

S. HRG. 118-21

**AIR, CLIMATE, AND ENVIRONMENTAL IMPACTS
OF CRYPTO-ASSET MINING: LEGISLATIVE HEAR-
ING ON S. __, THE CRYPTO-ASSET ENVIRON-
MENTAL TRANSPARENCY ACT OF 2023**

HEARING

BEFORE THE

SUBCOMMITTEE ON CLEAN AIR,
CLIMATE, AND NUCLEAR SAFETY

OF THE

COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS

UNITED STATES SENATE

ONE HUNDRED EIGHTEENTH CONGRESS

FIRST SESSION

MARCH 7, 2023

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COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

ONE HUNDRED EIGHTEENTH CONGRESS

FIRST SESSION

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**AIR, CLIMATE, AND ENVIRONMENTAL IM-
PACTS OF CRYPTO-ASSET MINING: LEGISLA-
TIVE HEARING ON S. __, THE CRYPTO-ASSET
ENVIRONMENTAL TRANSPARENCY ACT OF
2023**

TUESDAY, MARCH 7, 2023

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON CLEAN AIR, CLIMATE,
AND NUCLEAR SAFETY,
Washington, DC.

The subcommittee met, pursuant to notice, at 2:35 p.m. in room 406, Dirksen Senate Office Building, Hon. Edward Markey (chairman of the subcommittee) presiding.

Present: Senators Markey, Ricketts, Carper, Whitehouse, Lummis.

**OPENING STATEMENT OF HON. EDWARD MARKEY,
U.S. SENATOR FROM THE STATE OF MASSACHUSETTS**

Senator MARKEY. Good afternoon, everyone. I am pleased to call the Subcommittee on Clean Air, Climate, and Nuclear Safety to order for a legislative hearing on the Crypto-Asset Environmental Transparency Act, which I have introduced along with Senator Merkley and Senator Sanders.

This is our first subcommittee hearing of the year, so Senator Ricketts and I are going to begin, as they say in Casablanca, a beautiful relationship over the next 2 years.

[Laughter.]

Senator MARKEY. We are looking forward, of course, to working with Senator Carper and Senator Capito as well. We are looking forward to partnering with them and their extremely helpful staff. Over the course of the next 2 years, there will be many important issues that we will be asked to consider.

We welcome our witnesses. We appreciate your willingness to appear today.

Today is going to be the first Senate hearing ever held on the environmental impacts of crypto-mining. They may be mining digital assets, but their activities have real-world consequences. This is an emergency, an urgent issue. Congress needs to be proactive and reactive in tackling it.

The market size of the global crypto-mining industry was estimated at \$2 billion in 2022, more than one-third of which is in the United States. That industry is forecast to nearly quadruple over

the next 10 years, which means its threats to our environment, health, communities, and climate are set to explode.

Bitcoin mining consumes as much power globally each year as the entire Swedish economy. In the United States, carbon dioxide emissions from Bitcoin mining are equivalent to the annual emissions from as many as 7.5 million gasoline-powered cars. Right now, Bitcoin mining in the United States uses as much power as we need to light every single home in our Country. That demand on our grid is only going to grow.

That is an amazing number, that Bitcoin alone consumes as much electricity as every light on in our Country every day. We face an urgent climate crisis, which the Biden Administration has committed to addressing by reducing greenhouse gases by 50 percent by 2030. We know we need to tackle emissions from many different sectors of our economy, and I am sure we will have hearings on these sectors as well.

Our first hearing is focusing on the crypto-mining industry, because it deserves the spotlight. It has grown explosively in the United States over the past 2 years. It is extremely energy intensive. We have seen it harm the general public while enabling the creation of heavily concentrated wealth in our Country.

We are not here to debate the pros and cons economically of crypto currency. We are here to discuss what the impacts are environmentally in our society and what we can do to reduce its impact. As our expert witnesses will explain, Bitcoin was the first-ever crypto asset, and relies on a process known as proof-of-work mining. Crypto miners use large banks of computers that suck up huge amounts of energy to run computations and are awarded new Bitcoins as a result.

Every 10 minutes, a miner will generate Bitcoins a reward that are currently worth nearly \$140,000. As the value of Bitcoin increases, there is more incentive to run more computers, consume more energy and mine more Bitcoins. It is an energy arms race for the digital era.

Bitcoin miners have already had a direct impact on our climate by bringing mothballed coal-and gas-fired power plants back online to power their operations. It is more than just climate issues. Mining equipment creates significant amounts of electronic waste. Mining requires huge amounts of water for cooling and power generation. Residents from across the Country have provided me with testimony of devastating noise pollution from neighboring Bitcoin mining facilities.

With an environmental impact like this, Bitcoin is more like digital coal than digital gold. The commodity is virtual, but the harm is tangible. While the Bitcoin mining industry claims that they can actually be a boon to the environment, saying that they can capture and burn vented methane to power their operations, or that they can actually improve grid stability, we do not have the transparency which we need to vet those arguments to see if that assertion is true.

We do have real-world examples of how the industry is already creating real consequences for communities. That is why we are here. The Crypto-Asset Environmental Transparency Act would mandate a detailed EPA-led study of the environmental impacts of

crypto mining. The Act would also require crypto miners to report their carbon dioxide emissions under the EPA's Greenhouse Gas Reporting program.

The people who profit from Bitcoin mining can not be left to grade their own homework. A take-home exam that you grade yourself almost always gets an A, that is just human nature at work. So we need someone to check that work. We need independent, trustworthy, and accurate statistics, so that homework gets a grade that is independent.

I look forward to discussing how the study and reporting in my Crypto-Asset Environmental Transparency Act can help inform Congress and the general public about these emerging issues. All I can say is I am glad we are going to be able to have an active subcommittee this year. I am looking forward to partnering with the Ranking Member on the subcommittee, Senator Ricketts. At this point, I would love to recognize you for your opening statement.

**OPENING STATEMENT OF HON. PETE RICKETTS,
U.S. SENATOR FROM THE STATE OF NEBRASKA**

Senator RICKETTS. Thank you very much, Mr. Chairman, and thank you for calling this subcommittee hearing. I am grateful for the opportunity to be the Ranking Member on the Subcommittee for Clean Air, Climate, and Nuclear Safety.

I look forward to working with you and the other members as well, members on each side of the aisle in EPW. I understand that you had a very successful last year with a lot of bipartisan legislation coming out.

I also want to welcome our witnesses that are joining us here today. I appreciate you all taking your time to be able to be here. Especially I would like to recognize Courtney Dentlinger, who made the trip from Nebraska to come and testify. She works for Nebraska Public Power District. You may not know this, but Nebraska is one of the only, well, I think we are the only public power State left in the Country, completely a public power State.

During my tenure as Governor, Ms. Dentlinger actually led our Department of Economic Development. She was so good at her job that we actually won two Governors Cups for the most economic development projects per capita of any State in the Country, which not only was great for us back then, but she also knows a lot, she is an excellent choice to talk about how to market Nebraska both nationally and globally, as she helped us win those Governors Cups and helped develop job opportunities in Nebraska.

So today we are here to discuss an emerging industry, crypto-asset mining. I am particularly interested in this topic as to whether this industry could result in more economic development for the State of Nebraska and across the Country. While crypto-asset mining may be a relatively new topic for the Environment and Public Works Committee, it is actually not my first time interacting on this topic and the crypto-economy. When I was Governor the Nebraska legislature passed and I signed a Nebraska Fiscal Innovation Act into law. This law provided an avenue for financial institutions to invest in our State and benefit from this emerging sector.

According to CNBC, my home State of Nebraska was actually named the No. 1 State for developing a crypto economy in 2022. I

am proud that new businesses and new job opportunities related to the crypto-currency industry have either located in Nebraska, or are considering coming to our State.

When businesses are looking for a place to open their doors, what they are looking for is a business-friendly environment, some place that they are being welcomed. They are looking for regions also that can help them keep their costs low. For crypto asset mining, a key variable of course, as the Chairman pointed out, is electricity, one of the key variables of their operating costs.

That is one of the reasons that these businesses are choosing Nebraska. Our electricity rates are among the lowest in the Nation. Nebraska's average price for electricity per kilowatt hour in 2022 was just 9.84 cents.

In addition to favorable energy prices, the people in Nebraska know best how to succeed by getting government out of the way. That is one of the things I talked about, a business-friendly environment.

So I am interested in hearing on this topic we are discussing today about how we are treating one industry, the crypto-asset mining, differently from other electricity consumers. Crypto-asset mining is hardly alone in being an industry relying on large data server banks. Finance, technology, government, academia, many others use significant amounts of electricity to power their computing needs.

We should be providing the tools for open competition in a free market by not allowing politicians or bureaucrats in Washington, DC. to pick winners and losers. When the Federal Government targets an industry it has caustic consequences, especially for an industry just beginning its development. Overreaching laws and regulations can drive emerging technologies overseas. That often goes to countries that have fewer environmental regulations than the United States, which means you are actually adding to greenhouse gas emissions. This also means that we are losing jobs here in America.

I look forward to hearing our witnesses' testimony to explore discussions and opportunities related to crypto-asset mining. With that, Mr. Chairman, it is a pleasure to be serving with you. I yield back time to you.

Senator MARKEY. The feeling is mutual, thank you.

Thank you, Senator Ricketts. Now we are going to turn to our esteemed panel of witnesses. We are going to hear them in order. First, we will hear from Rob Altenburg. Mr. Altenburg is the Senior Director for Energy and Climate at Citizens for Pennsylvania's Future. Before that, he worked for the Pennsylvania Department of Environmental Protection, studied law at Widener Commonwealth Law School and he is also a combat engineer company in the United States Army Reserve.

Next, we are going to hear from Dr. Anna Kelles. Dr. Kelles is the Representative from New York State Assembly's District 125. Her district covers Tomkins County, where she was born. She earned a dual bachelor's degree in biology and environmental studies at Binghamton University, and a Ph.D. in nutritional epidemiology from the University of North Carolina at Chapel Hill.

Finally, we are going to hear from Courtney Dentlinger. Ms. Dentlinger is the Vice President of Customer Services and External Affairs at Nebraska Public Power District. She is a native of Battle Creek, Nebraska. She earned a bachelor's degree in political science, international studies and Spanish from Wayne State College and a juris doctorate from George Washington University here in Washington, DC, in addition to all the very nice things that Senator Ricketts said about you.

We welcome all of you. Thank you for testifying, and we will now in order recognize you for your opening statement. We will begin with you, Mr. Altenburg.

STATEMENT OF ROB ALTENBURG, SENIOR DIRECTOR OF ENERGY AND CLIMATE, CITIZENS FOR PENNSYLVANIA'S FUTURE

Mr. ALTENBURG. Thank you, Chairman Markey, Ranking Member Ricketts, for having me here today. My name is Rob Altenburg. I am the Senior Director of Energy and Climate at Citizens for Pennsylvania's Future. We are a membership-based non-profit environmental advocacy organization.

I have been working on energy and environmental issues for over 30 years. I am here today to share why I am concerned about Bitcoin mining and other related proof-of-work crypto-currencies. That requires a little bit of background.

First, for all its high-tech image, Bitcoin is based on a simple idea that has been around since the 1980's. It is called a block chain. It is basically an accounting ledger where each page or block records Bitcoin transactions.

Part of what keeps this ledger secure is that creating new blocks is very, very difficult. Finding or mining a new block is a guessing game where the odds of being correct are less than one chance in a hundred billion trillion. Much, much lower odds than winning the lottery.

The odds get worse the more miners join the race. The winner, the first one to mine a valid block, is rewarded with newly mined Bitcoin currently valued at over \$140,000 with no prizes for second place.

To be competitive, Bitcoin miners use racks of special purpose computers that make trillions of guesses, hundreds of trillions of guesses every second. Each of those computers uses more than three times the amount of energy as the average household and a single miner might run tens of thousands of them 24-7. Altogether, Bitcoin consumes more energy, more electricity than 80 percent of our States and more than many entire countries.

Bitcoin is wasteful by design. This sort of waste just is not necessary. Bitcoin's guessing game system called proof-of-work is essentially crypto-currency version 1.0. Newer versions accomplish the same thing faster and cheaper. Ethereum, for example, recently converted to a newer proof-of-stake system, and it can do everything Bitcoin can do and more while using just a fraction of the energy.

For now, though, Bitcoin's system is still dominant. The enormous amount of energy it wastes must come from somewhere. In Pennsylvania, we are seeing that on the ground.

In 2021, one company announced plans to purchase three waste coal-fired power plants, and install up to 57,000 miners. They already have two of these plants in operation. Waste coal is a problematic fuel to say the least. As the name implies, it has low energy value compared to ordinary coal, so plants need to burn even more to generate the same amount of electricity. In the process, they emit more ozone precursors, fine particulates, acid gases, heavy metals, and it is the second most carbon-intensive generation next to residual fuel oil.

Just in January of last year, State inspectors found 10 megawatts worth of generation have literally been plugged into fracked gas wellheads, and they were using the gas to mine Bitcoin without obtaining any permits. This sort of mining is increasing, but without clear reporting requirements, it is impossible to know which or how many of Pennsylvania's thousands of fracked gas wells are being used in this way. Media reports and even permit applications are sporadic, and even where there are reports, miners may call themselves data centers and not mention Bitcoin at all.

In addition to the problem from drilling and fracking, Bitcoin mining also causes noise pollution. The sound of these operations has been compared to the whine of a giant dentist's drill or a jet engine that never stops. In some cases, it can be heard for over a mile away. More than just an annoying nuisance that lowers property values, persistent noise pollution has been shown to cause health problems for both people and wildlife.

It is not just burning fossil fuels directly that is the problem. In Pennsylvania, we are seeing Bitcoin operations at nuclear power plants. The operators claim this is carbon-free energy, but that does not tell the whole story. We do not have a surplus of clean carbon-free energy on our grid. So when carbon-free energy is diverted from powering our grid to wasteful cryptocurrency, something has to make up the difference, and that is often fossil fuels.

Bitcoin mining is bad for public health and the environment. It is bad for the power grid and our wallets as well. Miners claim that they can easily pause operations when the grid needs power, but that only happens when the electricity is worth more than the Bitcoins. Essentially, we are linking our electricity prices to the volatility of the Bitcoin market, and that is a terrible idea.

Worse yet, by wasting the cheap electricity on Bitcoin mining, wholesale prices go up for everybody else. In short, Bitcoin mining is wasteful by design, and waste is never good. Thank you.

[The prepared statement of Mr. Altenburg follows:]

HEARING BEFORE THE UNITED STATES SENATE
 CLEAN AIR, CLIMATE, AND NUCLEAR SAFETY SUBCOMMITTEE
 ON THE CRYPTO-ASSET ENVIRONMENTAL TRANSPARENCY ACT

March 7, 2023

Testimony of Robert Altenburg,
 Senior Director for Energy and Climate,
 Citizens For Pennsylvania's Future (PennFuture)

Thank you, Chairman Markey, Ranking Member Ricketts, and members of the committee, for the opportunity to testify today in support of the Crypto-Asset Environmental Transparency Act. My name is Robert Altenburg, and I am the Senior Director for Energy and Climate at Citizens for Pennsylvania's Future (PennFuture). We are a nonprofit environmental advocacy organization with offices across Pennsylvania that is committed to leading the transition to a clean energy economy in Pennsylvania and beyond.

I've worked at PennFuture since 2014 and, before that, spent nearly 22 years at the Pennsylvania Department of Environmental Protection working in both the Bureau of Air Quality and the Policy Office on a wide range of issues impacting air pollution and energy. In the last few years, I've been following the growth of Bitcoin and other proof-of-work cryptocurrency operations with significant concern.

I. Introduction:

What is proof-of-work mining, and why it is a problem?

Bitcoin¹, and blockchain technology in general, is based on a very simple mathematical tool called a "hash". In practice, this is just a bit of computer code that, given any data, returns a number that represents a unique digital fingerprint.² While this hash helps keep the system secure, Bitcoin's implementation requires an enormous number of unnecessary hash calculations and that ultimately wastes energy.

Using a tool like a hash to fingerprint pages of a financial ledger, or similar data, can make it more difficult for someone to alter records, but only if copies of the fingerprints are kept somewhere secure, otherwise, a bad actor could alter the copies of the fingerprints too. Rather than rely on trusted third parties, like the government or a corporation, to keep everything secure, blockchains solve this problem by having each page of the ledger, or "block" of data, contain the fingerprint of the prior page. To change one piece of data on such a blockchain, the bad actor would need to change all the subsequent blocks. The harder that is to do, the more resistant the data is to manipulation.

¹ S. Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System, (2008) (available at: <https://www.bitcoin.com/satoshi-archive/whitepaper/>)

² Specifically, SHA-256, defined at: Nat'l. Inst. of Standards and Technology, FIPS PUB 202 (Aug 2015) (available at: <http://dx.doi.org/10.6028/NIST.FIPS.202>).

Each blockchain sets its own rules, or “consensus mechanism”, that allows everyone to validate and agree when new blocks are added. Because new Bitcoins are created every time a block is added to its blockchain, the consensus mechanism also must be rate-limited to avoid hyperinflation that would devalue the cryptocurrency. To accomplish this, Bitcoin’s creator chose to use a very simple consensus mechanism that is now called “proof-of-work”.

Essentially, prospective Bitcoin miners³ combine proposed transactions they want to include in with the hash (fingerprint) of the prior block, and some assorted boilerplate information, into a new potential block and calculate its hash. For this new block to be valid and accepted by the rest of the network, that hash must be a low-enough number. Exactly how low depends on how many other people are trying to create blocks—the system changes this target hash periodically adjust its difficulty and ensure new blocks are generated roughly every ten minutes no matter how much computer power is used to mine. Right now, the odds of any one prospective block being valid are less than one chance in a hundred billion trillion. If the potential block is no good, the miner must start the process again.

To improve their odds, miners need to test as many potential blocks as possible, but this is also a race. The first miner to find a valid block currently is rewarded with 6.25 new Bitcoin, worth around \$145,000, plus any transaction fees. All the other miners get nothing for their effort and start again from scratch to find the next block.

Because the chances of finding a valid block are incredibly low and the stakes are high, miners buy special-purpose computers called Application Specific Integrated Circuits (ASICs) that can each calculate around a hundred trillion of these hashes every second. But, in the process, they use a lot of energy. A single ASIC these days uses around three times as much electricity as an average household, and a single mining operation may use tens-of-thousands of these devices in massive racks.

Combined, the entire Bitcoin mining network uses over a hundred trillion watt-hours each year⁴. That is more electricity than we consume in about 80 percent of our states, and more than many entire countries.

For Bitcoin, wasting this much energy is part of the design, but it’s just not necessary. We can think of proof-of-work as “Version 1.0” and, like many products, newer innovations have been developed to accomplish the same things faster and cheaper.

In this case, non-proof-of-work blockchain systems have been successfully operating for over ten years⁵ and, in many cases, these alternate systems offer more capabilities than the Bitcoin blockchain while having a tiny fraction of the energy demand.

³ Calling the process of creating new Bitcoins “mining” and the creators “miners” is based on an analogy to gold mining (See: S. Nakamoto, at 4.)

⁴ Cambridge Bitcoin Energy Consumption Index (available at: <https://ccaf.io/cbeci/index>).

⁵ Peercoin implemented a proof-of-stake system in 2012.

II. Bitcoin Mining is Causing Increased Pollution

With no specific reporting requirements and inconsistent permitting, we often rely on media reports, or reports from residents, to discover new Bitcoin mining operations. What we have seen, however, represents a disturbing trend.

Waste coal

In July of 2021 a company by the name of Stronghold Digital Mining (Stronghold) filed an S-1 report with the Securities and Exchange Commission (SEC) disclosing plans to purchase three waste coal fired power plants and install 57,000 Application Specific Integrated Circuits (ASICs) dedicated to mining bitcoin. To date, Stronghold has purchased the 94-megawatt (MW) circulating fluidized bed (CFB) Scrubgrass power plant in Venango County and the 94 MW Panther Creek CFB facility in Carbon County. Strongholds initial plans also contemplated the purchase a third facility bringing their total generating capacity to 300MW.⁶ As of March 24, 2022, the company operated approximately 20,500 pieces of mining hardware and purchase agreements in place for an additional 29,400 miners.

Waste coal is a low-energy-value product that, before environmental restrictions were passed, was often dumped in piles near mining sites. Pennsylvania has approximately 840 such sites and operators such as Stronghold claim that burning it for energy is environmentally beneficial because it encourages the removal of these piles, and the waste ash can be used for fill and reclamation projects. Despite these claims, burning waste coal is still just burning fossil fuel and results in the emissions of significant amounts of air pollution including ozone precursors, fine particulates, acid gasses, heavy metals, and vast amounts of carbon pollution. The impacts of increased air pollution should not be ignored—particularly at these sites, since the Scrubgrass plant is located within ten miles of a designated Environmental Justice area and the Panther Creek plant is within three miles of such an area.

Burning a low-energy-value fuel source also requires subsidies to be profitable and the Pennsylvania state legislature has provided significant incentives to burn polluting waste coal. These incentives include \$4/MWh from the Coal Refuse Reclamation tax credit and a claimed \$16/MWh from the Tier II Alternative Energy Portfolio Standard Program. Altogether, Stronghold has claimed 60 percent of their generation costs will be covered by subsidies from taxpayers and ratepayers.⁷

Burning waste coal to generate electricity for bitcoin mining is one of the worst choices available. According to EIA data⁸, Pennsylvania's waste-coal fired power plants had average CO2 emissions of over 2,760 pounds per megawatt-hour making them the second most carbon-intensive fuel behind residual fuel oil. This effect is compounded because facilities used to mine Bitcoin are operating at significantly higher capacity factors than plants supplying energy to the grid and Pennsylvania has nine other such facilities where mining could expand. There are better, safer, and in many cases cheaper ways to clean up waste coal than burning it for Bitcoin mining.

⁶ Stronghold Digital Mining, SEC Form 10-k, (filed Mar. 29, 2022).

⁷ Stronghold Digital Mining, SEC Form S-1, (filed Jul. 27, 2021).

⁸ US EIA, Emissions by Plant and Region, 2020 (available at: <https://www.eia.gov/electricity/data/emissions/>)

For example, in some cases waste piles have been stabilized by planting American beachgrass.⁹ In other cases, it may be a better option to remove the material and dispose of it in an appropriately permitted facility.

Fracked gas

Pennsylvania is already seeing methane gas fired generators being installed directly at fracked gas well sites and, in certain market conditions these facilities could see significantly more revenue that would be obtained selling the gas on the wholesale market. Assuming no action by regulators, this would be expected to raise wholesale prices for methane gas which we currently rely on for 53% of their electricity generation and a significant portion of home heating. In addition to the consumer impacts, methane is 86 times more potent a greenhouse gas than carbon dioxide over a 20-year period, so any leakage from these operations would also be particularly dangerous for our climate.

In January of 2022, inspectors from the Pennsylvania Department of Environmental Protection (DEP) found 30 methane-gas-fired generators with an estimated capacity of more than 10MW at the Hegarty A well operated by Big Dog Energy, LLC and located in Clearfield County, PA within two miles of a designated Environmental Justice area. These generators were installed without authorization from the DEP in violation of Pennsylvania regulations and the resulting energy was being used to mine bitcoin.

While the DEP issued a Notice of Violation (NOV) for this operation¹⁰, it is unknown how many of Pennsylvania's many thousands of methane gas wells—many in rural and low-income areas—are hosting similar mining projects. Big Dog Energy alone has 38 other active well permits across Pennsylvania.¹¹

In addition to Big Dog Energy, another company, Pin Oak Energy, has purchased a midstream gathering system capable of 25,000 MMBtu/day. Given available ASIC mining hardware, that could represent fifteen to twenty thousand miners, and again, there are questions as to whether the required air quality permits have been obtained.¹²

Finally, in late 2022, Diversified Production LLC applied for an air quality plan approval to install five methane-gas fired generators to support bitcoin mining operation in Elk County, PA.¹³ This site is particularly problematic as it is in a region known as the Pennsylvania Wilds—a rural area that heavily depends on nature tourism, and the impacts of the noise from this facility on wildlife has not, to our knowledge, been considered.

⁹ R. Glennon, S. DePue, Succession on a Coal Mine Gob Pile Stabilized with 'Cape' American Beachgrass (available at: <http://www.energyjustice.net/coal/wastecoal/beachgrass>)

¹⁰ PA DEP, Notice of Violation to Big Dog Energy, LLC., (Jan. 7, 2022).

¹¹ PA DEP, eFacts information system (available at: <https://www.ahs.dep.pa.gov/eFACTSWeb/default.aspx/default.aspx>)

¹² B. Stockman, PA DEP Looking into Pin Oak Bitcoin Mine in Ridgeway Township, Ridgeway Record (Mar. 21, 2022) (available at: https://www.ridgewayrecord.com/news/pa-dep-looking-into-pin-oak-bitcoin-mine-in-ridgeway-township/article_5713036c-b136-11ec-bb37-2f666479782b.html).

¹³ Plan Approval Application 24-00195A, 52 Pa.B. 7143 (Nov 19, 2022).

Nuclear

In August of 2021, Talen Energy Corp. announced a joint venture with TeraWulf Inc. that would result in the construction of the 180MW Nautilus Cryptomine bitcoin mining facility adjacent to the Susquehanna nuclear power generating station in Columbia County, Pennsylvania.¹⁴ It has since been reported that this facility will benefit from significant state subsidies in the form of Pennsylvania's datacenter tax exemption.¹⁵

While claims are made that this will use carbon-free nuclear generation, we reject any suggestion that this is environmentally neutral. In 2020, nuclear generation was responsible for more than 33 percent of Pennsylvania's energy generation and represented more than 92 percent of the carbon free energy generated. Diverting carbon free energy to wasteful Bitcoin mining virtually guarantees that demand will be backfilled with fossil resources.

Given Pennsylvania's grid mix, diverting 180MW of carbon free generation from the grid could result in over one million tons of additional carbon pollution per year, in addition to thousands of tons of NOx and other dangerous air pollutants.

III. Wasting Energy on Proof-of-Work Mining Causes Additional Problems

Bitcoin mining operations are likely to raise wholesale electricity prices.

While most of the large Bitcoin mining operations in Pennsylvania are operating "behind the meter" and not drawing power from the wholesale power grid, there are still potential impacts for energy prices and reliability.

To the extent that miners are using electricity that would otherwise flow to the grid, that energy would, by definition, have been priced below PJM's market clearing price. By diverting that energy into wasteful Bitcoin mining, the energy markets will clear at a higher price. These increases in wholesale prices may ultimately be absorbed by consumers.

The claim that miners could provide a service to the grid as a source of interruptible load is highly suspect. Given current Bitcoin prices and network conditions, miners using competitive hardware can gross more than \$100 per MWh.¹⁶ According to PJM's Market Monitor¹⁷, average monthly wholesale prices in 2021 never exceeded \$92/MWh and averaged considerably less. That suggests that there are limited situations where miners would voluntarily curtail their demand because of price concerns. On the contrary, this makes it very likely that Bitcoin mining operations could be the marginal demand that sets an elevated price for the rest of the grid.

¹⁴ Press Release, *Talen Energy Corp. announces Bitcoin Mining Joint Venture with TeraWulf Inc.* (Aug. 3, 2021)

¹⁵ Caruso, S., *Pa. passed a tax break for data centers. Now crypto-miners are taking advantage*, Penn-Capital Star, (Mar. 13, 2022).

¹⁶ See Miner hardware profitability calculations at <https://minerstat.com/coin/BTC/profitability>.

¹⁷ Monitoring Analytics, *Components of PJM Price, 2021*, (April 12, 2022) (available at: https://www.monitoringanalytics.com/data/pjm_price.shtml).

Bitcoin mining does not help clean energy.

A similar strawman argument is to claim that mining Bitcoin could “absorb wasted clean energy.” Again, this assumes that the only option is waste and Bitcoin mining is a viable alternative—neither is likely true.

In certain scenarios, energy markets have shown a “duck curve” where high solar generation has driven prices very low—sometimes even negative—for short periods in the mid-day period before ramping up sharply later in the day. This can be addressed in different ways, including increased investment in transmission allowing power to be wheeled to where there is demand, and increased storage allowing the excess energy to be used later.

It’s unlikely Bitcoin will do anything to alleviate this issue. First, one of the reasons Bitcoin miners gravitate to more expensive fossil fuels rather than clean renewable generation is because 24/7 operations at high-capacity factors is more profitable. This is driven both by the nature of proof-of-work mining pools where increased hash rates directly translate to increased profits. (Other factors include the relatively short competitive life of ASIC hardware and the extreme market volatility.) It is highly unlikely that miners will invest a significant amount of money in mining hardware and let it sit idle until the energy grid “needs” their load.

It’s far more likely that these mining operations will burn fossil fuels for energy to support their 24/7 operations and only curtail that generation and buy from the grid when price signals favor doing so. While there may be rare cases when this might keep grid prices from going negative, that will come at a significant cost. In normal operation, the marginal cost of the Bitcoin miner’s behind-the-meter generation will become a floor price for the market and have the effect of raising average wholesale prices for everyone while continuing polluting combustion.

Bitcoin mining isn’t a solution to the problem of flared methane gas.

A recent claim noted that using methane gas for mining Bitcoin is a “better” choice than flaring it, but that is yet another strawman argument. An even better choice is investing in energy efficiency, electrification, and clean renewable generation, so we avoid the emissions and risk associated with extracting the fossil fuels in the first place.

The next logical question is why is there such an excess of flared gas? The 2016 New Source Performance Standards (NSPS)¹⁸ for oil and gas require that many wells utilize reduced emissions completions where gas is either captured and used for some productive purpose or reinjected. Those same standards will also often require low-bleed pneumatic controllers or other technology that further reduces the amount of potentially vented gas. Where flaring is allowed, this tends to be for a limited time and only for a limited number of wells.

Before claiming proof-of-work mining is a solution, we should first be sure the problem is well understood. Using flared methane gas for Bitcoin presupposes that capture of the gas be technically feasible and that enough gas is available that it is economical to use. Assuming that is the case, the question then is why is it not already being captured? The implication is that

¹⁸ See: 40 CFR 60.5360 *et seq.* (published: 81 Fed. Reg. 35824 (Jun. 3, 2016))

regulators are allowing oil and gas operators to opt-out capturing the gas for financial reasons. Such exemption forces the citizens to absorb the risk and damage from the polluting industry and acts as a subsidy encouraging pollution. If polluting industries were, instead, required to internalize the costs of their waste, flaring would be less of a problem.

Proof-of-work cryptomining hardware is not energy efficient.

Bitcoin advocates have also attempted to distract from criticism of Bitcoin’s enormous energy demand with red herring arguments. One example raised at a 2022 Congressional hearing¹⁹ was the claim that because the ASICs used for mining are highly optimized for hashing blocks of data, they are more efficient—or less energy intensive—than general-purpose computers used in conventional datacenters.

While an ASIC may be the least energy intensive tool available to calculate more than 100 trillion hashes in one second, that cannot be considered an efficient process if an alternate methodology exists that avoids the need to calculate trillions of hashes in the first place. In much the same way, using a single enormous mining truck may be the best way to move 400 tons of dirt, but if the desired results don’t require moving dirt at all, the efficiency of the truck is irrelevant.

We also note that ASIC hardware has an extremely limited useful life before it becomes obsolete e-waste. Hardware that was introduced just two or three years ago is often impossible to operate profitably and even newer hardware may be replaced and discarded in favor of the latest and most competitive equipment.

At a time when semiconductor shortages are contributing to higher consumer prices, this wasteful hardware cycle to proliferate is a particularly bad policy choice that disproportionately impacts low- and moderate-income families.

IV. Conclusion and Policy Recommendations

Reporting and quantifying the problem is essential.

In our discussions with regulators, we often find that they are unable to say with any degree of confidence where proof-of-work mining is happening. Even where permit-applications or local media stories indicate a project is being developed, it may be reported as a “datacenter” or other generic term not associated with crypto-mining. In this regard, the reporting provisions in Senator Markey’s Crypto-Asset Environmental Transparency Act are an essential step.

We should use the best available technology to reduce pollution and protect public health.

State and federal laws to combat air pollution often incorporate the principle that, before an industrial source is allowed to dump its waste into our air, it first must ensure it’s using the best

¹⁹ U.S. House Committee on Energy and Commerce Hearing, Cleaning Up Cryptocurrency: The Energy Impacts of Bitcoin, (Jan. 20, 2022).

technology available to reduce its emissions. Blockchain technology and crypto-currencies should be no exception and cleaner alternatives than proof-of-work mining are available.

Noise pollution must be systematically addressed.

In establishing a federal noise abatement program in the early 1970's, the EPA stated that "Noise differs from most other environmental pollutants in one very important aspect—the knowledge and technology exists now to control almost every indoor and outdoor noise problem"²⁰ In spite of this, one of the chief areas of concern we hear regarding crypto-mining is the loud and ceaseless noise created by these operations.²¹ Relying on local governments and public nuisance claims has not been effective to stop these operations—particularly in rural areas where the impact may be most acute on wildlife.

²⁰ U.S. EPA, EPA's Noise Abatement Program (May 19, 1971).

²¹ Vipal Monga, Bitcoin Mining Noise Drives Neighbors Nuts, Wall Street Journal, (Nov. 12, 2021).

Senator MARKEY. Thank you, Mr. Altenburg.
Dr. Kelles, you are up.

**STATEMENT OF HON. ANNA R. KELLES, PH.D., ASSEMBLY
MEMBER, NEW YORK STATE ASSEMBLY, 125TH DISTRICT**

Ms. KELLES. So wonderful to be here today, thank you.

I would like to voice my support for Senator Markey's Crypto-Asset Environmental Transparency Act as the representative of the 125th New York Assembly District.

The environmental and socioeconomic impacts of expanding proof-of-work based crypto-currency mining will continue to have devastating environmental and socioeconomic consequences. It is estimated that cryptocurrency mining facilities for the proof-of-work based currency, Bitcoin, used more energy than all the processing for Google, Amazon, and Facebook combined, more than all the data centers globally combined, and more energy than all the solar panels that exist globally.

In fact, according to Digiconomist, one Bitcoin transaction requires approximately 860 kilowatt hours. This is equal to the energy needed to power the average U.S. household for 1 month. Given that a cryptocurrency mining operation creates minimal jobs, for example, a large U.S. operation of 100,000 ASIC processors employs 40 staff per shift, yet a year ago made \$2 million per day. Profits for a cryptocurrency mining company are thus limited not by labor costs, but rather by the cost of electricity.

As one of the solutions for cheap energy, cryptocurrency mining companies work to reopen retired fossil fuel power plants like the large-scale facility called Greenidge, in Dresden, New York, on Seneca lake. An environment with moderate temperatures, clean air, and abundant fresh free water for cooling have made New York an ideal location for cryptocurrency mining companies.

In the Finger Lakes, Greenidge provides service directly to the cryptocurrency mining operation on their property, maximizing their State permit-allowed GHG emissions and increasing local air pollution, including nitrogen oxide and sulfur dioxide. Due to the frequent replacement of cryptocurrency mining processors, the facility has also created a notable amount of electronic waste.

Facilities like Greenidge also negatively impact aquatic life due to the large quantities of water withdrawn from freshwater bodies to cool the electrical generation systems and the large-scale computer processor rings. Water is removed at temperatures of 40 to 50 degrees and released back at temperatures of up to 108 degrees, killing thousands of fish every year, and increasing the risk of harmful algal bloom outbreaks that are toxic for both wildlife and humans.

Gas-fueled power plants also affect the health and quality of life in surrounding neighborhoods. Emission of hazardous air pollutants are known to cause asthma, heart attacks, strokes, reproductive damage and preterm birth. These public health impacts are most acutely felt in environmental justice communities.

Noise pollution is another significant concern for residents in towns across the Country who have stacks of consolidated mining rigs in open fields or mining warehouses in their community. The long waves of low-frequency noise ravel for miles around the

cryptocurrency mining facility and are often characterized as sounding like jet engines.

In addition, according to a Berkeley Haas working paper, 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, with little or no local economic benefit.

Although communities hosting cryptocurrency mining facilities experience few economic benefits due to minimal job creation and profits going to non-local corporate investors, these facilities can threaten other critical industries. In the Finger Lakes, for example, the \$3 billion annual tourism industry that employs over 65,000 people and relies on the lakes and the natural environment is directly threatened by the polluting activity of Greenidge.

With respect to meet our climate goals, large scale cryptocurrency mining in New York State is significantly increasing the State's total base energy demand on the grid, putting further pressure on our need for a massive electrical line overhaul. Due to the overall increase in base demand, some estimates suggest we need to increase our wind and solar infrastructure development goals by over 60 percent to meet our State climate goals just with the existing in-development and proposed cryptocurrency mining operations in New York.

Other forms of validation, such as proof-of-State, utilize far less energy. For example, Ethereum recently transited to proof-of-State, resulting in a total immediate energy consumption reduction of over 99.9 percent.

Please pass the Crypto-Asset Environmental Transparency Act. We must carefully study the environmental and grid impacts of cryptocurrency mining methods, such as proof-of-work mining, and implement appropriate statutes and regulations to prevent the damage it is doing and will continue to do to our public health and environment.

Thank you.

[The prepared statement of Ms. Kelles follows:]

Hearing Before the Clean Air, Climate, and Nuclear Safety Subcommittee on the Crypto-Asset Environmental Transparency Act
March 7, 2023
Testimony of Dr Anna Kelles, representative of the 125th New York Assembly District

Dear Senators Markey and Ricketts,

I write to voice my support for Senator Markey's "Crypto-Asset Environmental Transparency Act" as the representative of the 125th New York Assembly District. The environmental and socioeconomic impacts of expanding Proof-of-Work based cryptocurrency mining will continue to have devastating environmental and socioeconomic consequences on my constituents and the world.

There are two ways to grow wealth in the cryptocurrency space. One is to buy, sell, and invest in cryptocurrencies in digital exchanges like Coinbase, Binance, Kraken, Gemini and many others. This is most parallel to exchanges for stocks, bonds, and dividends like the Wallstreet exchange. Each exchange has its rules including fees they collect for all transactions. The second way to grow wealth is to become a validator of those transactions and mine or win coin in exchange for validating blocks of transactions. One method of validation, called Proof-of-Work, was the first to be established with the launch of the first mainstream cryptocurrency Bitcoin and is by far the most energy intensive and therefore environmentally harmful. With enough vertical integration and consolidation, however, mining or winning coin can be cheaper than buying it and is therefore highly attractive for investors.

In the early years of cryptocurrency mining starting in 2009, miners were almost exclusively what we call "boutique miners," individuals who have a few computers in their homes or small business owners who had a small operation added to their business. However, as the value of Bitcoin rose more miners entered the market. A miner's competitive advantage to win Bitcoin for their effort of validating blocks of transactions is based exclusively on having more computers using the newest cryptomining processing technology. Today most small scale boutique miners have been edged out by the giants in the industry.

In an article published earlier this year titled, "Is Crypto Mining Still Profitable in 2023?" the author notes, "The mining market is dominated by large companies who secure large warehouse facilities to house their army of ASIC mining rigs. Some of these companies might run mining pools that smaller miners can contribute to in order to get a piece of some block rewards in exchange for a small fee. This is all to say that today, mining Bitcoin as an individual is rarely profitable unless someone has access to extra low-cost electricity and affordable equipment." This is the main reason that cryptocurrency mining as an industry has not only become harder to access for traditional marginalized populations, but has also led to cryptocurrency like Bitcoin being one of the most consolidated currencies in the world, with 0.01% of Bitcoin accounts owning about 27% of all Bitcoin.

Proof-of-work data-processing efforts of cryptomining facilities require thousands of times more electricity than an average residential and commercial customer. It is estimated that cryptomining facilities for Bitcoin alone use more energy than all the processing for Google, Amazon, and Facebook combined, more than all the data centers globally combined, and more energy than all the solar panels that exist globally. In fact, according to Digiconomist, one Bitcoin transaction requires approximately 880 kWh. This is equal to the energy needed to power the average US household for 30 days.

