Congress of the United States

Washington, DC 20515

July 15, 2022

The Honorable Michael Regan
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Room 3426 WJC North
Washington, DC 20460

The Honorable Jennifer Granholm
Secretary
Department of Energy
1000 Independence Ave. SW
Washington, DC 20585

Dear Administrator Regan and Secretary Granholm,

We write to provide new information on our investigation of the environmental impacts of cryptocurrency mining, and to request that your agencies work together to require emissions and energy use reporting by cryptominers.

The cryptocurrency market has grown exponentially since first introduced over a decade ago.[1] Mining operations for Bitcoin, the largest cryptocurrency by market cap, are increasingly moving onshore, with the United States' share of global mining increasing from 4 percent in August 2019 to nearly 38 percent in January 2022 – meaning that over a third of the global computing power dedicated to mining Bitcoin is now drawn from miners in the U.S., in part due to a government crackdown in China last year.[2]

The networks of Bitcoin and many other tokens are secured through a "proof of work" algorithm, which involves "miners" using highly-specialized and power-intensive computers known as "mining rigs" to verify transactions by solving a mathematical puzzle, with the winning miner being rewarded in new tokens.[3] As more miners compete and the value of the

[1] MIT Technology Review, "The Cryptocurrency Market Is Growing Exponentially," Emerging Technology from the arXiv, May 29, 2017, https://www.technologyreview.com/2017/05/29/151496/the-cryptocurrency-market-is-growing-exponentially/.

[2] Cambridge Centre for Alternative Finance, Cambridge Bitcoin Electricity Consumption Index, "Bitcoin Mining Map," June 2022, https://cbeci.org/mining_map; CoinMarketCap, "Cryptocurrency Prices, Charts And Market Capitalizations," https://coinmarketcap.com/; The Wall Street Journal, "U.S. Takes Bitcoin Mining Crown After China Crackdown," Caitlin Ostroff, October 27, 2021, https://www.wsj.com/articles/u-s-takes-bitcoin-mining-crown-after-china-crackdown-11635327002.

[3] CoinDesk, "What Is Proof-of-Work?," Alyssa Hertig, December 16, 2020, https://www.coindesk.com/tech/2020/12/16/what-is-proof-of-work/; The Guardian, "Electricity needed to mine bitcoin is more than used by 'entire countries'," Lauren Aratani, February 27, 2021, https://www.theguardian.com/technology/2021/feb/27/bitcoin-mining-electricity-use-environmental-impact.

token increases, solving this puzzle becomes increasingly difficult, requiring more computational power and greater energy consumption.[4] Bitcoin's estimated annualized global power consumption had increased nearly four-fold between the beginning of 2019 and mid-June 2022 to as high as 130 TWh, rivaling the total annual electricity usage of countries such as Norway and Sweden and reportedly exceeding the total reductions in greenhouse gas emissions attributed to electric vehicles.[5] The total annual global electricity consumption associated with just the two largest cryptocurrencies by market capitalization, Bitcoin and Ethereum, has been estimated to be as high as 300 TWh in May 2022, comparable to the annual electricity usage of the United Kingdom.[6] And this electricity usage has major emissions consequences: the energy used to mine Bitcoin and Ethereum in 2021 resulted in almost 80 million tons of carbon dioxide emissions.[7]

Cryptomining facilities' energy consumption is also causing significant increases in energy costs for many small businesses and residents. Cryptomining in the city of Plattsburgh, New York reportedly resulted in residential electricity bills that were "up to $300 higher than usual" in the winter of 2018, leading the city to introduce the nation's first 18-month moratorium on new cryptomining operations.[8] A recent study estimates that "the power demands of cryptocurrency mining operations in upstate New York push up annual electric bills by about $165 million for small businesses and $79 million for individuals."[9] Moreover, states like Texas with relatively cheap electricity costs are experiencing an influx of cryptomining companies, raising concerns about the state's unreliable electricity market and the potential for cryptomining to add to the stress on the state's power grid.[10]

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[4] The Wall Street Journal, "Bitcoin Miners Are Giving New Life to Old Fossil-Fuel Power Plants," Brian Spegele and Caitlin Ostroff, May 21, 2021, https://www.wsj.com/articles/bitcoin-miners-are-giving-new-life-to-old-fossil-fuel-power-plants-11621594803.

