

May 9, 2022

VIA ELECTRONIC SUBMISSION

Office of Science & Technology Policy
Eisenhower Executive Office Building
725 17th Street NW, Washington, DC 20500
DigitalAssetsRFI@ostp.eop.gov

Re: The Energy and Climate Implications of Digital Assets

Thank you for the opportunity to provide comments on the Request for Information (“RFI”) on the Energy and Climate Implications of Digital Assets. 87 Fed. Reg. 17,105 (Mar. 25, 2022). Please accept these national comments on behalf of the undersigned organizations.

Overview

Our organizations are grateful for the Biden Administration’s commitment to combatting the climate crisis and addressing the detrimental impacts of digital currency on electricity use and climate pollution.¹ Digital currencies that rely on “proof-of-work” to validate transactions undermine your efforts to promote energy efficiency and to reduce climate pollution and will instead use more and more electricity and generate more and more climate pollution. As the [Intergovernmental Panel on Climate Change](#) (“IPCC”) warned in April, digital currencies like Bitcoin are likely to “be a major global source of CO2 if the electricity production is not decarbonised.”²

Unlike vehicles or manufacturers subject to energy efficiency standards or pollution limits, miners of digital currencies that rely upon proof-of-work are not required to use energy more efficiently or to power their mining operations with renewable energy and have little incentive to do so. Instead, miners can and increasingly do rely upon fossil fuel energy sources to generate and use more and more electricity. Digital currencies like Bitcoin also generate significant amounts of electronic waste and are contributing to supply-chain challenges in the semiconductor industry.

We urge you to use the Administration’s regulatory tools to curb the electricity use and climate pollution associated with digital currencies that rely on “proof-of-work” and to work with legislators to address the energy and climate impacts of digital currencies. In particular, we urge you to subject permits related to cryptocurrency mining to stringent environmental reviews, to create a registry of mining operations, to set energy efficiency standards for digital currencies, to establish power density limits, and to limit financial transactions which increase climate pollution, interrupt critical supply chains, or limit the availability and affordability of electricity for essential industries.

Bitcoin’s Growing Use of Electricity

Soaring electricity use by some digital currencies is a “**growing concern**,” according to the IPCC.³ Using powerful computers to solve complex puzzles to generate new cryptocurrency is called “**proof-of-work**.”⁴ Once puzzles are solved, new cryptocurrency coins are added to the blockchain. Deploying powerful computers to solve complex puzzles uses growing amounts of electricity.⁵

Although electricity use can be difficult to measure, experts at the [University of Cambridge](#) estimate that Bitcoin mining consumes 153.67 terawatt hours (“TWh”) per year—which is more electricity than what is used by countries like Sweden and Poland, and more electricity than Americans use to power our lights

and televisions.⁶ In the six weeks since the Biden Administration issued this Request for Information, the annual estimated electricity use associated with Bitcoin has increased by 12 TWh.

Bitcoin’s Use of Electricity is Growing Faster than Comparable Sectors

Between 2017 and 2022, electricity demand for Bitcoin increased from 7 TWh in April 2017 to 151.2 TWh in April of 2022—a 20-fold increase in just five years.⁷ If this trend continues over the next five years, Bitcoin could use as much electricity as Japan and India combined. By contrast, during the same period, electricity demand by [comparable sectors](#) has not increased and, in some cases, even declined.⁸

For example, electricity demand by [data centers](#) has not increased, even though internet traffic and data center workloads have increased significantly.⁹ In sharp contrast to Bitcoin, [data transmission networks](#) and [mobile communications networks](#) are rapidly becoming more energy efficient.¹⁰

Bitcoin already uses half as much electricity as the entire global banking sector, according to one [estimate](#), and will overtake the banking sector within two years if current trends continue.¹¹ One [study](#) estimates that the average electricity footprint of non-cash transactions by the global banking system is no more than 0.4 kWh, while the average electricity footprint per Bitcoin transaction ranges from 491.4 kWh to 765.4 kWh.¹² By some [estimates](#), a single Bitcoin transaction uses more energy than 100,000 Visa transactions.¹³

