Loki: Analysing the Emissions Scheme for Proof of Stake

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Executive Summary

Due to the impending switch to a Proof of Stake system, Loki will soon be removing mining rewards from the Loki emissions schedule. In this paper, I analyse various options to replace the current rewards scheme, modelling the projected impact of each option on the Loki Service Node network and the wider Loki economy. I then present a proposal for the optimal emissions scheme to be implemented upon Loki's transition to Proof of Stake.

Important Notice

This document makes reference the future technical and market performance of the Loki cryptographic coin. Any predictions or analysis made in this document is purely hypothetical and the actual real-world behavior of the Loki cryptographic coin may be affected by a number of other factors, including attacks on the network or bugs in the code, that may render the analysis made in this document incorrect or otherwise invalid. This document is not, and should not be considered, financial or legal advice. Those parties not operating a Service Node should not rely on the examples when deciding whether or not to participate in the Loki project. This document should be read together with the Loki whitepaper published and other publications by Loki.

1. Introduction

Loki is going full Proof of Stake. Instead of relying on miners to produce blocks and order transactions, this will now be left to the Service Node network. This will mean that upon the activation of Proof of Stake something else will need to be done with the 45% of the block reward that is currently handed to miners.

Unlike many Proof of Stake blockchains, Loki will have had the advantage of ample distribution prior to the activation of 100% PoS. Many of the criticisms of Proof of Stake arise from the unclear strategies for ensuring adequate decentralization in the resulting block producers. In the case of EOS, evidence of collusion exists even with as many as 21 block producers. Loki, however, was amply distributed during the premine through the initial fundraising period, and further distributed in the subsequent 2 years

since the launch of the mainnet to miners. As a result, it is very difficult to argue that there has not been enough time for distribution to occur. I estimate that there are approximately 180 individual Service Node operators based on the number of wallets that the Service Node network points to, who will all participate in block creation.

With a suitable backdrop and adequate research and development into the specific implementation of 'masternode' style Proof of Stake, Loki is well placed to adopt this new type of blockchain system[1].

We have now had plenty of time to observe the real-world dynamics of the Loki Service Node ecosystem and have a more in-depth understanding of the behaviours of Service Node operators. We can now safely discard many of our earlier assumptions and rely instead on more accurate estimates using this new data to make informed decisions about proposed changes to the emissions scheme.

In this paper, I aim to answer the question: "What should be done with the block reward once miners are out of the picture?"

In order to reach an answer, I will review each of the main components of the Loki Service Node economics scheme and collate the most relevant aspects into a new model, using new data we have collected in the last year. We can make newer, better informed assumptions using this data.

2. Reviewing the LSR

The Loki Staking Requirement (LSR) was the primary topic of discussion in the last paper that was written on this subject of cryptoeconomics[2]. For the purposes of this discussion, I will briefly touch on some updated figures in reference to this issue and then remove the LSR as a point of contention in this problem and assume that 15000 Loki is a high enough LSR to make the cost of running a node negligible in comparison to rewards in a range of price scenarios. This will remove a lot of complexity from the model, and allow us to focus on the matter at hand.

The primary question when defining the LSR is this: Given a particular rewards schedule for Loki Service Nodes, at what LSR value can we reasonably ensure that the

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[1] "loki-improvement-proposals/LIP-5.md at master · loki-project ...." 17 Sep. 2019, https://github.com/loki-project/loki-improvement-proposals/blob/master/LIPS/LIP-5.md. Accessed 29 Oct. 2019.

[2] "Loki Cryptoeconomics - Loki.network." https://loki.network/wp-content/uploads/2019/05/Loki_Cryptoeconomics-2-1.pdf. Accessed 29 Oct. 2019.

real-world costs of running a node are consistently outweighed by Loki Service Node rewards?

The answer is heavily dependent on the price of Loki itself. In the scenario where it costs approximately US$10 per month to run a Service Node, and the price of Loki is US$0.35, naturally, you would need to earn at least 28 Loki in that month to break even on that node. Currently, nodes are earning ~350 Loki per month, far exceeding the 28 Loki in costs.

So, in the current context, the price of Loki could drop by 4x and the returns would still far outweigh the costs. In the last paper, the cost of running a node was probably quite overestimated. Based on recent estimates looking at the predicted Loki Messenger usage and Lokinet usage, the requirements will not be that difficult to meet with around $10-15 USD per month budgeted for a VPS - if a relatively high node count (800+) can be maintained.