Given that a cryptocurrency mining operation creates minimal jobs (e.g. one of the largest operations in the US has 120 staff for 100,000 ASIC miners with only 40 staff on duty per shift, despite a daily profit as of a year ago of \$2 million per day), profits for a cryptomining company are limited not by labor costs like a majority of existing global industries. As a result, profits are limited by the cost of electricity.

Up until 2021, China was the hotbed of cryptocurrency mining, hosting over 75% of all cryptomining worldwide. Not only is there abundant hydroelectric but electricity prices are constrained by the government rather than fluctuating with demand. In 2021, due to environmental concerns and the opportunity costs to other industries of the higher energy demand of cryptocurrency mining, China banned the industry.

After the Chinese government banned bitcoin mining and trading to reach their greenhouse gas reduction goals, Bitcoin mining facilities went on the hunt for cheap electricity, including here in the US.

As one of the solutions for cheap energy, cryptomining companies worked to reopen dormant and retired fossil fuel plants like the large scale facility called Greenidge, in Dresden, NY on Seneca Lake. An environment with moderate temperatures, clean air with low particulate levels, abundant free fresh water for cooling, high availability of dormant fossil fuel power plants, and loopholes in regulatory and statutory structure have made New York an ideal location for cryptocurrency mining companies. Mining companies are buying retired or dormant electrical generating facilities that have outlived their viability in the wholesale electricity markets and are restarting operations under outdated certificates that do not account for the permitting standards applied to new, more efficient facilities to serve blockchain transaction authentication operations.

In the Finger Lakes, Greenidge Generation Station (Greenidge) provides service directly to the cryptomining operation on their property, entirely bypassing the grid and thus evading oversight by the Public Service Commission. This “behind-the-meter” power generation with outdated, inefficient technology has allowed Greenidge to perform cryptocurrency operations at the highest possible GHG emission rate, running at only 13% capacity and resulting in a ten-fold increase in emissions from the last time the facility was in use as a coal-fired plant. In addition to the harmful pollutants emitted by fossil fuel combustion at plants, such as nitrogen oxides (NOx) and sulfur dioxide (SO₂), frequent replacement of supercomputers has created a profound amount of electronic waste much of which is ending up in landfills throughout the world.

Furthermore, these facilities negatively impact aquatic life due to the large quantities of water withdrawn from regional freshwater streams and lakes to be utilized in cooling systems for both

generating electricity from the power plant and to cool the consolidated computer systems from the massive heat generation of the 24-hour operation of over 30,000 miners. The circulating water is returned to water bodies at significantly higher temperatures than the water withdrawn, killing thousands of fish every year and contributing to harmful algal bloom outbreaks that are toxic for both wildlife and humans and have been on a rapid rise in all freshwater bodies across NY state. Greenidge alone draws nearly 140 million gallons of water per day from Seneca Lake for use in its cooling systems heating 40-50 degree water to up to 108 degrees.

Gas fueled power plants also affect the health and quality of life in surrounding neighborhoods. Emission of hazardous air pollutants from the power plants are known to cause asthma, heart attacks, strokes, reproductive damage, and preterm birth. These public health impacts are most acutely felt in environmental justice communities and vulnerable populations including children, developing fetuses, seniors, and individuals with lung and cardiovascular disease.

Noise pollution is another significant concern for residents in towns across the country who have stacks of consolidated mining rigs in open fields or mining warehouses in their community. The long waves of low-frequency noise travel farther before losing energy and this can affect areas for miles around a cryptocurrency mining facility. Some liken the noise to a semi in a driveway, or a jet engine on a tarmac.

Communities hosting mining facilities, whether within power plants, warehouses, or in shipping containers stacked in open fields, find few economic benefits, as the facilities create scarce opportunities for permanent employment, harm local natural resources, and given that consolidated operations are mostly owned by large scale publicly-traded corporations, profits do not remain in the communities that are negatively impacted by the pollution that the cryptocurrency mining creates. Meanwhile, in many communities the cryptocurrency mining operations can threaten existing thriving industries. In the Finger Lakes, for example, the \$3 billion agritourism industry that employs over 65,000 people and is the backbone of the local economy depends on clean air and water and access to the quiet sounds of nature which are threatened by the introduction in the last 5 years of large scale cryptocurrency mining on Seneca Lake.

In the hunt for cheap energy, many mining operations have been set up in municipalities powered by hydroelectric energy. The energy is consistently cheap for residents unless the usage rate exceeds a statutorily set level and then rates go up, as is the case in upstate New York communities. According to a Berkeley Haas working paper authored by faculty at the University of Chicago's Booth School of Business, "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—with little or no local economic benefit."

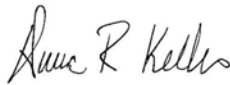
Industry proponents have stated that consolidated cryptocurrency operations can be part of the climate solution by promoting the development of renewable energy infrastructure but this is simply not true. Large scale cryptocurrency mining in New York state is significantly increasing the state's total base load demand on the grid itself putting further pressure on our need for a massive electrical line overhaul. The significant demand on our hydroelectric system and existing renewable energy infrastructure is in direct competition with getting our existing energy

demand off of fossil fuels. Some estimates suggest we will need to increase our wind and solar infrastructure development goals by over 60% to meet our states climate goals just with the completion of the "in-construction" and proposed cryptocurrency mining projects estimated for completion in 2023. As cryptocurrency mining operations that are on the grid do not themselves produce or store energy they do not act as a battery storage. They do not store excess energy. They can pause activity and reduce how much they pull off the grid at any one point in time but, as in Texas, they do not voluntarily do this unless paid to do so or unless they are at imminent risk of or are currently causing brownouts.

Proof-of-Work cryptocurrency mining uses a staggering amount of energy with each Proof-of-work-authenticated transaction, creating the same amount of greenhouse gas emissions as approximately 90 gallons of gasoline. Other forms of validation, such as proof-of-stake, open representative voting, federated consensus, proof-of-activity, and proof-of-burn, utilize far less energy, posing less of a threat to meeting state and federal climate change emissions goals. With appropriate regulation, it is possible for validation methods to transition to a less energy-consumptive method of authentications, as Ethereum recently succeeded in doing, resulting in a total immediate reduction in over 99.5% of their total energy consumption and a total 0.2% drop in global energy consumption.

Please pass the "Crypto-Asset Environmental Transparency Act" to require the Environmental Protection Agency to conduct a comprehensive impact study of U.S. cryptocurrency mining activity and require the reporting of greenhouse gas emissions from cryptocurrency mining operations that consume more than 5 megawatts of power. We must carefully study the environmental and grid impacts of cryptocurrency mining methods, such as proof-of-work mining, and implement appropriate statutes and regulations to prevent the damage it is doing and will continue to do to our public health and environment.

Sincerely,

A handwritten signature in black ink, appearing to read "Anna R. Kelles". The signature is fluid and cursive, with the first name "Anna" and last name "Kelles" clearly distinguishable.

Anna R. Kelles



Memorandum of Support for A.7389-C (Kelles)

An act to establish a temporary moratorium on proof-of-work cryptocurrency mining

Summary

Earthjustice strongly supports A.7389-C. This legislation would establish a two-year moratorium on the issuance of new air permits and air permit renewals for electric generating facilities that use fossil-fuels that provides in whole, or in part, energy used for proof-of-work cryptocurrency mining. The legislation also requires the Department of Environmental Conservation to issue a final generic environmental impact statement after close of the public comment and public hearing period no later than one year after the effective date.

Explanation

New York is facing a new significant threat to its ability to meet its critical climate mandates – the rapidly growing proof-of-work cryptocurrency mining industry. The urgency of addressing this matter cannot be understated. Proof-of-work mining operations have been resurrecting mothballed fossil fuel-based powerplants across the country, and putting pressure on our electric grid, including here in New York. Currently, there are two proof-of-work mining facilities with air permits up for renewal – the Greenidge Generating Station, based in Dresden on the shores of Seneca Lake and the Digihost-Fortistar North Tonawanda (FNT) plant just outside of Buffalo.

This legislation would ensure new permits could not be issued to electric generating stations that utilize fossil fuels for the purposes of proof-of-work cryptocurrency mining until a thorough environmental assessment is conducted.

These “mining” activities, particularly proof-of-work mining, use enormous amounts of energy to power the computers needed to conduct business – *should this activity expand in New York, it could drastically undermine New York’s climate goals established under the Climate Leadership and Community Protection Act.*

Environmental concerns regarding proof-of-work mining can be summarized as the following:

- **The energy use from proof-of-work mining is out of this world.** If Bitcoin were a country, it would rank in the top 30 countries of energy users worldwide—between Norway and Argentina.¹
- **Proof-of-work mining stands to jeopardize meeting global and New York State climate goals.** A recent study published in Nature Climate Change found that Bitcoin mining alone has the potential to push the planet past the targets set by the Paris

¹ See, e.g., N.Y. Times, Bitcoin Uses More Electricity Than Many Countries. How Is That Possible? (Sept. 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, <https://cbeci.org/cbeci/comparisons>.

agreement.² New York State has goals under the Climate Leadership and Community Protection Act to reduce greenhouse gas emissions 80% below 1990 levels by 2050, achieve 70% renewable energy for electricity by 2030, and to reduce energy consumption in buildings by 185 trillion British thermal units (Btu) from 2025 projections. New York doesn't currently have enough renewable energy to power existing needs, let alone an industry this energy consumptive. The energy consumption from proof-of-work mining operations would prevent the state from meeting these important goals.

- **Proof-of-work mining at power plants could jeopardize water quality.** These facilities require large quantities of water to generate energy, and the water returned to water bodies is significantly hotter than the water withdrawn. Fluctuations in water temperatures can negatively impact the chemistry of water bodies and the ability of certain aquatic species to survive.
- **Proof-of-work mining generates enormous levels of electronic waste.** Each Bitcoin transaction generates the equivalent of throwing away two iPhones. According to one estimate, cryptocurrency mining produces 30,700 tons of e-waste *annually*.³

It must be noted that Earthjustice and many of our partners are not opposed to cryptocurrency or blockchain technology – our concerns specifically lie with the hugely energy consumptive practice of proof-of-work mining. There are other forms of mining that can be used, such as the proof-of-stake mining methodology, which utilizes over 99% less energy than proof-of-work mining. Other less energy-consumptive methods include proof-of-authority, open representative voting, federated consensus, proof-of-activity, and proof-of-burn.

Environmental impacts should be carefully studied before allowing proof-of-work mining operations to expand in New York State. New York State has already demonstrated a strong history taking a precautionary approach to potentially harmful environmental practices, such as high-volume hydraulic fracturing (fracking). New York took the appropriate approach with fracking by issuing a moratorium as the State conducted a thorough environmental review process, which ultimately found that fracking could not be conducted safely. This decision has protected public health and the livelihood of businesses across the state.

Passing A.7389-C to pause proof-of-work cryptocurrency mining that utilizes fossil fuels is critical to ensure New York doesn't undercut its landmark climate law and protects communities.

Earthjustice supports A.7389-C

² Nature Climate Change, Bitcoin Emissions Alone Could Push Global Warming Above 2°C, <https://www.nature.com/articles/s41558-018-0321-8>.

³ BBC News, Bitcoin mining producing tonnes of waste (Sept. 20, 2021), <https://www.bbc.com/news/technology-58572385>; see also Howson & De Vries, Preying on the poor? Opportunities and challenges for tackling the social and environmental threats of cryptocurrencies for vulnerable and low-income communities, *Energy Research & Social Science*, Vol.84 (Feb. 2022), <https://www.sciencedirect.com/science/article/abs/pii/S2214629621004813?via%3Dihub>.



32 Court Street
Suite 1506
Brooklyn, NY 11201
T +347.778.2743
foodandwaterwatch.org

Moratorium on Cryptocurrency Mining Food & Water Watch Memorandum in Support A. 7389

Cryptocurrency mining is an incredibly energy intensive operation, and the amount of electricity the industry uses is growing at a breakneck pace. Lured by the rising values of various cryptocurrencies, operators are looking to New York State for locations to construct new and expand existing mining facilities that would use aging or decommissioned fossil fuel power plants to power their operations. This industry threatens to undo much of our progress in shutting down some of the state's dirtiest power plants.

The Greenidge power plant in the heart of the Finger Lakes that is currently powering a bitcoin mining facility could be the tip of the iceberg. According to Sierra Club and Earthjustice, there are an estimated 30 similar power plants the industry could target for repowering to provide electricity for cryptocurrency mining operations, and we've already seen operators target facilities in North Tonawanda and Watkins Glen.

Cryptocurrency mining operations pose a tremendous threat to the climate goals mandated by New York's nation-leading CLCPA, with the potential to undermine the state's efforts to slash greenhouse gas emissions while promoting fracking in neighboring states. We simply cannot allow that to happen. **Establishing an immediate moratorium on cryptocurrency mining while completing a comprehensive study of its impacts on the climate and the environment more broadly is a prudent and necessary action.**

We urge the legislature to pass A.7389 immediately.



Memorandum of Support

March 17, 2022

S.6486-D (Parker) / A.7389-C (Kelles)

Title: An act to amend the environmental conservation law in relation to establishing a moratorium on cryptocurrency mining operations that use proof-of-work authentication methods to validate blockchain transactions; and to require a comprehensive generic environmental impact statement review to ensure such operations do not conflict with the goals of the 2019 Climate Leadership and Community Protection Act.

Statement in support: When the State of New York enacted the Climate Leadership and Community Protection Act (CLCPA), the vision of an emissions-free grid by 2040 and a carbon neutral society by 2050 did not factor in the obstacles created by fossil fueled cryptocurrency operations. Cryptocurrency – which can come in many forms like Bitcoin, Litecoin, Ethereum, Ripple, Stellar (etc.) is a digital asset designed to serve as an alternative currency, without a third party validator (like a bank or country) where individual coin ownership records are stored in a computerized database. The technology uses strong cryptography to secure transaction records, control the creation of additional coins, and verify the transfer of coin ownership. While this technology is making some wealthy investors richer and some forms may hold promise for future beneficial blockchain applications, the process in other forms, like Bitcoin, can be incredibly energy intensive and could derail NY's climate goals if not carefully regulated or banned.

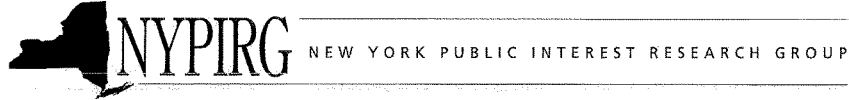
The most environmentally pernicious form of cryptocurrencies are those that require validation using the "Proof of Work" method. Proof of Work cryptocurrencies, like Bitcoin, require their validators to expend significant energy solving an arbitrary mathematical puzzle in order to both prevent interlopers from gaming the system and to validate transactions. This enormous energy consumption is by design. Not only does it take powerful and specialized computers to solve the required algorithm, but it takes warehouses full of these electronic "miners," resulting in increased energy expenditure.

By some estimates, the Bitcoin network [consumes](#) as much energy as entire countries like Argentina and Norway. The Chinese Government has recently banned both Bitcoin mining and trading because the practice is making it difficult for them to reach their greenhouse gas reduction goals. It is estimated that Chinese miners were responsible for 60% of the 120 terawatts of electricity consumed globally by Bitcoin. That amount is comparable to the entire energy consumption of a country like New Zealand. And with China rejecting the industry, dormant and underutilized fossil fuel plants in the US with cheap behind-the-meter power are becoming targets.

Several major corporations have been looking to exploit loopholes in New York's regulatory structure by targeting retiring, retired, or peaking power plants for data centers, Bitcoin mining, and the like. While the Public Service Commission (PSC) regulates grid-tied power plants, energy-consumptive Proof of Work Bitcoin mining facilities can absorb a generating plant's entire electrical output – off-grid and 'behind the meter' – evading PSC oversight. In the case of the recently converted coal plant "Greenidge" in Dresden, NY, the new gas turbines now run 24 hours a day, 7 days a week – with an output sufficient to power 93,000 homes – just to produce 5 Bitcoins a day. This under-regulated activity, with no discernable public benefit, has an enormous carbon footprint, and with proposals now spreading to other sites across NY we fear it could significantly undermine the emissions reduction goals of the CLCPA. In fact, if the gap in regulation for behind-the-meter cryptocurrency operations is not closed by the legislature, this kind of digital partnership could be an integral part of every power plant operating in NY – which could profoundly impact environmental justice communities, their air quality and the affordability of electricity.

A.7389-C/S.6486-D will establish a 2-year moratorium on the operation of cryptocurrency mining operations attached to fossil fuel facilities in NY, until a full generic environmental impact statement has determined whether such operations can be mitigated to comply with the CLCPA. Passing this bill is imperative, this session. By this time next year, there could be hundreds of unregulated data centers, paired with dirty fossil fuel facilities in NY claiming vested rights for their cryptocurrency operations if the legislature fails to act.

Sierra Club urges your support of this important legislation that will close the regulatory gap for cryptocurrency.



**TESTIMONY OF THE
NEW YORK PUBLIC INTEREST RESEARCH GROUP (NYPIRG)
BEFORE THE
ASSEMBLY STANDING COMMITTEE ON ENVIRONMENTAL CONSERVATION,
ASSEMBLY STANDING COMMITTEE ON ENERGY,
ASSEMBLY STANDING COMMITTEE ON SCIENCE & TECHNOLOGY,
& ASSEMBLY CLIMATE CHANGE WORK GROUP
ON CRYPTOCURRENCY MINING
OCTOBER 27, 2021
ALBANY, NEW YORK**

Greetings. My name is Russ Haven and I am General Counsel for the New York Public Interest Research Group (NYPIRG). NYPIRG is a nonpartisan, nonprofit research and advocacy organization whose primary areas of concern include environmental preservation, energy issues and our collective response to the unfolding climate crisis.

Thanks to the chairs, committee and work group members, and staff for holding this important hearing. The issue has been framed to explore the impact of “proof of work” cryptocurrency mining, the effects on the state’s greenhouse reduction goals, and whether additional laws or regulatory approaches are required. The hearing appropriately is sponsored by the key legislative standing committees, a recognition that when it comes to the climate crisis, *every aspect of our lives is and will be impacted.*

The short answer is that energy-hogging activities like proof of work cryptomining threaten and undermine New York’s ambitious climate mandates, as contained in the Climate Leadership and Community Protection Act, the state Energy Plan, and other parts of state environmental and energy policy. While we’re hopeful that the Department of Environmental Conservation and the Public Service Commission will use their rulemaking powers and regulatory proceedings to safeguard the state’s climate response plans, the Legislature must play a role.

The Climate Leadership and Community Protection Act and other climate programs are most threatened by death by a thousand cuts: the state and local regulatory, rate case and land-use decisions that collectively and cumulatively will determine whether we succeed in our climate goals. Accordingly the state must hang tough in making the seemingly small as well as the bigger decisions we’ll face.

Blockchain – or distributed ledger technology (“DLT”) -- is a way to create a secure *decentralized* digital ledger to establish chain of custody for digital information.¹ It has the

¹ Essentially blockchains replace trusted human or institutional verifiers with a technology that provides transparency for those with access to the blockchain to validate additions to the digital records. They do not verify the accuracy or truthfulness of information contained in a blockchain record, however.

potential to revolutionize records management and preservation.² In this way blockchain may prove useful in establishing ownership of digital or real property deed rights³ or helping to remove clouds over wills, for example.⁴ Blockchain is promoted as a way of eliminating trusted intermediaries, like government records offices and banks, to provide verification for some transactions.⁵

Digital currency earned by solving complex questions through the use of banks of computers, known as “proof of work,” was developed from the concept of blockchain technology. Solving the puzzles in order to have a chance of being awarded small amounts of Bitcoin has been likened to a “lottery.”⁶ This is the type of cryptomining that is used for Bitcoin, among other cryptocurrencies. The rush is driven by pure profit motive: It’s potentially enormously lucrative in a marketplace where actors are placing huge bets on this questionable form of currency. Bitcoin was valued at \$62,520.77 yesterday, October 26, 2021.⁷

The computer power necessary to compete in this highly speculative form of cryptocurrency mining is enormous. According to a recent study by Cambridge University, Bitcoin mining uses more energy than Argentina.⁸ *The New York Times* estimates that Bitcoin mining uses more electricity in a year than Finland, with 5.5 million residents, and more than the state of Washington.⁹

“‘Bitcoin alone consumes as much electricity as a medium-sized European country,’ says Professor Brian Lucey at Trinity College Dublin. ‘This is a stunning amount of electricity. It’s a dirty business. It’s a dirty currency.’”¹⁰

Two New York proposals currently before the DEC and PSC highlight the ways that investors are seeking cheap electricity to use exclusively or primarily in Bitcoin mining and the climate, environmental and public health hazards presented by this industry.

² Well beyond the scope of this hearing, but worthy of state legislative attention, are the financial and national security issues posed by adoption of blockchain technologies and digital currencies. See, e.g., <https://www.foreignaffairs.com/articles/united-states/americas-crypto-currency-conundrum>.

³ Maksymilian Ewendt, *Leveraging Blockchain Technology in Property Records: Establishing Trust in a Risk-Filled Market*, 19 N.C. J.L. & Tech. 99 (2018), <https://scholarship.law.unc.edu/cgi/viewcontent.cgi?article=1355&context=ncjolt>.

⁴ Bridget J. Crawford, *Blockchain Wills*, 95 Ind. L.J. 735 (2020), <https://digitalcommons.pace.edu/lawfaculty/1158/>.

⁵ While blockchain technology can be used to boost transparency, often it is its ability to provide security, verification and secrecy that makes it attractive, for example in digital currency.

⁶ *Bitcoin Consumes ‘More Electricity than Argentina,’* Cristina Criddle, *BBC News*, February 10, 2021. Accessed at <https://www.bbc.com/news/technology-56012952>.

⁷ *Yahoo Finance*, October 26, 2021. Accessed at <https://finance.yahoo.com/quote/BTC-USD/>.

⁸ *Id.*

⁹ *Bitcoin Uses More Electricity than Many Companies. How is that Possible?* *New York Times Interactive*, Jon Huang, Claire O’Neill and Hiroko Tabuchi, September 3, 2021. Accessed at <https://www.nytimes.com/interactive/2021/09/03/climate/bitcoin-carbon-footprint-electricity.html>.

¹⁰ *Bitcoin’s Growing Energy Problem: ‘It’s a Dirty Currency,’* Katie Martin and Billy Nauman, *Financial Times*, May 20, 2021. Accessed at <https://www.ft.com/content/1aecb2db-8f61-427e-a413-3b929291c8ac>.

In North Tonawanda, Fortistar is seeking approval from the DEC to sell a mothballed power plant and transfer its air pollution control permits to Digihost International Inc., a Bitcoin mining company. Digihost in turn intends to use the power plant to generate electricity for a fleet of supercomputers at the facility that would run the energy intensive mining processes to earn Bitcoin and other digital currencies. The data mining operation would run 24 hours a day, seven days a week, 365 days per year.¹¹ The plan is to house hundreds of computers in 8' long x 100' wide x 24' high "free standing structures" comprising 2400 square feet.¹² Additional structures would be constructed "to support electrical distribution throughout the site."¹³ A consultant to the project told the local planning board that the structures are repurposed shipping containers and "would be placed on the power plant's lawn" with each container holding "a few hundred computers."¹⁴ The supercomputers would be run by lithium batteries during periods when the power plant was selling electricity to the grid.¹⁵

In addition to energy consumption, the proposed facility would use five hundred thousand (500,000) gallons of water per day to be drawn from the City of North Tonawanda and generate one hundred thousand gallons per day of wastewater discharge to the City's collection system.¹⁶ The power plant is located within the West Erie Canal Corridor, designated as a New York State Heritage Area.¹⁷

A similar extremely energy intensive proposal is for the Greenidge Generating Station in Dresden, New York. The plan is to convert the power plant to a Bitcoin mining operation running 24/7/365. Most of the energy generated by burning natural gas at the Greenidge Generating site will not go into the electrical grid to serve the general public. Instead, it will be used by private technology companies where the financial rewards remain with the companies themselves and their investors, while the environmental impacts are externalized, impacting our community, our state, and our ever-warming world.

¹¹ *Canadian Cryptocurrency Company Plans to Buy North Tonawanda Power Plant*, Thomas J. Prohaska, *The Buffalo News*, July 19, 2021, updated September 21, 2021. Accessed at https://buffalonews.com/news/local/canadian-cryptocurrency-company-plans-to-buy-north-tonawanda-power-plant/article_8b9a8eba-e8b0-11eb-a010-2354a7440301.html.

¹² City of North Tonawanda Environmental Assessment Form (EAF), appended to public notice dated August 12, 2021. Accessed at

https://www.northtonawanda.org/documents/legal%20notice/fortistar%20amended%20seqr_2.pdf.

¹³ *Id.*

¹⁴ *Canadian Cryptocurrency Company Plans to Buy North Tonawanda Power Plant*, Thomas J. Prohaska, *The Buffalo News*, July 19, 2021, updated September 21, 2021. Accessed at https://buffalonews.com/news/local/canadian-cryptocurrency-company-plans-to-buy-north-tonawanda-power-plant/article_8b9a8eba-e8b0-11eb-a010-2354a7440301.html.

¹⁵ *Id.*

¹⁶ *Id.*

¹⁷ City of North Tonawanda Environmental Assessment Form (EAF), appended to public notice dated August 12, 2021. Accessed at https://www.northtonawanda.org/documents/legal%20notice/fortistar%20amended%20seqr_2.pdf.

It bears noting that historically, large industrial scale facilities like power plants were sited in marginalized communities: communities of color, low-income communities, and communities without political clout. To resuscitate these plants – which were permitted to fulfill public needs for reliable and affordable electricity, is to inflict additional damage on communities that rightfully received special protection under the Climate Leadership and Community Protection Act.

These proposals are part of a trend as a *digital gold rush is underway*. Since 2019, energy consumption for cryptocurrency mining has skyrocketed.¹⁸ As it increases in value, electric costs and the use of old, inefficient banks of computers are less of a concern because the profit margin increases with value.

And even if Bitcoin mining operations were powered 100% by renewable, green energy, it would mean that “it won’t be available to power a home, factory, or electric car.”¹⁹ While the Fortistar proposal for North Tonawanda indicates that they intend to move the power plant to be powered by “100% zero emissions sources by 2025,” they have not provided detail for their plans. But taken at face value, even if achieved it would not further the state’s climate or public health goals nor change the conclusion that the public’s interest is not furthered by approving the sale and permit transfer.

Blockchain technologies are relatively new and in particular proof of work cryptocurrency mining operations are expanding due to a speculative marketplace with potentially great financial payoffs. Regardless of whether these currencies become widely recognized and integrated into commerce, in the short term speculators see opportunities to make a killing. *Collateral damage in their rush to mine digital dollars is likely to be our climate goals, public health and our transition to greenhouse-gas free energy production.*

NYPIRG urges the Legislature to be vigilant in defending (and strengthening when appropriate) the Climate Leadership and Community Protection Act and related laws and policies. With respect to proof of work cryptocurrency mining, we support the following:

- A moratorium on approving proof of work cryptocurrency mining siting consistent with A.7389-B (Kelles).
- Requiring a Generic Environmental Impact Statement or similar independent life-cycle analysis of the full range of climate, environmental, public health and other possible effects of cryptocurrency mining operations, including proof of work models.
- Denying the Fortistar and Greenidge proposals.

Thank you for holding this important hearing. We look forward to working with you to safeguard New York’s climate, environment and public health laws.

¹⁸ *Id.*

¹⁹ *Bitcoin Uses More Electricity than Many Companies. How is that Possible?* New York Times Interactive, Jon Huang, Claire O’Neill and Hiroko Tabuchi, September 3, 2021. Accessed at <https://www.nytimes.com/interactive/2021/09/03/climate/bitcoin-carbon-footprint-electricity.html>.

Testimony Prepared for the New York State Assembly Hearing on Cryptocurrency Mining
Joint Hearing of the Standing Committees on Environmental Conservation, Energy,
Science & Technology, and Climate Change

Eswar Prasad*

October 27, 2021

Summary

Bitcoin and other decentralized cryptocurrencies that are meant to serve as mediums of exchange have a transaction validation process called “mining” that requires large amounts of computing power and electricity consumption. This is a wasteful process with no socially redeeming aspects, especially since Bitcoin has proven to be an inefficient medium of exchange.

Bitcoin’s underlying technology, called blockchain, could have transformative effects on finance. But this technology can be developed distinctly of Bitcoin. Hence, limiting cryptocurrency mining operations will not inhibit technological innovations that could have widespread benefits in terms of democratizing finance by making low-cost digital payments and basic banking services available to unbanked and underbanked households. Furthermore, Bitcoin mining has detrimental environmental consequences with few offsetting economic benefits to regions where this mining is done.

Bitcoin’s transaction validation through Proof of Work

Bitcoin is a decentralized cryptocurrency. It was designed to enable transactions using only the digital identities of transacting parties (referred to as pseudonymity) and without using traditional central bank money or the help of a financial institution. In other words, anyone with a computer could conduct transactions without relying on paper currency or having a credit card or bank account, and without having to reveal their real identities.

Bitcoin’s unstable value has, however, rendered it an unviable medium of exchange. Moreover, transactions using the cryptocurrency are slow and expensive. The Bitcoin network also cannot process large transaction volumes in a timely manner. While it has failed in its stated objective as a pseudonymous medium of exchange, Bitcoin has somewhat paradoxically turned into a financial asset. Since Bitcoin lacks intrinsic value, its adherents seem to believe that its scarcity is the basis for its high price. The algorithm that governs the process of creating the cryptocurrency posits a hard cap of 21 million Bitcoins (about 18.5 million have been created so far).

* The author is a professor at Cornell University and a senior fellow at the Brookings Institution. This testimony draws extensively on chapters 4 and 5 of his new book *The Future of Money: How the Digital Revolution is Transforming Currencies and Finance* (Harvard University Press, September 2021). The book also contains detailed references, citations to background material, and sources for some of the figures cited in this testimony.

Whatever the ultimate fate of Bitcoin as a financial asset, its underlying technology, called blockchain, is truly innovative. It allows commercial transactions to be consummated through a process called public consensus that relies on transparency—all transactions and account balances in “digital wallets” are posted on public electronic ledgers, with amounts and digital identities of transacting parties visible to anyone with an internet connection. Transactions are validated when a majority of computers on the network confirm the legitimacy of the transactions based on balances in users’ digital wallets. Blocks of newly validated transactions and updated account balances are then sequentially “chained” to earlier blocks using computer code. These blockchains, in effect electronic ledgers, are maintained on a large number of computers around the world and synchronized in real time, making them tamper-proof and secure.

The validation of transactions on the Bitcoin network requires that the nodes (computers) that maintain the digital ledgers accept the transactions as authentic and legitimate. The process of achieving such consensus among the nodes is referred to as Proof of Work, and is executed through a process called mining. This involves solving numerical puzzles generated automatically by the Bitcoin algorithm. These puzzles can only be solved by brute force computing power. The first computer to solve a particular problem gets the privilege of validating a specific block of transactions. The successful miner’s reward is in the form of a Bitcoin.

Hardware

Bitcoin mining was initially conducted on regular computers, with the processing power of the devices’ central processing units (CPUs) determining the success rate of the miners that used them. It soon turned out that graphics processing units (GPUs), essentially graphics cards used in higher-end machines, were better suited for the computations needed for cryptocurrency mining. The rising pecuniary benefits of cryptocurrency mining then led to some advances in hardware that could be better optimized for this purpose.

Much of the mining of Bitcoin is now carried out by specialized devices called ASICs, or application-specific integrated circuits. ASICs are tailor-built machines containing computer chips designed with a single, specific purpose. An ASIC can be optimized to mine a cryptocurrency that is based on a specific cryptographic algorithm. Bitcoin ASICs can now be bought for a few thousand dollars, and prospective Bitcoin miners are known to buy these by the hundreds or thousands. In some cases, they set up mining pools that combine the resources of individual miners. Such pooled resources increase the probability of successful Bitcoin mining because the pool, with its increased power, has a better chance of being the first to solve the cryptographic problems. Needless to say, it takes a lot of power to run the computers, or clusters of computers, that calculate potential solutions.

Environmental costs

The process of mining for Bitcoin has major environmental consequences. Miners now require huge arrays of computers that suck up large amounts of electricity simply to try to be the first to crack the complex numerical problems that yield rewards in the form of Bitcoin. This means that

vast amounts of computing power and energy are devoted simultaneously to solving the same problem, and the solutions to these problems offer no material benefit to humanity. The competitive aspect of mining is, however, important to ensure the integrity and security of Bitcoin transactions, as it makes it substantially harder for malevolent actors to tamper with the digital ledgers.

Researchers at the University of Cambridge estimated that, in 2016, the Bitcoin network accounted for about 0.4 percent of electricity consumption in the world. They noted that this amount of electricity could power all the tea kettles used to boil water in the United Kingdom for twenty-three years or could satisfy all the energy needs of their university for close to six hundred years. Arvind Narayanan, a computer science professor at Princeton University, estimated that in 2018 Bitcoin mining accounted for about 1 percent of world energy consumption.

Another researcher estimated that validating a *single* transaction on the Bitcoin network required power consumption equivalent to that of an average US household over about a month. According to this analysis, the Bitcoin network has a carbon footprint similar to that of New Zealand, an energy consumption total similar to that of Chile, and an electronic waste generation level comparable to that of Luxembourg. In fact, the electricity consumption of the Bitcoin network is estimated to be more than that of 150 countries in the world—only about forty countries have annual electricity consumption levels that exceed this network's annual electricity usage. The total cost of mining Bitcoin, adding up estimates of hardware and electricity costs, is \$4 billion per year.

It gets worse. Many other cryptocurrencies use the same Proof of Work protocol pioneered by Bitcoin. These networks are smaller but still require mining activity. Moreover, many of the electricity estimates mentioned above apply only to running the ASICs, not to cooling them.

This has led to concentrations of mining pools in locations that have cheap electricity or cold temperatures. Preferred locations, such as Canada and Iceland, have both features. China and Russia are also believed to have large cryptocurrency farms, in part because of government encouragement and support, although such government support has waxed and waned over time in both countries.

Some industry groups have argued that the environmental costs of Bitcoin mining are overstated. A report by the group Coinshares, for instance, argues that mining hardware has become more efficient over time and that renewable energy sources account for most of the power consumption by the Bitcoin network. This argument ignores the opportunity costs of using even renewable energy for mining rather than other uses and, in any event, is already undercut by the rising computational complexity of mining operations on the network.

In short, while mining blocks on a blockchain under the Proof of Work protocol offers creative solutions to some real-world problems, it also uses a large amount of real-world resources. Mining requires ongoing purchases of hardware and an immense amount of energy consumption, both of which are harmful for the environment. Moreover, the mining process requires hardware to be running constantly on a full load, wearing out machines sooner than under more normal

operating conditions. Since ASICs are designed for just a single application, they also face rapid obsolescence and cannot be repurposed for other uses. The constant turnover of equipment thus creates a massive stockpile of obsolete parts. The advent of Bitcoin and the Proof of Work protocol it is built upon constitutes an environmental calamity.

Alternatives to Proof of Work

The cost and inefficiency of Proof of Work protocols have motivated the development of alternative consensus mechanisms that are needed to validate transactions that take place on a blockchain without a trusted third party involved. The most popular of these is Proof of Stake, which uses a different process to reach consensus. Since Proof of Stake does not need highly complex sums to be solved, the hardware and electricity costs of validating transactions are substantially lower. The second largest cryptocurrency by market capitalization, Ethereum, is in the process of shifting to this consensus protocol, which could happen in the next few months. Proof of Stake is not only environmentally less damaging but would also increase the network's ability to process a larger volume of transactions quickly and to increase the functionality of the blockchain.

While such alternative consensus protocols exist, Bitcoin miners may not be eager to make such a switch as it could devalue their investments in mining operations. Thus, their economic self-interest might end up exacerbating the environmental and social costs of mining operations.

Broader economic impacts

The broader economic impact of Bitcoin in regions that play host to cryptocurrency mining operations is probably minimal at best.

Cryptocurrency mining is a hardware-intensive operation with minimal human intervention that is limited to setting up the mining operations and monitoring them. In fact, other than physical maintenance of the network of computers involved in the mining, there might be little local labor involved—the monitoring of the network can be done from anywhere.

Given that all of the activity on the Bitcoin network is virtual, other than the mining operations which require hardware and attendant resources, there is little economic gain from these activities for the location in which mining operations are conducted. The tax consequences are also not obvious—even if the physical mining operations take place in New York State, they could be operated by firms that are headquartered in lower-tax jurisdictions and that end up having limited direct tax obligations to New York State. By contrast, any environmental damage caused by cryptocurrency mining will be mainly local (although of course there will be spillover effects at the national and global levels) and could take a long time to reverse.

In short, from a cost-benefit perspective, there is no good argument to be made for supporting the advent of extensive Bitcoin mining operations in New York State.



STANFORD UNIVERSITY

MARK Z. JACOBSON

Professor of Civil & Environmental Engineering
 Director, Atmosphere/Energy Program
 Senior Fellow, Precourt Institute for Energy and Woods Institute for the Environment

Department of Civil & Environmental Engineering
 Yang & Yamazaki Environment & Energy Building
 473 Via Ortega, Room 397
 Stanford, CA 94305-4020

Tel: 650-723-6836
 Fax: 650-723-7058
jacobson@stanford.edu
www.stanford.edu/group/efmh/jacobson



October 27, 2021

Testimony on Cryptocurrency Mining to the New York State Assembly Standing
 Committees on Environmental Conservation, Energy, and Science and Technology

Dear State Assembly Members,

I am a professor of Civil and Environmental Engineering at Stanford University. Since 1989, I have studied and worked exclusively on understanding and solving large-scale air pollution and climate problems. Since 2009, I have developed roadmaps to transition cities, states, countries, and the world to 100% clean, renewable energy and storage for all energy purposes. In 2013, 2015, and 2021, our group developed specific roadmaps to transition New York State (Jacobson et al., 2013, 2015, 2021). We also developed a roadmap for New York City in 2018 (Jacobson et al., 2018). The science behind these roadmaps is described at length in a textbook (Jacobson, 2020).

The purpose of the roadmaps has been to develop science-based plans to transition the world away from fossil fuels as fast as possible. Our 2009 study (Jacobson and Delucchi, 2009), which was the scientific basis for the energy portion of the U.S. *Green New Deal*, concluded that a worldwide transition by 2030 to 100% clean, renewable energy was technically and economically possible, but such a transition would likely take longer due to social and political barriers. Those conclusions still hold. The plans that we have developed since 2009 provided the fundamental science basis for 100% clean, renewable energy laws in several states and territories and 176 towns and cities in the United States.

With this background in mind, I draw the following conclusions about the use of energy for cryptocurrency mining in New York State.

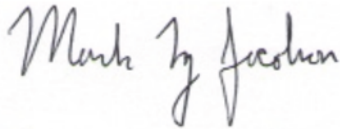
- 1) In order to avoid 1.5 degrees Celsius global warming since the 1850-1900 time frame, we need to eliminate 80% of all the world's emissions of greenhouse gases and warming particles by 2030 and eliminate 100% by no later than 2050.
- 2) In order to eliminate the 3,000 to 4,000 air pollution deaths that occur annually in New York State, we need to eliminate all fossil fuel and bioenergy combustion emissions immediately.
- 3) The combustion of any fossil or bioenergy fuel to provide new electricity in the state of New York for cryptocurrency mining will set back both goals. It will

increase air pollution mortality and morbidity and greenhouse gas emissions. For example, if New York State's electricity consumption increases by 8%, and that consumption is met with combustion turbines, the number of air pollution deaths may increase by up to ~64 per year. At an approximate statistical cost of life of \$8 million per person, that increases the social cost burden to the state of by up to \$512 million per year.

