

Pairing crypto mining with green hydrogen offers clean energy boost, study suggests

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Pairing cryptocurrency mining—notable for its outsize consumption of carbon-based fuel—with green hydrogen could provide the foundation for wider deployment of renewable energy, such as solar and wind

power, according to a new Cornell University study.

"Since current cryptocurrency operations now contribute heavily to worldwide carbon emissions, it becomes vital to explore opportunities for harnessing the widespread enthusiasm for cryptocurrency as we move toward a sustainable and a climate-friendly future," said Fengqi You, professor of energy systems engineering at Cornell.

You and doctoral student Apoorv Lal are authors of "Climate Sustainability Through a Dynamic Duo: Green Hydrogen and Crypto Driving Energy Transition and Decarbonization," which was published in the *Proceedings of the National Academy of Sciences*.

Their research shows how linking the use of energy-intensive cryptocurrency [mining](#) with green [hydrogen](#) technology—the "dynamic duo," they call it—can boost [renewable energy](#) sectors.

"Building a green hydrogen infrastructure to help produce cryptocurrency can accelerate renewable energy and create a more sustainable energy landscape," Lal said.

Using clean energy sources to power blockchain mining operations and fuel the production of green hydrogen can lead to growing wind and solar capacity—and expand sustainable energy production across the country, the researchers said.

In its current structure, mining blockchain-based cryptocurrency in the U.S. can use as much carbon-based energy as the entire country of Argentina, according to a 2022 White House Office of Science and Technology report. Nearly all domestic crypto-mining electricity is driven by computer power-hungry consensus mechanisms, known as "proof of work," which is used to verify crypto-assets.

Preliminary estimates by the U.S. Energy Information Administration suggest that 2023 annual electricity consumption for cryptocurrency mining likely represents from 0.6% to 2.3% of all U.S. electricity consumption.

"Acknowledging the substantial energy demands of cryptocurrency mining, our research proposes an innovative technology solution," You said. "By leveraging cryptocurrencies as virtual energy carriers in tandem with using green hydrogen, we can transform what was once an environmental challenge into a dynamic force for climate mitigation and sustainability."

In their research, You and Lal examined individual U.S. states to assess potential energy strengths in each region.

Supporting cryptocurrency can hasten the building of extra energy infrastructure and potentially create 78.4 megawatt hours of solar power for each Bitcoin mined in New Mexico, for example, and potentially 265.8 megawatt hours of [wind power](#) for each Bitcoin mined in Wyoming, according to the paper.

"While cryptocurrency currently has a high dollar value (Bitcoin traded for more than \$73,000 on March 13,) you cannot hold it in your hand," You said. "It's virtual. Think of cryptocurrency and energy in the same way—much like a gift-card concept. Cryptocurrency also can hold an energy value and that becomes an additional function."

To advance a sustainable future for blockchain-based cryptocurrency, the researchers said, stronger federal policies for climate goals and renewable energy need to advance.

"Coupled with green hydrogen, this approach to [cryptocurrency](#) not only mitigates its own environmental impact, but pioneers a sustainable path

for renewable energy transition," You said. "It's a novel strategy."

You is a senior faculty fellow at the Cornell Atkinson Center for Sustainability.

More information: You, Fengqi, Climate sustainability through a dynamic duo: Green hydrogen and crypto driving energy transition and decarbonization, *Proceedings of the National Academy of Sciences* (2024). [DOI: 10.1073/pnas.2313911121](https://doi.org/10.1073/pnas.2313911121).
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