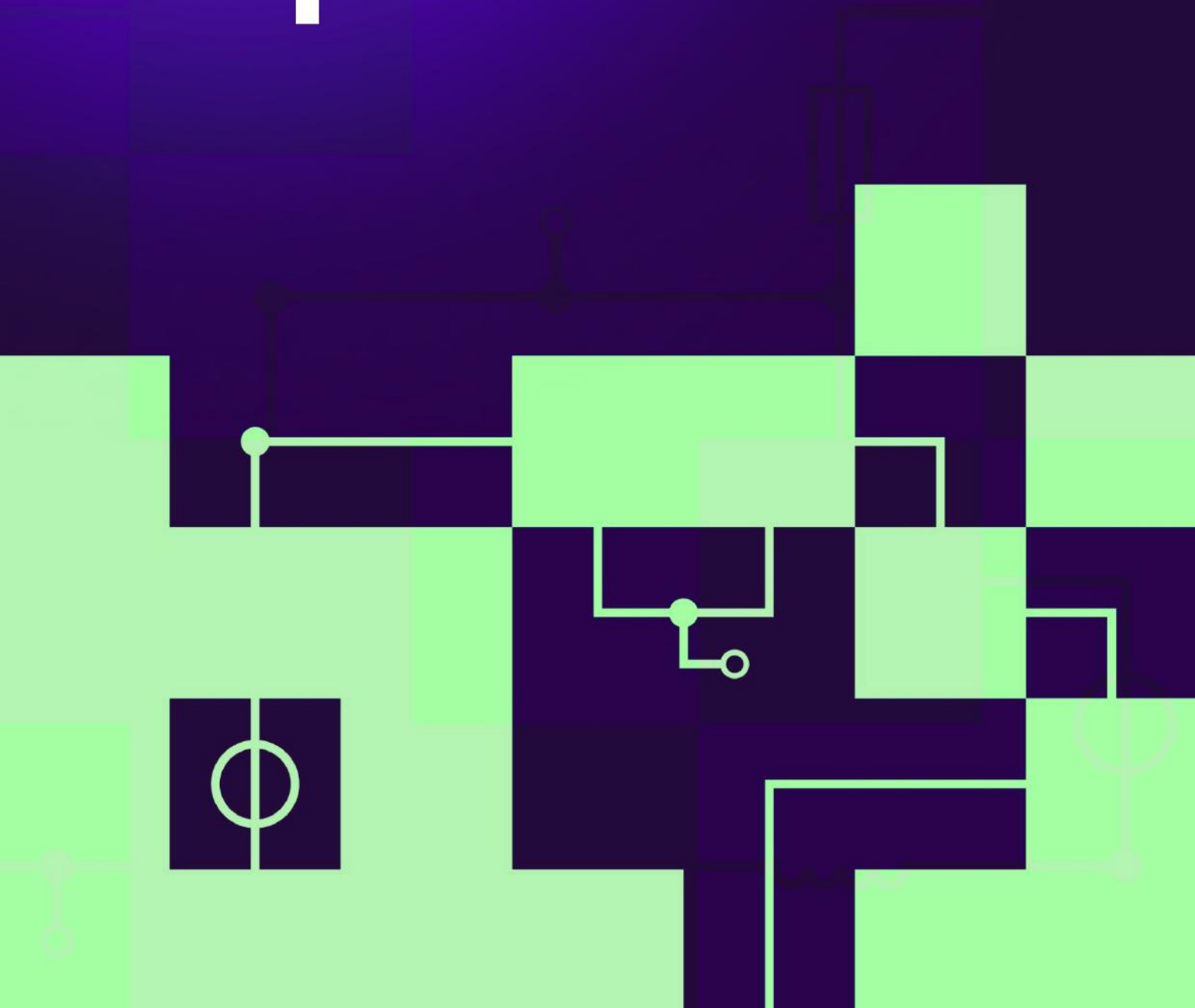
DePIN Token Economics Report



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Disclaimer:

There is no standard format for describing token economics and projects use a variety of channels: blogs, threads, and white papers to explain their tokens in a range of detail. And as the space is constantly evolving, we have seen updates to a number of token models which adds additional complexity to authoring a comprehensive report. We view this paper as an introductory overview to the topic, and we welcome feedback, corrections and addition so that it can be as useful to the DePIN community and the broader crypto and investor communities as possible.

Key Points

1. With over 32 million tokens in circulation and meme coins pumping and crashing in hours, DePIN offers a new, sustainable model for value creation

2. DePIN projects that generate substantial revenue from traditional customers will alter the crypto narrative

3. Revenue traction will attract new investors and a new level of scrutiny on token economics

4. The buy-and-burn mechanism, which uses revenue to buy/burn the project token, creates powerful deflationary dynamics which are already beginning to decouple successful DePINs from the broader crypto market

5. DePIN has no regulation, no public filings and no financial audits, and we will see revenue overstatements

6. Done transparently, buy-and-burn provides public, on chain revenue verification which is far faster and can be more trusted that traditional audits

7. Fiat payments drive adoption, fiat-linked rewards address crypto reward volatility

8. Staking models for cloud DePINs drive trust by aligning incentives and reduce supply as the networks grow

9. Decentralized governance employs many voting models, and regardless of the voting model, safeguards against rogue votes are important

10. DePIN token model success relies on simplicity and on linking revenue and scale to the token

About the Author

Tom Trowbridge

co-founder of Fluence

Tom Trowbridge is the co-founder of Fluence which is building its Cloudless platform; a decentralized and open computing platform that offers enterprise grade, low cost and resilient compute. Before Fluence, Tom helped found Hedera Hashgraph (HBAR, top 15 coin on CoinMarketcap) where he was president from inception. He hosts DePINed, the leading DePIN focused podcast and the DePIN Day series of conferences. He is an investor in a number of leading DePIN projects and Web3 funds.

Prior to entering the blockchain world full time in 2016, Tom spent four years at Goldman Sachs before leaving to build businesses at several other financial firms. He started his career financing telecom and technology companies at Bear, Stearns & Co., before spending four years at a Boston based venture capital firm investing in early-stage technology and telecom companies. He has a BA from Yale University and an MBA from Columbia University.

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Acknowledgement

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Disclaimer: Tom Trowbridge is a co-founder of Fluence, and he invests in tokens, including the ones discussed in this report. His views are his own, and should not be construed as financial, investment or legal advice. You should consult your attorney or financial advisor if you are thinking about making an investment. Tom is not responsible for any investment decisions you make based on the information shared in this report.

01. DePIN is Not a Meme!

Tom Trowbridge
Co-founder of Fluence

Since the inception of the crypto ecosystem, **crypto investing has been meme driven** even before memes were popular. In the absence of material revenue, investors chased a range of narratives to see which projects were 'winning'. Investors looked at sentiment, opinion leaders and 'expert' investors for signals as to what projects were getting traction or to see what other investors were likely to think.

To support 'traction' narratives (i.e. product market fit or growth) in the absence of customers and revenue, **crypto cycled through a long list of metrics** including transactions per second (TPS), Telegram followers, Total Value Locked (TVL), GitHub pull requests, active developers, number of partnerships, number of transactions (real or inflated), and Twitter followers.

And around and around we have gone with the top twenty crypto projects on CoinMarketcap (the industry website that tracks the market value of cryptocurrencies) changing substantially every few years. **But this is about to change.**

DePINs (Decentralized Physical Infrastructure Networks) are on the cusp of generating substantial revenue from paying customers which, when combined with compelling token economics that drives value to their tokens, will attract investor attention to this segment of crypto.

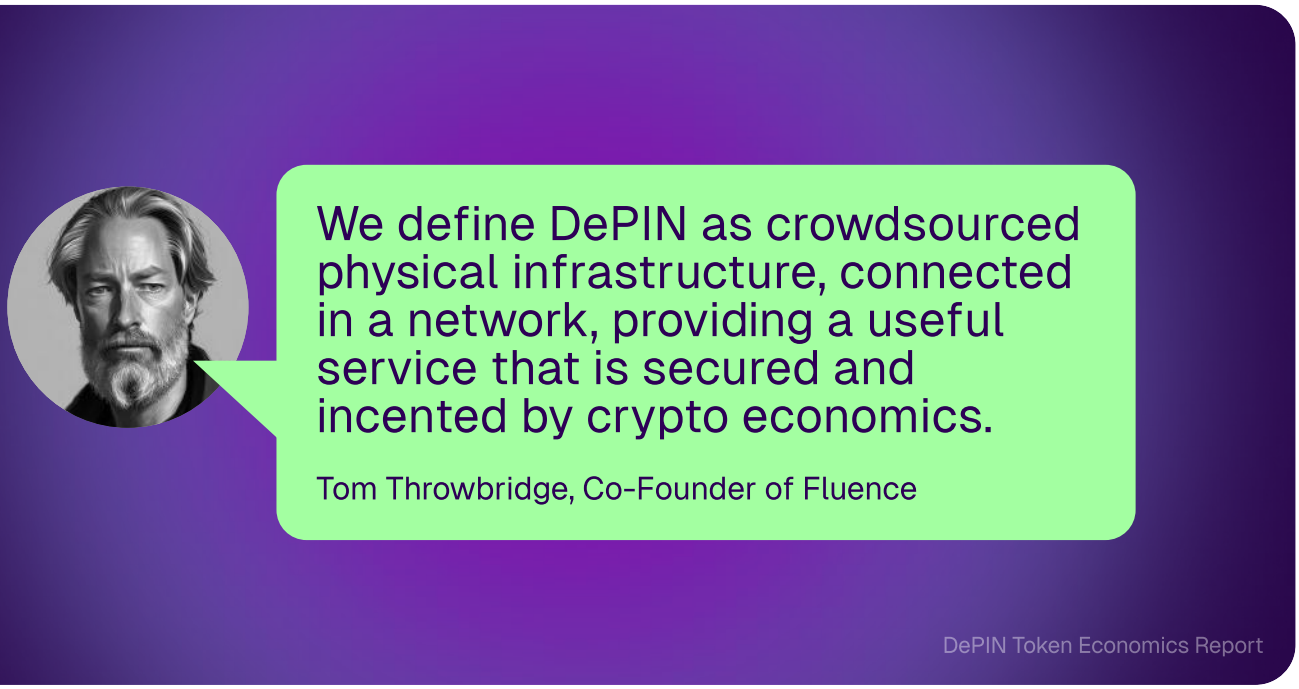
Traditional equity investors who historically have been unable to value the earlier generation of token projects will be interested in this traction and will bring a new level of diligence and a clear set of expectations when looking at DePIN token economics.

