14th CryptoSuper 500 Report

Bitcoin as a Global Decentralized Supercomputer

Stephen Perrenod | June 2025 | OrionX Research

This report is not, and must not be considered as financial, investment, or legal advice. The author holds positions in MSTR and its preferred shares, in SMLR, MPLTF, and various Bitcoin ETFs, but no positions in mining stocks.

Global Adoption and Holdings

As the Bitcoin regulatory environment has become increasingly clarified and as Bitcoin adoption has continued apace, its adoption by governments and institutions has accelerated.

There are around nine nation-states actively mining Bitcoin, including Bhutan, El Salvador, Pakistan, Russia, UAE, and Venezuela. Pakistan is the newest; it has recently announced a 2 GigaWatt initiative for AI and Bitcoin mining. While sanctions avoidance is one motivation, a broader motivation is to increase capital outside the US dollar system.

This is the same motivation behind investment by sovereign wealth funds, including those in several of the mining nations mentioned above, but also Norway and Singapore. Beyond sovereign wealth funds, nations and provinces or states are beginning to build treasury holdings.

The most important move to date was the funding of the US Strategic Bitcoin Reserve with 207,000 confiscated Bitcoin now transferred from the Department of Justice to the Department of the Treasury. There is a bill introduced in the Senate with bipartisan support to acquire up to one million Bitcoin (BTC) in a five year period and specifying a minimum 20-year holding time.

Other top government holders include China (194,000 BTC estimated), the United Kingdom (61,000 BTC), Russia (54,000 BTC), and Ukraine (46,000)

@HODL15Capital	Country	Ticker	1/10/24 # of Bitcoin	3/31/24 # of Bitcoin	6/30/24 # of Bitcoin	9/30/24 # of Bitcoin	12/31/24 # of Bitcoin	3/31/25 # of Bitcoin	4/30/25 # of Bitcoin	5/31/25 # of Bitcoin	$ Value
BlackRock iShares Bitcoin	USA	IBIT	228	252,011	306,979	366,451	551,918	576,039	604,042	660,814	$ 69,385,470,000
Fidelity WiseOrigin Bitcoin	USA	FBTC	440	144,704	167,463	180,345	201,557	196,933	198,379	198,159	$ 20,806,695,000
Grayscale Bitcoin	USA	GBTC	619,162	333,619	275,758	221,191	205,296	193,816	190,985	186,622	$ 19,595,310,000
ARK 21Shares Bitcoin	USA	ARKB	210	44,667	45,316	50,535	46,609	47,501	48,804	45,998	$ 4,829,790,000
Grayscale Bitcoin Mini	USA	BTC				33,552	38,057	40,604	42,108	43,361	$ 4,552,905,000
Bitwise Bitcoin ETF	USA	BITB	57	31,680	37,524	39,430	40,282	37,997	38,291	37,669	$ 3,955,245,000
VanEck Bitcoin Trust	USA	HODL	1,625	8,428	9,927	11,992	13,717	14,275	14,424	15,010	$ 1,576,050,000
Valkyrie Bitcoin Fund	USA	BRRR	10	7,676	8,372	8,983	8,847	5,784	6,094	6,003	$ 630,315,000
Invesco Galaxy Bitcoin	USA	BTCO	-	5,855	6,952	8,076	7,780	5,296	5,252	5,190	$ 544,950,000
Franklin Bitcoin ETF	USA	EZBC	58	4,843	5,887	7,039	7,612	4,955	5,163	5,078	$ 533,190,000
WisdomTree Bitcoin	USA	BTCW	54	1,147	1,290	3,708	3,865	1,854	1,564	1,564	$ 164,220,000
Total U.S. ETFs	🇺🇸		621,844	834,783	865,646	931,450	1,125,698	1,125,212	1,155,264	1,205,626	$ 126,590,730,000
Purpose Bitcoin ETF	Canada	BTCC	34,007	28,096	26,862	26,810	22,905	22,093	21,850	21,368	$ 2,243,640,000
CoinShares Physical Bitcoin	Switzerland	BITC		13,502	14,082	14,816	13,572	15,762	16,102	16,110	$ 1,691,550,000
CoinShares Bitcoin Euro	Sweden	COINXBE	14,405	14,405	14,375	14,827	15,580	14,491	14,344	14,012	$ 1,471,260,000
ETC Group Physical Bitcoin	Germany	BTCE	26,858	22,080	20,106	15,706	13,541	12,543	12,603	12,382	$ 1,300,110,000
CoinShares Bitcoin T One	Sweden	COINXBT	15,550	14,934	13,595	13,149	12,731	12,224	12,141	12,004	$ 1,260,420,000
WisdomTree Physical Bitco	Switzerland	BTCW	7,264	9,002	9,612	9,957	10,792	10,502	10,814	11,031	$ 1,158,255,000
Bitwise 10 Crypto Index	USA	BITW	11,003	10,969	10,882	10,748	10,765	10,487	10,775	10,531	$ 1,105,755,000
CI Galaxy Bitcoin CAD	Canada	BTCX.B	7,233	8,212	8,655	8,773	8,976	9,165	9,178	9,002	$ 945,210,000
21Shares Bitcoin ETP	Switzerland	ABTC	12,273	11,209	10,851	10,789	8,970	8,603	8,577	8,522	$ 894,810,000
Fidelity Advantage Bitcoin E	Canada	FBTC	3,621	4,828	5,394	5,854	7,232	7,793	8,044	8,394	$ 881,370,000
VanEck Bitcoin ETN	Germany	VBTC	7,077	6,674	6,904	7,200	6,817	7,025	6,975	7,003	$ 735,315,000
Hashdex NCI Crypto Index	Brazil	HASH11		6,301	5,564	5,780	6,976	7,007	6,870	6,736	$ 707,280,000
Grayscale Digital Large Cap	Cayman Islands	GDLC	5,995	5,995	5,999	5,962	5,901	5,802	6,317	5,823	$ 611,415,000
3iQ Bitcoin Fund	Canada	QBTC	6,719	6,696	5,419	5,373	5,351	5,318	5,308	5,299	$ 556,395,000
CI Galaxy Bitcoin USD	Canada	BTCX.U	5,904	5,316	4,629	4,998	4,562	4,404	3,772	3,718	$ 390,390,000
21Shares Bitcoin Core	Switzerland	CBTC	2,806	2,210	2,913	3,528	2,512	3,573	3,593	3,679	$ 386,295,000
Invesco Physical Bitcoin ET	Germany	BTIC	3,161	3,260	3,383	3,589	3,587	3,672	3,671	3,639	$ 382,095,000
ChinaAMC Bitcoin ETF	Hong Kong	3042.HK			1,998	2,080	2,323	2,237	2,162	2,910	$ 305,550,000
iShares Bitcoin ETP	Switzerland	IB1T							2,219	2,777	$ 291,585,000
Fidelity Physical Bitcoin ETP	Germany	FBTC:GER			963	954	1,789	2,490	2,637	2,692	$ 282,660,000
3iQ Bitcoin Fund	Canada	BTCQ	3,621	3,511	3,371	3,496	2,577	2,462	2,472	2,479	$ 260,295,000
Osprey Bitcoin Trust	USA	OBTC			1,952	1,942	1,929	1,930	1,931	1,928	$ 202,440,000
Evolve Bitcoin ETF	Canada	EBIT	@HODL15Capital		2,440	2,681	1,801	1,934	1,932	1,907	$ 200,235,000
VanEck Bitcoin ETF	Australia	VBTC			16	440	1,264	1,502	1,543	1,687	$ 177,135,000
Bosera HashKey Bitcoin ETI	Hong Kong	3008.HK			1,112	1,647	1,585	1,599	1,599	1,599	$ 167,895,000
QR Asset Bitcoin ETF	Brazil	QBTC11	1,102	1,240	1,430	1,520	1,567	1,567	1,515	1,512	$ 158,760,000
GlobalX 21Shares Bitcoin E	Australia	EBTC			1,100	1,145	1,288	1,362	1,376	1,422	$ 149,310,000
Virtune Bitcoin ETP	Sweden	VIRBTC	218	348	441	501	601	779	762	755	$ 79,275,000
Monochrome Bitcoin ETF	Australia	IBTC			65	114	266	316	348	667	$ 70,035,000
Amina Bitcoin ETP	Switzerland	SBTCU	947	889	833	861	1,232	824	604	556	$ 58,380,000
Harvest BitcoinSpot ETF	Hong Kong	3439.HK			732	500	366	357	302	302	$ 31,710,000
Iconic Funds Physical Bitco	Germany	XBTI	196	246	225	239	227	226	214	216	$ 22,680,000
Total Global ETFs			794,169	1,017,010	1,051,549	1,117,429	1,305,283	1,305,261	1,337,814	1,388,288	$ 145,790,610,000