However, it is possible for a dangerous downward spiral to occur, whereby an increased load on the network drives up node operating costs, forcing operators off the network, and increasing the costs for the remaining operators to cope with the load. This could occur until service to users becomes significantly disrupted, at which point users would start leaving the network, reducing load, but also devaluing the network. It is for this reason that the node operating costs must be correctly accounted for and that the reward always significantly outweighs the expense of running a node.

One possible solution would be leaving Loki Service Nodes rewards at their current ~14 Loki per block level, and simply removing the miner's reward from the schedule, reducing the overall emission. This is the lower bound of the solutions currently under consideration. As demonstrated, even at this level of emission, the LSR will be high enough to shield the operators from losses caused by a long-term depression in the price of Loki - however it does reduce the network's overall tolerance for this event. The greater the ratio between rewards and operating costs, the less likely short-long term price depressions will trigger downward spirals. I however consider it unlikely that any issues will occur at this current level of Service Node rewards emission.

For the purposes of this discussion, we will rule out LSR as a further consideration for the remaining topics, as we have ascertained that it is not a major factor in this problem.

3. Reviewing the Lockup Ratio

A major component of the previous paper asserted the desirable properties of having a high lockup ratio, and targeting a 50% lockup ratio overall. Although it has taken many months to reach something close to this target, we are now sitting at around 47%, and

have been able to observe the movement of Service Node collateral during times of price volatility to develop a better understanding of the factors affecting the liquidity of the overall supply.

What the last paper failed to consider is that there is probably some ceiling on the number of Loki that ever will be realistically locked up in Service Nodes. Some people, particularly early stage presale contributors, do not stake their Loki, even if it is profitable. I estimate that as much as 5-10 million Loki will never leave their current owner's wallets unless there are substantial increases in market price and liquidity, and some may never leave those wallets all together.

When looking at other PoS and Masternode coins, the highest lockup ratio that we have observed is Zcoin, boasting a 67% lockup ratio and offering 14% per annum on returns even at that extreme lockup level. Zcoin does appear to be an outlier though, with an unusual combination of fast emissions and a high market cap. More typically, most Masternode coins tend to hover around the 40% lockup mark. Dash is another exception, with 55% lockup ratio and offering a meagre 6% returns on new Masternodes, however as the oldest and biggest masternode-style coin, that is no real surprise.

While there is no obvious rule on what the general public considers to be an 'acceptable' rate of return to start running new nodes, there is a definite correlation between liquidity/market cap and the encouragement of new stakers. The larger a coin is, the lower the return equilibrium point will be.

Predicting the lockup ratio is a matter of predicting whether there will be more unstaked Loki being locked up than old operators unlocking their nodes. The stable point at which there are as many people staking in as there are unlocking their stakes can be described as a Staking Equilibrium.

There are several factors that affect the demand side of this equilibrium:

- Overall liquidity of the coin (accessibility, risk perception)
- Perceived upside potential (Speculation)
- Return rate (Annualised return rate)
- Difficulty and cost of node operation

In the last paper[3], it was estimated that the Staking Equilibrium would eventually be reached when the rate of return was around 8%. That may still be the case, but after watching the network for a year and analysing other staking schemes, I have come to believe that the rate of return is a small factor in the demand side when the rate of

[3] "Loki Cryptoeconomics - Loki.network." 16 Jul. 2018, https://loki.network/wp-content/uploads/2018/10/Loki_Cryptoeconomics-1.pdf. Accessed 11 Nov. 2019.

return is below around 12%. This can be substantiated by looking at other masternode coins like Dash, where even though they have a very low rate of return, they still see positive uptake of new nodes due to perceived future value. Below 12%, the competition from other staking coins with higher staking rewards would likely remove any 'masternode' enthusiasts from the pool of potential operators.

During periods of major upwards price movements in Loki, we have observed rapid deployment of new nodes. It is clear that at times, speculators are far more likely to stake new nodes without really considering the rate of return. It is also clear that after making UX improvements with infinite staking, there was a significant increase in the trajectory of nodes coming online versus going offline.

As we can see, there are a number of factors affecting the lockup ratio. Using this ratio as the defining metric of success remains crucial, as the lockup ratio is effectively a measure of the Loki network's degree of market-based Sybil resistance. However, due to the complex array of factors which affect it, the lockup ratio is not easy to pin down in the context of discussing emissions schemes.