[5] The New York Times, "Bitcoin Uses More Electricity Than Many Countries. How Is That Possible?" Jon Huang, Claire O'Neill, and Hiroko Tabuchi, September 3, 2021, https://www.nytimes.com/interactive/2021/09/03/climate/bitcoin-carbon-footprint-electricity.html; Cambridge Centre for Alternative Finance, Cambridge Bitcoin Electricity Consumption Index, "Bitcoin network power demand," June 2022, https://web.archive.org/web/20220612070718/https://ccaf.io/cbeci/index/; U.S. Energy Information Administration, "Electricity," https://www.eia.gov/international/data/world/electricity/electricity-consumption; Digiconomist, "Bitcoin now negating a decade of progress in deploying electric vehicles," June 27, 2021, https://digiconomist.net/bitcoin-now-negating-a-decade-of-progress-in-deploying-electric-vehicles/.

[6] NDTV Profit, "Ethereum Upgrade To Cut Energy Consumption By Over 99%: Know More About It," March 27, 2022, https://www.ndtv.com/business/ethereum-upgrade-and-energy-consumption-here-s-all-you-need-to-know-2846026; Digiconomist, "Ethereum Energy Consumption Index," https://digiconomist.net/ethereum-energy-consumption; Digiconomist, "Bitcoin Energy Consumption Index," https://digiconomist.net/bitcoin-energy-consumption; U.S. Energy Information Administration, "Electricity," https://www.eia.gov/international/data/world/electricity/electricity-consumption.

[7] Forex Suggest.com, "Global Impact of Crypto Trading," https://forexsuggest.com/global-impact-of-crypto-trading/.

[8] Congressional Research Service, "Bitcoin, Blockchain, and the Energy Sector," Corrie E. Clark and Heather L. Greenley, August 9, 2019, https://crsreports.congress.gov/product/pdf/R/R45863/3.

[9] Berkeley Haas, "Power-hungry cryptominers push up electricity costs for locals," Laura Counts, August 3, 2021, https://newsroom.haas.berkeley.edu/research/power-hungry-cryptominers-push-up-electricity-costs-for-locals/.

[10] Cointelegraph, "Crypto miners eye cheap power in Texas, but fears aired over impact on the grid," Samuel Haig, June 16, 2021, https://cointelegraph.com/news/crypto-miners-eye-cheap-power-in-texas-but-fears-aired-over-impact-on-the-grid.

Despite these adverse impacts from cryptomining, state and federal regulators currently know little about the scope of the problem. There is no national or state reporting requirement or compilation of the locations of cryptomining facilities in the United States, and no federal regulations specifically governing cryptomining. Consequently, policymakers and the public do not have a comprehensive source of information about where these operations are located, how much energy they consume, and what their sources of energy are – and without the energy use and source reporting, there is a subsequent lack of data regarding the associated air emissions of pollutants or carbon dioxide.

To address this concern, we wrote to seven of the largest cryptomining operations in the U.S. seeking information about the locations of their facilities, their energy sources and consumption, and the climate impacts associated with this production. None of the companies provided full and complete information in response to our questions. But the information they did provide reveals that these companies' mining operations are significant and growing, have a major impact on climate change, and that federal intervention is necessary. Specifically, this information reveals that:

- **Cryptominers are using substantial amounts of electricity.** The seven companies alone indicated that they presently have developed over 1,045 MW capacity for cryptomining (Table 1). This is nearly enough capacity to power all the residences in Houston, Texas.[11]

