



Statement for the Record

United States Senate Committee on Environment and Public Works
Subcommittee on Clean Air, Climate, and Nuclear Safety
Hearing: *Air, Climate, and Environmental Impacts of Crypto-Asset Mining*

March 20, 2023

Chair Markey, Ranking Member Ricketts, and other Members of the Subcommittee,

Thank you for the opportunity to share our recommendations on crypto-asset mining and its impact on our air, the climate, and our environment. The Natural Resources Defense Council (NRDC) is pleased to submit this statement of support for the Crypto-Asset Environmental Transparency Act (S.661). NRDC is an international nonprofit environmental organization with more than 3 million members and online activists. Since 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, public health, and environment. NRDC has offices in New York City, Washington D.C., Los Angeles, San Francisco, Chicago, Montana, and Beijing.

We appreciate the interest in better understanding the environmental impacts of crypto asset mining. Innovations in crypto assets have brought about a new industry with claims of safe and affordable access to financial services for underserved and underbanked communities. However, in reality, crypto assets have become an unregulated asset class used primarily for speculative trading. It is critical that policymakers ensure that when crypto assets are created, they are done so in an environmentally responsible, equitable, and just manner.

We recognize that this bill is an important first step in obtaining the data needed to understand the environmental and climate impacts of the crypto asset industry. The impact study proposed in section 5 of the Crypto-Asset Environmental Transparency Act of 2022¹ will help procure the data needed to address four major issues in the industry that have an adverse effect on the environment and achieving the nation's climate and clean energy goals:

- The energy consumption of the proof-of-work (PoW) protocol is enormous and must shift to a less energy-intensive protocol.
- The physical components that run the protocols for mining crypto assets are major sources of e-waste.

¹ Crypto-Asset Environmental Transparency Act of 2022, S.661, 118th Congress (2023)
<https://www.congress.gov/bill/118th-congress/senate-bill/661/>



- Communities lured in by the economic prospects of crypto mining often suffer adverse environmental and economic impacts with few benefits.
- The crypto industry’s claims of positive energy or climate impacts are largely unproven.

It is well documented that the energy consumption and carbon footprint of cryptocurrency, a form of crypto asset, is enormous. This impact will only increase as the global market for cryptocurrency is projected to reach \$32 trillion USD by 2027.² At its peak, if Bitcoin were a country, it would rank twenty-third in the world in energy consumption, at 204 terawatt hours, which is equivalent to the energy consumption of Thailand. Its carbon footprint, at 114 megatons of carbon dioxide (CO₂), is as large as that of the Czech Republic.³ Although the energy consumption of the industry has decreased due to a recent downward trend in prices, this does not mitigate or resolve its energy or carbon emission concerns.

The energy consumption and environmental pollution of the crypto mining industry is large and will continue to grow at a time when it is critical that we reduce greenhouse gas emissions to keep average global temperatures from rising more than 1.5 C above pre-industrial levels.

I. The energy consumption of the Proof of Work protocol is enormous and must shift to Proof of Stake

The central reason for the industry’s intensive energy consumption is the Proof of Work (PoW) protocol used to mine cryptocurrencies. Mining is a competitive validation method that pits pools of miners against one another, with the pool of miners that expends the most computational effort receiving the highest probability of collecting the financial rewards. It is this protocol’s computational intensity that results in PoW’s consuming enormous amounts of energy. While the industry may aspire to power its operations from renewable energy, currently about 75% of this energy demand is supplied from fossil fuel generation.⁴ In addition, research has shown that this energy consumption is directly correlated with the price of Bitcoin, suggesting that if cryptocurrency prices start rising again, more resources will be employed for mining and more energy will be consumed.⁵

Shifting from a PoW protocol to a Proof-of-Stake (PoS) protocol is projected to decrease energy consumption by 99.95%.⁶ This shift is essential if the industry is to operate in an environmentally responsible manner, and is the fastest way to reduce its carbon footprint. Ethereum, the second

² “Cryptocurrency Market: Global Industry Trends, Share, Size, Growth, Opportunity and Forecast 2022-2027.” *Research and Markets*, Feb. 2022, [researchandmarkets.com/reports/5546940/cryptocurrency-market-global-industry-trends](https://www.researchandmarkets.com/reports/5546940/cryptocurrency-market-global-industry-trends).

³ “Bitcoin Energy Consumption Index.” *Digiconomist*, digiconomist.net/bitcoin-energy-consumption/.

⁴ De Vries, Alex, et al. “Revisiting Bitcoin’s Carbon Footprint.” Mar. 16, 2022. [researchgate.net/publication/358861058_Revisiting_Bitcoin's_carbon_footprint](https://www.researchgate.net/publication/358861058_Revisiting_Bitcoin's_carbon_footprint)

⁵ De Vries, Alex. “Bitcoin boom: What Rising Prices Mean for the Network’s Energy Consumption.” *Science Direct*, March 17, 2021, [sciencedirect.com/science/article/pii/S2542435121000830](https://www.sciencedirect.com/science/article/pii/S2542435121000830).

