October 6, 2022

Re: Request for Information on Climate-Related Financial Risk

Thank you for the opportunity to submit comments on CFTC's Request for Information on Climate-Related Financial Risk. Our comments are a response to CFTC's question on digital assets, which asks:

"Are digital asset markets creating climate-related financial risk for CFTC registrants, registered entities, other derivatives market participants, or derivatives markets? Are there any aspects of climate-related financial risk related to digital assets that the Commission should address within its statutory authority? Do digital assets and/or distributed ledger technology offer climate-related financial risk mitigating benefits?"

We conclude the following:

- Digital assets that rely upon the proof-of-work consensus mechanism are increasing electricity use and climate pollution.
- Digital assets are increasing electricity prices and threatening the reliability of electricity supplies.
- CFTC should use CTFC's existing authorities to:
    - increase monitoring and reporting,
    - set environmental and energy standards for digital assets, and
    - to prohibit misleading claims about the climate and energy impacts of digital assets.

Proof-of-Work is Wasteful by Design

Proof-of-work cryptocurrency mining is designed to consume enormous quantities of energy. The process effectively entails millions of computing machines racing to solve a complex, but meaningless, problem. In Bitcoin's algorithm, for example, the computer or mining machine that successfully solves the problem is rewarded with Bitcoin (and functionally verifies the blockchain). As long as the reward is high enough (i.e., the price of Bitcoin is high enough), miners will attempt to use more – and faster – mining machines to increase their chances of winning that reward. As more mining machines enter the race, the difficulty of the computational problem gets harder, and the electricity required to win increases. Over time, the electricity used by miners in these races increases exponentially.[1]

The design of proof-of-work cryptocurrency mining incentivizes miners to ramp up operations as quickly as possible, often irrespective of the source of energy.[2] Indeed, big mining operations have shown a willingness to invest in otherwise uneconomic power sources, like defunct coal plants or low-capacity gas plants, as long as that electricity can be made available quickly.

[1] White House OSTP, *Climate and Energy Implications of Crypto- Assets in the United States*, at 10-12 (Sept. 8, 2022), https:// www.whitehouse.gov/wp-content/uploads/2022/09/09- 2022-Crypto-Assets-and-Climate-Report.pdf.
[2] https://www.sec.gov/Archives/edgar/data/1710350/000121390022024123/ea159396-424b3_bitdigital.htm

Unlike other large electricity users, cryptocurrency mining operations have a short time horizon, and most have shown little interest in investing in new clean energy.

Proof-of-Work Uses Significant Amounts of Electricity and Increases Climate Pollution

Cryptocurrency miners procure their electricity in four different ways: (1) outright purchase of power plants that supply mining rigs "behind-the-meter;" (2) power purchase agreements with power generators or utilities; (3) electricity purchases from a local utility; and (4) by burning gas at oil and gas wells.[3] Each type of mining produces excess emissions, and impacts electricity and energy consumers.

The scale, and explosive growth, of cryptocurrency mining in the United States is hard to fully document, because most mining operations do not readily disclose their energy consumption, much less location and source of electricity. But both ground-up accounting and top-down estimates reveal the same trend: cryptocurrency mining operations have a substantial emissions impact. The most obvious way cryptocurrency mining increases global emissions is by driving huge increases in electricity demand.

Based on the current grid generation mix and estimated Bitcoin energy consumption, we estimate Bitcoin mining in the United States is responsible for between 11 to 76 million annual excess tons of CO_2 in the last year, with a central estimate of 27.4 million tons of CO_2.[4] The White House's Office of Science and Technology Policy arrived at a similar estimate, of about 21 to 35 million tons of CO_2 by mid-2022 from Bitcoin mining, and 25 to 50 million tons of CO_2 from all cryptocurrency mining activity in the United States.[5] According to the U.S. House Committee on Energy and Commerce, the CO_2 emissions from global mining of Ethereum and Bitcoin in 2021 alone equaled the tailpipe emissions of more than 15.5 million gas-powered cars.[6]