To prepare for this investor scrutiny, we have prepared this paper to lay out the main components of DePIN crypto economics to provide a framework for evaluating projects and as a guide for DePIN founders, investors and participants. This paper does not attempt to review every DePIN project or token, but we use as many specific examples as possible to highlight each of the token economics components. Meme coins will continue to attract capital looking for a quick return based on the latest fad, but there will be a clear difference between DePIN and the rest.

02. DePIN Token Economics

2.1. What is DePIN?

We define DePIN as crowdsourced physical infrastructure, connected in a network, providing a useful service that is secured and incented by crypto economics.



For those new to the space, crypto economics are the economic incentives, game theory, and cryptography that enable the security, trustless participation, and long-term sustainability of a crypto ecosystem. Rather than being analogous to the leading crypto networks of Bitcoin or Ethereum, DePIN is closer to the capital light marketplace models of Airbnb and Uber but with some very important differences.

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Like Uber and Airbnb, DePINs connect providers with customers and do not fund the underlying infrastructure. But in the DePIN sector, the providers are paid in tokens, and if the token economics are architected well, the tokens appreciate as the network grows, equivalent to the Uber drivers and Airbnb home owners being paid in equity. Additionally, instead of the consumer focused Uber or Airbnb, nearly all of the DePIN sector provides services to businesses, eliminating the need for substantial brand building.

Also important is that many DePINs have a ‘set it and forget it’ model where participants buy and install hardware or software which requires almost no ongoing attention. The low ongoing effort greatly reduces turnover in the participant pool, eliminating the need for marketing spend to attract more participants and also reducing the financial return required to keep participants on the network.

Business Model Comparison

	Airbnb/Uber	DePIN
No capital expenditures	YES	YES
Marketplace	YES	YES
Compensation	CASH	TOKENS
Participate in platform growth	NO	YES
Provider effort	HIGH	VERY LOW
Provider Turnover	HIGH	LOW
Marketing Expense	HIGH	LOW
Customers	RETAIL	BUSINESS

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There are two broad categories of DePIN projects:

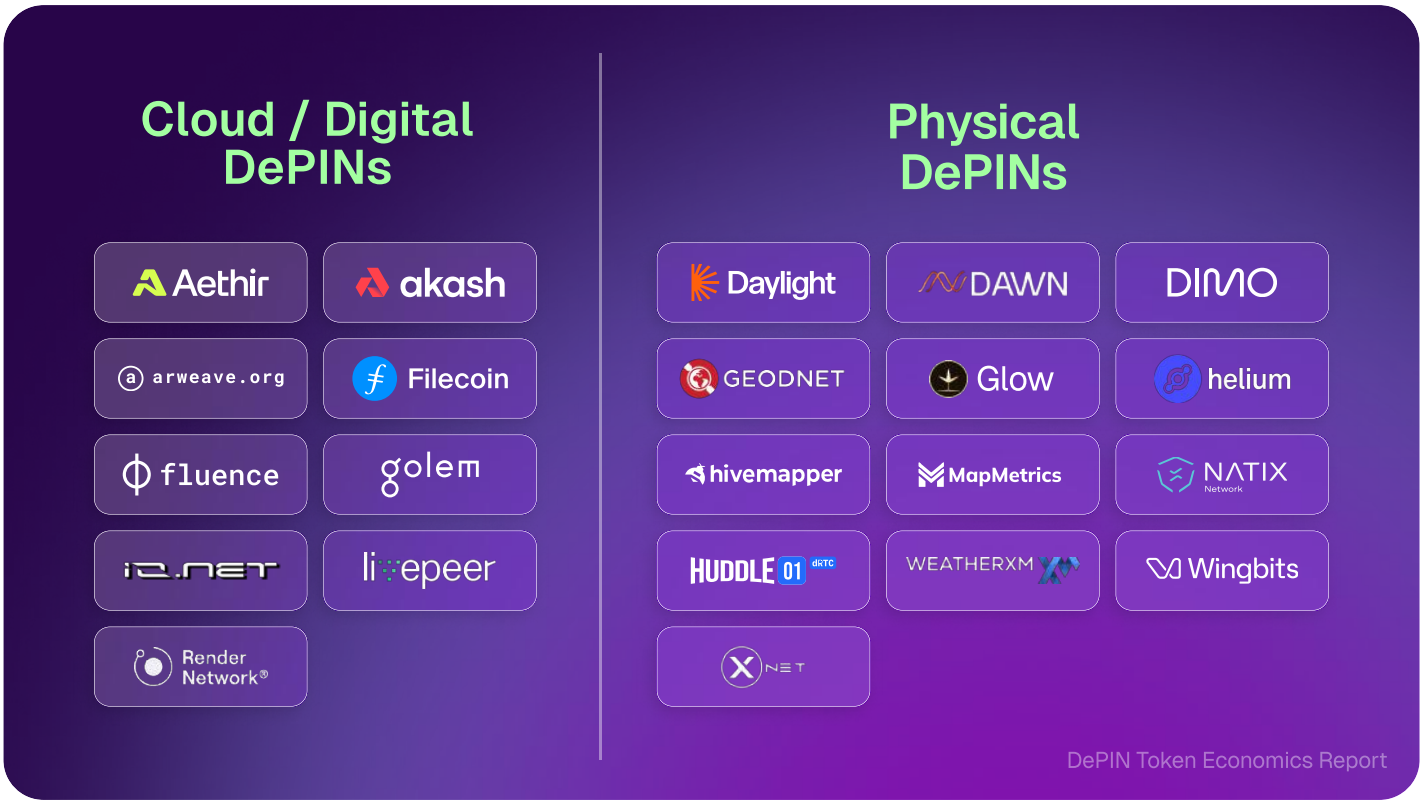
① Digital or Cloud DePINs:

provide a ‘digital’ service currently provided by the centralized clouds such as storage, compute or rendering. Cloud DePINs are generally marketplaces where the network connects users with a provider and the networks add a layer of access, reliability, trust or security.

② Physical DePINs:

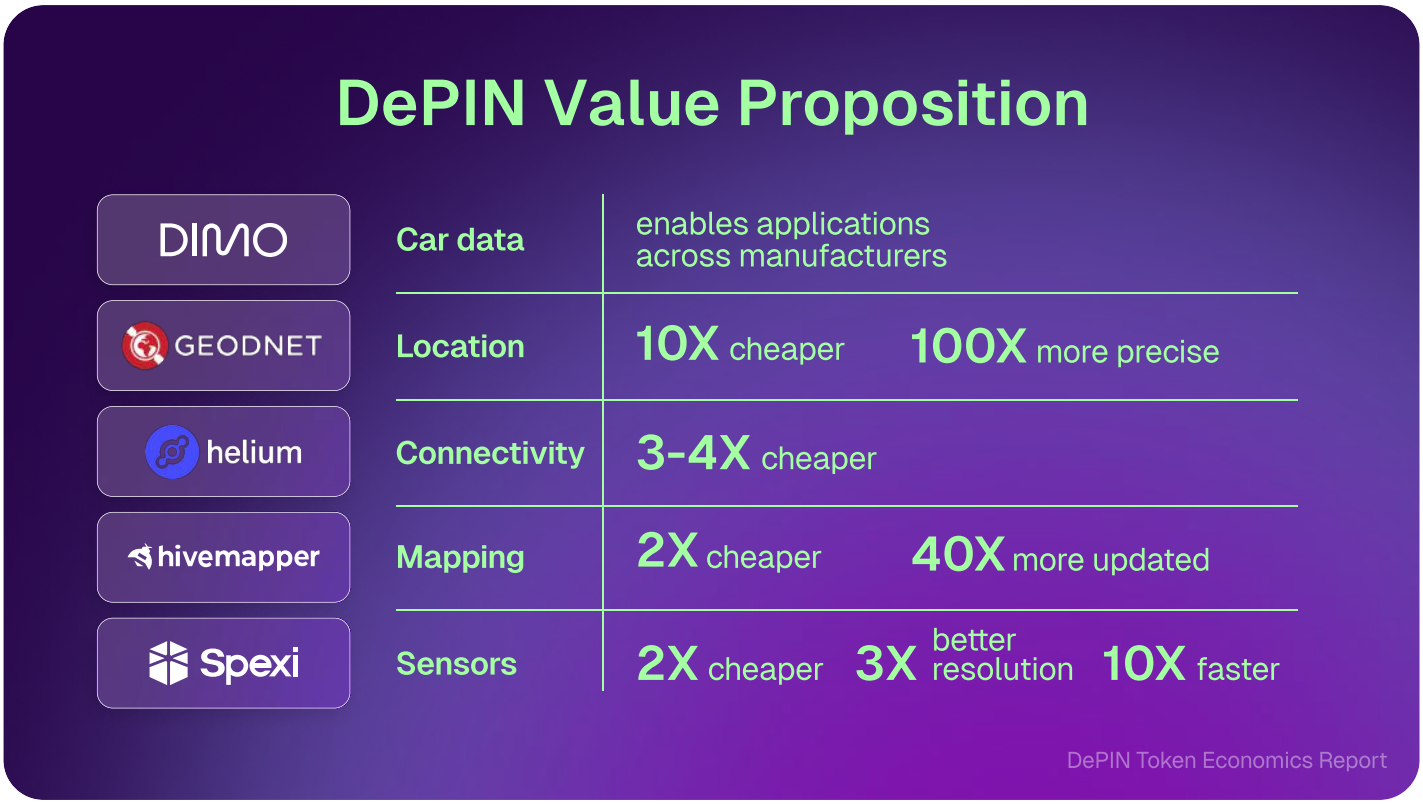
provide a ‘physical’ service based on hardware such as a router, antenna, drone, camera, or phone. These networks aggregate data from thousands or even millions of typically consumer-run devices and then monetize that data, sharing or returning the value to the providers via the network token.