- 4) The use of any renewable electricity in New York State to power cryptocurrency mining will set also back both goals because it will prevent such renewable electricity from eliminating existing fossil and bioenergy use in the electricity, transportation, buildings, or industry sectors in the state. As such, air pollution and climate damage will be worse than if no new electricity demand arose.
- 5) Given the massive scale of change needed over a short period of time (80% change by 2030) to transition existing energy to clean, renewable energy, the diversion of resources away from this goal will make it much more difficult to meet the goal. Transitioning existing energy will already require large numbers of energy generators and storage devices, substantial land, and substantial financial resources. Energy for cryptocurrency mining will also require generators, storage, land, and money so will compete directly with a transition, slowing the transition.
- 6) As such, I recommend not allowing either fossil, bio, or clean-renewable electricity generators to be used for cryptocurrency mining. Allowing such mining will result in substantial social cost damage and a slower and more costly transition to clean, renewable energy in New York State. It will also increase conflict over the limited land available to place renewable energy generators.

Thank you for considering my testimony.

Sincerely,



Mark Z. Jacobson

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Testimony of Conor Bambrick, Director of Climate Policy
and Amanda Sachs, Legislative and Climate Associate
Environmental Advocates NY

Before the
Assembly Standing Committee on Environmental Conservation
Assembly Standing Committee on Energy
Assembly Standing Committee on Science and Technology
Assembly Climate Change Work Group

Hearing on Cryptocurrency Mining
Wednesday October 27, 2021

On behalf of Environmental Advocates NY, I am pleased to offer the New York Assembly Standing Committee on Environmental Conservation, Assembly Standing Committee on Energy, Assembly Standing Committee on Science and Technology, and Assembly Climate Change Work Group our perspective on cryptocurrency mining and its possible impacts on the state's ability to meet greenhouse gas reduction goals.

Environmental Advocates NY has been a leading voice for the environment for more than 50 years. We commend the Assembly Standing Committee on Environmental Conservation, Assembly Standing Committee on Energy, Assembly Standing Committee on Science and Technology, and Assembly Climate Change Work Group for your leadership in developing and passing the Climate Leadership and Community Protection Act (CLCPA) and for holding the state accountable for ensuring its effective implementation. Thank you for the opportunity to submit testimony.

Our Climate Framework

New York has entered a new paradigm in climate policy based on the current realities of climate change impacts, and it is the responsibility of state agencies to be vigilant in ensuring that polluting facilities adhere to our laws and policies completely and uniformly on the ground. Under section 7 of the CLCPA, there is a key requirement that the permit review process account for impacts on the state's ability to meet the climate and equity mandates of the law, this includes the mandate that New York's electricity sector be emissions free by 2040.

Section 7, subdivision 2 of the CLCPA requires the Department of Environmental Conservation to consider whether issuing a permit would be inconsistent with or interfere with the attainment of greenhouse gas limits. A CLCPA analysis of emissions is a necessary part of this consideration, and waiving this analysis for air permit renewals, even when significant modifications are not needed is in direct violation of 6 NYCRR §621.11(i), which states, "an application for permit renewal or modification will be treated as a new application under this Part."

The rest of the nation looks to New York as we work to implement the boldest climate law in the country. As the state that raised the bar higher for equitable climate policy, we need to lead by example and show that industry interests do not trump the mandates of the climate law and the needs of the public to have a safe climate.

Cryptocurrency Mining and its Impacts

We are seeing a disturbing trend of retired and dormant electric generating facilities that have outlived their viability by being repurposed to power energy intensive behind-the-meter data centers.

In particular, sites like Greenidge Generation power plant have been put back online for the purposes of cryptocurrency proof-of-work authentication methods. Data centers designed to process proof-of-work authentication methods to validate blockchain transactions require a great amount of energy usage and over time see large increases in toxic co-pollutants including sulfur oxide, nitrous oxide, carbon monoxide, and particulate matter. The greenhouse gas emissions and co-pollutants associated with the increased energy usage will irreparably harm compliance with the Climate Leadership and Community Protection Act in violation of state law. The Greenidge Generation power plant operates near the shore and produces about 44 megawatts to run 15,300 computer servers. The Greenidge Generation facility plans to dramatically increase its mining capacity, the facility would emit up to a million tons of carbon pollution a year at full capacity.

Power plants repurposed for energy intensive industrial uses, like blockchain transaction authentication operations, could also have significant adverse impacts on air and water quality. In terms of purely environmental impacts, operations that use proof-of-work authentication methods to validate blockchain transactions often use large amounts of water, which, when discharged, can raise the temperature of adjacent water bodies to levels that harm aquatic life, including fish species that are important for local tourism, and may increase the amount and frequency of harmful algal blooms on lakes, ponds and streams. Seneca Lake is among the most polluted in the country and much of the local economy survives on wine tourism and agriculture.

Article 10 of the Public Service Law Needs to be Applied

Another major consideration in light of the revival of dormant power plants for the purpose of mining cryptocurrency is the failure to apply Article 10 of the Public Service Law. In 2012, Article 10 was enacted which requires a comprehensive review of the cumulative environmental and public health impacts of all new and re-powered major electric generating facilities. Unfortunately, the law only applies to new power plants or in situations in which old power plants are increasing their capacity when they're repowering by more than twenty-five thousand kilowatts.

New power plants are currently subject to Article 10, while re-powering old power plants fly under the radar if they are not increasing their capacity, even though operating these older facilities are dirtier and less efficient. Given the disproportionate siting of fossil-fueled power plants in low-income communities and communities of color, it is essential to the health of these communities that old power plants are covered and protected by the environmental justice provisions of Article 10. These environmental justice protections include a cumulative impact analysis of air quality and a

demographic, economic, and physical description of the local community located within a half-mile radius of the facility.

Although this hearing is intended to examine the impact of "proof of work" cryptocurrency mining on

the State's ability to meet greenhouse gas reduction goals, it also points to the bigger picture of dormant power plants across the state. Regardless of whether they're used for cryptocurrency mining or targeted for another purpose, dormant power plants need to adhere to current laws, including Article 10. Article 10 includes strict requirements that any other operator would need to follow. It is unjustifiable why dormant power plants are allowed to be repurposed for other industrial uses and restart operations under outdated certificates. It is possible that this loophole has allowed New York State to be targeted for more cryptocurrency mining operations as other areas ban certain decentralized currencies. There are dozens of dormant fossil fuel power plants in New York State.

It is our strong recommendation that the [A.7768-A \(Kelles\)](#) / [S.7006-A \(May\)](#) bill be taken up to prohibit the transfer of operating certificates for dormant electric generating facilities if the certificates were issued prior to 2012. The bill would add a section to Article 10 that prohibits retired or mothballed generating facilities with permits issued prior to 2012 from utilizing fossil fuels for electricity production or other industrial purposes without the issuance of a new operating certificate by the Public Service Commission and new air and water permits from the Department of Environmental Conservation. Currently, without this change, these plants are restarting operations under outdated certificates that do not account for the permitting standards applied to new, more efficient facilities.

Conclusion

We believe the siting of new and repowered fossil plants is inconsistent with the climate law. The Department of Environmental Conservation affirmed that belief in denial of permits for the repowering of the Danskammer and Astoria generating facilities on the grounds that the projects could not demonstrate compliance with the CLCPA. In addition to the [A.7768-A \(Kelles\)](#) / [S.7006-A \(May\)](#) bill, we recommend that legislation be taken up to establish a moratorium on the siting of new and repowered fossil fuel power plants and a full environmental review be conducted. It does not appear that additional statutory or regulatory changes are required per se in order to deny permit renewals for dormant power plants to repower for bitcoin mining operations, however, the law should clearly state that any plants granted permits prior to the siting law and CLCPA will still be required to go through a rigorous review process. It is imperative that action is taken immediately to ensure permit review processes do not violate the CLCPA, especially due to the alarming trend of and potential for cryptocurrency data mining operations targeting old, inefficient power plants across upstate New York. A moratorium on the issuance of permits for these blockchain operations would help complement the climate law in reaching its mandates and fulfilling its larger purpose of comprehensive climate planning for the State of New York.

Thank you for this opportunity to provide testimony.

Senator MARKEY. Thank you so much.
Courtney Dentlinger, whenever you are comfortable, please begin.

**STATEMENT OF COURTNEY DENTLINGER, VICE PRESIDENT,
CUSTOMER SERVICE AND EXTERNAL AFFAIRS AND CHIEF
CUSTOMER OFFICER, NEBRASKA PUBLIC POWER DISTRICT**

Ms. DENTLINGER. Thank you. Good afternoon, Chairman Markey, and Ranking Member Ricketts. Thank you for the opportunity to testify today.

I would like to share a little bit about Nebraska Public Power District, or as I will refer to it, NPPD, and the territory we serve, to set the stage for my remarks regarding our experience with cryptocurrency mining. As Senator Ricketts mentioned, Nebraska's electric utility industry is unique and the legacy of Senator George Norris. We are the only 100 percent public power State in the Nation.

NPPD is a public corporation, and a political subdivision of the State. We are not-for-profit. Our rates are set to deliver reliable, affordable, sustainable energy and related services to our customers. We do not have shareholders; rather our customers are in essence our owners. Our approximately 2,000 employees operate our integrated electric utility system, including generation, transmission, and distribution facilities. Our chartered territory encompasses all or parts of 84 of the State's 93 counties, spanning 500 miles from east to west.

The majority of our service territory is rural. The largest city we serve has fewer than 35,000 people. Much of the area receiving our power supply is farm and ranch land where crops and livestock are grown to help feed America and the world, along with significant ag processing, and other manufacturing. Our 3,200 megawatts of diverse generation located across the State includes nuclear, coal, gas, wind, hydro and solar. This diverse generation mix helps us meet our customer expectations to be reliable, affordable, sustainable and resilient.

NPPD and our fellow Nebraska utilities are proud to offer some of the lowest rates and highest reliability among the 50 States. We serve our Nebraska customers with a resource mix that is 62 percent carbon-free. In 2021, our board set a goal of achieving net-zero carbon emissions by 2050, while emphasizing the need to maintain reliability and affordability.

In fact, we are actively pursuing multiple technologies as we look to the future of carbon-free energy. NPPD is leading Nebraska's efforts along with partners in Iowa and Missouri to pursue Federal hydrogen hub designation. We are currently conducting a feasibility study to determine potential locations for advanced nuclear reactors. We are working with the U.S. Department of Energy and several companies on carbon capture and sequestration opportunities.

In Nebraska, like most other States, electric utilities, regardless of type, have exclusive retail service areas, which include an obligation to serve all customers under just, fair, and reasonable rates. We cannot refuse customer based on the business they may offer.

We generally must serve all electric loads agreeing to meet applicable terms of service.

Just as every generation source has its benefits and challenges, so does each type of customer load. Historically, steady electric demand from a customer resulted in the most efficient use of electric infrastructure at a lower cost per unit of electricity for those customers. Today, the variability of generation from an increasing amount of renewables, as well as other considerations, is allowing for opportunities for new tools to be implemented to manage generation and loads, including innovative rate designs and demand response.

In our predominantly non-metro and rural service areas, diversification of businesses and economic growth is critical as these areas continue to see population declines. In fact, local leaders have been very receptive to crypto-mining facilities as they have seen the potential for significant economic development benefits for their communities.

An economic impact study performed for a crypto mining project in Nebraska showed over a \$65 million economic impact on Nebraska's economy, nearly 200 associated and direct and indirect jobs, and \$5.59 million in tax revenue. In rural areas, these economic benefits can be significant.

The projects we have seen have an average wage of \$60,000 per job, higher than our median household income. Unlike traditional hyperscale data centers, which often need to locate in metro areas for work force and redundant fiber needs, these types of crypto operations are more suited for rural areas because of smaller work force requirements, less stringer redundant fiber requirements. Although the number of jobs is smaller, again, these good-paying opportunities can have significant impact in a rural area.

These types of projects can also be more flexible with respect to siting and often seek locations where there is existing excess or unused transmission capacity. They also have very high capacity load factors, running nearly 24 hours a day, 7 days a week, which is actually a benefit for load-serving entities. The load can be very flexible. They often seek interruptible rates and can quickly drop loads, which has proven to be helpful during local storm damage related events and even large-scale grid events, where transmission or generation might be insufficient to serve load.

With that, again, I appreciate the opportunity to share our experience with you today. I look forward to any questions you may have.

[The prepared statement of Ms. Dentlinger follows:]

Statement of Ms. Courtney A. Dentlinger

Vice President of Customer Service and External Affairs & Chief Customer Officer
for Nebraska Public Power District

Before the U.S. Senate Committee on Environment and Public Works,
Subcommittee on Clean Air, Climate, and Nuclear Safety

Subcommittee Hearing on Crypto-Asset Environmental Transparency

March 7, 2023

Good afternoon, Chairman Markey, Ranking Member Ricketts and members of the Subcommittee. Thank you for allowing me the opportunity to testify today.

My name is Courtney Dentlinger. I am the Vice President of Customer Service and External Affairs & Chief Customer Officer for Nebraska Public Power District (NPPD). Prior to joining NPPD five years ago, I had the privilege to serve as Director of Economic Development for the State of Nebraska, in then-Governor Ricketts' cabinet.

I would like to share a little bit about NPPD and the territory we serve to set the stage for my remarks regarding our experience with cryptocurrency mining.

Nebraska's electric utility industry is unique and a legacy of Senator George Norris. We are the only 100% public power state in the nation. All retail electric service in Nebraska is provided by municipal electric systems, public power districts and electric cooperatives. Public power districts like NPPD are public corporations and political subdivisions of the State of Nebraska. We are not-for-profit. Our rates are set to deliver reliable, affordable, sustainable energy and related services to our customers. We do not have shareholders; rather, our customers are in essence our owners. Approximately 2,000 employees operate NPPD's integrated electric utility system including generation, transmission, and distribution facilities.

Control of NPPD and its operation is vested in an 11-member Board of Directors, popularly elected from within NPPD's chartered territory which encompasses all or parts of 84 of the state's 93 counties, spanning 500 miles from east to west.

The majority of NPPD's retail and wholesale service territory is rural. The largest city we serve has fewer than 35,000 people and much of the area receiving our power

supply is farm and ranch land where crops and livestock are grown to help feed America and the world, along with significant ag-processing and other manufacturing.

Nebraska Public Power District's 3,200 megawatts of diverse generation, located across the state, includes nuclear, coal, gas, wind, hydro and solar. This diverse generation mix helps NPPD meet customer expectations to be reliable, affordable, sustainable, and resilient. NPPD and our fellow Nebraska utilities are proud to offer some of the lowest rates and highest reliability among the 50 states. According to the Energy Information Administration's preliminary 2021 data, Nebraska's average revenue per kilowatt hour was ranked 9th lowest in the Nation. NPPD serves its Nebraska customers with a resource mix that is 62% carbon free. In 2021, our Board has set a goal of achieving net zero carbon emissions by 2050, while emphasizing the need to maintain reliability and affordability. In fact, we're actively pursuing multiple technologies as we look to the future of carbon-free energy. NPPD is leading Nebraska's efforts, along with partners in Iowa and Missouri, to pursue a federal hydrogen hub designation. We're currently conducting a feasibility study to determine potential locations for advanced nuclear reactors as those technologies become commercially viable and affordable in the future. And we're working with the U.S. Department of Energy and several different companies on carbon capture and sequestration opportunities.

In Nebraska, like in most other states, electric utilities regardless of whether they are public power, cooperatives or investor owned have an exclusive retail service area which includes an obligation to serve all customers under just, fair, and reasonable rates. We cannot refuse customers based on the business they may operate. We generally must serve all electrical loads agreeing to meet applicable terms of service. And just as every generation source has its benefits and challenges, so does each type of customer load. All electric utility customers have unique characteristics as to how they impact the various aspects of electric infrastructure. Historically, steady electric demand from a customer resulted in the most efficient use of electric infrastructure and the lowest cost per unit of electricity for those customers. Today, the variability of generation from an increasing amount of renewables, as well as other considerations, is allowing opportunities for new tools to be implemented to manage generation and loads, including innovative rate designs and demand response.

I will now turn to NPPD's experience with crypto-mining loads.

In Nebraska over 55 percent of the state's population of approximately 2 million residents is concentrated in just three counties in eastern Nebraska. In our predominately non-metro and rural service areas, diversification of businesses and economic growth is critical as these areas continue to see population declines. In fact, local leaders have been receptive to the crypto mining facilities as they have seen the potential for significant economic benefits for their communities. For instance, an economic impact study performed for a crypto-mining project in Nebraska showed over a \$65 million economic

impact on Nebraska's economy; 193 jobs generated and supported; and \$5.5 million in state and local taxes and transfer payments generated. State sales tax, gross revenue tax, and related transfer payments made to the community generated significant revenues for local and state government. In rural areas, these economic benefits can be significant.

The Nebraska projects we have seen have an average wage of \$60,000 per job. The types of jobs include site managers/administrators, data center technicians, and security personnel (compared to NPPD's service territory 2020 median household income of \$55,000). In addition, there is an increased demand for specialized hardware and software, which can help create more jobs in the tech sector.

Unlike traditional hyperscale data centers, which often need to locate in metro areas due to workforce availability and the availability of redundant fiber, these types of operations are more suited for rural areas because of smaller workforce requirements and less-stringent redundant fiber requirements. Although the number of jobs is smaller, these good-paying opportunities can have a significant impact in a rural area.

The tax revenues for the state and local political subdivisions can also be significant. One crypto mining facility in Nebraska paid \$1.6 million in state sales tax in a 12-month timeframe on the energy it consumed. The local government received \$3.8 million in that same time period.

In Kearney, Nebraska, the community has been able to make significant enhancements to its municipal airport to attract commercial air service to the community due to increased tax revenues, which is important not only from a quality-of-life perspective, but also for recruiting additional economic development prospects.

In our experience, projects have not demanded incentives to come into our communities. In addition, because these types of projects can be more flexible with respect to siting requirements, the developers are often seeking locations where there is existing excess or unused transmission capacity.

These loads have very high-capacity factors, running nearly 24 hours a day, 7 days a week, which is a benefit for load-serving entities. Moreover, while crypto mining requires a lot of electricity, the load can be very flexible. They often seek interruptible rates and can quickly drop loads, which has proven to be helpful during local storm damage related events, and even larger-scale grid events, where either transmission or generation is insufficient to serve load across a regional transmission organization's footprint. NPPD has developed new interruptible rate structures that allow for this demand response that benefits the customer, the utility, and the regional transmission organization.

Again, I appreciate the opportunity to share our experience with you today, and I look forward to any questions you may have.

Senate Committee on Environment and Public Works
Hearing Entitled, "Air, Climate, and Environmental Impacts of Crypto-Asset Mining:
Legislative Hearing on S___, The Crypto-Asset Environmental Transparency Act of 2023"
March 7, 2023
Questions for the Record for Courtney Dentlinger

Chairman Markey:

1. Ms. Dentlinger, in your written testimony, you stated that "In our experience, projects have not demanded incentives to come into our communities." However, in 2020, according to reports¹, the Nebraska Public Power District (NPPD) spent \$12.5 million dollars constructing a substation in the city of Kearney for Compute North, a cryptomining company. Reports also state that Compute North received \$165,000 worth of free land, temporary substations during construction of the new substation, and significant discounts on its electricity.¹

- a. Could you please describe the nature of the deal with Compute North?

Compute North entered into standard transmission extension and service agreements, and qualified for an existing rate offered to any load that qualified. We do not have any special deal with Compute North; but are happy to outline the services offered.

- i. For the transmission upgrades needed to serve the facility's electric load, Compute North NE05, LLC (Compute North) entered into an agreement with NPPD through which Compute North committed that it would meet minimum expected load levels for at least 3 years. In addition, the agreement required Compute North to post security in the amount of \$7 million. The \$7 million security required by the agreement protects NPPD from being left with "stranded assets", or assets that could not readily be used for other customers in our service territory. Such assets were built by NPPD to accommodate the Compute North load and the security was put in place, per agreement of the parties, to compensate NPPD in the event that Compute North never put the facility into operation or did not meet the minimum expected load levels. The security can be reduced, and ultimately, can be returned, if Compute North meets the minimum expected load levels for the 3-year period. If the load does not operate as expected during the 3 years, NPPD may collect on all, or a portion of the security, to compensate NPPD for its investment into the facilities that it constructed. These security agreements are put in place to protect other NPPD customers from cost-shift of costs incurred for infrastructure investments necessary to serve new loads.

¹ https://journalstar.com/business/local/in-search-of-cheap-power-and-land-crypto-companies-look-to-nebraska/article_e507b86d-ee92-5d54-8b30-867d71367ed9.html; <https://revealnews.org/podcast/can-our-climate-survive-bitcoin/>

- ii. For electric service at this facility, NPPD required a billing deposit and implemented a prepay provision with Compute North NE05, LLC. The prepay provision requires Compute North to pay one-half of the estimated “next month” billing invoice during the current monthly billing cycle.
 - iii. It is our understanding that the Economic Development Corporation of Buffalo County conveyed five acres of land to Compute North NE05, LLC in return for a commitment of capital investment, job creation and electrical power usage, with associated sales tax, by the business.
 - iv. It is our understanding that the Economic Development Corporation of Buffalo County approved the use of the local economic development NDO loan program funds by Compute North NE05, LLC.
- b. Did NPPD, or other entities, provide incentives, such as a new substation, free land, and/or discounts on electricity, to the cryptomining company Compute North?
 - i. The new substation was not an incentive, it was a required upgrade needed to serve the load. NPPD studied the proposed new 100 Megawatt load and determined additional transmission capacity was needed to serve this load. This included network upgrades that cost approximately \$4 million, and a new substation that was constructed at a cost of \$12.5 million and is expected to be in service by June of 2023. Based on the size of the load/expected future revenues, and the reliability benefits to other load in this area, no direct funding was required from Compute North. A furnishing of security in the amount of \$7 million was required, as noted above, to ensure the load materialized and operates for at least 3 years. This methodology is used by NPPD in a non-discriminatory manner for all new load in NPPD’s service area as documented in our transmission extension policy
 - ii. NPPD was able to serve this load prior to completion of the new substation by connecting some of the load (approx. 30 MW) to existing substation assets and by placing mobile equipment (transformers and switches/breakers we have mounted on trailers) that NPPD has in its fleet to serve the remaining 70 MW until the new substation was in service.
 - iii. Compute North NE05, LLC qualified for NPPD’s existing Economic Development Rate. This rate recovers NPPD’s costs associated with the generation of electric power and energy to serve the load. Any project meeting outlined criteria qualified for this rate. The rate is further described in response to question 1.c.
- c. Were there any effects to ratepayers (e.g., increased prices) as a result of the deal with Compute North?

- i. Serving Compute North has not increased prices for other customers of NPPD. Serving the new load has accelerated the need for an approximately 9-mile transmission addition, which will enhance reliability for all customers in the Kearney area.
- ii. Compute North qualified for NPPD's Economic Development Rate, which recovers the costs associated with the generation of electric power and energy to serve the load. This rate can be utilized by a qualifying new customer for a maximum of five (5) years. Recovering the incremental costs through the rate insures that existing electric customers are better off financially with the new load than they would be without it. Once the five (5) year eligibility period is completed, the customer transitions to taking service under the applicable standard electric rate. NPPD is currently providing electric service under its economic development rate to a half-dozen commercial and industrial customers, only one of which is a crypto mining company (Compute North).
- d. Compute North declared bankruptcy in 2022, with its assets reportedly sold off to Generate Capital.
 - i. Did Compute North make a binding commit to operating the facility, and if so, for how many years?
 - 1. Compute North NE05, LLC, which owned and operated the Kearney facility, was not a party in the above referenced bankruptcy. However, Compute North NE05, LLC did transfer ownership of the Kearney facility to Generate Capital. NPPD is not privy to the details of that transaction. But, as noted above for the transmission upgrades, Compute North NE05, LLC signed an agreement with NPPD that required them to post security in the amount of \$7 million dollars that is returned only if they meet minimum required load levels over a 3-year period. That agreement, with all of its obligations, was assigned to Generate Capital in conjunction with the sale of the Kearney facility.
 - ii. Has Generate Capital assumed this commitment?
 - 1. Yes, Generate Capital has taken ownership of all existing agreements that were in place for the Compute North NE05, LLC facility.
- e. Has NPPD offered incentives to any other cryptomining company operating in Nebraska? If so, please describe.
 - i. A 35 MW cryptomining operation planned for the Minden, Nebraska area would also qualify for the Economic Development Rate. Related transmission investments would also be subject to the provisions of NPPD's Transmission Extension Policy, including any required security.

This is a planned facility to be owned by Compute North Minden, LLC or its successor.

- f. Has NPPD made any changes to the way it engages with cryptomining companies as a result of the Compute North bankruptcy? If so, please describe.

No, NPPD has not made any changes to the way it engages at this time.

- 2. What is the total power demand of all current cryptomining facilities in Nebraska?

- a. NPPD has 100 MW of cryptomining load at this time.
- b. NPPD provides service in all or part of 84 of the State's 93 counties. NPPD does not serve the entire State of Nebraska, does not have data for other Nebraska utilities, and is therefore unable to answer this question.

- 3. What is the total power demand of all planned cryptomining facilities in Nebraska?

- a. As stated above, NPPD does not have information for other utilities in the State of Nebraska. However, NPPD anticipates another 35 MW of crypto load on its system to come online in 2023-2024. NPPD does have one other prospect, that would be up to a 70 MW load, that is currently considering signing an agreement that would require them to post security and guarantee its load for at least 2 years. That load would not be fully served until upgrades are completed in year 2026.

- 4. In 2021, Nebraska Public Power District set a goal of achieving net-zero carbon emissions by 2050. How does the increased energy demand of cryptomining facilities in Nebraska affect the 2050 net-zero goal?

It has had no negative impact on NPPD's net-zero goal. NPPD is in the process of creating its Integrated Resource Plan. We are anticipating significant load growth, largely due to potential hydrogen-related facilities, with limited additional cryptomining loads. This load growth will accelerate our timelines for adding additional generation. Any generation we add would be lower carbon-emitting resources, in line with our goal to reach net-zero carbon by 2050.

Senator MARKEY. Thank you so much.

Now we will turn to a round of questions from the Senators. As we work to decarbonize our economy, we have to demystify electricity guzzling industries like Bitcoin mining. Bitcoin has an outsized effect on our grid and on our climate. Why is that? Well, because Bitcoin mining is inherently energy inefficient. The more demand there is for Bitcoin, the more work it takes to generate new Bitcoin.

I operated an ice cream truck to pay my way through college. So it is like saying that if my truck got worse gas mileage, it would be because each new ice cream which I sold reduced the energy efficiency of the truck.

Mr. Altenburg, is it true that Bitcoin's proof-of-work mining mechanism is set up to require more energy to earn each new Bitcoin as more miners come into the market?

Mr. ALTENBURG. Yes, it does. That occurs in two different ways. One is the Bitcoin race, the difficulty level of mining a new block gets harder the more miners mine. That is on the short time scale. We also have the issue on a longer-time scale where every approximately 4 years, the amount of Bitcoin that you get from mining is cut in half.

Senator MARKEY. So Bitcoin mining is like a fuel economy regulation in reverse. As time goes on and computers get faster, the network automatically adjusts to make sure more energy gets used. Mr. Altenburg, even if we improve the energy efficiency of crypto mining computers, would that lead to lower energy usage?

Mr. ALTENBURG. Bitcoin mining is inherently wasteful by design. The miners already have incentive to make the mining hardware as efficient as they possibly can, because of the enormous amount of energy they have to use. The problem is, as efficient as they can possibly be, they are not efficient enough. They are always going to increase the energy demand.

Senator MARKEY. So Bitcoin uses as much electricity as we need to power every light in every home in the United States on a daily basis. Globally, if Bitcoin mining was a country, it would be in the top 30 countries based on energy use worldwide above countries like Norway and Sweden.

Mr. Altenburg, Bitcoin supporters predict that the Bitcoin price will increase dramatically in the coming years. Does that mean that the electricity demand from Bitcoin mining will also increase?

Mr. ALTENBURG. As more miners enter the fray, enter the mining competition, we do see an increase, we have seen that. When Bitcoin was worth \$60,000 a Bitcoin, we had more active mining than we do at today's prices.

Yes, it is going to continually get more difficult to mine Bitcoin and the amount Bitcoin miners are going to be rewarded with is going to continue to get less and less. This system will continue to spiral at an exponential rate, using more and more energy.

Senator MARKEY. Thank you.

Dr. Kelles, was uncontrolled energy use a factor of concern in your assessment of Bitcoin mining in New York State?

Ms. KELLES. Yes, absolutely. Particularly given the impact on one, our climate goals, and two, our energy grid. We have very aggressive climate goals. The concern was that amount of

cryptocurrency mining that was growing rapidly in New York State would actually derail our ability to reach our climate goals.

Particularly, the more renewable energy infrastructure we put in place, if we divert that to the cryptocurrency mining, there is a profound opportunity cost that that exactly same renewable energy infrastructure would not be available then for all of the existing building infrastructure and transportation infrastructure, which are two of the biggest contributors to greenhouse gas emissions that we want to get on onto the electric grid.

Senator MARKEY. Thank you, Dr. Kelles, very much.

At this juncture, there is a roll call on the floor of the Senate right now, and I will leave it up to Senator Ricketts, my thought would be that I would hand the gavel over to him, I am going to run over and make the roll call and try to get back here. It will be a relay race; then he can run over and make the roll call as well. Let me turn it over to Senator Ricketts.

Senator RICKETTS.

[Presiding.] Thank you, Chairman.

Ms. Dentlinger, we were talking a little bit earlier, and you have first-hand knowledge of the economic development that we are talking about, the jobs that are created, the investment, the tax revenues and so forth that we get from investments in our State. Nebraska Public Power is no stranger to the crypto industry. What benefits in terms of economic development have you seen from new businesses in the crypto energy who are locating to Nebraska? Can you expand upon some of the things you were talking about before, please?

Ms. DENTLINGER. Thank you, Senator. Absolutely. We have actually seen significant benefits from this industry to date, mostly farm tax revenues and then job creation. Again, those are very good-paying jobs, particularly in rural areas of Nebraska. The tax revenues for the State and local political subdivisions, we have seen just for one crypto mining facility in Nebraska \$1.6 million in State sales tax over a 12-month period. During that same time-frame, \$3.8 million for the local taxing authorities.

That enables infrastructure investments in the host communities. In fact, due to those increased tax revenues, that Nebraska community has been able to make significant enhancements to its regional municipal airport, to attract commercial air service to the community, which is important not only from a quality of life perspective for the residents there, but also for recruiting additional economic development prospects to the area.

Senator RICKETTS. Is it also fair to say that it also helps to keep property taxes down?

Ms. DENTLINGER. Absolutely. That is certainly a concern in the State of Nebraska. Those sales tax revenues help every resident at the State on their property tax bill.

Senator RICKETTS. Are you hearing from companies that want to locate their crypto industry in the State of Nebraska, who have expressed an interest in moving?

Ms. DENTLINGER. We certainly are. There is a great deal of interest, due in large part, as you mentioned, to the low rates that we have, but also to the rate designs that we have put in place. Our customers, both rural public power districts and municipalities, are

eager to host these opportunities, again, because of the tax benefits and the good-paying jobs that they bring.

Nebraska is also rather unique because we have historically had additional capacity available. We are the Country's largest irrigator, thanks to the Ogallala Aquifer. Many irrigation wells have been converted to electric from diesel, because the load, while large, is seasonal. Two to 3 months out of the year, during the summer, those irrigation wells demand a lot of electricity. The remainder of the year, we have additional capacity to spare.

Senator RICKETS. Great. One of the things that has been mentioned here today is the impact of these facilities on emissions, the crypto assets mining businesses are responsible for increasing fossil fuel use and driving up greenhouse gas emissions. Ms. Dentlinger, my understanding is that Nebraska Public Power District is leading the way in the development and deployment of new clean energy technology, such as supporting a regional hydrogen hub, you mentioned that in your opening remarks, and supporting deployment of carbon capture technology, which you also mentioned.

Can you tell us a little bit more about the role new industries play in supporting clean energy technology and adoption in Nebraska?

Ms. DENTLINGER. Yes. Load growth creates opportunities. As you mentioned, we are exploring a number of those currently. We are in the process of developing our integrated resource plan. New load means an opportunity for additional generation resources and clean energy technologies would be part of those additions. In fact, any new generation resources we deploy would have a lower carbon footprint.

Loads with higher load factors, such as crypto mining, which means they are utilizing electricity at steady rates rather than ramping up and down, can produce more constant revenue streams, which in turn can help finance those clean energy technology deployments.

Senator RICKETS. To kind of just typify this a little bit for me, is it fair to say that if you and your community have a crypto currency or crypto asset generating facility that is creating more demand for electricity, and because of the scales of utility generation, you can actually help reduce the utility bills for other customers? Is that fair?

Ms. DENTLINGER. We work very hard to make sure that we are not shifting costs among various types of customer classes. We certainly are not subsidizing crypto. Those mining operations again are so stable in the usage of electricity it actually helps systemically for those costs that we do socialize to bring the costs down for every user.

Senator RICKETS. Yes, so because you have to give that consistent demand, you can keep it relatively, other people's rates, relatively lower, is that fair?

Ms. DENTLINGER. Yes. Consistent usage, 24-7, can actually be the most efficient use of electric infrastructure.

Senator RICKETS. All right, great. Thank you.

Mr. CARPER.

Senator CARPER. Mr. Chairman. Been in the Senate less than 3 months, he is already chairing committees.

[Laughter.]

Senator CARPER. Thank you for letting me work into the lineup.

I want to start off by thanking Senator Markey, our Chair, for today's hearing on his legislation that seeks to shine a light on the impacts of cryptocurrency on our environment. I held the first oversight hearing in Congress on cryptocurrency almost 10 years ago on November 18th, 2013, when I was privileged to be Chairman of the Homeland Security and Governmental Affairs Committee. Today, we are here having the first hearing in the Senate that is focused on the environmental impacts of cryptocurrency.

Regardless of what they believe about the role of cryptocurrency in the global economy, I hope we can all agree that cryptocurrency should not be increasing pollution that affects the air we breathe and the water we drink, or that otherwise degrades our climate and our environment.

Today we know that some cryptocurrencies require a massive amount of energy to power and control the temperature literally of thousands of computers, which run, I am told, all day and all night. I am told that cryptocurrency currently uses up to 1.4 percent of our Nation's electricity, 1.4 percent of our Nation's electricity. That is as much electricity as is needed to light every home in this Country.

When I first saw that, I had to read it twice. That is as much electricity as is needed to light every home in this Country.

As many industries are looking to reduce their energy usage, we have heard today that cryptocurrency electricity usage is surging as the need for additional computing power grows. We have also heard today that there is a lack of data on where and how this power is being generated.

I am going to start with a question for Mr. Altenburg. First of you, then Ms. Kelles. Are there ways for cryptocurrency to have fewer environmental impacts and still allow communities to benefit from the economic engine that it can provide?

Mr. ALTENBURG. Certainly, Senator. Our main concern is about proof-of-work cryptocurrency, which is the system that Bitcoin uses. This system is wasteful by design. Part of the mechanism for generating new Bitcoin requires using enormous amounts of energy.

The No. 2 cryptocurrency by market cap in the Nation right now, Ethereum, uses just a tiny, tiny fraction of that. There are literally dozens of competing technologies that can accomplish everything Bitcoin can do and more, without using that enormous amount of electricity.

Senator CARPER. Say again the approach that uses so much less electricity? Say it again.

Mr. ALTENBURG. Could you repeat the question?

Senator CARPER. Yes. You just said that there was an alternative that uses a lot less electricity to create. What was it?

Mr. ALTENBURG. Ethereum is a competing cryptocurrency. It uses a system call proof-of-stake. That is a class of systems that can reduce energy while still maintaining blockchain technology and cryptocurrency.

Senator CARPER. Thank you.

If I could, Ms. Kelles, same question. Are there ways for cryptocurrency to have fewer environmental impacts and still not reduce the benefit from the economic engine that it can provide?

Ms. KELLES. Absolutely. I wanted to note with respect to Bitcoin first, Bitcoin is one of the most consolidated cryptocurrencies on the planet. Point zero one of the accounts own about 27 percent of the currency. To say that this is a currency accessible to all people is misinformation.

What was previously mentioned, proof-of-stake, is another form of validating. There are about 16 different kinds of validations of cryptocurrencies. Proof-of-stake is the second most common. That is what Ethereum is built on. Ethereum also proved that you can convert, you can change from proof-of-work to proof-of-stake, sort of in the middle of flying the plane, when the blockchain is already active.

It is possible for ones who are using proof-of-work to shift over and reduce their total energy consumption by over 99 percent.

The thing that is also really important is that proof-of-stake is in many ways more nimble. It is really the validation system where a lot of smart contracts are used, where there is a lot of the innovations and decentralized finance Web3 systems. I would actually say that proof-of-stake is where we can see a lot of, expect a lot of the innovation to happen, and not on more dinosaur proof-of-work based validation methods.

Senator CARPER. Thanks very much for that.

I am going to come back to you, Mr. Altenburg. What types of data or further research is needed to better understand to monitor and to mitigate the energy and climate impacts of cryptocurrencies?

Mr. ALTENBURG. Thank you, Senator. One of the big problems we are seeing right now, particularly in Pennsylvania, is a lack of knowledge. We have asked even regulators where all the crypto mines are, and they really can not say with any degree of certainty. We have had a situation that happened in January 2021, where inspectors from the State's department of environmental protection showed up at a fracked gas well and found Bitcoin mining hardware plugged in. Nobody applied for permits, nobody notified anybody. These operations can just startup overnight.

That is why the reporting requirement of the Crypto-Asset Transparency Act is particularly important, so we will have some ability to see where these facilities come into communities. Sometimes when they come into the communities, they say they are a data center, they do not even mention crypto mining. Even the community has no idea what is going on next door.

Senator CARPER. I am a United States Senator, but I have been a recovering Governor for 22 years. As a former Governor, I love to learn what works well at the State level and do more of what works well, find out what works and do more of that. States and Governors are pretty good at that when it comes to addressing difficult problems.

What are some of the lessons learned from your experiences addressing pollution from cryptocurrencies in New York that may not have been mentioned yet in this hearing?

Ms. KELLES. I would elaborate on one, two that have been mentioned but have not really been extensively discussed, which is, one, the impact on water quality. We have a facility that started the conversation here, and I mentioned it in my testimony, Greenidge. They pull up to 140 million gallons of water a day from a lake and use that to cool the facility, then release it back into a Class C trout stream. Trout show signs of stress and start to die out at over 70 degrees temperature, and the water released is up to 108 degrees temperature.

It is seriously affecting the ecosystem, and also affecting all the livelihoods around that area, including fishing, hunting, the agrotourism industry, as I mentioned, which we have the Napa Valley of the east. The wine industry here is really important. Not only does the facility affect the water quality, but it also affects the experience because of profound noise pollution.

The other thing we have not talked about as much, and I think it is really important, is the opportunity cost of investing significantly in cryptocurrency mining operations. We have huge amounts of greenhouse gases as a State, as I said earlier, from our buildings, and from our transportation and other aspects of our industry, of our State economy. It is going to be a significant challenge to get all those onto electrification. The more cryptocurrency mining we have in the State that is feeding directly off the grid, the harder it will be to get all of those onto the grid because of the strain we experience.

I will say one last thing, which is, I hear often from the proponents that cryptocurrency mining can act as a battery. That is simply not true. It does not produce any energy, it does not store any excess energy. It can shut off when there is high demand, but in most cases that I have read of, in fact it actually has a contract, like in Texas, where it gets paid to shut off. In fact, Texas makes, in some cases, cases that I have read, more money when they shut off than when they do run their facility.

