The Shanghai Fork

What is the Ethereum Shanghai Upgrade?

The Ethereum Shanghai (or Shapella) upgrade is a hard fork that is anticipated to go live in mid-April 2023. The upgrade includes many improved features. Most importantly, the fork will allow stakers and validators to withdraw their staked principal and rewards, which are currently locked on the Beacon Chain. Moreover, it will instil more confidence in sidelined investors and institutions to participate in staking Ethereum

How will it affect Ethereum stakers?

Prior to this proposal, Ethereum stakers suffered from suboptimal conditions that prevented the withdrawal of any Ethereum that had been staked to the Beacon chain from December 2020. This included the 32 ETH principle that is required to run an Ethereum node, in addition to any execution and consensus layer rewards earned since they began staking their ETH.

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A. **Full withdrawals** will involve a validator exiting the beacon chain and stopping their node. The entire balance is submitted into an exit queue mechanism, which is designed to regulate the exit of the validator set and preserve the stability of the network.

B. **Partial withdrawals** involve an automatic sweep of accumulated rewards in excess of 32 ETH, which can be withdrawn after entering into the withdrawal queue. This process represents the most near-term risk to Ethereum's price.

What is expected to happen after the fork?

There are some common misinterpretations of the fork and its expected impact on Ethereum's price. These assumptions centre around the amount & timing of staked Ethereum that will be unlocked.

The argument against all unlocked Ethereum being sold on the market can be isolated to a few critical elements.

1) The Classification of Current Stakers

As of writing, the liquid staking segment contributes ~45% of total Ethereum that is staked. This makeup consists of Lido (stETH) , Rocketpool (rETH), Coinbase (cbETH) & Binance (bETH). With 'liquid' staking primitives growing in popularity, largely due to the 32Ξ bonding restriction, we can argue that a significant proportion of Ethereum stakers are agnostic to this upgrade. Whilst different in their mechanics, each token represents a tokenised share of staked ETH and typically trade close to 1:1 depending on market conditions and liquidity.

Beacon Chain Depositors

Legend: ● Liquid Staking ● Wahles ● CEX ● Staking Pools ● Others

Source: Dune Analytics

These users already have access to **liquidity**, and thus have no incentive to sell their ETH at the upgrade.

Upon the fork, the attention will be focused on the non-liquid (~55%) proportion of Ethereum stakers. Early contributors and believers stake their Ethereum and validate the network because of their overarching belief of where the network can grow to. A sizable (~15%) amount of ETH is staked via centralised exchanges, which is largely constructed of pooled retail holders that are unexpected to sell.

We note that a significant portion (78%) of Ethereum stakers are currently underwater, and view it unlikely that these holders use the Shanghai fork to liquidate their holdings and sell at a loss.

Ethereum Stakers

Legend: ● Underwater ● In the Money
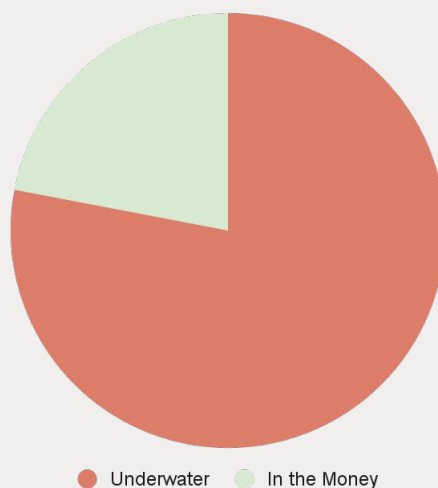
Source: Dune Analytics

2) The Staking Ratio & Sidelined Investors

With sidelined institutions and investors now having increased capacity to stake and withdraw their principal and rewards, we expect distinct supply imbalances to occur after the fork. We have seen strong interest from investors who are willing to operate a node post-Shanghai due to alleviated liquidity concerns, deflationary supply mechanics and ESG benefits. Staking-as-a-service firms have experienced rapid growth, and as a result, staking has become much easier for investors to execute than ever before.

Relative to other proof-of stake networks, Ethereum's ratio of staked assets versus the circulating supply is the lowest of this bracket.

Coin	Staking Ratio	Market Cap (bn)
	71.5%	7.92
	70.9%	11.64
	48.87%	7.25
	39.86%	10.46
	14.87%	188.97

Source: Coingecko

Following the upcoming changes, we expect that Ethereum's staking ratio will increase to above 30% over 2023. New primitives such as liquid staking and Eigenlayer are expected to play a crucial role in driving further growth in this segment.

