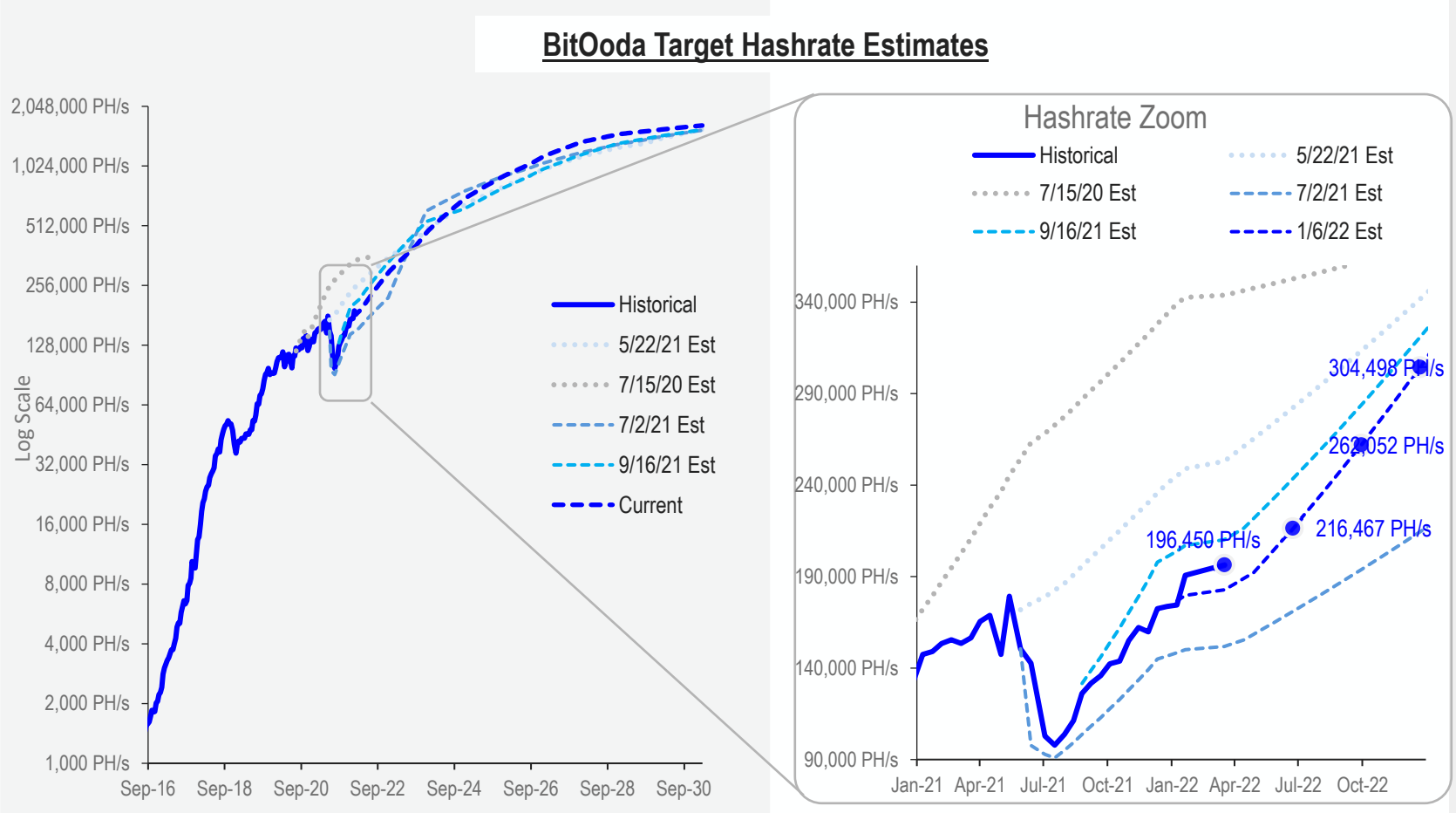

Figure: Historical and Estimated Target Hashrate 2017-2030
Historical as of 2/15/21; Estimates as of current, 9/16/21, 7/2/21, 5/22/21, and 7/15/20

Source: BitOoda estimates, CoinMetrics

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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
- Secondarily, 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**

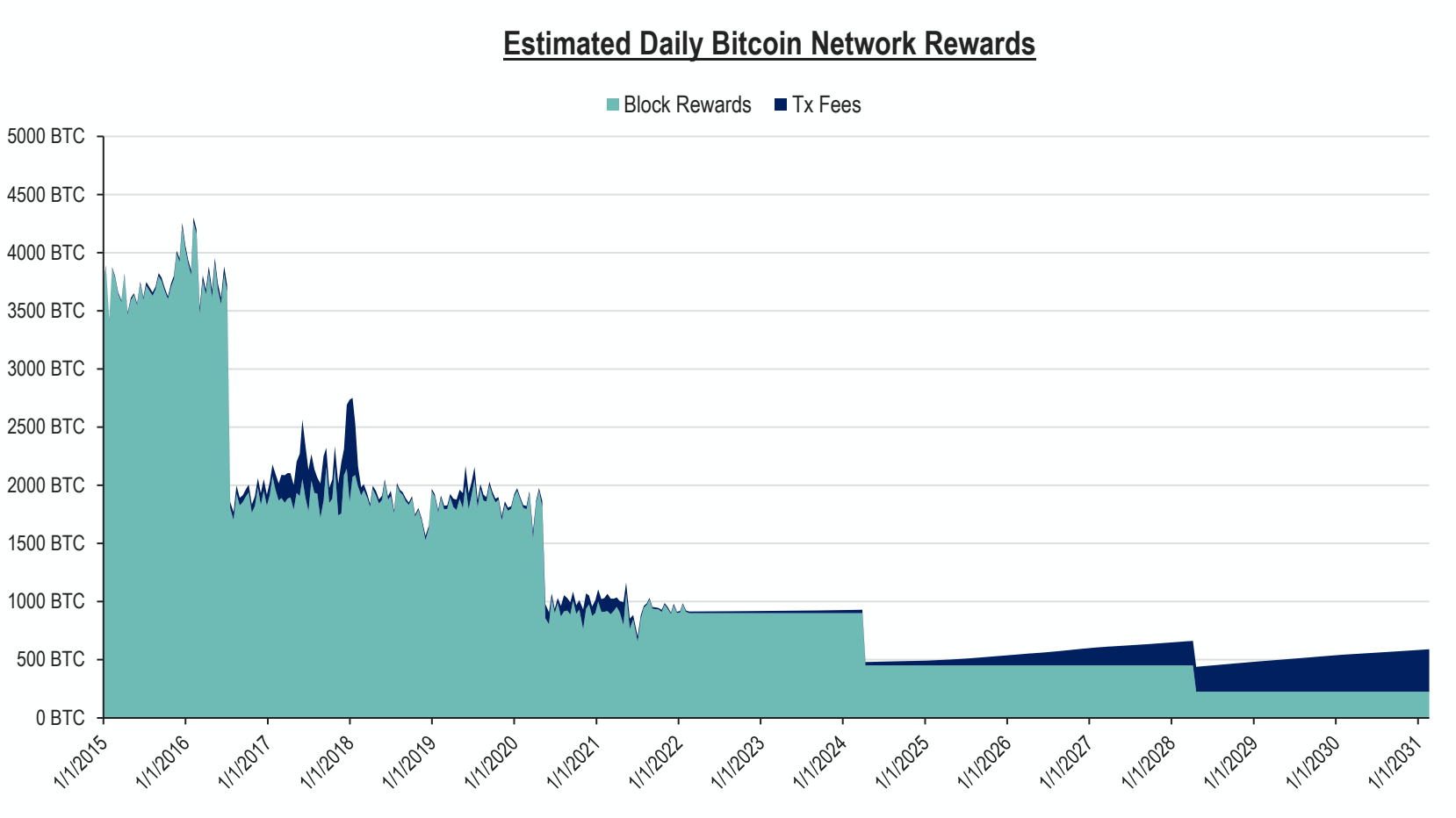

Figure: Historical and Estimated daily rewards to Bitcoin mining network, 1/1/2015 through 2031
Historical as of 3/15/22

Source: BitOoda estimates, CoinMetrics

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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**

