The OrionX Constellation
Blockchain

The Eighth CryptoSuper 500 List

CryptoSuper mining currently generates $19 Billion of annual value; the US now has a 38% share of Bitcoin mining

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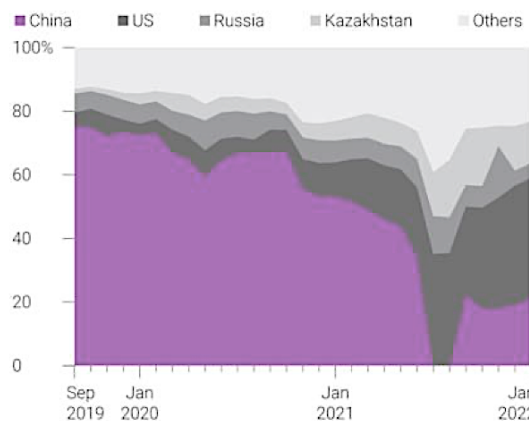## Global mining reset to North America

"Money has become information. Bitcoin is energy securely encapsulated as information. Electrons to eternal bits" - @moneyordebt

Three years ago, China was responsible for over 3/4 of the globe's Bitcoin mining production, enabled by the availability of cheap hydropower and cheap coal power and production of mining rigs by Chinese vendors. Sichuan province in particular has very large, but seasonal, hydropower resources. This was a cause of concern, that the blockchain production was too centralized in one nation.

By government edict, China shut down all Bitcoin and cryptocurrency mining in mid-June last year. While ESG was mentioned as a justification, in our opinion there were two primary motivators. One was capital flight, and the second was the rollout of the e-CNY, China's digital currency tied to their fiat Yuan. Bitcoin was perceived as competition for a central bank digital currency that they can entirely control and monitor usage of through mobile wallet technology.

Figure 1. The distribution of Bitcoin mining power (share of global hash rate) for the top four mining nations China (purple), US (dark gray), Russia (mid gray), and Kazakhstan (light gray) during the period from September 2019 to January 2022. From Cambridge Centre for Alternative Finance, South China Morning Post.

OrionX Constellation™ reports cover 6 Es: big trends (Envision), industry milestones (Events), historical view of a technology segment (Evolution), main vendors in a market segment (Environment), customer decision criteria (Evaluation), and how vendors in a segment score (Excellence) based on the OrionX methodology, which considers market presence and trends, customer needs and readiness, and product capabilities and roadmap.

It is not overstating things to say that the Bitcoin mining ban is symptomatic of the decoupling of US and China supply chains, and China's desire to increase its geopolitical footprint. China wants to free itself from US dollar dominance in world trade and also strongly seeks to control information inside its borders. Money, and how it is used, is information. China has long had capital controls.

The global mining hash rate dropped precipitously after the shutdown, but within a few months had recovered and has now gone on to new highs. The peak in 2021 nearly reached 200 Exahashes/second briefly and it is now around 200 and has been as high as 250 Exahashes/second. Post-shutdown, the centers for mining quickly migrated to North America and Central Asia.

Within the US, the four states of Georgia (31%), Texas (11%), California (10%) and New York (8%) are responsible for 60% of US hash rate, as of the end of 2021.
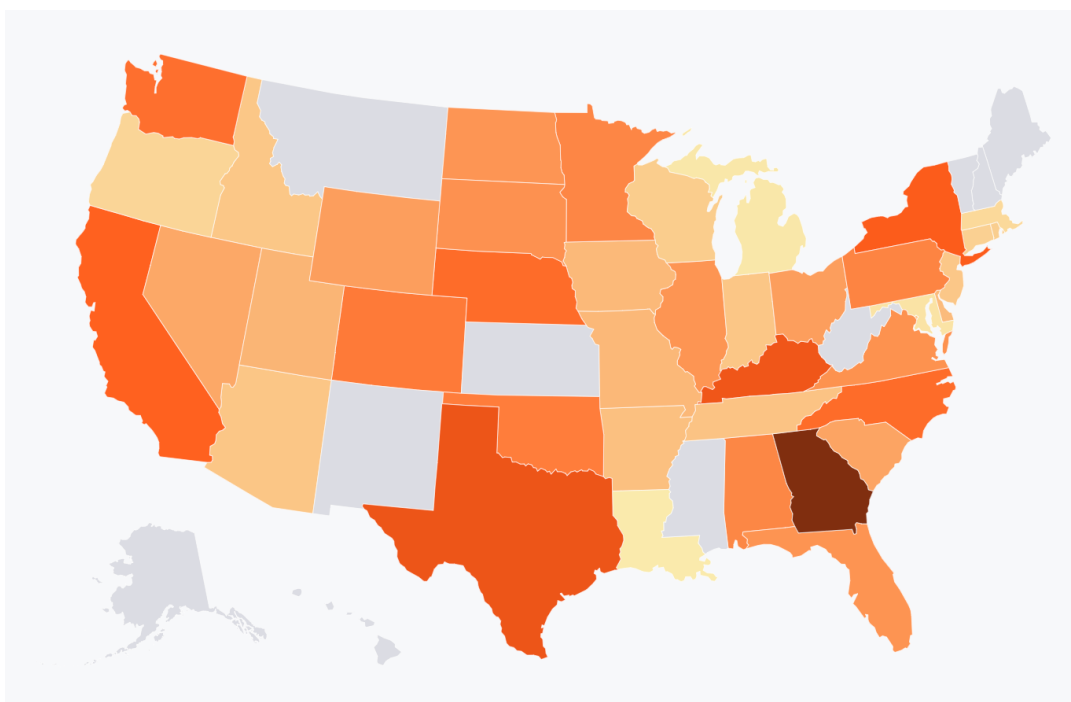

