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WHITE PAPER · 1

Profit Maximization and Protocol Risk

Do Bitcoin mining pools pose a material risk to protocol centralization and function? An empirical analysis and discussion of how mining operators can protect the network while maximizing revenues.

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Executive Summary

Over time, a unit of hashrate will earn equivalently across any fair Bitcoin mining pool. Between pools, variance management, template management, fees, and vendor-specific risks differ. Presently, the protocol's economic and technical decentralization are not at severe levels of risk. Miners and pools can ensure protocol decentralization and profit maximization, and we urge operators to utilize both business and technical analysis to maintain robust protocol function.

OVERVIEW

- Bitcoin mining is a process of transaction finalization and new bitcoin circulation. Miners participate in collaborative work, or pooling, to reduce variance in their revenue. Pooling introduces new protocol centralization risks.
- Block discovery is best described as a Poisson process. A node's share of the network helps estimate their expected blocks with wide variance based on size and time. For example, a pool that is 1% of network hashrate has a daily block count that typically deviates ~83% from expectations, and a monthly count that varies by ~15% from expected value.
- At a network level, pools operate like large nodes. Pool payout methods move variance between a miner and the pool, while expected value remains unchanged. Full-pay-per-share (FPPS) pools act as an insurance product and pay an averaged reward while smoothing block luck and fees. Pay-per-last N shares (PPLNS) pools pass this variance to the miner while improving individual variance through collaboration.
- All fair pools pay statistically similarly. In Elektron's analysis of 2025 pool data, two large FPPS pools paid within 0.2 sats/TH/day in every month, while a smaller, direct-payout pool ranged from 12% below to 25% above the FPPS pair and finished the year 4.7% above. This variance is within statistical expectations for the size of the pool and normalizes over time.[1]
- Pool fees impact expected miner revenue meaningfully. Published list fees across pools run from 0% to 4% by payout method, with FPPS the most expensive because of its role as revenue insurance. For smaller operators, PPLNS is meaningfully less expensive.
- Elektron analysis of publicly available market data indicate industry centralization is currently at low to moderate concentration both technically and economically. Revenue-maximizing miners have tools and strategies already available to reduce pool centralization, censorship, and jurisdictional risks such as multi-pool use, miner template ownership, and even self-mining.

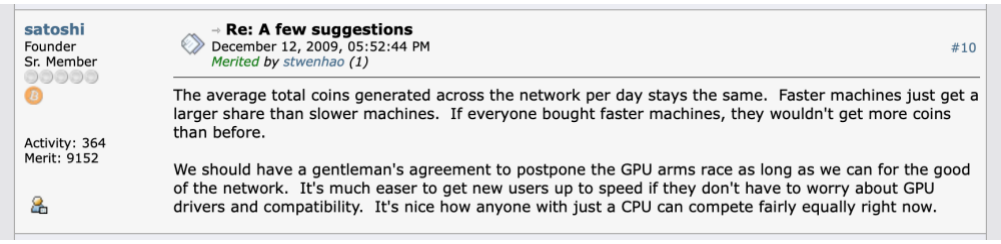
1 Introduction

1.1 Bitcoin Mining, Pooling, and Protecting Bitcoin

Bitcoin mining is the proof-of-work-based process by which transactions are recorded and settled, and new bitcoin are issued. Early bitcoin mining was highly decentralized across readily available consumer-grade hardware and operated with an ethos of one-CPU-one-vote.[2]

From the earliest days of bitcoin mining, the miner profit incentive drove rapid advancements in both the technology of the mining stack, and the business of miner operation. The two most impactful innovations within these respective domains are the bitcoin mining ASIC chip, and pooled mining. These advancements have radically altered the landscape, but not the ethos, of bitcoin mining.

This paper focuses on the latter innovation: pooled mining.



Note: In 2009, as GPU mining gained interest, Satoshi proposed a 'gentleman's agreement' to delay rapid technological advancement.[3]

Modern pooled mining is often identified as a risk to the function of the Bitcoin network. Common arguments state that operators of pooled mining services threaten protocol decentralization and censorship resistance by providing opportunities for technical attacks that corrupt transaction settlement, rendering bitcoin unusable.

Bitcoin mining was designed to be competitive. Revenues from direct mining are measured in hashprice, the commoditized reference value of a unit of hashrate per day. Measured in US dollars per PH/s per day, hashprice peaked at about $64 on 11 July 2025 and set a year low of about $35 on 22 November 2025.[4,5] This revenue compression is primarily attributable to an increase in miner competition, as well as a drop in the price of bitcoin in 2025.

Mining operator profitability is achieved by managing power costs, fleet efficiency, and uptime; however, pool selection is also a meaningful contributor to miner financial health, and relevant to network decentralization and censorship resistance.

We discuss the statistics of bitcoin mining, the origins, functions, and differentiators in pooled mining operators, and assess relevant threats to network function. We use a combination of fundamental analysis and Elektron's analysis of public network and internal data and argue that potential technical and economic corruption due to pooled mining is moderately low risk and is readily mitigated by miner profit-seeking behavior, as expressed in the Bitcoin White Paper.