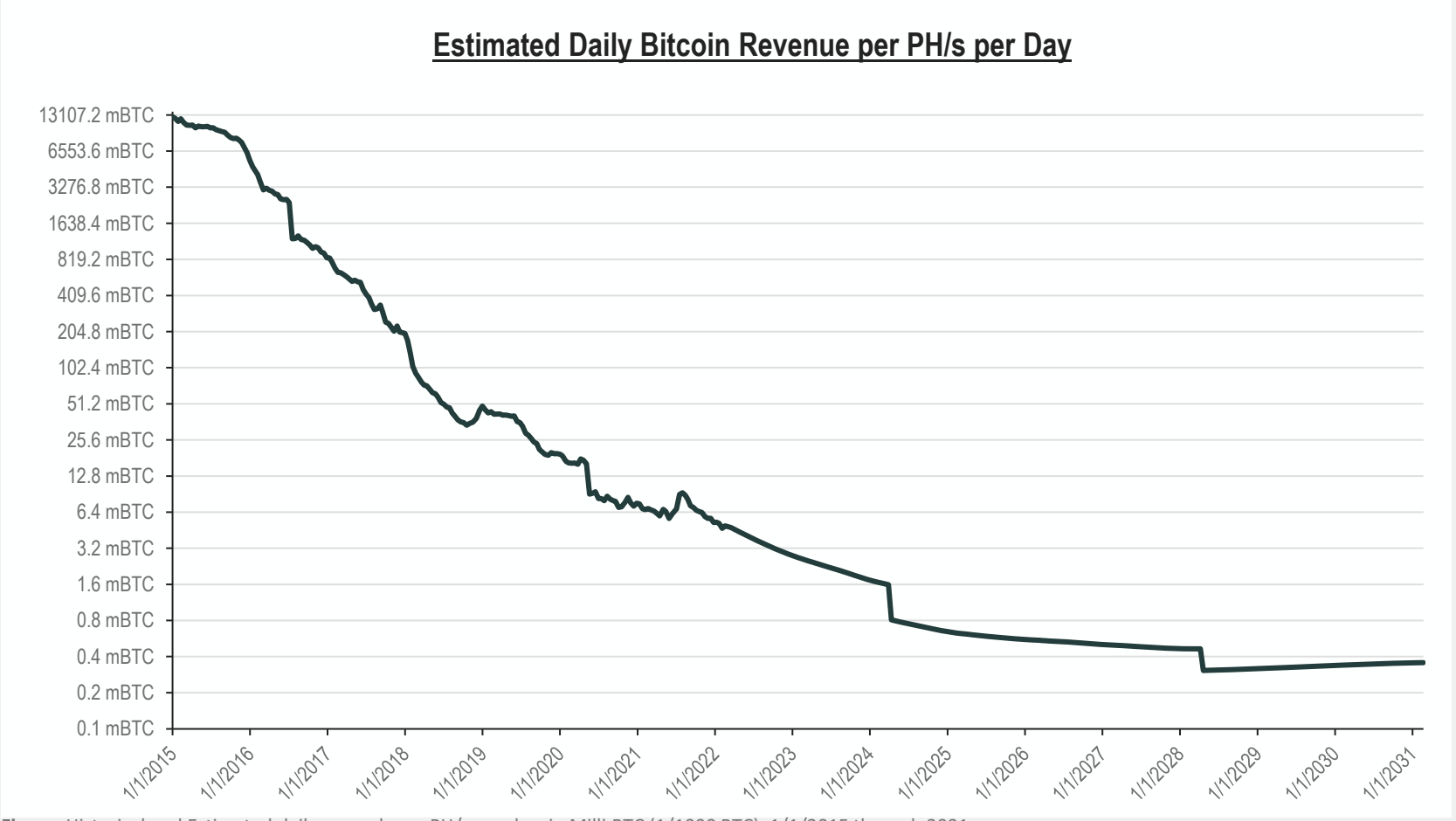

Figure: Historical and Estimated daily rewards per PH/s per day, in Milli BTC (1/1000 BTC), 1/1/2015 through 2031
Historical as of 3/15/22

Source: BitOoda estimates, CoinMetrics

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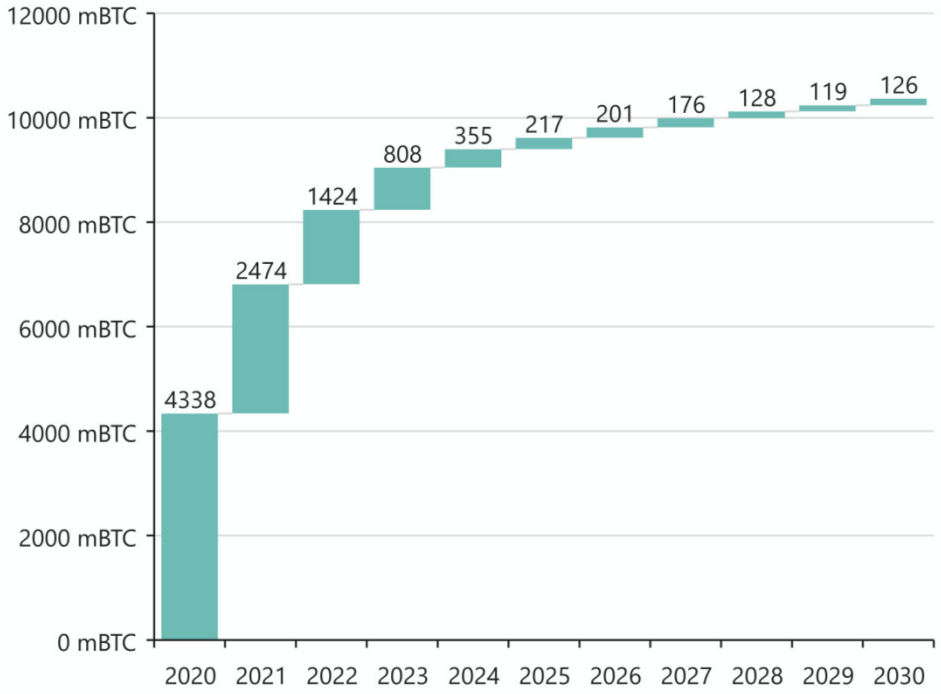
BTC Mining Reserve per PH/s
Declining Rapidly With Rising Hashrate

- 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 3/15/22

Source: BitOoda estimates, CoinMetrics

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Public Miner Valuation

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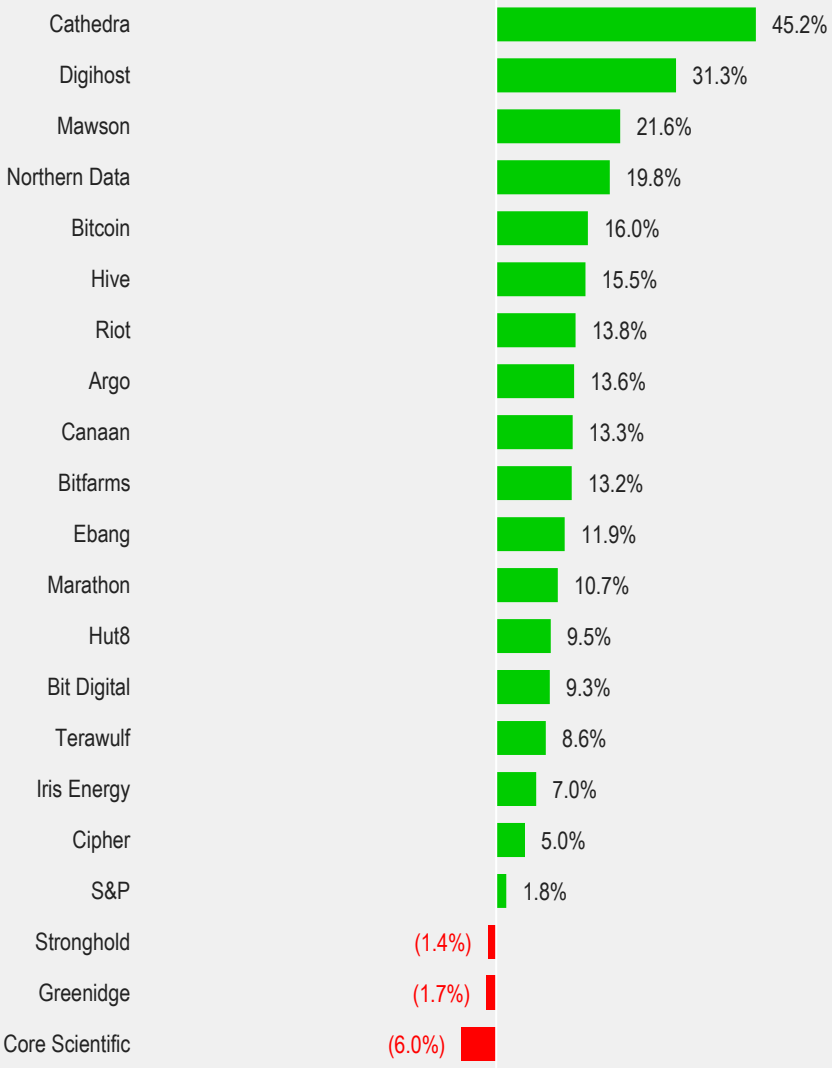
Bitcoin Miners
Performance Map