  Greenidge reported operating 50 MW of capacity for cryptomining at its Dresden facility; [12] Riot reported operating a total of 401 MW of capacity;[13] Bitdeer reported operating a total of 243 MW of capacity at three plants;[14] Stronghold reported operating 165 MW at its Scrubgrass and Panther Creek plants;[15] Marathon reported operating nearly 65 MW (in September 2021, prior to a major expansion);[16] and Bit Digital reported having mining agreements in place at various facilities for a total of 195 MW, with 73.6 MW of contracted hosting "in excess of the needs of our currently owned fleet and announced purchases" – indicating they currently operate just over 121 MW.[17] Bitfury did provide a response to our letter, but failed to include in their

[11] Based on estimates that, "Nationally, based on the EIA's average monthly residential consumption, 1 MW generated consistently would serve the monthly energy needs of roughly 800 residences." Congressional Research Services, information provided via e-mail to the Office of Sen. Elizabeth Warren, May 23, 2022; United States Census Bureau, "QuickFacts: Houston city, Texas," https://www.census.gov/quickfacts/houstoncitytexas.

[12] Letter from King & Spalding on behalf of Greenidge Holdings, Inc., to Senator Elizabeth Warren, Dec. 17, 2021, https://www.warren.senate.gov/imo/media/doc/Greenidge%20Response%20Letter%2012.17.2021.pdf.

[13] Letter from Riot Blockchain, Inc. to Members of Congress, February 24, 2022, https://www.warren.senate.gov/imo/media/doc/Riot%20Response%20Letter%202.24.20223.pdf.

[14] Letter from Bitdeer Inc. to Senator Elizabeth Warren, February 10, 2022, https://www.warren.senate.gov/imo/media/doc/Bitdeer%20Response%20Letter%202.10.20223.pdf.

[15] Letter from Stronghold Digital Mining to Members of Congress, February 8, 2022, https://www.warren.senate.gov/imo/media/doc/Stronghold%20Response%20Letter%202.8.2022.pdf.

[16] Letter from Marathon Digital Holdings to Members of Congress, February 10, 2022, https://www.warren.senate.gov/imo/media/doc/Marathon%20Response%20Letter%202.10.20221.pdf.

response answers to our questions regarding their mining locations, energy consumption, and energy sources.[18]

Table 1: Mining Capacity of Responding Cryptominers as of February 2022*		
Company	**Facility**	**Capacity**
Riot	Coinmint	51 MW
Riot	Whinstone	350 MW
Bit Digital	Compute North Kearney, Compute North Big Springs, Blockfusion USA Niagara Falls, Digihost Technologies Buffalo, Core Scientific Dalton	121.6 MW
Bit Deer	Pangborn	13 MW
Bit Deer	Knoxville	60 MW
Bit Deer	Rockdale	170 MW
Stronghold	Scrubgrass	85 MW
Stronghold	Panther Creek	80 MW
Marathon	Montana	57.6 MW
Marathon	South Dakota	2.2 MW
Marathon	Nebraska	4.9 MW
Greenidge	Dresden	50 MW
Total		**1,045.3 MW**

*Greenidge capacity is as of December 2021, and Marathon capacity reported in February 2022 is as of September 2021

- **Cryptominers are significantly increasing production.** Although miners are already using a significant amount of electricity at present, the companies that provided information indicated that they expect considerable increases in mining capacity and therefore electricity use in future years. Marathon indicated that "In January 2021, we operated 2,060 bitcoin [mining rigs]…As of February 1, 2022, we were operating 32,710 bitcoin [mining rigs]…By early next year we intend to have deployed 199,000 bitcoin [mining rigs]."[19] This represents nearly a hundred-fold increase in the number of operating rigs in just two years.

[17] Letter from Bit Digital to Senator Elizabeth Warren, February 18, 2022, https://www.warren.senate.gov/imo/media/doc/Bit%20Digital%20Response%20Letter%202.18.20221.pdf.

[18] Letter from Bitfury to Members of Congress, February 10, 2022, https://www.warren.senate.gov/imo/media/doc/Bitfury%20Response%20Letter%202.10.20221.pdf.