⁶ Beekhuizen, Carl. “Ethereum’s Energy Usage Will Soon Decrease By ~99.95%.” *Ethereum.org*, May 18, 2021, blog.ethereum.org/2021/05/18/country-power-no-more/.



largest cryptocurrency by market capitalization, switched from a PoW protocol to a PoS protocol last year and has decreased the energy consumption of mining by 99.84%.⁷

II. The physical components that run the protocols for crypto assets are major sources of e-waste

The data centers that house the mining rigs are also a major environmental concern. Because electricity is the largest variable financial cost for miners, they need efficient processors to minimize energy consumption. For this, they use highly specialized chips called Application-specific Integrated Circuits (ASICs). ASICs are so specialized—lasting on average 1.29 years due to intense calculations from the PoW algorithm causing the chips to run at extremely high temperatures 24/7, severely limiting their life span—that as they become obsolete, they cannot be repurposed or used for another type of algorithm. Research has shown that crypto mining generates approximately 30,700 metric tons⁸ of e-waste annually, the equivalent of the e-waste from the Netherlands.⁹

The chemicals that compose e-waste—including mercury, cadmium, and lead—are highly toxic when consumed or absorbed into the bloodstream. Global e-waste is on a trajectory to reach almost 74 million metric tons while the global recycling rate of e-waste is only at 17.4%. In 2019, the world generated 53.6 million metric tons of e-waste, and within the 82.6% of unrecycled e-waste was 55 metric tons of mercury that has either already been released into the environment or will be eventually.¹⁰ The U.S. generated over 6.9 million metric tons of e-waste in 2019 and crypto mining will only add to this environmental hazard.

III. Communities lured in by the economic prospects of crypto mining often suffer adverse environmental and economic impacts with few benefits

Many rural communities are looking for ways to revitalize their local economies. At the same time, crypto mining companies are constantly searching for cheap electricity. As a result, access to cheap energy offered by many of these communities is a major incentive for companies to site their operations there, especially ones with favorable policies such as federally designated opportunity zones.

⁷ De Vries, Alex. “Cryptocurrencies on the road to sustainability: Ethereum paving the way for Bitcoin.” *Patterns*, Dec. 6, 2022, [cell.com/patterns/fulltext/S2666-3899\(22\)00265-3](https://cell.com/patterns/fulltext/S2666-3899(22)00265-3).

⁸ Merriam-Webster. (n.d.). Metric Ton. In Merriam-Webster.com dictionary. Retrieved March 13, 2023, from <https://www.merriam-webster.com/dictionary/metric%20ton>

⁹ “Bitcoin Mining Producing Tonnes of Waste.” *BBC*, Sept. 20, 2021, bbc.com/news/technology-58572385.

¹⁰ “The Global E-waste Monitor 2020 – Quantities, Flows, and the Circular Economy Potential.” *United Nations Institute for Training and Research*. ewastemonitor.info/gem-2020/.



Crypto mining companies have made numerous claims about how their operations will benefit local communities, such as bringing jobs and strengthening the electricity grid for local utility companies. These claims are tenuous at best. Mining operations require only a handful of unskilled staff to maintain and thus do not provide many jobs, let alone high-quality ones, for the local community. While claims of better utilizing the grid and generation assets might make economic sense for vertically integrated utility companies, from a climate perspective, these crypto companies simply want to access to the cheapest form of energy even if this means using fossil fuels, which runs counter to state, national, and global climate goals.

These crypto mining data centers impose numerous environmental costs on local communities that host them. As previously mentioned, these operations generate large amounts of e-waste and release toxic chemicals in the air if they are powered by fossil fuels. In addition, like other types of data centers, they can create negative impacts on local water ecosystems due to water heating. They can also drive huge spikes in energy demand that often cause electricity rates to skyrocket to the detriment of local residents and businesses. Coinmint, a crypto mining company, began operating mining facilities in Plattsburgh, NY in 2017. With the servers running 24 hours a day, residents' electricity bills increased by \$30-\$40 a month. In response, the town enacted a moratorium on mining for 18 months in 2018. Plattsburgh ultimately passed a tariff structure agreement that ensured that if the city had to purchase extra power on the spot market, these costs would be passed on to miners, not residential users.¹¹ However, electricity prices for local residents are still higher than before these companies were operating in their community. A study concluded that cryptocurrency mining operations in upstate New York increase annual electric bills by \$165 million for small businesses and \$79 million for individuals with little to no local economic benefit.¹²

IV. The crypto industry's claims of positive energy or climate impacts are largely unproven

While it is encouraging to see an emerging trend of using renewable energy for mining, from a crypto mining perspective, renewables are an intermittent source of electricity and mining requires a constant flow. This is why many companies still choose fossil fuel-based electricity over renewables. Moreover, there are more important uses for renewable energy that can directly support decarbonization.