The most troubling aspect of cryptocurrency mining – Bitcoin in particular – are agreements to resurrect or extend the life of fossil fuel energy plants. Ready access to transmission infrastructure, a low cost of acquisition, and utilities eager to offload liability make the purchase of otherwise uneconomic fossil fuel power plants a profitable choice for miners. The largest partnerships between specific power plants and Bitcoin mining operations we have been able to identify are at existing coal plants and gas plants that were on the verge of retirement, have struggled to find buyers, or were operating infrequently: coal-fired plants in Hardin (MT), Scrubgrass and Panther Creek (PA), Coal Creek (ND), and Merom (IN) and gas-fired plants Greenridge and Fortistar (NY), Odessa and Wolf Hollow (TX). In most cases, the resulting

[3] https://earthjustice.org/features/cryptocurrency-mining-environmental-impacts

[4] Aggregate Bitcoin energy use data, from August 1, 2021 through July 31, 2022, is sourced from the Cambridge Bitcoin Electricity Consumption Index, with a daily estimated power consumption at an estimated 85% load factor and assuming ~38% of Bitcoin mining occurred in the United States in 2022. Cambridge Centre for Alt. Finance, *Cambridge Bitcoin Electricity Consumption Index: Bitcoin network power demand* (last visited Aug. 25, 2022), https://ccaf.io/cbeci/index; Cambridge Centre for Alt. Finance, *Cambridge Bitcoin Electricity Consumption Index: Bitcoin Mining Map* (last visited Aug. 25, 2022), https://ccaf.io/ cbeci/mining_map (CBECI fraction of consumption by region). National marginal emissions rate from is from EPA's Avoided Emissions and Generation Tool (AVERT). U.S. EPA, *Emission Rates from AVERT* (Mar. 2022), https://www.epa.gov/system/ files/documents/2022-03/avert_emission_rates_03-29-22. xlsx. *See also* White House OSTP, *Climate and Energy Implications of Crypto-Assets in the United States*, at 21 (Sept. 8, 2022), https://www.whitehouse.gov/wp-content/ uploads/2022/09/09-2022-Crypto-Assets-and-Climate- Report.pdf (estimating 25-50 million tons in the United States).

[5] https://www.whitehouse.gov/wp-content/uploads/2022/09/09-2022-Crypto-Assets-and-Climate-Report.pdf

[6] https://energycommerce.house.gov/sites/democrats.energycommerce.house.gov/files/documents/Briefing%20Memo_OI%20Hearing_2022.01.20.pdf

increased emissions of these power plants are directly attributable to the Bitcoin mining operations that support their operations in part or in whole.[7]

Digital assets that rely upon proof-of-work increase prices for other energy consumers and threaten the reliability of supplies.

In a similar vein to the problematic climate impacts emerging from proof-of-work cryptocurrency mining, these operations harm existing electricity customers both by increasing the total *quantity* of electricity needed on the grid and by introducing specific risks that are attributable to the intensity, portability, and extreme time-sensitivity of cryptocurrency mining operations.

High-density electricity users such as miners frequently demand the construction of transmission and distribution lines, substation upgrades, and other infrastructure to facilitate the delivery of huge quantities of electricity to a new energy intensive mining rig.[8] Ratepayers may be left on the hook for these investments when a cryptocurrency mining operation abruptly leaves (as they are generally capable of doing).[9] There is ample evidence of utilities expending significant sums to serve cryptocurrency mining operations – financial outlays that will be passed on as higher rates to the utility's other customers.

Empirical evidence strongly supports the conclusion that cryptocurrency mining operations push electricity rates higher for the surrounding community. Some states, recognizing the risks of cryptocurrency mining's unique position as a new, unregulated industrial user, have begun requiring miners to pay for upgrades as opposed to passing those onto the community at large. Likewise, some utilities, recognizing the risks cryptocurrency mining operations pose to their existing customers, have begun to develop tariff provisions to mitigate these risks.