And then there are the ETFs/ETPs and investment funds. There are now some 40 of these around the world that allow people in certain nations to purchase Bitcoin, held in custody by the funds, through stock market tickers. The three largest funds hold about 2/3 of a million Bitcoin and there is over 1 million held across all such funds.

Table 1. There are over 40 ETFs, ETPs, and publicly traded trusts and investment vehicles in the US and abroad, that hold almost 1.4 million Bitcoin in total.

Corporations are now very actively adding Bitcoin to their treasury balances; there is quite a race underway among a few firms. Strategy (formerly Microstrategy) and others actively raise money in the debt and equity markets in order to purchase Bitcoin for their treasuries. Collectively they account for 800,000 coins.

The HODL Top 85		Ticker		# of Bitcoin
1	Strategy	MSTR	⇧	580,250
2	Marathon Digital	MARA		48,237
3	TwentyOne	CEP/XXI		36,312
4	Riot Platforms	RIOT		19,211
5	Galaxy Digital	GLXY		12,840
6	Cleanspark	CLSK		12,101
7	Tesla	TSLA		11,509
8	Hut 8	HUT		10,264
9	Coinbase	COIN		9,267
10	Block (Square)	XYZ		8,584
11	Metaplanet	3350	⇧	7,800
12	Next Technology Hldgs	NXTT		5,833
13	Semler Scientific	SMLR	⇧	4,264
14	Bitcoin Group SE	BTGGF		3,605
15	Boyaa	0434.HK		3,350
16	Cango	CANG	⇧	3,289
17	Exodus	EXOD		2,011
18	BitFuFU	FUFU		1,908
19	Nexon	NEXOF		1,717
20	Fold	FLD		1,490
21	Canaan	CAN		1,408
22	Bitdeer	BTDR	⇧	1,310
23	Core Scientific	CORZ	⇧	1,300
24	Bitfarms	BITF		1,166
25	Brooker Group	BROOK		1,150
26	Cipher Mining	CIFR		855
27	The Blockchain Group	ALTBG	⇧	847
28	Ming Shing Group	MSW		833
29	KULR Technology Group	KULR	⇧	800
30	Aker ASA	AKER		754
31	SOS Ltd	SOS		675
32	Remixpoint	3825.JP		616
33	Hive Digital	HIVE		610
34	MercadoLibre	MELI		570
35	Samara Asset Group	SRAG		525
36	Jasmine International	JAS.BK		506
37	Alliance Resource Partners	ARLP		482
38	DMG Blockchain	DMGI		458
39	Bit Digital	BTBT		417
40	Neptune Digital Assets	NPPTF		401
41	Nano Labs	NA		400
42	Net Holding A. Sirketi	NTHOL		352
43	Meliuz	CASH3		320