Figure 2. The distribution of Bitcoin mining power in the US. Darker color for a state means more mining power. Half of the mining is in three states: Georgia had 31%, Texas 11%, and California 10% of the mining power as of December, 2021. Map from Cambridge Centre for Alternative Finance.

However after a month or two of hard lockdown, hashing power in China rose from zero, and as of January this year reached 21% of global hash rate, according to the Cambridge Centre for Alternative Finance (CCAF). This is presumably illegal (or local party boss sanctioned) mining by smaller, less visible collections of mining rigs, and location spoofing via VPNs, and puts China in second position globally. It will be interesting to watch how this evolves.

> *"Chinese miners were afraid that the government crackdown was serious, so they lied or spoofed their location data and moved underground." - CoinDesk*

The US remains in first place with 38% share for Bitcoin mining, and Kazakhstan is third with 13%. Other nations with significant hash rate share reported are Canada 6%, Germany 3%, and Malaysia 3%. However the German portion the CCAF itself says is suspect and may be due to IP address redirection via VPN or proxies. The numbers are not precise, they are projections by CCAF based on several of the major pools: Foundry, Poolin, and BTC(.)com in particular, for the January 2022 statistics.

The shift to the US and Canada has also corresponded with the rise of publicly traded venture funded crypto mining companies. These are primarily headquartered in the Anglo-American countries including the US and Canada plus the UK and Australia. Below is a table of public crypto mining companies with market caps above $300 million.

Some of these engage in other activities such as data center hosting and cloud computing. Many of these companies are losing money as they rapidly invest in scaling up their hash rate to gain a secure position in what is a very competitive business. Many are also choosing to hold on to a large fraction of the Bitcoin they mine, in anticipation of higher prices in the future.

If these companies implement their plans they may between them account for over 20% of all Bitcoin hash rate by early 2023. You won't generally see them in the pool listings in this report as they may contribute their hash rate into an existing pool to receive rewards.

(Disclosure: the author holds positions in Bitcoin mining companies Argo Blockchain and Marathon Digital. We have no consulting agreements with any crypto mining companies).

Company	Trading Symbol	Market Cap (B$)	EPS	Hash rate plans, in Exahash/s	Bitcoin held
Core Scientific	CORX	1.26	-2.56	16.2, 31 for year-end 2022	8497
Marathon Digital	MARA	1.10	-0.36	23 by early 2023	
Riot Blockchain	RIOT	0.91	-0.09	12.8 by early 2023	5783
Northern Data AG	NDTAF	0.85	-7.66	data center and cloud provider	
Cipher Mining	CIFR	0.48	-0.42	7.5 by early 2023	
Hut 8 mining	HUT	0.43	-0.42	2.54 now	6115
Iris Energy Ltd.	IREN	0.37	-18.07	10 by early 2023	
Bitfarms	BITF	0.38	0.13	2.7 now	5243
Hive Blockchain	HIVE	0.37	0.38	2.2 now	
Argo Blockchain	ARBK	0.30	0.90	5.5 by end 2022	2700

Table 1. Large publicly trade crypto mining companies as of 5/19/22, ordered by market cap (B$ US). Sources for data: Compass Mining, company web sites, Yahoo Finance.