I would not say that that is a cost-free battery storage system in place. It is an opportunity cost, and we really should be focusing on investing in the renewable energy infrastructure and long-term storage to create a long-term renewable energy infrastructure for our State.

Senator CARPER. Thank you very much. Mr. Chairman, let me say thank you for bringing this together, and bringing our witnesses to consider this issue. Frankly, it is not something as we are going through the battle, the fight on climate change and crafting legislation, whether it is the climate provisions in the Bipartisan Infrastructure Bill, whether it is the work we did in the Inflation Reduction Act, it's not something that I think many of us have thought about. Thank you for bringing it to us. Thanks to our witnesses for joining us today.

Senator MARKEY.

[Presiding.] Thank you, Mr. Chairman, very much.

A lot of this just fits into the frame of energy efficiency. My mother would always say, your father and I are going to donate your brain to Harvard Medical School as a completely unused human organ. She would say, you have to learn how to work

smarter and not harder. I would be 10, 11, 12, she would just keep saying the same thing.

When I authored the appliance efficiency laws in 1987, for example, the air conditioning is 80 percent of peak demand in Texas in the summer. If they doubled the efficiency, it would be half the electricity that people would have to purchase. They fought it, but once the law passed, they did it. The same thing was true for refrigerators, for stoves. They figured it out.

Same thing was true for automobiles. I used to make the amendment every year on the House floor to increase economy. The auto industry said, you just do not know how hard it is. We finally, in 2007, we passed my bill. Then Elon Musk just went to the markets and said, hey, I will be able to meet the standard. Give me money for all-electric vehicles.

That is what we are talking about here. We are just talking about, in my mother's words, working smarter and not harder and getting the same results.

Senator CARPER. Could I just say, I think our parents were talking with each other, even back then.

Senator MARKEY. You know, a correct assessment of our untapped human potential, I agree with you. I am sure it is a miracle that we are here from their perspective, given our attitudes at age 10.

[Laughter.]

Senator MARKEY. The Bitcoin network uses a mechanism called proof-of-work to issue new Bitcoins to miners. The problem is in the name itself, you need to prove you have done a lot of work and used a lot of energy in order to get awarded any Bitcoin. We can not be fooled into thinking that this amount of energy must be used in order to participate in crypto-asset markets. Other assets, like Ethereum, use methods that cut energy use by 99.9 percent.

Mr. Altenburg, could Bitcoin change its code to save substantial amounts of energy?

Mr. ALTENBURG. Ethereum certainly did that, switch from proof-of-work to proof-of-stake. Whether or not Bitcoin itself can arrange to do that, that would remain to be seen. It is certainly possible.

Senator MARKEY. It is possible. If it is possible, and it is more energy efficient, and it gets the same result, they could move in that direction and still achieve their economic goals.

This is not an issue that is built into blockchains. It is an issue that has been into Bitcoin, which is the difference. It all depends upon how that company or industry approaches the issue of energy efficiency. All power plants are held to the same emissions standards; all trucks are held to the same emissions standards. Crypto assets do not have those across-the-board standards. Some like Bitcoin get away with damage that the others would never dream of.

That has to be the goal, because we know that Bitcoin mining will also increase if they have more energy efficiency standards which they use. In our opinion, does a higher Bitcoin price mean more incentive for Bitcoin miners to use more energy? You do agree with that?

Mr. ALTENBURG. We have seen that in practice.

Senator MARKEY. You have seen that in practice. We just have to recognize that, and then take the analogous situation with refrigerators, stoves, air conditioning, automobiles, and just say that we are not looking to end refrigeration or automotive technology, we are just saying that we should be more efficient, we should be more aware of the emissions into our atmosphere that are avoidable.

On the one hand, this is a very innovative sector economically. They tout themselves as innovators. All we are asking for them to do is look across the board at innovation, not just that one idea, but embracing innovation and energy efficiency, innovation in the technologies which they use in order to generate their innovation.

That is why this hearing is so important, so that we can have a meeting of the minds over mining, so that we benefit from all of the lessons we have learned over the last 30 years that people thought were absolutely impossible to implement.

I thank you all again for the information. Let me turn again to Senator Ricketts.

Senator RICKETTS. Thank you, Mr. Chairman.

Mr. Altenburg, you had mentioned a couple of things that you said were problems with Bitcoin generation or I think you were talking about Bitcoin in particular. You mentioned they were talking about bringing online three waste coal plants in Pennsylvania, is that right? Again, I am from Nebraska, I am not from Pennsylvania, I do not know all the rules.

Wouldn't each of those plants have to be permitted to be able to go into operation? To get those permits, wouldn't they have to comply with the overall emissions targets for the State of Pennsylvania?

Mr. ALTENBURG. There are two waste coal plants that are in operation. They were existing waste coal plants that were in operation and they were operating at very, very low-capacity factors. All these plants are heavily subsidized. Pennsylvanians pay 60 percent of the energy cost for the Bitcoin miners of these plants through subsidies from taxpayers and ratepayers.

Yes, they do, the plants do meet their current permits, but they are increasing their emissions because of Bitcoin mining.

Senator RICKETTS. Is there a real limit on what they would be able to generate as far as power because they are generating more emissions? Or do they have some sort of grandfather clause that allows them to just continue to generate?

Mr. ALTENBURG. The State established permit limits for them based on the fact they are 90-megawatt plants each. They were operating, again, at much lower capacity. They weren't operating anywhere near that before Bitcoin mining started. Now they have ramped up their capacity.

Where they are, we believe operating under their permit limits, they are still emitting a lot more than they were just a few years ago.

Senator RICKETTS. Okay. You also mentioned something about Bitcoin operators plugging into fracking gas wells, and that was illegal, is that my understanding? There are laws against them doing that? Is that right? Without getting a permit, that is.

Mr. ALTENBURG. They plugged it in without a permit. The Department of Environmental Protection issued a notice of violation in that case. I believe there is still litigation in process over that.

Senator RICKETTS. Essentially what you are saying is, it was illegal for them to do that in the first place, so they were breaking the laws anyway, right? Is that accurate?

Mr. ALTENBURG. I believe they were. That has not been determined.

Senator RICKETTS. Not been proved yet. Okay. You also mentioned the noise pollution as well. Help me again with Pennsylvania. Are there rules or permits? do not you have to get a permit or something with regard to noise or generation for facilities?

Mr. ALTENBURG. Noise pollution is generally handled by local municipalities. It has traditionally been handled as a local nuisance issue. One of the recent fracked gas wells that is going into operation, Bitcoin, is in the location of the State called the Pennsylvania Wilds, which is some of our most pristine habitat. Frankly, there are not a lot of neighbors in that area to file noise pollution complaints. What we have is a considerable amount of wildlife that the tourism industry depends on. This noise pollution could directly impact the tourist industry. There really is not a strong regulatory mechanism.

Senator RICKETTS. There would be a local entity, maybe a county or something like that, who could put limits on how much noise you could generate, is that accurate? There is some form of local government there to put in those.

Mr. ALTENBURG. There is local government. I do not know the extent of their authority toward noise pollution.

Senator RICKETTS. Okay. Dr. Kelles, I think you also mentioned that noise pollution was one of the things, I think you described it as a jet engine, is that right?

Ms. KELLES. Correct.

Senator RICKETTS. Same question to you, is not the local entities, like a county or a city that would put in ordinances or whatever to say, hey, you can only have so much noise allowed?

Ms. KELLES. Yes, and there actually has been some effort like my colleague mentioned. There are limits on how much they can prevent and permit. There have been, there is at least one example of a moratorium on cryptocurrency mining because of issues of noise and all the safety issues, health and safety issues. It was a temporary one. They were able to do a temporary one there, yes.

Senator RICKETTS. Ms. Dentlinger, we are running out of time here, so I will ask you to be brief. In your experience, NPPD, I know that some counties in Nebraska have ordinances with regard to say, wind setbacks for noise, and so forth. Is that your experience in Nebraska as well?

Ms. DENTLINGER. Yes, I speak from my previous economic development experience. Typically we would see zoning regulations both within municipalities and then within counties. If they wanted to regulate decibels levels from any industry, as you mentioned, we have seen that recently with wind, they put those regulations in place.

Senator RICKETTS. Great. Thank you.

Senator MARKEY. As I said in my opening remarks, this virtual commodity has real-world impact. We do not know the total scope of the environmental effects of crypto mining. The White House Office of Science and Technology has specifically called for more information but they do not have the authority to call for it, which is the why the Crypto-Asset Environmental Transparency Act is so important.

Mr. Altenburg, do you agree that this legislation would provide more transparency and disclosure which could help us to oversee and understand the environmental impacts of crypto mining? It is almost alone in the entire American economy, kind of sealed off from the knowledge, the information everyone should have about the environmental impacts of the industry.

Mr. ALTENBURG. In Pennsylvania, we have an environmental rights amendment to our constitution that guarantees the public, actually the ownership of their public natural resources. One of the big things we are seeing with cryptocurrency and the lack of transparency is the public does not know where these facilities are coming in, they do not know where they are using the power. They do not know where the power is being used, they do not know where the pollution is.

As long as we have that, the State is not in a position where they are going to be able to effectively regulate these facilities.

Senator MARKEY. When I was growing up in Ward 2 in Malden, Malden is a city about four miles north of Boston, my grandfather got off the boat from Ireland, worked on the Malden River, and I grew up three blocks from there. My mother, when I was about 10, again, much more intelligent than I am, she would say, Eddie, whatever you do, do not swim in the Malden River. It was kind of black with a pre-Jimi Hendrix purple haze over it.

[Laughter.]

Senator MARKEY. All the industries used the Malden River as a dumping ground, the coal industry, every Converse All-Star was made in my home ward, 8,000 people just using the Malden River. It was obviously an era where there really weren't a lot of regulations. There was kind of a black cloud over our neighborhood growing up.

On the other side of town, they didn't have a black cloud, where other people lived. In my home ward, it was kind of the working-class ward. Every city has a ward like that.

My goal here is just to provide transparency, the disclosure that could help us to see and understand environmental impacts of crypto mining. Dr. Kelles, is that an unreasonable thing to ask, that people just understand what the impacts are?

Ms. KELLES. Absolutely not an unreasonable thing to ask. We can not improve our environment if we do not know how it is being used and we do not know what is happening around us. A perfect example is, we are now aware of the coal piles that were being used for providing energy, the coal piles that are left over and sitting on the road bank edges in Pennsylvania.

Now because of the fact that that made it into the news, otherwise we would not have known, we are having an honest conversation about it. The proponents would say, it is better to burn it than

let it sit there and have the pollutants like the mercury leak into the waterways.

I would ask in that conversation, which is better, that it pollutes the water or pollutes the air? If we do not have transparency, we do not have disclosure, we can not have an honest conversation about that. Neither one of those pollutions are what we are looking for. Of course, burning it, then we end up with the ash. That is another pollutant.

It is a great analogy, just like with coffee, running water over coffee grounds like the ash, we just farm more coffee, or in this case mercury, out than if you ran water over whole coffee beans, which is the actual unburned coal. Which one is worse?

Again, we can have that honest conversation but we can not, if do not have the disclosure and we do not have the transparency.

Senator MARKEY. Again, you make the case for more transparency because you can not manage what you do not measure. Unfortunately, we do know that harms are being felt now by families across the Country. I have received testimony from 12 States, from Georgia to Washington State, about the damage that crypto mining is already doing in their communities. I would ask unanimous consent that this testimony be included in the record.

Without objection, so ordered.

[The referenced information follows:]

Dear Senator Markey,

I live in Adel Ga where a Crypto company Blockstream moved in next door to our neighbor hood. They built to close to us and the last 4 yrs have been stressful has affected our hearing and overall health. We have lived here 30 yrs and we purchased this property to live out our golden years as we are 75 and 83 yrs old but can't enjoy our home with the excessive noise the site emits. They turned the units off Sept 1st of 2022 due to they could not pay their electric bill. It has been a different world since then , but in April 2023 they are possibly going to turn back on. The decibel count has been in the 40"s since they have been off when they are on it runs as high as 70 +. I pray each day that they do not turn back on. we spent over 7,000 dollars to insulate our home and extra windows but it did not help any. This is the worst company that has ever come to our community, we have not received much help or support from some of our City officials . Thank you for standing up for what is right . I don't understand about the how they do business, i appreciate you for standing in the gap and fighting along with us.

Thank you
Annette Tiveron



Dr. Treva Gear
41 Antler Ln
Valdosta, GA 31602

March 5, 2023

The Honorable Senator Edward J. Markey
Chair
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts
Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts,

Concerned Citizens of Cook County (4C) appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act. We are a non-profit community organization based in Adel, Georgia that is focused on environmental justice, social justice, civic engagement, and community improvement. Our organization began in June 2020 and much of our work has been focused on protecting our community from polluting and extractive industries. Adel is an environmental justice community (EJ) with a population of 5,500+ and a poverty level of 23%. The poorest citizens in our community are suffering from the highest electrical bills.

A crypto facility, Blockstream, was operating in our city from 2019 until September 2022 when operations were [temporarily ceased due to the cost of electricity rising above 14 cents per kilowatt](#). Blockstream was purchasing energy from the City of Adel at the rate of 270-300 megawatts of energy which is over 10 times the energy used by the entire city of Adel (24 megawatts). Adel is a member of the [Municipal Electric Authority of Georgia \(MEAG\)](#) which uses a combination of nuclear, coal, gas, hydro, and solar to provide energy to its 49 members in Georgia. The City of Adel had to partner with six other MEAG cities in order to provide energy to Blockstream because they did not have enough excess energy to serve them.

We, Concerned Citizens of Cook County, support Senator Markey's Crypto-Asset Environmental Transparency Act because we are tired of the disruption of peace of our residents as a result of the 60+ decibels of noise coming from the storage containers housing the servers. The bitcoin mining operation was placed directly adjacent to a longstanding community and directly beside the property and home of an elderly couple, Ron and Annette Tiveron. Despite their early



concerns about noise when only 3-5 containers in 2019, the operation expanded to over 30 containers with noise 24 hours/day and seven days per week. They had to double insulate their home and add an extra set of windows to stop the noise inside. The Tiverons were no longer able to enjoy sitting on their porch, fishing in their ponds, or doing work outside. Dealing with the noise all of these years has negatively affected their health and caused emotional and mental distress.

Furthermore, the Tiverons were not the only residents impacted, but were the closest to it. Eden Ark animal sanctuary adjacent to the property of Blockstream also complained of noise disturbances and changes in animal behavior due to the noise. Both the Tiverons and Eden Ark reported seeing less deer and other wildlife on or near their properties since Blockstream opened in 2019.

Despite noise complaints being made by our community to the City of Adel and the Adel Industrial Authority, nothing was ever done to abate the noise. The city was making so much money off of the energy being sold to Blockstream that they ignored community complaints. The City of Adel told business owners that the cost of electricity would go down for them once Blockstream started operations, but this did not happen. In the meantime, the most impoverished members of our city have been overburdened by high electricity bills prior to and during Blockstream's operation.

In the state of Georgia, the cryptomining industry is unregulated and is consistently seeking communities like ours in Adel, Georgia. Blockstream has used over 10 times the energy of our city, robbed our citizens of peace, used up our natural resources, and has not provided jobs to our residents. The operation can be run remotely, only employs a couple of guards, and has not served as an economic opportunity for job-seekers. Blockstream has not served as an economic opportunity for us, but has been nothing more than a burden on our peace and natural resources; a liability. We hope that Blockstream does not re-open but we need permanent protection from it and other cryptomining industries.

We, Concerned Citizens of Cook County, appreciate your consideration of these comments. We need federal action to address all of the impacts EJ communities like ours are facing, and Senator Markey's Crypto-Asset Environmental Transparency Act is an important beginning in this process.

Sincerely,

Dr. Treva Gear
Concerned Citizens of Cook County, Chair

TO: The Honorable Senator Edward J. Markey, Chair Clean Air, Climate, and Nuclear Safety subcommittee; The Honorable Senator Pete Ricketts, Ranking Member, Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts:

I appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act.

My husband and I just heard about a proposed crypto center in McLouth about six weeks ago and were stunned to learn more about this unhealthy, destructive business and the effects it has on the environment. We are retired in Lakewood Hills, next to Lake Perry and love the beauty of nature here and the quiet. This could all be ruined if these types of projects are approved and unregulated. The following information is from a list of information provided by Edith Williams, founder of Keep JeffCo Rural Facebook group, of which we are members. The group which is opposed to this and any future development such as this in our rural county currently has over 800 members.

The Crypto Mine called itself a "Data Center." It was being built without a permit, and was located only 0.3 miles from the edge of the town of McLouth, KS.

If it were built as planned, it would have 8-15 generators that would produce more power than that used by the power plant in nearby Lawrence, KS, a city of over 95,000 people.

The mine would use "sour" gas that would increase sulfur dioxide pollutants in the air.

It is possible that this air pollution could affect people's respiratory health.

It could also cause acid rain, affecting cropland in the area.

The extreme noise would affect livestock production and wildlife.

Water usage could affect the local water supply.

Water pollution issues were not addressed by the company.

It is likely that property values would fall across the County.

The company does not seem to be aware of, or observant of, local and state regulations.

The company claimed that they would create "renewable" energy on the site, but did not explain how.

The company has not been forthright with the community and does not appear to be financially stable.

The company has made unrealistic promises about jobs, and has recently increased the promised number of jobs from 35 to 50. They do not respond when asked if these jobs would be temporary or permanent, local or remote.

There was a serious fire at the site on December 10, 2022, which required six rural fire departments to extinguish. The cause of the fire was undetermined, but it was very likely caused by worker error.

Cryptomining is dangerous to communities, farmland, ranches, and the climate.

Jefferson County came together very quickly to oppose this facility.

The County enacted a 12-month Moratorium on Cryptomining on February 27, 2023.

Residents continue to seek local and State regulations to limit this destructive industry.

We believe Federal regulation is also needed and we appreciate your consideration of these comments.

Sincerely,

Bud and Maura Dingman

8725 Lakeshore Dr

Ozawkie, KS

785-640-9172

Eric and Caryn Vaught
18688 106th Street
McLouth, KS 66054

The Honorable Senator Edward J. Markey, Chair
Clean Air, Climate, and Nuclear Safety subcommittee
The Honorable Senator Pete Ricketts, Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts,

Eric and Caryn Vaught appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act. We are members of the McLouth, Kansas community where a crypto facility is threatening/looming. We support Senator Markey's Crypto-Asset Environmental Transparency Act.

As community members of McLouth, we are writing to express great concern about the requested proposal by Crypto Colo Center Corporation to develop a commercial data center (crypto mining) less than a mile from the town of McLouth, along the east side of K-92 Hwy. This change of property use will create noise pollution, impact many natural resources along with livestock and wildlife and most of all energy consumption.

The proposed location of the crypto mine, 8974 North Hwy. 92, McLouth, Kansas, is very close to not only the town of McLouth, but to many rural community members. Sound travels in waves and tends to travel farthest in open landscapes. With current operational crypto mines, the noise levels read from 55-85 decibels, depending on the weather, but most importantly, the noise never stops. The thought of sitting outside and enjoying a family dinner is disturbing.

Human-caused noise will have consequences on wildlife and livestock. It will reduce the ability for them to hear natural sounds, which will mean the difference between life and death for many animals. In general, a growing number of studies indicate that animals, like humans, are stressed by noisy environments (Shannon et al.2015).

This location is claiming to power by natural gas that is produced on site. With oil wells on the location, they will be using the flared gas from the oil wells to generate the electricity. Gas flaring puts a chemical called benzene into the air, which can give people who live nearby headaches, tremors and irregular heartbeats. Benzene can also cause cancer.

The method of energy will cause more fires in this area. The town of McLouth does not have regular/career firefighters. Volunteer firefighters lack the practical experience when it comes to working on a scene and are thus limited to roles that they can serve when required to be in action.

In closing, we are also very concerned about property values if this were to come to fruition. The town of McLouth and area citizens deserve a better way of life than a daily constant roar of noise. As a community member yourself, we don't believe you would want this operation as your neighbor.

We would appreciate your consideration of these comments. We need federal action to address all of the impacts communities like ours and our country is facing, and Senator Markey's Crypto-Asset Environmental Transparency Act is an important beginning in this process.

Sincerely,
Eric and Caryn Vaught

Dr. Daniel L. Lau, 774 Bravington Way, Lexington KY, 40503, drhalfone@gmail.com

The Honorable Senator Edward J. Markey
Chair
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts
Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts,

I appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act. I live in Lexington Ky, a state that has opened its arms to crypto-mining facilities through taxpayer funded incentives. Because of these incentives, I have joined the National Coalition Against Cryptomining.

I support Senator Markey's Crypto-Asset Environmental Transparency Act because as a fully tenured Professor of Electrical and Computer Engineering, I am fully aware of the enormous electricity demands of this insidious and self-serving practice. As I'm sure you know, these miners are selling the dream of high paying, highly skilled jobs while offering little tangible benefit to the communities they reside and are, in fact, penalizing these communities by increasing the local electricity rates. To demonstrate my point, I would direct your attention to Toyota Manufacturing's local plant in neighboring Georgetown, Ky, a facility that employs over 7,000 Kentuckians while assembling up to 550,000 cars per year. This facility consumes, on average, 50 MW of electricity while paying over \$500M in employee salaries. At the same time, we know from public statements by Riot Blockchain that their Navarro County facility in Texas consumes 1,000 MW of electricity while employing less than 700 people, likely paying less than \$40M in salaries. To truly appreciate how small that number is, one only has to extrapolate from Toyota Manufacturing that if they expanded their 50 MW facility to consume 1,000 MW, they would employ over 149,000 people with salaries exceeding \$10B per year.

Please when considering future bitcoin mining regulation, also keep in mind its impact on the future of carbon free electricity production. As I'm sure you are well aware, Georgia Power is completing work on Vogtle Units 3 and 4, the first new nuclear reactors to be built and commissioned in the United States in over 30 years. Combined, these two reactors have cost over \$30B and bankrupted Westinghouse, and when they do go online, they will produce 2,400 MW of carbon free electricity; however by the time they go online, bitcoin mining is likely to be consuming over 2,000 MW of electricity from Georgia's power grid while continuing to grow unabated. Perhaps in a year or two, depending on the price of bitcoin, all 2,400 MW of Vogtle 3

and 4 will be consumed by bitcoin mining, meaning not one kilowatt hour of fossil fuel produced electricity will be retired from Georgia's grid in spite of this \$30B investment. It's unconscionable that taxpayers, such as myself, are so flagrantly being fleeced to pay for the expansion of our power grids to the exclusive benefit of bitcoin miners.

I appreciate your consideration of these comments. We need federal action to address all of the impacts the country is facing, and Senator Markey's Crypto-Asset Environmental Transparency Act is an important beginning in this process.

Sincerely,
Dr. Daniel L. Lau

The Honorable Senator Edward J. Markey
Chair
Clean Air, Climate, and Nuclear Safety subcommittee
Eddie Val Gould and Sandra Olson, 1121 Armstrong Ave, Glencoe, MN 55336
valbot10.8@gmail.com; veronival@embargmailmail.com
320-864-3921; 320-300-8078

The Honorable Senator Pete Ricketts
Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts,

Eddie Gould and Sandra Olson, appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act.

Sandra and myself, Eddie, live on the western edge of Glencoe, MN. Sandra owns the home and she has lived there for fifty years and I have lived there since about 1995. We are domestic partners. In the fall of 2020 we heard a rumor that a crypto mining company was about to come to town and locate on a agriculture parcel of land which had been used for growing crops and is across the County Rd. from our home and is adjacent to a large electrical substation placed there a dozen or so years earlier, much to our chagrin and against our complaints. The city of Glencoe gave us no notice.

At one point the city seized a portion of their(Wayne and Sandy Olson's) property by eminent domain in order to alter and relocate County Rd. 3 coming into town.

When Sandy and her deceased husband bought their lot and home it was a mixed zoning, residential and industrial and agriculture across the road.

When the construction of Bit49 began in the fall of 2020. I (Eddie) went to the site and Cody Nelson the COO of Bit49 was there to oversee the early stages of construction. I had done some research about cryptocurrency mining and what I learned is that what is termed "mining" is "block chain computing", that is, numbers of computers bundled together along with fans to keep the techno apparatus from overheating. My research has told me that crypto mining is outlandishly loud and clamorous. I told the COO this, but Cody Nelson assured me that Bit49 would be a good and gracious neighbor and they would mitigate the noise. He also told me that he had left his profession of being a physical therapist in order to seize the opportunity to make a lot of money, saying "You can understand that, don't you?? I said, "No not really." but then I suggested that if the situation were to become untenable that perhaps Bit49 would consider

buying Sandy's lot and home at a fair market price; that is, not for a diminished offer because obviously Sandy's property would be much less desirable with the presence of Bit49. He acknowledged that could be a possibility and I left.

Fast forward to April 5th 2022: We have just arrived home from our snow bird rental in SC. The next day we unpack and go out to our deck off the back of the house. We are bowled over by a droning groaning mechanical din, it is loud and we are in the midst of a life changing imposition from Bit49 with the City of Glencoe in full support and complicity with it. We called the mayor and he comes and listens and tells us that this is a noisy corner, what with Seneca Canning two blocks away and the truck traffic going to and from the factory, also the railroad crossing is a block away. We reply that those situations are not ideal but that those noises do come and go and with Seneca's huge warehouse in between we do not hear the factory. Bit49 however is much louder with its obnoxious intrusive mechanical moaning and it is there 24/7. In the spring, summer and fall we use our deck daily, we relax and we eat out there. Our use of the deck is now impossible and any activity outside such as gardening is ruined. He suggests we could sell. But, who would buy and the value is totally diminished, our very decent home and lovely lot is now undesirable and how can we hope to replace it without selling this house??

That was the beginning of our realization that we are being screwed by Bit49 and Glencoe's desire to sell them electricity. That is the reason Bit49 is in our backyard.

Cryptocurrency is a voracious user of electricity and Bit49 canvassed their way into town by the promise of big money in exchange for electricity. We have been told that Bit49 is a top three user of electricity in this town of 6000 residents and a couple of factories. We have spoken to every governmental agency in the town. When we asked the police to issue a noise complaint, they dodged us. We have repeatedly asked for decibel readings and they said they did not have the equipment. We contacted the Minnesota Pollution Control Agency (MPCA) for help. They informed us that the municipality was the governing authority and that it must go through the City of Glencoe. Eventually, Bit49 did ask for decibel readings at the site and on the edge of our property. Using equipment borrowed from MPCA the Glencoe Police Department conducted decibel readings. The results failed the Minnesota State mandated requirements. Bit49 said they were dealing with it and that they were spending large amounts of money to baffle the noise; their efforts failed and the sounds remained loud, clamorous and unsettling.

Last November Glencoe and Bit49 said it was a windy day when they took the decibel readings and that they would do them again in the spring of 2023. We were there the day they initially recorded the readings; it was a lovely summer day and not noticeably windy. Misdirection and kicking the can down the road are their MO. We have been dodged and misdirected at every juncture. We have so many incidents of indifference by our city and other agencies in the county and state that we are left to feel that maybe it is us who attacked them. What a sham; where are the sheltering arms for citizens? The City of Glencoe and Glencoe Light and Power have layers of attorneys that defend the status quo rather than the base of its citizens. We are told that the city council and the mayor are our representatives. They are either inept or perhaps

they are invested in crypto coins. Lawyers and law firms will not take a case on a contingency basis. It is very hard and expensive to take action against a municipality.

I have written many editorials in our local newspaper. People stop us in the supermarket and express sympathy and support. Definitely we have public opinion sympathy and support for our plight. We have had a front page article in the Minneapolis Star Tribune newspaper; we have had KSTP Television do a news segment which was aired several times. We have submitted a monetary settlement proposal to Glencoe and Glencoe Light and Power at the suggestion of the Glencoe City Attorney. No response, in fact we had to ask for a confirmation of receipt of our proposal. Finally after months and by further inquiry we received a confirmation from a secretary, nothing from anyone with authority. Such is the state of rudeness and helpfulness from our authorities and anyone in the pockets of the crypto vultures.

Cryptocurrency is an attempt to take over the economy of the world. "We'll give you fraudulent concepts of air in exchange for actual wealth." is the Ponzi and it is now engaging municipalities and more. Bernie Madoff scammed many individuals via his Ponzi schemes. These "entrepreneurs" have the deepest pockets; they are thrown out of China and they don't blink. They go bankrupt and then doubledown.

The reason for bringing Bit49 into Glencoe is touted to be a lowering of electricity costs, a savings for the citizens. However, when we have inquired into that claim we are stonewalled and no answer is given. We have asked "what are savings, how much?" Where is the evidence that this is working and are the taxpayers perhaps even subsidizing the so-called cryptocurrency industry?

It is said that the long term benefits of techno accounting of air molecules will create a more equitable flow for the business of doing business and that non-regulation of currency will be a great thing.

To counter that ruse I would say, how can you convince us that this will be fairer when you have just stolen our property. The taking of property is a crime, the stealing of our peace and well being is a crime. Beginnings are important and the evidence is that cryptocurrency reveals a horrid beginning from our perspective and I might add that we have seen nothing but foulness across the board from this gang of soulless weasels. If Bit49 and the City of Glencoe are about goodness it is high time that these techno entrepreneurs show us some goodness. Hell, they don't understand basic kindness and self respect. They turn a blind eye to "Do No Harm" and in fact they have unleashed some hell on us.

We thank you for hearing our dilemma; we feel like we are like seals being clubbed by poachers. We realize that this is happening now to many others and that there is the looming and larger issue of what these demons are doing to our sacred environment. Still, a killing is a killing and indifference to that is ignorance too. No way are these people good guys.

We need help and legislation that favors the interests and rights of people and that is why we favor Senator Markey's Crypto-Asset Environmental Transparency Act.

We support Senator Markey's Crypto-Asset Environmental Transparency Act

appreciate your consideration of these comments. We need federal action to address all of the impacts our environment is facing, and Senator Markey's Crypto-Asset Environmental Transparency Act is an important beginning in this process.

Sincerely, Eddie Val Gould and Sandra Olson, Glencoe, MN.

Cherokee County Citizens Against Crypto Mining
Murphy, NC 28906

March 4, 2023

The Honorable Senator Edward J. Markey, Chair,
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts, Ranking Member,
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts.

Our local citizens group, Cherokee County Citizens Against Crypto Mining, fully supports Senator Markey's Bill to bring more accountability, regulation, and structure to the crypto mining industry. Small, rural counties like ours with little zoning, cheap power, and inexpensive land are prime targets for this opportunistic industry. The noise from these 24/7/365 out in the open crypto mines is deafening. It is loudest at night where those up to a mile away cannot sleep with the roar of a jet engine permeating through their bedroom. We need help to enact regulation to protect citizens, the environment, and our power grid.

With deep connections in Western North Carolina (WNC), I can share our forefathers planned for the future when building five hydroelectric dams to power the Western tip of NC for generations with renewable, clean energy. In our immediate area, this is estimated at **288.8 MW** of power generation.

<https://www.tva.com/energy/our-power-system/hydroelectric>

Apalachia Dam **82 MW**

Chatuge Dam **14 MW**

Hiwassee Dam **172 MW**

Nottley Dam **19 MW**

Mission Dam **1.8 MW** (Duke Power)

With one MW of power estimated to power 200-300 homes, this level of production should take care of all our households, all our legitimate businesses, and give back to the grid during normal consumption periods.

Although neighboring Clay County NC Commissioners and the Town of Hayesville NC have been proactive in enacting ordinances this year to prevent Bitcoin / Crypto mining in those communities, three crypto mines in neighboring Cherokee County NC have placed new strains on the power grid for all of us in WNC. Below you will find public information on the crypto mine power consumption in Cherokee County NC. Only the Wingate Rd site does not have published information and is an estimate.

Core Scientific - **250 MW**
155 Palmer Lane
Marble, NC 28907

ANKR Mining Solutions/Exponential Digital/PrimeBlock - **50 MW**
3245 Harshaw Rd
Murphy, NC 28906

ANKR Mining Solutions/Exponential Digital/PrimeBlock - estimate **10-20 MW**
150 Wingate Rd
Murphy, NC 28906

In late December 2022, the TVA's implementation of rolling blackouts in sub-freezing conditions was an unconscionable approach during the Christmas holidays. The crypto mines' collective, new consumption in our local area of at least **310-320 MW** of our power is certainly a consideration of the root cause. The public utilities contractually can tell the crypto mines to power down during high utilization periods. The catch, they must be PAID to do so. Here is an article from Texas disclosing how much one crypto mine was paid in August 2022 to power down <https://decrypt.co/106669/bitcoin-miner-riot-earned-9-5m-for-shutting-down-during-texas-heatwave>

It would be helpful to have more information on the local agreements in WNC to power down. For this reason, our neighbors to the north in Canada are putting the brakes on new crypto mining connections to their grid in British Columbia, Manitoba, and Quebec. Like WNC, they are rich in hydroelectricity and were targeted as well.
https://archive.news.gov.bc.ca/releases/news_releases_2020-2024/2022EMLI0067-001928.htm

As a country, we need to consider how we can be good stewards of our lands and our resources before prioritizing the needs of the self-serving Bitcoin / crypto industry above our citizens. Crypto mining activity anywhere in the U.S. needs further oversight at the National level.

Thank you for your consideration,

Cyndie Roberson
Cherokee County Citizens Against Crypto Mining



Scott Scholz
Nebraskans for Social Good
nebraskansforsocialgood@gmail.com

The Honorable Senator Edward J. Markey
Chair
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts
Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts,

We appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act. Nebraskans for Social Good is a new group of citizens who have come together to speak out when we see public institutions in Nebraska at risk: public libraries, public schools and universities, health care institutions, public transit, and in this case, public power. Nebraska is unique as the only state in our union with 100 percent publicly-owned power utilities, which is something that we think Nebraskans should be proud of and protect. Now that crypto-asset mining companies are exploring their options in many states including Nebraska, we would like to point out the number of longer-term losses to be risked by working with these companies for the sake of relatively minor shorter-term gains.

We support Senator Markey's Crypto-Asset Environmental Transparency Act as a first step toward holding crypto-asset mining operations accountable for at least the environmental impact of their businesses. As detailed in the bill, crypto mining is a fundamentally energy-hungry process, and the economic rewards for this industry's

massive power consumption don't seem to justify the means. The most obvious concern is an environmental one, although observers needn't be particularly environmentally conscious to note that when crypto mining operations start consuming as much electricity as the entire cities where they locate, that seems inordinately wasteful. Leveraging our communities' power security for the sake of generating cryptocurrency assets for a small handful of investors is not an activity our government should be subsidizing.

While Nebraska has some diverse energy sources, the longer-term reality is that we're going to be increasingly burning coal and natural gas for electricity for some time. Our Cooper Nuclear Station is already past its prime, and is unlikely to be in operation beyond its current license, which expires in 2034. The facility will be 60 years old then — 20 years past its engineered life expectancy. Nebraska produces some hydroelectric power, perhaps a surprise to many outside of our state, but those plants are more supplemental in terms of capacity. Wind and solar are developing on smaller scales, but there's a lot of resistance to those movements. The question we raise, then, is whether we want to end up in a position where we are burning massive amounts of our own energy so that international tech bros can skim off a few cyberbucks for themselves?

We are of the opinion that crypto-asset mining operations are bad for Nebraska and our country more broadly on several fronts. Besides being environmentally irresponsible from a broad-based perspective, if crypto mining were to become more common in Nebraska, there are specific risks to the physical and economic stability of our electrical grid that we don't think are being considered thoroughly.

This might be because of how abstract cryptocurrency and crypto mining is at first glance. These companies send in their slickest lawyers and developers to chat up small town mayors and city councils about how their "data centers" will fortify their local tax base, and then a regional power district gets involved. Our small communities are flattered by this attention, as they've been seeking new developers and employers to attract and retain workers for decades. The reality of these arrangements, they discover too late, is too few jobs added, their local resources diverted, massive vacated facilities not suitable for other uses, and depleted TIF funds that could have been better allocated to longer lasting investment in their communities.

The first major crypto-asset mining arrangement in Nebraska quickly became a cautionary tale to consider when it comes to the more immediate risks for taxpayers. Our state's first crypto-asset mining/power district arrangement was established in 2019 between Compute North and Nebraska Public Power District (NPPD). Compute North's Kearney, NE facility opened at 30 MW in 2019, a power load demand that NPPD was

surely happy to take on as a steady customer. After all, you have peak and off-peak hours of power consumption, and this seems like a great way to make some money during off-peak hours when prices are at their lowest. But crypto-asset mining operations always need to ramp up their consumption to stay competitive, and soon you reach the point where their consumption is pushing local limits off-peak and absolutely requires more infrastructure to handle the loads during peak hours.

Indeed, in 2021 Compute North announced expansion plans that would bring their facility up to 100 MW. At that time, General Manager of NPPD Retail Division Pat Hanrahan noted that “NPPD would have to build a new substation to serve the expanded load from the industrial park, but the utility has worked out commitments from Compute North to cover those costs” (via <https://www.publicpower.org/periodical/article/bitcoin-mining-operation-add-flexible-load-nppds-area>).

The details of this arrangement are behind a non-disclosure agreement, but let’s look at some basic math around this scenario: the substation costs are \$12.5 million. Ramped up to 100 MW, NPPD could expect approximately \$1 million a year in revenue from the Compute North facility, so in the worst case scenario considering only revenue from their load consumption, it would take over 12 years to recoup those costs. The arrangement probably represents a better deal than that, of course, but to some extent that depends on how long crypto mining businesses stay in business.

That’s not long, it turns out: by the end of 2022, Compute North filed for bankruptcy as the bitcoin market slumped: <https://www.datacenterdynamics.com/en/news/compute-north-sells-two-data-centers-amid-bankruptcy/#:~:text=Compute%20North%2C%20which%20provides%20data.to%20at%20least%20200%20creditors>.

In this case, NPPD got lucky, and one of Compute North’s creditors (Generate Capital) has taken over their data centers, but considering the volatility of the crypto market in general, what will happen when one of these projects fizzles out and they can’t meet their commitments with a power district to cover infrastructure costs?

Consider also that this additional power infrastructure in Kearney, made to accommodate a consumption load from one company equal to the consumption of the entire town’s population of 34,000 people, would be redundant without this data center. And remember that there are limits on the total supply of various forms of cryptocurrency: once they hit their limit, there’s no more of the currency, and there’s nothing to mine. So these businesses have a terminal business model at their core.

They could switch to mining other forms of crypto, but who knows which, if any, of those will become popular? In the future, it's more likely that new forms will be built on a different kind of blockchain "proof of stake" model, rather than the "proof of work" models that require crypto mining facilities. Effectively, we are preparing to build race cars that won't have a racetrack in the near future.

Accommodating crypto-asset mining operations around the country also puts our power grid at risk, a national security issue. We hope for a deeper conversation about infrastructure and our power grid in the future. Consider that China, a country with a very new "supergrid" power infrastructure, banned crypto mining in 2021. Their power grid is much newer and more robust than ours.

Here in the Great Plains, the bones of our power grid go back to the New Deal in the 1930s, and the Rural Electrification Act that was part of the Works Progress Administration. Crypto issues aside, the US power grid is in need of massive overhaul to prevent the increased power outages we're already seeing during inclement weather, like the February 2019 Texas infrastructure failures that caused rolling blackouts all the way to Nebraska and beyond. If China's grid can't handle it, we certainly can't. We would like to see Congress act on improving and modernizing our national power assets, but in the short term, protecting them and our communities from potential economic and physical damage by the volatile crypto market seems like an obvious first step.

We appreciate your consideration of these comments. We need federal action to address all of the impacts our country could face from the proliferation of crypto-asset mining operations, and Senator Markey's Crypto-Asset Environmental Transparency Act is an important beginning in this process.