Bitcoin’s Growing Climate Pollution

U.S.-based Bitcoin miners are already responsible for [one quarter](#) of the global greenhouse gas emissions caused by Bitcoin mining.¹⁴ Although miners use a variety of power sources to provide electricity for their computers, mining for cryptocurrencies like Bitcoin results in far more greenhouse emissions than validation methods employed by other digital currencies. The electricity used to mine Bitcoin in 2020 resulted in almost **60 million tons** of carbon dioxide emissions, according to one estimate.¹⁵ The carbon dioxide emissions from mining Ethereum and Bitcoin in 2021 [equaled](#) the tailpipe emissions of more than 15 million gas-powered cars.¹⁶

Other Digital Currencies Use Less Electricity and Produce Less Climate Pollution

Currently, Bitcoin uses [two-thirds](#) of all the energy consumed by cryptocurrencies.¹⁷ Other digital currencies use less electricity and produce less climate pollution than digital currencies like Bitcoin. For example, cryptocurrencies using “proof-of-stake” generally require **far less electricity** than those using proof of work.¹⁸ The energy consumed per transaction is “[two-to-three orders of magnitude](#)” lower than that of Bitcoin, or an amount similar to the energy consumption of VisaNet.¹⁹ Another analysis found proof of stake uses [75% less energy](#) than proof-of-work, and Ethereum [estimates](#) that moving from proof-of-work to proof-of-stake will reduce the electricity use of their digital currency by 99.95%.²⁰

Expected Increase in Electricity Use and Climate Pollution

As the price of cryptocurrency increases, the incentive to use more and more powerful computers grows—as does the amount of electricity these computers consume. The development of mining “pools” has created an “[arms race](#)” that has significantly increased electricity consumption.²¹ As computing power increases, the Bitcoin protocol adjusts to make the puzzle more difficult to solve—using more and more electricity.²² Increasing demand for electricity is a feature of Bitcoin, not a bug. Indeed, the Bitcoin protocol is “[energy-intensive](#)” by design.²³ As Bitcoin prices increase and Bitcoin puzzles become harder to solve, electricity use will increase.

Increased Cryptocurrency Mining Threatens Critical Supply Chains

A global shortage of semiconductor chips, or integrated circuits, has impacted more than 100 industries, including the electric vehicle industry. A contributing factor has been Bitcoin miners replacing earlier mining hardware with an application-specific integrated circuit (“ASIC”) to improve speed and efficiency.

Demand for ASICs is expected to [grow substantially](#) in the next few years, compounding shortages in semiconductor chips and potentially offsetting efforts to boost domestic production of semiconductor chips.²⁴

Proof-of-work Cryptocurrency Mining Harms Local Communities

By increasing electricity use and providing an incentive to extend the life of fossil fuel sources of energy, Bitcoin miners are increasing climate pollution and electricity prices—[harming local communities](#).²⁵ Mining operations in upstate New York [increased electric bills](#) by about \$165 million for small businesses and \$79 million for individuals.²⁶

Examples include:

- at least two waste-coal plants in Pennsylvania that have sharply increased capacity, local air and water pollution,²⁷ and greenhouse gas emissions since they were bought by a private equity fund in 2021;
- a coal-fired power plant in Montana that had previously filed for bankruptcy and was barely operating and then began operating and polluting full-time;²⁸
- two gas-fired power plants in upstate New York that powered up rarely – only in heat waves and cold snaps;²⁹
- mining powered by a grid that is nearly 70% coal-powered in Kentucky;³⁰
- and orphaned gas wells in South Dakota.³¹

On the western shores of Seneca Lake, among the productive vineyards and farms of the Finger Lakes, is the Greenidge Generation Station. In its first year of mining operations, Greenidge operated seven fold more than the year prior and its CO₂ emissions increased 479%.³² In addition, significant amounts of extremely hot water are now discharged from the plant, and the plant is permitted to discharge 134 million gallons of water daily into Seneca Lake at temperatures of up to 108 degrees Fahrenheit.³³ This thermal pollution endangers health and wildlife habitability, including but not limited to potential harmful algal blooms, fish deaths, migration and loss of biodiversity, oxygen depletion, direct thermal shock, and changes in dissolved oxygen.

