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The Merge Is Upon Us: What It Means for Ethereum

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As of this writing, the Ethereum "Merge," one of the most anticipated events in blockchain history, is finally expected to occur in September 2022. The "Merge" will shift the Ethereum blockchain (native token ETH, or ether) from a proof-of-work (PoW) consensus mechanism to a proof-of-stake (PoS) consensus mechanism that uses over 99.9% less energy. Technically, the Merge involves transitioning the current Ethereum proof-of-work Mainnet protocol (the blockchain used for ETH-based transactions) to the Beacon Chain proof-of-stake network. As a result, transactions will be conducted on the new proof-of-stake network and new ETH tokens will be minted by nodes on the network staking a fair amount of ether tokens into a pool to secure the network and validate transactions. Post-Merge, the practice of ether cryptomining on the Ethereum 2.0 network will end, either forcing miners to pivot to mining on Ethereum Classic or find a new endeavor.

While the move to Ethereum 2.0 is being closely-watched, akin to the countdown to the New Year's Eve Times Square ball drop, it's a little more complicated and more of a series of actions (and accompanying benefits) that will happen over time. The Merge is but the first step in a series of five (notably followed by upgrades titled 'the Surge,' 'the Verge,' 'the Purge,' and 'the Splurge') that intend to make Ethereum faster, more scalable, more powerful, more energy efficient and more robust.

Proof of Work vs. Proof of Stake: What's the Difference?

PoW and PoS are the two major consensus mechanisms that cryptocurrencies use to verify new transactions, add them to the immutable blockchain ledger and create tokens. Decentralization requires many computers, each using energy, to participate in the verification process. PoW and PoS are the two methods by which the computers agree on the legitimacy of a transaction. As discussed in Part I and Part II of prior posts on blockchain and ESG issues, the PoS model is faster and considerably more energy efficient than the PoW model.

Proof of work, the original blockchain consensus mechanism, was a method of cryptographic proof popularized by the advent of Bitcoin (and the 2008 release of Satoshi Nakamoto's noteworthy paper about the technology underlying it). Blockchains using PoW consume large amounts of energy, as virtual miners around the world race to solve a complex cryptographic problem to secure the network and win the right to update the blockchain. Winners are rewarded with the network's currency. In other words, PoW networks reward miners for security. Practically speaking, this PoW consensus mechanism incentivizes miners to invest in expensive computing equipment, which in turn results in investments in places to store and cool equipment, and the consumption of massive amounts of energy to power their systems, or rigs.

On the other hand, Proof of Stake – the predominant consensus mechanism used by some other blockchains (and after the Merge, Ethereum) – is much less energy intensive, to the tune of 99.99% less than PoW blockchains. PoS "validators" are the analog of PoW miners: validators secure the network in exchange for a cryptocurrency reward. While PoW miners use their intensive computing power and energy in the race to validate transactions and secure the network, PoS "validators" dedicate their own stake of cryptocurrency to the network.

Contrasted with PoW, PoS does not require high-powered computers and intensive energy consumption because any user can act as a validator by using a computer to create a node. PoS nodes only use marginally more energy than a laptop. In addition, PoS is faster, more scalable, and can process more transactions per second than PoW.

How Do You Transition an Immutable Blockchain?

As an asset, ETH's market capitalization currently stands at about $200B; however, the network itself supports many more billions of assets. Consequently, the Merge required years of careful planning, testing and execution to mitigate the technical risks involved with the massive transformation.

This first step is aptly named 'the Merge' because two independent, parallel blockchains will be merged: the main Ethereum blockchain will merge with the Beacon Chain.

The Beacon Chain, known as the consensus layer, was launched on December 1, 2020 and runs parallel to the live Mainnet. The Beacon Chain is responsible for controlling PoS. Even though it is live, the Beacon Chain does not yet process Mainnet transactions; rather it runs in parallel and reaches consensus by agreeing on active validators and their account balances. The Beacon Chain allows users to begin staking their ETH and become validators, which is a necessary step to preparing the Beacon Chain for transaction validation.