Year to Date	Quarter to Date	Month to Date	30 Day	7 Day	1 Day
					Cathedra, 12.7%
					Northern Data, 11.0%
					Bitfarms, 10.7%
					Riot, 7.6%
		Cathedra, 61.7%	Cathedra, 60.6%		Marathon, 5.9%
		Riot, 29.6%	Riot, 37.7%		Stronghold, 5.9%
		Marathon, 20.7%	Mawson, 33.8%		Hut8, 5.6%
		Cipher, 20.5%	Marathon, 32.6%	Cathedra, 45.2%	Hive, 5.2%
Ebang, 41.3%	Ebang, 41.3%	Mawson, 20.1%	Cipher, 27.2%	Digihost, 31.3%	Digihost, 5.2%
Cathedra, 34.3%	Cathedra, 34.3%	Ebang, 16.4%	Bitfarms, 25.5%	Mawson, 21.6%	Canaan, 3.8%
Canaan, 17.5%	Canaan, 17.5%	Canaan, 14.8%	Canaan, 21.2%	Northern Data, 19.8%	Bit Digital, 3.6%
Bitcoin, 2.9%	Bitcoin, 2.9%	Bitcoin, 14.5%	Bitcoin, 20.8%	Bitcoin, 16.0%	Bitcoin, 3.4%
Riot, 0.0%	Riot, 0.0%	Argo, 10.8%	Ebang, 18.3%	Hive, 15.5%	Ebang, 2.8%
S&P, (4.8%)	S&P, (4.8%)	Bitfarms, 9.5%	Digihost, 17.7%	Riot, 13.8%	Argo, 2.1%
Marathon, (6.9%)	Marathon, (6.9%)	Hive, 9.3%	Argo, 16.8%	Argo, 13.6%	Terawulf, 1.7%
Iris Energy, (13.5%)	Iris Energy, (13.5%)	Northern Data, 6.4%	Hive, 16.8%	Canaan, 13.3%	Cipher, 1.5%
Hive, (15.5%)	Hive, (15.5%)	S&P, 3.8%	Hut8, 8.5%	Bitfarms, 13.2%	Greenidge, 0.6%
Argo, (16.7%)	Argo, (16.7%)	Digihost, 3.4%	Bit Digital, 6.4%	Ebang, 11.9%	Mawson, 0.4%
Bitfarms, (18.2%)	Bitfarms, (18.2%)	Hut8, 2.0%	S&P, 3.5%	Marathon, 10.7%	Core Scientific, 0.0%
Cipher, (20.6%)	Cipher, (20.6%)	Bit Digital, (0.1%)	Northern Data, 2.5%	Hut8, 9.5%	S&P, (0.1%)
Hut8, (20.6%)	Hut8, (20.6%)	Core Scientific, (6.5%)	Iris Energy, (3.4%)	Bit Digital, 9.3%	Iris Energy, (2.8%)
Digihost, (21.2%)	Digihost, (21.2%)	Iris Energy, (6.6%)	Stronghold, (7.9%)	Terawulf, 8.6%	
Core Scientific, (21.5%)	Core Scientific, (21.5%)	Greenidge, (13.8%)	Core Scientific, (8.3%)	Iris Energy, 7.0%	
Mawson, (23.5%)	Mawson, (23.5%)	Terawulf, (21.2%)	Greenidge, (8.6%)	Cipher, 5.0%	
Stronghold, (24.2%)	Stronghold, (24.2%)	Stronghold, (22.8%)	Terawulf, (20.0%)	S&P, 1.8%	
Northern Data, (27.9%)	Northern Data, (27.9%)			Stronghold, (1.4%)	
Bit Digital, (35.4%)	Bit Digital, (35.4%)			Greenidge, (1.7%)	
Terawulf, (38.9%)	Terawulf, (38.9%)			Core Scientific, (6.0%)	
Greenidge, (48.6%)	Greenidge, (48.6%)				

- Most miners have outperformed the S&P over the past week and day
- However, relatively few have outperformed Bitcoin's 16% 1-week rally
- YTD, only Cathedra and Riot, and the hardware makers Ebang and Canaan have outperformed the S&P 500

7 Day Performance



Source: BitOoda, Bloomberg

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EV vs Reserves:
Oil & Gold Case Studies

- In many commodity markets, an investor has the option to own the stock of producers or directly own the underlying commodity, either physically or through financial products
- Admittedly, institutional options for direct ownership of Bitcoin are somewhat more limited than more established commodities
- We propose a framework to value Bitcoin miners on a similar metric to other commodity producers
- Oil and gold producers below trade at a steep discount to the spot value of their proven reserves
- This intuitively makes sense: there is both an operating cost and a capital cost to extract gold / oil, so an investor should value reserves on a capital-cost adjusted basis

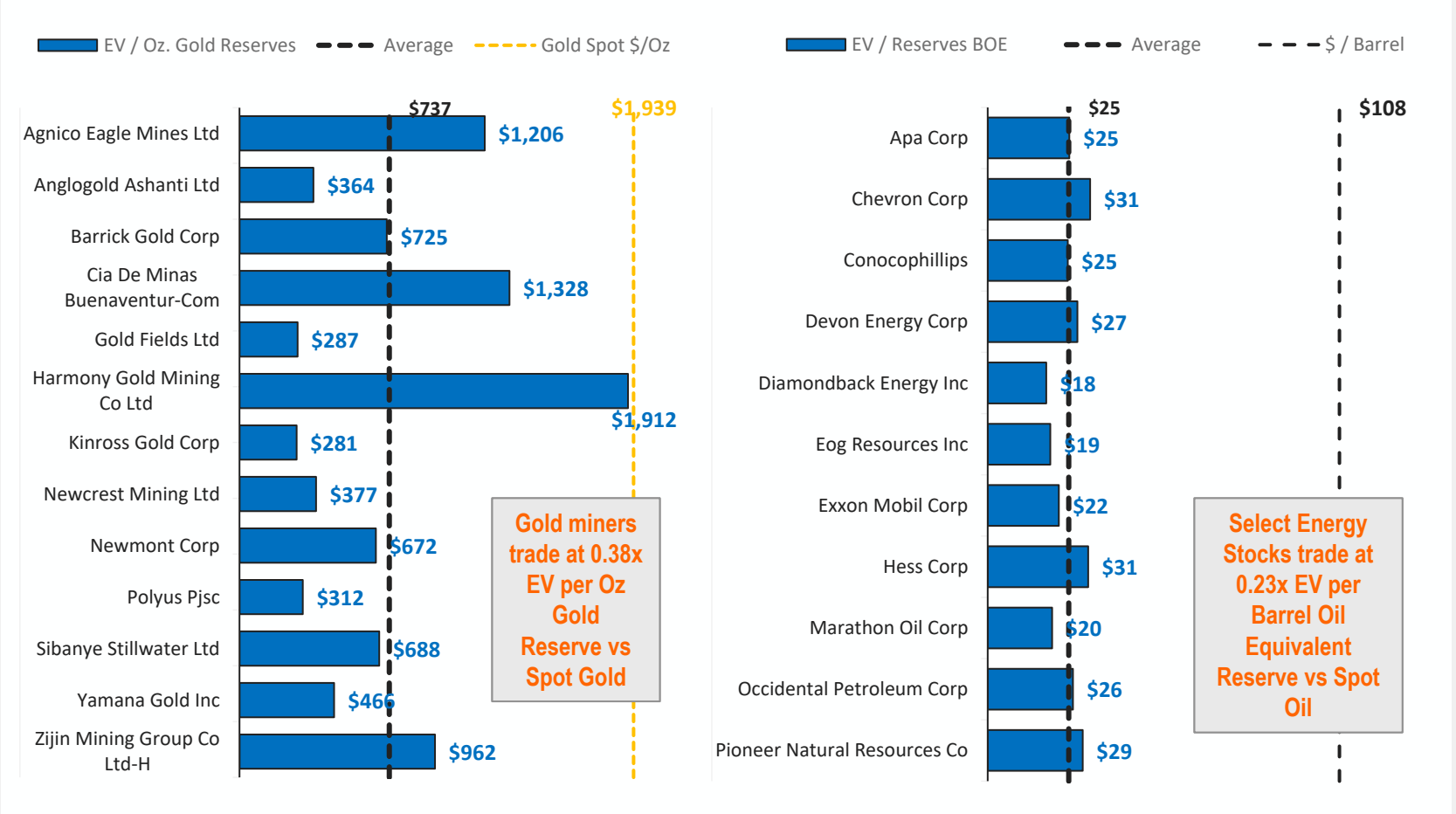

Figure: Enterprise Value vs Reserves or "future production" Oil and Gold markets

Source: BitOoda, Bloomberg

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Adjusted EV vs. BTC Reserves: Weighted Average $45.8k / BTC in Reserve

- We used the preceding analysis of YE 2022 Hashrate to estimate the Bitcoin mined by each company in 2023 and beyond
- For 2022 production, we used an average of current and year end Hashrate, adjusting for declining BTC / PH/s as more Hashrate comes online
- Based on these estimates, we forecast a "Bitcoin Reserve" for each company
- This is based on 2022 YE Hashrate and may not fully adjust for capex needed to achieve the Hashrate, and includes BTC already mined in 2022 YTD
- Further capex would be needed to sustain the Hashrate over time, as well as to grow it further.
- **Further Hashrate growth is not examined in this analysis: since capex for such growth is not accounted for in the EV numerator, we do not increase the Bitcoin reserve denominator**