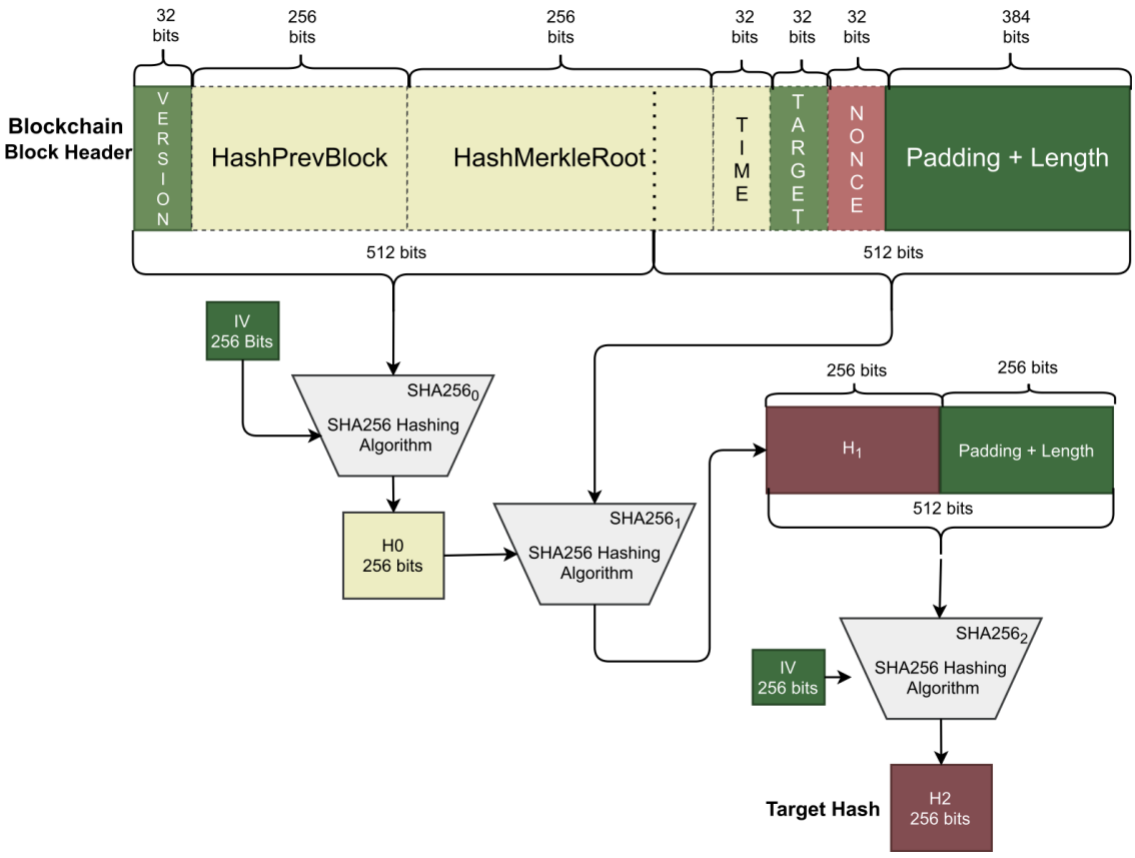
2 Mining is a Randomness Game

2.1 The Role of Mining and the Origins of Pooled Mining

Bitcoin mining is how new bitcoin enter circulation and transactions are recorded and finalized in blocks. Bitcoin miners combine data, including incoming transactions, with additional randomness in a block header. The block header is then hashed using the SHA-256d algorithm. The resulting output hash is compared to the current network difficulty target to determine if the result is valid and can be broadcast to network nodes, thus extending the tip of the blockchain.

Miners receive, check, and build on new blocks, continuing the hashing process. This constitutes the compute 'work' done in calculating a valid proof-of-work. The miner incentive to perform this work is the reward of the coinbase, new issuance of bitcoin and the sum of the block's transaction fees.

EXHIBIT 1 The Data a Miner 'Works' On



Note: The above illustrates a rough technical process where Bitcoin block header data is compiled and hashed using SHA-256d.[6]

Historically, all individual bitcoin nodes could mine bitcoin. Nodes assembled valid blocks from network transactions and hashed them on their CPUs. However, as the network grew, operators with smaller, less powerful computers found themselves waiting longer and for less predictable durations before finding a valid block. This network growth posed the new issue of revenue stability for operators seeking profit in bitcoin, driving the emergence of pooled mining.

The first pooled mining proof of concept was announced in October 2010 by Bitcoin Talk Forum user *puddinpop*. A month later, in November 2010, Bitcoin Talk Forum user *slush* launched Slush Pool, the first widely available pooled mining service. This service was started with the stated purpose of variance reduction, or as *slush* wrote, "Join poor CPU miners to one cluster and increase their chance to find a block!" Notably, *slush* also identified the primary trade-off of pooled mining, "you need to trust in [sic] central authority."[7] The resulting centralization risk and debate around trusted authorities in bitcoin mining has persisted to this day. To understand the nature of this risk, we detail the statistics behind this variance in bitcoin mining block discovery and how pools redistribute variance without changing expected value.

2.2 Mining Pools as Network Nodes

Pooled mining is the primary method of block discovery with mining pools functioning on the network as large, individual nodes. In the same way early Bitcoin users ran Bitcoin software locally, received transactions to their mempool, hashed them using personal compute, and broadcast found blocks to the network, many mining pools (exceptions discussed later) now aggregate transactions, compose and distribute block templates for their users to hash, and broadcast found blocks to the network.

However, due to the random nature of block discovery, a pool cannot reliably observe its miners' work from found blocks alone. How do pools pay their miners if they cannot know how much work each contributes? This is the primary innovation *slush* implemented with the launch of Slush Pool.

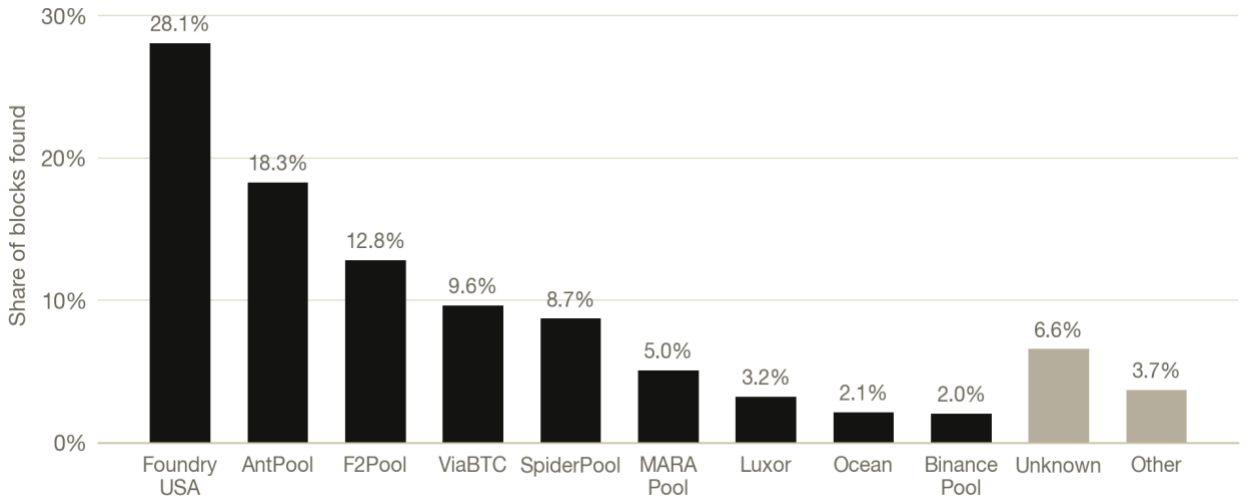
Pools utilize share accounting systems to solve this problem. The pool asks participating miners to submit proofs-of-work that fulfill a lower difficulty than the current network difficulty target. These easier proofs-of-work are submitted to the pool when found, allowing pools to track contributions over time and accurately allocate miner payments based on work done under the pool's particular payout scheme.

This expansion of pooled mining and the formalization of the industry led to a commoditized reference value for hashrate known as hashprice. Hashprice is a calculation of the expected value of a unit of hashrate, originally created by Luxor, and is a function of bitcoin price, network difficulty, transaction

fees, and block subsidy. In practice, it is not deterministic, but rather a convenient derivative reference value for a unit of hashrate.

