





How Green Is Ethereum?

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Part of the Series

What Is Ethereum and How Does It Work?



Ross Durant Photography/Getty Images

Ethereum's update in September 2022 was called the [Merge](#). Developers integrated the long-anticipated transition to proof-of-stake in this update (among other issues) significantly reducing the blockchain's energy requirement. The new [Ethereum](#) chain, which was called Ethereum 2.0 until the Ethereum Foundation requested that it not be, reduced energy use and promised faster transactions and lower [gas fees](#). Read on to discover how green Ethereum is and learn about its plans that may be even more environmentally



KEY TAKEAWAYS

- The Ethereum blockchain upgrade was called the Merge.
- The upgrade enhanced the network and reduced energy consumption.
- Its proof-of-stake validation mechanism is more environmentally friendly than proof-of-work mechanisms.
- Gas fees fell after the Merge (not because of it), but they aren't as low as from 2017 to 2020.
- The Merge set the stage for further scalability enhancements to the Ethereum Virtual Machine.

Ethereum and Energy Use

Ethereum is a software platform that is open to anyone. It is commonly associated with [ether \(ETH\)](#), a cryptocurrency that is bought and sold by investors. Ethereum can be used by anyone for different reasons, including banking and finance, network and application building, and peer-to-peer financial networking without the need for middlemen. ^[1]

Ethereum was created in 2013 and launched two years later by Vitalik Buterin. It is among the most well-known names in the cryptocurrency markets, coming in as the second-largest by [market capitalization](#) after Bitcoin. As of May 27, 2024, Ethereum's market cap was \$466.67 billion. ^[2] But, Ethereum mining is no longer possible after the move from the [proof-of-work \(PoW\)](#) model to [proof-of-stake \(PoS\)](#). Proof-of-stake reduced the blockchain's energy use by more than 99%.

PoS differs from PoW in that it is not a network-wide competitive process of encrypting information through a [hashing](#) algorithm. PoS still uses a hashing [algorithm](#) and verifies transactions through a consensus layer, but the validators are randomly chosen by the network based on the amount of ether they have staked. Staking means offering ether as collateral to become a



Selecting one semi-trusted validator to hash the information in a block and verify it uses far less energy than a competition. So, Ethereum is much more [green](#) in terms of energy consumption than it used to be.

Were Ethereum Gas Fees Reduced?

Transaction fees rose on the Ethereum network in 2020 because of increased network activity. At the time, the transactions of originators who offered the most in fees were placed in front of those who paid less. This created a fee war of sorts, with users trying to get their transactions validated quicker and miners charging more for prime validation spots.

An earlier attempt to fix rising costs tried to remove the transaction auction mentality from the network by imposing a base fee and a priority fee. The priority fee is similar to a tip to validators for them to choose to process one transaction instead of another. This was ineffective at lowering [transaction fees](#) because users still increased their tips to get transactions approved faster.

Important: Ethereum is on its way to becoming a greener blockchain and network. Future upgrades are expected to make it more efficient, scalable, and less costly.

Ethereum Transaction Speeds

The Merge, which was an upgrade to the Ethereum [blockchain](#) to a different version set the stage for future upgrades. Many people called the upgrade [Ethereum 2.0](#), It was the most significant update to the system. Although it didn't improve transaction speeds at the time or even a few years later, future upgrades will introduce improvements in network speed and scalability.

Is Ethereum Green?

According to the Ethereum Foundation, the blockchain and network consume 0.0026 terawatt-hours per year (TWh/yr). This translates to the equivalent of 870



the U.S. (34 TWh/yr) and less than Google (19 TWh/yr). ^[3]

The University of Cambridge's Judge Business School researched the energy sources for the Ethereum network after the Merge. According to its findings, 48% of Ethereum's energy comes from [sustainable sources](#) like wind power, nuclear power, and other [renewables](#). The remaining 52% is powered by natural gas (30%), coal (19%), and oil (3%). ^[4]

According to similar reports, Ethereum is greener than it was before switching to PoS. However, there are many more upgrades planned that have the potential to make it even more efficient and eco-friendly.