Proof-of-work cryptocurrency mining operations drawing energy from the grid are placing a mostly-unplanned-for load on already-strained grids across the country. This is largely due to cryptocurrency mining's energy intensity and ability to quickly scale operations up or down. The sheer speed and magnitude of load growth associated with cryptocurrency mining is unprecedented and threatens the ability of both generation and transmission resources to get electrons where they are needed without overheating or unbalancing the physical infrastructure. Perhaps the most worrying site of potential grid instability due to cryptocurrency mining load

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[7] https://earthjustice.org/features/cryptocurrency-mining-environmental-impacts, Mining operations at existing hydroelectric facilities are more complicated to parse. To the extent that the facility would have otherwise marketed its energy to the broader grid and remained viable, the cryptomining operation might be utilizing a low emissions resource that would have otherwise displaced fossil consumption. However, if the hydroelectric facility would have otherwise been abandoned but for the favorable pricing offered by the cryptocurrency mine, it may have little emissions impact.

[8] For example, in Idaho, investor-owned utility Idaho Power requested that cryptominers prepay for required infrastructure upgrades to prevent stranded assets on remaining ratepayers when the economics of cryptocurrency change. Idaho Pub.
Utils. Comm'n, *Application of Idaho Power Co. for Authority to Establish a New Schedule to Serve Speculative High-Density Load Customers*, at 13-14, Case No. IPC-E-21-27 (Nov. 4, 2021), https://puc.idaho.gov/Fileroom/PublicFiles/ELEC/ IPC/IPCE2137/CaseFiles/20211104Application.pdf; *see also* Justine Calma, *Texas' Fragile Grid Isn't Ready for Crypto Mining's Explosive Growth*, The Verge (July 14, 2022), https://www. theverge.com/2022/7/14/23206795/bitcoin-crypto-mining- electricity-texas-grid-energy-bills-emissions ("Unfortunately, the costs for building out all this infrastructure are often passed on to consumers — particularly if it's done at a huge scale under a rushed timeline as crypto mining might demand.").

[9] Naureen S. Malik & Michael Smith, *Crypto Mania in Texas Risks New Costs and Strains on Shaky Grid*, Bloomberg (Mar. 15, 2022), https://www.bloomberg.com/news/ articles/2022-03-15/crypto-mania-in-texas-risks-new-costs- and-strains-on-shaky-grid.

increases is in Texas, and how that impacts Texans both from a safety perspective and financially.[10]

Digital assets that rely upon proof-of-work are making misleading claims.

The Bitcoin mining community understands its extraordinary energy consumption – and fossil fuel habit – is unattractive when much of the rest of the economy strives to rapidly decarbonize. In the last year, the industry and its trade organizations have rolled out a series of sustainability claims that are anywhere from outright fiction and greenwashing to no more than hopeful theories, undermined by actual practices.

One of the most widespread mischaracterizations is that mining is "sustainable" when the facility is physically located near existing wind power or solar power. But most mining facilities draw power from the grid – meaning their electricity is generated by whatever existing energy is in place in the region or is contracted by their utility. Worse, adding a new large-scale load, like a cryptocurrency mining facility, to the grid generally requires existing fossil generators to increase their output. Mining facilities located near wind or solar sites do not have a special claim to energy produced by that entity, but instead drive increased emissions from gas and coal plants.

Co-location is not miners' only form of greenwashing. Miners often claim "carbon neutrality" when in fact they are simply purchasing offsets or renewable energy credits – paying renewable generators elsewhere while increasing load on (and pollution from) fossil fuel plants locally. Several mining companies rely on purchase of carbon "offsets" to advertise to the public and their investors that they are a sustainable operation. As a general matter, many carbon offsets programs are unverifiable and hard-to-measure, and in many instances, not actually reducing carbon pollution.[11]

Another myth put forward by proponents is that proof-of-work cryptocurrency mining only uses "wasted" (or curtailed) energy from solar or wind overproduction. The fact is that mining operations operate and draw on the grid at all hours, not just when there is excess solar or wind. Mining operations would likely fail to be profitable using only the sparse hours in which solar or wind curtails. The final proof of course is in the pudding: few cryptocurrency mining operations are even located where wind or solar might provide curtailed energy and operate far in excess of the amount of curtailed energy even available.