For my modelling, I have included an estimated lockup ratio at different points. However, it should be noted that this will be affected by short and medium term market effects in the wild and so should be analysed with a grain of salt.

The basic assumption behind the model that I have generated here is that liquidity will improve over time as the network gains more users. Therefore, as liquidity increases, this is likely to lower the Staking Equilibrium (expected rate of return based on market conditions) over time. For the models discussed today, this assumption is factored in as a descending rate of return from the current 20% annualised return to 10% in 8 years' time.

4. Reviewing the effects of Emission

As this discussion is entirely oriented towards the discussion of the creation of new coins, it is important to review assumptions about what the ongoing creation of new coins does to the ecosystem.

From a macroeconomic point of view, creating new coins devalues every other coin when the overall market capitalisation remains static. This, in economics, is commonly known as the Quantity Theory of Money, where an increase in monetary supply results in the overall value of each unit of currency going down. According to this theory, creating any new coins at all will automatically lead to downward selling pressure to stabilize the overall market capitalisation.

In the case of miners, we have seen numerous instances where miners with access to cheap or free computing power and electricity can exploit this access by mining

cryptocurrencies and immediately selling them to, in essence, print free money (or at least free for them). Gone are the days where speculators have found mining to be a worthwhile and engaging way to acquire new cryptocurrencies, who traditionally have mined cryptocurrencies with the intention of holding them in the long term with the expectation of greater profits. With the lack of this distributed network of speculators, all that is left is a few system administrators and other advanced users who have access to the resources (datacenter spare cycles, FPGAs, ASICs, etc) to extract value from cryptocurrency networks like Loki with a massive advantage compared to private consumer GPU miners.

I am convinced that miners of today simply find what is profitable, mine it, and then immediately sell it. By using tools to analyse the breakdown of pools and miners in most proof of work ecosystems, a small number of players control very large percentages of hash rates, and squeeze the profitability of consumer grade hardware to at or below zero. In this case, the Quantity Theory of Money correctly predicts that the creation of new coins directly causes currency valuation. Miners, in general, only wish to extract value from the currency they produce, and so immediately cause its devaluation upon creation.

The value of each Loki matters, because it directly influences the proclivity of Service Node operators to retain their stake, and for new operators to come online because they are confident they can earn a return on their investment. Therefore, every possible effort to reduce devaluation by emission should be enacted. Needless to say, it is not possible to entirely remove emissions, and as previously explored, leaving the Service Node rewards as they are leaves only a reasonably tolerable risk of network failure, so reducing Service Node rewards is not a good solution to currency devaluation either.

Further to this, I am of the belief that Service Node rewards do not cause immediate devaluation of Loki. Based on the publicly available information on the Loki Blockchain, we could conduct an analysis and see of the Service Nodes that do get deactivated by their operators, what percentage of them get restaked, and extrapolate what the rewards are being used for in this case. However, I am not convinced such an analysis would tell us much about the long-term dynamics of this, so I have omitted it from this discussion. There is enough anecdotal evidence available to give me confidence that Service Node operators are far more likely to retain their Service Node rewards than miners, and either reinvest them into new nodes, or hold on to them with the anticipation of appreciation at some later stage. This does not mean that these rewards will never end up on the market and cause devaluation, but it does mean that this effect is drawn out over months or years as opposed to days, which the Quantity Theory of Money fails to predict.

It is for this reason that I do not think that cutting Service Node rewards will have any positive impact on the price. If anything, lowering Service node rewards would lead to a

lower rate of return, and if that falls below the Staking Equilibrium, then that will actually cause Service Node operators to unlock their Loki and sell it, causing a decrease in price. By extension, I don't think increasing Service Node rewards will have much of a negative impact on the price.

Devaluation by emission is difficult to measure, especially when the market is driven largely by speculators in this pre-product environment. However, I predict that even if the entire mining reward is given to Service Nodes, it will cause an immediate reduction in devaluation by emission. Better still, if the mining reward is removed altogether, this will have an even greater effect. Later in this paper, I will explore the potential effects of systems such as LNS on the ecosystem, which is relevant to this finding.

5. Capturing and modelling the problem

The challenging part of this exercise is striking a balance. The two qualities that we are concerned with are the node count and devaluation by emission. We must find a good balance between improving expected node numbers, and reducing selling pressure over time for the health of the network. I have analysed three different settings for the block rewards and have modelled the relationships of each variable to determine the expected outcomes of each.