@HODL15Capital		Ticker		# of Bitcoin
44	The9 Limited	NCTY		285
45	Advanced Bitcoin Tech	ABT		254
46	Coinshares Int'l	CS.ST	⇧	236
47	Virtu Financial	VIRT	⇧	235
48	WeMade	112040.KQ		223
49	Rumble	RUM		210
50	DEFI Technologies	DEFTF		209
51	BitMax	377030.KQ	⇧	194
52	LQwD FinTech	LQWDF		161
53	LM Funding America	LMFA	⇩	148
54	Phoenix Group	PHX		131
55	Horizon Kinetics	HKHC		131
56	Neowiz Holdings	042420.KQ		123
57	DigitalX	DGGXF		115
58	Bitcoin Depot	BTM		94
59	BTCS Inc	BTCS		90
60	ANAP Holdings	3189.T	⇧	87
61	Greenidge Generation	GREE		85
62	Genius Group	GNS	⇩	85
63	Digihost Technology	DGHI		81
64	Yuxing	8005.HK		78
65	Winland Holdings	WELX		77
66	BIGG Digital Assets	BBKCF		68
67	Matador Technologies	MATA		68
68	SBC Medical Group	SBC		67
69	FRMO	FRMO		63
70	Atai Life Sciences	ATAI		58
71	Smarter Web	SWC.AQ	⇧	58
72	Cathedra Bitcoin	CBIT		52
73	Mogo Inc.	MOGO		50
74	Linekong Interactive	8267.HK		44
75	Vinanz	BTC.AQ	⇧	40
76	Sato Technologies	CCPUF		36
77	OneMedNet	ONMD		34
78	HK Asia Holdings	1723.HK		29
79	Kontrol Technologies	KNR		25
80	Value Creation	9238.T		24
81	Coinsilium Group	COIN.AQ		21
82	DDC Enterprises	DCC	⇧	21
83	Investview	INVU		20
84	Thumzup Media	TZUP		19
85	BIT Mining	BTCM		19
@HODL15Capital		5/26/2025		804,745

Table 2. The largest 85 publicly traded companies with Bitcoin treasury holdings, collectively over 800,000 coins and over $80 billion in value. The dominant player is Strategy with 580,000 Bitcoin amassed since August 2020.

If we add up the government holdings, corporate holdings, and ETFs, we account for nearly three million Bitcoin. The remainder of the holdings are in private hands, in self-custody wallets, including privately held companies and individuals, or through exchanges as custodians. That is around 17 million out of the 19.87 million Bitcoin produced to date. And the vast bulk of the ETF and corporate holdings are also custodial for the purchasers of those ETFs and for the corporate shareholders, respectively.

Bitcoin can act as a strategic reserve asset for individuals, families, corporations, non-profits, pension funds, and governments. While Bitcoin holdings are concentrated in large wallets, when one corrects for the custodial portions, the distribution is broader than appears. There are something like 50 million direct owners or client accounts globally holding Bitcoin valued at $100 or more in some form. Government holdings would add hundreds of millions of citizens as indirect owners.

Price, Difficulty, and the Red Queen Race

"Now, here, you see, it takes all the running you can do, to keep in the same place." – Spoken by the Red Queen in Through the Looking Glass, by Lewis Carroll

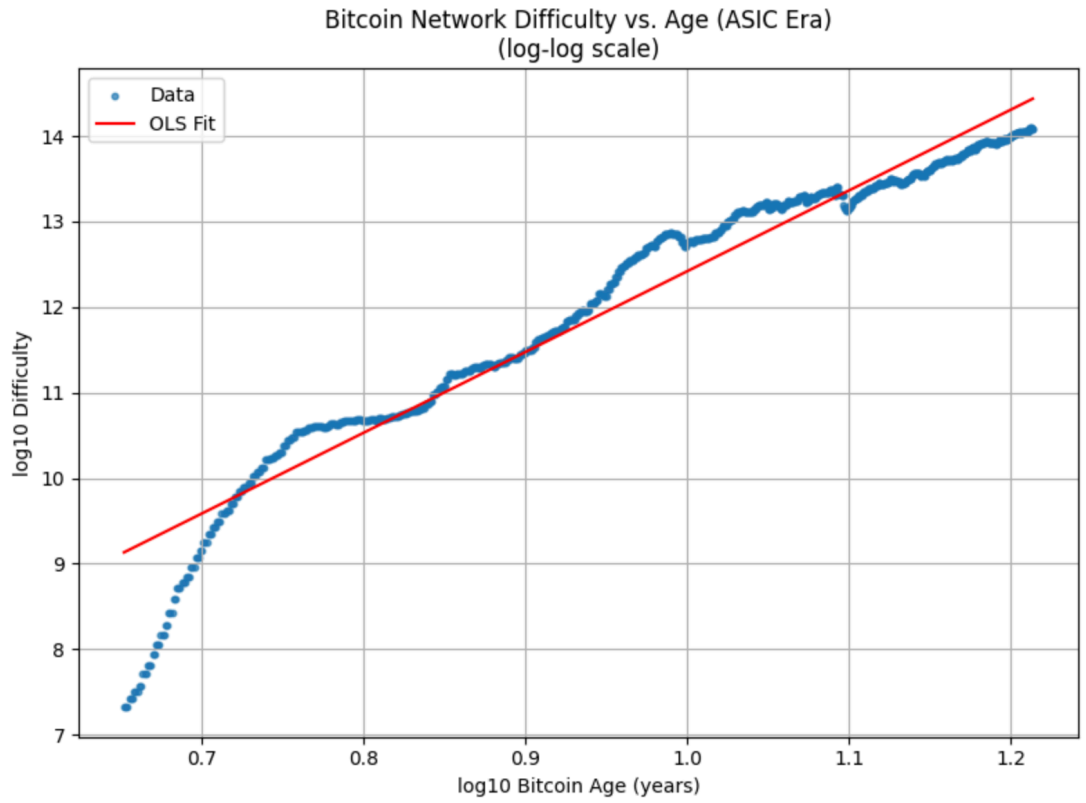


Figure 1. Log-log (base 10) plot of difficulty parameter vs. Bitcoin age. The data begins from 7/1/2013 during the transition to ASIC dominated mining, so one sees the last half year of a quick rapid rise to the main trend of a rapid 9.5 power law growth in mining difficulty. Bitcoin is now 16.42 years of age (log10 =1.22). The R^2 goodness-of-fit parameter is a strong 0.94. Both Bitcoin's price and its difficulty of mining adhere more or less to power law growth curves. Power laws are scale free growth with no intrinsic time frame, but a definitive origin point, in this case January 3, 2009 when the Bitcoin genesis block and the time chain were instantiated. Both of these power laws are quite steep function of Bitcoin's age.

The mining difficulty was a brilliant design choice by Satoshi Nakomoto that maintains block times to be roughly uniform with average duration of 10 minutes. It is necessary in order to avoid extremely short block times as more and more mining rigs with higher and higher performance enter the winner take all lottery that is Bitcoin minting.