The hashrate of any one pool is the sum of what contributing miners allocate to it, only visible publicly by found blocks, and often labeled by the pool upon broadcast to the network of nodes. While these block discoveries are visible to the network, independent observers of the blockchain can only estimate the absolute hashrate of a pool. Estimates over shorter time durations are statistically noisier: a one-day estimate is largely statistical noise, with a rolling one- or two-week window typically used as the compromise between responsiveness and accuracy.[8,9,10]

EXHIBIT 2 The Distribution of Bitcoin Pools Over a Year



Note: Share of blocks found by pool, 26 October 2025 to 26 October 2026, from Elektronics.dev.[11] Binance announced the closure of its pool in October 2026.[12]

> *"Hashprice is a calculation of the expected value of a unit of hashrate, and is a function of bitcoin price, network difficulty, transaction fees, and block subsidy. In practice, it is not deterministic, but rather a convenient derivative reference value for a unit of hashrate."*

2.3 Modeling Block Discovery

Each hash of a block header a bitcoin miner computes is an independent attempt at producing an output that fulfills the current difficulty target. Each attempt is distinct, and the chance of the current hash succeeding or failing to achieve the difficulty target does not depend on any prior hash. This is the

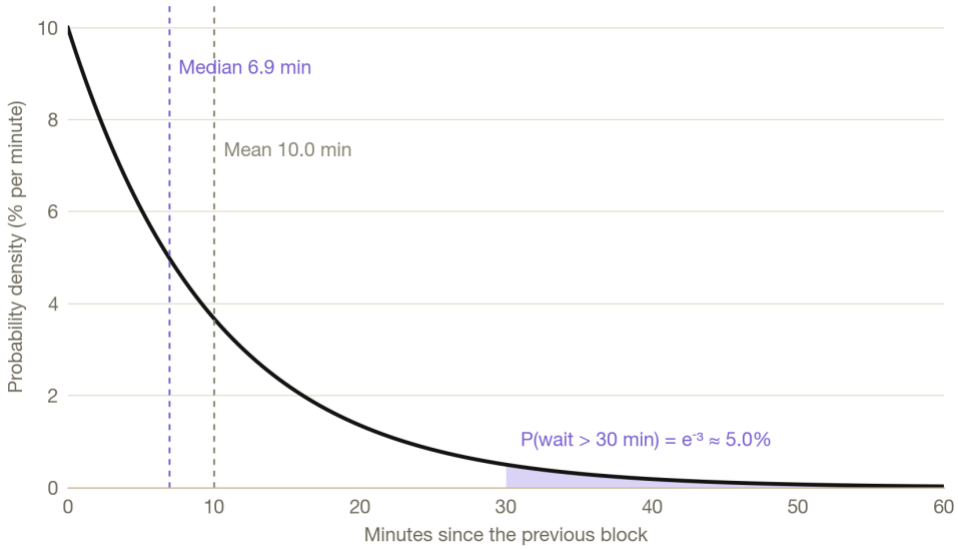
defining property of proof-of-work. Unlike cumulative efforts such as the depression of a pump to fill a tire, or the number of steps it takes to walk a mile, bitcoin mining work is non-cumulative and entirely memoryless. In this sense, it is more like flipping a coin. Each coin flip is random and independent of all other coin flips.

Statistically, bitcoin mining is best understood and modeled as a Poisson process, where block discovery occurs randomly, independent of any other miner operating, regulated by the difficulty adjustment occurring every 2,016 blocks, which adjusts up or down to target a block discovery time of 10 minutes.

Modeling the waiting time between blocks using Poisson modeling shows an exponential distribution with a mean set by the difficulty target adjusting up or down towards ten-minute block arrivals.[13] The distribution of block arrivals is skewed. The median wait is 6.9 minutes, one in twenty waits exceeds thirty minutes, and long-run observations of the chain match the theoretical curve closely. The skew is a property of the distribution itself. Separately, a growing network causing rising network hashrate between difficulty adjustments has kept the observed average slightly below ten minutes.[14]

> *"Unlike cumulative efforts such as the depression of a pump to fill a tire, or the number of steps it takes to walk a mile, bitcoin mining work is non-cumulative and entirely memoryless."*

EXHIBIT 3 An Exponentially Decaying Wait Time



Note: Density percent per minute. The shaded area is the probability that a wait exceeds 30 minutes, e to the power of minus three, or 5.0%. Half of all blocks arrive within 7 minutes, and a twentieth take more than half an hour.

2.4 Size Matters: Modeling Miner Variance

Bitcoin miners, working independently or through pool providers, are all subject to the randomness of block discovery. Variance in block discovery depends on the total accumulated hashrate of the miner, is most significant in the short term, and will converge over time towards expected value in sats/TH/day. The standard deviation of a Poisson count is the square root of its mean, so the relative spread of a pool's block count is 1 divided by the square root of 144 × s per day.[13]

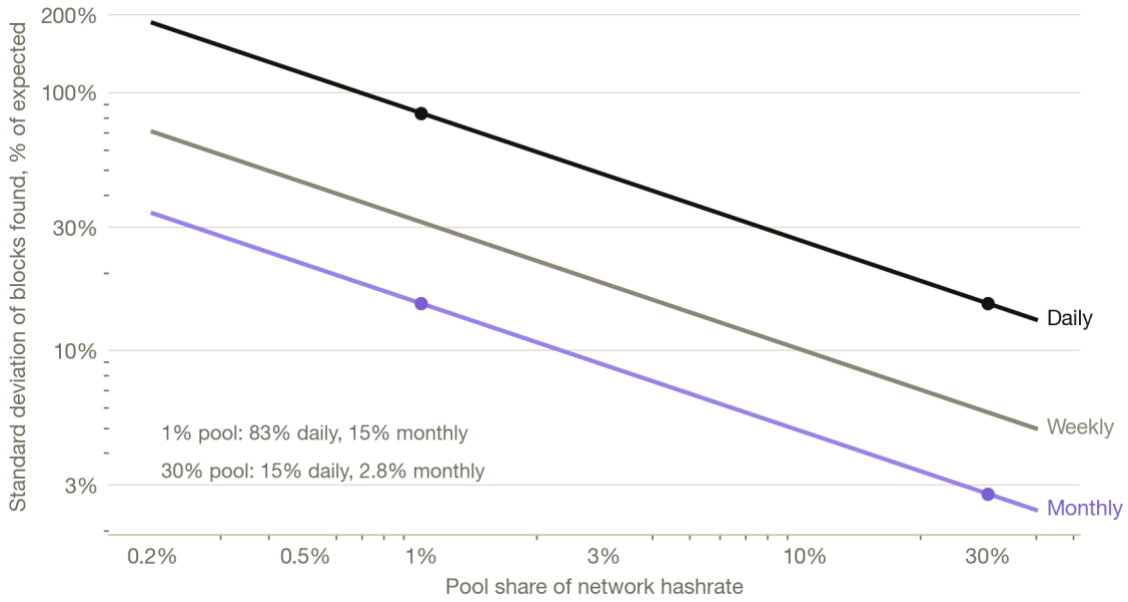
$$1 \div \sqrt{(144 \cdot s)}$$

s = share of network hashrate

For a pool at 3% of the total network, variance is 48% a day, 18% a week and 8.8% a month. Nothing a pool does will change this figure except growing or shrinking.