Modelling the Relationships

E is the Staking Equilibrium, which is the average return on investment a Service Node operator expects as discussed in heading 2, modelled as:

Date	E	Date	E	Date	E
Feb , 2020	20.00%	Jul , 2022	16.77%	Apr , 2025	13.17%
Jun , 2020	19.50%	Nov , 2022	16.37%	Aug , 2025	12.77%
Sep , 2020	19.20%	Feb , 2023	15.97%	Nov , 2025	12.37%
Jan , 2021	18.77%	Jun , 2023	15.57%	Mar , 2026	11.97%
May , 2021	18.37%	Jan , 2024	14.77%	Jul , 2026	11.57%
Aug , 2021	17.97%	May , 2024	14.37%	Oct , 2026	11.17%
Dec , 2021	17.57%	Sep , 2024	13.97%	Feb , 2027	10.77%
Apr , 2022	17.17%	Dec , 2024	13.57%	Jun , 2027	10.37%

S is the Staking Requirement

C is the Circulating Supply (a function of block reward over time)

B is the Block reward

r is the Reward per node:

$$r = E \times S$$

n is the Node Count:

$$n = a \div r$$

Where a is annual rewards, being:

$$a = (B \times 0.95) \times 720 \times 365$$

L is the Lockup Ratio:

$$L = (n \times S) \div C$$

Which can therefore be represented as:

$$L = (262800(0.95B) \div ES) \div C$$

Three Options

Based on this modelling, I have gathered the following data about 3 options for the block reward. The first is leaving the emission rate as it is, giving the existing mining rewards to the Service Nodes. The second removes the mining reward altogether, diving the remaining 15.4 Loki per block in a 95%, 5% split between Service Nodes and the foundation, and the third is an option that I believe sits in a nice middle ground.

Fig 1. Option 1 - Maintain minimum of 28 Loki per block (as 95% SNs, 5% Foundation)

* Note: This kind of Lockup ratio is unlikely to actualise given the discussed issues in the review

Date	Block Height	Stking Req (S)	Block Rwrd (B)	Circulating Supply (C)	Node Count (n)	Annual Rewards (a)	Reward per node (r)	Staking Equilib. (E)	Lockup Ratio (L)
Feb , 2020	470000	18480	28.66	46,005,973	1936	7154144	3696	20.00%	77.75%*
Jun , 2020	550000	17268	28.28	48,283,338	2097	7060032	3367	19.50%	74.99%*
Sep , 2020	630000	16479	28.12	50,539,217	2219	7020038	3164	19.20%	72.35%*
Jan , 2021	710000	15964	28.05	52,785,966	2338	7003041	2996	18.77%	70.69%*
May , 2021	790000	15628	28.02	55,028,833	2437	6995818	2870	18.37%	69.22%*
Aug , 2021	870000	15410	28.01	57,270,052	2526	6992749	2769	17.97%	67.96%*
Dec , 2021	950000	15267	28.00	59,510,570	2607	6991444	2682	17.57%	66.88%
Apr , 2022	1030000	15000	28.00	61,750,790	2715	6990890	2575	17.17%	65.95%
Jul , 2022	1110000	15000	28.00	63,990,884	2780	6990654	2515	16.77%	65.16%
Nov , 2022	1190000	15000	28.00	66,230,923	2847	6990554	2455	16.37%	64.49%
Feb , 2023	1270000	15000	28.00	68,470,940	2919	6990511	2395	15.97%	63.94%
Jun , 2023	1350000	15000	28.00	70,710,947	2994	6990493	2335	15.57%	63.51%
Oct , 2023	1430000	15000	28.00	72,950,950	3073	6990486	2275	15.17%	63.18%
Jan , 2024	1510000	15000	28.00	75,190,952	3156	6990482	2215	14.77%	62.96%
May , 2024	1590000	15000	28.00	77,430,952	3244	6990481	2155	14.37%	62.84%
Sep , 2024	1670000	15000	28.00	79,670,952	3337	6990480	2095	13.97%	62.82%
Dec , 2024	1750000	15000	28.00	81,910,953	3435	6990480	2035	13.57%	62.91%
Apr , 2025	1830000	15000	28.00	84,150,953	3539	6990480	1975	13.17%	63.09%
Aug , 2025	1910000	15000	28.00	86,390,953	3650	6990480	1915	12.77%	63.38%
Nov , 2025	1990000	15000	28.00	88,630,953	3768	6990480	1855	12.37%	63.78%
Mar , 2026	2070000	15000	28.00	90,870,953	3894	6990480	1795	11.97%	64.28%
Jul , 2026	2150000	15000	28.00	93,110,953	4029	6990480	1735	11.57%	64.91%
Oct , 2026	2230000	15000	28.00	95,350,953	4173	6990480	1675	11.17%	65.65%
Feb , 2027	2310000	15000	28.00	97,590,953	4328	6990480	1615	10.77%	66.53%
Jun , 2027	2390000	15000	28.00	99,830,953	4495	6990480	1555	10.37%	67.55%