Counter to the crypto industry's claim of going green, crypto mining firms have started resurrecting stranded fossil fuel assets to power their operations, giving them easy access to cheap

¹¹ De, Nikhilesh. "US City Mulls 18-Month Moratorium on Bitcoin Mining." *Coindesk*, Mar. 5, 2018, coindesk.com/markets/2018/03/06/us-city-mulls-18-month-moratorium-on-bitcoin-mining/.

¹² Counts, Laura. "Power-hungry Cryptominers Push Up Electricity Costs for Locals." *Berkeley Haas*, Aug. 3, 2021, newsroom.haas.berkeley.edu/research/power-hungry-cryptominers-push-up-electricity-costs-for-locals/.



energy. A prominent example is the Greenidge Generation plant in Dresden, New York,¹³ where an unprofitable natural gas plant decided to pivot and supply energy for crypto mining. Greenidge has so far installed more than 17,000 crypto mining rigs and plans to double that number to 32,500. When Greenidge applied for its 2016 permit, it indicated that it would operate solely to provide power to the grid in a “peaking” capacity; however, since 2020, Greenidge has begun utilizing the energy it produces to power an on-site cryptocurrency mining operation. As a result, Greenidge’s greenhouse gas emissions have increased considerably and will continue to increase going forward.¹⁴ In June 2022, the New York Department of Environmental Conservation denied the renewal of a key air permit for Greenidge. However, because of Greenidge’s “behind the meter” status, which means it doesn’t provide electricity to the public, the plant is still trying to skirt environmental regulations.¹⁵

Due to instances like Greenidge Generation, New York has enacted legislation to impose a two-year moratorium on issuing air permits for fossil fuel-powered facilities that provide energy for proof-of-work mining operations. Under this law, permits and renewals cannot be issued to any “electric generating facility that utilizes a carbon-based fuel and that provides, in whole or in part, behind-the-meter electric energy consumed or utilized by cryptocurrency mining operations that use proof-of-work authentication methods to validate blockchain transactions.”¹⁶ The law also calls for a generic environmental impact statement directed to all crypto mining operations in the state conducted by the department of environmental conservation, in consultation with the department of public service.

Another claim of the cryptocurrency industry is that cryptocurrencies increase the demand for renewable electricity sources. However, there is already ample demand for renewable sources of electricity and the current supply already cannot keep up with the growth in demand globally, even without additional uptake from the cryptocurrency industry. According to the International Energy Agency (IEA), growth in renewables will serve around 90% of the projected growth in demand for electricity from 2022-2025.¹⁷

¹³ Misdary, Rosemary. “A Bitcoin Mining Operation in the Finger Lakes Runs Up Against New York’s Climate Law.” *Gothamist*, Feb. 17, 2022, gothamist.com/news/bitcoin-mining-operation-finger-lakes-runs-against-new-yorks-climate-law.

¹⁴ Elkin, Jacob. “New York Denies Air Quality Permit to a Cryptocurrency Mining Facility, Citing Sabin Center White Paper.” *Columbia Climate School*, Jul. 7, 2022, news.climate.columbia.edu/2022/07/07/new-york-denies-air-quality-permit-to-a-cryptocurrency-mining-facility-citing-sabin-center-white-paper/

¹⁵ Greenfield, Nicole. “Bitcoin Mining Is Bad for the Climate—and Local Communities Too.” *NRDC*, 27 Apr. 2022, nrdc.org/stories/bitcoin-mining-bad-climate-and-local-communities-too.

¹⁶ De, Nikhilesh. “New York State Assembly Passes Bill Blocking New Crypto Mines That Use Non-Renewable Power.” *Coindesk*, 26 Apr. 2022, coindesk.com/policy/2022/04/27/new-york-state-assembly-passes-bill-blocking-new-crypto-mines-that-use-non-renewable-power/.

¹⁷ “Electricity Market Report 2023.” *International Energy Agency*, <https://www.iea.org/reports/electricity-market-report-2023>.



Other arguments such as the claim that using superfluous methane gas—such as methane generated from landfills—for mining Bitcoin is a better choice than flaring it, and the claim that mining Bitcoin could absorb wasted clean energy, do not hold up. While it is true that using methane for productive purposes is better than flaring it, the real question is what is the best use for excess energy generated through methane that would otherwise be flared? The answer isn't mining for bitcoin. The country needs every net zero carbon resource, like captured methane, to generate electricity and decarbonize our economy. Moreover, better alternatives like investing in energy efficiency, electrification, and clean renewable generation can help reduce emissions and energy waste in the first place.

In sum, to date crypto mining, particularly using the PoW methodology, has been a voracious user of energy, inconsistent with combatting climate change. Any purported climate or economic benefits to local communities in the form of economic development or jobs are largely unproven. By requiring the disclosure of relevant data from these mining operations, the Crypto-Asset Environmental Transparency Act allows for a better understanding of the significant environmental impacts of cryptocurrency mining and is an important first step in ensuring these facilities operate in an environmentally responsible way.

Respectfully submitted,

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