Name	Ticker	Adj EV ($mm)	Current Hashrate	2022 YE Hashrate	BTC Mined				Adj EV / BTC Reserve
					2022	2023	Beyond 2023*	Total	
Argo	ARBK	$369	1605 PH/s	3700 PH/s	2833 BTC	2990 BTC	4888 BTC	10710 BTC	$34,411
Bit Digital	BTBT	226	1603	2603	2246	2103	3439	7788	$28,975
Bitfarms	BITF	580	2300	8200	5607	6626	10832	23065	$25,168
Cathedra	CBIT CN	48	187	725	487	586	958	2031	$23,525
Cipher	CIFR	683	0	8000	4272	6464	10568	21304	$32,078
Cleanspark	CLSK	534	2200	4370	3508	3531	5773	12812	$41,644
Core Scientific	CORZ	2506	8200	20560	15358	16612	27160	59130	$42,386
Digihost	DGHI	42	415	3600	2144	2909	4756	9808	$4,275
Greenidge	GREE	337	1400	4700	3257	3798	6209	13264	$25,426
Hive	HIVE	670	1870	2870	2531	2319	3791	8641	$77,478
Hut8	HUT	739	2360	4500	3663	3636	5945	13244	$55,777
Iris Energy	IREN	721	800	6471	3883	5229	8548	17659	$40,845
Marathon	MARA	3331	3500	22500	13884	18180	29723	61787	$53,919
Mawson	MIGI	402	1100	4150	2804	3353	5482	11639	$34,530
Northern Data	NB2 GY	1357	2000	4600	3524	3717	6077	13318	$101,910
Riot	RIOT	2159	3400	12800	8651	10342	16909	35902	$60,144
Stronghold	SDIG	500	1300	8900	5447	7191	11757	24395	$20,493
Terawulf	WULF	938	100	2200	1228	1778	2906	5912	$158,707
Total		**$16,142**	**34340 PH/s**	**125449 PH/s**	**85327 BTC**	**101363 BTC**	**165718 BTC**	**352408 BTC**	**$45,806**

Figure: Enterprise Value vs Reserves or "future production" of Bitcoin

Source: BitOoda, Bloomberg

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BTC Miners' Reserve Valued In Line With Spot BTC Price (Simple Average)

- The chart below shows that many miners are trading at an adjusted EV / BTC in reserve very close to or above spot
- While some such miners have other revenue streams, including hosting, or alternate crypto / GPU mining / high performance compute, most do not.
- Note that the adjusted EV metric in the numerator already excludes the present value of all disclosed treasury BTC / other crypto
- Considering there would be both opex and capex needed to "extract" a Bitcoin, one would expect stocks trading at lower EV / BTC to be more attractive, although variations in business models (self mining, hosted, etc.), current degree of capital funding, and power / hosting costs do have an impact

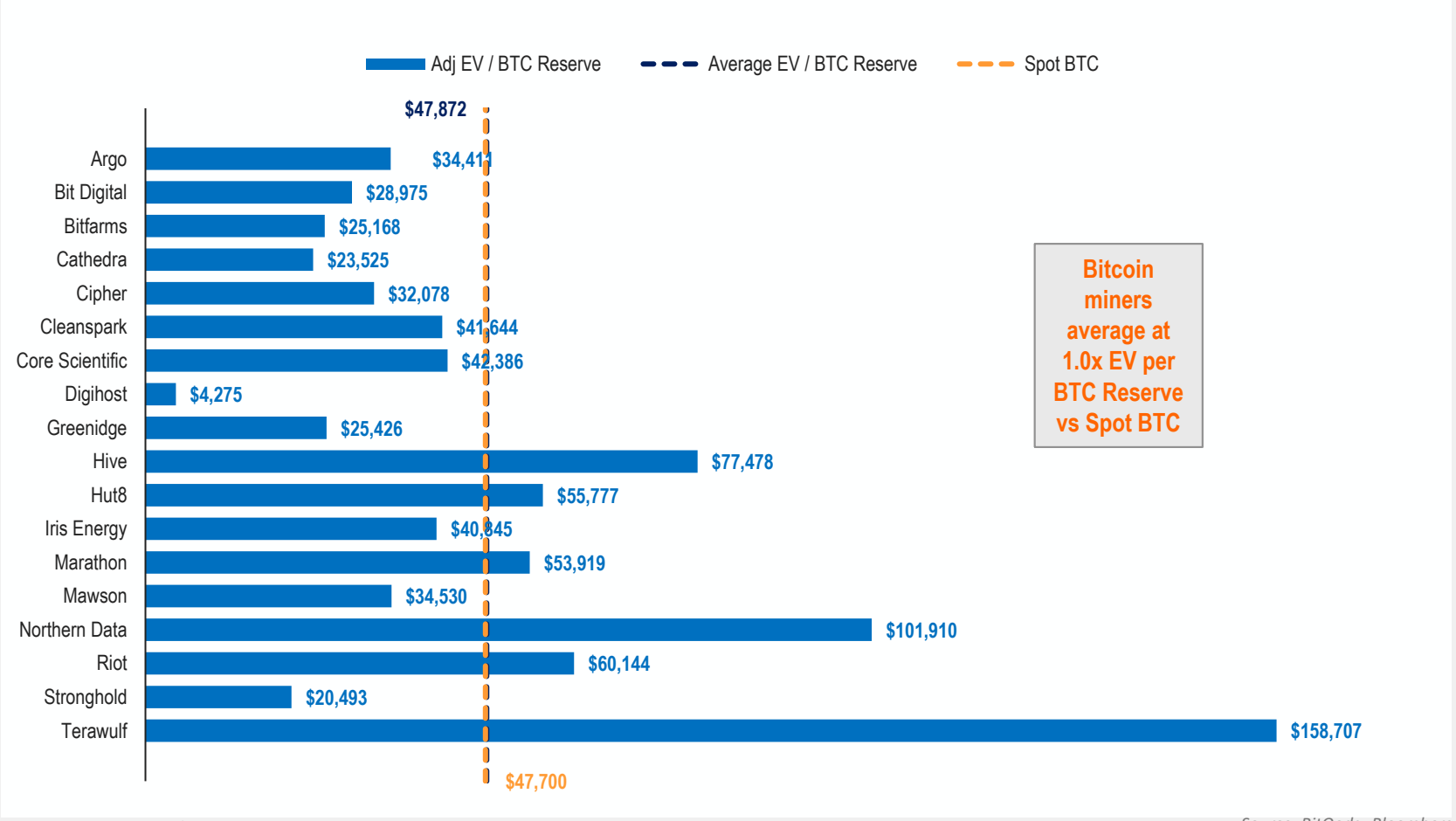

Figure: Enterprise Value vs Bitcoin Reserves

Source: BitOoda, Bloomberg

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BTC Miners Richly Valued
vs. Oil & Gold Examples

- Oil producers trade at 23.1% of current spot oil – reflecting both extraction costs, future capex, and the current run-up in oil prices with the conflict in Ukraine
- Gold miners trade at ~38% of spot gold, reflecting both all-in sustaining capex and mining production costs
- By the same token, there is an ongoing capex to maintain Hashrate once companies achieve their announced deployments
- Additionally, it takes an increasing amount of power to produce future Bitcoin
- **Thus, we assess that Bitcoin miners as a group should be trading at a much more significant discount to the spot price of BTC than the ~4% the group currently exhibits**