Fig 2. Option 2 - Drop to 15.4 Loki per Block (Remove the mining reward entirely, dividing what's left 95% SNs, 5% Foundation)

Date	Block Height	Stking Req (S)	Block Rwrd (B)	Circulating Supply (C)	Node Count (n)	Annual Rewards (a)	Reward per node (r)	Staking Equilib. (E)	Lockup Ratio (L)
Feb , 2020	470000	18480	16.06	46,005,973	1085	4008428	3696	20.00%	43.56%
Jun , 2020	550000	17268	15.68	47,275,338	1162	3914316	3367	19.50%	42.46%
Sep , 2020	630000	16479	15.52	48,523,217	1225	3874322	3164	19.20%	41.59%
Jan , 2021	710000	15964	15.45	49,761,966	1288	3857325	2996	18.77%	41.30%
May , 2021	790000	15628	15.42	50,996,833	1341	3850102	2870	18.37%	41.11%
Aug , 2021	870000	15410	15.41	52,230,052	1390	3847033	2769	17.97%	41.00%
Dec , 2021	950000	15267	15.40	53,462,570	1434	3845728	2682	17.57%	40.95%
Apr , 2022	1030000	15000	15.40	54,694,790	1493	3845174	2575	17.17%	40.95%
Jul , 2022	1110000	15000	15.40	55,926,884	1529	3844938	2515	16.77%	41.00%
Nov , 2022	1190000	15000	15.40	57,158,923	1566	3844838	2455	16.37%	41.10%
Feb , 2023	1270000	15000	15.40	58,390,940	1605	3844795	2395	15.97%	41.24%
Jun , 2023	1350000	15000	15.40	59,622,947	1647	3844777	2335	15.57%	41.42%
Oct , 2023	1430000	15000	15.40	60,854,950	1690	3844770	2275	15.17%	41.66%
Jan , 2024	1510000	15000	15.40	62,086,952	1736	3844766	2215	14.77%	41.94%
May , 2024	1590000	15000	15.40	63,318,952	1784	3844765	2155	14.37%	42.26%
Sep , 2024	1670000	15000	15.40	64,550,952	1835	3844764	2095	13.97%	42.65%
Dec , 2024	1750000	15000	15.40	65,782,953	1889	3844764	2035	13.57%	43.08%
Apr , 2025	1830000	15000	15.40	67,014,953	1947	3844764	1975	13.17%	43.57%
Aug , 2025	1910000	15000	15.40	68,246,953	2008	3844764	1915	12.77%	44.13%
Nov , 2025	1990000	15000	15.40	69,478,953	2073	3844764	1855	12.37%	44.75%
Mar , 2026	2070000	15000	15.40	70,710,953	2142	3844764	1795	11.97%	45.44%
Jul , 2026	2150000	15000	15.40	71,942,953	2216	3844764	1735	11.57%	46.20%
Oct , 2026	2230000	15000	15.40	73,174,953	2295	3844764	1675	11.17%	47.05%
Feb , 2027	2310000	15000	15.40	74,406,953	2381	3844764	1615	10.77%	47.99%
Jun , 2027	2390000	15000	15.40	75,638,953	2473	3844764	1555	10.37%	49.03%

Fig 3. Option 3 - Drop to 20 Loki per Block (95% SNs, 5% Foundation)