Mining rewards consist of a block subsidy provided only to the unique lottery mining machine owner, along with a small amount of associated transaction fees. The cryptographic lottery is a coopetition where millions of rigs run the same Nakamoto consensus algorithm continuously with a winner 'chosen' every 10 minutes by being the first to solve the hashing puzzle of rising difficulty.

The difficulty is a parameter that controls how hard it is to win the reward and it is updated every 2016 blocks, around a fortnight. It is a quantity that is directly proportional to the average hashrate over the prior roughly two weeks' worth of blocks.

A power law regression of difficulty over any substantial period will thus have the very same power law index as the hashrate. We restrict our regression to the ASIC era which began in 2013, and provided a quantum leap over CPU and GPU performance for Bitcoin minting.

Figure 1 presents a log-log plot of the Bitcoin difficulty parameter versus Bitcoin age. Both axes are in log10 terms; the difficulty parameter now exceeds 100 trillion, and global hashrate is now of order 1000 Exahash/sec = 1 Zettahash/sec. A straight line in a log-log plot represents a power law of a given slope, in this case that slope or power law index is 9.45 and the standard error of the slope is just 0.36.

Miners have to account for this rapid difficulty growth in their planning scenarios. If you put a new mining rig into production it has a certain percentage of the global hash rate, but that percentage on average is dropping in accordance with the inverse of the steep 9.45 power law.

That is partially offset by the steep rise of Bitcoin price, which is a power law close to the 6th power. But then there are the halvings, which arrive at 4-year intervals and cut the block subsidy reward in half, and then in half again. The last halving was in April 2024, and the next one will be in April 2028, or within a month or so of that.

Bitcoin mining is, as a result, a brutally competitive business. At some point miners will need to rely on transaction fees, but for now those are nominal, typically between 1% and 2% of the total rewards received. Miners must account for ever-faster machines coming onto the marketplace and ever more mining rigs around the world, both of which contribute to the rapidly rising growth in hashrate and difficult.

⚙️ Performance Comparison

Hardware Type	Year	Typical Hash Rate	Power Draw
CPU	2010	~5–10 MH/s	~100 W
GPU	2011	~100–300 MH/s	~250 W
FPGA	2012	~400–800 MH/s	~80–120 W
1st ASICs (Avalon, BFL)	2013	~5–60 GH/s	~150–300 W

Table 3. The first ASICs introduced in 2013 gave a large boost, of several hundred times or more relative to GPUs, for Bitcoin's double SHA-256 hashing algorithm. Today's ASICs are extremely well optimized for parallel bitwise operations and are hundreds of thousands of times faster than current GPUs for the problem.

And they need to be aware of price trends and the volatility of price. They must move to the efficient frontier of electricity production while dealing with availability and regulation of electricity and load-shedding requirements during periods of high electricity demand. They preferentially look for green sources, over half of the 21 GigaWatts globally of electricity consumption is from renewable or nuclear power. Methane capture is a popular theme lately since methane is much more dangerous than CO2 for global warming.

Price Power Law

With the increase in Bitcoin's value, that has attracted very rapid growth in mining, the annual economic value of newly minted Bitcoin has reached a new record of $18 billion per annum.

Bitcoin's price power law, demonstrated first by physicist Giovanni Santostasi a decade ago, and later by this author, is well established. It has exhibited a stable power law index for the past decade. The relationship is believed to arise from Metcalfe's law since Bitcoin is a network for monetary value built on top of the Internet and is in effect a social media network as well. Metcalfe's law says that the value of a network grows as close to the square of the user community. And Bitcoin's user community has grown as something like the third power of its age. Together these two relations imply a power law index of around 6 for Bitcoin as a function of its age, now over 16 years.

Bitcoin is actually a meta-network as shown in the table below, and there are many feedback effects between the individual networks, such feedback effects tend to stabilize the meta network and result in emergent power law behavior.

****Networks of the Bitcoin Ecosystem** - *Chat GPT o1 preview***

1. Bitcoin Blockchain Network
2. Mining Network
3. Lightning Network
4. User Network
5. Developer Network
6. Merchant Network
7. Exchange Network
8. Full Node Network
9. Regulatory and Legal Network
10. Service Providers Network

The Bitcoin ecosystem is a complex interplay of various networks, each contributing to its overall functionality and growth. Feedback loops within these networks can amplify effects, leading to accelerated adoption, innovation, and, at times, challenges. Understanding these loops is essential for stakeholders, as they can influence strategic decisions, policy-making, and future developments in the Bitcoin landscape.

Table 4. Networks of the Bitcoin ecosystem.

Figure 2 is a log-log plot of Bitcoin price vs. age. Two regression lines are shown, one is OLS (ordinary least squares) and the other GLS (generalized least square correcting for auto-regression). They both are excellent fits, the GLS power law index is 5.9. Note also that price volatility is declining with Bitcoin's age.

If the difficulty grows as the 9.5 power and the price as the 5.9 power of age then a given rig will experience revenue falling inversely with age to the 3.6 power, which is a rapid depreciation outlook. It indicates that mining companies need to be continuously upgrading to remain competitive.