The protocol targets 144 blocks a day, meaning a pool above 15% of total network hashrate expects more than 21 blocks a day. The arithmetic of the Poisson process for this pool suggests daily variance under 22% and monthly variance under 4%. By comparison, a pool with 3% of total network hashrate expects approximately four blocks per day with 48% daily variance and 8.8% monthly variance, respectively. At the smallest levels of operation, a pool with 1% of total network hashrate will expect 1.4 blocks a day. Approximately one day out of every four it finds no blocks. For a pool at 0.1%, two weeks without a block find is within expectations.

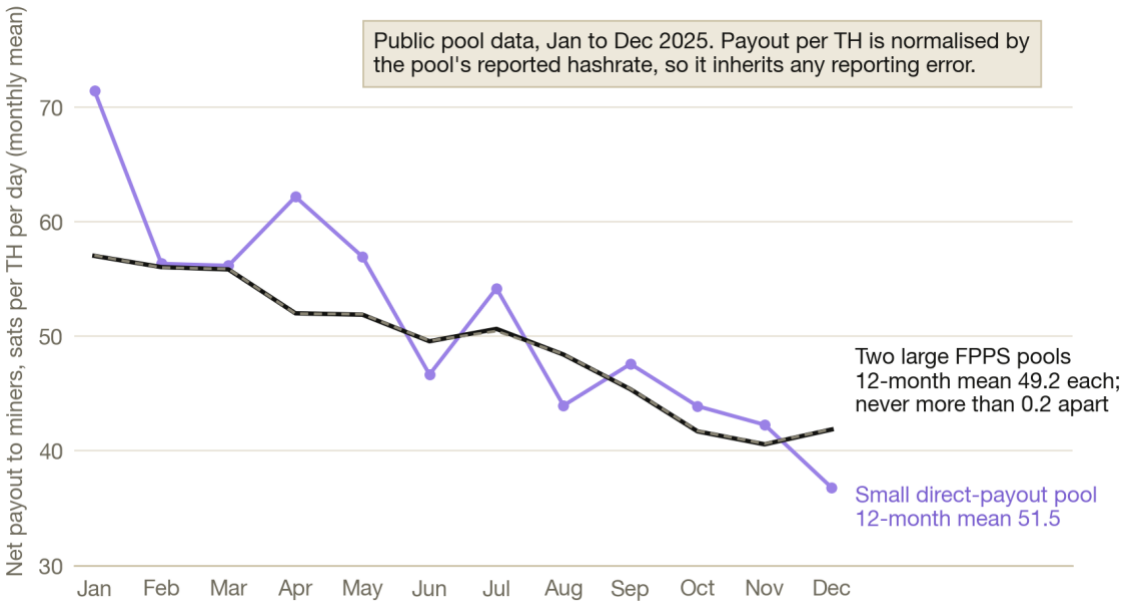
EXHIBIT 4 Pool Size and Impact on Daily, Weekly, and Monthly Variance



Over a long duration, every pool's block count approaches its expected value in sats/TH/day. However, as miners are free to enter and leave the network, this expected value can only be estimated. In Elektron's analysis of public 2025 data as shown in Exhibit 5, one mid-tier pool finished the year with 3,469 blocks against 3,429 expected from its reported hashrate, 1.2% above expectations, after months in which its daily count varied between a third of and twice expected value.[1,15] Two large FPPS pools, each above 10% of network hashrate, paid monthly net amounts per TH that tracked almost exactly, never more than 0.2 sats/TH/day (about 0.4%) apart. Both large pools averaged 49.2 sats/TH/day for the year. A small, direct-payout pool, with less than 3% of network hashrate, paid 25% more than the FPPS pair in its luckiest month and 12% less in its unluckiest, and averaged 51.5 sats/TH/day, 4.7% above comparative FPPS pools for the year.[1] Statistically this variation between large and small pools, while tempting to miners for profit maximization, will converge in sats/TH/day. A year is not long enough to assess a small pool against expected value over time.

Our analysis suggests that different pool payout methodologies will smooth short-term variance, while over longer periods all pools regardless of size or payout method will converge towards the expected value of their total hashrate.

EXHIBIT 5 Pool Payout Per TH over Time by Pool Size and Type



Note: The January to December 2025 period included increasing mining competition and decreasing hashprice. This trend of decreasing hashprice dominated the period measured.

3 The Roles of Pool Payout Methods

In a fair pool, a miner will receive, on average, the hashprice of each share less operator fee, regardless of payout method. Pool payout methods differ primarily in which party incurs the statistical variance of block discovery, how long a share takes to mature into payment, and whether the pool custodies funds.[13]

3.1 Pool Payout Methods

Payout methods fall into three main groups. **Pay-per-share** methods (PPS, PPS+, FPPS) pay each share at its expected value as it is submitted, with the pool incurring the variance. **Proportional** methods (proportional, score-based, PPLNS) divide each block the pool finds among recent shares, so miners incur the variance. **Direct** methods (non-custodial proportional schemes and solo services) do the same but pay from the block's own coinbase transaction, so the miner incurs the variance and the pool never holds miners' funds.[13,16,17]

METHOD	WHAT A SHARE EARNS	BLOCK VARIANCE	FEE VARIANCE	POOL HOLDS FUNDS	FEES
PPS	Expected subsidy per share, paid on submission	Pool	None	Yes	n/a (rarely offered)
FPPS	Expected subsidy plus network-average fee per share, rolling	Pool	Pool	Yes	2% to 4%
PPS+	Expected subsidy per share; actual fees from blocks the pool finds	Pool (subsidy), miner (fees)	Miner	Yes	2% to 4%
PPLNS	Share of each found block, over the last N shares	Miner	Miner	Yes, until payout	0% to 2%
Proportional, score	Share of each found block within the round, with time decay	Miner	Miner	Yes, until payout	n/a (rarely offered)
Direct, non-custodial	Share of contribution in coinbase payout	Miner	Miner	No	1% to 2%
Solo	The whole block, or nothing	Miner	Miner	No	0% to 2%

3.2 FPPS: The Pool as an Insurance Product

Under an FPPS payout scheme the pool computes a rate from the whole network's blocks: the sum of transaction fees over a period divided by the sum of subsidies, added to one. This produces a multiplier applied to the pay-per-share base for every accepted share.[18,19] Transaction fee rates are calculated using

different methods per pool and did not generate significant differences in payouts when comparing large FPPS pool operators.