Proof of Work vs. Alternatives

Trust, Consensus	Who	What (currency)	Where
Proof of Stake	Crypto founders, companies	ICO token (equity)	Centralized ledger or partially decentralized blockchains
Proof of Authority	Governments	US $, Euro, other fiat	Centralized ledgers (Fed, banks)
Proof of Work	Miners	Bitcoin, other PoW coins	Public decentralized blockchain (full nodes)

Table 2. Major classes for consensus of financial ledgers. Proof of Stake in the crypto world is analogous to shares in a corporation, those who hold more stake have more consensus votes and more dividends from staking. Governments hold a monopoly on the issuance of fiat under their legal authority. Proof of Work coins, most notably Bitcoin, are privately generated and rely on electricity and cryptographic hashing for creation of the currency.

Cryptocurrencies use consensus algorithms to validate transactions onto a blockchain, and to avoid double spending or counterfeiting of additional tokens. Cryptocurrencies are digital assets only and are held in a partially or highly decentralized ledger, typically in a blockchain form. In a blockchain, each block is linked to the prior block via a cryptographic hashing technique.

Fiat currency is issued by a central governmental authority and uses a variety of techniques to secure the digital representations and physical instances, in order to limit counterfeiting of the currency.

Proof of Stake cryptos use some type of voting scheme, including election of validators, in order to determine which transactions enter the ledger. Voting power depends on staking tokens, those who own more get more votes. Little compute power is employed in this effort.

Proof of Work on the other hand requires supercomputing levels of computational (and electrical) power for validating blocks onto the blockchain. Proof of work uses a cryptographic hash lottery in which the effective number of chances to win depends on the computational power devoted to a cryptographic hash puzzle. The resultant power is measured in hashes/second for the algorithm in question.

Hash Rate Drives Security, Value

> *"In return for (enforcing) security, Bitcoin miners get paid in bitcoin, and the Bitcoin network demands and consumes more energy as adoption increases." - Parker Lewis, Unchained Capital*

The whole point of proof of work, of hash rate, is to secure the blockchain's transactions against reversal and against double spending by bad actors. If the hash rate is dispersed among many players, and no one can accumulate 51% of the global hash power, that security holds.

Security imparts value, in fact it is the most important attribute determining Bitcoin's value, followed by the supply dynamics (scarcity attribute).

Technology increases hash rate as the specialized mining ASICs get faster. Their efficiency metric can be measured in Terahashes/kWh, the hash rate divided by the energy consumption.

Manufacturer	Model	MSRP K$	Hashrate TH/s	Electricity Watts	Operating Profitability per day at 5 cents kWH, BTC $29.5K	Availability (if new)
Bitmain	Antminer S19 XP	11.6	140	3010	$13.10	Oct. 2022
	Antminer S19 Pro+Hydro	15	198	5540	$17.00	May 2022
	Antminer S19 Pro	7.9	110	3250	$9.23	
	Antminer S19	5.7	95	3250	$7.40	
MicroBT	Whatsminer M53	7.4	226	6554	$19.13	Q3 2022
	Whatsminer M50S	5.8	126	3276	$11.12	July 2022
	Whatsminer M30S++		112	3472	$9.20	
Canaan	Avalon 1266		100	3500	$7.74	
	Avalon 1246 90T	7.2	90	3420	$6.61	

Table 3. Top Bitcoin mining rigs. The first and second column give the manufacturer and model name for a number of the latest mining rigs. The third, fourth, and fifth columns give suggested unit pricing, the hashrate for Bitcoin's SHA256 hashing algorithm in Terahashes/second, and the power drawn in Watts. The operating profitability is estimated for 5 cents per kWH electricity. The operator must cover capital costs and other operating costs as well before deriving a profit. Some of these rigs will not ship until later this year.

Global hash rate has been increasing drastically as faster mining rigs come on the market and as more players seek to profit from Bitcoin mining. Over the past four years hash rate has been rising as roughly the 6th power of the age of the Bitcoin blockchain.

Fortunately for miners seeking to profit from the mining rigs they purchase, the long term Bitcoin price has increased rapidly in the long term as its adoption has spread to large firms include blockchain companies and crypto exchanges, investment companies, corporate treasuries (e.g., Microstrategy and Tesla), and even to government adoption through sovereign wealth funds and as legal tender (with El Salvador and the Central African Republic representing the first two such legal tender nations).

