

# The Spare Blockchain

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## **Abstract**

This document describes the principles and approach of the Spare blockchain.

It describes political and environmental problems with energy intensive mining processes like Proof of Work, and ties such intensive energy requirements to centralization issues in Bitcoin. An argument for Proof of Space and Time as an ideal method for attaining maximally distributed consensus is made.

The paper describes briefly the Proof of Space and Proof of Time mechanisms used in the Chia consensus layer and inherited in full by Spare, a fork of Chia. It describes the process of Farming Spare and the reductions in energy cost per coin through concurrent farming ("recycling") on Chia Plots.

Four pillars of long-term viability of the Spare network are discussed, two inherited from the Chia network and two unique to Spare:

1. Recycling Existing Plots (inherited)
2. Open Source Code Base (inherited)
3. Economic incentive for Improvement
4. Maximum Dispersal of Nodes via Ease of Use

## **1: Proof of Work (PoW) and Centralization**

The mechanism for proof of work is well understood and respected for its successful implementation in Bitcoin, where it enables distributed consensus through a network of mutually untrusted nodes while allowing entrance of any entity into that distributed consensus-proving effort, thus depoliticizing and distributing consensus.

In theory, consensus can thereby be achieved at such a broad and dispersed scale as to make corruption of the blockchain by an attacker nearly impossible, enabling untrusted parties to execute contracts and transactions between one another without central authorities, escrow, or punishment/enforcement.

In practice, recent events have illustrated that large percentages of Proof of Work coins like Bitcoin are mined by pools of miners in specific political territories that can and do pose serious threats to the stability, incorruptibility, and long-term viability of the blockchain.

### **China Pulls the Curtain Back**

On May 21, 2021, the Financial Stability and Development Committee of China's State Council announced a crackdown on cryptocurrency mining, and began shuttering operations in some provinces in a coordinated action justified by state leaders as necessary to meet aggressive emissions reduction targets set by the central government [[Pan](#)]. An immediate result was a reduction in Bitcoin's network hash rate of 40% [[Rapoza](#)].

This makes visible the end-result of the incentives that exist in Proof-of-Work mining: an inevitably drive toward centralization of mining. The resource

intensivity results in high energy costs that can be mitigated most effectively through geographic relocation. Maximizing efficiency through specialized hardware network-wide compounds the issue, eliminating any profitable strategy other than geographic relocation. It is thus hardly surprising, though certainly concerning, to see 40% of a supposedly decentralized network go dark at the bequest of a few individuals in one part of the world.

### **US Headwinds for High-Emissions Cryptocurrency**

The Chinese crackdown is also a reminder of how rising environmental concerns around emissions and climate change in popular sentiment give political entities a leg to stand on in arguments against decentralized currencies.

While such direct intervention on this scale would seem to be further out in Canada (where lower energy prices have resulted in a profitable bitcoin mining industry) or the United States, North American popular opinion supports the gist of the Chinese government's approach and their climate-based justifications. As of Fall 2020, The Yale Program on Climate Change Communication survey found three in four registered voters (75%) in the US support the United States pressuring other countries to reduce their carbon pollution, including 51% of self-described conservative Republicans and 68% of self-described liberal/moderate Republicans [[Climate Communications](#)]. Majorities of registered voters are also found to support increased action in the United States, and a scant minority (7% of registered voters) take the contrarian view that the US should *not* reduce emissions.

Given such broad interest in emissions reduction, blockchain's marquee coin's utilization of more energy than some first world countries through its Proof-of-Work methodology is likely to continue to bring

unwanted political pressure on all cryptocurrencies, increasing explicit and implicit public support for political interventions by actors who are unlikely to share the decentralized values of blockchain enthusiasts and developers, whatever overlap they may or may not have on environmental issues.

If Bitcoin's cost-to-mine is prohibitively high for most would-be hobbyists, the cost is increasingly perceived as even higher for the environmentalist, and in the US, we're all environmentalists now.