The FPPS pool pays out smoothed daily revenues while receiving inconsistent revenues from block discovery. To provide this service, a pay-per-share operator needs a bitcoin reserve to survive runs of bad luck. To keep the probability of ruin below a safe level, an FPPS pool must calculate and hold substantial treasury reserves.[13] This insurance function is why FPPS fees are the highest among service providers.[13,20]

3.3 Proportional, PPLNS and Direct Payout: The Pool as Collaboration

Proportional schemes divide a found block among the shares submitted since the last round. In early implementations of this mining scheme, this was “hoppable”: a miner who joined early in a round and left once the round achieved 43.5% of difficulty could earn up to 128% of a fair payout at the expense of the pool’s other miners.[13,21] For this reason, the early proportional pool methodology was quickly deprecated in favor of the PPLNS accounting scheme.

PPLNS removes the concept of rounds and pays each found block across the last N shares regardless of when blocks are found, with N set as a multiple of difficulty. This scheme resists hopping and is now the standard proportional method, because it limits operator risk and the need to hold excess reserves. Increasing N will lower variance and lengthen the time a share takes to mature.[13] One non-custodial scheme documents an eight-difficulty window, under which a share has a 99.97% chance of being paid at least once, and pays miners from the block’s own coinbase transaction so the pool never directly holds funds; a miner only ever earns when the pool finds blocks.[16,22]

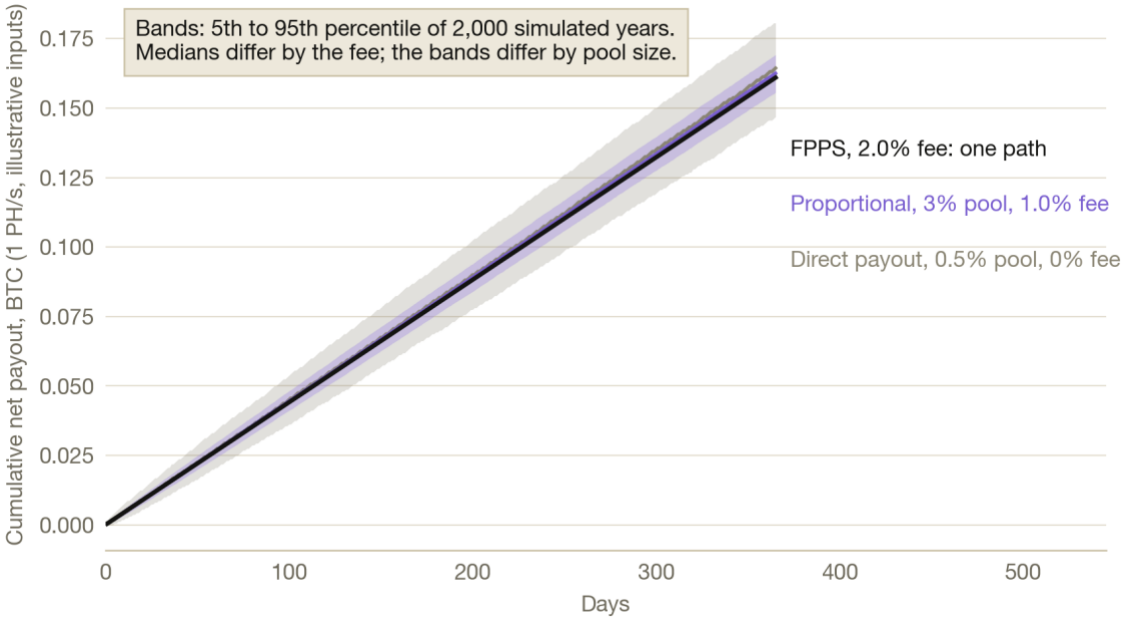
Under both FPPS and PPLNS schemes expected value remains unchanged, but the consistency of cash flow and who custodies funds changes.

4 Fees Make the Difference

4.1 Why Fees Differ

Published list fees cluster by payout method. FPPS pools list 2% to 4%; PPLNS options range from 0% to 2%; non-custodial direct schemes 1% to 2%.[17,22,23,24,25,26] As operators scale, however, they typically pay enterprise rates. Due to reserve requirements by FPPS pools, their fees are consistently higher than other payout methods. Zero-fee offers exist, with conditions. One firmware vendor offers 0% pool fees to miners running its firmware, which itself takes 2% to 2.5% of hashrate as a development fee.[27,28] True zero-fee mining exists for self-miners, typically only done at large scale, where operators incur all variance and generate no benefit from collaborative block discovery.

EXHIBIT 6 Cumulative Fee Variance Over Time

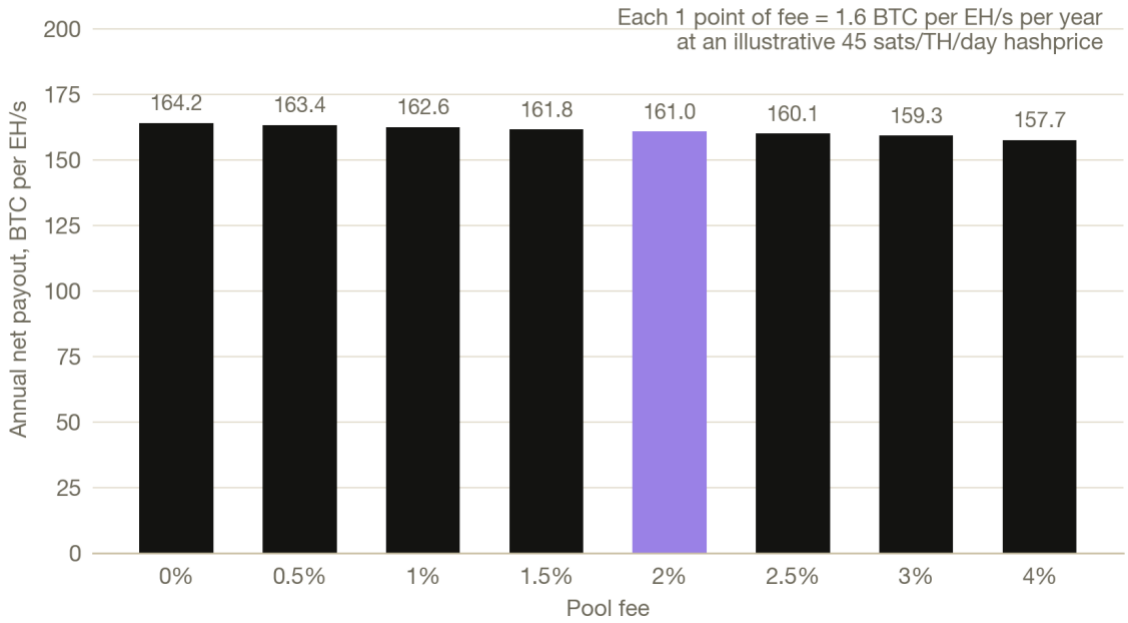


Note: Simulated with illustrative inputs: 1 PH/s, flat 45 sats/TH/day hashprice, 365 days.