Sincerely,

Scott Scholz
Nebraskans for Social Good



PO Box 505 Penn Yan NY 14527-0505

SENT VIA EMAIL

March 4, 2023

The Honorable Senator Edward J. Markey-Chair

Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts-Ranking Member

Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts,

On behalf of the Committee to Preserve the Finger Lakes and the individuals we represent in the Finger Lakes region of New York, we appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act.

The Committee to Preserve the Finger Lakes, formed in 2010, is committed to preserving the natural beauty and purity of the water in the Finger Lakes region of New York State. We seek to make the region worth preserving for future generations while ensuring that tourism and agriculture are the well-established foundation of the region's economy. The Committee promotes the region's preservation by identifying environmental and economic threats and then informing and educating the general public, municipal officials, and government regulators. We work collaboratively with other organizations, such as Seneca Lake Guardian and the Sierra Club Atlantic Chapter to protect and preserve our Finger Lakes Region.

Seneca Lake is the heart of the Finger Lakes region- a world-class tourist destination- where our thriving agricultural and tourism industry drives the economy, supporting 60,000 jobs and generating \$3 Billion for New York's economy annually. This agri-tourism industry relies heavily on clean air and water for its survival. Seneca Lake itself contains 4.2 Trillion gallons of

fresh water and serves as a drinking water source for 100,000 people. When a once-shuttered coal burning power plant along the shores of Seneca Lake was retrofitted to burn natural gas, the public was told that it would only operate at roughly 6% capacity to provide power to the public in times of high demand. Finding that unprofitable, however, Greenidge Generation, LLC, owned by Connecticut based Atlas Holdings, started installing Bitcoin mining machines and suddenly the power plant was running 24 hours a day, 7 days a week. With only 7,900 machines to start, its air emissions increased ten-fold.

With a goal of installing over 30,000 machines, the facility's combined upstream and downstream emissions would be over 1,000,000 tons of CO2 Equivalents every year. Greenidge also has permits that allow it to withdraw up to 139 million gallons of water each day from Seneca Lake and dump up to 134 million gallons back in at temperatures up to 108 degrees F, risking toxic algal blooms that could make this water source for 100,000 people unusable for any purpose. The added computers mean it's on track to emit at least as much as 100,000 homes and cause more harm to Seneca Lake. The plant has brought only 48 new jobs to the region, while poisoning the Finger Lakes' natural resources. The constant hum of noise from the plant disrupts area residents and wildlife, turning a once bucolic area with sounds of birds chirping and water lapping along the lake's shores into what sounds more like a Florida swamp air boat. The Greenidge facility was not an outlier, however; it served as a test case for how roughly 48 decommissioned or underutilized power plants in communities across New York could fall victim to crypto mining.

The NYS Department of Environmental Conservation (DEC) [denied Greenidge's air permit renewal](#) in June stating that the facility poses a threat to the state's climate goals. But Greenidge is still permitted to operate and even expanding as it appeals the DEC's decision.

Thankfully, the NYS Legislature passed a moratorium that was later signed into law by the Governor that puts a [two year moratorium](#) on issuing permits to fossil fuel burning power plants that mine for cryptocurrency, while the DEC studies the impacts of this industry. This is a good start, but these miners are extremely mobile, and with other countries like China banning the practice, they are spreading like a cancer across the country. And we realize that even with some success in New York, this must not be a state-by-state battle. The pro-crypto industry is aggressive, lucrative, and its supporters often reach a religious fervor pitch when touting what they perceive as a panacea in the financial world. They downplay the environmental harms and spend millions on lobbying, making it extremely difficult for those impacted to convince elected officials to heed their concerns. But we need our federal decision makers to enact national legislation, and we need it to happen now.

In September, the White House Office of Science and Technology Policy released a [report](#) about the cryptomining industry's climate threats and the need for regulation. Earthjustice and the Sierra Club recently released a new [Guidebook](#), finding that from July 2021-22 Bitcoin mining in the U.S. alone consumed as much electricity as four states combined, emitting 27.4 million tons of CO2 - equivalent to the emissions of as much as 6 million cars annually.

Globally, Bitcoin mining consumes more energy each year than the entire country of Argentina. In the U.S. alone, Bitcoin mining produces an estimated 40 billion pounds of carbon emissions each year. Scientists agree that we must reduce greenhouse gas emissions 43 percent by 2030 in

order to keep global warming from exceeding dangerous levels. Crypto mining operations are a fast-growing industry in the U.S. and this climate-insidious form of operation threatens to veer our climate goals completely off track. While governments should be doing everything they can to reduce greenhouse gas emissions and beat back climate change, the U.S. is shepherding in an industry adding an entire country's worth of greenhouse gas emissions to the atmosphere.

When cryptocurrency miners rely on the public grid, they can stick everyday people with the bill. A [2021 study](#) estimates "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."

Many have suggested using renewable energy as a solution to this problem, but it's not. The Coinmint plant in Massena, New York, is powered by enough green, baseload hydroelectricity sourced from the public grid to power 14,000 homes. Instead of this green power being used to reduce New York's dependence on fossil fuels, we're squandering it on making virtual money. This serves as a clear example for why using precious green electrons for crypto mining is not the answer for the rest of the nation, and how it ultimately makes the rest of us more reliant on fossil fuels.

Meanwhile, Bitcoin has plummeted this year, and the crypto industry is imploding. Greenidge is in [financial ruin](#), losing \$44 million earlier this year as its stock had tanked more than 95% (now at \$0.50/share today). Last week, Greenidge announced that it will host Bitcoin mining for its lender, rather than mining its own Bitcoin, in order to pay back its [\\$74 million debt](#). This came after the company's [CEO abruptly stepped down](#). Other Bitcoin miners have been similarly struggling - Compute North recently filed for bankruptcy, and TeraWulf Inc., which operates a Bitcoin mining facility in New York, has seen its stock fall more than 90% this year.

We appreciate your consideration of these comments. Just today Seneca Lake Guardian hosted a press conference where local business owners representing sectors of the Agri-Tourism economy shared their perspectives about the harms this industry poses locally. The recording can be found here: [3/3/23 FLX Agritourism Industry to Greenidge](#). Local communities and the industries that help them prosper need your leadership now.

This can't be left to a town by town or state by state fight. As a founding member of the (National Coalition Against Cryptomining) we have been heartened to connect with other impacted and to join our impacted communities together. Here is our press announcement of support for Senator Markey's Bill: [NCAC National Coalition Against Cryptomining Press Release](#)

We need federal action on climate-killing cryptocurrency mining, and Senator Markey's Crypto-Asset Environmental Transparency Act is a great start.

Respectfully Submitted Via Email,

Abi Buddington, Secretary

Committee to Preserve the Finger Lakes



March 5, 2023

The Honorable Senator Edward J. Markey-Chair
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts-Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey, Ranking Member Ricketts, and all Committee Members:

On behalf of Fossil Free Tompkins, I am writing to urge your committee to support the Crypto-Asset Environmental Transparency Act. Fossil Free Tompkins is an advocacy organization in Ithaca, Tompkins County, NY, where we advocate for local, state and national policy to advance a rapid, equitable and affordable transition to a clean energy economy.

The Crypto-Asset Environmental Transparency Act will help us gain a better understanding of crypto's environmental impacts in the United States to better inform our policy solutions. The Act would require the Environmental Protection Agency (EPA) to conduct a comprehensive impact study of U.S. crypto mining activity and require the reporting of greenhouse gas (GHG) emissions from crypto mining operations that consume more than 5 megawatts of power. It would also include crypto mining facilities in energy efficiency and reporting programs that apply to other types of data centers. These would all be important first steps toward addressing the threats posed by this extremely energy-intensive industry, and we urge the committee to support this Act.

From 2012 - 2020, Fossil Free Tompkins led the fight to shut-down the 300 MW coal-burning Cayuga power-plant on Cayuga Lake. Now the owners of that shuttered plant are actively exploring use of that facility for crypto mining. Fortunately, our Assemblymember, Dr. Anna Kelles, championed the first in the county 2-year Moratorium on Cryptomining at fossil-fueled power plants while an environmental impact analysis is conducted. While using fossil-fuels is precluded by the NYS moratorium, this plant could still draw power from the grid to power its proposed crypto mining activities.

Right now, the marginal energy source in upstate New York is from gas power plants, meaning that if this plant were to begin cryptomining, fossil-fueled power plants would supply the energy needed. Notably, upstate NY is also planned to be the primary location for on-shore renewable power generation, and many projects are currently in the queue. It would be devastating if the renewable power generated from these sites were used to feed the insatiable energy appetite of cryptomining rather than to displace the need for fossil-fuel generation.

In support of Dr. Kelles' legislative effort, Fossil Free Tompkins undertook preliminary research to identify crypto mining facilities in NYS and to quantify their impact on our State's ability to reach its climate goals. The [results were alarming](#) - demonstrating how difficult it will be to reach NYS climate goals while supporting existing and proposed crypto mining facilities. Moreover, I can attest to the difficulty of identifying existing and proposed crypto mining facilities and determining their energy loads and fuel source while we undertook the study. The Crypto-Asset Environmental Transparency Act is a much needed starting point to index where cryptomining is occurring across the country and to evaluate the environmental impacts.

For the above reasons, Fossil Free Tompkins strongly supports the Crypto-Asset Environmental Transparency Act.

Additionally, we make the following suggestions for (hopefully friendly) amendments to the Act.

1. Please add a clause regarding enforcement of the crypto-mining facility registration requirement.
2. In regard to the environmental impact study, please add a section requiring the evaluation of alternatives. For example, when crypto-mining facilities are located at landfills or atop old oil or gas wells that are leaking methane - what alternative actions might be taken that would have a more environmentally beneficial impact vs burning that methane for power generation used for crypto mining? Or, when crypto-mining facilities are located near renewable energy resources to use the "excess" power that is generated - what alternative actions might be taken (such as adding energy storage, or improving capacity of the grid) that would be more environmentally beneficial than cryptomining.

Thank you so much for championing this important legislation.

Respectfully,

/s/

Irene Weiser

Coordinator, Fossil Free Tompkins



Mary T. Finneran,
104 Jerome Ave.
Cairo, NY 12413

The Honorable Senator Edward J. Markey, Chair,
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts, Ranking Member,
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts,

As a member of FrackBustersNY and a NYS representative for the NCAC, I truly appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act. I live in Greene County NY, but grew up in the Finger Lakes Region where the Greenidge Bitcoin crypto facility is operating to my dismay and deep concern and to great environmental impact. In Tonawanda the Fortistar Bitcoin proof of work facility is also stressing locals for pure private profit and no public benefit.

I am extremely concerned regarding any and all forms of proof of work cryptocurrency due to noise, toxic emissions, water, waste, but mostly due to the inordinate energy consumption whichever source of electricity the mining facility uses. Energy, regardless the power source, cannot be allowed for pure proof of work due to the usurpation from the public power needs. Bitcoin alone, from data I compiled last year, used 137.2 Terra Watt Hours (TWH) globally whereas New York State used 132 TWH.

I strongly support Senator Markey's Crypto-Asset Environmental Transparency Act and hope that this act will address this extreme energy consumption which is purely for private profit. While some companies claim that they use renewables the renewable energy used could greater benefit public power needed but instead perpetuates the use of fossil fuels for public power; also perpetuating GHG emissions and climate change.

Federal action to address all of the impacts of proof of work crypto mining is especially urgent. Senator Markey's Crypto-Asset Environmental Transparency Act is a critical beginning in this process.

Thank you for your consideration and all you do for the people.

Sincerely,
Mary T. Finneran
FrackBustersNY

Deborah Gondek
257 Brentwood Drive
North Tonawanda, NY 14120

March 1, 2023

The Honorable Senator Edward J. Markey
Chair
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts
Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts,

On behalf of hundreds of concerned residents in North Tonawanda, NY, I appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act.

Digihost, a Canadian bitcoin company, began operating in our city in 2022. Like most cities, we want new business in North Tonawanda, but not to the detriment of residents and the environment. Proof-of-Work cryptomining is harming our community in many ways -- some are immediately apparent, such as high noise levels from fans required to cool computers -- while other issues such as increased emissions, electronic waste, air and water pollution are less obvious at the start.

Located between Buffalo and Niagara Falls, our city is bordered by the Niagara River, Tonawanda Creek, and Erie Canal. North Tonawanda is home to 31,000 people, the historic Riviera Theatre, Wurlitzer organ factory, Hershell carousel museum, a revitalized business district, and one of the best farmers markets in the country. Unfortunately, last year it also became home to a bitcoin mining operation -- a project that was rushed through by city officials, despite concerns raised by residents and outside experts.

Digihost dangled the "new high-tech jobs and revenue" carrot, along with all sorts of greenwashing and unsubstantiated claims, and North Tonawanda elected officials fell for it. Later, when they discovered that our local zoning codes and laws couldn't keep up with the unique issues of this new operation, the damage had already been done. We've learned the hard way, it's not easy to rectify the new problems created by cryptocurrency miners.

High noise levels became a problem to hundreds of residents living within a mile of the bitcoin site. The computers and fans to cool them are housed in stacked shipping containers outdoors. People can hear the loud humming and feel the vibrations from this operation inside their homes, even with all windows closed. It's disrupting sleep, disturbing pets, and creating anxiety for homeowners. We are only beginning to understand the impact that this type of 24/7 noise has on people, animals, birds and pollinators -- not to mention the tangible impact on property values. Testing at the Digihost site began in February 2022. Despite ongoing complaints, more than a year later the noise problem hasn't been resolved.

I support Senator Markey's Crypto-Asset Environmental Transparency Act because without a thorough assessment about the impacts of this relatively new industry, communities like ours will continue to be taken advantage of. Most municipalities don't have zoning codes or other planning requirements that address the unique issues related to bitcoin mining.

The expansion of crypto currency mining in the United States increases air and water pollution, strains the electrical grid, and increases electricity rates of local residents. In cases like ours, it's resulted in firing up a natural gas power plant which Digihost recently purchased. Forcing bitcoin companies to convert to clean energy sources won't solve the problem as there is not enough renewable energy to power this electricity-hungry industry. However, forcing them to convert to a more energy-efficient operation would solve many of the current problems. This is one of many issues and potential solutions the transparency act could uncover.

The method used by Digihost and other bitcoin companies to mine cryptocurrency is a process called "Proof of Work" (PoW). It is extremely energy intensive. A single bitcoin transaction could power the average US household for a month! That level of energy use is unconscionable during a climate crisis. It also brings adverse environmental impacts to our community in the form of increased emissions and noise. We don't want that in our city, our state or our world.

The process for mining cryptocurrency matters. There are other options for verifying transactions, such as "Proof of Stake" which uses 99% less energy than PoW. Ethereum's recent move from PoW to PoS shows that it is possible for a large crypto company to transition to a much more energy-efficient validation method. Our appliances have to meet energy efficiency standards. Shouldn't crypto mining be required to do so as well?

Greenhouse gas (GHG) emissions from burning fossil fuels is a big contributor to climate change. Last year, carbon emissions from mining Bitcoin and Ethereum equaled the tailpipe emission of more than 15 million gas-powered cars. Automobile emissions are regulated to protect our health and our climate. Why wouldn't cryptocurrency mining be held to similar standards? I serve on North Tonawanda's Climate Smart Community Task Force. For each step forward we take to reduce GHG emissions in our city, bitcoin mining forces us several steps backward.

I appreciate your consideration of these comments. We need federal action to address all of these impacts facing communities across the country. North Tonawanda is just one of many examples. Senator Markey's Crypto-Asset Environmental Transparency Act is an important step in helping the country make smarter decisions about energy use, so we have a better chance of mitigating the impacts of climate change.

Sincerely,

Deborah Gondek
257 Brentwood Drive
North Tonawanda, NY 14120
dggondek@gmail.com
(716) 572-5564

Mary T. Finneran

104 Jerome Ave.
Cairo, NY 12413

The Honorable Senator Edward J. Markey, Chair

Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts

Ranking Member

Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts,

As a member of FrackBustersNY and a NYS representative for the NCAC, I truly appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act. I live in Greene County NY, but grew up in the finger lakes region where the Greenidge Bitcoin crypto facility is operating to my dismay and deep concern and to great environmental impact. In Tonawanda the Fortistar Bitcoin proof of work facility is also stressing locals for pure private profit and no public benefit.

I am extremely concerned regarding any and all forms of proof of work cryptocurrency due to noise, toxic emissions, water, waste, but mostly due to the inordinate energy consumption regardless the source of electricity. Energy regardless the power source cannot be allowed for pure proof of work, Bitcoin alone, from data I compiled last year used 137.2 Terra Watt Hours (TWH) globally whereas New York State used 132 TWH.

I strongly support Senator Markey's Crypto-Asset Environmental Transparency Act and hope that this act will address this extreme energy consumption which is taking energy from the public for private profit. While some companies claim that they use renewables the renewable energy used could greater benefit public power needed but instead perpetuates the use of fossil fuels for public power, perpetuating GHG emissions and climate change.

Thank you for your consideration.. Federal action to address all of the impacts of proof of work crypto mining is especially urgent. Senator Markey's Crypto-Asset Environmental Transparency Act is a critical beginning in this process.

Sincerely,
Mary T. Finneran
FrackBustersNY



PO Box 333
Watkins Glen, NY 14891
senecalakeguardian@gmail.com
senecalakeguardian.org

March 3, 2023

The Honorable Senator Edward J. Markey-Chair
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts-Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts,

On behalf of Seneca Lake Guardian (SLG) and the thousands of individuals, communities and businesses we represent in the Finger Lakes region of New York, we appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act.

Seneca Lake Guardian, a Waterkeeper Alliance Affiliate, is a New York State Not-for-Profit Corporation with 501(c)(3) and is dedicated to preserving and protecting the health of the Finger Lakes, its residents and visitors, its rural community character, and its agricultural and tourist related businesses through public education, citizen participation, engagement with decision makers, and networking with like-minded organizations. SLG supports Senator Markey's Crypto-Asset Environmental Transparency Act based on our experiences with the Greenidge Generation, LLC crypto mining facility in the Finger Lakes, which spurred a statewide initiative in New York.

Seneca Lake is the heart of the Finger Lakes region- a world-class tourist destination- where our thriving agricultural and tourism industry drives the economy, supporting 60,000 jobs and generating \$3 Billion for New York's economy annually. This agri-tourism industry relies heavily on clean air and water for its survival. Seneca Lake itself contains 4.2 Trillion gallons of fresh water and serves as a drinking water source for 100,000 people. When a once-shuttered coal burning power plant along the shores of Seneca Lake was retrofitted to burn natural gas, the public was told that it would only operate at roughly 6% capacity to provide power to the public in times of high demand. Finding that unprofitable, however, Greenidge Generation, LLC, owned by Connecticut based Atlas Holdings, started installing Bitcoin mining machines and suddenly the power plant was running 24 hours a day, 7 days a week. With only 7,900 machines to start, its air emissions increased ten-fold.



PO Box 333
Watkins Glen, NY 14891
senecalakeguardian@gmail.com
senecalakeguardian.org

With a goal of installing over 30,000 machines, the facility's combined upstream and downstream emissions would be over 1 million tons of CO2 Equivalents every year. Greenidge also has permits that allow it to withdraw up to 139 million gallons of water each day from Seneca Lake and dump up to 134 million gallons back in at temperatures up to 108 degrees F, risking toxic algal blooms that could make this water source for 100,000 people unusable for any purpose. The added computers mean it's on track to emit at least as much as 100,000 homes and cause more harm to Seneca Lake. The plant has brought only 48 new jobs to the region, while poisoning the Finger Lakes' natural resources. The constant hum of noise from the plant disrupts area residents and wildlife, turning a once bucolic area with sounds of birds chirping and water lapping along the lake's shores into what sounds more like a Florida swamp air boat. The Greenidge facility was not an outlier, however; it served as a test case for how roughly 48 decommissioned or underutilized power plants in communities across New York could fall victim to crypto mining.

The NYS Department of Environmental Conservation (DEC) [denied Greenidge's air permit renewal](#)¹ in June stating that the facility poses a threat to the state's climate goals. But Greenidge is still operating and even expanding as it appeals the DEC's decision.

Thankfully, the NYS Legislature passed a moratorium that was later signed into law by the Governor that puts a [two year moratorium](#)² on issuing permits to fossil fuel burning power plants that mine for cryptocurrency, while the DEC studies the impacts of this industry. This is a good start, but these miners are extremely mobile, and with other countries like China banning the practice, they are spreading like a cancer across the country. And we realize that even with some success in New York, this must not be a state-by-state battle. The pro-crypto industry is aggressive, lucrative, and its supporters often reach a religious fervor pitch when touting what they perceive as a panacea in the financial world. They downplay the environmental harms and spend millions on lobbying, making it extremely difficult for those impacted to convince elected officials to heed their concerns. But we need our federal decision makers to enact national legislation, and we need it to happen now.

In September, the White House Office of Science and Technology Policy released a [report](#)³ about the cryptomining industry's climate threats and the need for regulation. Earthjustice and the Sierra Club recently released a new [Guidebook](#)⁴, finding that from July 2021-22 Bitcoin mining in the U.S. alone

¹ Statement from the New York State Department of Environmental Conservation on Denial of the Title V Permit Renewal for Greenidge Generation, LLC: <https://www.dec.ny.gov/press/125678.html>

² New York Times, "New York enacts 2 year ban on some crypto-mining operations" <https://www.nytimes.com/2022/11/22/nyregion/crypto-mining-ban-hochul.html>

³ White House Fact Sheet: <https://www.whitehouse.gov/ostp/news-updates/2022/09/08/fact-sheet-climate-and-energy-implications-of-crypto-assets-in-the-united-states/>

⁴ Sierra Club/Earthjustice, Energy Bomb/Bitcoin White Paper- https://earthjustice.org/wp-content/uploads/energy_bomb_bitcoin_white_paper_101322.pdf



PO Box 333
Watkins Glen, NY 14891
senecalakeguardian@gmail.com
senecalakeguardian.org

consumed as much electricity as four states combined, emitting 27.4 million tons of CO₂ - equivalent to the emissions of as much as 6 million cars annually.

Globally, Bitcoin mining consumes more energy each year than the entire country of Argentina. In the U.S. alone, Bitcoin mining produces an estimated 40 billion pounds of carbon emissions each year. Scientists agree that we must reduce greenhouse gas emissions 43 percent by 2030 in order to keep global warming from exceeding dangerous levels. Crypto mining operations are a fast-growing industry in the U.S. and this climate-insidious form of operation threatens to veer our climate goals completely off track. While governments should be doing everything they can to reduce greenhouse gas emissions

and beat back climate change, the U.S. is shepherding in an industry adding an entire country's worth of greenhouse gas emissions to the atmosphere.

When cryptocurrency miners rely on the public grid, they can stick everyday people with the bill. A [2021 study](#)⁵ estimates "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."

Many have suggested using renewable energy as a solution to this problem, but it's not. The Coinmint plant in Massena, New York, is powered by enough green, baseload hydroelectricity sourced from the public grid to power 14,000 homes. Instead of this green power being used to reduce New York's dependence on fossil fuels, we're squandering it on making virtual money. This serves as a clear example for why using precious green electrons for crypto mining is not the answer for the rest of the nation, and how it ultimately makes the rest of us more reliant on fossil fuels.

Meanwhile, Bitcoin has plummeted this year, and the crypto industry is imploding. Greenidge is in [financial ruin](#)⁶ losing \$44 million earlier this year as its stock had tanked more than 95% (now at \$0.50/share today). Last week, Greenidge announced that it will host Bitcoin mining for its lender, rather than mining its own Bitcoin, in order to pay back its [\\$74 million debt](#)⁷. This came after the company's [CEO abruptly stepped down](#)⁸. Other Bitcoin miners have been similarly struggling - Compute North recently filed for bankruptcy, and TeraWulf Inc., which operates a Bitcoin mining facility in New York, has seen its stock fall more than 90% this year.

⁵ BerkleyHaas, "Power-hungry cryptominers push up electricity costs for locals":

<https://newsroom.haas.berkeley.edu/research/power-hungry-cryptominers-push-up-electricity-costs-for-locals/>

⁶ Waterfront Online Blog: <https://waterfrontonline.blog/2022/11/15/greenidge-sounds-new-alarms-about-its-financial-condition-in-sec-filing-says-cash-expected-to-run-out-in-march/>

⁷ The Block, "Greenidge deal with lender NYDIG would see miner shift to hosting":

<https://www.theblock.co/post/196461/greenidge-deal-with-lender-nydig-would-see-miner-shift-to-hosting>

⁸ Waterfront Online Blog: <https://waterfrontonline.blog/2022/10/09/greenidges-ceo-jeff-kirt-abruptly-resigns-as-company-reels-financially-canadian-forestry-exec-replaces-him/>



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senecalakeguardian@gmail.com
senecalakeguardian.org

We appreciate your consideration of these comments. As we have stated many times, burning more fossil fuels to make volatile virtual money in the middle of a climate crisis is literally insane. We need federal action on climate-killing crypto mining, and Senator Markey's Crypto-Asset Environmental Transparency Act is a great start.

Respectfully Submitted,

A handwritten signature in blue ink that reads "Joseph M. Campbell". The signature is written in a cursive style with a large, stylized "J" and "C".

Joseph Campbell, President
Seneca Lake Guardian



March 3, 2023

The Honorable Senator Edward J. Markey
Chairman
Clean Air, Climate, and Nuclear Safety Subcommittee

The Honorable Senator Pete Ricketts
Ranking Member
Clean Air, Climate, and Nuclear Safety Subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts,

My name is Michael Coleman, I serve as the Energy Advocate for Upstate Forever. I appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act. Our organization focuses on supporting land conservation, clean energy, and clean water in the ten county "Upstate" region of South Carolina. Specifically, I advocate to protect the Upstate region from new fossil fuel projects that can negatively impact our air, water, and communities.

Upstate Forever was first made aware of the opening of a cryptocurrency mining facility in Spartanburg in late 2021. We immediately began connecting with various communities to understand how to mitigate impacts locally and statewide. Through those conversations, we have learned that communities across the nation have already reported varying effects to the environment, ratepayers, the electric grid, and a increase in e-waste, because of cryptocurrency operations locating in their town.

We support Senator Markey's Crypto-Asset Environmental Transparency Act because we have significant concerns on the potential risks mining facilities could pose to our region. We believe to fully understand and mitigate the effects of these facilities, an interagency study is

necessary to identify all environmental and energy impacts with emphasis on the following considerations:

Ratepayer Impacts

High-density energy customers like cryptocurrency mining facilities, demand increased infrastructure like transmission lines, substation upgrades, and other related mechanisms needed for the delivery of large amounts of electricity. Ratepayers could be left to pay for these investments even after mining operations have left their area due to the portability of their business. Crypto operations present a great risk to electricity consumers by increasing the total amount of electricity needed to power the grid. These effects are attributable to the extreme energy intensive nature of these operations.

Grid Impacts

Mining operations use electricity to power four major functions of their business: data storage, computing, cooling, and data communications. Our grid is already experiencing strains due to hotter temperatures and intense storms, which reduce the amount of electricity that can be provided when consumers need it. The energy demand from the cryptocurrency mining industry requires system operators to deploy more natural gas and coal power plants. These facilities also have high load factors and use power constantly and when they continue to operate during peak demand, they place stress on the grid infrastructure.

Air Quality

Cryptocurrency miners procure their electricity through purchase of power plants that supply mining rigs “behind-the-meter”, power purchase agreements with utilities, electricity purchases from a local utility, and by burning gas wells. Each type of mining produces excess emissions, and impacts electricity and energy consumers. The explosive growth of cryptocurrency mining in the United States has been difficult to access, since most mining operations do not publicly disclose their energy consumption, location, or source of electricity. However, estimates reveal cryptocurrency mining operations have a major impact on emissions. Additionally, cryptocurrency mining increases global emissions by driving increases in electricity demand.

E-Waste

The specialized computer systems that are used to “mine” cryptocurrency have a limited lifespan (3-5 years) and could increase the turnover of equipment, which would equate to more electronic waste. When mining operations are first set up, there is an enormous amount of solid waste from installation and construction. We believe crypto mining operations should be required to publicly report their locations and existing electronic waste protocols.

We appreciate your consideration of these comments. We need swift action to address the impacts communities like ours could face, and Senator Markey's introduction of the Crypto-Asset Environmental Transparency Act is an important step in this process.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read 'm k coleman', with a long horizontal flourish extending to the right.

Michael K. Coleman

Energy Advocate

Elizabeth Price
2344 East Main Street
Rogersville, TN 37857

The Honorable Senator Edward J. Markey
Chair
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts
Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

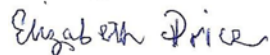
Dear Chairman Markey and Ranking Member Ricketts,

I appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act. I live in Hawkins County and there are no crypto-mines in our area that I am aware of.

I am aware that the crypto mines cause noise problems for many neighborhoods. As we are trying to decrease our carbon footprint, these mines demand enormous electrical power burdening our power grid. I certainly hope that I do not have a crypto mine in my neighborhood. Please work to control the growth of these mines and protect our limited resources.

In my opinion, we need to control crypto mining growth to protect our environment and protect our citizens from the crypto mining's on-going noise pollution that disrupts the peace in our communities and upsets our citizens.

Sincerely,

A handwritten signature in cursive script that reads "Elizabeth Price".

Elizabeth Price

Concerned Citizens of Navarro County, Texas

The Honorable Senator Edward J. Markey
Chair
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts
Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts,

The Concerned Citizens of Navarro County appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act. My name is Jackie Sawicky. I founded the Concerned Citizens of Navarro County after the surprise announcement that Riot Platforms (Formerly Riot Blockchain) plan on building "the world's largest Bitcoin mine" in our Texas county. They misrepresented themselves as a "data center" to get their foot in the door. Riot & the City of Corsicana worked behind closed doors, in secret for five months before the announcement was made to the public. County commissioners weren't even aware of their plans until the rest of the public was told on April 27th, 2022. Riot & the City of Corsicana have been extremely secretive about their operation. Our group has had to do extensive records requests in order to find out their plans.

We support Senator Markey's Crypto-Asset Environmental Transparency Act because Navarro county is an indigent county. We have a 16% poverty rate & 17% rate of seniors living here, many of whom are on fixed incomes. We know for a fact that when these massive operations go online, they increase the cost of everyone's power bills. Single moms & seniors literally cannot afford for Riot to operate in this county. We're also VERY concerned about the TWO pairs of nesting bald eagles in the area. Riot also plans on dumping water into a creek that abuts the property. This water will be heated to over 100 degrees and we know that it will affect the ecosystem of that creek. The creek also feeds into Richland Chambers Reservoir. Richland Chambers is the tap water source for Tarrant County, where Arlington/Fort Worth is. We are VERY worried about the possibility of fire and all those toxic metals and who-knows-what leeching into and contaminating the tap water of some of the largest Texas cities. Riot did not perform an environmental impact study. Lastly, they chose a location in a RESIDENTIAL rural neighborhood. There is literally a house across the street from the site and several others in view of the property. These folks live in the country to be away from the noise and pollution of the city, but that noise & pollution came to them without any of their consent or input. Again, the sale & planning of this land & project was kept secret for over five months. This will be years and years of heavy construction, noise pollution, and air quality concerns. The city of Corsicana DOES NOT CARE that the overwhelming vast majority of its citizens and the county as a whole is adamantly against this endeavor.

Our group has caught Riot Platforms in innumerable lies & half-truths. We need federal legislation so that these companies are mandated to perform environmental impact studies. We need transparency so residents have time to organize and push back BEFORE these deals are done. We need federal legislation so that corrupt local governments are held accountable when they go against the wishes of their constituents.

Riot promises jobs & tax revenue, but we know from studies of “miners” in other areas that those jobs & taxes don’t materialize and they’re actually economically depressing. I worry about local business owners who will be impacted three times - with higher utility bills as a resident, in their businesses and because everyone’s utility bills will be increased, folks will have less money to spend on their services and products.

Riot Platforms already has a “mine” in Rockdale Texas, Milam county. They get a sweetheart, cut-rate energy deal on 3.55 cents a KWH until the year 2030, while the average Texan has seen their electricity bills skyrocket by 70%. They are property tax exempt for ten years, they are sales tax exempt under the guise of a “data center,” and when they’ve helped bring the fragile Texas grid to the point of failure, THE GET PAID TO SHUT DOWN. They then turn around and sell the deeply discounted energy they have stored back to the grid at a “spot” or premium price. And in every instance, it’s the Texas taxpayer and energy consumers that are picking up the tab. All while not actually producing any goods or services that any of us need or want. Why on earth should we subsidize such a wasteful, destructive, and stupid project when so many of us are struggling to make ends meet? It is truly the definition of insanity.

We appreciate your consideration of these comments. We need federal action to address all of the impacts communities & states like ours are facing, and Senator Markey’s Crypto-Asset Environmental Transparency Act is an important beginning in this process.

Sincerely,
 Karen Joice
 Concerned Citizens of Navarro County
 Don’t Mess With Texas



Concerned Citizens of Navarro County, Texas

The Honorable Senator Edward J. Markey
Chair
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts
Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

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VERY worried about the possibility of fire and all those toxic metals and who-knw-what- leeching into and contaminating the tap water of some of the largest Texas cities. Riot did not perform an environmental impact study. Lastly, they chose a location in a RESIDENTIAL rural neighborhood. There is literally a house across the street from the site and several others in view of the property. These folks live in the country to be away from the noise and pollution of the city, but that noise & pollution came to them without any of their consent or input. Again, the sale & planning of this land & project was kept secret for over five month. This will be years and years of heavy construction, noise pollution and air quality concerns. The city of Corsicana DO NOT CARE that the overwhelming vast majority of their citizens and the county as a whole is adamantly against this endeavor.

Our group has caught Riot Platforms in innumerable lies & half-truths. We need federal legislation so that these companies are mandated to perform environmental impact studies. We need transparency so residents have time to organize and push back BEFORE these deals are done. We need federal legislation so that corrupt local governments are held accountable when they go against the wishes of their constituents.

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We appreciate your consideration of these comments. We need federal action to address all of the impacts communities & states like ours are facing, and Senator Markey's Crypto-Asset Environmental Transparency Act is an important beginning in this process.

Sincerely,
 Jackie Sawicky
 Concerned Citizens of Navarro County
 Don't Mess With Texas

To the Honorable Sen Markey:

My name is Jackie Sawicky and I'm writing in support and endorsement of the Crypto-Asset Environmental Transparency Act. I'm a founding member of the Concerned Citizens of Navarro County, Texas, where Riot Platforms is currently built "the world's largest Bitcoin mine." Our Electrical grid operator, ERCOT, refuses to disclose vitally important information on the current usage and expected future burden of cryptomining on our beleaguered energy infrastructure.

Thank you,
Jackie Sawicky
Concerned Citizens of Navarro County
Don't Mess With Texas

Geoffrey Sawicky
818 Se Cr 2260
Corsicana Tx 75109

The Honorable Senator Edward J. Markey
Chair
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts
Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts,

I appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act. I live in Corsicana where the threat of a crypto facility is looming.

I support Senator Markey's Crypto-Asset Environmental Transparency Act because Corsicana does not need the added strain of a crypto mining operation.

I appreciate your consideration of these comments. We need federal action to address all of the impacts communities like mine are facing, and Senator Markey's Crypto-Asset Environmental Transparency Act is an important beginning in this process.

Sincerely,
Geoffrey Sawicky

March 4, 2023



www.rgnew.org

To: The Honorable Senator Edward J. Markey-Chair
Clean Air, Climate, and Nuclear Safety subcommittee

To: The Honorable Senator Pete Ricketts-Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

From: Responsible Growth * NE Washington

RE: Letter of Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts;

On behalf of Responsible Growth * NE Washington core team and our supporting friends in the Pacific Northwest, we thank you for this opportunity to provide a statement for the committee's legislative hearing and to add our letter of support for the Crypto-Asset Environmental Transparency Act.

RG * NEW organized in December of 2017, to stop a massive silicon metal smelter from being sited in our rural area. We were successful to the point that the proposed smelter is not being sited in our county, but in Tennessee at an industrial site.

Pend Oreille County is a small county with a population of approximately 14,000 people. We are a river system of mountains and valleys. An abundance of wildlife, clean air & water, and many recreational opportunities make Pend Oreille County a living paradise.

This paradise is going to rapidly change as heavy industry is viewing this high poverty area, cheap land, and low energy prices as a perfect site for urban industrialization growth. Our primary economic source is and has always been agriculture, forestry, & mining (not to be confused with cryptomining, which is not a form of traditional mining).

Allrise/Bitmain appeared on the scene and won the bid for a bankrupt papermill site as soon as our fight with the proposed smelter ended. They were granted a Conditional Use Permit to begin operations. An appeal was initiated against the CUP; the appeal was denied by the county's hearing examiner.

There are so many levels as to why these Cryptomining facilities need oversight and regulations.

#1. Our local and state governments have no regulations governing these facilities, nor the amount of energy needed to run them at full capacity. The federal government has no regulations. Our Comprehensive Plans and Development regulations set up to protect our environment and health are not adequate; we are not prepared to take on this energy-hog, heavy industry. Our environment and health are at the mercy of cryptomining unless we get our legislative act together. In other words, did we close the barn door after we let the horse escape.

#2. The U.S. Treasury provides currency as efficiently as possible. It doesn't cost anymore to print a \$1.00 bill than a \$1,000 bill. Is \$1.00 of Bitcoin worth as much as a \$1,000 of Bitcoin? Wasting energy, resources and money on Cryptocurrency makes no economic sense.

#3. I mentioned Bitmain, which is a Chinese company. Who or what will prevent Russian or Chinese communist enemies from influencing or controlling our currency and monetary policies? If every corporation was permitted to print its own currency, there would be monetary chaos and collapse. We are leaving ourselves wide-open and vulnerable if we don't act on regulating cryptocurrency and mining.

#4. Cryptomining is not mining. It does not bring forth valuable elements and compounds from the Earth. There is nothing natural or valuable about crypto products itself. It does not exist in nature. This type of advertising appears to be a deceptive sales pitch. U.S. currency is vital because it can accurately represent values of everything from real estate to the paper this letter is being typed on. We just don't understand how it has gotten this far without checks and balances.

#5. Why are compatriots, who are so frightened of and opposed to world governing organizations, so eager to promote world-wide cryptocurrency? It appears that making a lot of money fast is their only goal and the impact to the planet and future generations is being overlooked. The horse may be out of the barn, but it isn't too late to start doing something to curb and control cryptomining currency and facilities.

There is so much more that can and should be said, but the high points have been touched upon. Thank you for this opportunity to comment. Your efforts and actions, Sen. Markey and Sen. Ricketts, are very much appreciated.

Respectfully,

Phyllis J. Kardos,
RG * NEW, Co-chair

1.509.447.7958
pkardos_jean@yahoo.com

2843 Scotia Road
Newport, WA 99156



West Virginia Chapter
Monongahela Group
P.O. Box 4142
Morgantown, WV 26504

March 2, 2023

The Honorable Senator Edward J. Markey, Chair
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts, Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts,

The Monongahela Group of the West Virginia Chapter of the Sierra Club appreciates the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act.

In the fall of 2021, one of our members was astute enough to notice an obscure legal advertisement in our local newspaper for a air quality permit application from our state Department of Environmental Protection. A bit of digging revealed the permit was for a 'science facility' and the company applying for the permit, Marion Energy Partners (MEP), turned out to be a shell company for Northeast Natural Energy (NNE), a frack drilling company. There was otherwise no public announcement about this project.

The 'science facility' was to be located close to one of their fracking sites in the city industrial park on the Monongahela River, just outside city limits but in close proximity to schools and residential neighborhoods. It was obvious to everyone by then that the facility was to be a crypto mining facility, using their own fracked gas to power it. No one ever specifically said what the 'science facility' was for. But even *Marcellus Drilling News*, which supports gas-fired bitcoin operations, in reporting on the the MEP project, said, "*The best guess is that this is another new cryptocurrency mining operation.*" Why was MEP/NNE being so secretive?