Clean energy concerns

Bitcoin uses some 2/3 of 1% of the world's electrical consumption, roughly 147 Terawatt-hours per annum, according to the Cambridge Bitcoin Electricity Consumption Index. However, a more recent report from the Bitcoin Mining Council places the consumption at only 1/6 of 1% of global energy and only 0.08% of carbon emissions; the principal difference in the two is the former compares to electricity consumption and the latter to all global energy usage. A presentation on the Bitcoin Mining Council report can be found here: https://youtu.be/uotDxbKJmlo

Figure 3. Slide from Bitcoin Mining Council presentation of 4/26/22 regarding Q1 energy usage and carbon emissions from the Bitcoin mining industry. Energy usage actually dropped from a year prior.

Critics like to compare Bitcoin's energy usage to small countries in its power consumption. But like small countries, Bitcoin has its own GDP, its own production.

What's Bitcoin's GDP? It's basically the annual number of Bitcoin produced times the price. Currently that number is 900 BTC per day or 328,5000 per year. At the current price of $30,000 that amounts to about a $10 billion dollar GDP.

What is interesting though is that the value created is permanent, and grows rapidly over time, <u>faster than the 5th power of the age of Bitcoin's blockchain</u>, so the longer-term wealth creation is even greater. If we take all 19 million Bitcoin there has been almost $600 billion of value creation over a 13 year period. The Bitcoin produced today is on a long-term trend to more than double in price every two years.

So the first point is that of Bitcoin as long term production of value. Charge a Tesla and you use that energy up in a few days. Unlike Teslas or air conditioners, Bitcoin's electricity goes to production of long-term value, not consumption.

The second point is that Bitcoin seeks out the low-cost and efficient energy frontier and can also be used as a load-balancing buffer for the grid. If a utility is saturating load during peak hours and their customers' air conditioners need to be supplied with power, electricity prices or contract terms can be used to dial back the Bitcoin mining in that utility's region.

The third point is that Bitcoin mining on average has greener inputs than electricity on average. The Bitcoin Mining Council pegs it at 58% green, higher than the EU average and higher than the US average. When much of the mining was in China it was dominated by a mix of green but seasonal hydropower and low-cost but dirty coal power. Now it is increasingly being located with renewable power sources and that even includes capturing natural gas in the field to prevent flaring of highly polluting methane. Methane is up to 80 times worse than CO2 for its atmospheric warming effect.

You can learn more about Bitcoin's energy demands at <u>Cambridge Centre for Alternative Finance</u> and <u>endthefud.org</u> (from the Bitcoin Mining Council).

Mining rig technology

Mining rigs are designed around different hashing algorithms, for example SHA-256 for Bitcoin and Ethash for Ethereum. Most of the mining is done with custom ASIC based systems, but there are many coins, including Ethereum, that can be mined using GPUs.

The competition between manufacturers is to produce the highest hash rate, optimizing also for electrical power requirements. The fastest Bitcoin mining rigs produce over 100 Terahashes/second and typically draw about 3 kiloWatts. Some liquid cooled models are now being produced in an effort to push up hash rate even further.

One can compare the hash rate of a mining rig to Bitcoin's global hash rate to see what the average expected earnings would be. Each block is currently worth 6.25 Bitcoin, and if global hash rate is 225 Exahashes/s then a single 100 Terahash/s rig has a one in 2.25 million chance of winning the reward.

Figure 4. Bitmain Antminer S19 XP (not shipping until Oct. 2022).

After 100,000 blocks the expected return would be 0.278 Bitcoin or about $83,000 worth. The problem is that generating 100,000 blocks on the blockchain takes about 1.9 years. After 2 years one would have less than a 5% chance of winning a single block. So one must have large farms with thousands and thousands of rigs, specialized supercomputers, operating around the clock. Alternatively, a small scale or hobby miner with only one or a few machines, will usually add their rigs (virtually) into a mining pool where rewards are equally shared according to proportional hash rate contributed.

The mining pools in this report may have their own large farms but are also accepting hash rate from other farms and from many smaller miners around the globe.

There is additional good news and bad news. One is that Bitcoin's price goes up in the long rate, roughly as the blockchain age to the 5th power. The bad news is that global hash rate is going up as well, at something like the

6th power of blockchain age or faster. So every day your shiny new rig is earning a smaller fraction of the total block reward and maybe less in absolute terms as well. And in a couple of years the block reward will be cut in half once again.

Crypto supercomputing is an extremely competitive business. The profitable lifetime for a rig may be as short as a couple of years or less; if electricity costs more than 6 cents and you aren't getting good discounts on your capital expense, it may never pay for itself.