A second political shift underway in the US portends headwinds for Bitcoin: Big Tech, only recently the darling of the US government under Obama, just survived a spat of criticism from right-populists under Donald Trump. It now finds itself in the crosshairs of far more capable adversaries on the left, with President Biden's new FTC chair Lena Khan representing a dramatic shift in federal attitude toward monopolistic practices by big american technology companies. Biden's executive order of July 9, 2021, "Executive Order on Promoting Competition in the American Economy," [[WhiteHouse.gov](https://www.whitehouse.gov)] is described by noted critic of Big-Tech Matt Stoller in his usually-pessimistic newsletter *BIG* in this way:

*The executive order does a lot, but to put it simply, if there were a way to write an executive order just for readers of this newsletter, that's what this order would be.*  
[[Stoller](#)]

Readers of this whitepaper will note there are substantial differences between the philosophy of Big Tech companies like Facebook--a publicly-traded, for-profit corporation built on the auction of its users' privacy to the highest bidder--and decentralized, open-source blockchain technologies. The public will not make such an easy distinction between the two, particularly if political entities find it useful to

conflate them, and promote conflation of them among the public, for their own purposes. Also, Elon.

## **2: Proof of Space and Time (POSaT)**

The Chia Blockchain Network was created in part as a solution to the centralization and environmental issues rising for Bitcoin and similar proof of work blockchains. Chia represents an “attempt to improve on Proof of Work-based blockchains with a new consensus algorithm we call Proof of Space and Time,” notes the Chia Business White Paper, adding that

*Instead of consuming massive amounts of electricity and wasteful single-purpose ASIC hardware to validate transactions, Proof of Space leverages the over-provisioned exabytes of disk space that already exist in the world today. [[White Paper](#)]*

The Chia Blockchain Network was created by Bram Cohen, founder of Bittorrent. Cohen’s proposed consensus algorithm reduces energy consumption in a distributed consensus process dramatically by relying on Proofs of Space combined with a veritable delay function. The Chia Green Paper gives a technical overview of the challenges of designing a blockchain without relying on the energy intensive processes necessary for proofs of work: Chia alternates proofs of space with proofs of time (the veritable delay function), combined with difficulty adjustments modified from Bitcoin’s original approach to prevent attacks that this new approach is otherwise open to [[Cohen & Pietrzak](#)]. The resulting blockchain requires no synchronisation and provides “rigorous security guarantees.” The making available of space by a contributor to the Chia network is referred to as “Farming” as opposed to the computational effort undertaken by “Miners” of bitcoin or other proof-of-work

coins. Farmers receive rewards that will inevitably be distributed based on space committed, or, in Chia parlance, "Plots."

### **3: Criticisms of POSaT**

The Proof of Space and Time (POSaT) mechanism has nonetheless been criticized for several reasons. We discuss 3:

#### **'The Cost of SSD is Too Damn High'**

Hard drive cost has already been driven up by Chia Farmers, illustrating that there will certainly be non-zero environmental costs associated with Farming Chia, in the form of actual physical waste from a new market pressure on SSD drives.

And, while Chia Farming reduces energy consumption several orders of magnitude per transaction as compared to Proof of Work efforts in Bitcoin, one cannot equate even dramatic improvements in energy efficiency with the elimination of energy requirements. In particular, there is an energy-intensive, and thus environmentally problematic, process that Chia Farming requires: Plotting. Plotting is the process by which a Chia farmer prepares harddrive space to be reserved for Farming on the Chia network. It is energy intensive and physically demanding on the hard drives. Were Chia Farming to be primarily a Plotting and Re-Plotting process, Green claims about environmental benefits of POSaT relative to PoW would be somewhat dubious. It follows that the less plotting one does per coin yielded, the more environmentally sound one's farm is.

The environmental costs from Plotting can be reduced (on a per-coin yielded basis) through the

process of "recycling" plots, which we discuss below and which is a central, non-unique feature of Spare farming.

### **'Miners Gonna Mine'**

A second criticism of Green arguments about Chia is that Farming Chia, regardless of how much more energy efficient it is than Bitcoin, is increasing total worldwide environmental expenditures for cryptocurrency-seeking. This argument points out that the 30+ EiB of space plotted for Chia by farmers (as of this writing) does not represent a reprovisioning of hardware or of energy that would have been used otherwise by miners of Bitcoin; rather, it's predominantly additional energy and space being committed beyond the current Bitcoin network.

This argument accurately points out that if Chia was eradicated from the planet tomorrow, the absence of additional EiB's of space being plotted for Chia Farming tomorrow would represent a net reduction in Environmental cost relative to present projections.