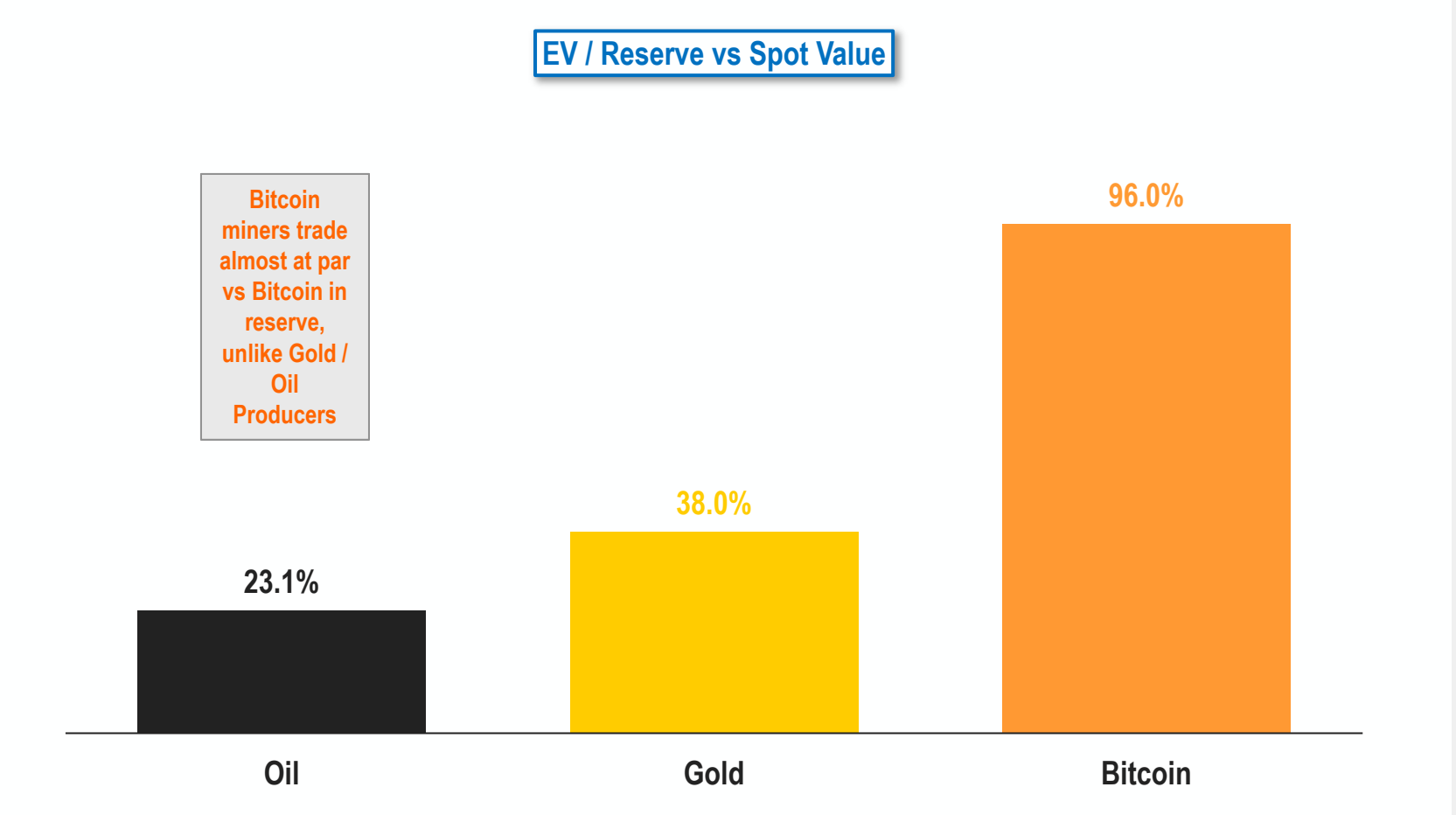

Figure: Comparing EV/ Reserves vs. Spot prices for Oil, Gold & Bitcoin

Source: BitOoda, Bloomberg

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Trading Comparables

Miners Trade at an Adj EV of $140k per PH/s of 2022YE Hashrate, Up $30k WoW

- Updated Hashrate and Bitcoin holdings for each of the miners reveals both a lower adjusted EV (on higher holdings) and a higher Hashrate. Adjusted EV is Market Cap + Debt – Cash – USD value of crypto holdings
- **The public companies have 34 EH/s operational, above our prior compilation of 24EH/s**
- This includes a placeholder for Terawulf, which just announced commencement of mining operations but did not disclose hashrate
- We exclude future capex commitments: for many miners, part of the balance sheet will be used to pay for delivery of future Hashrate, boosting adjusted EV. However, a lack of data for most companies makes this adjustment imprecise in practice
- On our preferred valuation metric, the group trades at an average of $930k per current operating PH/s and $140k per YE 2022 (up $30k WoW) expected PH/s

Trading Comparables

Name	Ticker	Price	52-week Range		Market Cap	Cash	Debt	Bitcoin on BS	Bitcoin on BS (USD)	Adj EV ($mm)	Hashrate			EV/ PH/s	
			Low	High							Current	2022 Deliveries	YE 2022	Current	2022YE
Bitcoin	XBTUSD Curncy	$47,700.12	$29,307.88	$68,991.85	$906,121										
S&P	SPX Index	4539.7	3917.1	4818.6	$39,995,498										
Nasdaq Comp	CCMP Index	14273.07	12555.4	16212.2	$24,100,156										
	Public Miners														
Argo	ARBK	$10.67	$7.25	$21.00	$499.6	$0.0	$0.0	2748 BTC	$131.1	$368.6	1605 PH/s	2000 PH/s	3700 PH/s	$0.23	$0.10
Bit Digital	BTBT	$4.05	$2.74	$20.74	$282.0	$26.5	$0.0	627 BTC	$29.9	$225.7	1603 PH/s	1000 PH/s	2603 PH/s	$0.14	$0.09
Bitfarms	BITF	$4.22	$2.75	$9.36	$835.6	$43.3	$21.1	4883 BTC	$232.9	$580.5	2300 PH/s	5900 PH/s	8200 PH/s	$0.25	$0.07
Cathedra	CBIT CN	$0.67	$0.29	$0.92	$59.0	$5.7	$0.6	129 BTC	$6.2	$47.8	187 PH/s	566 PH/s	725 PH/s	$0.26	$0.07
Cipher	CIFR	$3.86	$2.33	$15.39	$965.7	$282.3	$0.0	0 BTC	$0.0	$683.4	0 PH/s	8000 PH/s	8000 PH/s		$0.09
Cleanspark	CLSK	$13.69	$5.47	$24.65	$567.5	$6.0	$2.2	633 BTC	$30.2	$533.6	2200 PH/s	2170 PH/s	4370 PH/s	$0.24	$0.12
Core Scientific	CORZ	$9.01	$5.82	$14.98	$2,858.7	$1.6	$0.0	7355 BTC	$350.8	$2,506.3	8200 PH/s	12360 PH/s	20560 PH/s	$0.31	$0.12
Digihost	DGHI	$3.75	$2.42	$8.00	$93.5	$17.3	$2.5	770 BTC	$36.7	$41.9	415 PH/s	3185 PH/s	3600 PH/s	$0.10	$0.01
Greenidge	GREE	$8.92	$7.01	$60.00	$362.6	$51.6	$26.3	0 BTC	$0.0	$337.2	1400 PH/s	3300 PH/s	4700 PH/s	$0.24	$0.07
Hive	HIVE	$2.28	$1.50	$5.60	$933.3	$114.3	$15.7	3463 BTC	$165.2	$669.5	1870 PH/s	1000 PH/s	2870 PH/s	$0.36	$0.23
Hut8	HUT	$6.51	$3.15	$16.57	$1,116.0	$140.1	$40.7	5826 BTC	$277.9	$738.7	2360 PH/s	2140 PH/s	4500 PH/s	$0.31	$0.16
Iris Energy	IREN	$15.26	$8.55	$28.25	$839.9	$118.6	$0.0	0 BTC	$0.0	$721.3	800 PH/s	5671 PH/s	6471 PH/s	$0.90	$0.11
Marathon	MARA	$31.63	$18.32	$83.45	$3,259.5	$268.5	$728.4	8133 BTC	$387.9	$3,331.5	3500 PH/s	19000 PH/s	22500 PH/s	$0.95	$0.15
Mawson	MIGI	$5.37	$2.00	$17.25	$384.4	$5.5	$23.0	0 BTC	$0.0	$401.9	1100 PH/s	3050 PH/s	4150 PH/s	$0.37	$0.10
Northern Data	NB2 GY	$58.40	$38.10	$134.00	$1,357.2	$0.0	$0.0	0 BTC	$0.0	$1,357.2	2000 PH/s	2600 PH/s	4600 PH/s	$0.68	$0.30
Riot	RIOT	$23.22	$12.90	$61.55	$2,722.8	$323.1	$14.6	5347 BTC	$255.1	$2,159.3	3400 PH/s	9400 PH/s	12800 PH/s	$0.64	$0.17
Stronghold	SDIG	$10.15	$7.26	$35.80	$489.5	$41.4	$54.5	56 BTC	$2.6	$499.9	1300 PH/s	7600 PH/s	8900 PH/s	$0.38	$0.06
Terawulf	WULF	$9.40	$4.03	$43.98	$939.8	$1.5	$0.0	0 BTC	$0.0	$938.3	100 PH/s	2100 PH/s	2200 PH/s	$9.38	$0.43
Total					**$18,566.6**	**$1,447.3**	**$929.7**	**39969 BTC**	**$1,906.5**	**$16,142.4**	**34340 PH/s**	**91042 PH/s**	**125449 PH/s**	**$0.47**	**$0.13**
Average					**$1,031.5**	**$80.4**	**$51.6**	**2221 BTC**	**$105.9**	**$896.8**	**1908 PH/s**	**5058 PH/s**	**6969 PH/s**	**$0.93**	**$0.14**
Median					**$837.7**	**$33.9**	**$2.3**	**630 BTC**	**$30.1**	**$625.0**	**1604 PH/s**	**3118 PH/s**	**4550 PH/s**	**$0.31**	**$0.11**

Figure: Comparable analysis: Adjusted Enterprise Value per PH/s of YE 2022 Capacity

Source: BitOoda, Bloomberg

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Adj EV / 2022YE PH/s
Average of $140k

- The chart shows the adjusted EV per PH/s of expected 2022 YE Hashrate valuation
- The group trades at an average of $140k per future PH/s, up $30k WoW