Date	Block Height	Stking Req (S)	Block Rwrd (B)	Circulating Supply (C)	Node Count (n)	Annual Rewards (a)	Reward per node (r)	Staking Equilib. (E)	Lockup Ratio (L)
Feb , 2020	470000	18480	20.66	46,005,973	1395	5156864	3696	20.00%	56.05%
Jun , 2020	550000	17268	20.28	47,643,338	1503	5062752	3367	19.50%	54.49%
Sep , 2020	630000	16479	20.12	49,259,217	1588	5022758	3164	19.20%	53.11%
Jan , 2021	710000	15964	20.05	50,865,966	1671	5005761	2996	18.77%	52.44%
May , 2021	790000	15628	20.02	52,468,833	1741	4998538	2870	18.37%	51.87%
Aug , 2021	870000	15410	20.01	54,070,052	1804	4995469	2769	17.97%	51.42%
Dec , 2021	950000	15267	20.00	55,670,570	1862	4994164	2682	17.57%	51.07%
Apr , 2022	1030000	15000	20.00	57,270,790	1939	4993610	2575	17.17%	50.79%
Jul , 2022	1110000	15000	20.00	58,870,884	1985	4993374	2515	16.77%	50.59%
Nov , 2022	1190000	15000	20.00	60,470,923	2034	4993274	2455	16.37%	50.45%
Feb , 2023	1270000	15000	20.00	62,070,940	2085	4993231	2395	15.97%	50.38%
Jun , 2023	1350000	15000	20.00	63,670,947	2138	4993213	2335	15.57%	50.38%
Oct , 2023	1430000	15000	20.00	65,270,950	2195	4993206	2275	15.17%	50.44%
Jan , 2024	1510000	15000	20.00	66,870,952	2254	4993202	2215	14.77%	50.57%
May , 2024	1590000	15000	20.00	68,470,952	2317	4993201	2155	14.37%	50.76%
Sep , 2024	1670000	15000	20.00	70,070,952	2383	4993200	2095	13.97%	51.02%
Dec , 2024	1750000	15000	20.00	71,670,953	2454	4993200	2035	13.57%	51.35%
Apr , 2025	1830000	15000	20.00	73,270,953	2528	4993200	1975	13.17%	51.76%
Aug , 2025	1910000	15000	20.00	74,870,953	2607	4993200	1915	12.77%	52.24%
Nov , 2025	1990000	15000	20.00	76,470,953	2692	4993200	1855	12.37%	52.80%
Mar , 2026	2070000	15000	20.00	78,070,953	2782	4993200	1795	11.97%	53.45%
Jul , 2026	2150000	15000	20.00	79,670,953	2878	4993200	1735	11.57%	54.18%
Oct , 2026	2230000	15000	20.00	81,270,953	2981	4993200	1675	11.17%	55.02%
Feb , 2027	2310000	15000	20.00	82,870,953	3092	4993200	1615	10.77%	55.96%
Jun , 2027	2390000	15000	20.00	84,470,953	3211	4993200	1555	10.37%	57.02%