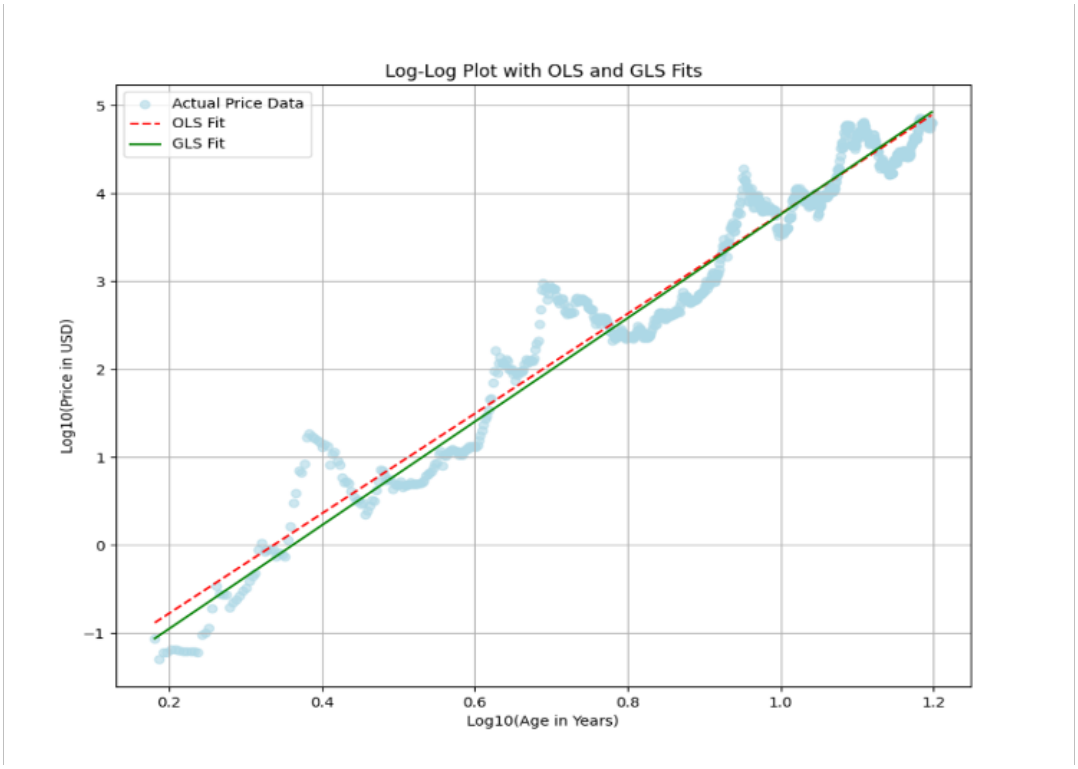


Figure 2. Log-log plot of Bitcoin's price history from $0.1 to $100,000, the power law index is 5.9 for this GLS regression.

Dogecoin: The Distant Runner-Up

Among Proof-of-Work coins, only Bitcoin and Dogecoin meet our CryptoSuper $250M annual production threshold requirement. Dogecoin is around 5% of the total $19 billion produced based on current prices. It has a higher supply inflation rate, 3.5%, than does Bitcoin at only 0.8%.

Coin	Annual Production Value	Market Cap	Hashing Algo
Bitcoin	$18 billion	~$2 trillion	SHA-256
Dogecoin	~$1 billion	~$25 billion	Scrypt

Table 5. Bitcoin and Dogecoin annual production and market cap.

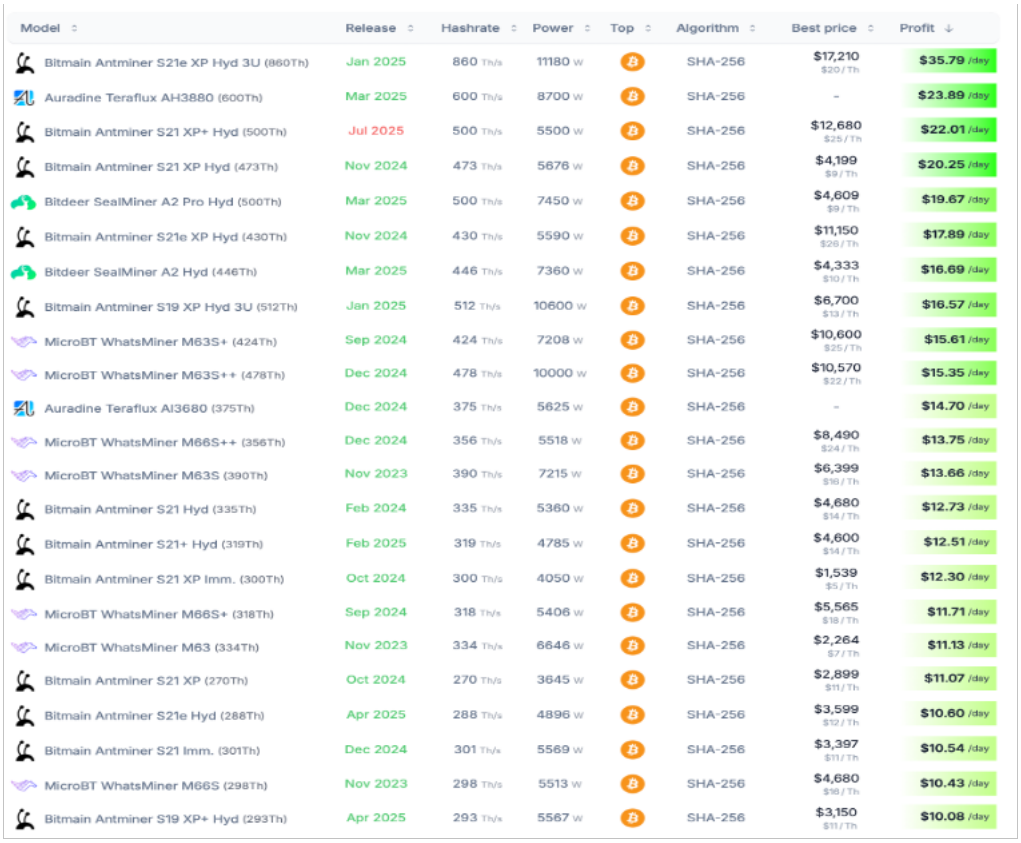
Hashing Power and Mining Hardware

Currently the global hashrate has reached Zettascale recently for the first time in Bitcoin's history. It is typically around 900 Exahashes/sec. in the past month, or 0.9 Zettahashes/sec. A Zettahash/sec. is 10^{21} hashes per second, a billion trillion. Each hash consists of around 1600 low-level bitwise operations.

The table below shows 23 of the fastest Bitcoin mining rigs on the market, from the four largest vendors, and shows hashrate, power required, and operating profit for a 5 cents per kiloWatt-hour electricity price. Typical hash rates are now about 300 Terahashes/sec. and above. The operating

profit per day is after subtracting electricity cost only and is above $10 per day for the mining rigs in this table.

These current generation mining rigs are of order several hundred thousand times faster for the required double SHA-256 hashing as the fastest GPUs.