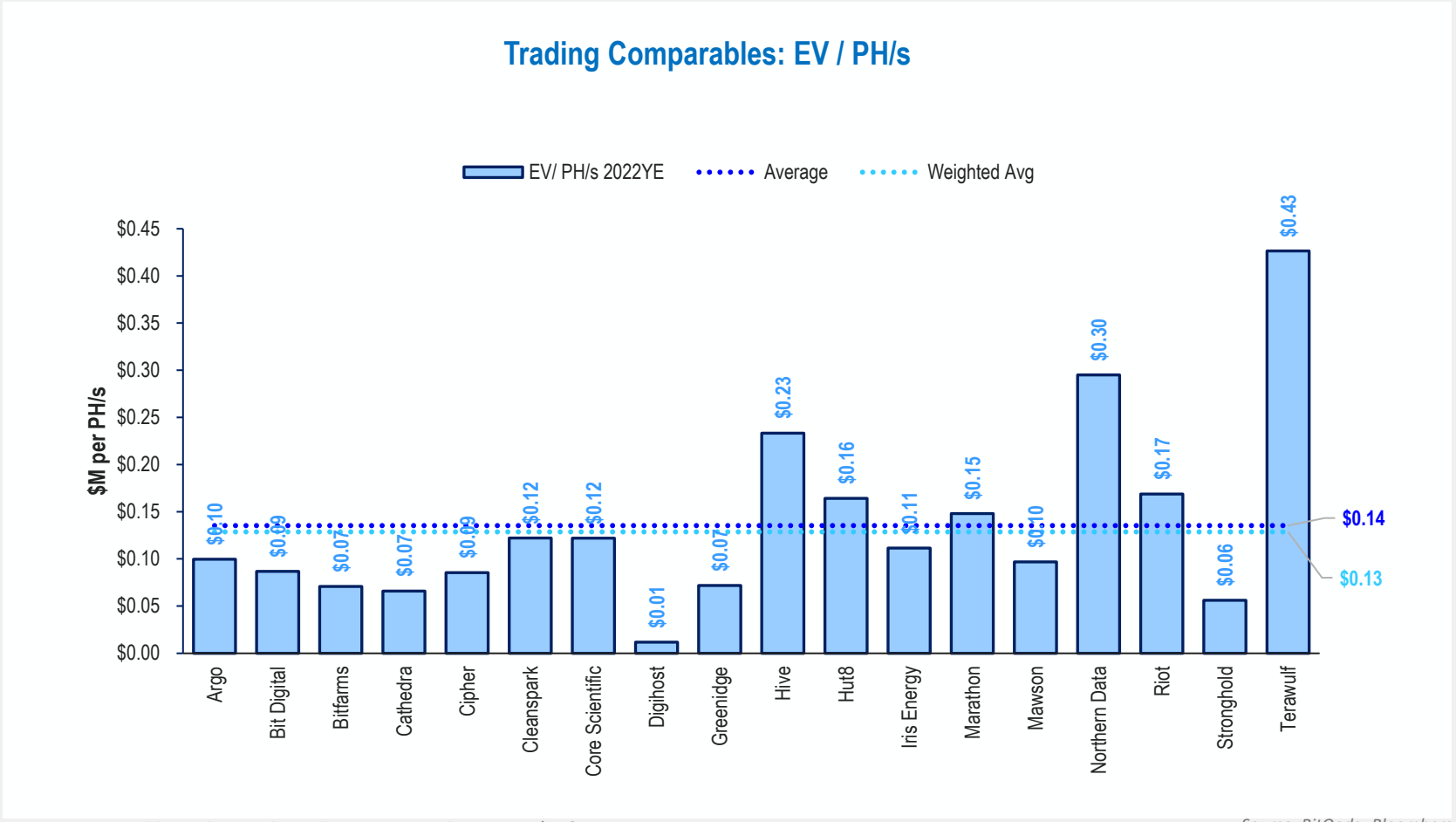

Figure: Comparable analysis: Adjusted Enterprise Value per PH/s of YE 2022 Capacity

Source: BitOoda, Bloomberg

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Valuations are Higher
The More YE 2022 Hashrate Comes Online

- Markets give a premium to operational capacity
- The more year end 2022 capacity is already online, the higher the valuation, with a 31% R^2
- This supports the notion that the market recognizes the drop-off in Bitcoin production over time
- **Thus, the less growth is in the future, the higher the multiple; this is quite unlike most traditional equities**

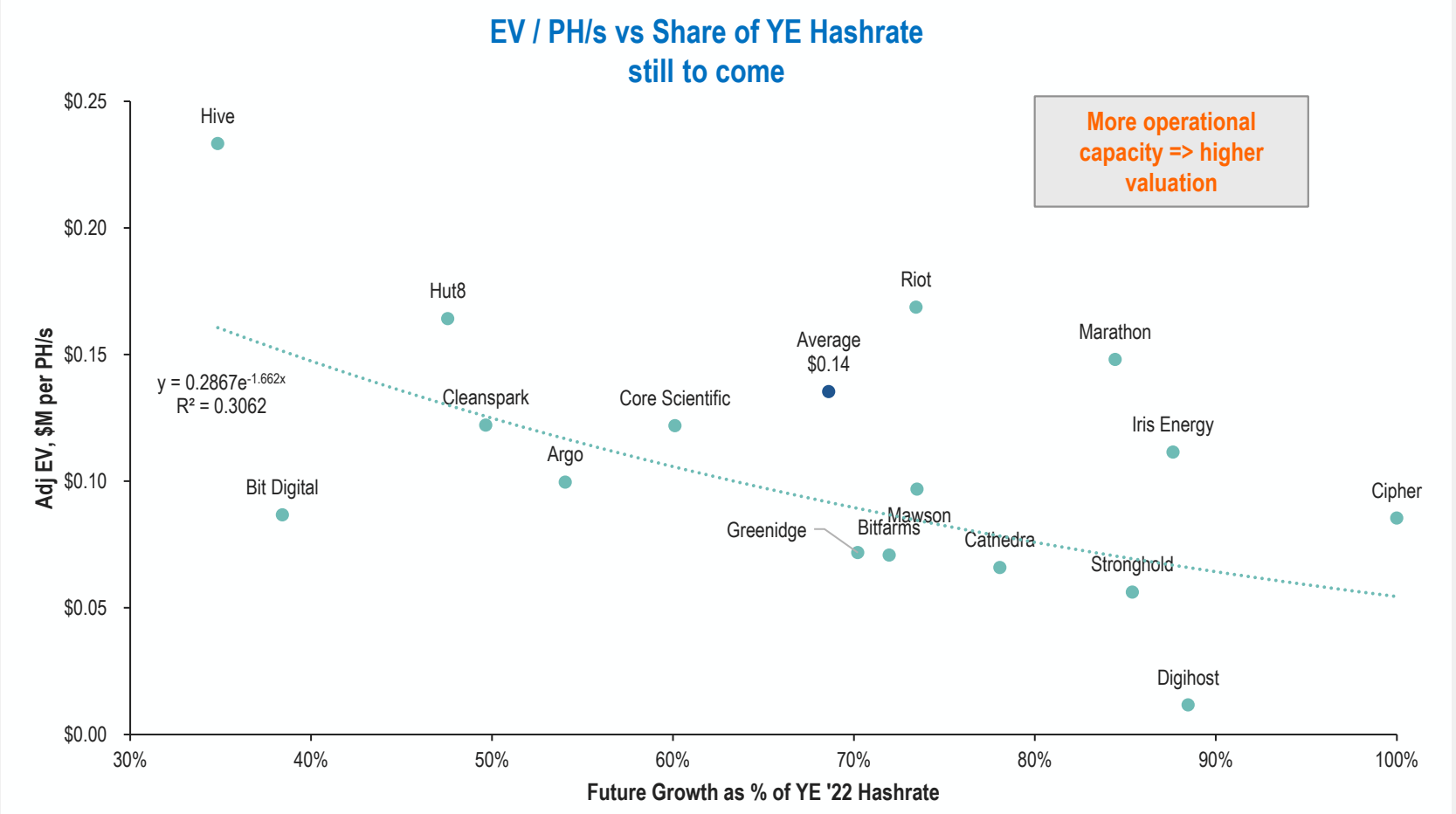

Figure: Public miner adjusted EV per PH/s vs. percentage of YE 22 Hashrate already operational
Note: Terawulf and Northern Data excluded as outliers

Source: BitOoda, Bloomberg

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Valuation Differentials
Aided by Power / Hosting Costs

- Entities with the lowest direct operating cost, such as Greenidge and Riot, exhibit a premium to the group
- However, for most other companies, the relationship is weaker
- Hive, which has the highest valuation in the group, has a higher estimated all-in direct operating cost (based on BitOoda's estimates)
- Hive also has the largest share of YE 2022 Hashrate already operational, which may explain the higher valuation