[19] Letter from Marathon Digital Holdings to Members of Congress, February 10, 2022, https://www.warren.senate.gov/imo/media/doc/Marathon%20Response%20Letter%202.10.20221.pdf.

Bit Digital indicated that it planned to increase its capacity for mining from over 121 MW in 2021 to 173 MW in 2022, with further expansion planned to 195 MW in 2023 and beyond.[20] Riot indicated that it plans to double the current mining capacity of its Whinstone plant, from 350 MW to "700 MW of cutting-edge Bitcoin mining infrastructure," within the year.[21] Bitdeer plans to quadruple its current capacity, expanding its existing operations by 598 MW and "developing additional Texas-based data centers with an approximate aggregate capacity of 362 MW in 2022."[22] Marathon stated that "we estimate that it will require approximately 630 MW to power our fleet once fully deployed," an increase of 565 MW.[23] And Greenidge stated that it "expects to have at least 500 MW of mining capacity across multiple locations by 2025" – which would represent an expansion of 450 MW.[24] However, the New York Department of Environmental Conservation denied Greenidge's request for renewal of a required air permit in June 2022 on grounds that the company's current cryptomining operations were a threat to the state's climate goals and were "for a wholly new purpose unrelated to its original permit."[25] It not clear how this decision affects Greenidge's long-term expansion goals, though the company "said it would continue operating under its current permit while it challenged the decision."[26]

Overall, this limited set of information indicates that just the few cryptominers that were part of this investigation will increase their total mining capacity by at least 2,399 MW in the next few years – an increase of nearly 230 percent, and enough new capacity to power a city of over 1.9 million residences.[27] For comparison, Los Angeles has 1.4 million households.[28]

- **Cryptomining results in substantial amounts of carbon emissions.** Several of the companies that wrote to us insisted that their mining efforts were environmentally friendly and did not have a significant adverse impact on climate and air quality. For example, Greenidge described its "clean burning natural gas facility…[that] has never

[20] Letter from Bit Digital to Senator Elizabeth Warren, February 18, 2022, https://www.warren.senate.gov/imo/media/doc/Bit%20Digital%20Response%20Letter%202.18.20221.pdf.

[21] Letter from Riot Blockchain, Inc. to Members of Congress, February 24, 2022, https://www.warren.senate.gov/imo/media/doc/Riot%20Response%20Letter%202.24.20223.pdf.

[22] Letter from Bitdeer Inc. to Senator Elizabeth Warren, February 10, 2022, https://www.warren.senate.gov/imo/media/doc/Bitdeer%20Response%20Letter%202.10.20223.pdf.

[23] Letter from Marathon Digital Holdings to Members of Congress, February 10, 2022, https://www.warren.senate.gov/imo/media/doc/Marathon%20Response%20Letter%202.10.20221.pdf.

[24] Letter from King & Spalding on behalf of Greenidge Holdings, Inc., to Senator Elizabeth Warren, Dec. 17, 2021, https://www.warren.senate.gov/imo/media/doc/Greenidge%20Response%20Letter%2012.17.2021.pdf.

[25] CBS News, "New York denies permit renewal for bitcoin mining company, calling it threat to state's climate goals," July 1, 2022, https://www.cbsnews.com/news/bitcoin-mining-plant-greenidge-generation-new-york-state-permit-denial-climate-goals.

[26] *Id.*

[27] Based on estimates that, "Nationally, based on the EIA's average monthly residential consumption, 1 MW generated consistently would serve the monthly energy needs of roughly 800 residences." Congressional Research Services, information provided via e-mail to the Office of Sen. Elizabeth Warren, May 23, 2022.

