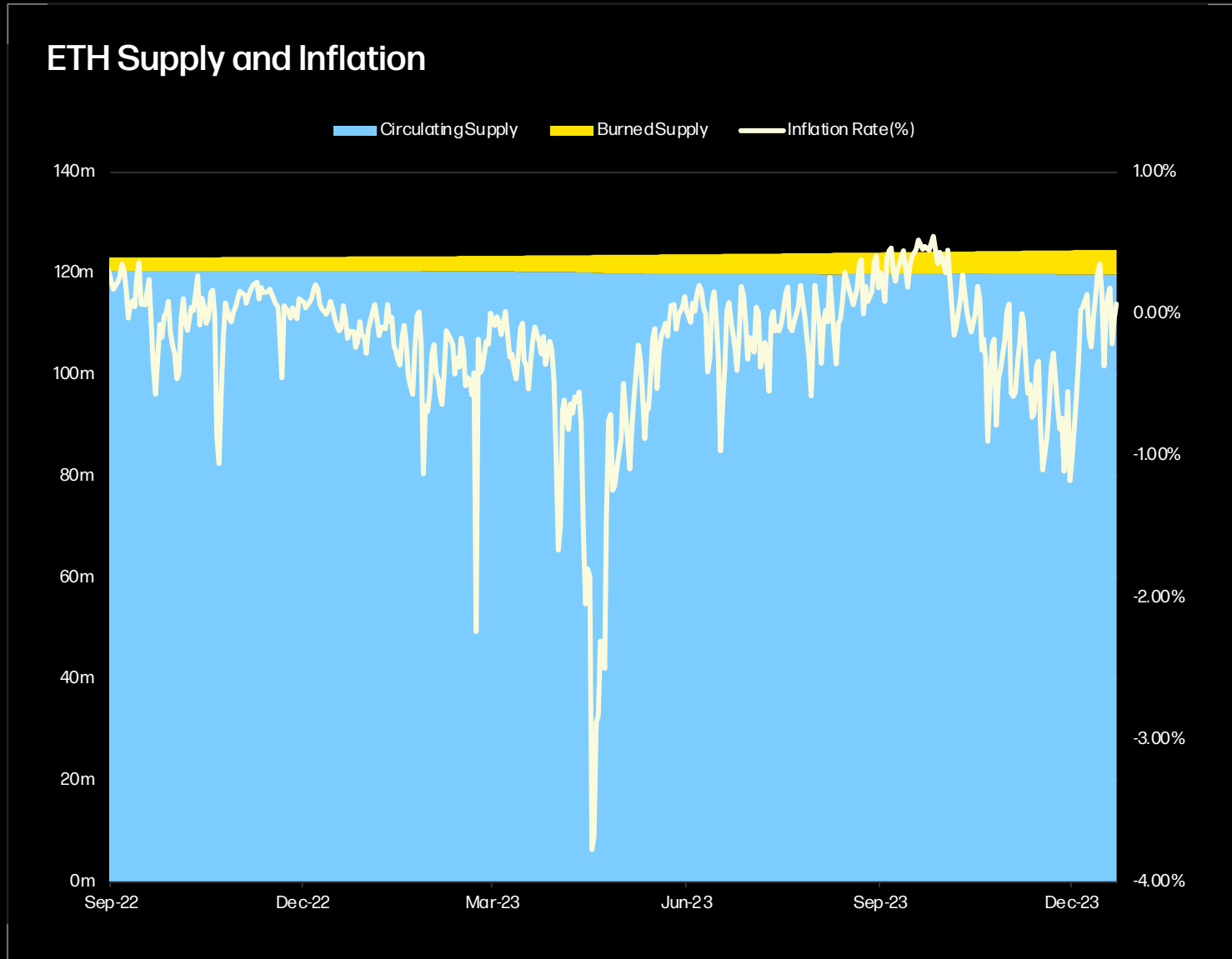


# Ethereum Proof-of-Stake Put to the Test

Challenges to Staking and Modularity



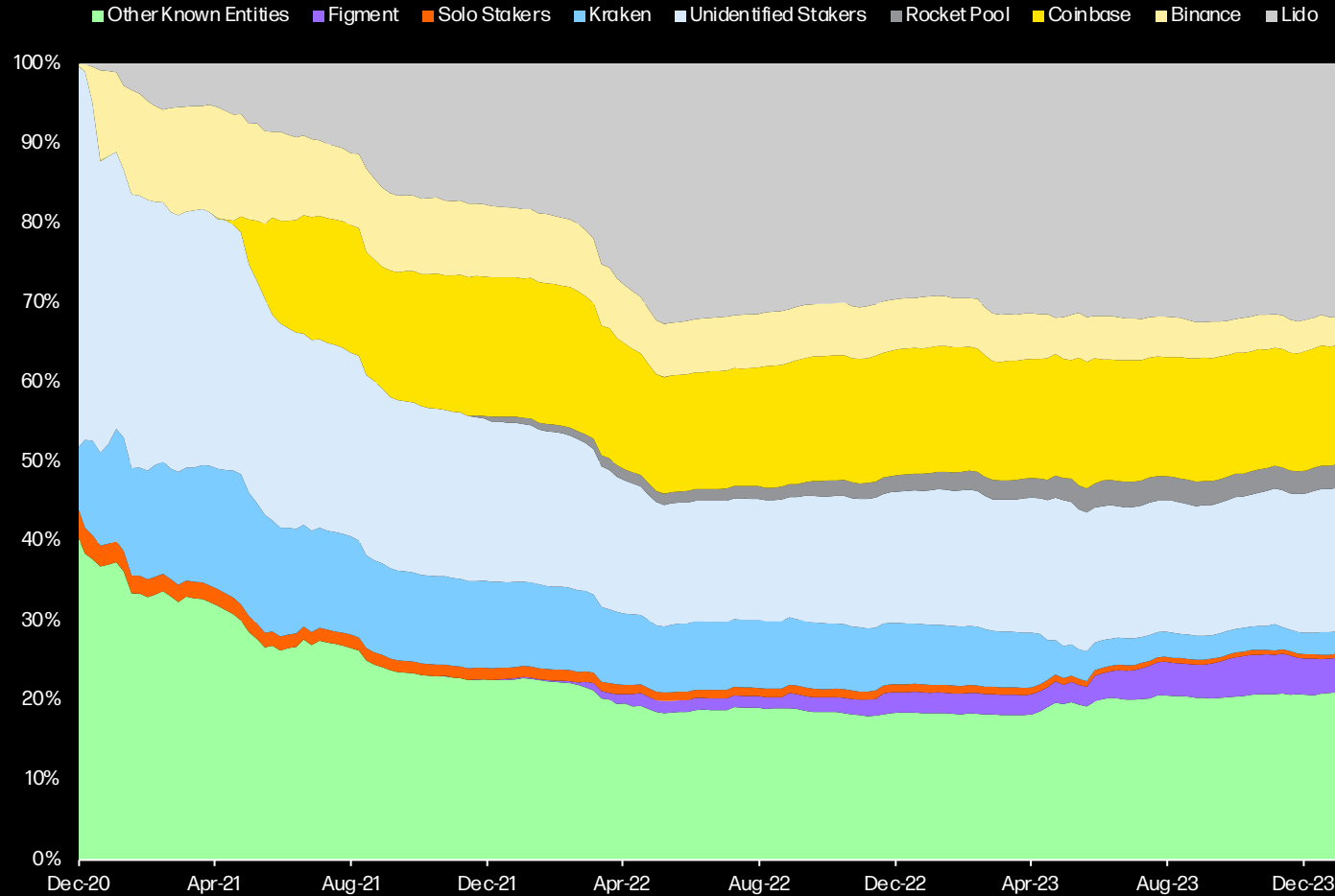
Ethereum is the world's first and most valuable general purpose blockchain. Since the network's momentous upgrade to a proof-of-stake consensus protocol in the fall of 2022, the circulating supply of ether (ETH) has remained relatively unchanged at slightly under 120mn ETH.