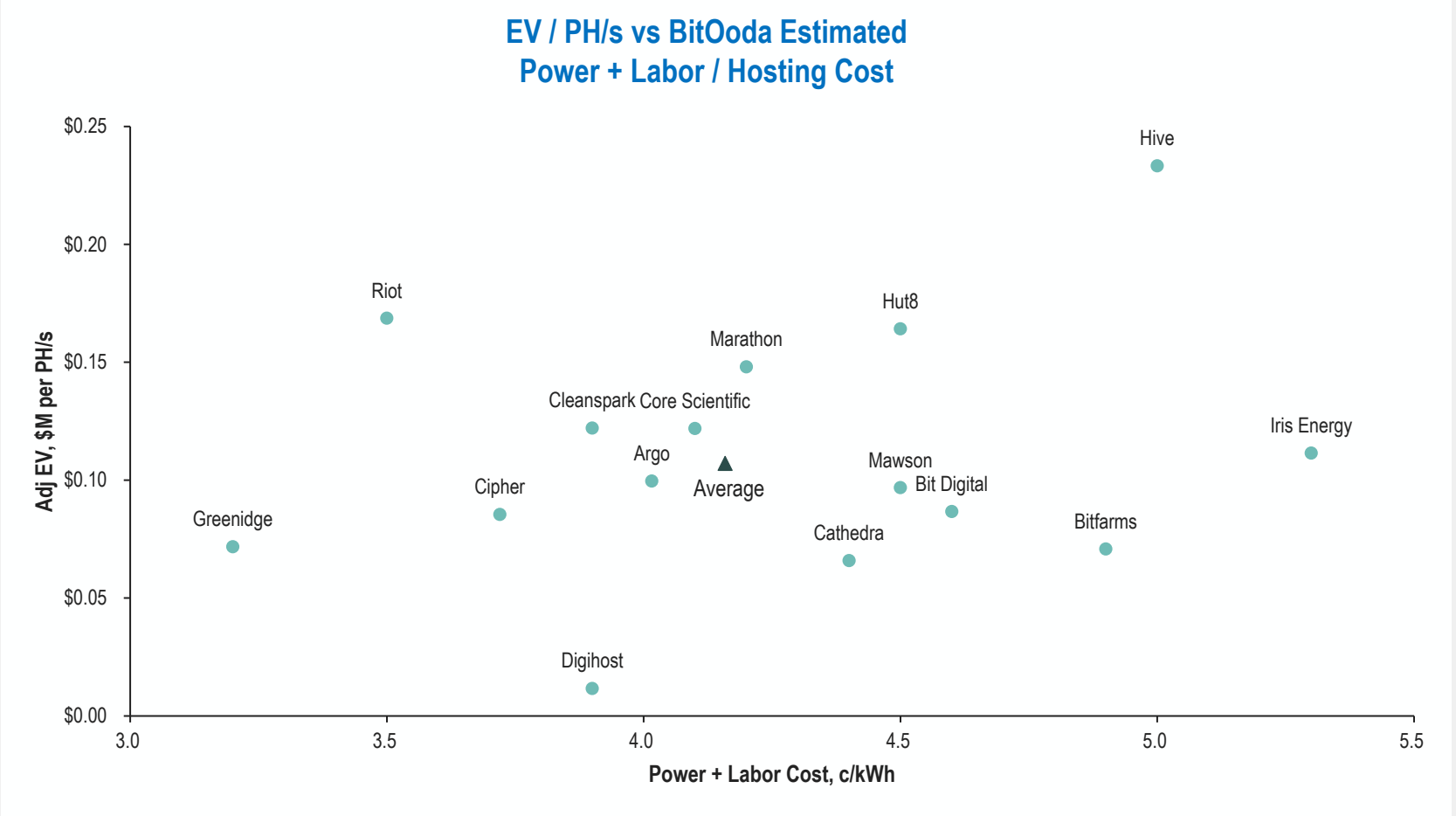

Figure: Adjusted EV per PH/s vs all in power + labor or hosting cost, cents per kWh
Notes: 1. BitOoda estimates based on publicly available information; may not fully reflect actual all-in cost. 2. Excludes Terawulf and Northern Data

Source: BitOoda, Bloomberg

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Select Financials

Consensus Estimates Must Assume Price Appreciation

- As a group, the miners are expected to generate $3.2B in 2022 EBITDA on $5.2B in revenue, based on Bloomberg consensus, and trade at 4.9x 22 EBITDA
- However, at current spot price, the 85,327 anticipated Bitcoin mined during 2022 by the group would be worth $4.07B
- Thus consensus anticipates revenue recognition at a full year average 27% higher price than current spot, or $61,000
- Of course, increasing immersion deployment may increase the group's BTC mined somewhat, although we doubt by much this year
- As we have shown earlier, the miners are richly valued already against their future Bitcoin mined, with no room for capex and operating expenses
- **These two facts combine, in our opinion, to prefer spot Bitcoin to the overall public miner group, though pockets of relative opportunity remain for more diversified operations**

On Slide 10 we show the public miners are expected to mine 85327 BTC in 2022

Select Miner Financials

At current spot of $47,700, that would imply revenue of $4.07B, well below consensus $5.2B

Name	Ticker	LTM Margins		Revenue			Gross Margin			EBITDA			D&A	EBIT			Contribution	Multiple of	Adj EV / 2022E
		Gross	EBITDA	LTM	CY21E	CY22E	LTM	CY21E	CY22E	LTM	CY21E	CY22E	CY22E	LTM	CY21E	CY22E	CY22E	Contribution	EBITDA
Argo	ARBK				97.51	134.23		77.04	77.04		71.95	104.64	34.77		57.19	69.87	109.89	3.4x	3.5x
Bit Digital	BTBT				109.00	112.00		73.30	73.30						35.40	37.00		—	—
Bitfarms	BITF			169.49	172.00	244.00		69.80	69.80						86.60	112.00		—	—
Cathedra	CBIT CN	31.04	260.07	3.08			31.04			4.64				3.54				—	—
Cipher	CIFR			0.00							(5.00)	271.00		(4.47)				—	2.5x
Cleanspark	CLSK	75.76	(0.87)	88.42	45.55	182.50	75.76	73.20	73.20	1.16	(4.90)	88.50	36.05	(17.97)	(17.75)	52.45	69.39	7.7x	6.0x
Core Scientific	CORZ				519.33	1078.50		57.90	57.90		210.33	570.25	88.75		167.33	481.50	389.44	6.4x	4.4x
Digihost	DGHI			27.42														—	—
Greenidge	GREE				116.50	197.00		73.40	73.40		40.05	96.15	32.15		(10.45)	64.00	117.66	2.9x	3.5x
Hive	HIVE	67.29	120.30	240.03	208.10	210.89	67.29	76.60	76.60	260.21	212.53	151.24	40.81	214.38	150.69	110.43	200.21	3.3x	4.4x
Hut8	HUT	51.10	41.54	173.77	140.70	218.74	51.10	49.27	49.27	72.00	81.97	105.18	40.04	48.72	41.28	65.14	109.35	6.8x	7.0x
Iris Energy	IREN				74.82	338.50		82.50	82.50		43.87	242.83	43.43		29.13	199.40	105.16	6.9x	3.0x
Marathon	MARA	77.61	(172.35)	150.46	151.00	594.50	77.61	79.25	79.25	(61.62)	120.00	456.80	92.20	(85.08)	25.05	364.60	211.87	15.7x	7.3x
Mawson	MIGI	77.42	(120.81)	43.86		137.00	77.42			(28.56)				(42.67)		17.30		—	—
Northern Data	NB2 GY				231.05	807.52		66.30	66.30		117.81	602.78	218.47		36.60	384.32	371.65	3.7x	2.3x
Riot	RIOT	61.50	(10.10)	213.24	211.11	453.67	61.50	65.40	65.40	4.64	112.41	233.92	111.30	(22.36)	55.75	122.63	249.36	8.7x	9.2x
Stronghold	SDIG				33.78	266.80		4.00	4.00		6.37	175.60	38.46		(5.24)	137.14	39.81	12.6x	2.8x
Terawulf	WULF	33.76	(4.61)	16.30	15.80	201.00	33.76			(0.76)	(22.60)	123.00	23.90	(1.51)	(23.70)	99.10		—	7.6x
Total				**1126.08**	**2126.24**	**5176.85**				**251.72**	**984.80**	**3221.90**	**800.32**	**92.58**	**627.89**	**2316.88**			
Average		**59.44**	**14.15**	**102.37**	**151.87**	**345.12**	**59.44**	**65.23**	**65.23**	**31.47**	**75.75**	**247.84**	**66.69**	**10.29**	**44.85**	**154.46**	**179.44**	**7.1x**	**4.9x**
Median		**64.40**	**(2.74)**	**88.42**	**128.60**	**218.74**	**64.40**	**73.20**	**73.20**	**2.90**	**71.95**	**175.60**	**40.42**	**(4.47)**	**36.00**	**110.43**	**117.66**	**6.8x**	**4.4x**