Proponents of Bitcoin mining like to claim that the intensive demand of mining will spur new renewable development and stabilize the grid. The reality is that clean energy allocated to cryptocurrency mining is then unavailable for grid decarbonization. As such, there are few mining facilities that are building new renewable energy to power their operations. The only claim to grid stability is that cryptocurrency mining operations may be willing to curtail operations if they are paid enough to do so. A miner's participation in demand response

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[10] Naureen S. Malik, *Texas crypto miners could require as much power as all of New York state*, Bloomberg (Aug. 26, 2022), https://www.bloomberg.com/news/articles/2022-08-26/texas- crypto-rush-may-need-as-much-power-as-entire-state-of-n-y.

[11] HBO, *Carbon Offsets: Last Week Tonight with John Oliver*. Season 9 - Episode 21 (Aug. 22, 2022), https://pressroom. warnermedia.com/na/video/carbon-offsets-last-week-tonight- john-oliver?language_content_entity=en; Raphael Calel *et al., Do carbon offsets offset carbon?* Centre for Climate Change Econs. & Policy, at 1 (Nov. 2021), https://www.lse.ac.uk/ granthaminstitute/wp-content/uploads/2021/11/working- paper-371-Calel-et-al..pdf. data

programs during emergency periods (which many other electricity users do as well) can amount to tens of millions a year and is often paid by other ratepayers.

Some proponents of proof-of-work cryptocurrency claim that mining "acts like a battery." This is false. Unlike batteries, mining operations cannot store electricity produced at peak solar or wind hours for later use and provide no other grid services. Mining operations simply do not provide ancillary services, such as load balancing, that maintain the operability of the grid. They also do not provide storage capacity. Energy consumed by a mining operation cannot be exported or redeployed.

Finally, some proponents of proof-of-work cryptocurrency claim miners are no worse than other electricity users.[12] This is also false. Electricity demand in comparable sectors has not increased and, in some cases, even declined as energy efficiency increased.[13] For example, electricity demand by data centers has not increased, even though internet traffic and data center workloads have increased significantly.[14] In sharp contrast to cryptocurrency mining, data transmission networks and mobile communications networks are rapidly becoming more energy efficient.[15] Moreover, Bitcoin's ratio of energy consumption to human participation – people buying Bitcoin, holding it, or even working at mining facilities – is wildly larger than other electricity users. 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.[16] Unlike other sectors, it can, through innovation and a voluntary code change, eschew the need for electricity-wasting mining altogether.

Despite the purported economic development justification for cryptocurrency mining incentive programs, these operations create few jobs.[17] Most of the work that is created at cryptocurrency mining sites is hiring temporary workers to set up the mining machines; less than a dozen people may be required to maintain the operation.[18]

CFTC should use CFTC's existing authorities to address the climate and energy impacts of digital assets and to prohibit misleading claims.

CFTC should use CTFC's existing authorities to increase monitoring and reporting, to set environmental and energy standards for digital standards, and to prohibit misleading claims about the climate and energy impacts of digital assets. CFTC should use listing standards to

[12] Bitcoin Mining Council, *Global Bitcoin Mining Data Review: Q2 2022*, at Slide 8 (July 2022), https://bitcoinminingcouncil. com/wp-content/uploads/2022/07/2022.07.19-BMC-Presentation-Q2-22-Presentation.pdf ("Bitcoin mining energy use is only 0.15% when compared to the world's total energy."). The figures used in this comparison are misleading because they compare Bitcoin energy against all other consumptive energy purposes, including electricity, transportation and shipping, industry, heating, cooling, agriculture, and cooking. According to the Bitcoin Mining Council, Bitcoin already consumes 253 billion kWh, or 1% of global electricity production, Bitcoin Mining Council, *Global Bitcoin Mining Data Review* at 6; *see* U.S. EIA, *International Data World Electricity* (last visited Aug. 29, 2022), https://www.eia.gov/international/data/world/electricity/ electricity-generation.

