Bitcoin estimated to use half a percent of the world's electric energy by end of 2018

May 16 2018

Credit: CC0 Public Domain

Bitcoin's burgeoning electricity demands have attracted almost as much

attention as the cryptocurrency's wildly fluctuating value. But estimating exactly how much electricity the Bitcoin network uses, necessary for understanding its impact and implementing policy, remains a challenge. In the first rigorously peer-reviewed article quantifying Bitcoin's energy requirements, a Commentary appearing May 16 in the journal *Joule*, financial economist and blockchain specialist Alex de Vries uses a new methodology to pinpoint where Bitcoin's electric energy consumption is headed and how soon it might get there.

"We've seen a lot of back-of-the-envelope calculations, but we need more scientific discussion on where this network is headed. Right now, the information available is pretty poor quality overall, so I'm hoping that people will use this paper as a foundation for more research," says de Vries, who works at the Experience Center of PwC in the Netherlands and is the founder of Digiconomist (@DigiEconomist), a blog that aims to better inform cryptocurrency users.

His estimates, based in economics, put the minimum current usage of the Bitcoin network at 2.55 gigawatts, which means it uses almost as much electricity as Ireland. A single transaction uses as much electricity as an average household in the Netherlands uses in a month. By the end of this year, he predicts the network could be using as much as 7.7 gigawatts—as much as Austria and half of a percent of the world's total consumption. "To me, half a percent is already quite shocking. It's an extreme difference compared to the regular financial system, and this increasing electricity demand is definitely not going to help us reach our climate goals," he says. If the price of Bitcoin continues to increase the way some experts have predicted, de Vries believes the network could someday consume 5% of the world's electricity. "That would be quite bad."

Bitcoin is dependent on computers that time-stamp transactions into an ongoing chain to prevent duplicate spending of coins. Computers in the

network perform calculations continuously, competing for the chance, once every ten minutes, to be appointed to create the next block of transactions in the chain. The user of the computer that wins is awarded 12.5 new coins—a process known as "mining" Bitcoin. But all the time, even the users that don't win are expending computing power. "You are generating numbers the whole time and the machines you're using for that use electricity. But if you want to get a bigger slice of the pie, you need to increase your computing power. So there's a big incentive for people to increase how much they're spending on electricity and on machines," de Vries says.

It's figuring out when that incentive stops paying off that is at the heart of de Vries's estimation method. Economic principles suggest that the entire Bitcoin network will eventually reach an equilibrium where the costs of the hardware and electricity used to mine equal the value of the Bitcoin being mined. And that information can approximate the total amount of electricity that the network will use at said equilibrium.

Other researchers have used the fundamentals of this method before, but de Vries goes farther. He uses production information about Bitmain, the biggest manufacturer of Bitcoin mining machines, to estimate both how much of a miner's costs are associated with hardware rather than electricity and when this equilibrium might be reached. And while he does have confidence in his estimates, the problem with this method is that these manufacturers are extremely secretive. "Sometimes the best information we've got is really shaky eyewitness accounts. That's the stuff we have to work with," he says.

Still, he believes that getting a good estimate is important in determining the sustainability of cryptocurrencies moving forward and in helping shape policy around them. Some states in the U.S. have already started to put restrictions around Bitcoin mining. "But you need to base your policy on something. And I think that my method is important in that regard,

because it's very forward-looking. It's focused not on the now, but on where we're headed. And I think that's something you really need to know if you're going to draft policy about it," he says.

He also points out that there is plenty of room for discussion of his method. "I think everyone agrees on the minimum energy consumption. But the future estimate? That's actually quite debatable. We don't really have a common approach to getting to a future estimate of electricity consumption right now, which is why I am hoping to get this conversation started. I'm doing this research, but a lot of people should be doing it."

More information: *Joule*, de Vries: "Bitcoin's Growing Energy Problem" www.cell.com/joule/fulltext/S2542-4351(18)30177-6

Provided by Cell Press