3) The Exit and Withdrawal Queues

To prevent validators from exiting the system all at once, a "churn limit" was created for full withdrawal submissions. This limit allows only a limited number of validators to exit the system each day. When estimating the total number of active validators expected to be validating around the time of the Shanghai fork, we anticipate that the expected churn limit value will be 8 (rounded down).

Churn Limit = Estimated Number of Active Validators / Churn Limit Quotient
= 575,000 / 65,636 = 8.22 = ~8

Using this limit, we can calculate the expected max amount of validators that can execute full withdrawals each day, assuming the average epoch time is 6.4 minutes.

Max Validators Per Day = *Avg Minutes Per Epoch x Churn Limit*
= *225 x 8 = 1,800*

With the principal amounts fixed to 32 ETH, this means that peak selling pressure that can be generated per day by full withdrawals is 57,600 ETH (32 ETH x 1800 validators) - representing $92m USD (assuming ETH price of 1,600), and less than 0.2% of average daily volume (30d).

The system has been constructed to keep price volatility limited.

The **exit queue** only applies to validators who opt-in for full withdrawals. Partial withdrawals are allowed to bypass the exit queue and go directly to the **withdrawal queue** as long as their validators are still operational.

If we anticipate that 20% of validators will request a full exit, this would represent 287,500 validators assuming that the active validator set is in line with our above estimate of 575,000.

If only 1,800 validators can request an exit per day, it would take roughly 63 days to complete the process. It's worth noting that as the number of active validators declines, the churn limit will also decline, which means fewer validators can submit full withdrawals over time (for simplicity, we assume a fixed limit of 8 in our below table).

As of 08/03, there is 833k Ethereum in excess of 32 ETH reflected as partial withdrawals. This is expected to be closer to 850k at Shanghai, depending on the date of the fork.

Est Partial Withdrawals = *850,000 total; est 180,000 per day for a max of 3.4 days*

We can assess the impact by applying the above logic to potential scenarios at the upgrade.

	Worst Case		Mid Case		Best Case	
	50% 'Full' Withdrawals Requests, 316k Validators Exit **Assumes that a % of LSD stakers also exit** **All 'Partial' Withdrawn ETH is sold**		**50% 'Full' Withdrawals Requests, from illiquid stakers** **50% of 'Partial' Withdrawn ETH is sold**		**20% 'Full' Withdrawal requests from 'illiquid' stakers** **25% of 'Partial' Withdrawn ETH is sold**	
	Full WD Requests	Partial WD	Full WD Requests	Partial WD	Full WD Requests	Partial WD
Total ETH	9,200,000	850,000	5,060,000	425,000	2,530,000	212,500
Days to Complete (MAX)	160	4.33	88	4.33	35	4.33
ETH Per Day	57,600	196,305	57,600	98,152	57,600	49,076
Per Day % of 30d Volume	0.86%	2.93%	0.86%	1.47%	0.86%	0.73%
Per Day Combined	3.8%		2.3%		1.6%	

In our worst-case scenario, we assume that 50% of active validators will submit requests to exit. However, this does not take into account that only 55% of validators are in the illiquid bracket that is most likely to submit full withdrawal requests. Both the mid and best-case scenarios assume that the 55% bracket is the most likely to submit full withdrawal exits due to the liquidity constraints they currently face.

Overall, we expect the selling pressure resulting from the upgrade to be limited, even in a worst-case scenario. We anticipate a neutralising effect of new validators joining and current ones exiting in the short term, and thus most impactful selling pressure will come from partial withdrawals rather than full exits.

Zerocap's View

Although the 32Ξ node requirement remains for native staking post-Shanghai, the easing of liquidity concerns is expected to lead to an increase in staked Ethereum relative to its circulating supply. However, any validators unable to fulfil the remaining amount of Ethereum required to run an additional node may turn to liquid staking alternatives such as Lido. In recent months, liquid staking derivative tokens have surged in popularity as there are no minimum staking requirements or unbonding periods. In addition, these derivatives themselves can now facilitate redemptions for physical Ethereum, thus alleviating any peg concerns that were present previously.

Our scenario analysis of potential outcomes from the upgrade indicates that the potential selling pressure is far lower than initially predicted. Therefore, we believe that the Shanghai event will be a net positive for Ethereum and contribute to long-term price appreciation. Supply flows are likely to be net negative as institutions can stake without liquidity concerns, and we anticipate that some long-term holders will re-stake their rewards rather than selling them to show their commitment to the network.

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