Top Proof of Work coins

Of the top 10 coins by market cap, only three use a Proof of Work (PoW) consensus algorithm, including the two most valuable coins, Bitcoin and Ethereum. PoW imparts security and that is a key driver of value. As of 5/16/22 Bitcoin and Ethereum account for almost 2/3 of the entire market cap of the cryptocurrency universe of over 19,000 coins. The third one in the top 10 is Dogecoin, which while a 'meme coin' of sorts also uses PoW. The others in the top 10 are either "stable coins" tied to the US dollar, or use some other consensus algorithm.

Since our last list in November 2021 the cryptocurrency market has been in a crypto winter (the market peaked in early November), with the Bitcoin and Ethereum price currently down to about half of prior peak values. Thus the annual mined value is at a $19 billion run rate as compared to the $42 billion annual economic value from the last list.

Dogecoin was #3 on the 7th list, but has fallen by nearly a factor of three (perhaps due to Elon Musk's neglect) in the past six months so it does not qualify for this 8th release of our list, given its annual production of less than $1/2 billion.

Other candidates which have appeared on previous lists, Bitcoin Cash, Litecoin, Ethereum Classic, Monero, and Zcash, also fail to qualify and have dropped in price by factors of two to four. The algorithm, block subsidy amount and block time for several of these coins can be found in Table 2 of the Seventh CryptoSuper list at https://orionx.net/wp-content/uploads/2021/11/CryptoSuper500-7th-Evolution-OrionX-Constellation-20211118.pdf.

Thus for this list we have consolidation around the top two coins, and we only include mining pools for Bitcoin and Ethereum that have an annual run rate of production of over $200 million per pool.

Top mining pools

Our Eighth CryptoSuper 500 list includes 20 mining pools that are each producing over $200 million in annual value, based on the current price of Bitcoin and Ethereum and their three month block production rate. Table 4 shows the pool name and host country and the annual value of Bitcoin and Ethereum production as well as total production for those two coins. The pools may mine other smaller coins as well, that don't make our cut.

We see that for both Bitcoin and Ethereum, one has close to $10 billion in the annual value production for each. For Bitcoin, 97% of that is captured in the top 10 pools and for Ethereum, 85% of that is captured in the top 10 pools.

A detailed breakdown of percentage of blocks won over the previous three months by each pool is shown via pie charts in the Appendix.

Pool	Country	Bitcoin ($M)	Ethereum ($M)	Total $M
Ethermine	Global	0	2,714	2,714
F2pool	Global	1,307	1,346	2,652
Poolin	US	1,102	920	2,022
Foundry USA	US	1,889	0	1,889
Antpool	China	1,386	256	1,642
Binance	US	1,140	168	1,308
Hiveon	Global	0	1,018	1,018
ViaBTC	Germany	997	0	997
Slushpool	Global	589	0	589
Btcdotcom	Global	563	0	563
2Miners	Global	0	531	531
Flexpool	Global	0	514	514
Nanopool	Global	0	259	259
SBI crypto	Japan	247	0	247
MiningPoolHub	Global	0	229	229
Luxor	US	216	0	216
Top 20		9,436	7,955	17,391
All Mining		9,708	9,411	19,119

Table 4. The top 10 Bitcoin mining pools account for 97% of the nearly $10B annual economic value of Bitcoin mining. Included here are the small transaction fees of about 1.3% additional received by miners from the users of the network. Antpool is hosted in China but the mining rigs are presumably outside the country in a variety of locations. The top 10 Ethereum mining pools account for 85% of its $9B+ annual economic value. Included are additional transaction fees of 4.7% of the block reward. Both Bitcoin and Ethereum have almost identical mining revenue of around $9 to $10 billion per year. Four of the listed pools are mining both Bitcoin and Ethereum.

Crypto Winter of 2022 and outlook

Bitcoin reached a peak price of $68,000 around the time of our last list in November 2021; we take no responsibility for the significant decline in price since then to around $30,000 at present. Bitcoin is highly volatile, with a single standard deviation corresponding to about a multiplicative factor of 1.7 in either direction for one of our favorite models, a Lindy persistence model (and early phase of S-curve model), that has the price as a power law vs. blockchain age and has a fair value close to the current price. Because of the rapid long term rise, one really needs to look at the logarithm of the price vs. time (even better: log price vs. log time).

We make three observations for the decline. The first is the unfavorable macroeconomic backdrop. While inflation has been rising worldwide, the growth rate in most countries has been falling as the "post-COVID" bounce in economies wore off, and as COVID didn't end even while becoming more endemic, and as supply chain

disruptions cut activity in some sectors. And for the last three months the world has experienced the brutal invasion of Ukraine and the sanctions on Russia, further slowing economic activity while also contributing to inflation.