A similar story can be told about the Big Horn Data Hub operated by Marathon Digital Holdings, a publicly traded cryptomining company, at the Hardin Coal Plant in Hardin, Montana, where in 2021, compared to the prior year, NOx emissions increased 842%, SO₂ emissions increased 508%, and CO₂ emissions increased 850%.³⁴ Because coal plants spew toxic air pollution and coal ash contamination, the neighboring Crow Indian Reservation is most disproportionately impacted by local environmental issues.³⁵

The former Mayor of Plattsburgh New York commented: “... the automated nature of these servers meant that the new mines provided few local jobs.”³⁶ And as one of the authors of a Berkeley Hass study similarly observed: “These are warehouses full of computers and they only require one or two IT people to run the whole operation, so it’s unlikely that it brings jobs or stimulates the economy.”³⁷

Proof-of-work Cryptocurrency Mining Will Not Accelerate Transition to Renewable Energy

Experts **agree** that Bitcoin will not aid the transition to renewable electricity.³⁸ Cryptomining requires a steady source of power, so miners are seeking cheap sources of electricity generated by burning coal and natural gas. Unless renewable electricity like wind and solar is paired with large-scale battery storage, renewables are not an attractive option for miners. Actual use of renewable energy by Bitcoin miners has fallen in recent years, according to one [estimate](#).³⁹

More importantly, there is no way to ensure that cryptocurrencies that use proof-of-work will switch to clean energy. Unlike industries subject to pollution or energy efficiency standards, electricity use by miners and their climate pollution are not subject to state or federal limits. In addition, there is little incentive for proof-of-work cryptocurrency miners to reduce their electricity use. Voluntary, unenforceable “[accords](#)” are not binding on individual miners and rely on unverifiable and hard-to-measure offsets.⁴⁰

Proof-of-work Cryptocurrency Mining Generates Significant Electronic Waste

Digital currencies like Bitcoin generate significant amounts of electronic waste. In 2021, Bitcoin generated more than [30,000 metric tons](#) of electronic waste,⁴¹ which is comparable to the e-waste produced by the whole country of the Netherlands.⁴² The mining devices used for proof-of-work quickly go obsolete, often lasting less than two years, and recent changes in the hardware used by miners has made the generation of e-waste more likely.⁴³ The e-waste generated from proof-of-work mining is significant, and experts predict it will continue to increase as proof-of-work mining operations increase in scale.⁴⁴ Much of this waste is sent to low-income communities around the world who bear the harms of this toxic waste.⁴⁵

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Due to the harmful climate and energy externalities from proof-of-work mining, we propose the following ideas for consideration as potential mitigation strategies to be further explored.

EPA Must Subject Proof-of-work Cryptocurrency Mining Permits to Stringent Reviews

We urge the Biden Environmental Protection Agency (“EPA”) to institute stringent reviews of every air and water permit issued or renewed for any proof-of-work mining operations. The Clean Air Act, as well as state climate and environmental review laws, contains provisions for the EPA to deny permits or modify permits to institute severe constraints on air and water pollution from proof-of-work cryptocurrency mining operations in order to protect local communities.⁴⁶

We urge the EPA to institute rules and regulations to mitigate the harms of cryptocurrency mining e-waste disposal in large quantities. We also urge the EPA to review its powers under the Noise Control Act of 1972 and the Quiet Communities Act of 1978 to protect the public health and welfare, by setting insulation requirements to mitigate the enormous noise pollution generated by the hundreds to thousands of mining rigs set up at each location.⁴⁷