This is due to reduced issuance since the transition to proof-of-stake, which has significantly slowed the rate of inflation on Ethereum to consistently below 1%. It is also in part due to Ethereum's burn mechanism, which developers activated back in August 2021 through an upgrade dubbed the "London" upgrade. For the majority of 2023, the daily annualized inflation rate of ETH was negative meaning more ETH has been burned through transaction fees than newly issued through validator rewards.

Because of Ethereum's burn mechanism and proof-of-stake consensus protocol, ETH supply is no longer consistently inflationary, which has strengthened the narrative of ETH as "ultrasound money" in 2023. This narrative is likely to continue to compel investors in 2024.



## % Share of Cumulative Staked ETH Deposits



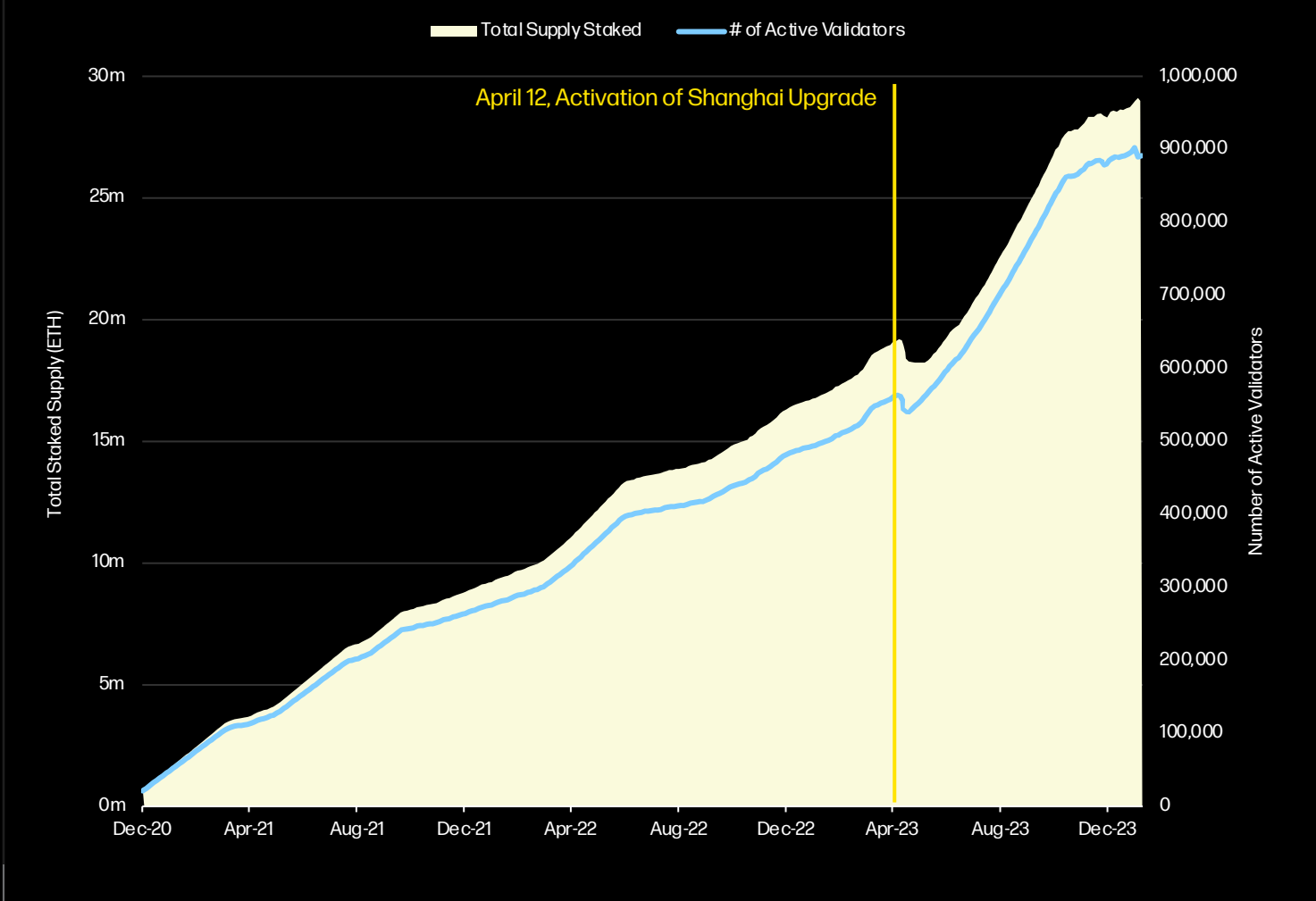
Unlike other proof-of-stake blockchains, Ethereum is not designed to support native stake delegation. Because of this, the percentage of total ETH staked through third-party staking pools has increased since Ethereum transitioned to a PoS consensus model while the share of staked ETH from independent, unidentified stakers has declined.