So what gives? Inflation is thought to be supportive for Bitcoin right? Well Bitcoin price rises depend on liquidity in the markets at well. And liquidity is being removed by the Federal Reserve's tightening policy and by rising interest rates. The Fed is raising short term rates to fight inflation and long term rates have been driven up by the market response to inflation.

Bitcoin itself pays no yield although it can be lent out at a few percent return. But lately it has been correlated to other "long duration" assets such as tech stocks that also depend on future growth of their economic networks and have low or zero dividends.

Inflation may be peaking now in the US and the environment of slowing growth and slowing inflation is the worst possible combination for Bitcoin price behavior. These factors affect Ethereum as well, which tends to correlation with Bitcoin's price with even higher volatility. In addition to the macro backdrop and tech stock correlation, Bitcoin is in the most unfavorable portion of its four year block reward halving cycle. The price tends to rise nicely one year prior to, and for one year to one and a half years after, the halving. The last halving was in May 2020 and the price peaked just 18 months later before starting to fall. We have now just passed the midpoint of the four year cycle so this next year would be expected to have weaker price action.

Despite the large price drop since our last list, the economic value of Bitcoin mining has risen at a 28% compound annual growth rate, while that of Ethereum has risen at 91% compounded since our first list was published in November of 2018. We find it strange that the Ethereum community wants to undermine that value creation with the Merge.

Ethereum (ETH) has always been a proof of work coin, but is in the midst of a multi-stage upgrade to Ethereum 2.0 with consensus moving to proof of stake (PoS) rather than proof of work (PoW). There is already a new chain called the beacon chain that supports PoS rather than PoW and will be merged with the mainnet. The Merge event will set off a "difficulty bomb" that drives difficulty so high that mining ETH will be uneconomical, and then all block validation will be via staking.

The Merge was originally going to happen over two years ago, and then more recently was supposed to happen last year, and then by this June. Once again it has been delayed, and is now expected in the second half of 2022, perhaps as early as August; a testnet of Merge is planned for June. Ethereum will shift entirely to validation of the blockchain, validators qualify by staking a minimum of 32 ETH. Pools have already been established to allow smaller players to join the staking activity. Over 10 million ETH has been staked, but it is receiving no return until the Merge occurs. People are locked in, with no assurance as to when they will start to receive a return on their stake.

Ethereum miners will need to switch to other PoW coins, such as Ethereum Classic that forked off six years ago during the DAO crisis, when Ethereum was only one year old. We expect that Ethereum will lose value as its hash rate goes to zero. Conversely if hash rate switches to ETC (Classic), that could drive up its value and it will become a more lucrative mining target.

Trends to watch going forward include faster and more energy-efficient mining hardware including some rigs that have liquid cooling, the continued dominance of the North American mining industry now with public companies as major players, the end of Ethereum mining now expected in the second half of 2022, and the trend of increasingly green electricity and even carbon neutrality goals for the industry. What will be the #2 mined PoW coin on our list a year from now is an open question.

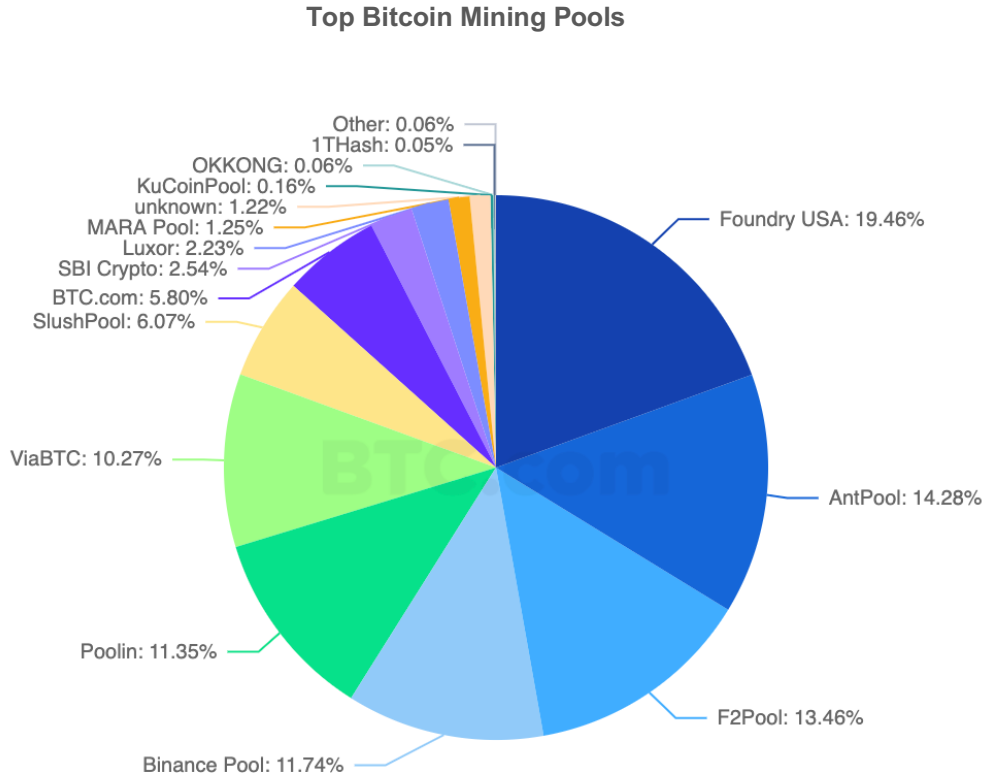Appendix: largest Bitcoin, Ethereum pools