The DePIN sector has grown dramatically in the past twelve months with some research groups estimating that there are over 1,000 projects. Across the DePIN ecosystem, over three million individual providers are powering various DePIN networks by providing Wi-Fi coverage, charging stations, energy generation and transmission, broadband access, traffic data, street images, car data, weather stations, antennas, file storage and compute.



As with any new sector that is attracting interest and capital, we see a number of more traditional crypto projects and even simple phone applications attaching themselves to the DePIN name, but if we use the definition stated above, the number of true DePIN projects is substantially smaller than the numbers mentioned above.

But even this smaller list includes well over a hundred high-quality projects that have the potential to disrupt massive sectors and be worth hundreds of billions of dollars and even trillions in the aggregate. DePIN will change the crypto narrative as the projects offering these real world services are scaling faster and offering better services at lower prices than their centralized competitors.



2.2 Why Now?

The recent emergence of DePIN is due to the recent convergence of three factors: hardware pricing, software sophistication, and crypto adoption.

① Hardware Pricing

Reductions in hardware pricing which has allowed, for example, antennas, routers and cameras to be 95% cheaper than several years ago has brought pricing of a range of DePIN hardware to the $500 level, making it affordable to a very wide range of participants.

The increased quality of the sensors on smart phones has also made phones appropriate for a wide range of data collection. Overall, the lower cost and higher quality of hardware has made it far easier for participants to earn an attractive return on a range of devices.

② Software Availability

Software availability/sophistication; the availability of open source instances of sophisticated, formerly proprietary software now allows the operations and services of crowdsourced infrastructure networks to be competitive with traditional companies.

③ Global Crypto Market

And finally, the scale and maturity of the global crypto market enables the large-scale crowdsourcing of infrastructure via the token reward model without the capital expenditure requirements of traditional companies, resulting in an enduring cost advantage.

03. Token Models

We have seen a number of DePIN research pieces from Binance, Coinbase, Kraken, Grayscale, Mythos and Messari's annual State of DePIN on this growing space and the websites DePIN Hub and DePIN Ninja provide regular reports and are a good source of industry data.

But no reports have focused on a detailed analysis of how DePIN tokens work, how they capture value and the different methods used to link project tokens to revenue and network growth: i.e. the token economics. This report serves to highlight the main components of DePIN token economics and to suggest the components that we think will drive value in the long term.

Thinking about long term value to the token is critical because without a clear link between adoption (revenue) and token economics, projects that gain traction run the risk of being eclipsed by later projects that can drive wealth, attention and ultimately higher adoption by well architected token economics.

To paraphrase the famous Bruins coach ‘Red’ Sanders, tokens economics aren’t everything, they are the only thing.

Many DePIN token models are new, and we see continuous evolution of these models as even mature projects continue to update their token models. Of course, given the early stage of the sector, many have yet to launch their economics and will be learning from the successful examples in the market.

As soon as this report is published, some project details will likely be out of date given the rapid transformation of this early stage crypto segment, but we think it still relevant to note where we are now with an eye on the likely trajectory of these models. Despite the evolution we are seeing some projects undertake, we think it is important for projects to launch with as mature a token model as possible.

Changing economics after launch is time consuming at a minimum and can be very challenging depending on interests impacted by the changes. While it might sound prudent to develop models over time, making substantive changes post launch risks alienating one or more of the constituencies that form quickly around token models.

These constituencies invest capital or operate infrastructure predicated on the returns they project from the token model, and if they are disadvantaged by any change, no matter how beneficial to the network, they can be a powerful, motivated force against change.

3.1 Token Economics

Token economies have two primary components: token issuance and token use and within those two broad categories are a number of subcategories.

On the issuance side, DePIN projects allocate tokens to the team, to investors, and to reward providers with tokens subject to a number of project specific details. On the use side, tokens can be used for payment, trust, and governance.

Few project token models incorporate all of these uses, and DePIN networks generally fall into two broad categories based on the need or lack thereof to provide trust in the underlying infrastructure:

① Cloud DePIN projects

that provide storage and compute generally link customers with providers, and their token economies prioritize aligning the provider with the customer to provide trust.

The Web2 clouds such as Amazon Web Services are trusted by customers given their SLAs (service level agreements), scale and brands. CloudDePINs that can't compete in those categories, like Io.net, Fluence and Filecoin, require their storage or compute resources to have stake that can be slashed in the case of poor service or malicious activity. The risk to this stake aligns users with smaller, less well known or even consumer providers and is a key component of achieving trust in these providers.

② Physical DePIN projects

that provide more tangible services like Wi-Fi access, mapping, imaging or data collection do not require stake to activate devices.

These networks bear the responsibility of validating the data and, given the high number of devices contributing to the network, the consequences of fraud are less severe, rendering trust in each contributor less of a priority. Instead of providing trust, physical DePINs prioritize rewarding their large network of providers who generate the data which is monetized by the network, not the individual providers.

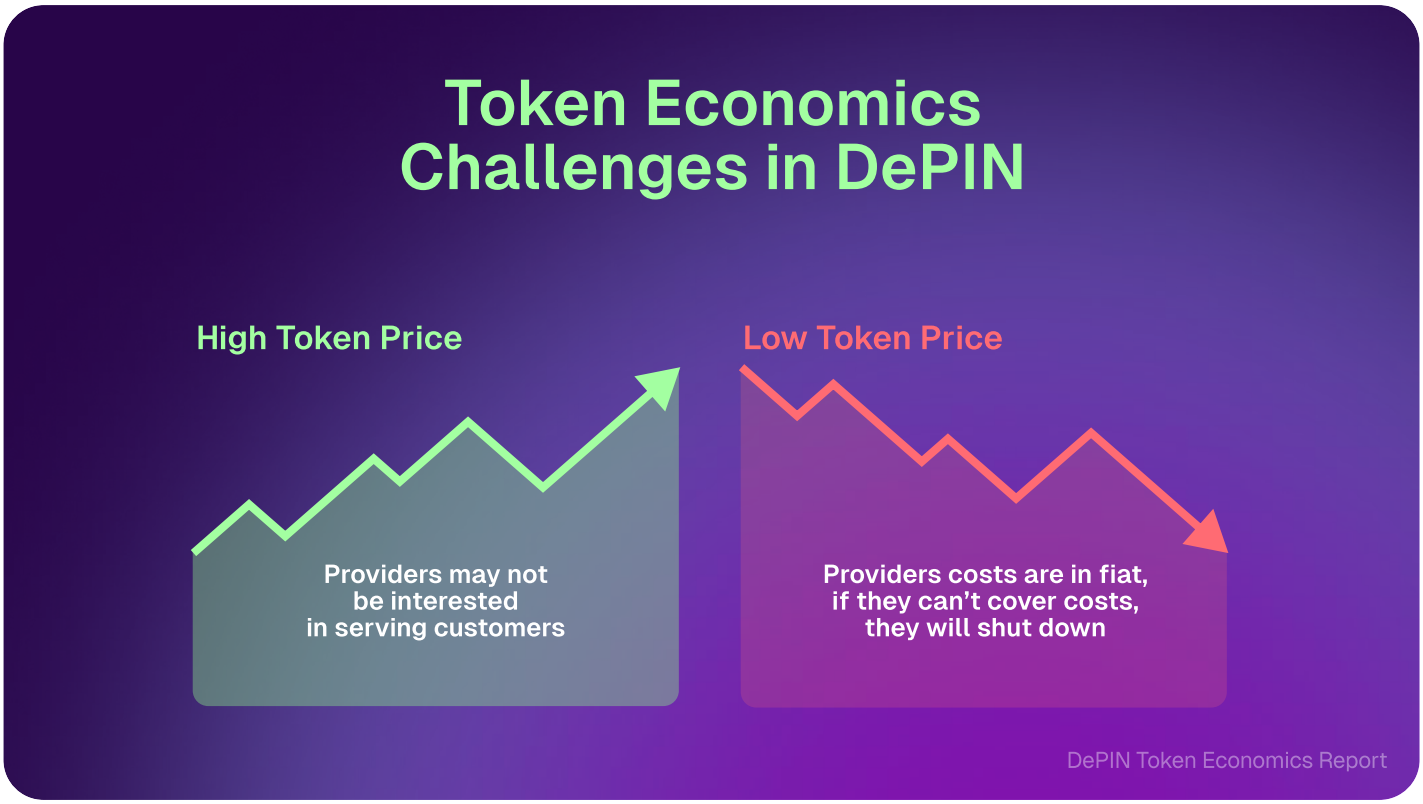
In both cases, tokens serve as a proxy for network value and allow projects to bootstrap their economies as long as the market perceives a high future value for the network. Given the long duration of any early stage project, small changes in the perceived likelihood of success or in the discount rate has a large impact on the current token price, leading to the high volatility we see.