Among the staking pools operating on Ethereum, the most popular is liquid staking protocol Lido, which has almost consistently controlled over 30% of total ETH staked since May 2022. Lido is trending close to the threshold of controlling over 1/3 of total ETH staked, which prominent Ethereum core developers have pointed out presents a major “systemic threat” to Ethereum’s security, neutrality, decentralization, and legitimacy.

Ethereum developers and prominent members of the Ethereum ecosystem have called on Lido to “self-limit” and reduce the stake under their control. Lido developers are exploring solutions like distributed validator technologies (DVT) to increase the resiliency and decentralization of the protocol.



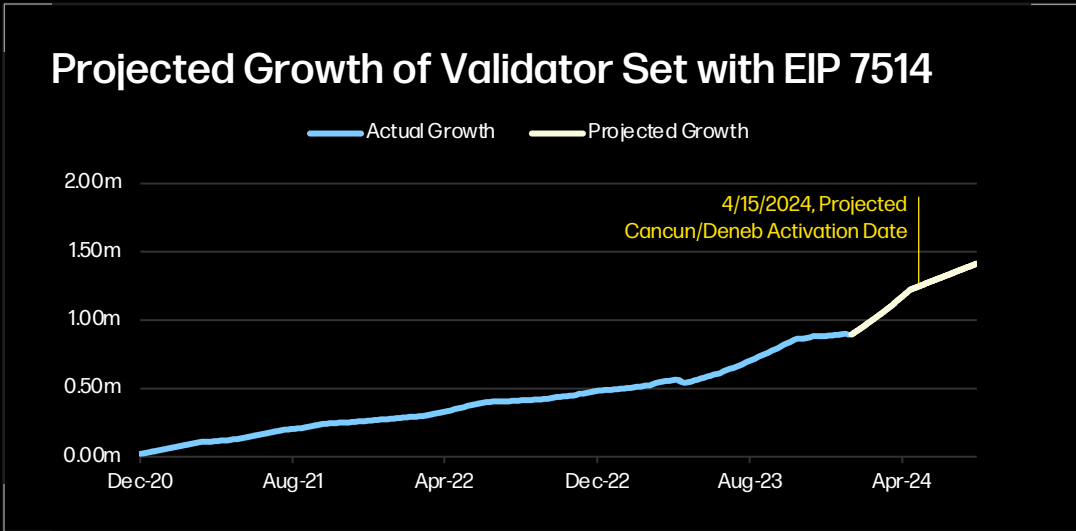
### Ethereum Total Staked Supply and Number of Active Validators, All-Time



Since the activation of staked ETH withdrawals on April 12, the total amount of ETH staked on Ethereum has nearly doubled. This has also caused the number of validators on Ethereum to soar given that validators on Ethereum cannot earn yield on staked ETH deposits greater than 32 ETH.