[13] Andrew R. Chow, *Fact-Checking 8 Claims About Crypto's Climate Impact*, Time Magazine (July 1, 2022), https://time. com/6193004/crypto-climate-impact-facts/.

[14] George Kamiya, *Data Centres and Data Transmission Networks*, International Energy Agency (Nov. 2021), https://www.iea.org/ reports/data-centres-and-data-transmission-networks.

[15] Joshua Aslan *et al.*, *Electricity Intensity of Internet Data Transmission: Untangling the Estimates*, 22(4) J. of Indus. Ecology 785 (2017), https://onlinelibrary.wiley.com/ doi/10.1111/jiec.12630; Albrecht Fehske *et al.*, *The global footprint of mobile communications: The ecological and economic perspective*, 49(8) IEEE Commc'n Mag., at 55-62 (Aug. 2011), https://ieeexplore.ieee.org/document/5978416.

[16] Rachel Rybarczyk *et al.*, *On Bitcoin's Energy Consumption: A Quantitative Approach to a Subjective Question*, Galaxy Digital, at 8, 13 (May 2021), https://docsend.com/view/ adwmdeeyfvqwecj2.

[17] Fitch Ratings, *Crypto Mining Poses Challenges to Public Power Utilities* (Jan. 24, 2022), https://www.fitchratings.com/ research/us-public-finance/crypto-mining-poses-challenges- to-public-power-utilities-24-01-2022.

[18] Laura Counts, *Power-hungry cryptocurrency miners push up electricity costs for locals*, Berkeley Haas (Aug. 3, 2021), https://newsroom.haas.berkeley.edu/research/power-hungry- cryptominers-push-up-electricity-costs-for-locals/ (quoting Assistant Professor Giovanni Compiani, one of the co-authors of Matteo Benetton *et al.*, *When Cryptocurrency Comes to Town: High Electricity-Use Spillovers to the Local Economy*, SSRN, at 3 (Aug. 2022), https://papers.ssrn.com/sol3/papers. cfm?abstract_id=3779720).

prohibit platforms that offer cryptocurrencies from listing assets that fail to report electricity use and the source of electricity, and which fail to meet energy and environmental standards, such as energy efficiency standards.

To address electricity use – and ultimately the climate pollution caused by digital assets – CFTC should require registered exchanges to only list digital assets who meet energy efficiency and other environmental standards for air, water, and noise pollution. Another option would be to make listing subject to the development of a plan to transition to less energy-intensive methods of validation. Imposing these standards would create a powerful incentive for the Bitcoin community to transition from proof-of-work to proof-of-stake or another validation method that uses far less electricity.

These recommendations are consistent with the recommendations by the White House Office of Science and Technology Policy. In particular, OSTP recommended that federal agencies should "*develop effective, evidence-based environmental performance standards for the responsible design, development, and use*" of cryptocurrencies. These should include "*standards for very low energy intensities, very low water usage, low noise generation, clean energy usage by operators, and standards that strengthen over time."* OSTP also called on federal agencies to ensure energy reliability by conducting energy reliability assessments and, if needed, developing and enforcing reliability standards.[19]

The CFTC should also use CFTC's existing authorities to prohibit false or misleading information regarding cryptocurrencies. These prohibitions on misleading claims apply not only to traders but also cryptocurrency issuers, wallet providers, and exchanges. CFTC should use these authorities to write rules clarifying which types of claims are misleading, especially claims related to climate and energy.

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Thank you for the opportunity to provide these comments.

Sincerely,

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[19] https://www.whitehouse.gov/wp-content/uploads/2022/09/09-2022-Crypto-Assets-and-Climate-Report.pdf