Figure: Select financial metrics – Bloomberg consensus revenue and EBITDA estimates
Note: Contribution is BitOoda estimate of gross profit less depreciation

Source: BitOoda, Bloomberg

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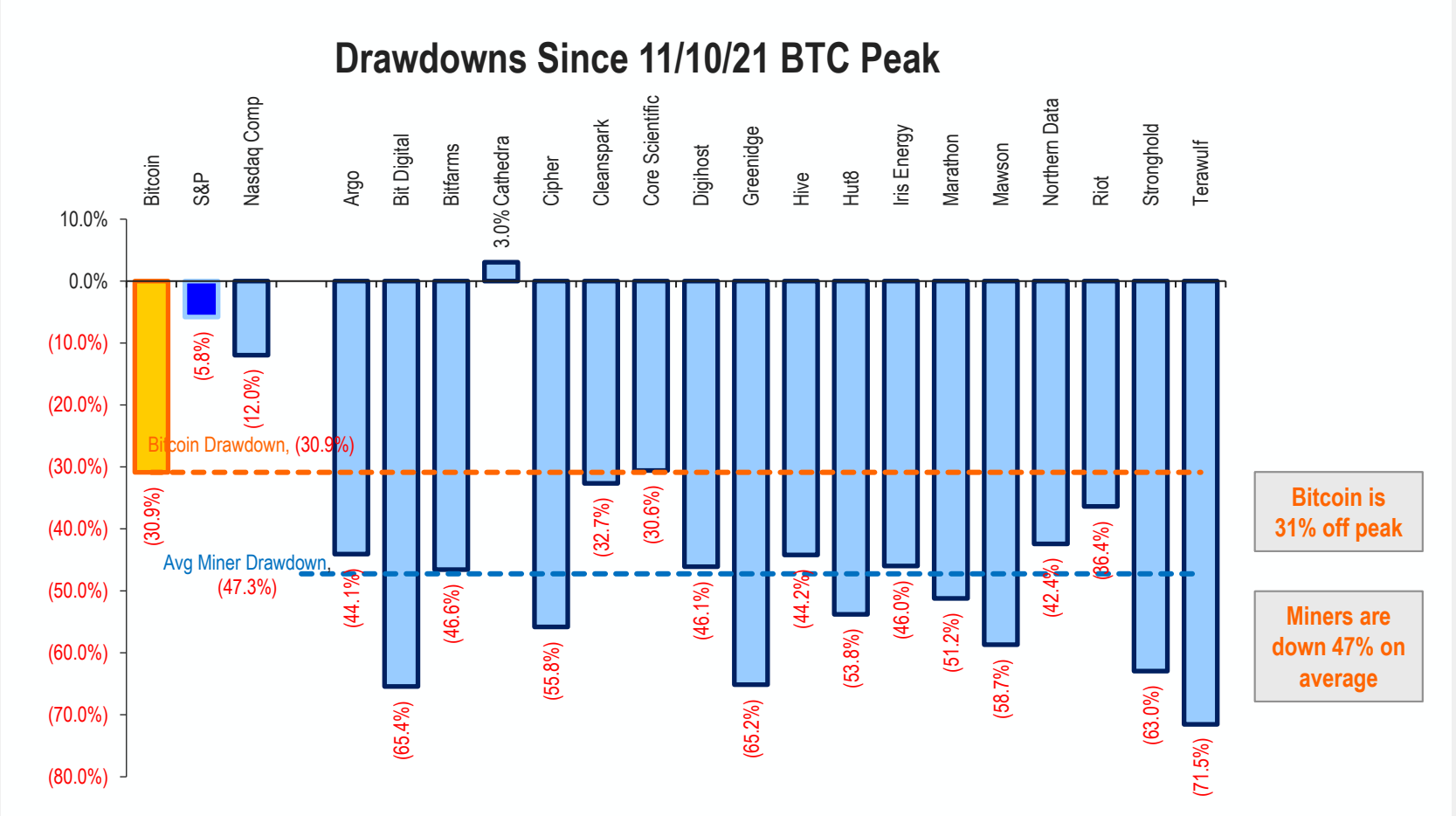
Drawdowns From BTC Peak

Miners Underperforming Bitcoin

- Bitcoin is off 31% from its peak on November 10, 2021
- Over the same period, the S&P 500 is down 6% and the Nasdaq 12%
- Most miners have underperformed Bitcoin since November 2021 by an average additional 16%



Source: BitOoda, Bloomberg

Figure: Bitcoin miner drawdowns
Note: Iris Energy's drawdown measured from 11/17/21

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Beta & Correlation
Not All Miners Are Equal

- We expect most miners to exhibit a Beta > 1 relative to Bitcoin
- Bitcoin is off 31% from its November 2021 peak, Hashrate is up, and transaction fees are flattish, so miners should experience both falling revenue and margin compression
- Interestingly, although most miners have underperformed Bitcoin, both the beta to Bitcoin and correlation to Bitcoin show much more dispersion
- The correlation of Bitcoin to the S&P and Nasdaq is quite high, at 52% & 60%, respectively

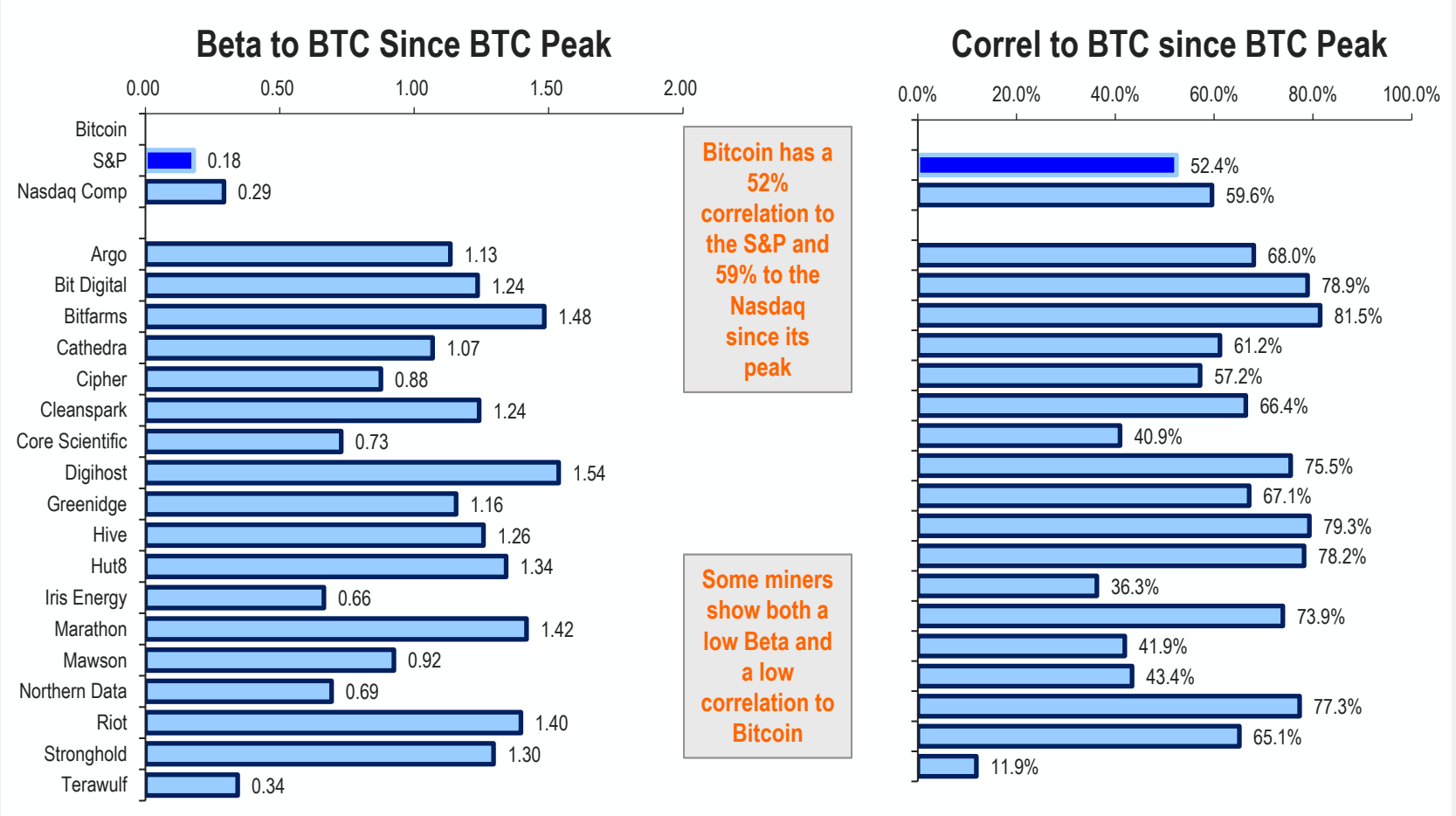

Figure: Bitcoin miner drawdowns
Note: Iris Energy's drawdown measured from 11/17/21

Source: BitOoda, Bloomberg

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