We requested a public hearing with the WVDEP, which was held January 11th, 2022 via Zoom. Forty local residents participated and everyone spoke against the facility. Even our local newspaper, *The Dominion Post*, ran an editorial questioning the purpose and value of such a facility so close to Morgantown's downtown, schools and homes. Because of the efforts of local environmental groups, Morgantown residents were informed of how much noise is generated and how much energy is consumed by the masses of computers, with absolutely no benefit to Morgantown or to anyone who lives here.

The air quality permit to build this facility was granted on March 7, 2022. The WVDEP claimed that as long as MEP met their air quality standards, it was not their job to say how the facility should or should not be used. A year later, no construction has yet been seen on the site but the public has no way of knowing what future plans are.

We support Senator Markey's Crypto-Asset Environmental Transparency Act. We appreciate your consideration of these comments. We need federal action to address all of the impacts communities like ours are facing and Senator Markey's Crypto-Asset Environmental Transparency Act is an important beginning in this process.

Sincerely,
Betsy Lawson, Secretary
Sierra Club,
West Virginia Chapter
Monongahela Group

**MON
VALLEY
CLEAN AIR
COALITION
(MVCAC)**

The Honorable Senator Edward J. Markey
Chair
Subcommittee on Clean Air, Climate, and
Nuclear Safety

The Honorable Senator Pete Ricketts
Ranking Member
Subcommittee on Clean Air, Climate, and
Nuclear Safety

March 2, 2023

Subject: Support for Senator Markey's Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts:

The Mon Valley Clean Air Coalition in Morgantown, West Virginia wholeheartedly supports Senator Markey's Crypto-Asset Environmental Transparency Act. We need help from Congress! Cryptocurrency miners often call themselves "Data Centers" or "Data Facilities." The Marion Energy Partners, LLC cryptocurrency mining facility proposed for Morgantown, West Virginia calls itself a "Science Center," a bland, patently false name meant to obfuscate its true purpose. An alert resident saw the legal ad for an air permit in the local newspaper and became suspicious; otherwise, we would never have caught this. We knew that cryptocurrency mining operations in other parts of the country use these innocuous terms to allow their business to fly under the radar of the community and the regulators.

Another local resident obtained the mobile phone number of the parent company's CEO and asked him directly, "Is this a cryptocurrency mining facility?" The CEO demurred. He did not answer the direct question and spoke as if he didn't know the significance of what Marion Energy Partners was doing.

We live in a state with few regulations. This facility is proposed along the Monongahela River in a valley near two schools, between two municipalities, but outside any municipal limits. Therefore, it does not need a building permit and does not need to comply with any noise ordinances. If this facility were not using greater than 10MW of power, it would not even need an air permit: it would need no permits at all!

We desperately need protection from Congress and this legislation will help us. We know from other communities that these proof-of-work cryptocurrency miners are extremely loud energy hogs, cutting deals with power companies and taking electricity away from residents and businesses when extreme weather taxes the grid. They have been allowed to propagate unfettered and they need strict regulation.

We appreciate the opportunity to provide this information for the subcommittee's legislative hearing on the Crypto-Asset Environmental Transparency Act.

Sincerely
Mon Valley Clean Air Coalition


Paula J. Hunt
Treasurer

The Honorable Senator Edward J. Markey, Chair
Subcommittee on Clean Air, Climate, and Nuclear Safety

The Honorable Senator Pete Ricketts, Ranking Member
Subcommittee on Clean Air, Climate, and Nuclear Safety

RE: More than 40 turn out for WV-DEP meeting on “Science Facility” [(Crypto-Mining Facility)]

>>> From an [Article by Ben Conley, Morgantown Dominion Post](#), January 12, 2022

MORGANTOWN — “Science Facility” & “Data Center” — These are the terms used to describe a project proposed by **Marion Energy Partners** for placement in the **Morgantown Industrial Park**.

What is known is that a 10,000 square-foot facility would pull natural gas directly from a nearby **Northeast Natural Energy** well pad to power four natural gas-fired engines around the clock, 365 days a year.

Beyond that, information about the project is very limited. It’s believed the engines will provide electricity for a cryptocurrency mining operation, but attempts to confirm that with Marion Energy Partners have been unsuccessful.

Cryptocurrency mining uses banks of specialized computers to validate blockchain transactions for a specific cryptocurrency in order to receive percentages of said currency in return. Popular examples include Bitcoin and Ethereum. As of this writing, one Bitcoin was worth \$42,631.80.

A virtual public comment meeting held Tuesday, January 11th, by the West Virginia Department of Environmental Protection’s Division of Air Quality drew more than 40 participants.

For about two hours, participants, including local and state elected officials, offered comments and asked questions, including why so little information is available and who beyond **Marion Energy Partners & Northeast Natural Energy** would receive any benefit.

“I would propose this permit be rewritten in a way that people would know with transparency what is going to transpire as far as what the business actually is,” Morgantown **Mayor Jenny Selinsaid**. Morgantown City **Councilor Bill Kaweck**i said the facility will offer no benefit, only environmental cost.

Delegate Evan Hansen, D-Monongalia, agreed. “Often there’s balancing acts and decisions that are made where there are pros and cons to a type of development that would bring jobs or economic opportunities or community benefits to the table,” he said. “But I don’t see any of those in this proposal. What I see is local air pollution, greenhouse gas emissions and noise.”

Air quality-related public comments can be submitted to the DEP at edward.s.andrews@wv.gov until 5 p.m. Thursday, January 13th. “Marion Energy Partners LLC” should be included in the subject line.

Non-air quality related comments may be emailed anytime to: depadvocate@wv.gov

Duane Nichols, who first brought this project to the attention of the Monongalia County Commission late last year, called on **WV-DEP Cabinet Secretary Harold Ward** to get involved. He challenged Ward “to

look at this project and to make a public statement of whether there is any redeeming social value and whether there is any value to the public interest that can possibly justify polluting the Mon River Valley, the neighborhoods, and Mon County. Otherwise, this project stands as an insult to our community.”

NOTE: This document is submitted for information purposes to the US Congress in the public interest by the undersigned on March 2, 2023 on behalf of FrackCheckWV.net, a not-for-profit Internet blog in the public interest.

Submitted by: C. Sue Miles Nichols, 330 Dream Catcher Circle, Morgantown, WV 26508

Senator MARKEY. We are joined by Senator Lummis from Wyoming. Let's turn and recognize you, Senator, for a round of questions.

Senator LUMMIS. Thank you, Mr. Chairman.

My first question is for Mr. Altenburg. What does a digital asset mining operation look like? Are there shovels digging in the ground? What does it look like?

Mr. ALTENBURG. It depends on the location. The mining sites that are being placed at our fracked gas wells are essentially semi-trailers that have methane gas powered generators that are plugged into the well, and big shipping containers full of racks of Bitcoin miner.

Senator LUMMIS. A Bitcoin miner is actually a computer?

Mr. ALTENBURG. It is about the size of a toaster, and it uses three times the energy of a house.

Senator LUMMIS. There is a bunch of toasters in a line, sometimes they are dipped in fluids so they run cooler, they can be air-cooled, they can be water-cooled. It is basically just a computer?

Mr. ALTENBURG. Yes.

Senator LUMMIS. Is that computer that is mining Bitcoin directly emitting pollutants?

Mr. ALTENBURG. No, its energy source, its electric source, is what is emitting.

Senator LUMMIS. Okay. Now let's take an EV charging station. If that EV charging station is powered by electricity from natural gas or coal, should not it also have the same monitoring that is being requested by this bill?

Mr. ALTENBURG. I think the issue is looking how efficiency is measured. All sources of electricity, whether it is the lights or the speaker system here, are going to use electricity and produce a certain amount of work for that electricity.

The issue with Bitcoin and proof-of-work cryptocurrency is the work that we are doing is not actually necessary to have cryptocurrency or to have blockchain technology.

Senator LUMMIS. Okay. Let's talk about gold. Where does gold come from?

Mr. ALTENBURG. It is mined.

Senator LUMMIS. It is mined, Okay. Is energy expended in producing gold?

Mr. ALTENBURG. Yes.

Senator LUMMIS. Okay. Is gold absolutely essential?

Mr. ALTENBURG. For certain technologies, it is.

Senator LUMMIS. Is it Congress' job to decide whether an energy use is worthwhile or not? Surely you have heard that Bitcoin is digital gold, because it is limited to 21 million Bitcoin ever to be mined, it is permission-less, which means you do not have to rely on a third party, a trusted third party to do transactions or to hold it. It is a store of value, and that is commonly agreed to.

You have gold, it is a store of value, you have Bitcoin, it is a store of value. They both consume energy to produce.

Now, is it Congress' role to say gold is a more worthwhile use of energy than Bitcoin?

Mr. ALTENBURG. There is a long history of that very thing. We have energy efficiency standards for appliances, we have CAFE

standards for vehicles. For most air pollution, for most new air pollution sources, there are legal requirements that before they operate, they install the best available technology to reduce the pollution.

We do make those decisions every day.

Senator LUMMIS. We are still mining coal in this Country. We are still producing natural gas, and we have the cleanest-burning natural gas in probably the world, here in the United States, and produce it in the most environmentally sound manner. It is a hydrocarbon.

If my car is oil-consuming or natural gas consuming, is it a less worthy use of energy than energy that comes from coal and natural gas but is converted to electricity for an EV?

Ms. ALTENBURG. Using vehicles, our entire transportation network requires a certain amount of energy. There are economic benefits that we get from that transportation network.

Senator LUMMIS. My time is about up, so thank you.

I have a question for Ms. Dentlinger. Do you view digital asset mining operations as a negative for the power sector?

Ms. DENTLINGER. I certainly do not speak for the entire power sector. Within the State of Nebraska, we have actually seen benefits. We have not seen the drawbacks that have been mentioned during the hearing today. Most of those have just been managed locally, whether by the municipality, by the county, or by the Nebraska Department of Environment and Energy.

Senator LUMMIS. If you have a natural gas well and you are venting the natural gas because that well is not hooked up to a gathering line, is it better to vent it into the atmosphere, or is it better to use the energy to produce something of value?

Ms. DENTLINGER. In my opinion, it is much better to actually use the energy and produce something of value.

Senator LUMMIS. Thank you. Mr. Chairman, I yield back.

Senator MARKEY. Thank you so much.

Air pollution is a major area of concern around crypto mining, as miners are bringing coal and gas fired plants back online, or even using dirtier sources of energy, like waste coal in order to buy power for their mining rigs. Mr. Altenburg, have you seen instances where crypto miners have kept dirty and inefficient power plants online?

Mr. ALTENBURG. It certainly appears they have, especially in the two waste coal power plants in Pennsylvania. Prior to Bitcoin mining operation, they were running at very, very low capacity factors.

Coal-fired power plants tend to run 60, 70, maybe 80 percent or more of the time. They tend to want to run full out at a very constant rate. These plants were running closer to 10 percent of the time. When Bitcoin came into operation, part of the goal was to increase the output of these power plants.

Senator MARKEY. The energy use of Bitcoin, especially if it brings carbon-intensive generation back onto the grid, could threaten our climate goals and supercharge climate change. We already know we are living through unprecedented climate chaos.

If Congress turns a blind eye to an energy-intensive energy like Bitcoin while it works to tackle climate impacts, it is like a plumber who tries to fix an overflowing bathtub while the faucet will not

stop running. The problem will not go away, and the damage will just get worse if you do not deal with the potential dangers that are right in front of you.

Dr. Kelles, do you agree that crypto mining jeopardizes State and Federal climate commitments?

Ms. KELLES. Absolutely, to answer it in the context of what you were just speaking about. In New York State, we have about 49 retired power plants. They are retired, because they are less efficient, they are all using older technologies, single cycle turbine technology, and cannot compete on the market with the more modern dual cycle turbine technology, for example. They were mothballed.

The crypto currency mining industry is buying up power plants in New York State and turning them back on and running them up to their full greenhouse gas emissions allowable permits. That is a situation where we had these facilities that were at zero emissions, they were shut down because of inefficiency.

Even if they are converted, as one of them was from coal to natural gas, we still have a significant increase in greenhouse gas emissions from a facility net zero which is where we were. Of course, everyone knows at this point that methane is a stronger greenhouse gas than carbon dioxide. Although coal is less clean with respect to all the types of particulates that it releases into the air, with the gas-fired power plant, particularly with the single cycle turbine that is less efficient, we are of course having significant increases in methane that is released through the entire process of getting the gas to the facility and then of course from the facility.

It is significantly, I believe, hurting our ability to reach our climate goals. We see another facility that is working to come online, and we have all the others that are in our State.

We are very worried. That is why New York State put a moratorium on any of these power plants being turned back on by large scale corporate crypto currency miners, so that we ourselves could do a full-scale investigation of the impact of crypto currency mining on our ability to reach our climate goals.

Senator MARKEY. Thank you. Industry figures claim that Bitcoin miners can burn flared or vented methane gas to power their mining operations. We know that we need to cut down on our methane emissions. That is why we passed an historic methane emission reduction program as part of the Inflation Reduction Act.

I am curious as to whether these claims hold water. Mr. Altenburg, do you believe there are better ways to deal with flared and vented methane than using it to power Bitcoin mining operations?

Mr. ALTENBURG. What we have seen with Bitcoin mining, the innovation we have seen has been innovation in ways to justify that wasting energy is good. Methane is particularly one of those situations.

If you have a situation where you have enough methane that you can capture, that you are flaring, if you can capture it to run a Bitcoin mine, you might as well capture it and put it into the distribution pipeline and get useful work out of it. There is no need to waste the energy that we are wasting on Bitcoin.

Senator MARKEY. If there are better ways to deal with methane, we should avoid fossil fuels in the first place. At the end of the day,

we have direct reports of harms and significant projections of impacts in our society. That is just why we need more transparency across the board.

That is why we are fighting for it today. We are not saying ban, we are not saying do not ban, we are saying, let's just know what is happening. Information will be helpful for everyone, no matter where they live. Just understand, like my mother did, just do not swim in the Malden River. She didn't have any evidence except for the black cloud over our home ward, which wasn't over the other seven wards in Malden. The EPA wasn't even created for 20 more years after I was a boy.

Obviously, you just can not be working off your gut. You need information.

If the industry is confident in its positive contributions to the environment, they should welcome the transparency of the Crypto-Asset Environmental Transparency Act that would provide that information. Really only vampires are afraid of the sunshine. In the same way that so many devices that we plug in at night now, we are all plugging in all these devices every night. They are almost vampires consuming all this electricity.

I had this big battle about 15, 18 years ago with the computer industry. They were of course God's gift, oh my goodness, do not ask us to do an more, didn't we do a great job in just providing you with all these laptops at home? do not ask us to do anything else.

I just said to them, is there any way you could cut the electricity consumption for the home computer when it is just on overnight in default position, when you have your kids' pictures up all night? Can you just cut that electricity consumption overnight? Oh, you have no idea how difficult that is, oh my goodness, you are asking us to figure out something like that after we have given you the great gift of home computers?

Of course they figured it out. Why would we have 100 million devices unnecessarily consuming electricity when you can just put the fix in to make sure it is more efficient while getting the benefit of the new technological breakthrough.

That is just kind of the default position of a new group of geniuses in their little industry, you can not actually call upon us to have any additional burdens when all we are saying is, like my mother, work smarter, not harder. Just use a more efficient way of doing it.

Let me again turn to Senator Ricketts for more questions.

Senator RICKETTS. Thank you, Mr. Chairman.

Dr. Kelles, you had said that in New York, that the crypto industry was going to turn on 49 plants that had been retired, is that accurate?

Ms. KELLES. No, what I said is we have 49 power plants. The concern is that there was a trend beginning, we saw one purchased and turned back on, and another purchased in the permitting process and turned back on with the existing rigs that they have. We have 49 in the State.

The concern was if that trend continued without us evaluating the full impact on our ability to reach our climate goals with respect to GHG emissions, water impacts, and air quality impacts, that we might not reach our climate goals.

The idea of course was that we needed to stop that particular trend. I want to be clear: this was a very narrow moratorium. It was specifically on the purchasing of retired power plants in the State by consolidated crypto currency mining corporations. Of course, you and I probably can not afford on our own to buy a retired power plant. This did not pertain to those that plugged into the grid or those using renewable energy infrastructure onsite.

It was narrow, but the intention was to give us the opportunity in time to not have the full extent of the impact, which I think is fundamentally parallel to what you are trying to do with this piece of legislation, to capture the data and be able to do a full analysis.

Senator RICKETTS. Presumably, the other plants went through a permitting process, is that accurate? At least the one plant that did get up and running went through a permitting process and got permitted, so that was in operation, is that accurate?

Ms. KELLES. The first use, the permits that had been in place, and they got an extension of those permits, but then they went through a renewal process this last year and actually were denied an extension of that, the air permit, because it was recognized that the permit and the activity that was being used for that facility no longer aligned with our Climate Leadership and Community Protection Act. That is currently in the courts, because that was appealed. That will go through, I presume, for potentially even years. That was the initial process.

The water permit was extended at the time. Actually for 4 years they were out of compliance with the permit that required that they put a screen up on the pipe that was pulling water into, from the lake, and then into the facility. Therefore, because there wasn't a screen, it was killing wildlife, a significant amount of wildlife.

Last year, they did finally put that screen in and are now compliant. They were given a couple extra months to become complaint.

That is with the water permit. We will see what happens with the renewal of that permit.

Senator RICKETTS. It is safe to say though, there is a process in place for the permits, and they go through the process, and the State itself was deciding whether or not to give those permits, is that right? You just said that the State denied them on the air permit.

There is a way in place to be able to address the emissions, correct?

Ms. KELLES. Not fully. Those are only the facilities that are in power plants. As we have talked about, there are many different types of facilities, so they can be mini-rigs inside shipping containers in a field, which is very common. They can be in a warehouse, all of those plugged into the grid. They can be plugged into the grid but doing net metering so paying for hydroelectric. Then there is the question of opportunity costs.

The reason for the requirement for the full environmental impact assessment—

[Simultaneous conversations.]

Senator RICKETTS. Everything that is going to provide power to any of these crypto things is going to have to be permitted, right?

Ms. KELLES. No, not necessarily. You are pulling directly from the grid and you have a warehouse on your property, even if you have a different type of business, that does not require a permit.

[Simultaneous conversations.]

Senator RICKETTS. The power that is generated to go into that warehouse has to be permitted, right?

Ms. KELLES. Not necessarily, no.

[Simultaneous conversations.]

Ms. KELLES. If you say there is no power generation, then there is no power generation. If you are plugged directly into the grid, you are not producing your own energy.

Senator RICKETTS. Somebody is producing the energy if it is supplying it, right?

Ms. KELLES. The grid. Yes. It may be buying the energy from the grid, that is just the grid. If they want to pay more of an electricity bill, they will.

Senator RICKETTS. Somebody has to put power into that grid, which means it has to be permitted some place, right?

Ms. KELLES. What is permitted would be the hydroelectric or any of the electrical generating facilities, but not a warehouse that is tied onto the grid.

Senator RICKETTS. Dr. Kelles, I think you are missing my point, that anything that is going to generate power, that is going to create emissions, is going to be permitted. There is a rule and system in place to be able to handle that, and you yourself have demonstrated in New York that you are taking steps to limit emissions based upon what you want to do in New York. In fact putting a moratorium on bringing on any of these other lines.

You are actually——

Ms. KELLES. I am being very clear, with all due respect, being very clear, there is energy generation and there is energy usage. Energy generation is regulated. Energy usage, if you have a restaurant or a warehouse, or if you have a superstore, you are not permitted for your energy usage. Usage is not the same as generation.

Generation, a generator is permitted. If you are not a generator, then you are not permitted in that way.

Senator RICKETTS. Right, and that was my point, that all this power generation, not the use, the power generation is permitted, and New York is taking steps to do it.

Ms. KELLES. The question is whether or not there is an opportunity cost, because the energy that is used, the significant amount of energy that is used, when we are trying to get our entire grid onto renewable energy infrastructure, if we are increasing our baseload on that grid significantly, then we will have to increase significantly our renewable energy infrastructure construction goals. The question is whether or not we have the land infrastructure and other ability to reach those goals. We have limited amount of land that we can build solar on, for example, and it competes directly with agricultural land and food production.

There are limits.

Senator RICKETTS. Is Nebraska New York? And vice versa, is New York Nebraska?

Ms. KELLES. No, it is not.

Senator RICKETTS. They are different States. It is fair to say that different States are going to have different needs with regard to power generation and permitting and clean air and things like that?

Ms. KELLES. Yes, and I would say with a caveat that any increased energy demands that you are putting on a grid means that you will need to produce more renewable energy infrastructure to make that grid completely renewable.

Senator RICKETTS. Thank you, Dr. Kelles. I have run way over. Thank you, Mr. Chairman.

Senator MARKEY. Absolutely no problem. I love this subject. Honestly, every question we are asking is vastly expanding the body of knowledge for all the Senators. This is the frontier in terms of issues. It gets kind of arcane until you have the discussion, then you can keep reducing it down to a more simple understanding of what we are talking about.

I love any question that anyone has, because I am learning from all of this as well.

Mr. Altenburg, do you think crypto supports or undermines our national goal for clean, affordable and reliable electricity?

Mr. ALTENBURG. It certainly does, even in the situation where we have crypto mining coming from our new plants, that is diverting carbon-free energy from the grid. We heard testimony or you have heard people say that doing things like using more Bitcoin mining can incentivize solar or bring more solar on the grid.

That is not what we are seeing happening on the ground. The Bitcoin miners are incentivized to use energy sources that are available at very, very high capacity factors. In almost all cases, those are fossil fuel or formerly baseload resources. Those resources we have to, if we are going to decarbonize our grid, we are going to need clean, renewable generation. Wasting energy on unnecessary proof-of-work mining, when we can have crypto currency and blockchain technology without that is just counterproductive.

Senator MARKEY. Do you think that more disclosure would stifle or actually encourage innovation in this industry?

Mr. ALTENBURG. More disclosure always helps regulators. I speak from working for 22 years as a State regulator. Having the information to back up our decisions is absolutely essential.

Senator MARKEY. I just have a couple more questions. Do you have any additional, Senator? You do, great.

It is the goal of the legislation to provide transparency in all types of environmental impacts. People who live near crypto mining facilities have said "It is like living on top of Niagara Falls, it is like a jet that never leaves."

Dr. Kelles, is it true that crypto mining facilities produce non-stop noise which can affect quality of life, especially in rural communities?

Ms. KELLES. Yes, absolutely. That is what I hear also from constituents around the State, that it has not only significantly impacted their own experience, because many of them are in fields, many of them are in places where there are not that many people. We have examples of a large-scale crypto currency mining operation near trails, and it is significantly impacting people's ability

to appreciate nature and get away, because it is like standing on a tarmac, is what I have heard from people.

There is also some disturbing data on the impact of the noise on animal species, birds, which I think is actually particularly disturbing given the estimates of decline in birds that we are already seeing.

Senator MARKEY. Could you also talk about the facilities using water in excess of necessary quantities?

Ms. KELLES. Yes. The facility that began this conversation, as I spoke of earlier, Greenidge, does pull in up to 140 million gallons of water a day and releases it at significantly higher temperatures. One thing that I have not emphasized is that we have seen massive surges in harmful algal bloom outbreaks all throughout all of the Finger Lakes, the Great Lakes, even coastal areas. That can be directly impacted by increasing temperatures from these facilities.

That is also harmful. It is harmful for all the wildlife and also toxic for humans.

Senator MARKEY. One final question, which is that some of the supplemental testimony which has been submitted today states that each Bitcoin transaction is tied to the same amount of e-waste as throwing away two iPhones. Could you talk about that?

Ms. KELLES. Yes, absolutely. The e-waste, there is some research showing a massive, exponential global increase in e-waste directly tied to cryptocurrency mining. I would also note it is not just the existence of e-waste which in and of itself is concerning, but a large percentage of e-waste produced every year is exported from high income countries to low and middle income countries where regulations on dismantling, recycling, and refurbishing may be lacking or even poorly enforced.

According to the WHO, an estimated 12.9 million women, and I think it was 18 million children and adolescents as young as 5 years old work in the informal waste sector, which potentially exposes them to toxic e-waste. Their goal in this work is often to recover copper and gold from used electronics, risking exposure to harmful chemicals such as lead, mercury, nickel, brominated flame retardants and polycyclic aromatic hydrocarbons.

All of these are highly correlated with some health issues like stillbirth and premature birth, low birth weight and length, and exposure to lead, of course, we know has a lot of neurological issues, increasing rates of ADHD, behavioral problems, sensory integration difficulties. Huge, huge, issues that we are not discussing sufficiently with respect to the health and the escalating e-waste from this industry.

Senator MARKEY. Thank you so much.

Senator Ricketts?

Senator RICKETTS. Thank you, Mr. Chairman.

Mr. Altenburg, so you have many times throughout the course of the day today have described this as wasteful energy. I think you said it should be used for useful work. You also said that a Bitcoin, once you mine it, is worth \$144,000, right?

Mr. ALTENBURG. That is what the market value is.

Senator RICKETTS. Doesn't that mean, if there is a market for it, that somebody considers it valuable because they are willing to pay for it?

Mr. ALTENBURG. People certainly see a cash value. The question of what does it do productive for the economy, Warren Buffet had said in an interview not too long ago that when you buy Bitcoin, you have nothing. The only thing you really have is the hope that somebody else is going to pay more.

Senator RICKETTS. What do you use the blockchain technology for, right?

Mr. ALTENBURG. A blockchain itself could be potentially used for a lot of different things, smart contracts was one of the things mentioned, which Bitcoin is not currently capable of doing, but Ethereum is. Certainly recording data in a secure way.

[Simultaneous conversations.]

Senator RICKETTS. You talked about before how hard it was to break that encryption, right?

Mr. ALTENBURG. It is not the encryption. The blockchain is very transparent. You can see everything that is on it. What it is, what has happened it is very, very difficult to change. It is basically a write-once structure.

Senator RICKETTS. Okay. Then who are the people that find value in Bitcoin?

Mr. ALTENBURG. Mostly currency speculators.

Senator RICKETTS. Okay, and who are they speculating with?

Mr. ALTENBURG. They are buying Bitcoin hoping that somebody tomorrow will buy it for more.

Senator RICKETTS. Okay, so, but somebody, you are generating this Bitcoin and then you can turn that Bitcoin in to buy other things, right?

Mr. ALTENBURG. Yes.

Senator RICKETTS. It does actually have value?

Mr. ALTENBURG. Yes.

Senator RICKETTS. Somebody is willing to pay for it.

Mr. ALTENBURG. There is no doubt there is a market value to it. The question is, are we actually gaining something. When we build a bridge, we have built a physical asset. When we build a car or a cell phone, there is a physical asset. Bitcoin does not have that. The only real value you have is potentially transaction fees as part of extending the blockchain.

We can do all the blockchain stuff. We can have all of that without using anywhere near the amount of energy that Bitcoin uses. It is not adding anything new to the economy.

Senator RICKETTS. When you say you do not have anything physical, do you have to have something physical to have value?

Mr. ALTENBURG. Again, there is a distinction between, is there a market value, yes. People are willing to spend money for it. When we are evaluating whether this is a reasonable thing to do, people are willing to spend money on lots of things. Are they the best choice?

Senator RICKETTS. Is it the government's job to tell people they can or cannot spend money on the things they wish to choose to?

Mr. ALTENBURG. As Senator Lummis said, in a lot of cases, the government does exactly that. We have plant sufficiency standards.

Senator RICKETTS. Well, that is very different. A plant sufficiency standard is very different than saying, you can or cannot spend your money on something, right? I am not telling you you can not

buy an appliance, I have standards for how you produce them, but I am not telling you you can not buy one. It seems to be what you are implying when you are talking about this Bitcoin being wasteful.

Mr. ALTENBURG. I am looking at it in this context of things like efficiency standards. We do that all the time for whether it is environmental reasons, for pollution, whether it is national security reasons, for energy security. There is a long history of the government making judgments about these industries are wasteful, it is inappropriate, it does not put us in a good position going forward. I think Bitcoin is one of them. It does not bring anything unique that we need.

Senator RICKETTS. Ms. Dentlinger, in Nebraska, NPPD, how do you look at different industries with regard to the rates you charge? Do you have any additional requirements on different industries? Do you treat them differently with regard to things like disclosure or anything like that? Is there an analogy here somewhere?

Ms. DENTLINGER. No. We are very agnostic to whatever the industry that is actually using the industry. We have different rates for different customer classes, whether it is residential or commercial or industry. Beyond that, we are not looking into the industry.

Senator RICKETTS. Who is your largest power user in the State of Nebraska?

Ms. DENTLINGER. Currently, Nucor Steel.

Senator RICKETTS. Okay, so Nucor Steel. Do you ask them to disclose anything with regard to their power generation?

Ms. DENTLINGER. No.

Senator RICKETTS. Do you actually charge them a separate rate because they are using so much power?

Ms. DENTLINGER. No, actually, again, because they are using so much and using it so regularly, the rate that they pay tends to be lower, because it is a more efficient use of our assets.

Senator RICKETTS. again, it is one of those things where as you are generating more or you have a customer who is using more energy and it is more stable, as Nucor Steel is, you are actually charging them less because it actually is more efficient to generate that power.

Ms. DENTLINGER. Yes. We are cost-of-use, our rates are based on what it costs us to produce and deliver the electricity. That is reflected in our industrial rates.

Senator RICKETTS. Great. Thank you.

Senator MARKEY. I thank Senator Ricketts, I thank all of our witnesses. Of course, Nucor's emissions are captured by the EPA. That is a part of the public record, what their emissions are.

In general, I would say this has been one of the most informative hearings that the Congress has had in a long time, about a subject that is just not had the attention which it needs. I thank all of our witnesses for your great testimony today. We are going to proceed on this subject because ultimately we just need to ensure the information is out there.

Bitcoin is the first cryptocurrency, but it is not staying current with other assets like Ethereum. Its impacts are real, but its energy efficiency innovation is not developing at the same time.

Bitcoin is like if we still insisted on using whale oil to light our homes instead of energy efficient LEDs. That is the gap between proof-of-work that Bitcoin uses, and other systems like proof-of-stake that Ethereum uses. One is 99 percent more energy efficient than the other.

It is just good to get that out there to make it clear that there are other ways of doing business.

We are talking today about unavoidable, untracked environmental impacts. We track emissions and impacts of mines, of cars, of power plants. We have a drain on our system with Bitcoin that is not accounted for. Other crypto assets like Ethereum produce value while using 99.9 percent less energy.

It is climate, it is air, it is noise, it is water, it is waste. These computer motherboards are harming Mother Earth. We do not know the extent of the damage, we do not have anyone checking the work of crypto mining companies that argue they are helping the planet or the grid.

That is why the Crypt-Asset Environmental Transparency Act is so important, and States like New York or Pennsylvania or Massachusetts or Nebraska are taking a case by case approach to this new power sucking powerhouse industry. We need a Federal approach just so we have the information out there as to what the climactic impacts are.

The Senate Environment and Public Works Committee is the ideal forum to consider legislation which would do just that. They are unlikely to have this hearing over in the Banking Committee, the Financial Services Committee. This is our job. Our job is to look at these aspects of this new technology.

I thank my colleagues for their participation in this hearing. I am very grateful to our witnesses today.

Before I adjourn, some housekeeping. I would like to ask unanimous consent to submit for the record a variety of materials that include letters from stakeholders that relate to today's hearing. Without objection, so ordered.

[The referenced information follows:]



March 5, 2023

The Honorable Senator Edward J. Markey-Chair
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts-Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey, Ranking Member Ricketts, and all Committee Members,

We write on behalf of Earthjustice, the premier non-profit environmental law organization, to urge your committee to support the Crypto-Asset Environmental Transparency Act. We represent and partner with many communities and organizations around the country who are negatively impacted by the externalities of cryptocurrency mining operations that have moved into their backyards and which threaten progress in our fights to prevent the worst of the climate crisis in the coming years.

The explosive growth of crypto-asset mining in the United States is impacting utilities, energy systems, emissions, communities, and ratepayers in real-time. Crypto-asset mining is an extremely energy-intensive process that threatens the ability of governments across the globe to reduce our dependence on climate-warming fossil fuels. If we do not take action to limit this growing industry now, we will not meet the goals set forth by the Paris Agreement and the Intergovernmental Panel on Climate Change to limit warming to 2°C. Because these operations operate 24/7/365, and are designed to consume enormous quantities of energy, they increase demand for fossil fuel operations – increasing local air, water, and noise pollution, increasing costs on others, and increasing climate pollution at a time when we should be doing everything in our power to move in the opposition direction to mitigate the worst impacts of the climate crisis.

In the year prior to July 2022, Bitcoin consumed an estimated 36 billion kilowatt-hours (kWh) of electricity, as much as all of the electricity consumed in Maine, New Hampshire, Vermont, and Rhode Island put together in that same time period. Top-down estimates of the electricity consumption of cryptocurrency mining in the United States imply that the industry

was responsible for an excess 27.4 million tons of carbon dioxide (CO₂) between mid-2021 and 2022 — or three times as much as emitted by the largest coal plant in the U.S. in 2021.¹

The past two years have demonstrated that the industry preferentially seeks readily-available energy and minimal regulation, re-starting defunct coal and gas plants, flooding the restructured electricity market in Texas, and tapping into rural power grids where regulators have little oversight. This explosive growth strains energy grids, raises retail electricity rates, and increases total carbon emissions and local air pollution.

In September 2022, Earthjustice and the Sierra Club released a guidebook, “The Energy Bomb: How Proof-of-Work Cryptocurrency Mining Worsens the Climate Crisis and Harms Communities Now,” attached as Attachment A. The guidebook is a comprehensive report on the opaque and little-regulated cryptocurrency mining industry and its negative effects on the climate, local communities, and public health. It also provides a myth-busting section that tackles the industry’s greenwashing talking points to justify its massive energy use. The guidebook includes policy recommendations for local and state officials, utility regulators, utilities, environmental regulators, and grid operators to protect energy systems, communities, and ratepayers.

Some highlights, or perhaps low-lights, from the guidebook include:

- Proof-of-work cryptocurrency mining has grown explosively in the United States since 2020. Today, an estimated 38% of Bitcoin is mined in the U.S, resulting in nearly 30 million tons of excess CO₂ emissions in the last year alone.
- The massive energy consumption of cryptocurrency mining threatens to undermine decades of progress toward achieving climate goals and reducing local pollution.
- Cryptocurrency mining operations raise costs and risks for utilities and their ratepayers, and can stress electric grids. Our guidebook provides examples of this in Texas, Kentucky, and New York, among other states.
- Cryptocurrency mining operations flood neighboring communities with unbearable noise pollution.
- The cryptocurrency mining industry already uses half the electricity of the entire global banking sector, and it will overtake the sector in two years if current trends continue. Meanwhile, the ratio of Bitcoin’s energy consumption to humans who actually have Bitcoin is extremely high.

¹ Earthjustice & Sierra Club, *The Energy Bomb: How Proof-of-Work Cryptocurrency Mining Worsens the Climate Crisis and Harms Communities Now*, at 13 (Sept. 2022), <https://earthjustice.org/feature/cryptocurrency-mining-environmental-impacts>, attached as Attachment A.

- Rather than investing in long-term energy infrastructure that benefits the grid, the cryptocurrency mining industry seeks the fastest energy that can serve its needs, and looks for minimal regulation and oversight. In practice, that translates to mining cryptocurrency at coal and gas plants, straining the electric grid in Texas, and tapping into power grids that are often fossil-fuel heavy. Miners are often given preferential electricity rates – much lower than average Americans pay for their electricity.
- Most mining facilities draw their power from the grid. That means electricity is generated by whatever existing energy is in place in the region. No grid anywhere in the U.S. is 100% renewable yet.
- Proponents also claim that mining is spurring new renewable development and stabilizing the grid. But clean energy allocated to cryptocurrency mining doesn't actually do anything to decarbonize the grid, and there are few mining facilities that are building renewables to even power their own operations, let alone send to the grid. Increased load is increased load, which in nearly every locality, means increased fossil-fueled generation.
- Cryptocurrency mining proponents claim that mining can use “wasted” energy from solar or wind overproduction. But mining operations consume energy 24 hours a day, not just when there is excess solar or wind — meaning mining operations would fail to be profitable using only the hours when wasted energy is available. That renewable energy needs to get to everyday people as soon as possible, without incentives to be hoarded by for-profit mining that benefits very few. And flared or vented gas from oil and gas production that is used to mine Bitcoin merely incentivizes additional oil and gas production, which is the opposite of what needs to be done in the middle of, and to prevent the worst impacts from, a climate crisis.

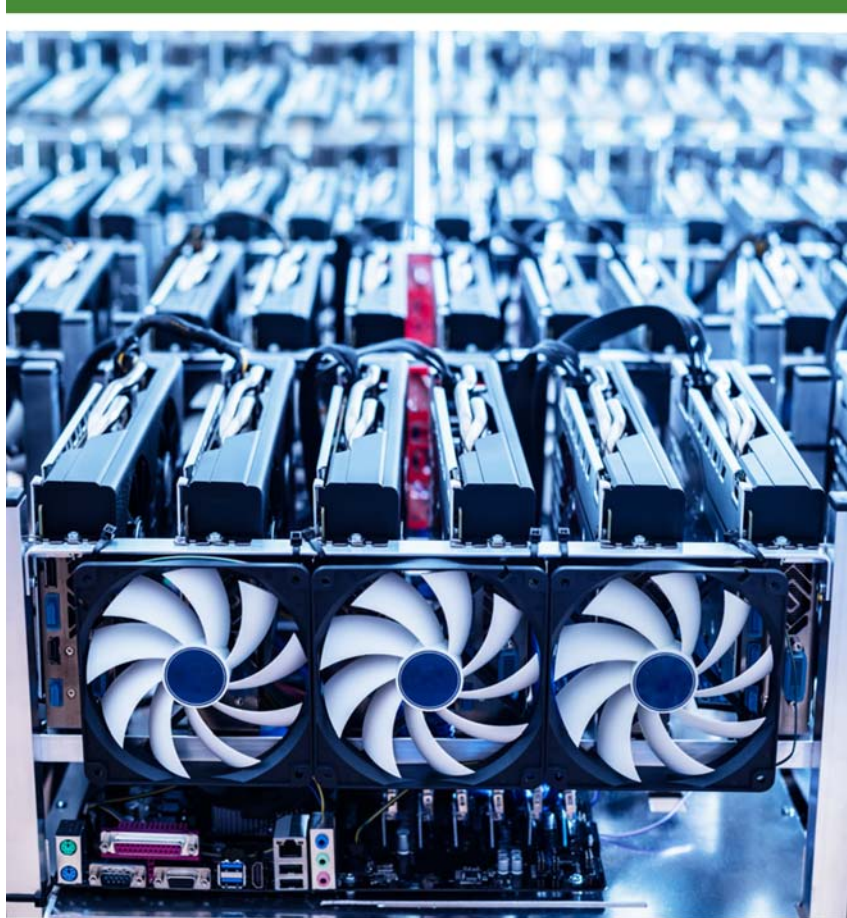
The crypto-asset mining industry continues to be nebulous and opaque, with very little regulation or reporting standards. That makes it difficult to track and get a complete picture of its full impact.

The Crypto-Asset Environmental Transparency Act will help us gain a better understanding of crypto's environmental impacts in the United States to better inform our policy solutions. The Act would require the Environmental Protection Agency (EPA) to conduct a comprehensive impact study of U.S. crypto mining activity and require the reporting of greenhouse gas (GHG) emissions from crypto mining operations that consume more than 5 megawatts of power. It would also include crypto mining facilities in energy efficiency and reporting programs that apply to other types of data centers. These would all be important first steps toward addressing the threats posed by this extremely energy-intensive industry. We urge the committee to support the Crypto Environmental Transparency Act.