Top Bitcoin Mining Pools

Figure 5. Distribution of block win rate for top Bitcoin mining pools over three months prior to 5/19/22. There were 13,155 blocks added to the blockchain. There are 6 pools with over 10% of the block rate and these account for 80% of the total win rate and hash rate of the network. An additional 6 pools with between 1% and 10% of the win rate account for another 19% of the total network rate. Chart, data from BTC.com

Top Ethereum Mining Pools
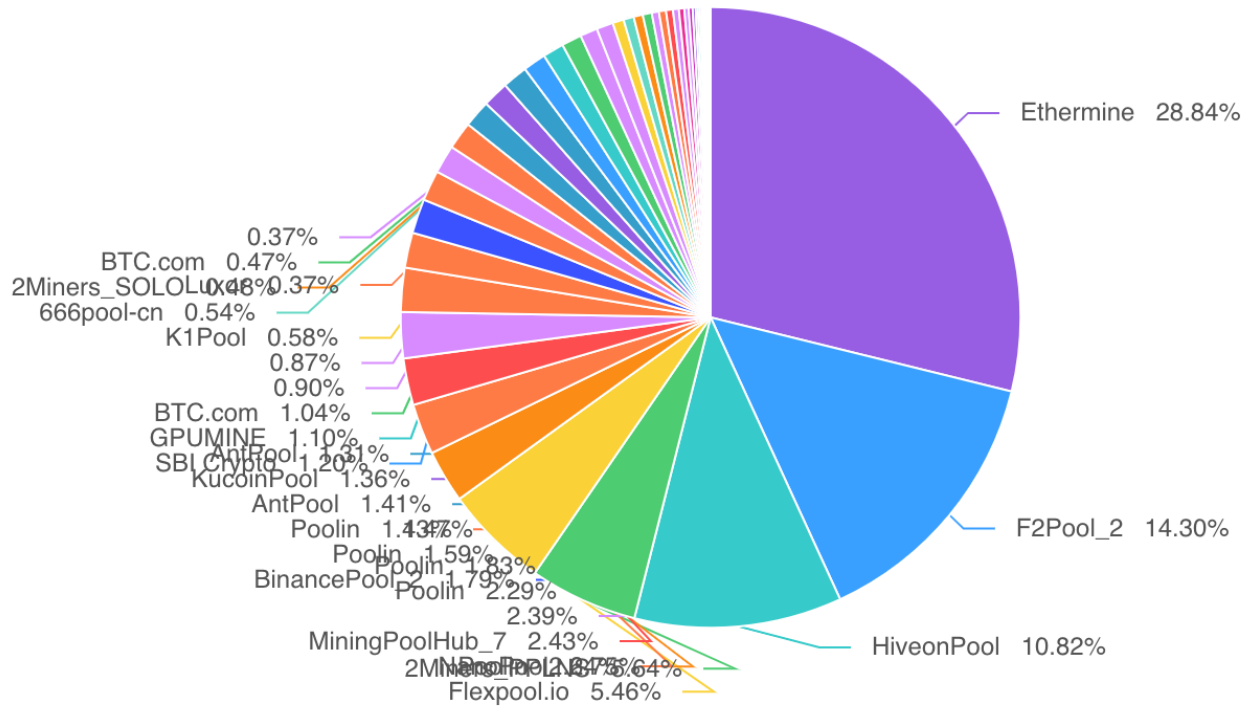
Figure 6. Distribution of Block win rate for Ethereum mining pools over three months prior to 5/19/22. There were 575,033 blocks generated (these are much shorter in duration, around 15 seconds as compared to 10 minutes for Bitcoin). Three pools account for 54% of the block win rate. The Ethereum world has many more small mining pools relative to Bitcoin. Chart, data from BTC.com.