We find this criticism to be, ultimately, an unconvincing one, because it reduces to a suicidal solution: were humans to eradicate not just Chia but ourselves as a species entirely by tomorrow, we would permanently solve the emissions problem. Environmentalist arguments about emissions presuppose the value of the human lives being affected by the follow-on effects of those emissions; therefore, emission reduction efforts are and should be evaluated for their tradeoffs to the value of human lives. We believe it is most valid to evaluate POSaT cryptocurrency in similar context, with a presupposition that the value provided by decentralized currencies is sufficient to justify their existence at a non-zero cost to the environment; granting this, it is reasonable to evaluate the relative extent to which POSaT impacts the environment destructively. And as a far less

computationally intensive process than PoW, POSaT enables blockchain networks that are and will continue to be orders of magnitude less environmentally destructive per transaction than PoW Blockchain networks.

The preceding argument supportive of POSaT does not relieve one of the responsibility to evaluate the true environmental costs of Farming Chia or other POSaT coins. It instead introduces a responsibility for a cryptocurrency enthusiast to evaluate their contribution to global emissions, and to reevaluate them as they make their specific choices about what and how to mine, farm, or trade. Where there are levers for affecting one's contributions to global emissions, a sincere adherent to the philosophy above is ethically compelled to pull them.

Spare believes the Chia network provides just such a lever in the form of Plot Recycling, discussed later as a central feature of the Spare network and a central pillar of our philosophy.

### **'Think Small'**

The adoption of Chia has been explosive. The ability for anyone in the world to be able to farm Chia, even on an old hard drive or laptop, has driven speedy growth. However, as Chia's network has grown, and the likelihood of receiving rewards has decreased, many would-be Chia farmers are sitting idle with dedicated, plotted hard drives and farming setups. This underutilization has created waste in the ecosystem and is unfortunate: the resource-intensive plotting procedure has been completed, and the resource-minimal farming process is going underutilized for lack of incentive in the massive network.

The size of the Chia network also presents problems for decentralization. As incentives become sparse for individual farmers, resources will inevitably be centralized and grouped. Dairy farmers form co-ops; Chia

farmers form pools. Such pooling of resources foreshadows an inevitable march toward centralization of resources in fewer and fewer hands. More middlemen means more opportunity for graft; larger pooled earnings means more incentive for the same.

Strictly speaking, a network able to incentivize small farmers to stay small would realize maximally distributed consensus.

#### **4: Synchronous Harvest Tolerance**

The environmental soundness of POSaT farming on the Chia network is a function of farmer behavior. The largest lever for reducing environmental cost on a per-coin yielded basis is Plot Recycling.

Through Plot Recycling, a Chia farmer can simultaneously farm multiple POSaT coins that are forks of the Chia blockchain. This means that without any reduction in a farmer's Chia yield, they can begin concurrent harvesting of any number of other coins, provided those coins tolerate synchronous harvest<sup>1</sup>. Such coins are hereafter referred to as Recyclable Coins.

Enter Spare.

#### **5: Spare Popularizes Recycling of Plots**

Spare piggybacks off the innovative efforts of Bram Cohen and Chia, utilizing the same POSaT mechanism as a fork of Chia. It is equivalently open source and secure.

Farming Spare doesn't require additional plotting of harddrives, so it happens with near-zero environmental impact. Farming Spare thus increases coin yield per plot for a Chia farmer dramatically, reducing

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<sup>1</sup>Consideration was given to the descriptive moniker *Synchronous-Harvest-Tolerant Coins*; but *Recyclable Coins* was judged syllabically (and acronymically) superior.

in real terms the amount of environmental harm caused by Chia Plotting.

This inherited feature of reusing the plots already plotted by a Chia farmer is the first of 4 Pillars of Viability of Spare described below. But the idea of Recyclable Coins runs deeper for the creators of Spare than a mere feature. We believe that Recyclable Coins represents the only sustainable solution to the problems of centralization and environmental degradation. We thus set out to popularize and grow familiarity with this process of recycling.

Paramount is the comfort of new farmers just adopting Spare, who must, if recycling is to be accomplished, provide to the Spare farming application their 24 word mnemonic key that maps to their Chia Plots. If user willingness to provide this key cannot be achieved by the front-end application, concurrent farming of Recyclable Coins is impossible, and all the benefits of recycling Chia plots are lost.

Savvy readers are aware that vetting the open source codebase of Spare or any Chia Fork is the only necessary and sufficient method for evaluating the security of the application. Practical readers, savvy or no, will admit that the greater part of even technical farmers of Spare will not review the codebase closely, and that an application's front-end design will have an outsized impact on farmer perception of security and willingness to trust the application with their 24-word key.