Respectfully submitted,

Mandy DeRoche, Deputy Managing
Attorney
Thomas Cmar, Senior Attorney
Clean Energy Program
Earthjustice

Attachment A



THE ENERGY BOMB

How Proof-of-Work Cryptocurrency Mining Worsens
the Climate Crisis and Harms Communities Now





September 2022

Mandy DeRoche, Deputy Managing Attorney,
Clean Energy Program, Earthjustice

Jeremy Fisher, Senior Advisor for Strategic Research and
Development, Environmental Law Program, Sierra Club

Nick Thorpe, Climate & Energy Senior
Program Associate, Earthjustice

Megan Wachspress, Staff Attorney,
Environmental Law Program, Sierra Club

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Cryptocurrency Mining Worsens the Climate Crisis and Harms
Communities Now* (Sept. 2022).

Cover photo: iStock/NiseriN

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Executive Summary

Cryptocurrency mining is an extremely energy-intensive process that threatens the ability of governments across the globe to reduce our dependence on climate-warming fossil fuels. If we do not take action to limit this growing industry now, we will not meet the goals set forth by the Paris Agreement and the Intergovernmental Panel on Climate Change to limit warming to 2 degrees Celsius. And cryptocurrency mining operations harm local communities now, including by increasing local pollution and impacting electricity rates and delivery. In our paper, we discuss several such examples where fossil-fueled cryptocurrency mining has increased local air, water, and noise pollution, increased costs on others, and increased climate pollution at a time when we should be doing everything in our power to move in the opposite direction to mitigate the worst impacts of the climate crisis.

The cryptocurrency mining industry is opaque: there are few, if any, reporting standards, and there is little or no formal tracking of mining operations. This report is the first attempt to comprehensively document the explosive growth of cryptocurrency mining in the United States and examine how this industry is impacting utilities, energy systems, emissions, communities, and ratepayers — based on public filings before utility and financial regulators, investor presentations and reports, and local media reports.

Cryptocurrency Mining's Explosive Growth in the United States

After cryptocurrency mining was banned in China in 2021, the amount of mining operations exploded in the United States. As of this writing, it is estimated that 38% of Bitcoin — the predominant proof-of-work cryptocurrency — is mined in the United States. We estimate that in the year prior to July 2022, Bitcoin consumed around 36 billion kilowatt-hours (kWh) of electricity, as much as all of the electricity consumed in Maine, New Hampshire, Vermont, and Rhode Island put together in that same time period. And while proof-of-work mining proponents claim that cryptocurrency always looks for the cheapest energy, the last two years have demonstrated that the industry preferentially seeks readily-available energy and minimal regulation, re-starting defunct coal and gas plants, flooding the restructured electricity market in Texas, and tapping into power grids where regulators have little oversight. This explosive growth strains energy grids, raises retail electricity rates, and increases total carbon emissions and local air pollution.

What is Cryptocurrency Mining, and How Does It Work?

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.

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. 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. 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.

In addition, the mining industry is becoming highly concentrated. The energy and technology requirements of cryptocurrency mining means that mining operations require the backing of large capital. For example, the National Bureau of Economic Research estimates that 0.5% of mining companies control 70% of mining. This increasing concentration in turn lends itself to the arms race where large corporations are able to leverage enormous capital to build massive mining facilities, like the 750 megawatt Whinstone mining facility an hour east of Austin, Texas.

Proof-of-Work Cryptocurrency Mining Increases Emissions in the United States

Top-down estimates of the electricity consumption of cryptocurrency mining in the United States imply that the industry was responsible for an excess 27.4 million tons of carbon dioxide (CO₂) between mid-2021 and 2022 — or three times as much as emitted by the largest coal plant in the U.S. in 2021. But these estimates are simply based on

the likely energy consumption to solve cryptocurrency's puzzles. A ground-up approach, looking at how the industry has actually been deployed, suggests that proof-of-work cryptocurrency might be yet more impactful.

Tracking down the energy sources—or even just the consumption—of proof-of-work cryptocurrency mining in the United States is difficult. The industry is notoriously opaque, and little-to-no reporting requirements exist at either the state or federal level. The most reliable sources of information are a patchwork of filings before the Securities and Exchange Commission (SEC) by publicly-traded cryptocurrency companies, environmental permit applications, utility and other energy filings, and local reporting.

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. Each type of mining produces excess emissions, and impacts electricity and energy consumers.

- **Behind-the-Meter at Power Plants.** Most egregiously, we identified four fossil-fueled power plants (the Scrubgrass and Panther Creek waste coal plants in Pennsylvania and the Greenidge and North Tonawanda gas plants in New York) that have been purchased and converted to mine proof-of-work cryptocurrency mining.
- **Power Purchase Agreements (PPAs).** Power plants or utilities may agree to sell a specific amount of electricity to a cryptocurrency miner. In some cases, a PPA is just a financial transaction, and in some cases, it can even change the amount that a power plant operates. In either case, when a cryptocurrency mining facility holds a contract with a fossil plant or a fossil-heavy utility, it provides a direct incentive to keep running polluting power plants. For example, an arrangement between Marathon Digital and the Hardin coal plant in Montana, which had been on the verge of retirement, led to ramped up operation and an 800% increase in CO₂ emissions (and 500% increase in sulfur dioxide emissions) from the plant in one year. Another example is the recent AboutBit agreement to purchase electricity from the Merom coal plant in Indiana. There, the plant's owner had previously announced a May 2023 retirement date, which has now been postponed, and a nearby coal mine has reopened to serve the plant.

- **Electricity Purchases.** Cryptocurrency miners that rely on retail electricity seek low cost—and rapidly available—electricity, wherever they can find it. An influx of new, large customers (sometimes doubling the utility's existing load) has forced utilities to seek additional generation resources or reduce off-system sales, strained their ability to manage the system, and raised prices for other customers. We found numerous examples of utilities making significant investments to serve cryptocurrency miners that were—or are likely to be—paid for by existing ratepayers. In some of these cases, the mining operation left abruptly months later, leaving behind stranded costs that are picked up by the utility and its customers:

- The Nebraska Public Power District spent \$17.6 million, or 18% of its 2020 budget, on transmission and a substation for a cryptocurrency mining operation.
- Big Rivers Electric utility plans to spend \$12.7 million in upgrades to service a new cryptocurrency mining operation in Paducah, Kentucky.
- Entergy Arkansas reported that a cryptocurrency mining operation left “virtually overnight” in search of lower rates in 2019 after the utility expended significant funds on facility upgrades on the customer's behalf.
- In 2018, a mining operation in Washington State left more than \$700,000 in utility bills unpaid after it declared bankruptcy.
- **Combusting Fossil Gas at Oil and Gas Wells.** Some companies mine cryptocurrency at the site of previously closed or low-operating fossil gas wells and use on-site generators to power their mining equipment. There is also an increasing amount of companies that sell cryptocurrency mining rigs specifically designed to tap into gas at oil-producing wellheads. The cryptocurrency mining operations provide additional revenue to oil drilling companies, by finding entities that would have otherwise been unwilling to gather oil-drilling's “associated gas” as required.

The Industry Keeps Greenwashing Its Poor Practices

The proof-of-work cryptocurrency mining community is well aware that 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 energy, but instead drive increased emissions from gas and coal plants.

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. 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 proof-of-work cryptocurrency 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 actually 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 paid enough to do so. A miner’s participation in demand response 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. Unlike batteries, mining operations cannot store electricity produced at peak solar or wind hours for later use, and provide no other grid services.

Today, the cryptocurrency mining industry already uses half the electricity of the entire global banking sector (while holding a minuscule fraction of the value), and continues to increase. In the United States, the industry has shown little indication of slowing its growth when prices are high. Miners have demonstrated, consistently, from their initial rush to China where coal is a predominant source of electricity to the recent deal between AboutBit and a soon-to-be-retired coal plant in Indiana, that proof-of-work cryptocurrency mining prioritizes the short-term need for large amounts of electricity over longer-term investments in renewable energy. And unlike other industries where self-imposed, or regulation-based, community standards could result in more sustainable practices, proof-of-work mining is an inherent arms race towards increased energy consumption, until prices no longer support growth.

Regulators and Policymakers Can Take Steps to Reduce the Harm of Cryptocurrency Mining

State, local, and federal policymakers and regulators can help ensure cryptocurrency mining does not undermine climate or health goals, or adversely impact ratepayers.

The massive energy consumption of cryptocurrency mining threatens to undermine decades of progress towards achieving climate goals, and threatens grids, utilities, communities, and ratepayers. Some jurisdictions have, or are considering, simply banning the practice of mining proof-of-work cryptocurrencies. Shy of a complete moratorium, there are actions that can be taken by state, local, and federal officials to protect energy systems, communities, and ratepayers.

POLICY AND REGULATORY OPTIONS

- Local and state officials can enforce pollution and noise ordinances, ensure that they are not extending economic development dollars on false promises of long-term jobs or revenue, develop careful zoning codes, and — in the cases where municipalities run the electric utility — develop tariffs that protect existing ratepayers.
- Utility regulators can influence or bar problematic power purchase agreements, create protective electricity rates or system benefits charges that ensure speculative mining operations do not leave a trail of stranded assets, critically assess utility plans for energy procurement for cryptocurrency mining facilities, and ensure that mining facilities do not increase electricity or capacity costs for existing customers.
- Utilities can develop electricity rates that protect against stranded assets, ensure that they do not need to expand power capacity to meet cryptocurrency mining load, and charge rates sufficient to fully protect existing ratepayers from the increased marginal cost of production.
- Grid operators can develop comprehensive guidance and rules around the interconnection of high-density loads, study the impact of cryptocurrency mining on congestion, resource adequacy, and wholesale market prices, and create rules that minimize the impact of cryptocurrency mining on other customers.
- Environmental regulators at all levels should consider affirmative regulation to minimize the local health and environment impacts cryptocurrency mining places on local communities.

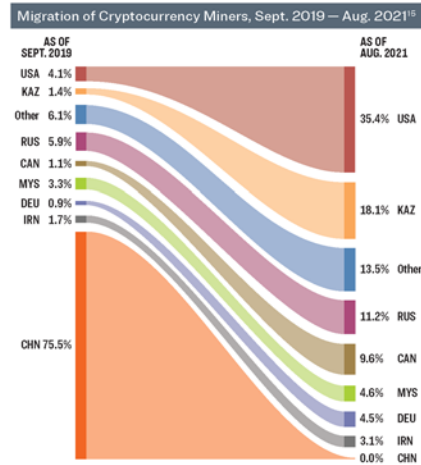
I. Cryptocurrency Mining's Explosive Growth in the United States

So-called “proof-of-work” cryptocurrencies are secured by the use of intensive computing—and electricity—resources. Cryptocurrencies, starting with Bitcoin, innovated an approach to tracking, and verifying, transactions that requires no central entity, like a bank. But the currently predominant cryptocurrency, Bitcoin, bases its security on an approach that requires machines to compete to solve complex puzzles. The growth in the value of Bitcoin led to an arms race—and explosive energy consumption globally, and over the last year, in the United States. The Cambridge Centre for Alternative Finance estimates that Bitcoin alone increased its electricity consumption from less than a gigawatt (GW) per day in early 2017 to more than 11 GW in July 2022.¹ By early 2022, prior to the collapse of Bitcoin prices,² Bitcoin was consuming over 10.5 billion kilowatt hours (kWh) every *three months*—or the equivalent output of ten large coal-fired power plants.³

In its April 2022 report, the Intergovernmental Panel on Climate Change (IPCC) warned that soaring electricity use by proof-of-work digital currencies is likely to “be a major global source of CO₂ if the electricity production is not decarbonized.”⁴ The White House’s Office of Science and Technology Policy (OSTP) recently estimated that proof-of-work cryptocurrency mining likely comprises somewhere between 0.9% to 1.7% of total annual U.S. electricity usage, or 36 to 66 billion kWh per year in mid-2022.⁵

Bitcoin has been at the center of cryptocurrency energy debates, and rightfully so: Bitcoin mining uses far more electricity than any other cryptocurrency, for two reasons. First, Bitcoin makes up more than 40% of the cryptocurrency market share, by far the largest of any currency.⁶ Second, Bitcoin is the most energy-intensive cryptocurrency in wide circulation, because it uses a “proof-of-work” mining method that is designed to require increased energy inputs for the same economic output over time. Because of its outsized energy footprint, this paper focuses on Bitcoin as a proxy for other proof-of-work cryptocurrencies. As of this writing, the second largest energy consuming cryptocurrency, Ethereum, was in the process of transitioning from a proof-of-work construct to a “proof-of-stake” verification, an alternative mechanism of securing cryptocurrency transactions that does not require machines to solve the same volume of puzzles—and hence uses only a small fraction of proof-of-work algorithms.⁷

Until last year, the majority of Bitcoin mining was physically located in China. In May 2021, Chinese officials initiated a crackdown on cryptocurrency mining operations; within a month, more than 90% of operations were shut down or planned to.⁸ Bitcoin mining, however, continued its upward trajectory, with much of the computing shifting to the United States.⁹ Although there had been some indications of growth in U.S.-based mining in 2020,¹⁰ in a matter of months, the amount of U.S.-based mining exploded, with little regulatory oversight.¹¹ In 2019, the U.S. accounted for just 4% of global mining; as of August 2022, nearly 38% of Bitcoin mining activity is estimated to be based out of the U.S.¹² By January 2022, U.S. Bitcoin operations were consuming an estimated 3.7 billion kWh per month—more than the January electricity sales of the entire state of Kansas or Nevada.¹³ Assuming that the efficiency of mining machines in the United States is roughly consistent with those used in other countries, we estimate that Bitcoin mining consumed 35.8 billion kWh from June 2021 to July 2022, or as much electricity as all of Maine, New Hampshire, Vermont, and Rhode Island put together—or every industrial electricity customer in Georgia.¹⁴



When primarily located in China before it was banned, cryptocurrency mining was often powered by hydroelectric facilities and coal plants. When miners fled China, they began to power operations with gas and fossil-heavy grids (especially in the United States) and hard coal (in Kazakhstan). The share of renewable energy used to power Bitcoin mining is estimated to have dropped from 41.6% in 2020 to about 25.1% in August 2021.¹⁶ At least one estimate suggests that U.S.-based Bitcoin miners are already responsible for at least one-quarter of the global greenhouse gas emissions caused by Bitcoin mining.¹⁷ OSTP estimates that Bitcoin mining in the United States alone is responsible for between 21 to 35 million tons (Mt) CO₂ per year; and global Ethereum operating on a proof-of-work algorithm accounts for 25 to 50 MtCO₂ per year.¹⁸

This paper identifies the impacts from proof-of-work cryptocurrency mining have on our electric system, utility bills, air and water quality, communities, and decarbonization goals. The rapid rise of massive, centralized, proof-of-work cryptocurrency mining operations affects utilities, ratepayers, and the environment. It also threatens to reverse ongoing trends toward the decarbonization of the U.S. power sector, further entrenching fossil fuel production and consumption. This paper seeks to educate advocates, policymakers, regulators, and the public about the immediate threat that proof-of-work cryptocurrency mining poses to communities, ratepayers, and climate action and to provide a much-needed corrective to myths that cryptocurrency mining companies have promoted about the relationship between their business model and clean energy.

II. Proof-of-Work Cryptocurrency: A Brief Introduction

What are “proof-of-work” cryptocurrencies, and why do they use so much energy? In short, proof-of-work cryptocurrencies’ mechanism for protecting the integrity of ownership is to require computers or mining machines to compete to solve complex mathematical puzzles, and reward the winner (the miner) with currency. The mechanism is designed to promote an arms race: more machines competing to solve the puzzle theoretically means that no single entity can control, or monopolize, the system. The person or company with the most computational power will be rewarded with the most currency. Consequently, cryptocurrency mining operations are running immense computational operations, often *tens of thousands* of mining machines, around the clock to secure the best chances of winning.

Cryptocurrencies generally use a “distributed ledger,” meaning that ownership and transaction records are not centrally located but can only be established through computations conducted across participants’ mining machines. To minimize the chances of participants trying to cheat each other by writing false transactions into the ledger, cryptocurrencies need a mechanism to decide how a transaction can be considered valid. For proof-of-work cryptocurrencies, the first mining machine to solve a cryptological problem (i.e., a puzzle) gets to validate the next set of transactions, and in doing so, earns a reward. The form of the puzzle requires mining machines to perform millions of computations, in effect guessing at the answer. To induce individuals to commit computing power towards these validation puzzles, the Bitcoin network rewards participants with new Bitcoins if they successfully

validate a set of transactions—that is, be the first to solve the puzzle, thereby adding another “block” (or solution) in the chain (that in turn becomes an input to the next puzzle). Operations that try to earn this new Bitcoin are called “miners” (because they are “mining” new Bitcoin), as are the mining machines that are specially designed to *only* solve these puzzles.¹⁹

The puzzle that Bitcoin miners try to solve is calibrated approximately every two weeks such that across the global network, rewards are earned, on average, about every ten minutes.²⁰ As more miners enter the system, the reward becomes harder to earn. To have a better chance of earning the reward, miners add new machines to the system, consequently consuming more energy, and in doing so, make the reward harder to earn. The entire system can be compared to an unbounded lottery, played every ten minutes. To have the best chance of winning the lottery, you need to buy more tickets, but as more people buy tickets, your chances of winning the lottery decrease. The winning strategy, to date, has been to buy as many chances at the lottery as possible, as quickly as possible—i.e., build mining centers as quickly as possible.²¹ Importantly, the vast majority of computational energy in the Bitcoin system at any one time is wasted: the system works if there are twenty thousand mining machines competing—or two million.²²

Will the explosive growth in energy consumption ever come to an end for proof-of-work cryptocurrencies? There are two countervailing forces that drive the trajectory of energy use for Bitcoin: difficulty drives the value of mining down, and the price of Bitcoin drives the value of mining

(and energy consumption) up. Difficulty is driven by miners entering the system, increasing the complexity of the problems and thereby raising the energy cost of winning a block of Bitcoin. By design, the Bitcoin reward offered to miners is cut in half approximately every four years. These two factors together make it increasingly costly to obtain

new Bitcoin.²³ But higher Bitcoin prices can overwhelm these barriers. Even at the relatively depressed price of Bitcoin as of this writing (~\$20,000), Bitcoin miners can afford to pay well above what ordinary users of electricity pay — and can afford to keep adding new processing power.

III. No Longer a Hobbyist's Experiment: How Cryptocurrency Mining Transformed Into Massive, Centralized Operations to Maximize Profits

In October 2010, just one year after Bitcoin was publicly introduced, its network processed around ten billion calculations (gigahashes) per second (Gh/s),²⁴ meaning the entire network could be run by between 6,000 and 7,000 mining machines.²⁵ With Bitcoin trading at a modest 20 cents, Bitcoin miners were mostly restricted by the cost of acquiring hardware and allocating it to Bitcoin mining.²⁶ Cryptocurrency mining was largely a hobbyist's exercise, with miners found in garages, basements, or home offices.²⁷ But today, these small operations are in the minority; in 2020, 4.5% of Bitcoin holders held 85% of the currency.²⁸

Beginning in early 2012, miners began switching to specialized equipment, first using modified graphics processing units and quickly advancing to application-specific integrated circuit (ASIC) machines. As mining got more popular (and thus more competitive), the estimated power dedicated to Bitcoin mining rose from less than 1 GW at the start of 2017 to nearly 4.4 GW by the end of 2018.²⁹

Today, the scale of cryptocurrency mining is expanding rapidly in the United States. Cryptocurrency mining is now the largest source of electricity demand for some utilities. In Texas alone, we tracked 2,234 MW of cryptocurrency mining facilities, almost entirely built since mid-2021. Eight of the facilities are between 150 to 300 MW each.³⁰ A single 300 MW facility might host nearly 100,000 machines,³¹ consuming enough electricity to power, on average, nearly 49,000 nearby homes.³² Unlike many industrial operations or even data centers that reduce energy usage at off-peak times, these facilities typically run 24 hours a day, seven days a week, 365 days a year, at full capacity. Any downtime is a lost opportunity to "win" blocks of Bitcoin, and mining machines can run for hours with minimal human supervision.

Cryptocurrency is touted as a democratizing form of finance³³ — but it is increasingly a highly concentrated industry that relies on large financial institutions to fuel its growth. Because of the immense amount of capital needed to purchase enough ASIC miners, with high-performance machines many thousands of dollars each, cryptocurrency mining is beyond the reach of only a few mining companies.³⁴ Even small-scale miners' operations are part of high-density loads, as many pool their computing power to increase their chances of validating a coin. Almost 80% of all computing power on the Bitcoin network is owned by seven mining pools.³⁵ A 2021 paper from the National Bureau of Economic Research tracing rewards within a subset of those pools found that 90% of rewards (Bitcoin blocks) were received by just 10% of miners — nearly 70% were received by just *half a percent* of miners.³⁶

A. Proof-of-Work Cryptocurrency Mining Incentivizes Mining As Quickly As Possible to Maximize Profits

The structure of proof-of-work cryptocurrency mining — where the first mining machine to solve the puzzle gains a reward, where the reward falls over time, where there is no limit on the number of entrants in the competition to earn the reward, and where there is a perception that the value of cryptocurrency is effectively limitless — creates an incentive to mine cryptocurrency as quickly as possible. Mining equipment, too, quickly becomes obsolete.³⁷

The ability to get existing mining equipment running as soon (and often) as possible is incentivized over nearly all other considerations. Bitcoin is designed so that the reward that miners receive for validating a transaction shrinks over time. These are known as "halving" events. At the inception of Bitcoin, miners that successfully validated

transactions were provided 50 Bitcoin. That reward has fallen approximately every four years. Today, in 2022, it is just 6.25 Bitcoin. At the height of Bitcoin's value in March 2022, that 6.25 Bitcoin was worth \$294,146. The next halving event is projected for 2024, at which point the value per computational effort of mining Bitcoin will immediately fall by 50%. Miners looking towards that halving event will seek to mine as much Bitcoin today as feasible, knowing that the value of mining will sharply decline at that event.³⁸

B. Cryptocurrency Miners Often Value Speed of Access to Energy Over Price, Even to the Point of Reviving Dying Fossil-Fueled Power Plants

Proponents of proof-of-work claim that it seeks low-cost energy, or even excess energy. This is true — but only to an extent. Utilities with particularly inexpensive energy due to subsidized hydropower, for example, have seen a higher number of interconnection requests from miners. But because proof-of-work cryptocurrency mining rewards speed above all other considerations, miners are turning to any and all readily available energy options, such as defunct or otherwise uneconomic power plants, so they can set up mining operations as quickly as possible.

Accordingly, some of the fastest growth of cryptocurrency mining in the United States recently has occurred where miners have made direct deals with defunct generating stations, and in Texas's unique electricity market.

Miners have invested at power plants that have otherwise

struggled to demonstrate economic value, a trend that would seem to be counter to prudent planning. But unlike other customers, miners have been willing to pay above-market prices for electricity from otherwise retiring coal plants (such as at the Hardin coal plant in Montana), or inefficient plants (such as the Panther and Scrubgrass waste coal plants in Pennsylvania) because energy from these plants could be procured quickly, and with few regulatory hurdles.

Similarly, Texas's deregulated electricity market means end-users are not limited to a particular retail electricity provider based on location, and the absence of a wholesale capacity market (basically, a requirement that utilities pay for a guarantee of available electricity) can lead to price extremes (both low and high). Both of these characteristics have made Texas attractive to geographically flexible miners who can shop around for favorable terms, and can shut down operations when prices spike. Texas's restructured market makes it easy for miners to build facilities with few obligations to the grid.

Given the uncertainty as to future Bitcoin prices, the fact that Bitcoin cannot be widely used as a currency for ordinary transactions, and the exceptional volatility in prices, mining operations cannot — and generally do not — bet on the long-term stability of their enterprise. There is little reason for cryptocurrency miners to make investments lasting even a year or two to build solar or wind generation, as long as existing fossil fuel plants can provide the same electricity, faster.

IV. The Scale and Source of Bitcoin Energy Usage is Largely Invisible to Regulators

Although cryptocurrency mining operations have become increasingly specialized, concentrated, and capital-intensive — and thus identifiable as a distinct class of business and energy user — it is difficult or impossible to find information about the scale, location, or fuel source of cryptocurrency mining operations in the United States.

Proof-of-work cryptocurrency mining operations are not tethered to any particular geography: miners seek speed to market, cheap energy, flexibility, and distance from regulators. For example, multiple companies offer mining equipment in shipping containers to chase the best prices,³⁹ and when prices fluctuate, mining facilities can migrate quickly. For example, in April 2022, Marathon Digital announced that it would abandon its new position adjacent to the Hardin coal plant in Montana, noting that

it could complete the transition by the third quarter of 2022, or in less than half a year.⁴⁰ Similarly, Compass Mining recently announced that it would close its Georgia facilities and move its mining machines to Texas, reportedly just two months after proposing to ship Texas mining machines to Georgia to chase a faster interconnection.⁴¹

Currently, the primary sources for publicly available information about cryptocurrency's energy usage and environmental impacts are local journalists, company press releases, and Securities and Exchange Commission (SEC) filings for publicly-traded cryptocurrency mining operations. Occasionally, information about mining operations may be found incidentally through regulatory oversight of utilities or generation facilities (such as through utility tariff filings that identify new interconnection requests or

Federal Power Act Section 203 filings before the Federal Energy Regulatory Commission (FERC) relating to the sale of generation facilities).

Many mining operations, however, are not owned by publicly-traded companies. Among those that *do* file reports with the SEC, many do not disclose the fuel sources associated with the miners listed in their 10-K or 8-K reports, or provide only partial or selective information, such as describing the energy supply as “reliable, renewable” or as having “high emissions free content.”⁴² If the mining company reports a Power Purchase Agreement

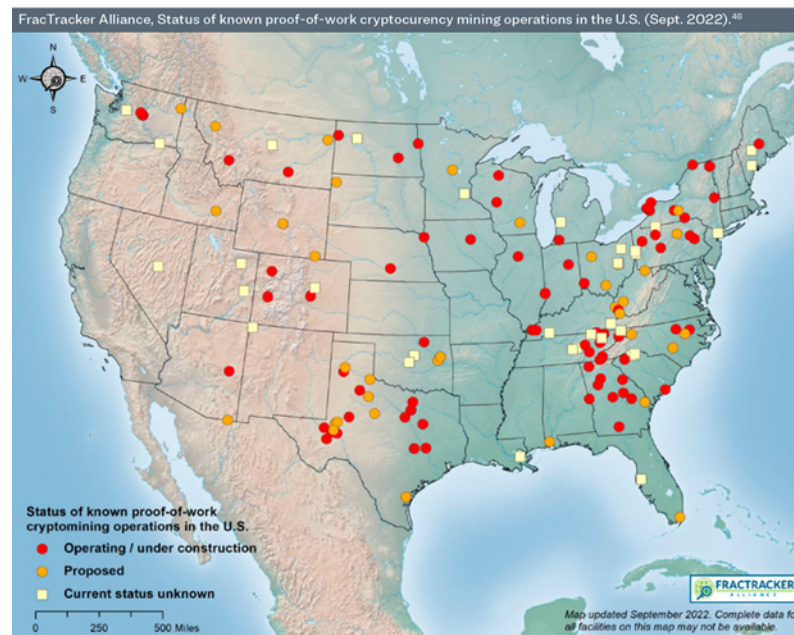
(PPA) with a utility, and that utility is required to file an integrated resource plan or other public information about its generation under state law (or does so voluntarily),⁴³ that information can be used to help determine fuel mix when operations use energy from the grid.

In the cases where the mining company directly purchases generation resources, there may be additional information through the U.S. Environmental Protection Agency (EPA) or state air or water permitting processes,⁴⁴ or within filings under Section 203 of the Federal Power Act if FERC approval is required for the purchase.⁴⁵

V. Where *Do* The Electrons Come From?

Despite the lack of centralized information about the location or energy source for large-scale cryptocurrency computing centers, we were able to identify more than 140 cryptocurrency mining operations through a patchwork of SEC filings, investor presentations, public utility commission dockets, grid operators’ public processes,

local newspaper coverage, and local activist efforts. Using this information, we then attempted to determine how these operations were obtaining electricity and the greenhouse gas emissions associated with that electricity usage.



A. Types of Electricity Procurement by Cryptocurrency Miners

There are four primary means by which proof-of-work cryptocurrency mining companies power their operations: (1) operating behind-the-meter at a power plant;⁴⁷ (2) purchasing power directly from a power plant or utility; (3) purchasing electricity from the grid either through a power purchase agreement with a utility or by paying a retail rate (which may be a general industrial rate or an even lower “economic development” rate); or (4) hooking up a generator to oil and gas wells to burn gas that would not be combusted, or otherwise not be injected into the pipeline system, either through flaring or venting. In nearly all of these scenarios, these unregulated, energy-intensive proof-of-work cryptocurrency mining operations are financing the continuation of fossil fuel extraction and generation—in direct opposition to what is needed to prevent the worst of the impacts from the climate crisis.

⁴⁸ And in some places, investments in fossil generation will be made in response to this boom in demand that will have ongoing effects for decades.

1. Behind-the-Meter Generation at Fossil-Fueled Power Plants

Cryptocurrency mining operations most directly drive increased greenhouse gas emissions when they outright purchase fossil fuel plants. We have identified several fossil fuel power plants where greenhouse gas emissions and local pollution increased dramatically after those plants were acquired by cryptocurrency mining companies and began operating around-the-clock.

i. Burning Waste Coal to Generate Electricity for Cryptocurrency Mining in Pennsylvania

In July 2021, Stronghold Digital Mining Inc. filed an S-1 report with the SEC disclosing plans to purchase three waste-coal-fired power plants in Pennsylvania with a combined capacity of 300 MW and install 57,000 ASICs dedicated to mining cryptocurrency.⁴⁹ To date, Stronghold has purchased the 94 MW Scrubgrass power plant in Venango County and the 94 MW Panther Creek facility in Carbon County.⁵⁰

Burning waste coal to generate electricity for cryptocurrency mining is one of the worst possible choices for the climate and for local air pollution.⁵¹ According to U.S. Energy Information Administration data, Pennsylvania’s waste-coal-fired power plants had average CO₂ emissions of over 2,760 pounds per megawatt-hour (MWh), making them the second most carbon intensive fuel behind residual fuel oil.⁵²

The Scrubgrass plant relies on a mixture of rejected waste coal and dirt that emits hundreds of tons of dangerous air pollution, including sulfur dioxide, nitrogen oxide, and hazardous air pollutants.⁵³ The waste coal is also carried on hour-long trips by large trucks over two-lane country roads, endangering communities along the route with additional air pollution. Adding insult to injury, the plant receives subsidies from Pennsylvania taxpayers and ratepayers because it burns “waste,” including \$4/MWh for the Pennsylvania Coal Refuse Reclamation tax credit and \$16/MWh from the Pennsylvania Tier II Alternative Energy Portfolio Standard Program.⁵⁴ Stronghold, which owns and operates the two waste coal plants, has claimed that 60% of their generation costs will be covered by subsidies from taxpayers and ratepayers.⁵⁵

ii. Burning Fossil Gas to Generate Electricity for Cryptocurrency Mining in New York State

In upstate New York, the Fortistar North Tonawanda power plant plans to power proof-of-work cryptocurrency mining full-time behind-the-meter. Prior to the change in operations, the facility operated rarely, at only a 2 to 13% capacity factor, meaning its emissions of greenhouse gases and other harmful air pollutants were relatively small compared to what the plant was capable of.⁵⁶ Running the plant full-time to mine cryptocurrency could cause a nearly 3,000% increase in its annual CO₂ emissions along with dramatic increases in other harmful local air pollutants such as haze-producing nitrogen oxides, particulate matter, and carbon monoxide.⁵⁷ This significant increase in air pollution will spew into several nearby environmental justice areas.⁵⁸

About a hundred miles away, on the western shores of Seneca Lake, among the productive vineyards and farms of the Finger Lakes, the former coal-fired and now fossil gas-fired Greenidge Generation Station began operating as a cryptocurrency mining facility full-time in 2020. In its first year of mining operations, CO₂ emissions at the plant increased 479%.⁵⁹ Other local air pollutants rose sharply as well when it began operating 24 hours a day.⁶⁰

Fortunately, it is not clear how much longer Greenidge will continue to pollute; the New York State Department of Environmental Conservation denied an air permit renewal application for the Greenidge gas plant in June 2022, concluding the plant’s expanded operations and significant increase in air emissions over the past two years were inconsistent with the state’s climate law, because its behind-the-meter cryptocurrency mining “was creating a significant demand for energy for a wholly new purpose unrelated to its original permit.”⁶¹ There are also serious

question as to whether the plant's owners can safely and effectively address and remediate the existing coal ash contamination or water pollution issues on site.⁶²

2. Power Purchase Agreements with Fossil-Fueled Power Plants or Utilities

As the Greenidge plant's air permit denial demonstrates, outright ownership of fossil fuel resources entails legal responsibilities and both invites scrutiny and requires transparency that many cryptocurrency mining operations have sought to avoid. Therefore, a large number of mining operators instead set up mining facilities in close proximity to, and directly connected with, fossil fuel power plants, and enter into power purchase agreements for electricity from those plants. Some of these arrangements are negotiated with the local utility to purchase electricity at rock bottom prices, often with no scrutiny from regulators. For example, Cipher Mining has negotiated PPAs with an average fixed price of 2.73 cents per kWh.⁶³ For many others, the electricity rate paid by miners in PPAs is unknown.

These arrangements, often not publicly available, can prolong the operation of coal- or gas-fired power plants that were otherwise likely to retire or even had an announced retirement date.

i. A Coal Plant in Hardin, Montana That Hardly Operated Powered Up to Mine Cryptocurrency

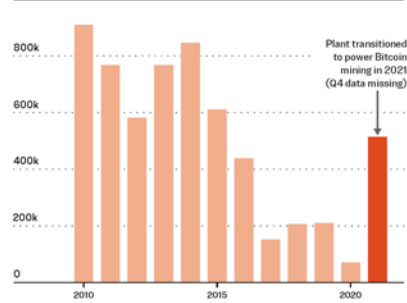
One prominent example of this practice is the Big Horn Data Hub operated by Marathon Digital Holdings at the 115 MW Hardin Generating Station, a coal plant just north of the Crow Indian Reservation in Big Horn County, Montana. Before cryptocurrency mining operations ramped up at Hardin, the plant had been slated to close permanently in 2018 and generated power for just 75 days per year on average from 2017 through 2020.⁶⁴ In late 2020, publicly-traded cryptocurrency mining company Marathon announced a partnership with the plant's operator, Beowulf Energy, to utilize roughly 37 MW of power from the plant to mine cryptocurrency around the clock. Hardin operated 323 days in 2021.⁶⁵

The plant's operations were enormously profitable for Marathon, which won approximately 34 Bitcoin on December 1, 2021 alone⁶⁶—equivalent to \$1,945,786 at the time.⁶⁷ Hardin's neighbors were not so lucky. In 2021, nitrogen oxide emissions increased 842%, sulfur dioxide emissions increased 508%, and CO₂ emissions increased 850%.⁶⁸

As Hardin plant powered Bitcoin mining, emissions spiked

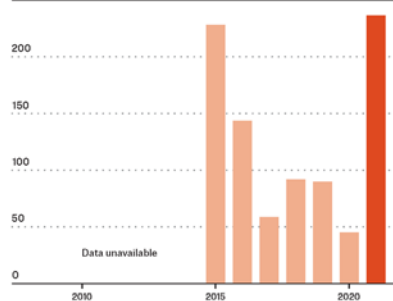
CO₂ EMISSIONS

1M TONS OF ANNUAL CO₂ EMISSIONS



BOILER OPERATING DAYS

250 OPERATING DAYS



Sources: Provided by the Montana Environmental Information Center from reports submitted to the Montana Department of Environmental Quality. Graphic is adapted from The Guardian.

As with all coal plants, delaying a retirement date and increasing operations to mine cryptocurrency increases all pollution from the plant. Additional years of operations mean millions of tons more of coal ash or coal combustion residuals (CCR)—a toxic solid waste byproduct of burning coal.⁶⁹

In early April 2022, Marathon Digital announced that it would transition its operation at Hardin to other locations to use “more sustainable sources of power” and reduce its pollution by the end of 2022.⁷⁰ However, agreements between Marathon and Compute North suggest the

miners were simply moved to a behind-the-meter operation at fossil gas-powered Wolf Hollow Generating Station in Texas.⁷¹ And even in leaving, Marathon left millions of dollars' worth of infrastructure intact, "so another miner can come in right behind us with a minimal delay and then com[e] up to speed," according to its CEO.⁷² The Hardin plant's owner is currently in discussions with potential tenants that are interested in moving into the Big Horn Data Hub.⁷³

ii. A Coal Plant's Polluting Operations in Merom, Indiana Are Extended to Mine Cryptocurrency

Cryptocurrency mining may also help prolong the life of the Merom Generating Station, a 1,080 MW coal-fired power plant in southwest Indiana. Hoosier Energy, a generation and transmission rural electric cooperative that has owned the plant for around 40 years,⁷⁴ previously announced the plant would retire in May 2023.⁷⁵ Then, in February 2022, Hoosier Energy announced plans to sell the plant to Hallador (a coal-mining company) and purchase a portion of the plant's energy and capacity from the new owner.⁷⁶ Shortly thereafter, in May 2022, the public learned that AboutBit, a cryptocurrency mining company, would be constructing a new mining site adjacent to the Merom plant and purchasing 115 MW of electricity from WIN Energy, a distribution cooperative that purchases all of its power from Hoosier Energy.⁷⁷ It is unclear whether the PPA between WIN and AboutBit was known to Hallador, Hoosier Energy, or both, before the two parties reached an agreement on the sale of the plant, but it makes the Merom plant considerably more economically viable as a merchant generator than it would otherwise be.⁷⁸ In fact, AboutBit's co-founder responded to criticism about keeping a coal plant open by stating, "It's 100 percent correct. For anyone to say their crypto operation is green, unless they are 100 percent hydro, they can't make that claim. As an operation, it's not humanly possible."⁷⁹ Hallador also plans to reopen a coal mine in Knox County, Indiana, to supply this plant's extended operations.⁸⁰

3. Retail Purchases of Electricity from the Grid

Some miners simply purchase energy from their local utility as retail customers. Miners seek out utilities where industrial electricity rates (which are often lower than residential rates on a cent per kWh basis) are particularly low.

One of the largest cryptocurrency mining companies, Riot Blockchain, only pays 2.5 cents per kWh for its electricity. These rates are roughly 10 to 11 cents less than the going residential rate,⁸¹ and about 5 cents less than the large consumer rate.⁸²

At the same time, miners often also participate in demand response programs, which will pay miners to stop drawing electricity during periods of high demand. Although such programs mitigate some of the impacts of mining on the grid, other customers must effectively pay miners to shut down, which may be extremely profitable for such large consumers like mining operations during extreme weather events than actually mining.⁸³ As described further below in Section VIII.D, while demand response programs are essential tools to mitigate the pressure the power grid faces from extreme weather events like heat waves, the vast amount of new and increasing load placed on the grid by cryptocurrency miners who often pay lower electricity rates than others, but then are paid very high rates for demand response are not fair to other electricity users.

The impacts on other ratepayers from discounted electricity rates provided to miners and from the payments to miners for demand response can be severe, which is discussed further below in Section VII.B.