Model	Release	Hashrate	Power	Top	Algorithm	Best price	Profit
Bitmain Antminer S21e XP Hyd 3U (860Th)	Jan 2025	860 Th/s	11180 W	₿	SHA-256	$17,210 $20/Th	$35.79 /day
Auradine Teraflux AH3880 (600Th)	Mar 2025	600 Th/s	8700 W	₿	SHA-256	-	$23.89 /day
Bitmain Antminer S21 XP+ Hyd (500Th)	Jul 2025	500 Th/s	5500 W	₿	SHA-256	$12,680 $25/Th	$22.01 /day
Bitmain Antminer S21 XP Hyd (473Th)	Nov 2024	473 Th/s	5676 W	₿	SHA-256	$4,199 $9/Th	$20.25 /day
Bitdeer SealMiner A2 Pro Hyd (500Th)	Mar 2025	500 Th/s	7450 W	₿	SHA-256	$4,609 $9/Th	$19.67 /day
Bitmain Antminer S21e XP Hyd (430Th)	Nov 2024	430 Th/s	5590 W	₿	SHA-256	$11,150 $26/Th	$17.89 /day
Bitdeer SealMiner A2 Hyd (446Th)	Mar 2025	446 Th/s	7360 W	₿	SHA-256	$4,333 $10/Th	$16.69 /day
Bitmain Antminer S19 XP Hyd 3U (512Th)	Jan 2025	512 Th/s	10600 W	₿	SHA-256	$6,700 $13/Th	$16.57 /day
MicroBT WhatsMiner M63S+ (424Th)	Sep 2024	424 Th/s	7208 W	₿	SHA-256	$10,600 $25/Th	$15.61 /day
MicroBT WhatsMiner M63S++ (478Th)	Dec 2024	478 Th/s	10000 W	₿	SHA-256	$10,570 $22/Th	$15.35 /day
Auradine Teraflux AI3680 (375Th)	Dec 2024	375 Th/s	5625 W	₿	SHA-256	-	$14.70 /day
MicroBT WhatsMiner M66S++ (356Th)	Dec 2024	356 Th/s	5518 W	₿	SHA-256	$8,490 $24/Th	$13.75 /day
MicroBT WhatsMiner M63S (390Th)	Nov 2023	390 Th/s	7215 W	₿	SHA-256	$6,399 $16/Th	$13.66 /day
Bitmain Antminer S21 Hyd (335Th)	Feb 2024	335 Th/s	5360 W	₿	SHA-256	$4,680 $14/Th	$12.73 /day
Bitmain Antminer S21+ Hyd (319Th)	Feb 2025	319 Th/s	4785 W	₿	SHA-256	$4,600 $14/Th	$12.51 /day
Bitmain Antminer S21 XP Imm. (300Th)	Oct 2024	300 Th/s	4050 W	₿	SHA-256	$1,539 $5/Th	$12.30 /day
MicroBT WhatsMiner M66S+ (318Th)	Sep 2024	318 Th/s	5406 W	₿	SHA-256	$5,565 $18/Th	$11.71 /day
MicroBT WhatsMiner M63 (334Th)	Nov 2023	334 Th/s	6646 W	₿	SHA-256	$2,264 $7/Th	$11.13 /day
Bitmain Antminer S21 XP (270Th)	Oct 2024	270 Th/s	3645 W	₿	SHA-256	$2,899 $11/Th	$11.07 /day
Bitmain Antminer S21e Hyd (288Th)	Apr 2025	288 Th/s	4896 W	₿	SHA-256	$3,599 $12/Th	$10.60 /day
Bitmain Antminer S21 Imm. (301Th)	Dec 2024	301 Th/s	5569 W	₿	SHA-256	$3,397 $11/Th	$10.54 /day
MicroBT WhatsMiner M66S (298Th)	Nov 2023	298 Th/s	5513 W	₿	SHA-256	$4,680 $16/Th	$10.43 /day
Bitmain Antminer S19 XP+ Hyd (293Th)	Apr 2025	293 Th/s	5567 W	₿	SHA-256	$3,150 $11/Th	$10.08 /day

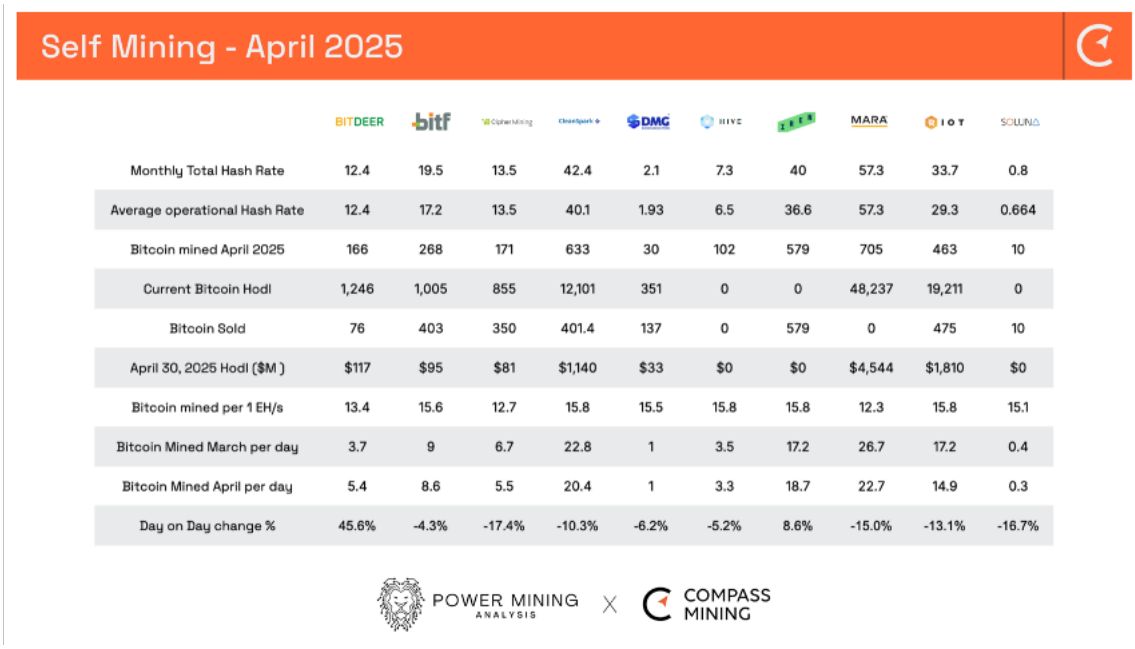
Table 6. Columns are model, release date, hashrate, power consumption, main coin, SHA-256 is algorithm for Bitcoin, and system price and gross profitability per day at 5 cents per kWh. Operating revenue after electricity costs only, ignoring equipment capital amortization. One model in red is announced in advance of release. Source: asicminervalue.com

Energy consumption is generally 4 kiloWatt and higher per system, with hydro models running as high as 11 KiloWatts. Efficiency ratings are calculated by dividing power consumption by hashrate and under 20 Joules per Terahash is desirable. Mining rig prices are often quoted in $ per Terahash.