[28] United States Census Bureau, "QuickFacts: Los Angeles city, California," https://www.census.gov/quickfacts/fact/table/losangelescitycalifornia/PST045221.

operated on coal under Greenidge's ownership and will never burn coal again."[29] Bit Digital emphasized that the company "has taken a step towards decarbonization by signing the Crypto Climate Accord" and bragged that in Niagara Falls, the company has converted "a former coal-burning power plant …into an innovative, sophisticated, and nearly carbon-free operation."[30] Riot stated that "Bitcoin mining drives more demand for renewable energy than the typical U.S. energy consumer."[31]

But these and similar promises about clean energy use obscure a simple fact: Bitcoin miners are using huge quantities of electricity that could be used for other priority end uses that contribute to our electrification and climate goals, such as replacing home furnaces with heat pumps. The current energy use of cryptomining is resulting in large amounts of carbon emissions and other adverse air quality impacts, as well as impacts to the electric grid. And it is worth noting that pledges like the Crypto Climate Accord are non-binding and do not hold cryptominers to specific actions.[32]

For example, Riot indicated that its 51 MW Coinmint facility "utilizes nearly exclusively hydroelectricity, a zero-emission, sustainable energy source."[33] But its Whinstone facility, which is seven times larger, uses power from the Texas grid that relies on coal or natural gas for more than 63 percent of its generating capacity.[34]

Other miners reported significant amounts of carbon emissions. Bit Digital indicated that its operations resulted in an estimated 92,000 metric tons of CO2 emissions in 2021, and projected 1.075 million metric tons of CO2 emissions in 2022, increasing to 1.2 million metric tons in 2023 and beyond – annual emissions that are equivalent to those from over 260,000 automobiles.[35] Greenidge reported 273,326 tons of CO2 equivalent emitted in the 12 months prior to November 30, 2021, the equivalent of nearly 60,000 cars.[36] Stronghold indicated that the cumulative estimated CO2 emitted by its Panther Creek and Scrubgrass facilities in supplying the power required for its

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[29] Letter from King & Spalding on behalf of Greenidge Holdings, Inc., to Senator Elizabeth Warren, Dec. 17, 2021, https://www.warren.senate.gov/imo/media/doc/Greenidge%20Response%20Letter%2012.17.2021.pdf.

[30] Letter from Bit Digital to Senator Elizabeth Warren, February 18, 2022, https://www.warren.senate.gov/imo/media/doc/Bit%20Digital%20Response%20Letter%202.18.20221.pdf.

[31] Letter from Riot Blockchain, Inc. to Members of Congress, February 24, 2022, https://www.warren.senate.gov/imo/media/doc/Riot%20Response%20Letter%202.24.20223.pdf.

[32] Crypto Climate Accord, "Make Crypto Green," https://cryptoclimate.org/.

[33] Letter from Riot Blockchain, Inc. to Members of Congress, February 24, 2022, https://www.warren.senate.gov/imo/media/doc/Riot%20Response%20Letter%202.24.20223.pdf.

[34] *Id.*

[35] Letter from Bit Digital to Senator Elizabeth Warren, February 18, 2022, https://www.warren.senate.gov/imo/media/doc/Bit%20Digital%20Response%20Letter%202.18.20221.pdf; The average automobile in the United States emits approximately 4.6 metric tons of CO2 annually, Environmental Protection Agency, "Greenhouse Gas Emissions from a Typical Passenger Vehicle," https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle#:~:text=typical%20passenger%20vehicle%3F-,A%20typical%20passenger%20vehicle%20emits%20about%204.6%20metric%20tons%20of,8%2C887%20grams%20of%20CO2.

[36] Letter from King & Spalding on behalf of Greenidge Holdings, Inc., to Senator Elizabeth Warren, Dec. 17, 2021, https://www.warren.senate.gov/imo/media/doc/Greenidge%20Response%20Letter%2012.17.2021.pdf.

Bitcoin mining operations is nearly 1.3 million metric tons, and that its expansion plans would result in emissions of more than 6.4 million metric tons of CO2 over five years[37] – the equivalent of putting nearly 280,000 passenger cars on the road. These three companies that provided clear emissions data alone are currently responsible for approximately 1.6 million tons emitted annually, the equivalent of almost 360,000 cars – and these figures are only set to go upwards in the coming years.