We, being at least practical, recruited top-notch product designers to design the front end of the Spare application in order to minimize friction and increase comfort and trust during the onboarding process, and we count these designers among the individuals holding premined Spare coins and/or large amounts of Spare, alongside current executives at successful product companies, dedicated back-end engineers, and a Philosopher King/copy editor.

Our objective is to encourage the community of cryptocurrency enthusiasts of all types toward the environmentally superior method of farming Recyclable Coins. We are encouraged by the high number of Recyclable Coins Chia network enthusiasts continue to produce.

Our perspective on the relationship between design, ease of use, and maximal dispersal of nodes will be discussed later as the fourth of our Pillars of Viability.

## **6: Spare's 4 Pillars of Viability**

1. Recycling Existing Plots (inherited)
2. Open Source Code Base (inherited)
3. Economic incentive for Improvement
4. Maximum Dispersal of Nodes through Ease of Use

### **1. Recycling Existing Plots (inherited)**

Discussed above.

### **2. Open Source Code Base (inherited)**

As table stakes for decentralized currencies, and fully inherited<sup>2</sup> from the Chia code base, Spare's open source code base will not be discussed.

### **3. Economic incentive for Improvement**

Spare represents a commitment to community development and coin success, balancing the legitimate need for developer and designer incentives against the risk of either a depressive long-term pre-farm like Chia's, or the risky prospect of full dependence on open-source goodwill in the form of zero pre-farm.

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<sup>2</sup>The method of inheritance is [diagrammed in this figure](#)\*

\*diagram inherited from [original](#)

Striking a balance here, Spare held a 5 million coin pre-farm that was split between the original creators and an incentive pool. This pragmatically-sized pre-farm means that a month after launch, the community of small farmers already held greater than 10% of outstanding Spare coins, a marker that won't be reached by the Chia community for years to come. Within 2 years, the community of Spare farmers will hold well over 50% of all Spare in circulation.

In the meantime, development continues and will continue on Spare, with the intention of inviting participation not just for the technically savvy, but for open-source currency enthusiasts and practical transactors everywhere. On our roadmap is a nearterm listing at top exchanges, Windows and Mac clients, and a mobile application to grow farming and Recyclable cryptocurrency interest and usage among the untechnical. We believe that the Chia network will continue to provide ways for small farmers to participate in Recyclable Coin farming, and we intend to develop Spare toward usage by the smallest farmers and the broadest base of users possible.

As discussed, we encourage the simultaneous farming of as many additional Recyclable Coins as possible, and we thus envision a high number of worthwhile coins to farm. We believe the development requirements to maintain that ecosystem will tax the open source community. Our pre-farm gives us the opportunity to recruit community members to more intensive projects that require and justify legitimate investment. We believe the advantages here to the community will become increasingly clear in time if they are not already to the reader.

#### **4. Maximum Dispersal of Nodes through Ease of Use**

Until Cryptocurrency is easy to Farm and enjoyable to transact with, mass adoption will not happen.

Spare creators believe this is a user experience design problem. Good front-end design and user experience is not window dressing. We believe its absence is a central failing of cryptocurrencies to date.

The lack of ease-of-use in cryptocurrency is not merely a missed opportunity for wider adoption; it's also a security threat, as accumulation of influence in consensus algorithms by experts and powerful interests is inherently destabilizing. The more that Spare feels like a consumer application, the greater the network security attained through dispersed adoption of farming.

As discussed previously, deeply embedded in the Spare ethos owing to our blend of original creators is a design ethic absent from every other cryptocurrency, and certainly from today's ecosystem of Recyclable Coins.

Spare creators are committed to promoting maximal dispersal of farming nodes, and we will do so in part through top-notch front-end development, a roadmap that reaches out to the non-technical community, and a user experience that we hope other Recyclable Coins will emulate.

Further, by encouraging and supporting Recycling, Spare will negate to a real extent the incentive for pools and the march toward centralization that they portend. The smoothing of farmer yield that pools provide to the small farmer will be accomplished without stifling distribution of nodes through growth in Recycling across a large set of coins.

## **7: Conclusions**

Spare's Four Pillars of Viability represent our beliefs about what it will take for decentralized currency to become environmentally responsible and broadly adopted.

Our vision supports and is supported by the small farmer, with smoothed yields obtained through broad recycling of plots across numerous Recyclable Coin. We believe incentivized continuous development of Spare, with an emphasis on ease of use, is the best route to broad adoption of environmentally sustainable, fully decentralized cryptocurrency.