4.2 What Fees Cost

Because expected gross payout is set by the network hashprice, or expected value over time, fees are a simple deduction from expected revenues. At an illustrative hashprice of 45 sats/TH/day, one EH/s earns an expected 164 BTC a year before fees, with each percentage point in fees costing 1.6 BTC to the miner. The gap between a 4% list rate and a 1% negotiated rate is therefore about 4.9 BTC per EH/s per year, lucky or not. For smaller operators paying higher pool fees, this cost can become significant when comparing FPPS to PPLNS pools. Exhibit 7 illustrates the cost of fee percentage points.

EXHIBIT 7 Example Fee Cost to a Large Miner



Note: Illustrative inputs: 1 EH/s for one year at 45 sats/TH/day.

5 Protocol Decentralization Risks and Profit Maximization

5.1 Centralization Risks and Mitigation

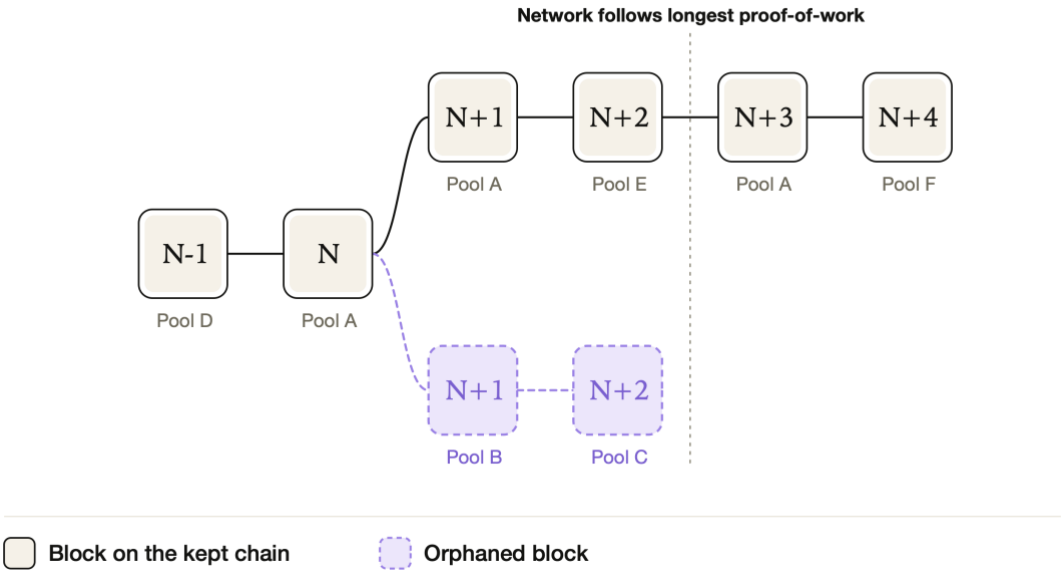
The primary miner incentive is profit maximization. Rational miners and pool operators are incentivized to construct the most profitable blocks to add to the blockchain. In practice, we have seen operators accrue substantial network hashrate but never engage in destructive network behavior. Satoshi addresses this phenomenon in the Bitcoin White Paper directly, noting a large miner "ought to find it more profitable to play by the rules… than to undermine the system and the validity of his own wealth."

The risks of network centralization due to hashrate growth accruing to these large operators fall into three broad and connected categories: malicious chain reorganizations, user censorship, and pool jurisdictional risks.

In a malicious chain reorganization, or 51% attack, a miner with a majority of hashrate pays someone, then privately mines a longer competing chain that leaves the payment out. When that chain is published, the network adopts it and the payment disappears. Importantly, this is a statistical attack, not absolute in effect, and waiting for multiple block confirmations mitigates it. Additionally, it is an attack that occurs at an individual level and threatens few attacker counterparties.

One pool, GHash.io, briefly exceeded half of network hashrate in June 2014,[29] but there was no recorded 51% attack on Bitcoin at this time. Exhibit 8 illustrates a chain split and orphaned blocks as network nodes follow the longest proof of work.

EXHIBIT 8 Orphaned Blocks and 51% Attacks



Note: Chain splits resulting in orphaned blocks are common and typically not the result of nefarious actors. Orphaned blocks result in lost revenues for the pool or miner that finds the block.

Transaction censorship is a more immediate consequence of network centralization, with precedent: in May 2021, MARA Holdings (then Marathon Digital) briefly mined only OFAC-compliant blocks.[30] This initiative lasted less than two months before being halted due to lost mining revenue.

Large mining pools pose a censorship risk to bitcoin should they operate within jurisdictions that regulate adherence to certain transaction settlement rules. In this case, jurisdictional oversight could threaten full permissionless function of the Bitcoin blockchain, though we are not aware of any current or pending rule that seeks pool oversight.

Pool operators are aware of the consequences of these risks and have implemented strategies that offer template decentralization at the miner level. Technical solutions such as Stratum V2 and the DATUM protocol allow individual miners to construct block templates locally and maintain centralized pool share accounting, removing centralization risks from pool operators.

In addition to technical analysis of pool centralization, economic measures, such as the Herfindahl-Hirschman Index (HHI), can be used to quantify industry centralization at the pool level. The HHI is calculated by squaring the market share of each firm in the industry and summing the result. This generates an output commonly represented on a 0 to 10,000 scale. The current US Merger Guidelines treat a market with an HHI above 1,800 as highly concentrated.[31]

When analyzing pool block finds over the past year (26 October 2025 to 26 October 2026), we calculate an HHI of ~1,520, below that threshold.[32] Because this analysis is conducted at the level of reporting

pools and not individual operators utilizing multiple pools (a decentralizing force), or pools that share templates (a centralizing force), an empirical representation of 'true' decentralization is not possible. Best estimates of HHI based on these centralizing and decentralizing factors range from about 1,100, when known large operators are treated as independent of their pools, to about 2,100, where white-labeled proxy pools are grouped with the pool whose templates they relay. Importantly, HHI is an economic metric that describes the risk of monopoly and oligopoly, and not technical threat; however, it is a valuable tool in describing network centralization risk.