OMB Must Create a Registry for Proof-of-work Cryptocurrency Mining Operations

We encourage the Office of Management and Budget’s Office of Information and Regulatory Affairs to create a registry for proof-of-work mining operations over a certain threshold. Determining which sites have begun proof-of-work mining is difficult to ascertain, whether it be at a power plant, connecting to the grid, at a fracked gas wellhead, or otherwise. Many of the most noxious mining operations can operate

as-of-right under preexisting and permissive air and water permits or zoning regulations, despite the change in operations and the negative impacts to local residents and the climate.

A registry would allow for transparency to help with the public commenting processes and can inform other agencies' work. It could also inform the Federal Energy Regulatory Commission and/or the Regional Transmission Organizations and Independent System Operators, as well as utilities that may need to serve that additional power load to better plan and prevent or mitigate the potential strain such operations will place on the grid.⁴⁸ For example, the Electric Reliability Council of Texas ("ERCOT") recently required new large cryptocurrency miners to seek permission to connect to the state's power and required utilities to submit studies on the impact of miners and other large users on the grid because it all could not be tracked.⁴⁹ One important component of this would be to ensure that operations that mine cryptocurrency disclose their energy sources and quantities, with specificity. Many cryptocurrency mining operations advertise the use of renewable energy to mine, without detailing the source or amount of the energy used.

DOE Must Set Energy Efficiency Standards for Proof-of-work Cryptocurrency Miners

We encourage the Department of Energy ("DOE") to study how to implement or make recommendations on how best to institute reforms for high-density-load businesses like proof-of-work crypto miners. In particular, we encourage the DOE to study how to implement or make recommendations on how best to institute energy efficiency limits based on kilowatt-hour ("kWh") per transaction or block. A minimum energy efficiency limit set around a kWh per transaction or block could ensure that the methodology to mine blockchain/cryptocurrency is the best available technology and uses the least amount of energy. The efficiency limit should tighten over time to eventually eliminate proof-of-work mining.⁵⁰

We also encourage the DOE to study how to implement or make recommendations on how best to institute power density limits, based on the number of kilowatts of energy consumption or load per thousand square feet. A power density limit could be set at an initial limit and tightened over time to allow existing operations to adjust operations over time to mitigate their impacts. We further encourage the DOE to study how to implement or make recommendations on how best to institute reforms such as increasing System Benefit Charge surcharges or adjusting Renewable Energy Credit purchase requirements for any proof-of-work mining operations that have added more than, for example, a certain megawatt hour per year load.

Finally, we encourage the DOE to study how to implement or make recommendations on how best to protect low-cost public power allocations to be siphoned to proof-of-work mining operations at the expense of local ratepayers.

Financial Regulators Must Act to Address Climate Pollution and Economic Impacts of Bitcoin

Financial regulators should use existing tools under the Securities Exchange Act, the Commodity Exchange Act, and the Federal Trade Act to require greater transparency regarding electricity use and climate pollution, to place limits on the environment limits posed by these digital assets; to combat misleading claims regarding the environmental impacts of digital currencies; and to address the serious risks Bitcoin poses to supply chains and electricity prices and availability.

We agree that digital currencies like Bitcoin are securities and commodities subject to jurisdiction of the Securities & Exchange Commission ("SEC") and Commodity Futures Trading Commission ("CFTC"), and that digital currencies like Bitcoin are subject to the greenhouse gas reporting requirements recently [announced](#) by the SEC.⁵¹ The CFTC should also take steps to require [greater reporting](#),⁵² and the SEC and the CFTC should use the CFTC's [broad power](#) to address the impacts of Bitcoin on critical supply chains

and electricity prices.⁵³ In particular, both the [SEC and CFTC](#)⁵⁴ have statutory authority over listing standards for registered securities exchanges and commodity futures exchanges. Finally, the Federal Trade Commission should take steps to limit unfair or deceptive claims related to the climate impacts of digital currencies.