It would take nearly 3 million of the Bitmain Antminer S21 Hydro models to produce all 900 Exahashes/sec. of global hashrate. That would collectively amount to some 16 GigaWatts. According to the CCAF at the University of Cambridge the current electricity usage of the Bitcoin network is roughly 21 GigaWatts, over half of which is from sustainable sources. Miners are highly incentivized to seek out lower cost electricity and generally renewable sources are of that nature. Bitcoin mining can also be done in situ, tapping into energy sources that are otherwise wasted or underutilized. According to the Bitcoin Mining Council the contribution to global CO2e from Bitcoin mining is only a little over one part in a thousand.

Top Public Bitcoin Miners

The top 10 publicly traded mining companies, with the majority of their hashrate located in North America, are responsible for one quarter of Bitcoin's global hashing and Bitcoin production. They minted 23% of all new Bitcoin during April 2025.



	BITDEER	bitf			DMG	HIVE	IREN	MARA	IOT	SOLUNA
Monthly Total Hash Rate	12.4	19.5	13.5	42.4	2.1	7.3	40	57.3	33.7	0.8
Average operational Hash Rate	12.4	17.2	13.5	40.1	1.93	6.5	36.6	57.3	29.3	0.664
Bitcoin mined April 2025	166	268	171	633	30	102	579	705	463	10
Current Bitcoin Hodl	1,246	1,005	855	12,101	351	0	0	48,237	19,211	0
Bitcoin Sold	76	403	350	401.4	137	0	579	0	475	10
April 30, 2025 Hodl ($M)	$117	$95	$81	$1,140	$33	$0	$0	$4,544	$1,810	$0
Bitcoin mined per 1 EH/s	13.4	15.6	12.7	15.8	15.5	15.8	15.8	12.3	15.8	15.1
Bitcoin Mined March per day	3.7	9	6.7	22.8	1	3.5	17.2	26.7	17.2	0.4
Bitcoin Mined April per day	5.4	8.6	5.5	20.4	1	3.3	18.7	22.7	14.9	0.3
Day on Day change %	45.6%	-4.3%	-17.4%	-10.3%	-6.2%	-5.2%	8.6%	-15.0%	-13.1%	-16.7%

Table 7. Top 10 mining company production of Bitcoin during April. Table is taken from Compass Mining's monthly report on the marketplace.

The top names include Marathon, CleanSpark, Riot, IREN, Bitfarms, Cipher, and Terawulf. Collectively the top 11 public mining companies hold $9 billion in Bitcoin in their treasuries.

Most mining companies are now supporting GPU hosting for AI and HPC workloads in order to diversify and smooth out their revenues, since Bitcoin prices are volatile, the competition is fierce, and halvings arrive every four years.

Table 7 summarizes the Bitcoin production for the top 10 companies during April 2025. Four of these companies are consuming over 1/2 a Gigawatt each.

Supercomputing Comparison

We can compare Bitcoin's cooperative and competitive global decentralized mining supercomputer in general terms to the world's fastest supercomputer, El Capitan at the Department of Energy in the US, although the algorithms and hardware details are quite different.

El Capitan has a peak performance of 1.74 Exaflops (the unit is a billion billion floating point operations), and consists of 11 million GPU and CPU cores It consumes 30 - 35 MegaWatts, which is of order 10,000 times as much as a typical Bitcoin mining rig. The cost is $600 million and the science mission is of critical national importance.

We can go further and compare to the collective processing power of the entire Top 500 supercomputer list from November, 2024, which is 11.7 Exaflops. Note that all of the hundreds of

millions of GPU and CPU cores on the Top 500 list would not be able to outperform of order 1000 mining ASICs for the hashing problem.

Attribute	El Capitan Supercomputer (#1)	Top 500 (all) Nov. 2024	WhatsMiner 63S Hydro cabinet	Bitcoin Network Equivalent
Performance	1.74 Exaflops	11.7 Exaflops	4.68 Petahash/s	900 Exahash/s
One year increase	46%	~100%	~60% for industry	37%
Chips	11,136 nodes, 11.04 million cores, AMD Epyc AMD Instinct	Hundreds of millons of cores	12 multithread, 5 nm ASIC	2,300,000 ASICs
Cabinets	?		1	192,000 cabinets
Power consumption	30-35 MegaWatts, liquid cooled		89.2 KW, liquid cooled	17,100 MW
Weight	Tens of tons		0.76 metric tons	133,500 metric tons
Cost	$600 million		$107,000	$20.5 billion
Output	Science and Nuclear Security Mission	Science & Engineering & AI	0.85 Bitcoin per year	164,000 Bitcoin per year
Value	Priceless	Enormous	$89,000 per year	$18 billion per year

Table 8. Comparison of Bitcoin mining network to supercomputer Top 500 list from November 2024.

Since Bitcoin mining with ASICS is hundreds of thousands of times faster than general purpose GPUs used for HPC and AI computing, combining all of the AI/HPC and cloud computing capacity around the world would be insufficient to mount a 51% attack and win even a single Bitcoin block. And since each block inside the chain has exponentially harder security relative to the adjacent newer block, by the nature of the hashed chain, unwinding the blockchain is an impossibility.

For our comparison of cost and power consumption we use the WhatsMiner 63S Hydro cabinet, that contains 12 ASIC servers, costs $107,000, consumes 89 KiloWatts and at current difficulty levels would produce 0.85 Bitcoin per year on average, worth $89,000.