5.2 Strategic Pool Use

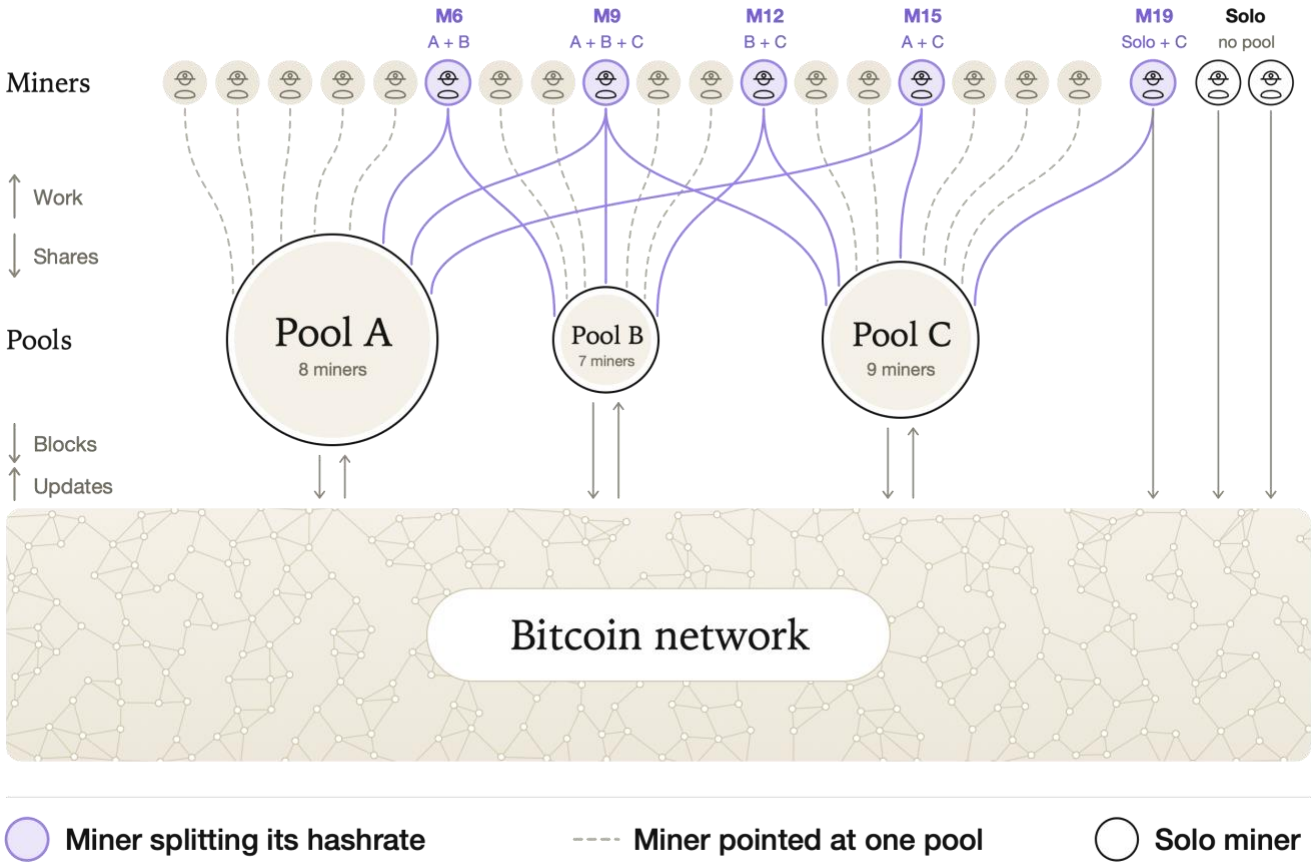
As fair pools will pay out similar revenues approaching expected value over time, four primary variables drive maximal miner revenues: fee tier relative to size, pool rules regarding payout of transaction fees, settlement cadence and threshold, and net payout per TH over time. As discussed, for smaller operators, pool fees will make up a more significant percentage of total earnings. For larger operations with negotiating power, fees can be negotiated below published rates.

Revenues from transaction fee handling are currently marginal at less than 1% of total reward[33,34] but are expected to rise as block subsidies decline in coming halvings. Settlement cadence and thresholds impact the speed at which miners realize revenue and are most impactful to smaller operators who may have to wait multiple days or weeks to receive payouts and are concerned with third-party custody of funds.

Given the similarities of pools, miners choose a pool vendor based on their business structure and needs. Financing costs and payment terms impact whether a bitcoin miner chooses the security of FPPS payouts or can manage the variance of PPLNS schemes themselves. Miners can also choose to allocate portions of their total hashrate to different pool vendors or even self-mine, as illustrated in Exhibit 9. This form of decentralization is active only at the individual miner level and is never visible publicly.

Pools should be treated like any other key vendor by reviewing contract terms and measuring output against expected value. Financially sensitive operators must determine whether the cost of insurance via FPPS payouts is worth the variance reduction. Importantly, certain operators, subject to public market regulation and auditing, must also consider institutional security and accounting practices when choosing a pool.

EXHIBIT 9 Allocating Miner Work Across Pools for Profit and Decentralization



Note: The above visual represents how miners might strategically allocate hashrate across multiple pools of various payout methods to both maximize revenue and improve network decentralization. Individual miners splitting their hashrate across multiple pools is not visible on-chain.