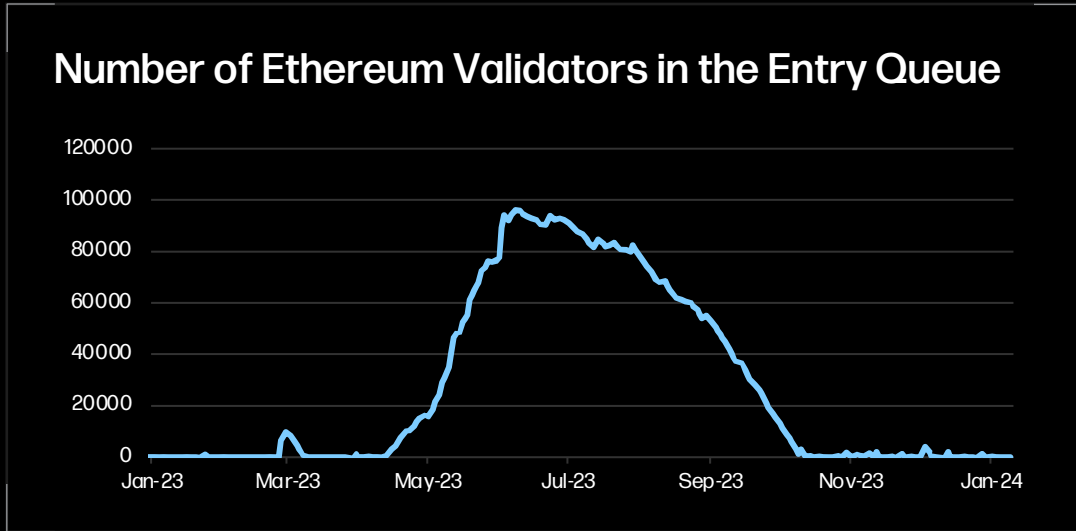
The lack of auto-compounding for staking rewards has become a growing concern as every new validator adds strain to the peer-to-peer networking layer of Ethereum. Every additional validator represents another cryptographic signature that must be aggregated by the network every 6.4 minutes, or epoch, to progress the chain.

Based on tests that have been run by the Ethereum Foundation, major networking issues start to arise when the active validator set size reaches 2.1 million. The largest validator set size that developers are confident Ethereum can support without disruption and issue is 1.4 million, which is the size of Ethereum’s newest test network, Holesky.



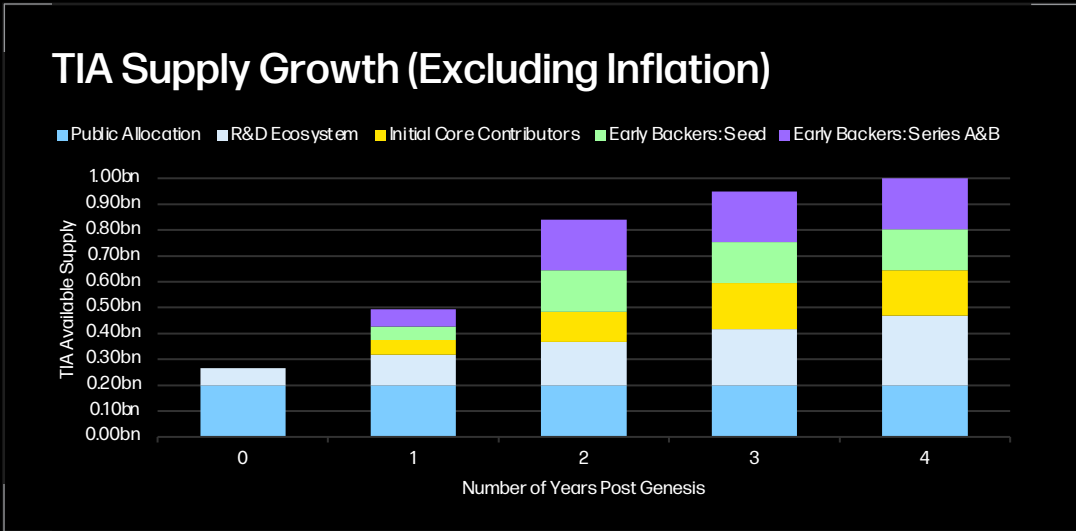
Validator entries and exits on Ethereum are limited per epoch by a churn rate that increases in a step wise fashion with the total validator set size. As the validator set size has grown, the churn rate for validator entries and exits has increased from a maximum of 8 to 13 validator entries and exits per epoch.