Unlike traditional equity financing markets for early stage companies, the crypto markets are global, allowing projects to access capital around the world far, far faster than is possible for any early stage company and even faster than much more mature businesses.

‘Stake’

For those newer to some of the terminology, ‘stake’ is the capital (in the form of an amount of crypto currency tokens) that enables trust or support the operations of a blockchain network. Stake serves the purpose of a security deposit. This deposit is at risk, and if the provider doesn’t behave honestly, the stake will be ‘slashed’ (i.e. impaired, reduced or totally eliminated). However, unlike traditional security deposits, the stake earns rewards in return for putting the capital at risk. The economics behind staking aligns providers and users who do not know each other and secures the network, validates transactions, and generates income for participants.

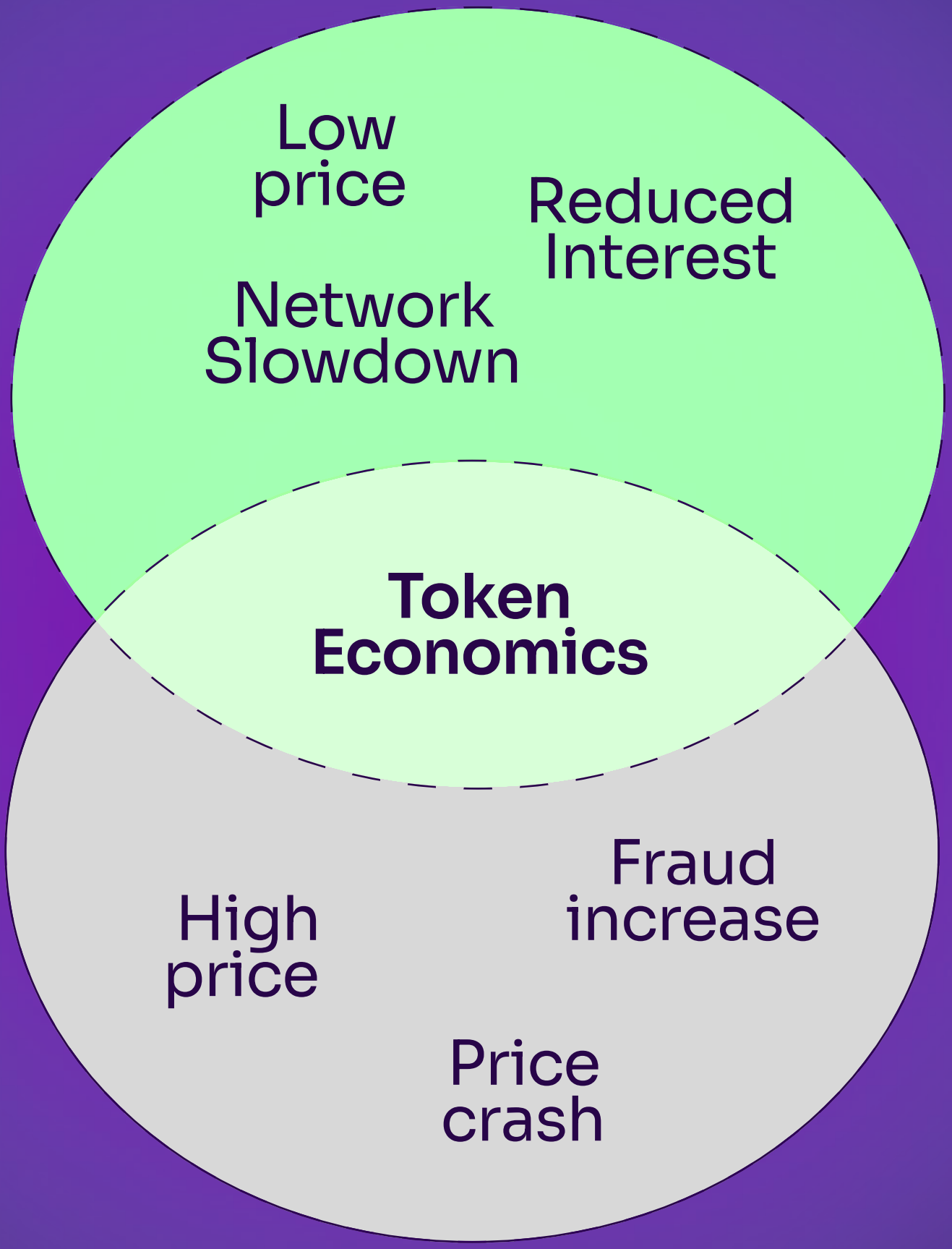
In designing token models, founders are usually aware of the risk of a low token price which can reduce interest in the network, impairing the incentive for providers to offer the service, rendering the network less valuable to customers and catalyzing a negative spiral to irrelevance.



But it is also important to consider the risk of a high token price, which can attract transient providers only interested in a quick profit, increase the incentive for fraud, and reduce interest in doing the actual work of serving real customers for revenue.

Without real customer traction, the token price will eventually fall, causing the tourist or fraudulent network providers to vanish, thereby risking the network's viability.

We have seen several projects including Hivemapper and Xnet update their token economics to address the behaviors driven by a high token price. The Filecoin ecosystem has suffered from both 1) a high token price, which attracted providers interested in FIL rewards not in serving customers, and 2) also from a low token price, which caused providers to shut down as they were unable to pay their fiat costs. Filecoin isn't uniquely susceptible to these swings, it just has been around much longer than all but a few DePINs. And like all early DePINs and most crypto projects, it had no underlying mechanism to mitigate the volatility in the value of its provider rewards.

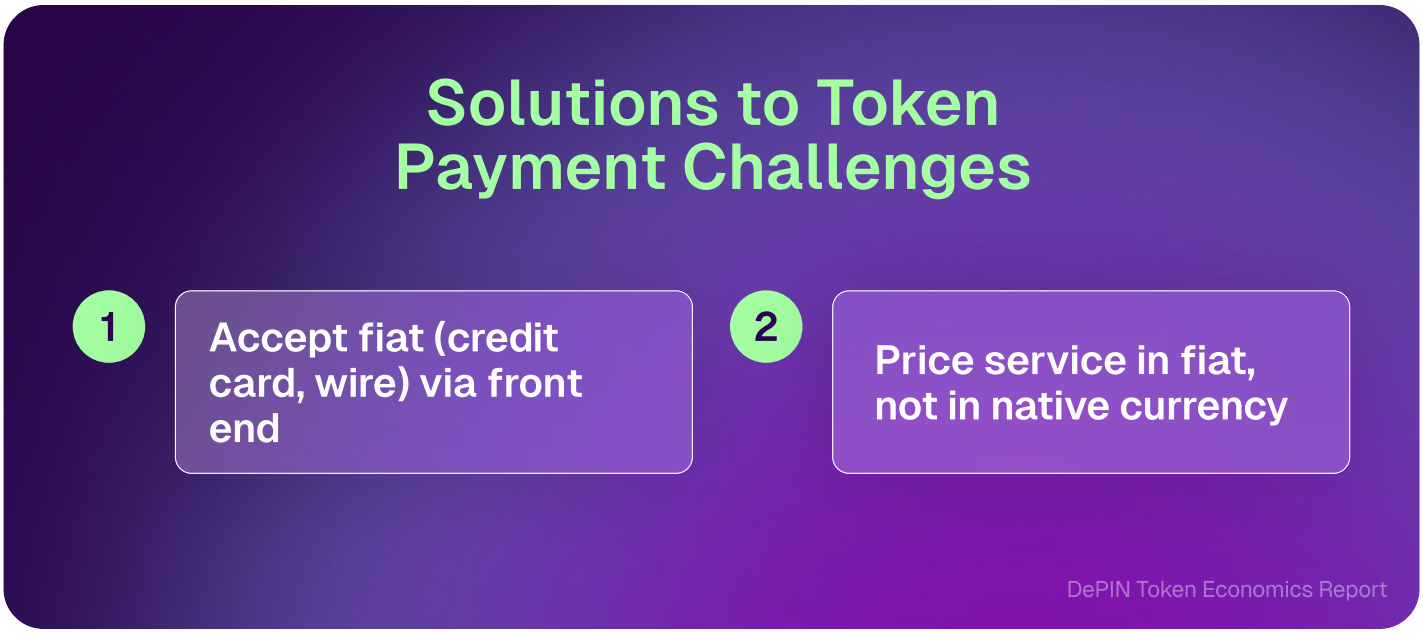

Low price
Reduced Interest
Network Slowdown
Token Economics
Fraud increase
High price
Price crash

04. Token as Payment Currency

The most traditional use of a token in a crypto network is for payments on that network. The requirement to use the token gives the token utility, and as payments on the network grow, demand for the token should also grow.

However, the economics of a token used for payment with the objective of increasing token scarcity, is not straightforward. Requiring token use is an impediment to adoption, particularly among Web2 customers that are not equipped to handle crypto payments. Additionally, any traditional customers will struggle to forecast costs in volatile crypto currencies which will impair adding DePINs to the budgeting process. We are also skeptical that requiring use of a native token for the network drives long-term token value. Customers and providers can purchase tokens right before use and sell after receiving, driving token volume, but not materially impacting the scarcity or substantive demand for the token.