5.3 Template Control

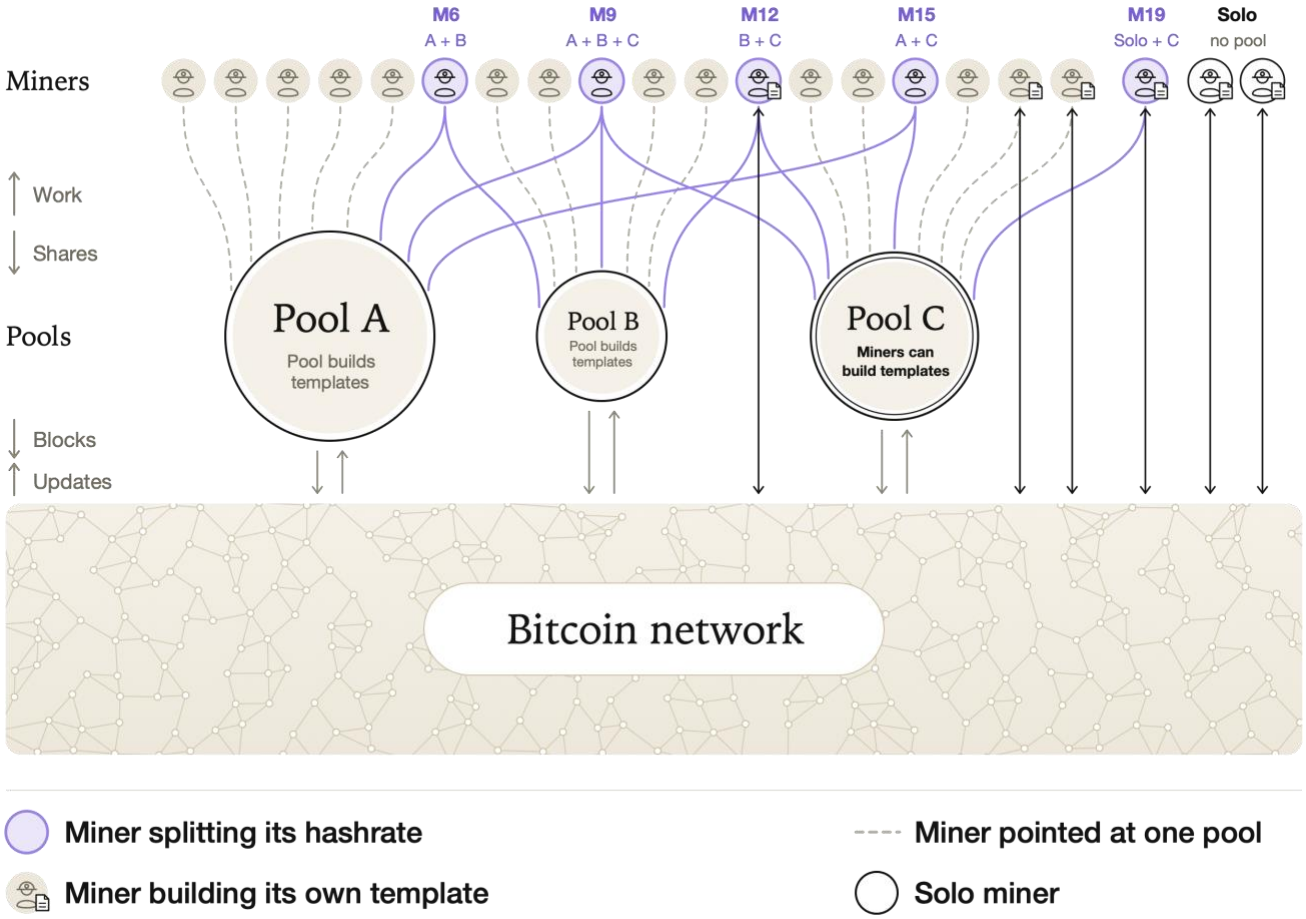
To further steward decentralization on the Bitcoin blockchain, bitcoin miners may also choose to mine with pools that allow for individual template construction. Decentralized Alternative Templates for Universal Mining or DATUM is a key protocol that enables this; Stratum V2's job declaration is another. Using DATUM, miners run a DATUM gateway in conjunction with a node and choose which transactions go into a block. The pool maintains share accounting of contributing miners and serves each DATUM gateway with coinbase payouts based on those contributions.

DATUM allows for both FPPS and PPLNS payment schemes. The pool sets the coinbase outputs, so it can pay contributing miners directly from the block under PPLNS, or in a different arrangement, pay into a pool wallet that funds FPPS payouts. The miner's node chooses the transactions; the pool still decides who gets paid. The added template optionality and payout flexibility under DATUM is a win-win for protocol decentralization and payout method flexibility. For large operators the gateway also

works like a local stratum proxy: new work comes from the site's own node, so miners switch jobs faster and found blocks are broadcast from both the site and the pool.

A miner running a full node and DATUM gateway improves network node count and template decentralization directly but incurs additional technical complexity. This technical complexity, while easy for large operators to surmount, may prove prohibitive for small operators to implement. However, for miners concerned with protocol robustness, these complexities are surmountable and worthwhile.

EXHIBIT 10 Miner Template Control and Pool Splitting



Note: The above visual represents how miners might combine distributed hashrate and/or template control to improve protocol decentralization while maximizing revenues.

6 Conclusions

6.1 Master Mining and Bitcoin Thrives

Based on our analysis of both internal and publicly available information we argue that centralization risks are minimal and readily resolved by both miners and pools. Regardless of the pool an operator chooses, expected value of hashrate remains similar over time. Short-term variance based on pool size is entirely luck-driven. Switching pools to increase earnings is not expected to increase actual earnings over time.

Pool payout methods are designed for different purposes, and their fee structures reflect those purposes. An FPPS payout scheme behaves like an insurance product by smoothing out revenue realization and as a result commands a fee rate that accommodates that service. In contrast, PPLNS and direct payout schemes provide the benefits of collaborative block discovery but shift variances in payment from the pool to the miner. Miners are best served by choosing the pool product that fulfills their individual financing, cash flow, custody, and institutional counterparty needs.

Fee differences in pool operators can amount to ~1.6 BTC per EH/s per year for every additional percentage point and accrue in greater proportion to smaller operators. These small percentages add up over time, and pool accounting around currently marginal revenues (such as fee revenue accounting) becomes more significant as halving cycles progress.

When assessed both technologically and economically, the Bitcoin network has a healthy level of decentralization. Publicly visible centralization in pool operators does not pose a severe risk when measured in the economic indicator HHI. Settlement attacks have faded in relevance, and censorship risks prove uneconomical over time, as seen in historical precedent with the creation of OFAC-compliant blocks.

The profit incentive of Bitcoin mining creates a shared incentive between both mine operators and pool operators. Miners are incentivized to protect the profitability of their work by splitting hashrate between pools to meet their goals. Template construction, the primary centralization and censorship risk for Bitcoin, is currently mitigated by both work splitting between pools, and local template construction using protocols such as Stratum V2 and DATUM.

Overall, a suite of powerful tools already exists and are being utilized to positive effect to maintain robust decentralization of the Bitcoin network.

Meet Elektron

Understanding Bitcoin changes how decisions are made.

Supply does not respond to demand, and outcomes are determined by cost, competition, and network difficulty rather than narrative or timing. This drives our unique approach: one grounded in probabilities, cost structures, and long-term economics rather than speculation.

Elektron Energy approaches mining as a capital and energy intensive infrastructure business, with commodity-like economics. Decisions are reduced to first principles: capital in, energy in, Bitcoin out. Each input is optimized as part of a single system. Energy is not simply consumed. It is transformed.

Our Bitcoin mining operations can act as a flexible load, converting surplus and underutilized power into productive output while maintaining the ability to adjust to changing conditions.

Important Notice

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Forward-Looking Statements

Forward-looking statements included in this document are based on Elektron Energy's current expectations and assumptions and are subject to known and unknown risks, uncertainties and other factors, many of which are beyond Elektron Energy's control, that could cause actual results, performance or achievements to differ materially from those expressed or implied. Elektron Energy undertakes no obligation to publicly update or revise any forward-looking statement, whether as a result of new information, future events or otherwise.

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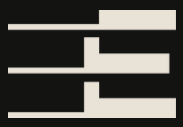
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