FAST FACT

The [Securities and Exchange Commission \(SEC\)](#) approved the listing of eight new spot Ether [exchange-traded funds \(ETFs\)](#) in May 2024. Trading will take place on the NYSE, Nasdaq, and CBOE BZX. There is no initial trading date as of yet, as the SEC is still working on final approvals. ^[5] The move follows the approval of spot Bitcoin ETFs, which began trading in January 2024—three years after Bitcoin futures ETFs were launched. ^[6]

The Green Future of Ethereum

Ethereum has plans for upgrades to bring a new concept to the blockchain, which is expected to allow it to scale and increase transaction processing speeds. In March 2024, the Dencun Upgrade was released.

This upgrade introduced proto-danksharding, a process where [second-layer](#) rollup providers can send Binary Objects (also known as blobs) to the Ethereum main chain. Blobs are much cheaper to send than rollups, so transaction fees are expected to drop when full danksharding is released.

The full upgrade to danksharding is expected to allow Ethereum to scale up to



Future upgrades will address issues regarding:

- Censorship resistance
- [Decentralization](#)
- Protocol risks from Maximal Extractable Value
- Block verification
- Computational costs ^[7]

FAST FACT

Maximal Extractable Value is the maximum amount of value a validator or miner can get from a block in excess of the [block reward](#) and usual fees. ^[8]

The lesser the blockchain costs, the more decentralized it becomes and the more efficient it will be. However, there are concerns whether [decentralized applications](#) built on Ethereum will consume more energy. Ethereum has positioned itself as the platform of choice for Web3 development.

Web3 is a concept of restructuring the backend of the internet, where control of people's information, data, and digital creations are returned to them. Many steps must be taken and hurdles overcome before blockchain technology can be used to create the new internet infrastructure conceived by developers.

If Ethereum is the platform used to create applications for this emerging and in-development restructuring, its eco-friendlier network might not be as environmentally friendly. However, it could be even more so—there is no way to tell.

Does Ethereum Use Energy?

Yes, Ethereum uses energy. It is a blockchain, a distributed ledger secured by



Is Ethereum Environmentally Friendly?

Ethereum's carbon footprint is much less than it was before September 2022 but it still uses energy. Nearly half of its network is located in developed areas that use sustainable energy sources. About 30% of the remaining half is powered by natural gas, 10% by coal, and 3% by oil. ^[4]

How Much Energy Did Ethereum Use Before the Merge?

According to data from the University of Cambridge's Sustainability Index, Ethereum used about 21.41 TWh of electricity per year and released 10.26 million tons of carbon dioxide. ^[9]

The Bottom Line

For Ethereum, the evolution to a better-performing, more accessible network has begun. Continued updates promise to cut back on emissions and make the network more energy-efficient while improving speeds and cutting transaction costs. However, Ethereum has much ground to cover to get to the levels of efficiency it wants, both in speed and environmental friendliness.

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Related Terms

Cryptocurrency Dogecoin (DOGE): What It Is, History, and Uses

Established in 2013, Dogecoin is a peer-to-peer, open-source cryptocurrency that is categorized as an altcoin. It has no apparent use cases besides existing. [more](#)

Ethereum Merge

The Ethereum Merge was the joining of Ethereum's proof-of-stake (PoS) Beacon Chain with the Ethereum Mainnet. [more](#)

What Was the Ethereum Shanghai Upgrade?

The Ethereum Shanghai upgrade was designed to give ETH crypto token holders access to their staked assets, a major change for the network. [more](#)

Difficulty Bomb: Ethereum's Increased Difficulty in Mining

"Difficulty bomb" referred to the increased difficulty and time needed to mine Ethereum blocks to discourage a fork after the blockchain transitioned to proof-of-stake. [more](#)

Decentralized Applications (dApps): Definition, Uses, Pros and Cons

Decentralized applications, or dApps, are software programs that run on a blockchain or P2P network of computers instead of a single computer. [more](#)

Ripple Definition

Ripple is a blockchain company that provides financial institution-level blockchain financial payment solutions that are cheaper and faster than traditional payment methods. [more](#)

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