Fig 4. Emission Curve Comparison

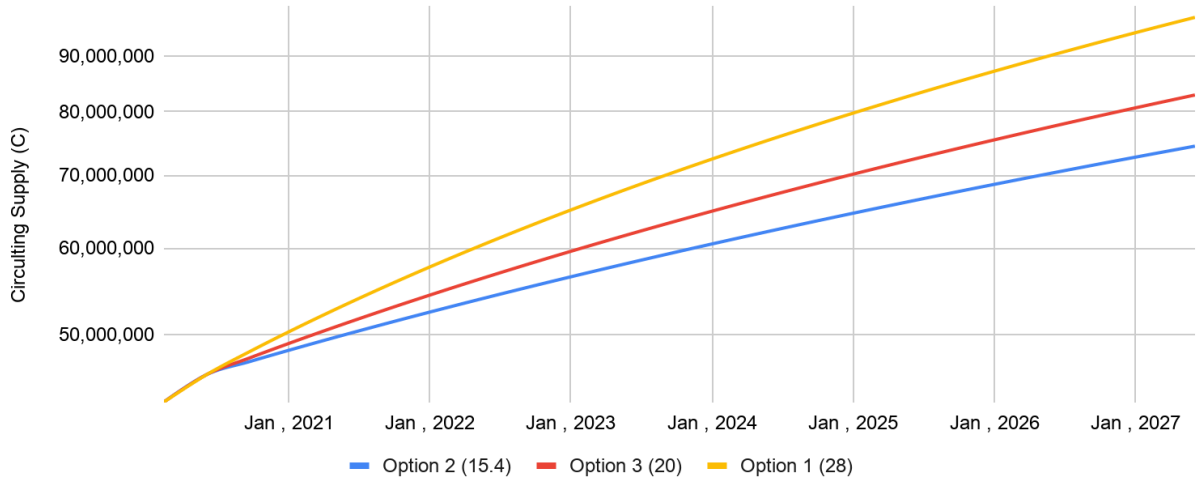
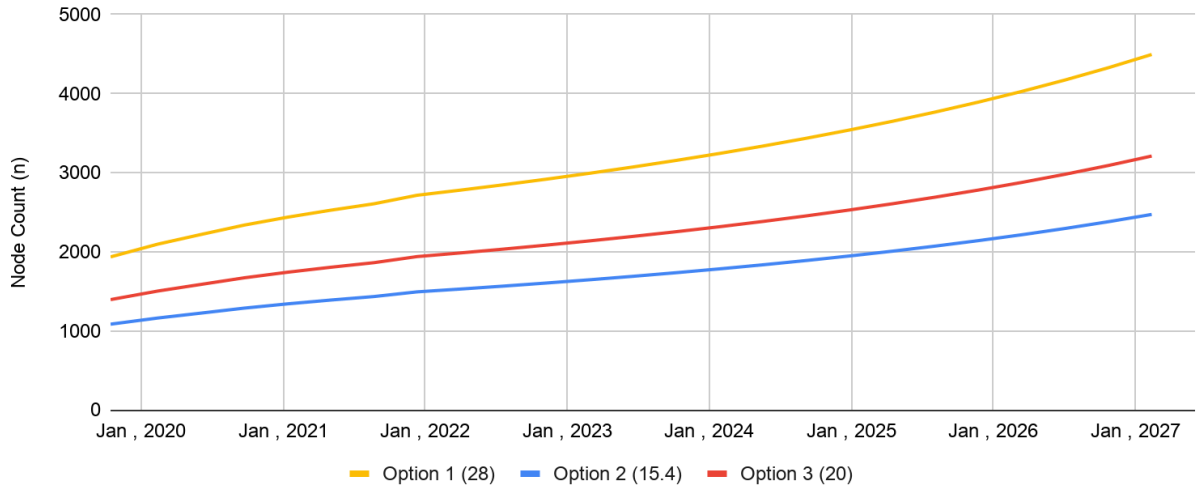


Fig 5. Expected Node Count Comparison



6. Final Assessment

Option 1, where the current mining rewards are directed to Service Nodes, seems foolish to me. With a block reward of 28, the first two years would put the Lockup Ratio higher than any other major Masternode coin, which I don't think will actually be possible anyway. Under this condition, Service Nodes will be receiving extra rewards without having any substantial effect on the lockup ratio for the first two years. This is just additional emission that could cause additional selling pressure for no extra gain.

However, it must be said that this model certainly prepares Loki the best for a situation in which a heavy load is placed on the network, and a higher node count is required to account for it. Not, however, to the extent that I think this course of action is appropriate, as the increase in nodes is only around 40% in 2021, compared to an emission rate that is nearly double what is has to be.

Looking at Option 2, with the updated figures we can certainly see that the current block reward for Service Nodes is not as strong as we had originally anticipated using the older model, where the lockup ratio was fixed instead of the rate of return. The node count at this level is still reasonable, with a Dec 2021 figure of 1434, however this may not be high enough if the network is put under extremely high loads. The lockup ratio is also not expected to readily exceed 50% under the new model. In times of price depression, this option also provides a lower tolerance for USD operating costs of Service Nodes.

Option 3, on the other hand, provides a node count of 1862 (~30% increase) in Dec 2021 for a ~30% increase in the block reward in comparison to Option 2. This limited increase in block reward meets a middle ground, where there is a healthy Lockup ratio (above 50%), improved node count, and still significantly reduced emission from the current model with mining. It also would not cause theoretically unlikely Lockup ratios, and also increases the network's insulation from increasing USD costs to operate nodes.

I therefore propose that the Loki Community and the Loki Foundation support altering the lower bound of block rewards to being 20 Loki per block.

7. Other things to note:

7.1 Reduction in number of Loki granted to the Loki Foundation

Implementing the proposed change would result in the Loki Foundation receiving less Loki per block than it currently receives if the ratio is left at 5% of the block reward. In the current scheme, the Foundation receives 1.4 Loki per block, which is 367,920 Loki per year. If the proposal is accepted, it will only receive 1 Loki per block, which is 262,800 Loki per year, a decrease of 105,120 per year.