To address the adoption challenges of revenue that is in a token, projects have taken two approaches: Accept fiat (credit card, wire) via front end and price service in fiat, not in native currency



1 Deploying a fiat front end:

A fiat front end is a portal that facilitates customer payments in fiat (e.g., credit cards or wire transfers), while tokens are handled in the backend, without the customer's involvement. This solution sounds obvious, but setting it up to be compliant with existing US financial regulations takes significant effort. A fiat front end facilitates adoption, but, importantly,

if the service remains priced in a native token, the problem of crypto volatility and its related budgeting challenges remain, thereby limiting adoption as discussed above.

② Pricing in fiat but requiring token payment:

If the service is priced in fiat, customers can predict and budget costs, which is an important path to adoption. The number of tokens used will depend on the exchange rate at the moment of transaction and will be transparent to the customer. The token is still required for network use, maintaining the token utility.

However, given the importance of a fiat front end in order to accelerate adoption, any requirement for the token to be used in transactions adds complexity. Such complexity is only justified when it is the DePIN project accepting revenue, and it is unsuitable for projects that serve as marketplaces where the large number of both customers and providers would need to use and accept the token.

We have seen many DePIN projects move to accepting fiat with Grass taking fiat, IO.net accepting fiat for payments to providers and Helium, DIMO and Geodent all selling some form of data credits, priced in fiat, with the token used only on the backend.

Render, founded in 2016, facilitates the use of fiat via the purchase of Render Credits (USD value but in native token) which are used to use the network. Arweave, another early DePIN project, prices storage in USD, but customers pay in AR or in a number of other tokens.

Projects that require their native token to be used for payments include the compute networks of Akash, Aethir and the storage leader Filecoin.

Projects should facilitate transactions in the most easily adopted payment method, whether that is via a token or a fiat currency. Our view is that the most successful networks will reduce barriers to adoption via pricing in USD with fiat front ends, and that such models will become the default solution.

05. Token as Reward

Perhaps the most compelling and unique attributes of the crypto token model is the ability to bootstrap an ecosystem via token rewards. All DePINs pay rewards to providers in return for providing a service such as storage, weather data, or wireless connectivity, and the tokens have value based on the market's future expectation of the platform's ability to be successful and drive value to the token.

These rewards have typically been a predetermined number of tokens issued daily or weekly, which are then divided equally among the providers and subject to a declining schedule over time. The tokens are of course subject to market volatility, but the rewards, even if low in value, can be compelling if the network scales and the tokens appreciate significantly.

5.1 Why Early Rewards Really Matter

The potential to earn rewards that can appreciate over time is not limited to DePIN, but is critical in generating a passionate and aligned community. The ability to reward early providers in a potentially appreciating asset is unique to crypto and one of its most democratizing features. Even as many projects become more institutionalized over time, the early providers may remain beneficiaries of this growth and evolution thanks to the appreciation of their early token rewards.

5.2 Token Rewards Strategies

Rewards vary by project, but usually include sending tokens to anyone providing services to the network with some projects offering higher rewards to providers in the most useful location or contributing the most data.

DIMO

Most reward schedules decline over time like DIMO which declines 15% annually for 40 years

GLOW

Several others like Glow mint a fixed number of tokens every month in perpetuity.

FILECOIN

Filecoin, arguably the first DePIN project, incorporates a dual release schedule where 16.5% of supply releases to miners over 30 years, subject to a six year halving. An additional 38.5% releases to miners upon achieving ever more aggressive storage capacity peaking at 1,000x the current cloud storage capacity in 20 years.

HELIUM

The decentralized wireless network Helium structured rewards to decline on a two-year halving schedule, and the rewards are paid to hotspots based on a number of criteria including uptime, contiguousness with other hot spots and location desirability.

IO.NET

IO.net rewards all GPUs on their network from the rewards pool which is subject to a 20 year life with a 12% annual decline. Render rewards are subject to a 25 year decline.

HIVEMAPPER

The Hivemapper network pays rewards to drivers based on their activity and location and also pays providers who help train their AI models.

GRASS

The bandwidth sharing project Grass issues points to participants which makes them eligible for periodic air drops. Points are allocated based on location and quality of bandwidth contributed, and participants also earn referral fees which continue three levels of referrals down, similar to a MLM (multi layer marketing). Participants earn 20% of the earnings of their referral, 10% of their referral's referral and 5% of their referral's referral's referral! This approach has helped Grass very quickly onboard over 2.5 million consumer providers. [Moved this MLM point to this last sentence to shorten the previous sentence]

NODLE

Nodle pays a base reward to all users and then additional rewards based on the activity of each device. The Hivemapper network pays rewards to drivers based on their activity and location and also pays providers who help train their AI models.

GEODNET

Geodnet rewards are reduced by 50% every year on June 30th, and rewards are two to four times higher in areas that lack coverage and are a priority. Hivemapper has a similar 'burst' program which rewards drivers for mapping priority areas.

The main distinction we see in participant reward models relates to rewards being equally distributed versus being weighted to particular activities. Cloud DePINs, for which location is rarely relevant, offer an equally distributed reward while physical DePINs that must build out networks often increase rewards in areas that lack coverage in order to accelerate network growth. Some even reward individual participants based on their contribution to revenue.

5.2 Token Reward Strategies: Market by Market

The video mapping network Natix pays token rewards only to participants in geographic markets that are active, and Natix increases the token reward pool in line with user base and revenue growth, thereby reducing the impact of additional users diluting the reward pool.

Given that mapping is largely local, a market must have a critical mass of participants to generate sufficient data to be relevant to customers, and so Natix does not offer rewards until markets reach critical mass. Delaying rewards until reaching commercial scale reduces inflation until, in theory, a market can generate paying customers. Natix also only rewards only the top 60% of participants in each market. This monthly activity competition between providers helps ensure rewards are paid only to above-average participants.

Rewarding only the most active providers helps drive participation, which should increase the quantity or usefulness of the data. But to be successful, the project must have a mechanism to share this value with all token holders.

Projects must be sure that the providers are adding sufficient value and that the protocol will be able to offset this dilution to token holders. It is here where the details matter: two key factors are the amount and duration of dilution, and the degree of monetization and its link to the token. Taken to the extreme, a project could become a co-op that provides a valuable service, but is unlikely to attract the same level of capital interest as a more widely applicable token model. Reduced capital attracted to the token accelerates the requirement that network revenue is sufficient to reward all participants adequately.

Of course no project can be successful without rewarding participants, but there is a range of options, and when alignment isn't as clear with token holders, we would expect to see valuations impacted.

Reward Models

Project	Reward Model	Key Characteristics
DIMO	15% annual decline	Rewards decline 15% annually for 40 years.
Filecoin	Dual release schedule	Rewards decline 15% annually for 40 years.
GEODNET	Annual halving on June 30th	Rewards are 2-4x higher in areas lacking coverage and are a priority.
Glow	Fixed number of tokens issued monthly	Mints a fixed number of tokens every month in perpetuity.
helium	Two-year halving schedule	Rewards are based on uptime, contiguousness with other hotspots, and location desirability.
io.net	12% annual decline	Rewards all GPUs on the network from the rewards pool, with a 20-year life and a 12% annual decline.
NATIX Network	Rewards only in active markets	Rewards are only paid in markets with critical mass; increases token pool as user base grows; only top 60% of participants in each market receive rewards.
Render Network®	25-year decline	Rewards are subject to a 25-year decline.

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5.3 Lottery

One issue that a number of consumer centric DePIN projects face is the low dollar value of rewards. Sensor based networks that use smartphones like Silencio, Natix and Nodle require hundreds of thousands of active users. At that scale, each individual provider's value to the network is very small, but the network must find a way to keep a large number of providers engaged despite not being able to sustainably offer a high reward to everyone.

Silencio solves this problem by offering a base reward to all providers, a premium reward in high priority markets and a monthly lottery that gives all providers, weighted by activity, the chance to earn a number of high value rewards. This lottery approach turns participation in the DePIN network into a monthly lottery ticket which has the potential to increase participation engagement far more than if the value of the winning was equally distributed among all participants.

06. USD Denominated Rewards

The standard approach to crypto rewards involves distributing an essentially arbitrary number of tokens to network providers. The rewards usually follow a decline schedule so that early providers, whose contributions are most valuable, receive more tokens than later providers.

Several projects such as Storj and Fluence employ a different model: they pay rewards in their native token but denominate the rewards in USD. Storj rewards Storage Node Operators $1.5 TB/month and $2.00 per TB for data downloaded, paid in STORJ. Fluence rewards network participants (CPU providers) with a monthly token payment calibrated to track a fiat value of $10 per core per month. As FLT moves up and down, the number of tokens paid to providers adjusts daily to offset this variability.

An important benefit of calibrating rewards in fiat, as opposed to an arbitrary token amount, is the potential for the network to achieve deflation assuming network traction.

With buy-burn or stake driving token demand and presumably a higher token price, a fiat based reward model results in fewer tokens required for rewards, leading to reduced dilution and then a higher price, fueling a virtuous cycle of appreciation and reduced issuance, while also extending the duration of the reward pool.

This cycle is of course predicated on project traction and revenue, because without traction, a falling token price will result in additional token issuance driving dilution. In this downside case, providers will continue to be compensated, and we think this approach will extend the life of the project beyond an arbitrary token reward which also would drive providers to leave the network faster.

The primary benefit of the fiat linked reward is the increased certainty providers have regarding their revenue and the type of institutional providers this attracts.