Glossary

Bitcoin – The original cryptocurrency, blockchain and consensus algorithm was outlined in October 2008 in the Satoshi white paper. The Bitcoin blockchain began in January 2009. Bitcoin uses proof of work and has a disinflationary monetary policy based on Halvings.

Blockchain – A chain of transaction blocks with each block linked to the one prior and the one after by a hashing technique. Each block incorporates a hashed representation of the prior block along with its own transaction records. A specific type of database with timestamped and linked record blocks.

Block reward – The reward for being the winning miner of a block. It consists of a subsidy and any transaction fees collected by miners.

Block years – A block year is one quarter of a four-year Halving era of 210,000 blocks; block years have 52,500 blocks. They are close to a calendar year in duration, within a week or two. Just over 14 block years have elapsed since Bitcoin began.

BTC – Abbreviation for the bitcoin cryptocurrency.

Cryptocurrency – A currency stored in a digital ledger that implements cryptographic security to prevent theft or counterfeiting. Cryptocurrencies may be created with different mechanisms and the ledgers are often decentralized to varying degrees.

DeFi –Decentralized Finance. DeFi implements automated financial methods by use of cryptocurrencies and blockchains.

Dogecoin – A cryptocurrency created from Litecoin, itself a clone of Bitcoin, in 2013, as a joke. It has a mildly disinflationary monetary policy.

ETH – the native cryptocurrency of the Ethereum network.

Ethereum – The second largest cryptocurrency by market value was created in 2015 by Vitalik Buterin, Joe Lubin and others. It was designed to implement smart contracts such as those used in DeFi. It presently mines ETH, its native cryptocurrency via proof of work, but will shift to proof of stake as Ethereum 2.0 rolls out.

Halving – The algorithmically enforced decrease in the block reward subsidy for Bitcoin miners. Originally this was 50 BTC for the winning block. Halvings occur roughly four years apart after each 210,000 block interval. The last halving in May 2020 dropped the subsidy from 12.5 to 6.25 bitcoins per block.

Hash rate – The rate at which a computer system (mining rig) can generate hash guesses to solve the cryptographic puzzle. A Terahash/s is a trillion hashes per second, a Petahash/s is a quadrillion, and an Exahash/s is a quintillion (10^{18}) hashes per second.

Lightning – Lightning is a second layer solution for Bitcoin that allows for speedy payments including for very small amounts at very low cost. Lightning channels are opened between parties and this forms a network. Lightning payments are eventually resolved back onto the first level blockchain in batched transactions.

Merge, The – This refers to the merger of a new 'beacon chain' blockchain for Ethereum 2.0 with the original blockchain. Ethereum 2.0 is based on proof of stake

Miners – The computer systems that solve the cryptographic puzzle for a proof of work cryptocurrency. Miners are characterized by hash rate, the amount of solution power. Custom ASICs or GPUs are employed, typically. The first computer that solves the puzzle commits the block of transactions and receives the block reward.

Money – A medium of exchange, store of value, and unit of account. Bitcoin and Ethereum represent monetary technology; they have not achieved full 'moneyness' but are on the path as their utility grows. Ethereum removing proof of work will decrease its 'moneyness' and make it more of a payments solution. Bitcoin is now legal tender in El Salvador and the Central African Republic.

Pools – Pools consist of mining farms plus smaller miners that voluntarily contribute their hash power in order to gain a portion of the mining rewards. Pools are run by companies for profit.

Proof of Stake – In proof of stake, rewards or dividends are paid, in proportional to their share, to existing holders of a coin or token, who have governance and block validator privileges. Conceptually similar to a share of a company.

Proof of Work – In proof of work, a cryptographic lottery must be won by miners competing with their hash power. The winning miner validates the transactions for that particular block and receives a block reward that includes a subsidy of new coins and transaction fees. Monetary policy is set by changing the block subsidy on a schedule, and a difficulty adjustment

keeps block times around the nominal target. Proof of work solves the double spending (of the same coin) and counterfeiting problems.

Sharding – Sharding is a database technique of dividing the database into multiple sections for faster parallel access. Ethereum 2.0 is implementing 64 shards.

Smart contract – An automated contract for exchange of value implementing agreed upon rules between the parties for transfers.

Zipf's law – A relationship that says the rank order and value of some quantity (e.g. size of lakes) are inversely correlated to the first power. Cryptocurrency market cap value for the 19,000 plus coins and tokens falls off even faster than this.

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