When the Mainnet merges with the Beacon Chain, the Beacon Chain will become the consensus layer. So, instead of mining blocks in a PoW model, as on Ethereum Mainnet, the Beacon Chain's PoS validators assume the role of processing transactions and proposing blocks. In short, verifiers will stake substantial capital in the form of ETH, instead of pure mining computer power, to validate new blocks on the Beacon Chain. Under a PoW model, an attacker interested in controlling the network would need to deploy more than 51% of the computing power of the network (i.e., a so-called 51% attack), while in a PoS model, an attacker would have to stake more than 51% of the staked ETH tokens, meaning the more tokens staked by the verifiers, the more secure the network. As a reward for verifying a transaction, the validator is rewarded with ether; on other hand, block verifier misbehavior or inactivity will be met with economic penalties and a potential "slashing," or loss, of their staked ether.

The Merge will be different than a hard fork, which is when a change of protocol results in two different branches or versions of the blockchain network. For example, after 2016's The DAO hack, which was a decentralized autonomous organization created on the Ethereum network that suffered an exploit due to vulnerabilities in its underlying smart contract code, with the hacker siphoning off of $150 million of investor tokens, the Ethereum network deployed a hard fork to essentially undo the theft, which created an entirely separate blockchain (now called Ethereum Classic). In the case of the Merge, however, Ethereum will continue as a single blockchain, so all user transactional history will be merged. As a result, all transaction history currently stored on Mainnet will not be lost, and therefore users do not need to take any action to protect their assets.

What are the Impacts?

A common misconception is that the Merge will materially lower Ethereum's transaction fees (i.e., gas fees) through the incorporation of sharding. Sharding is the splitting of a network into smaller pieces, or shard chains, and allow more scalability for applications and the so-called "rollup" of multiple transactions into a single transaction, thus reducing latency and increasing network speed. However sharding was delayed until the Surge in lieu of focusing on the transition to PoS. Thus, a substantial drop in gas fees will not occur until the Surge.

The Merge will have several effects on ETH and the Ethereum blockchain. First, the PoS consensus mechanism is expected to cut energy consumption by 99.9%. Less energy is required to secure the network, so ETH issuance (the amount of newly created ETH minus the amount of ETH burned) as a reward will be cut to .43% of total supply, from 4.3% per year. Whereas PoW requires expensive investment and overhead, which demanded significant rewards to compensate miners for providing security, the opportunity cost of capital is PoS validators' overhead. In other words, because less energy is required to secure the network, validators do not require as much compensation which results in lower fees and lower issuance. Simply put, PoS validators require less compensation, therefore requiring lower ETH issuance.

Decreased energy consumption is certain to pique the interest of ESG advocates and investors alike. Indeed, there has been much discussion over how the Merge will affect the price of ether, as there may be several market forces that will determine the ultimate effect, including how the end of PoW mining will affect the price, how successful the Merge is, and whether the new, greener PoS Ethereum 2.0 will attract additional interest or investment in ETH (or projects that run on the Ethereum network) by organizations that formerly eschewed ether due to climate change and ESG considerations.

One other hotly contested issue is whether the Merge turns ETH into a security. The answer depends, of course, on whom you ask. Note: back in 2018, a former SEC Division of Corporation Finance Director delivered a speech and stated that offers and sales of ether at that time were not securities transactions, while in an interview in June 2022, SEC Chair Gary Gensler stated that Bitcoin was the "only one" token he could confirm was not a security, but a commodity. The *Howey* test determines whether a transaction qualifies as an "investment contract." Under this metric, an investment contract is: (1) an investment of money (2) in a common enterprise (3) with the expectation of profit (4) solely to be derived from the efforts of others. If a transaction is an investment contract, then it qualifies as a security under the Securities Act of 1933 and Securities Exchange Act of 1934. The debate centers on whether validators are pooling funds such they are engaging in a "common enterprise" and whether the rewards offered by ETH amounts to an "expectation of profit." Both sides agree that there is an open question regarding who the "issuer" is in a decentralized system like Ethereum. In any case, one also might ponder if the SEC, already embroiled in a contested action against one well-known digital asset issuer over what the agency considers an unregistered offering, would want to engage over Ethereum 2.0.

The Merge and the remainder of Ethereum's roadmap present exciting opportunities and innovations, but it remains to be seen how these changes will impact the ecosystem. As the Ethereum ecosystem continues to evolve, users, developers, and investors will focus on these monumental changes, and their consequences, with the hope that they continue to positively impact the industry, users and the climate.

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