Rewards denominated in a project's native tokens are subject to crypto volatility, and if the project's goal is to attract institutional infrastructure providers who need to forecast expenses and revenue, payments in a volatile currency render even medium term planning impossible.

In the fiat linked reward model, providers receive a more predictable revenue stream. Retail providers may not care as much about the current value of rewards and for many physical DePINs, the ongoing work is minimal after the hardware has been installed which reduces the focus on token volatility. The same is true for cloud DePIN providers who are using consumer hardware to resell compute, storage or bandwidth capacity. But for projects like Filecoin, Fluence and Aethier that target an institutional provider base that must make capital allocation decisions and pay fiat costs, a fiat based reward is much more attractive.

The increased stability of fiat linked rewards attracts a different type of provider. Historically, only a very specific type of provider has been interested in investing capital based on the expectation of a token price increase, and traditional infrastructure operators have not been willing to accept token volatility.

Fiat linked rewards attract the utility-like providers who are interested in predictable margins and not in the chance of a moon shot.

Many cloud DePINs, like Filecoin and Fluence, subject their token rewards to vesting which requires the provider to continue providing capacity for six months to receive the full reward. Over this period, providers are still subject to token volatility which isn't fully eliminated in this model.

6.1 Arbitrary Reward Pool

Rather than set a reward schedule in advance as is standard practice, or price in USD to protect from token volatility like Fluence and Storj, several projects have decided to determine the reward pool annually. Aethir offers one reward pool for gaming and one for AI, and the foundation determines the size of the pool annually as does Silencio. The Grass Foundation determines the timing and amount of airdrops to participants. This annual determination requires trust in management or the foundation to make the 'best' decision.

The decision gets progressively more difficult as providers, investors and customers may have very different ideas as to what constitutes the ‘right’ decision given their different roles, interests and time horizons, and the consequence of getting it ‘wrong’ gets ever greater as the project grows.

Reward Schedule

Aethir	Foundation sets pool size annually
Ar	Gradual decline
DIMO	15% annual decline
Filecoin	6 year halving & target based
GEODNET	2 year halving
Glow	12 million annually
helium	2 year halving
hivemapper	Max of 26 million p/a
HUDDLE 01	Dynamically minted rewards; network revenue based
livepeer	Pro rata % of revenue based on stake
Render Network®	Network revenue based

DePIN Token Economics Report

07. Token for Stake and Trust

DePIN networks that provide cloud services like storage and compute all require a trust model of some kind. Some like Akash serve as marketplaces where customers can evaluate provider who might even have ratings. Other networks like Fluence, Filecoin, Io.net and Livepeer rely on crypto economics for trust. These networks require tokens to be staked to the compute or storage resources to generate trust, and should the provider behave badly, the stake can be slashed.

The requirement to stake on resources, when architected appropriately, also drives the amount of locked tokens as the network scales. This stake provides alignment between the providers and customers, helping assure customers that the providers can be trusted.

The projects take different approaches in determining the stake required, however, and that choice has important implications for the token economics. Filecoin for example, requires 30% of circulating supply to be staked by storage providers. If the providers go off line, this stake is slashed and returned to the network as revenue.

The challenge of a model that requires only a set percentage of supply to be staked is that as supply increases, only 30% must be staked which means the circulating supply of tokens increases even as the network grows. The other challenge related to a fixed amount of tokens required for stake is that if the token price is low, the trust model is jeopardized as the value of the stake could be below the value of the data stored, whereas if the price is very high, the cost to acquire and stake the tokens could be prohibitive for providers who need to budget their capital expenditures.

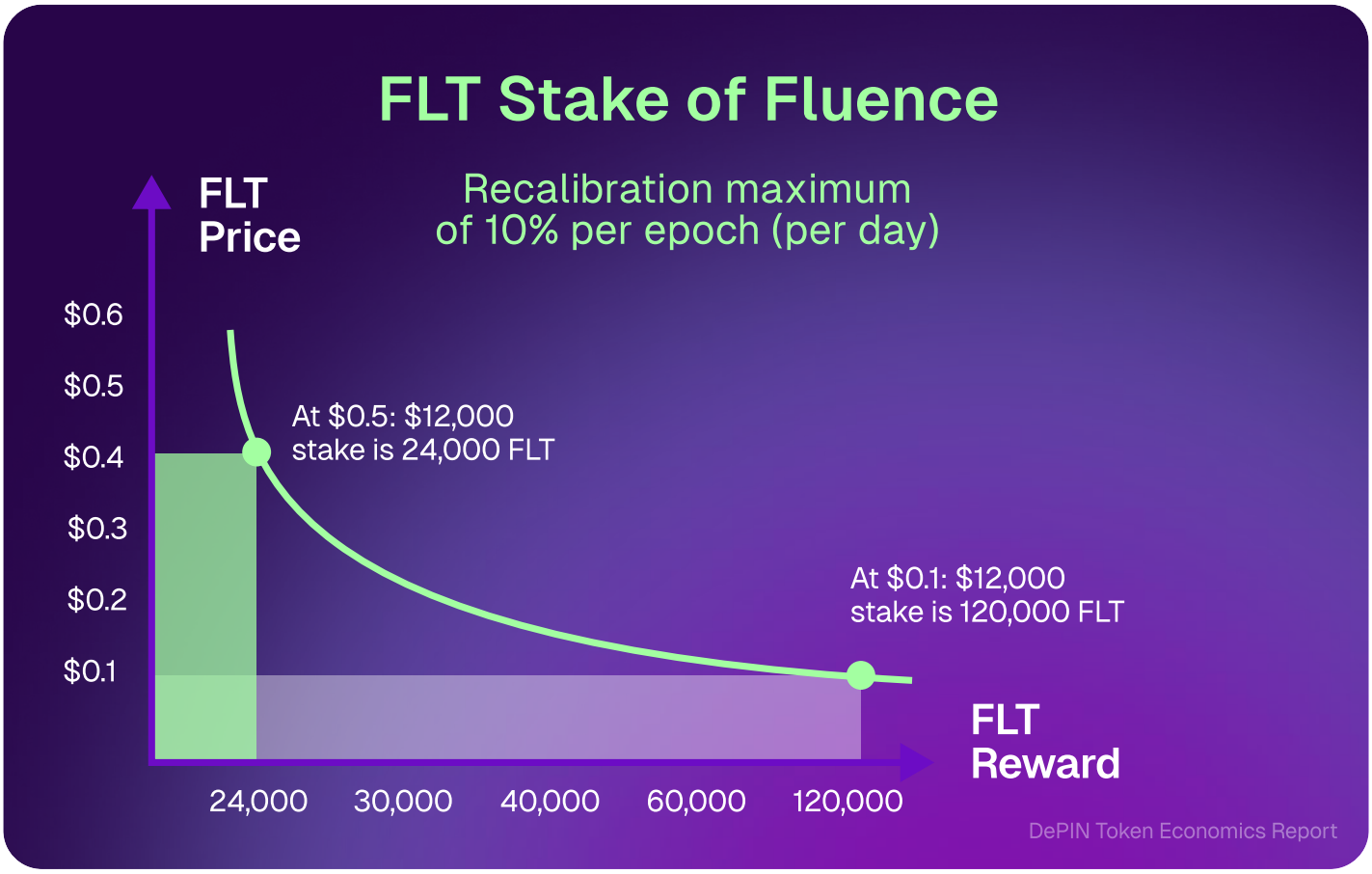
The GPU marketplace IO.net requires providers to stake 200 IO tokens per card and each GPU is subject to a number of multipliers based on its specifications. Stake enables the GPU to join the network and earn rewards, but is subject to slashing for malicious behavior or inadequate service. For stake set in a fixed number of tokens, the fiat value is likely to fluctuate considerably and the USD value of the required 200 IO tokens has ranged from $250 to $1,200.

Like other cloud DePINs, Fluence has a stake model to provide trust, but like its reward model, the stake is priced in fiat but deployed in FLT. Stake is $12,000 per CPU for the duration of the stake commitment which varies from one to 12 months. If FLT is $0.25, 48,000 FLT are required and if FLT is $1, 12,000 FLT is required.

This model has the benefit of providing a clear security model to the network while also equipping the community to forecast the USD demand for FLT to stake based on the number of CPUs forecast to join the network. If we expect 10,000 CPUs to join the network, we know that $120 million of FLT is required to activate those CPUs.

Fluence thinks that denominating stake in USD provides more security and aligns providers with customers more than models that require an arbitrary number of tokens to be staked. Requiring an arbitrary number of tokens is problematic both if the tokens have either a very low value which reduces security or a very high value which increases the cost for providers.

If the stake required was an arbitrary number of coins, and in a market decline only required $250 for example, customers will likely not trust the provider as much as if the cost was $12,000. Of course the value of the stake in the Fluence model also declines with a decline in the token price, but upon expiration of the capacity commitment, the $12,000 threshold must be achieved to re-enable the CPU. In an arbitrary token stake model, however, the value of the stake required remains low as long as the token is low.



Livepeer requires its video rendering providers to provide stake, and the revenue each provider receives is linked to the amount of stake.

If a provider has 10% of the network staked, they can earn 10% of the network's ETH revenue, assuming they perform at least 10% of the work. Livepeer also pays rewards but only to staked tokens, and if the overall network stake is less than 50%, the reward increases. If it is more than 50%, the reward decreases.

The video streaming, computing and content delivery protocol Theta employs market dynamics to drive staking volume.

Only the 31 nodes with the largest THETA stake are eligible to participate in block production and voting. As rewards grow in value, there should be ever increasing demand for rewards, requiring higher stake to be in the top 31, reducing supply and driving further token appreciation.