The Foundation does have a policy to run no more than 10% of the node network, so an increase in Service node rewards would also increase the amount of Loki it receives. If Option 3 is implemented, the annual Foundation Service Node reward will be 499,320 Loki, compared to the current 384,476 Loki per year, an increase of 114,844 per year. However, to date this 10% figure has never actually been achieved, with the number always being no more than slightly less than 10% of the network. It is therefore unlikely

that the change to Option 3 will have any noticeable effect on the number of Loki the Foundation receives.

As a sitting member of the Loki Foundation board, I need to disclose my potential bias. However, I do think it is important for the community know how this will effect Foundation funding, which in this case is negligibly, but I do think there does need to be a further conversation about Foundation funding into the future. Even at $2 per Loki, the Foundation reward would barely cover current annualised costs of the project, so I think a deeper conversation about this is worthwhile.

7.2 Effects of LNS and other 'burning' features

Throughout this analysis, I have omitted the potential effects of previously discussed ideas to 'monetize' the network and give Loki another utility-token like quality. We have had several ideas over the course of the last year on things that users of the Loki suite could pay for in a permissionless, decentralised manner, that would enhance their experience on the platforms without disadvantaging users who are unable or unwilling to pay for such features.

The main idea that has been floating around for several months now is that of the Loki Name System (LNS). LNS can be used to replace complicated pubkey addressing with a simple blockchain based domain-name like system that allows users to share their messenger address, SNApp address, or wallet address in a human readable, context driven format. For instance, I could buy the LNS name simon.loki, and then anyone typing in the name 'simon' in the search bar of the Loki Messenger would immediately find my public key and be able to contact me without having to copy and paste my public key or scan my QR code. Similarly, if I had a SNApp running where I was selling cool Loki t shirts, I could buy the name merch.loki and anyone accessing that domain name over Lokinet would be connected to my SNApp.

Instead of paying Service Nodes the fee to register these names, the concept instead is that the fee is provable 'burned' - the fee is now unspendable and effectively is removed from the supply of Loki altogether.

This concept is interesting, because it uniformly distributes the value of that 'burn' across the whole Loki market. Instead of favouring any particular group of Loki users, everyone benefits in the long term by the value of that burned Loki being captured for all eternity.

In the case where an LNS name is worth 30 Loki (~$10USD at the time of writing), a handful of purchased names really won't have any noticeable impact on the price. In order for this system to be truly impactful, there needs to be hundreds of thousands or even millions of users of the Loki product suite. This is a huge challenge for the Loki Project, as any type of consumer apps struggle to achieve these kinds of numbers.

However, the theoretical benefits of this system can be easily demonstrated. Where there are 1 million daily active users of the Loki Messenger, which is a very small number in comparison to most successful chat apps, and it is assumed that 1 in 20 of these users each decide to buy 1 LNS name on average, that would equate to 1.5 million Loki that is purchased off the market, and can never again be sold.

Of course, it is difficult to predict how many users there will be, and how likely they would be to actually purchase a name, but when coupled with other advanced monetisation features, it is likely that this can have a very positive effect on the Loki markets over time.

In the above example, 50,000 names at 30 Loki a piece per year would offset 30% of the entire block reward once the block reward reaches the asymptote of 20 Loki per block if Option 3 is selected. You can probably easily extrapolate that an increase in Loki price would reduce the number of Loki burned as a utility token, but you can also probably see that there exists potential for this monetisation to completely offset all newly emitted coins. If this ever occurred, that probably wouldn't be as good as it sounds, as it could result in stalled node count growth. However, I consider this outcome relatively unlikely.

To summarise why I think discussing monetisation is important, the Staking Equilibrium, as discussed, is affected by the perceived stability, accessibility, liquidity, and upside potential of Loki itself. Successful monetization does more than eliminate selling pressure over time: It will also help drive down the Staking Equilibrium, which will result in an increased lockup ratio and a higher node count.

In terms of its effect in this discussion, monetization is still some time away, and I don't think it is a convincing argument to increase the reward given to Service Nodes any more that is suggested here, because while it will decrease the circulating supply, the important thing under consideration is how much Loki per year is being emitted to Service Nodes, as that number is far more important when calculating things like Lockup and Node count, than the actual circulating supply.

8. Conclusion

I have thoroughly analysed the Loki emissions scheme using new observations and propose to the Loki Community and the Loki Foundation that when Proof of Stake is enabled on the Loki blockchain that the emission scheme is altered to confirm with Option 3 described in this paper, where the block reward is altered to reduce to an asymptote of 20 Loki per block, with a Service Node/ Loki Foundation split of 95/5%.