To curb the growth of the active validator set, Ethereum developers have implemented a stopgap solution in the forthcoming Cancun/Deneb upgrade that will limit validator entries by a constant churn rate of 8. If the upgrade is activated on Ethereum mainnet in mid-February and the number of validator entries consistently max out the churn rate between now and June, Ethereum will exceed the key threshold of 1.4 million validators by the beginning of June 2024.



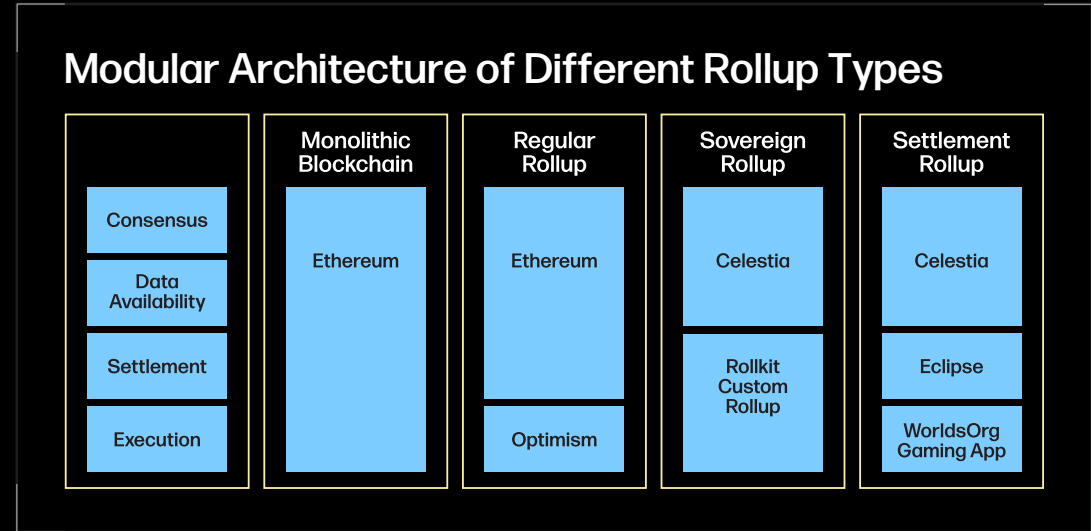
Developers will likely have a few more months of leeway before the threshold of 1.4 million active validators is reached because the validator entry queue on Ethereum has started to decline and the number of new validators activated on Ethereum is no longer consistently maxing out the churn rate like it was between April and October 2023.

However, the issue of validator set size growth is not one that can be avoided for long, especially if transaction activity picks up again on Ethereum, increasing fees, and therefore demand for staking. Ethereum developers will need to weigh drastic changes to staking dynamics and monetary policy in 2024 to address this issue of validator set size growth.



A growing share of Ethereum’s revenue from transaction fees is coming from Layer-2 rollups (L2s). The resurgence of layered scaling solutions on Ethereum is in large part motivated by a broader thesis on how to solve the blockchain scalability trilemma called the “[blockchain modularity thesis](#).” This thesis has mainly been popularized by the developers of a new Layer-1 blockchain, called Celestia.

Celestia is a Layer-1 blockchain designed to validate batched transaction data from L2s. Celestia has no native smart contract functionality of its own. It is highly optimized to function as a data availability (DA) layer, meaning a network that allows L2 block producers, also called sequencers, to temporarily store proofs of user transactions on-chain. To learn more about Celestia, read [this Galaxy Research report](#).



The growth of the Celestia ecosystem and the forthcoming activation of the Cancun/Deneb upgrade on Ethereum in 2024 will advance innovation in L2 technologies and rollup architecture. Because of L2s on Ethereum and Celestia, there will be an unprecedented amount of flexibility in the way decentralized application (dapp) developers can launch their products according to different user needs such as privacy, cost, security, and compliance.

However, the modular architecture of different rollup types will introduce new challenges and technological risks due to their nascency. The most differentiated general purpose blockchain that is pursuing a monolithic architecture is Solana. It will be important to watch heightened competition and differentiation between Solana and other modular blockchains like Ethereum and Celestia in 2024.