In other words, it would take just under 4 cabinets of this type to win a single block on average in an entire year, that is worth 3.125 Bitcoin and fees. To match all of the current global hashrate would require 192,000 cabinets and over 2 million ASICs of this particular system, amounting to 17 GigaWatts of power consumption, and costing just over $20 billion. So that gives a feel for the current total amount of capital investment the past several years (in systems only, not including data center infrastructure) in active Bitcoin mining.

Suppose the average system life is 3 years, that is a per year capital investment by the industry of order $7 billion plus infrastructure. If 21 GigaWatts is purchased at 4 to 5 cents per kWh on average, that is around $7 to $9 billion of electricity per year. And the output is currently $18

billion. One gets a rough sense of the costs and tight margins in the Bitcoin mining business with this back of the envelope estimate.

Long-Term Growth

The increase in Bitcoin's hash rate over the past 6.5 years has exceeded Moore's law growth, as has Bitcoin's market capitalization. Bitcoin dominance has continued to grow, with now only two coins making the cut, and Bitcoin being close to 95% of the annual economic production value of the list.

There remain only 1.13 million Bitcoin yet-to-be-minted, with about 450 per day currently, but the block subsidy reward to be cut to 225 per day in 2028 and 112.5 per day in 2032. Eventually the miners will need to collect most of their rewards from transaction fees, from encoding transactions in blocks, rather than Bitcoin minting.

Attribute	Nov. 2018	June 2025	6.5 Year Growth
Coins making cut for CryptoSuper report	Bitcoin, Ethereum, Litecoin, Bitcoin Cash, Monero	Bitcoin, Dogecoin	Consolidation
Number of different cryptocurrencies	2000	~ 10,000 active; millions of meme coins	Vast Majority worth little
Bitcoin Market Capitalization	$111 billion	$2200 billion	20 x
Bitcoin Price	$6,334	$110,000	17 x
Bitcoin annual production rate and fees	$4.2 billion	$18.3 billion	4.4 x
Bitcoin Hash Rate Exahash/s	57	900	16 x
Cryptocurrency Market Cap	$220 billion	$3400 billion	15 x
Top cryptos annual mining production w/ fees	$5.6 billion	$19.5 billion	3.5 x

Table 9. Comparison of parameters of first CrytpoSuper list and this list. The number of coins making the cut dropped from six to two. Ethereum was once a large contributor but gave up on proof of work in September 2022. The Bitcoin hash rate and price have grown by 16 or 17 times in the intervening 6.5 years.

Strategic Outlook

Bitcoin mining takes place on a decentralized supercomputing grid, in which anyone can participate with a rather small initial investment, or by purchasing mining cycles at a hosting facility.

However, it is a brutally competitive business and thus much of the hashrate is now a highly industrialized activity, funded in many cases by significant venture capital, and taking advantage of economies of scale for efficiency and for access to the cheapest sources of electric power.

It is a Red Queen style race since there are new and faster mining rigs being added to the network every month and thus the difficulty of the winner-take-all lottery that happens about 6 times an hour increases much faster than Moore's law. To add insult to injury the block subsidy is cut in half, without fail, every 210,000 blocks or basically every four years.

Fortunately the price is also rapidly increasing as a function of Bitcoin's age, and mining operations have sought out the lowest electricity pricing and received load balancing offsets in their contracts with grid authorities when possible. The ASIC manufacturers have been adept at producing faster systems that lower the price per TeraHash, but their power requirements have crept up to 5 kiloWatts and above such that liquid cooling is now required for high end rigs.

Most of the publicly traded mining companies have added AI/HPC hosting to their businesses as they seek to balance out some of the high volatility and uncertainty associated with Bitcoin mining.

If history rhymes we could be due for another bubble later this year, followed by a bubble collapse and shakeout and further consolidation for the mining industry.

To be sure, innovation will continue apace in the Bitcoin mining field. They are no longer the bogeyman for electricity consumption, that is now AI. They are also greener than other industries in their electrical inputs and - very importantly - produce a highly circular low friction asset, unlike AI or Tesla charging that are primarily one time consumption use of electricity.

Pull Quotes

Bitcoin is produced by a special purpose global decentralized supercomputer, the world's largest, of the scale of several million ASIC servers.

Among proof-of-work coins that use significant computational power, only Bitcoin and Dogecoin make the cut, and Bitcoin's $18 billion of annual production — a new record in value created — is nearly 95% of the total.

The global Bitcoin hashrate is now of order 1000 Exahashes/sec or 1 Zettahash/sec (10^{21}).

Over half of the 21 GigaWatts globally of electricity consumption for Bitcoin minting is from renewables or nuclear power sources.

Both Bitcoin's hash rate (the standard for measurement just as flops are in the the HPC/AI world) and its price, have both increased over a factor of 16 since our first report in November 2018.

The latest high-end mining rigs are increasingly liquid-cooled and exceed 5 kiloWatts power consumption.

A single ASIC, highly optimized for Bitcoin hashing, would outperform a hundred thousand of the latest NVIDIA Blackwell GPUs for the problem at hand.

The top 10 publicly traded Bitcoin mining companies, primarily in North America, are responsible for 1/4 of all the hashrate.

The difficulty parameter for the cryptographic lottery has risen as a steep 9.5 power law of Bitcoin's age, leaving Moore's law in the dust.

Bitcoin mining is a Red Queen style race that requires rapid equipment upgrades due to increasing difficulty of the cryptographic problem and regular halvings of the reward. "It takes all the running you can do, to keep in the same place" - the Red Queen in Through the Looking Glass, Lewis Carroll.

As bitcoin regulation has become increasingly clarified and Bitcoin adoption continues apace, its adoption by governments and institutions has accelerated.

There are around nine nation-states actively mining Bitcoin.

The most important move by a government to date was the funding of the US Strategic Bitcoin Reserve, beginning with 207,000 confiscated Bitcoin being relocated to the Treasury from the Justice Department..

If we add up the global government holdings, corporate holdings, and ETFs, we account for nearly 3 million out of almost 20 million total Bitcoin in existence.

Bitcoin can act as a strategic reserve asset for individuals, families, and non-profit organizations as well as corporations and governments.

Bitcoin's long-term trend of price following a power law vs. age is well established. And it is a steep power law at that, nearly the 6th power of Bitcoin's age.