One often overlooked aspect of staking is who is eligible to stake. In many cloud DePINs, like Io.net, Render and Livepeer, only the network providers who are for now generally technically adept individuals (not companies) are eligible to stake.

We think that professional hardware providers will be required for networks to scale, and that these providers may not have an interest in buying and holding a project's token which raises their capital requirement.

Meanwhile, investors who like the project are likely interested in staking their tokens for rewards. As projects mature, we see the universes of providers and token holders being separate but very complimentary. For example, Fluence allows any token holder to stake, and it quickly engaged liquid staking provider Parasail to provide a staking service for smaller and less sophisticated stakers.

The challenge to the open staking model is that staked tokens remain with investors so no new buying is required to add capacity to the network. In theory, if providers are required to stake, they must purchase tokens as they grow capacity, adding buying pressure on the token.

But in the provider stake model, we have seen the quick development of lending markets which allow providers to scale without capital investment, but with the added friction, fees and complexity of third party lenders.

Cloud DePINs that do not require staking like Akash and Golum must rely on more traditional trust models such as reviews and reputation. They also need to determine what drives the scarcity of their token and how that scarcity relates to increasing scale.

Most physical DePINs do not employ staking but several, including Geodnet and Grass, do involve staking. For Geodnet, staking is required to activate its RTK nodes, and Grass rewards routers based on the amount of stake they hold. Geodnet requires stake to be locked for one year, while Grass allows stake to be released with just one week's notice. Stake that can be unlocked in a short period has less of an impact on scarcity than projects that require longer locked periods.

08. Token Linked to Revenue – Buy-and-Burn

Buy-and-burn (buy/burn) is the most direct mechanism to tie network scale with token demand. Buy/burn refers to the mechanism that uses the revenue generated by the network to purchase and burn the network token. If the amount burned every year is in excess of the tokens generated to pay rewards, the network is deflationary which should be positive for the token price over time. Buy/burn is a relatively simple concept, similar to share buybacks, but it is not widely used in crypto outside of DePIN.

Prior to DePIN, the primary users of buy/burn within the crypto ecosystem are the exchanges. The profitable centralized exchanges of Binance, Huobi, OKX and Kucoin use 10-30% of their revenue to buy and burn their native token.

A number of DeFi protocols have also implemented a buy/burn including MakerDAO, Raydium, GMX Gains and Synthetix. Buy/burn for these projects has had mixed success for these projects for a few reasons.

One challenge these projects face is that their revenue is correlated with the crypto market so the buy/burn is pro cyclical and can be highly correlated to the token price which reduces its impact. The buy/burn rates and process also differs for each with several relying on DAO votes, reducing certainty and thus the overall value of the buy/burn program.

EIP-1559 in 2021 implemented buy/burn on Ethereum, but given the continued ETH issuance and volatility in network use and fees, supply doesn't reliably contract, reducing the impact of the buy/burn on the price of ETH.

DePIN revenue, however, is not correlated to the crypto market, and DePIN is the only decentralized crypto sector to widely implement buy/burn. The potential impact on tokens will come as revenue scales independent of the crypto market dynamics, and the buy/burn dynamics become powerful. One example is the decentralized location and data verifier XYO which has bought back over 80% of its tokens and continues to purchase more.

8.1 The Role of Network Revenue

The obvious precondition to using the buy/burn model is that the network is generating revenue, not the individual participants.

In the cloud related DePIN networks like Filecoin, Akash, IO.net and Fluence, the providers receive the revenue, with little to none going to the network, rendering the buy/burn model largely irrelevant. For physical DePIN projects, however, like Helium, Hivemapper, Geodnet, DIMO, Glow and many others, it is the network which generates revenue and so the network can buy and burn the token.

① Cloud-related DePIN networks

(e.g., Filecoin, Akash, IO.net, Fluence): Revenue flows to individual providers, making buy and burn impractical.

② Physical service projects

(e.g., Helium, Hivemapper, Geodnet, Render, DIMO): The network generates revenue, enabling buy and burn to function effectively.

For these projects, the value to customers usually comes from the aggregation of network participants which makes any individual harder to reward.

There are exceptions, however: XYO rewards participants who source relevant data with points that can be redeemed for BTC, ETH or XYO. Nodle has a different model and sends most of its revenue to the users whose devices were used to serve a particular customer. But even with Nodle, which tracks locations, there could be hundreds of devices serving a customer so the reward is divided considerably.

8.2 Buy Burn Range

The rates at which projects use revenue to buy and potentially burn tokens varies significantly. Glow uses 100% of the revenue generated from the sale of carbon credits to burn its tokens, Render uses 95%, Geodenet and Xnet each use 80%, Hivemapper 50%, and Nodle uses just 5% with the rest returned to the relevant devices as mentioned above.

The buy and burn model is the most widely adopted mechanism that links DePIN project traction and revenue with token demand. Some projects that didn't originally include this feature, like DIMO, have since adopted it and others are in the process of doing so.

We see buy and burn becoming a core feature of DePIN token models with the burn amount standardizing in the range of 80% of revenue. As revenue traction of projects increases, the buy/burn demand should ramp up considerably driving demand for the tokens and increased price. Some projects have worried about 'too many tokens' being purchased, forgetting that as tokens are purchased, the scarcity should drive up the token price, resulting in the need for ever more revenue to purchase the same number of tokens.

Geodnet has demonstrated this already with $500k of revenue in Q4 2024 buying approximately the same number of tokens as $300K did in Q3 2004 given the token appreciation.

We expect token markets to adjust to the demand driven by this revenue and to reset the token price to a level that discounts future purchases from revenue.

This higher token price results in fewer tokens being purchased, setting a higher equilibrium which should allow the purchases to offset any issuance. This is no different than a company like Apple repurchasing stock in the open market, which it has done since 2012.

Auki, a DePIN of DePINs, which is building a computer for AI to operate in physical space, enabling digital maps of the world for AI, designed their burn to start at 50% of revenue and to decline as the token supply falls. When the token supply has been reduced by half, the burn is reduced to 0%. At this point, revenue buys tokens and the network mints the same value of tokens to reward participants. Auki contends that a fixed supply is more predictable than an ever shrinking supply which requires more and more decimal places as token burns continue. If this concern ends up being justified, it implies a very significant token price increase for the buy and burn projects that achieve material revenue.

The most compelling aspect of the buy/burn model is that it significantly reduces the need for market demand for a project's token, allowing the team to focus on business development instead of marketing to token buyers. If a project with an 80% buy/burn rate is able to generate millions or tens of millions in revenue, that is millions in continuous demand for the token.

With that level of demand, no new token buyers are needed for the price to appreciate as the project itself becomes the source of demand for its token, not the whims of fickle crypto buyers. But as this dynamic is proven, investors will be attracted to this mechanism and will likely bid up the projects where this dynamic is at play resulting in these projects trading at a premium.

We also think investors will put a much higher value on a higher buy/burn revenue percentage because of the revenue verification that the buy/burn accomplishes. We see multiple DePIN projects claiming over $70 mm in revenue, but with no quarterly filings, no annual reports or 10Ks and no financial auditors, the market is asked to just trust these numbers. In fact one of the largest and oldest DePIN projects is accused of revenue misstatements.

It was only a question of time before revenue exaggerations were uncovered, and on January 25th, 2025, the SEC charged the wireless DePIN network Helium with misleading investors by falsely claiming Lime, Nestlé, and Salesforce were customers. Post the inauguration of President Trump and the leadership changes at the SEC, the SEC dropped many of the high profile suits against crypto projects but notably not this one. We will likely see additional projects accused of revenue exaggerations and even fraud claims (this is still crypto after all) which will reduce faith in any revenue that can't be easily verified.