The results of our investigation, which gathered data from just seven companies, are disturbing, with this limited data alone revealing that cryptominers are large energy users that account for a significant – and rapidly growing – amount of carbon emissions. Our investigation suggests that the overall U.S. cryptomining industry is likely to be problematic for energy and emissions. But little is known about the full scope of cryptomining activity. Given these concerns, it is imperative that your agencies work together to address the lack of information about cryptomining's energy use and environmental impacts, and use all available authorities at your disposal, such as Section 114 of the *Clean Air Act*[38] and 15 U.S.C. § 772(a) and (b),[39] to require reporting of energy use and emissions from cryptominers.

This collected data would enable valuable public policy activities, including better monitoring of energy use and trends, better evidence basis for policy making, improved data for national mitigation analyses, better abilities for evaluating technology policies for the sector, and better modeling of national and regional grid loads and transitions, among other purposes.

Thank you for your attention to this important matter. We ask that you provide us with a written description of your authority to require such reporting, and any plan to do so, and provide us with a staff-level briefing on this matter by no later than August 15, 2022.

Sincerely,

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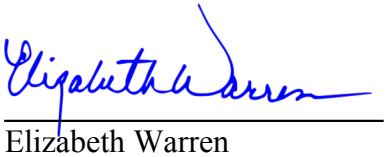
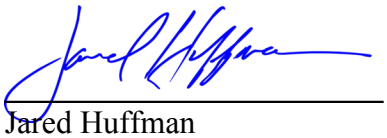
[37] Letter from Stronghold Digital Mining to Members of Congress, February 8, 2022, https://www.warren.senate.gov/imo/media/doc/Stronghold%20Response%20Letter%202.8.2022.pdf.

[38] Govinfo.gov, "§7414. Recordkeeping, inspections, monitoring, and entry," U.S. Government Publishing Office, https://www.govinfo.gov/content/pkg/USCODE-2013-title42/html/USCODE-2013-title42-chap85-subchapI-partA-sec7414.htm. This section of the Act provides that "the [EPA] Administrator may require any person who owns or operates any emission source, who manufactures emission control equipment or process equipment, who the Administrator believes may have information necessary for the purposes set forth in this subsection, or who is subject to any requirement of this chapter … to ….establish and maintain such records… make such reports… keep records on control equipment parameters, production variables or other indirect data when direct monitoring of emissions is impractical…and… provide such other information as the Administrator may reasonably require."

[39] Govinfo.gov, "§772. Administrator's information-gathering power," U.S. Government Publishing Office, https://www.govinfo.gov/content/pkg/USCODE-2010-title15/html/USCODE-2010-title15-chap16B-subchapI-sec772.htm. This section of the U.S. Code provides this authority to the Administrator of the Energy Information Administration under DOE: "The Administrator shall collect, assemble, evaluate, and analyze energy information by categorical groupings…of sufficient comprehensiveness and particularity to permit fully informed monitoring and policy guidance…" and "All persons owning or operating facilities or business premises who are engaged in any phase of energy supply or major energy consumption shall make available to the Administrator such information and periodic reports, records, documents, and other data…as the Administrator may prescribe by regulation or order as necessary or appropriate for the proper exercise of functions under this chapter."

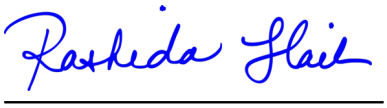


Elizabeth Warren
United States Senator

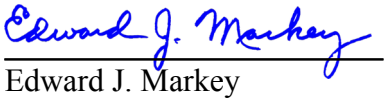


Jared Huffman
Member of Congress

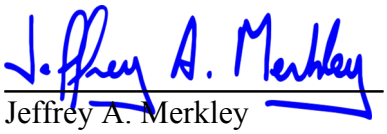
Sheldon Whitehouse
United States Senator



Rashida Tlaib
Member of Congress



Edward J. Markey
United States Senator



Jeffrey A. Merkley
United States Senator