In particular, the SEC and CFTC should use listing standards for registered securities exchanges to require digital assets to meet environmental and electricity standards, such as limits on the amount of electricity that can be used for mining. While Bitcoin requires hundreds of kilowatt hours of energy per transaction, some digital assets require [less than 1 kilowatt hour](#).⁵⁵ Requiring registered exchanges only to list digital assets whose transactions consume electricity below a certain energy-efficient standard would drive innovation or a transition to other methods of validation.

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Thank you for the opportunity to provide these comments.

Sincerely,

Environmental Working Group

Earthjustice

Greenpeace

League of Conservation Voters

Sierra Club

Friends of the Earth

Seneca Lake Guardian

Milwaukee Riverkeeper

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- ²⁸ See the Letter submitted by the Montana Environmental Information Center, et al. (May 9, 2022).
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⁴⁶ Comments from Seneca Lake Guardian, The Comm. to Preserve the Finger Lakes, Fossil Free Tompkins, Sierra Club, and Earthjustice in Opposition to the Draft Title V Air Permit for Greenidge Generating Station, located at 590 Plant Road, Dresden, New York 14441 (Permit ID: 8-5736-00004/00017) (Nov. 19, 2021), https://earthjustice.org/sites/default/files/files/2021-11-19_slg-cpfl-fft-sc-ej-comments-to-dec.pdf.

⁴⁷ Vipal Monga, *Bitcoin Mining Noise Drives Neighbors Nuts—a Giant Dentist Drill That Won't Stop*, The Wall Street J. (Nov. 12, 2021), <https://www.wsj.com/articles/bitcoin-mining-noise-drives-neighbors-nuts-giant-dentist-drill-that-wont-stop-11636730904>.

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⁴⁹ Naureen S Malik, *Crypto Miners in Texas Need ‘Approval to Energize’ in New Grid Hurdle*, Bloomberg (Mar. 30, 2022), <https://www.bloomberg.com/news/articles/2022-03-30/texas-crypto-miners-need-approval-to-energize-in-grid-hurdle>.

⁵⁰ Standard energy efficiency requirements will not be sufficient. As the value of mining rewards has increased, more sophisticated mining equipment has developed. *See, e.g.*, Namcios, *News Intel Launches New Bitcoin Mining Chip, Blocksale*, Bitcoin Magazine (Apr. 4, 2022), <https://bitcoinmagazine.com/business/intel-launches-new-bitcoin-mining-chip-blockscale>. While ASICs are more powerful and energy efficient than the hardware previously used for cryptocurrency mining, the efficiency gains have not resulted in decreased overall energy consumption because of the substantially increased scale of mining. Neel Dhanesha, *The daunting task of making cryptocurrency climate-friendly*, Vox (Apr. 18, 2022) (“There hasn’t been any time in the history of bitcoin where increasing machine efficiency led to less energy consumption,” said Alex de Vries, founder of the website *Digiconomist*, which tracks the sustainability of cryptocurrencies.”), <https://www.vox.com/recode/23005493/cryptocurrency-bitcoin-climate-friendly>.

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⁵² Todd Phillips, *A Climate and Competition Agenda for the Commodity Futures Trading Commission*, CAP (Feb. 1, 2022), <https://www.americanprogress.org/article/a-climate-and-competition-agenda-for-the-commodity-futures-trading-commission/>.

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⁵⁴ Todd Phillips, *The SEC’s Regulatory Role in the Digital Asset Markets*, CAP (Oct. 4, 2021), <https://www.americanprogress.org/article/secs-regulatory-role-digital-asset-markets/>.

⁵⁵ Kimberly Gedeon, *The most energy-efficient cryptocurrencies — Tesla's top picks to replace Bitcoin*, Laptop (May 31, 2021), <https://www.laptopmag.com/best-picks/most-energy-efficient-cryptocurrencies-the-best-picks-for-teslas-new-coin>.