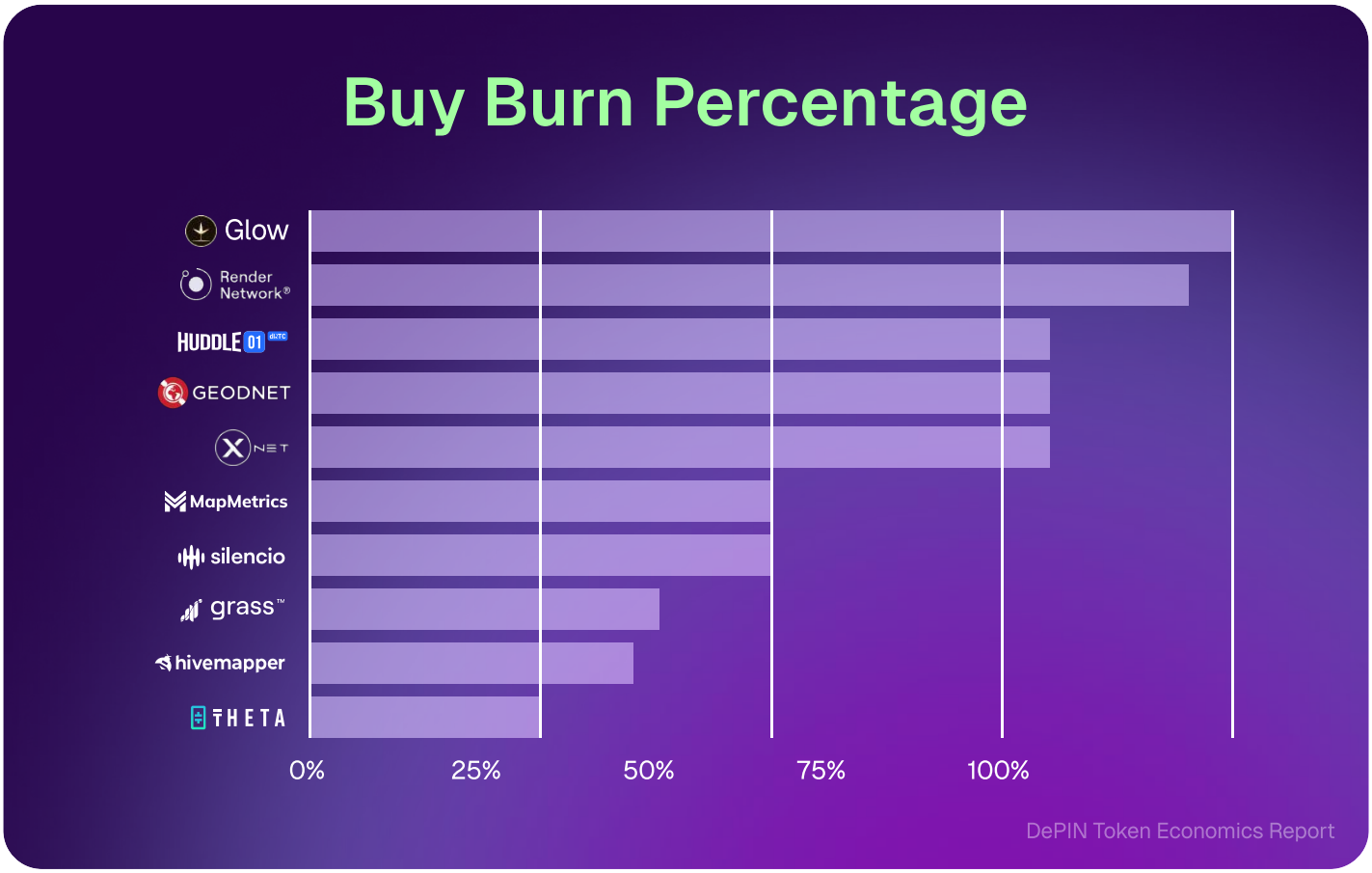
But with transparent buy/burn, we leap from having to trust a project, past having to trust auditors to actually seeing the quantity of tokens and the prices purchased and burned on chain. Of course, the higher the buy/burn percentage, the more trusted; if two projects each claim $1 mm in revenue, but one burns $800k worth of tokens and other burns $250k, which $1 million revenue number is more trustworthy?

The former project should trade at a significant premium. We think this mechanism will drive trust and become required in the sector. Even buy/burn, however, which sounds straightforward, often isn't and Helium also has faced questions on the amount of tokens burned so the sector needs best practices on buy/burn transparency.

The other reason for these higher buy/burn projects to trade at a premium is alignment with token holders. Some DePIN projects have been hesitant to commit to a high buy burn rate given their need for funding in the early stages of roll out. But as they demonstrate success, we hope they quickly move to a high percentage because any divergence from 100% buy burn introduces a divergence between the interests of the team and the tokenholders. We think that projects that minimize that divergence with a very high buy burn are best positioned for success as the higher burn should drive a higher token price which helps the project treasury be sufficient to cover medium term revenue shortfalls.

This dynamic is no longer theoretical. We see it playing out with Geodnet which has an 80% buy/burn for its $3mm in annualized recurring revenue. We do not think it is a coincidence that Geodnet is the only token we are aware of in the entire crypto market which achieved its all time high in 2024 (January 25th).

Ultimately physical DeIN projects need to decide if they are going to clearly prioritize maximize value for the token, as Geodnet does, because the more they try to hedge, the less value will accrue to the token. This leaves an opportunity for competitors to launch with a clearer value proposition for the token holders.



09. What Are Medallions?

A recent innovation in token models is the medallion concept that essentially securitizes an aspect of the network.

1. Daylight is contemplating auctioning geographic specific medallions that permit the holder to purchase the energy from the geography.

2. Dawn will auction geographic medallions that enable the holder to share in the revenue from specific areas.

The Dawn medallion mechanism is especially interesting because it crowdsources the attractiveness of additional network areas; the higher the perceived revenue potential of a particular area, the more expensive the medallion. We expect to see medallions implemented by other projects in similar ways, but are wary of overly complex medallion models.

The best token economics are the simplest. So while medallions can generate valuable signals, some projects run the risk of getting caught up in the design and overcomplication of the concept. We think medallions will play a role, but only where really necessary and where they serve as an economic signal as they do for Dawn, and not just a value creation mechanism.

10. Token as Governance

Decentralized projects use tokens for governance and the DePIN sector is no different. Governance deserves a paper on its own, but it is worth highlighting a few aspects here

Token voting is important to achieve decentralized governance but it is not without risk. **Decentralized systems are harder to govern and decisions can be driven** by any number of small constituencies including vocal members who have small economic interests or, conversely, large token holders interested in short term token performance.

These issues are not unique to DePIN, but as revenue creates ever more valuable treasuries, we can expect governance scrutiny and even attacks that attempt to usurp treasuries. When architecting the DAO voting process, **projects should consider how to address a rogue vote** where low participation allows a large holder to drive through a self-serving proposal. To protect against this potential, **the Fluence governing council has a week to veto any DAO vote,** but the council is elected by the DAO every two years to ensure that the council can not diverge from the legitimate interests of the community.

For projects planning on evolving their token models, one cautionary example is FIL-0056, the Filecoin proposal supported by management to increase the amount of FIL required to stake from 30% to 50%. Almost doubling the amount of locked tokens would have increased scarcity, likely improved the token price which would have increased the value of the treasury, extended the runway and made more funds available for grants. Despite those broad benefits, the FIL mining constituency would have had to bear the cost of the increased stake, and the miner-heavy community voted down the proposal in April 2023.

Natix and Aethir have implemented a staking mechanism for voting where only staked tokens can vote, and Natix gives higher voting weights to tokens that are locked for longer. Besides aligning voting with longer term holders, Natix also pays 40% of revenue to locked tokens, rewarding those holders and providing a mechanism for holders to benefit from network revenue without operating phone hardware. Several projects are evaluating quadratic voting to reduce the influence of whales. No project wants to be controlled by a few whales, but **a project also benefits from incentivizing participation from the holders with the largest economic interest. Projects also benefit from potential investors having confidence that their voices will be heard.** It will be interesting to see the impact of these various vote weighting methods over time.

11. The Path Forward, A Prediction

While there is no one token model that works for all projects, we see most DePIN projects evolving to accept fiat, denominate rewards in fiat and link revenue to the token with a buy/burn mechanism or stake tied to the scale of the network. For cloud DePIN projects, stake denominated in fiat seems the simplest way to both ensure network security and to drive demand for the token. **Allowing anyone to stake, not just hardware providers,** should **both ensure the widest community participation and the lowest provider cost.**

DePIN Model

Revenue	Accept Fiat
Customers	Business
Token Use (Cloud DePIN)	Stake
Token Use (Physical DePIN)	Buy/Burn
Rewards	Fiat-linked (not arbitrary tokens)
Marketing Expense	Low

DePIN Token Economics Report

A final thought is that token models should be easy to understand and easy to find.

When designing and then describing token economics, founders should remember that readers are providers and, just as importantly, investors who are almost certainly not technical and not accustomed to digging into formulas. If the key drivers of token economics don't fit on one page, you might lose prospective investors to the project that does have that simplicity. And if token economics can't be explained simply, is the complexity actually adding value or is it obscuring the real value drivers making it harder for providers and impossible for investors?

Note

And a note to the community and to investors: make it clear to founders what you would like to see both in terms of token economics transparency and also with regard to the actual mechanics

2025 will bring the launch of dozens of DePIN projects with a number of new token models, and we look forward to seeing the space continue to evolve. We will see DePIN set the example for crypto token economics and show the world the tremendous value the decentralized ecosystem is creating. With revenue of several DePIN projects growing materially in 2025, we expect to see both inflated revenue numbers but also those with a transparent, verifiable buy/burn mechanism to be very differentiated from the rest of crypto. The market will take notice, and the sector will grow dramatically.

DePIN is not a meme!

Glossary

Crypto Economics:

Crypto economics (also called cryptoeconomics or tokenomics) is the study of economic incentives and cryptographic mechanisms used to secure, incentivize and maintain decentralized blockchain networks. It combines economics, game theory, and cryptography to ensure security, participation, and long-term sustainability of a crypto ecosystem.

DePIN:

Decentralized Physical Infrastructure Network, crowdsourced physical infrastructure, connected in a network, providing a useful service that is secured and incented by crypto economics.

DeFi:

Decentralized Finance: A blockchain-based financial system that enables users to access financial services without intermediaries like banks, brokers, or centralized institutions. Instead of trusted intermediaries, DeFi uses smart contracts (programs) to provide open, transparent, and automated financial solutions.

Meme:

Cultural trend, idea or joke that spreads rapidly, especially online, through social media, images, videos, or text. Within the crypto ecosystem, memes are cryptocurrencies that gain popularity through social media, community hype or humor rather than technical innovation or utility.

Stake / Staking:

The process of locking up a certain number of cryptocurrency tokens or cryptocurrency of a certain value to enable trust or support the operations of a blockchain network and earn rewards. It is commonly used in Proof-of-Stake (PoS) and consensus mechanisms and by cloud DePINs to secure the network, validate transactions, and generate income for participants.

Token:

A token is a digital asset built on an existing blockchain that can represent ownership, utility, or access to a service. Tokens power the crypto ecosystem, providing utility, governance, and financial services across decentralized applications.