4. Combusting Fossil Gas at Oil and Gas Wells

Many cryptocurrency mining companies are utilizing electricity generated from combusting fossil gas at oil and gas well pads. This type of mining operation can reopen orphaned wells, often in remote areas such as in rural South Dakota or western Pennsylvania, that should otherwise be plugged or capped to prevent methane and other pollution.⁸⁴ Some of these operations are literally off-the-map. One journalist visited a "small installation [in Kentucky], miles from the nearest paved road, [that] draws methane gas from a long abandoned well that [the miner] has fixed up with a generator and satellite internet . . ."⁸⁵ The mobility and remoteness of these operations make them and their pollution extremely difficult to quantify.

This type of cryptocurrency mining also incentivizes further oil and gas drilling, as it converts what would be a loss for drillers ("waste" flared gas that could go to beneficial end uses or minimized) into a new source of revenue.⁸⁶ Some miners claim these operations are a kind of environmental mitigation because they use the "waste" flared gas to generate electricity.⁸⁷ As one professor at University of California, Santa Barbara, has observed, "This is basically a way to monetize flaring. It's not a way to stop flaring."⁸⁸

Just one of the companies engaging in flare-based generation for cryptocurrency mining, Colorado-based Crusoe Energy, claimed in April 2022 to operate 86 "Digital Flare Mitigation" data centers in Montana, North Dakota, Wyoming, and Colorado, with more planned in

Texas and New Mexico.⁸⁰ Major oil companies have also expressed interest in these operations.⁸⁰ In March 2022, Exxon Mobil announced that it would consider expanding a North Dakota-based pilot program with aforementioned Crusoe Energy to Alaska, the Qua Iboe Terminal in Nigeria, Argentina's Vaca Muerta shale field, Guyana, and Germany, which would use up to 18 million cubic feet of gas per month.⁹¹

When regulators do locate and inspect wellhead miners, they can find violations of law. For example, in January

2022, inspectors from the Pennsylvania Department of Environmental Protection found 30 methane-gas-fired generators with an estimated capacity of more than 10 MW that were cryptocurrency mining without authorization.⁹² In Adams County, Colorado, inspectors found four cryptocurrency mining operations at oil and gas wells operating without proper authorization.⁹³ Concerned about these operations and their pollution, in May 2022, the county "prohibit[ed] cryptocurrency / digital currency / electronic currency mining operations on oil and gas facilities."⁹⁴

VI. The Climate and Energy Impacts of Cryptocurrency Mining in the United States are Substantial

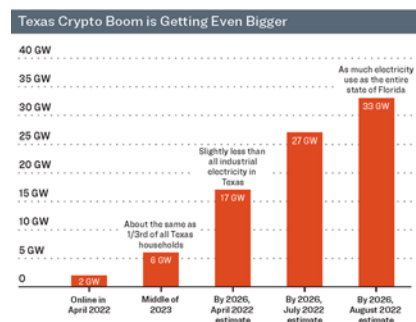
The scale, and explosive growth, of cryptocurrency mining in the United States is hard to fully document, because most mining operations do not readily disclose their energy consumption, much less location and source of electricity. But both ground-up accounting and top-down estimates reveal the same 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. For example, Texas's grid operator, the Electric Reliability Council of Texas or ERCOT, recently disclosed that it expected nearly 6 GW of new cryptocurrency load

to be interconnected by mid-2023.⁹⁵ ERCOT continues to adjust its forecasts of crypto-related load — announcing 17 GW by 2026 in April 2022,⁹⁶ to 27 GW by 2026 in July 2022,⁹⁷ to 33 GW by 2026 in August 2022.⁹⁸

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 CO₂ in the last year, with a central estimate of 27.4 million tons CO₂.⁹⁹ For context, that is about three times as much CO₂ as was emitted by the largest coal plant in the United States in 2021.¹⁰⁰ The White House's OSTP arrives at a similar estimate, of about 21 to 35 million tons by mid-2022 from Bitcoin mining, and 25 to 50 million tons CO₂ from all cryptocurrency mining activity in the United States.¹⁰¹ According to the U.S. House Committee on Energy and Commerce, the CO₂ emissions from global mining of Ethereum and Bitcoin in 2021 equaled the tailpipe emissions of more than 15.5 million gas-powered cars.¹⁰²

In the absence of a comprehensive strategy to reduce all emissions from the power sector, adding this massive amount of new electricity demand will drive up emissions. Until the grid and all new generation build-out has been completely decarbonized, proof-of-work cryptocurrency miners will never exclusively rely on renewable energy to power their operations.

But cryptocurrency mining threatens to derail or reverse decarbonization in ways that go beyond simply adding electrical load. At a moment when the cost of fossil fuel generation exceeds wind or solar alternatives, the economic fundamentals of cryptocurrency mining distort the U.S. energy market and drive increased coal and gas generation.



Texas Blockchain Council. ERCOT Large Flexible Load Task Force Meeting, at 4 (April 22, 2022) [Link](#)

6 GW of cryptomining equipment operating at 85% load factor results in 44.7 TWh per year. Texas residential consumption in 2021 was 156.1 TWh. Source: Energy Information Administration, *Annual Electric Power Industry Report*, Form EIA-861. (Last accessed August 3, 2022). [Link](#)

33 GW of cryptomining equipment operating at 85% load factor results in 245.7 TWh per year. Total Florida consumption in 2021 was 244 TWh. Source: Energy Information Administration, *Annual Electric Power Industry Report*, Form EIA-861. (Last accessed August 3, 2022). [Link](#)

The acceleration of cheap renewable energy in the U.S. pushed higher cost coal, gas, and nuclear plants out of service. As the cost and risk of retaining and operating coal plants increased, and the cost of new solar, wind, and storage—along with fossil gas—fell, coal plants retired in waves.¹⁰³ But to cryptocurrency miners, with their short-term focus on mining as much as possible, as quickly as possible, these same power plants look like an attractive, ready source of electricity, even if they do come with above-market rates. 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, at least in the short-term. In the long-term, acquisition of these power plants risks creating new long-lived environmental impacts and remediation obligations. And because cryptocurrency mining operations are focused on near-term margins, they are unlikely to foot the bill for these long-run social obligations.¹⁰⁴

The largest partnerships between specific power plants and cryptocurrency 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: Hardin (MT), Scrubgrass and Panther Creek (PA), Coal Creek (ND), and Merom (IN) (coal plants); and Greenidge and Fortistar (NY), Odessa and Wolf Hollow (TX) (gas plants). In most cases, the resulting increased emissions of these power plants are directly attributable to the cryptocurrency mining operations that support their operations in part or in whole.¹⁰⁵

These behind-the-meter operations are particularly pernicious but relatively rare. As discussed above, the majority of cryptocurrency mining operations appear to be served by electric utilities, taking service under a power purchase agreement or that utility's existing tariffs (i.e., retail rates). In both cases, energy is served by increasing the output of existing generators, or those on the operating margin, or adding new resources. In today's energy system, the operating margin is almost entirely composed of fossil generators that are able to serve incremental load.¹⁰⁶

Marginal emissions, or the emissions that are associated with incremental additions or reductions in demand, vary

across the country, primarily determined by the resource mix on the grid, and to a lesser extent market structures and local fuel costs. According to data aggregated by the EPA, these marginal emissions vary from half a short ton of CO₂ per MWh consumed in New England and California to just under one short ton of CO₂ per MWh in the Midwest / Central regions and Rocky Mountains, where coal dominates the margin.¹⁰⁷

A 300 MW data center in Texas might be estimated to contribute 1.4 million tons of CO₂ to the atmosphere, while a similarly sized data center in North Dakota (not affiliated with a specific generator) might contribute more than 2 million tons of CO₂ to the atmosphere every year. In some cases, the net impact might be higher than the utility-wide average, such as when a utility procures from or constructs specific energy sources to serve its customers, and changes in the energy mix that serve the utility might be attributed to the new demand (at least financially).

It is at least theoretically possible for cryptocurrency miners to develop truly zero-emission sources of electricity. (See Section VIII.C below.) But simply purchasing energy from existing renewable sources is insufficient, because but for the cryptocurrency mining operation, energy from that renewable facility would be consumed by other customers. Additionality, or contracting for new clean energy sources, is key. Miners that fund *new* renewable development can fairly claim to be non-emitting. For example, Aspen Creek Digital announced in June 2022 that it is developing a 6 MW solar behind-the-meter cryptocurrency mining center in Colorado.¹⁰⁸ To the extent that Aspen actually builds new solar facilities and relies exclusively on the energy they produce, it is as close as feasible to a non-emitting mining facility, albeit a tiny fraction of overall cryptocurrency usage.¹⁰⁹ But as of this writing, Aspen Creek Digital's website was non-functional, and we were unable to determine what, if any, steps have been taken to construct the facility.¹¹⁰ The overwhelming majority of the 140 mining operations we were able to identify, in contrast, rely in whole or in part on fossil-fuel generation.¹¹¹

VII. Cryptocurrency Mining Harms Communities and Electricity Ratepayers

A. Most Environmental Impacts from Cryptocurrency Mining Are Borne by Local Communities

The climate impacts of cryptocurrency mining will be felt globally, but the operations also have disproportionate and damaging impacts on local communities, as well as generating enormous quantities of electronic and packaging waste, which in turn cause toxic contamination where it is ultimately disposed.

1. Local Air Pollution

Cryptocurrency mining that relies on fossil fuel combustion for energy generation indirectly causes all of the air pollution impacts of the underlying combustion method. For coal combustion, this means fine particles, sulfur dioxide, nitrogen oxides, and air toxics; for gas, the biggest air pollution impact is typically nitrogen oxide. Where cryptocurrency mining occupies an existing generation plant, it is unlikely to add pollution controls unless compelled to do so. When cryptocurrency mining facilities use electricity from fossil-fueled grids, like most in the U.S. and especially so with a coal-heavy grid like Kentucky's, it increases the pollution in another community.

In fact, last year, the World Health Organization released new Global Air Quality Guidelines, finding that “[a]ir pollution is one of the biggest environmental threats to human health, alongside climate change.” Air pollution exposure, especially to particulate matter, is estimated to cause 7 million premature deaths annually and result in the loss of millions more health years of life across the globe.¹¹²

In an assessment of recent research, the World Health Organization concluded last year that air pollution is “the single largest environmental threat to human health and well-being.”

....

Researchers at the University of Chicago estimated last year that air pollution cuts 2.2 years off the average human life. The effects are worse where pollution is thickest. But a wave of recent research, built on big data and improved computer models, shows that even lower levels of air pollution — levels legal under federal law — have devastating consequences. Even people living

in rural areas where the air feels fresh are often inhaling levels of pollution sufficient to cause serious health problems. An analysis of the health records of 68.5 million Medicare recipients, published this year, found that regular exposure to low levels of air pollution significantly increased the chances of an early death.¹¹³

2. Water Usage and Thermal Pollution

The environmental impacts of fossil-fueled cryptocurrency mining operations are not limited to climate and air pollution. Many cryptocurrency mining operations use water to cool their operations, whether at the site of the mining machines or the water use that comes with fossil-fueled electricity generation, or both.¹¹⁴ The Fortistar North Tonawanda facility in New York, for example, will consume 500,000 gallons of water per day for cooling purposes once ramped up for full-time mining operations, approximately 12% of the City of North Tonawanda's current total water consumption.¹¹⁵ This water will flow to the City's wastewater treatment facility, which is in need of \$3 million in emergency repairs and \$30 million for long term repairs, which will be borne by local residents.¹¹⁶ The Greenidge plant, also in upstate New York, is permitted to discharge up to 134 million gallons of water, at temperatures up to 108 degree Fahrenheit, into the Keuka outlet at Seneca Lake.¹¹⁷ This thermal pollution endangers health and wildlife habitability, including but not limited to potential harmful algal blooms, fish deaths, biodiversity loss and migration, oxygen depletion, direct thermal shock, and changes in dissolved oxygen.¹¹⁸ And thermal pollution from the Merom coal plant in Indiana (which will supply 115 MW of power to a new AboutBit facility) has been associated with the “virtual collapse” of the largemouth bass population in the nearby Turtle Creek Reservoir.¹¹⁹

3. Fire and Safety Risk

Mining equipment operating 24 hours a day, 7 days a week in small, enclosed spaces generates tremendous amounts of heat, creating a fire risk.¹²⁰ The risks of fire at the facility can originate from “unsafe equipment, wiring failure, . . . overloading of electrical network[s], overheating of the equipment due to . . . incorrect cooling system[s].”¹²¹ Cryptocurrency mining facilities often operate in low-tech environments, in previously unused warehouses, or old

industrial sites.¹²² Fires and fire risk are common enough as to drive a market in cryptocurrency mining insurance and industry “guidelines.”¹²³

There is also fire and explosion risk associated with electric grid equipment serving the mining operations, in addition to the mining facilities. For example, recently in Buffalo, New York, there was a fire and explosion from “faulty equipment” serving a mining operation.¹²⁴ Some localities have instituted new fire and safety regulations or instituted moratoria on the basis of fire risks for neighbors and damaged grid equipment not sized for the load.¹²⁵

These fire risks are especially of concern in drier areas of the country where wildfires abound and especially in the dog days of summer, when drought warnings cover much of the country.¹²⁶

4. Noise Pollution

While all fossil fuel plants entail air and water pollution, cryptocurrency mining introduces yet another local environmental harm: noise pollution.¹²⁷ Mining companies acknowledge this: Compass Mining’s website explicitly states that, “Bitcoin mining isn’t a quiet activity. . . . A typical ASIC’s noise levels range between 50 DB and 75 DB, or a noise level similar to a food blender or a loud vacuum.”¹²⁸

Neighbors have reported much worse:

- At a mining facility in **Limestone, Tennessee**, residents have described the noise as “like a jet engine idling on a nearby tarmac.”¹²⁹ A commissioner who voted to approve the operation told a reporter that he has “never regretted a vote like this one. I sure wish I could take it back.”¹³⁰
- In **Cherokee County, North Carolina**, residents offer that the noise is “like living on top of Niagara Falls” and “like sitting on the tarmac with a jet engine in front of you. But the jet never leaves. The jet never takes off. . . . It’s just constant annoyance.”¹³¹
- In **Elk County, Pennsylvania**, a local farmer said, “My family, farm, and businesses have been severely impacted by the constant noise from the site, and it has led to death for some of my animals as well as health issues with my horses.”¹³²
- In **North Tonawanda, New York**, one neighbor described it as “that whistling and that howling and it’s nonstop.” Another resident stated “she continues to hear the whine one mile away from the plant.”¹³³
- In **Adel, Georgia**: “An inescapable drone that is driving

many of them crazy. ‘It’s comparable to torture,’ said [a] city councilor who has heard the noise and received complaints from constituents.” One local resident offered, “‘I wear earplugs inside my own house’ . . . The noise sounds like 1,000 hair dryers blowing in unison.”¹³⁴

- In **Plattsburgh, New York**, one local resident described the “constant, high-frequency whine . . . ‘like a small-engine plane getting ready to take off.’ It wasn’t just the decibels, but the pitch: ‘It registers at this weird level, like a toothache that won’t go away.’”¹³⁵

5. Enormous Amounts of Electronic and Other Solid Waste

ASICs, the specialized machines used exclusively in the proof-of-work cryptocurrency mining process, have a limited lifespan, and recent changes in the hardware (to mine faster) potentially increase machine turnover and thus the annual amount of electronic waste.¹³⁶ Today, the average lifespan of a well-kept, maintained machine is projected to be around 3 to 5 years. In harsh or poor conditions, they can deteriorate in as little as a few months.¹³⁷

Cryptocurrency mining results in enormous amounts of electronic waste.¹³⁸ This externality of cryptocurrency mining also suffers from a lack of data, but a recent estimate found that in 2021 alone, proof-of-work mining generated more than 30,000 metric tons of waste,¹³⁹ which is comparable to the e-waste produced by the whole country of the Netherlands.¹⁴⁰ Much of this waste is sent to low-income communities around the world who bear the harms of this toxic pollution but do not see any of the profits from the mining.¹⁴¹

When cryptocurrency mining operations first begin, there is also a tremendous amount of solid waste from installation and construction. One community in North Carolina, for example, needed to revise their solid waste ordinances after large amounts of solid waste could not be handled by the local waste processing center.¹⁴²

B. Impacts on Electricity Prices for Local Residents and Businesses

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. In this section, we explore the risks faced by utilities and their

ratepayers, grid operators, and localities when energy-intensive cryptocurrency mining operations move in.

1. Utilities, and Their Customers, Face Unique Risks from 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.¹⁴³ Ratepayers may be left on the hook for these investments if and when a cryptocurrency mining operation abruptly leaves (as they are generally capable of doing).¹⁴⁴ For example, one cryptocurrency mining operation in Washington that declared bankruptcy in 2018 left more than \$700,000 in unpaid utility and electricity bills.¹⁴⁵ Mining operations may leave solely because they can get a better deal on electricity somewhere else. For example, after the New York Municipal Power Authority increased rates for supplemental electricity used by high-density load customers in Plattsburgh because the rates for local residents there skyrocketed, many cryptocurrency miners moved west to Massena, increasing electricity costs in Massena.¹⁴⁶

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. Americans are already struggling to keep up with their electricity bills, particularly those living in disadvantaged communities. 25% of U.S. households (30.6 million) face a high energy burden (i.e., paying more than 6% of income on energy bills) and 13% of U.S. households (15.9 million) have a severe energy burden (i.e., paying more than 10% of income on energy).¹⁴⁷

As an example of customers being stuck holding the bag for costly infrastructure upgrades, one need only look to Kentucky. There, the Kentucky Public Service Commission recently approved \$12.7 million in transmission upgrades for Big Rivers Electric to provide service to Blockware Mining in Paducah, the costs of which will be allocated across all of Big Rivers' ratepayers.¹⁴⁸ These investments are often made instead of long-overdue transmission upgrades that would benefit ordinary ratepayers.

In addition to discounted infrastructure, Kentucky also offers discounted electricity rates to cryptocurrency mining operations.¹⁴⁹ Recently, Kentucky Power, a utility serving 165,000 consumers in 20 counties, recently requested additional discounted electric rates to as many as eight new cryptocurrency mining operations, which would add more than 395 MW of new load for a utility

with approximately 80% coal generation.¹⁵⁰

Yet many Kentucky residents and local businesses struggle with ever increasing energy burden from their bills.¹⁵¹ As the executive director for Appalachians for Appalachia, recently said, "[l]ocal energy infrastructure is being pushed to the limit. Meanwhile these miners are receiving benefits that local business owners, and everyday people, are not being extended as well."¹⁵²

Nebraska customers are also being forced to pick up the tab for cryptocurrency miners. Compute North operates cryptocurrency mining facilities where power is supplied by the Nebraska Public Power District. In 2020, the Power District spent \$17.6 million, or 18% of its 2020 capital budget, constructing a transmission line and substation to increase the delivery capacity to the Compute North facilities from 30 MW to 100 MW.¹⁵³ This new infrastructure was built specifically to serve Compute North, not for general benefit — but retail electricity customers will likely subsidize the cost. Customers will do so as the \$17.6 million is rolled into NPPD's revenue requirement and through residential rates that are higher per-kWh than Compute North itself pays.

Empirical evidence strongly supports the conclusion that cryptocurrency mining operations push electricity rates higher for the surrounding community. Several other localities have seen local electricity prices rise when proof-of-work cryptocurrency miners show up. For example, in Plattsburgh, New York, residents' electricity bills increased 30% when a mining boom came to town a few years ago.¹⁵⁴ A recent study found that Plattsburgh residents and small businesses paid \$189 million and \$90 million, respectively, more in electricity bills due to crypto's arrival.¹⁵⁵

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. In November 2021, Idaho Power became the first investor-owned utility to submit an application with its state regulator, the Idaho Public Utilities Commission, to create a separate class of "Speculative High-Density Load Customers," since the utility received at least 17 separate inquiries totaling 1,950 MW — roughly 52% of its until-then-record peak demand.¹⁵⁶ According to the utility, these inquiries reflected customers with: (1) high energy use and load factor; (2) the ability to relocate and

disaggregate equipment to obtain favorable rates; (3) volatile load growth and load reduction; (4) high responsiveness to short-term economic signals or volatility; and (5) lack of demonstrated long-run financial viability.¹⁵⁷ To meet demand from these mining operations, Idaho Power would need to procure additional generation resources or wholesale energy purchases, but doing so risked overprocurement (and stranded assets) if and when these highly mobile and high-risk customers left or went out of business.¹⁵⁸ On June 15, 2022, the Idaho PUC approved Schedule 20 for Speculative High-Density Load¹⁵⁹—finding that the new rate is “fair, just, and reasonable.”¹⁶⁰ However, cryptocurrency mining company GeoBitmine LLC has challenged the new Schedule, leaving its ultimate fate uncertain.¹⁶¹

Similarly, prompted by approximately 150 MW of “cryptocurrency related interest” in its service territory, Entergy Arkansas recently submitted a proposed tariff for “Large Power High-Load Density” customers. Entergy’s filing provides more examples about how explosive growth of crypto’s energy consumption can harm customers. According to testimony submitted by Entergy, a 15’ x 15’ x 30’ pod of mining machines in the New Orleans area used more energy than the nearby airport.¹⁶² Entergy also described an incident in 2019 where a new cryptocurrency mining customer requiring significant facility upgrades opted to pay a monthly minimum for those upgrades under Entergy’s tariff—only to move its shipping containers “virtually overnight” “shortly after taking service . . . effectively disappearing” and leaving Entergy unable to even reach the customer to recoup their upfront costs, forcing existing customers to pick up the bill.¹⁶³

To prevent such interconnect-and-run incidents from recurring, Entergy Arkansas’s rate filing proposes safeguards: to protect customers from a disappearing miner, new cryptocurrency customers would be required to pay a security deposit; contribute to any construction upfront; and post a surety bond or letter of credit.¹⁶⁴ And to address the potential increase in capacity requirement due to the influx of shipping containers full of mining equipment with insatiable energy demand, the cryptocurrency mining tariff would require miners to select between two interruptible rates that would allow Entergy or the grid operator to require the miner to cease operation on 30 minutes to an hour’s notice ten to twenty times per year, ensuring the additional cryptocurrency load is available as a demand response resource and will not—at least in theory—add to Entergy’s capacity obligations and require it to construct new generation resources.¹⁶⁵

Some utilities have gone further in an effort to protect their existing ratepayers: the Chelan County Public Utility District in Washington instituted two moratoriums on new mining operations as well as a new rate structure to discourage miners from setting up shop within its footprint after the utility was overwhelmed by demand for cheap hydropower from crypto miners.¹⁶⁶ The New York Municipal Power Agency, an association of 36 municipal power authorities, petitioned the New York State Public Service Commission to prevent high-density load customers, specifically cryptocurrency companies, from requesting disproportionately large amounts of power, which according to those utilities could be up to 33% of a municipal utility’s total load.¹⁶⁷ While not a utility, Missoula County, Montana adopted emergency “green” regulations to require cryptocurrency miners to purchase or build new sources of renewable energy to offset 100% of their energy demands.¹⁶⁸

It remains to be seen whether the Arkansas Public Service Commission will approve Entergy’s proposal, or whether the tariff’s safeguards will be sufficient to protect Entergy’s current customers from stranded transmission or generation asset costs. But utilities should consider incorporating elements of Entergy’s proposed tariff or the Chelan County Public Utility District’s proposed rate structure—upfront deposits, guarantees, or cost coverage for infrastructure investments; interruptible rates designed to avoid the need for new capacity buildout; and even temporary moratoria¹⁶⁹ as appropriate—as requests from new cryptocurrency mining customers accelerate. Fitch Ratings, a ratings agency that advises on the creditworthiness of both investor-owned and public power utilities, has already advised utilities as much.¹⁷⁰

2. Rural Electrical Cooperatives and Cryptocurrency: A Costly Partnership for Ratepayers

One pattern that emerged in our research is the predilection of cryptocurrency miners for rural electric cooperatives. Rural electric cooperatives—which supply 13% of U.S. electricity to 42 million people over 56% of the U.S. land mass¹⁷¹—often lack the regulatory oversight that investor-owned utilities are subject to. Thus, rural electric cooperatives generally do not need to obtain approval from state or federal regulators to propose new rate structures or enter into large-scale contracts. Although regulation varies by state, many rural electric cooperatives have only minimal reporting requirements (such as a ten-year or integrated resource plan) to the state utility commission and most (but not all) are exempt from oversight by the Federal Energy Regulatory Commission with

respect to their wholesale rates.¹⁷² Cooperatives also lag investor-owned and municipal utilities in decarbonization; as of 2020, “six out of the top ten most carbon-intensive emitters were cooperatives.”¹⁷³

In theory, ratepayers are protected from excessive rates by cooperatives’ governance structure and non-profit status. Ratepayers are also “members,” who vote for a cooperative’s board of directors and thus select its leadership. However, cooperative elections tend to be low-information and low-turnout, and incumbent leadership is rarely unseated. Further, under the cooperative model, if rates are higher than necessary to cover costs, any excess income is returned to member-customers in the form of “patronage capital” or “capital credits.” In practice, as Representative Jim Cooper (TN) has described, cooperatives rarely provide a full and accurate accounting as to whether they have distributed patronage capital to member-customers.¹⁷⁴

Without active engagement by customers (and greater transparency than cooperatives generally provide), cooperatives tend to increase sales rather than minimize rates.¹⁷⁵ Courting large-scale cryptocurrency mining operations is a surefire way to increase sales. The complex changing of ownership and related transactions surrounding the gigawatt-scale coal-burning Merom Generating Station in Sullivan County, Indiana, previously discussed in Section V, is one example of a cooperative increasing electricity sales through partnership with cryptocurrency mining operations.¹⁷⁶ The upshot of the deal (which involves selling a coal plant to a coal mining company) is that a coal plant previously slated to retire in 2023 will now operate indefinitely.

Merom is not the only example of cooperatives entering into large-scale electricity sales to cryptocurrency mining operations with little or no transparency and at significant risk to their member-customers. Big Rivers Electric Cooperative reached a 100 MW power purchase agreement with Blockware Mining to supply its mining operation in Paducah, Kentucky.¹⁷⁷ According to local reporting, Big Rivers intends to spend \$12.7 million on infrastructure upgrades at the proposed mining site.¹⁷⁸ And the Rayburn County Electric Cooperative in North Texas found that serving two cryptocurrency mines interested in connecting to the utility’s service territory north and east of Dallas would require up to \$40 million to fortify power lines to avoid blackouts while consuming enough electricity to power as many as 60,000 Texas homes.¹⁷⁹ As of this writing, it is unclear whether the Rayburn County Electric Cooperative followed through on

these investments, especially considering that “upgrades to the grid threaten to drive up bills for consumers already shouldering price shocks for almost everything.”¹⁸⁰

3. Grid Impacts and Reliability

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. In January 2022, Fitch Ratings issued research finding that “[d]igital asset or crypto currency mining in the US could pose power supply risks to public power utilities unless they are sufficiently mitigated.”¹⁸¹ 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. For example, if mining operations for which we were able to find SEC reports and other data expand to the extent their literature suggests, by the fourth quarter of 2022, there could be up to 1,626 MW of demand directly for proof-of-work mining operations in New York State alone. Assuming these facilities operate 24/7/365, their annual energy use of over 14,000 GWh would be a whopping 9.5% of New York State’s total 2020 electricity consumption.¹⁸²

Perhaps the most worrying site of potential grid instability due to cryptocurrency mining load increases is Texas, and how that impacts Texans both from a safety perspective and financially. The instability of Texas’s grid was exposed, with tragic consequences, by Winter Storm Uri in February 2021, in which at least 246 people lost their lives,¹⁸³ and 69% of Texans lost electricity for an average of 42 hours.¹⁸⁴ Evidence is also becoming public that cryptocurrency miners are taking advantage of such extreme weather. One cryptocurrency miner resold electricity valued at more than \$125 million to the Texas grid during that storm and the state still owes the miner \$86 million, with that amount likely to be paid by ordinary utility customers.¹⁸⁵

A February 2022 report by five former Texas Public Utility Commissioners and a former regulatory advisor found that ERCOT still has not improved its ability to restart power plants during a blackout, improved its load forecasting and resource assessments (including accounting for extreme weather), or adequately winterized the state’s gas system.¹⁸⁶ In 2021, an analysis by ERCOT found that

four of the five extreme risk scenarios considered by ERCOT would leave the grid short of a significant amount of power.¹⁸⁷

Yet, as of August 2022, 33 GW worth of cryptocurrency mining operations have applied to connect to the Texas grid over the next several years—a third more than ERCOT’s announcement in April 2022.¹⁸⁸ This 33 GW figure represents 41% of ERCOT’s record peak demand of 79.8 GW on July 20, 2022.¹⁸⁹ By some measures, this is equivalent to New York State’s entire energy demand.¹⁹⁰ If the cryptomining facilities run at an 85% load factor, the would consume as much electricity as the entire state of Florida.¹⁹¹ Wood Mackenzie predicts that Bitcoin mining could more than double the rate of demand growth in ERCOT’s territory.¹⁹²

Further impacting average Texans, it appears that cryptocurrency miners are buying electricity low and selling it high. As the Tech Transparency Project recently found: “Programs that appear to be unique in the country allow miners to leverage their contracts to resell electricity at massive mark-ups and collect millions of dollars in incentive payments from the state grid operator. . . . Some miners already view themselves as energy traders. One bitcoin miner called his company ‘[a]n energy arbitrage operation disguised as a bitcoin mining company.’”¹⁹³

In response to the overwhelming influx of cryptocurrency mining, ERCOT has instituted new processes aimed at ensuring the system can handle the enormous load.¹⁹⁴ As a temporary measure, ERCOT will now require new, large cryptocurrency miners to seek permission to connect to the state’s power grid and will require utilities to submit studies on the impact of miners and other large users on the grid.¹⁹⁵ Any project that will add 20 MW of demand on the site of a generator within the next two years, and any project that will add 75 MW of demand without its own power generation on site within the next two years, will have to undergo a review process.¹⁹⁶ Local officials are also sounding the alarm on grid instability that would be caused by cryptocurrency mining operations. For example, the City of Brenham’s Planning and Zoning Committee said that the city’s current power grid cannot sustain the amount of electricity required for large scale and commercial-like cryptocurrency mining setups, thus necessitating the committee halting the approval of more mining setups.¹⁹⁷

4. Tax Incentives for Cryptocurrency Miners are Breaking the Bank

Making matters worse, some states provide additional subsidies or tax breaks in an effort to encourage

cryptocurrency mining operations. Kentucky passed a law last year that waives taxes on energy purchases by cryptocurrency mining companies, while Wyoming exempted from taxes any natural gas used to power mobile mining rigs. In 2021 alone, a total of 33 states had bills supporting cryptocurrency developments and 17 enacted new laws to create working groups, provide tax breaks, and/or establish subsidies for cryptocurrency mining operations, according to the National Conference of State Legislatures.¹⁹⁸

Kentucky has proven particularly short-sighted in offering benefits to cryptocurrency miners in addition to discounted electricity, offering cryptocurrency-specific tax incentives estimated to cost Kentucky taxpayers at least \$9 million a year in lost revenue.¹⁹⁹ These tax incentives include “tax exemptions totaling 9 percent on electricity consumed at larger cryptocurrency mining operations, . . . sales-tax refunds on mining equipment, as well as potential incentives on income taxes and wage assessments.”²⁰⁰

Kentucky is not alone. In Texas, the City of Corpus Christi is forgoing \$7 million annually in sales tax and franchise fees, equating to \$70,501,509 over ten years, to accommodate Bootstrap Energy’s \$1.1 billion cryptocurrency mining operation.²⁰¹ Bootstrap has contracted with AEP Texas for 600 MW.²⁰²

5. Reports of Cryptocurrency Mining Jobs Have Been Greatly Overstated

Despite the purported economic development justification for cryptocurrency mining incentive programs, these operations actually create few jobs. 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. As a Berkeley Haas professor 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.”²⁰³ And Fitch Ratings found “Cryptocurrency mining operations typically bring in very little additional economic benefits in the form of jobs or ancillary business to a local economy.”²⁰⁴

Here are just a few examples of the meager job benefits of cryptocurrency mining operations:

- The **Blockware Mining** operation in Paducah, Kentucky will provide just 10 full-time jobs in its initial phase.²⁰⁵
- **Core Scientific**, with seven facilities, reported 205 full-time employees in the United States, as of December 31, 2021.²⁰⁶

- **Marathon Digital Holdings**, which mines cryptocurrency in Montana and Texas, has nine full-time employees, as of December 31, 2021.²⁰⁷
- **Stronghold Digital Holdings**, which mines cryptocurrency in Pennsylvania, has 16 full-time employees, as of March 24, 2022.²⁰⁸
- **AboutBit's** \$50 million facility adjacent to the Merom coal plant in Indiana is expected to create 15 jobs.²⁰⁹
- The **Greenidge** cryptocurrency mining operation in New York employed 5 union workers on site as of October 2021.²¹⁰
- "A \$1.9 billion facility by **FX Solutions** and **Atlas Power** near Williston, North Dakota, would create around 100 temporary construction jobs and support only 30 employees over the long-term. Meanwhile, the first stage of the project would draw 240 MW of electricity — roughly, the amount of energy needed to power the city of Fargo — and eventually ramping up to a powerhouse 700-megawatt scale."²¹¹
- "In Rockdale, Texas, during the BTC boom of 2017, a cryptocurrency mining company promised to build the largest crypto mining facility in the world — one that could eventually be used for other data-driven applications and create more than 300 jobs. In reality, the facility only generated 14 of 350 promised jobs and was quickly scaled back."²¹²

The municipalities who handled an earlier boom in cryptocurrency mining in the mid-2010s can attest to the lack of economic development benefits from cryptocurrency mining. The former mayor of Plattsburgh, New York has said that due to the automated nature of these servers, the new mines provided few local jobs: "when you look into it, and I have — [the jobs,] they just don't materialize."²¹³ "I'm pro-economic development, but the biggest mine operation has fewer jobs than a new McDonald's."²¹⁴ The former head of the Bonneville Power Administration and Chelan County Public Utility District testified before the U.S. House Energy and Commerce oversight subcommittee panel, stating that: "we heard substantial reservations from our community about supporting cryptocurrency mining due to . . . [the r]elatively low number of local jobs per unit of electricity consumed."²¹⁵

For local communities, the above-described tax incentives and promise of jobs that do not materialize end up being a bad deal; a recent *Forbes* study estimated that cryptocurrency mining tax incentives end up costing counties and municipalities across the U.S. roughly \$1 million per job.²¹⁶ As one reporter who interviewed community members in Kentucky observed: "Some see echoes of what they say were the worst elements of the now largely defunct coal industry: out-of-state money, absentee owners, and huge fortunes made with little wealth trickling down to local communities."²¹⁷

VIII. Breaking Through the Bitcoin Myths

Proponents of proof-of-work cryptocurrency often make grandiose statements about how energy-intensive mining advances environmental and climate goals, using a variety of half-truths and cherry-picked information. In this section, we explore the narratives and messaging used by proof-of-work miners, identify the elements of truth that make some of these statements so confounding, and explore how climate and environmental advocates can probe these often deeply misleading statements.

Myth 1: Cryptocurrency Mining is Already Sustainable Because it is Located Near Clean Energy, or Because it Purchases Renewable Energy Certificates or Carbon Offsets

1. Claims of Co-Location

It is not uncommon for cryptocurrency mining companies and advocates to tout that, while their operations are energy intensive, they are "sustainable" or run on renewable energy.²¹⁸ One industry-funded organization, the Bitcoin

Mining Council, claims 58% of energy used to power Bitcoin in 2020 was from renewable sources, based on selected companies' self-reporting.²¹⁹ The Cambridge Centre for Alternative Finance puts this number much lower — at 39%.²²⁰

What explains the discrepancy? In many cases miners are claiming (or implying) "renewable" energy simply by being in proximity to wind or solar farms with which they have no contractual relationship. In our opinion, they're greenwashing.²²¹

For example, in Argo Blockchain's 2021 Sustainability Report, released August 18, 2022, the company claims that it "is taking action against climate change" by "select[ing] sustainable energy sources."²²² Argo's primary mining facility is the Helios facility, a 200 MW facility east of Lubbock, Texas. Argo does not hold a power purchase agreement with a renewable energy provider, instead noting that "Argo currently uses grid electricity in a low

carbon part of the ERCOT market,”²²³ and has purchased renewable energy certificates (RECs),²²⁴

But simply locating new demand in a region rich in renewable resources does not mean that the new demand is served by the renewable resources of that region. When a load is added to the grid, it is served by the generation available on the grid at the time electricity is consumed (unless it specifically causes new generation to be built for its exclusive use). Large loads, like cryptocurrency mining operations, can themselves cause changes in the generation mix as the grid dispatch patterns shift in response to the new load’s requirements. The generators that adjust output in response to load changes will set the “marginal” emissions rate.²²⁵ In almost every circumstance, new demand drives an instantaneous increase in the output of fossil generators.²²⁶

For example, the aforementioned Argo Helios facility in West Texas pays for market-based grid generation, and therefore drives changes in marginal generation in Texas, which is typically gas and coal. According to recent research from the Proceedings of the National Academies of Science, while the average emissions rate of all generation in West Texas has fallen to about 0.375 tCO₂/MWh, the marginal emissions rate holds steady at around 0.5 tCO₂/MWh, or equivalent to the output of a gas-fired generation station.²²⁷ The current wind in West Texas will generate irrespective of whether Argo’s Helios facility exists or not. Argo does not pay for incremental wind generation, and has not built wind to serve its facilities. Therefore, it drives existing fossil-based generation to increase its output—and results in an increase in emissions.

2. Claims of “Carbon Neutrality” by Purchasing Renewable Energy Credits or Carbon Offsets

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 certificates—paying renewable generators elsewhere while increasing load on (and pollution from) fossil fuel plants locally.

Examples abound. In late 2021, at the opening of its massive Denton, Texas facility, Core Scientific claimed that it would “increase the Company’s total power capacity to more than 800MW while remaining 100% net carbon-neutral.”²²⁸ This claim of carbon neutrality is entirely based on unbundled renewable energy certificates (RECs).²²⁹ Prior to Denton, Core’s largest facility was a 125 MW facility in Calvert City, Kentucky, opened in late 2019. Core Scientific’s Calvert City facility holds a contract with the Tennessee Valley Authority, a provider whose resource

Claims of Carbon Neutrality via Voluntary REC Purchases

To drive clean energy buildout, some states have established renewable portfolio standards (RPS), that require a certain minimum amount of electricity to be generated by “renewable resources.” Most states allow utilities to demonstrate compliance with RPS by retiring RECs. Utilities can either generate their own RECs through their own renewable resources, or can purchase RECs on the market. RECs can be purchased with or without the associated electricity. RECs that are purchased without the accompanying electricity are known as “unbundled RECs.” Each REC represents the non-energy attributes of a megawatt-hour generated by renewable energy resources. In other words, when you purchase a REC, you’re purchasing the legal right to claim all of the “renewableness” of that electricity. Often the REC will also include the avoided emissions value of that MWh of electricity. However, the avoided emissions value of any particular MWh of renewable energy is highly dependent on the grid mix and marginal resource at the time the MWh is generated. In other words, the avoided emissions value of a REC can vary from state to state, month to month, and hour to hour. Because clean energy deployment today far exceeds RPS standards in most states, there is a glut of RECs on the market. Some people and businesses purchase these excess RECs in order to claim their homes or businesses are powered by clean energy. In some cases, these REC purchases can effectively spur new clean energy development that offsets fossil energy: specifically, this can occur where the demand for the REC is incentivizing the construction of new, additional renewable electricity that would otherwise not be built. But in most cases, REC purchases provide little or no additionality: usually, REC sales revenues are not driving the decision about whether to build a new wind or solar facility. A clean energy project would have been built irrespective of the REC sale. Where the REC sale is not the result of additional, incremental clean energy development, it has little or no incremental climate benefit.²³³

mix is just 3% wind and solar.²³⁰ And yet Core Scientific's claimed carbon neutrality is entirely based on RECs it purchases from wind farms in North Dakota.²³¹ Argo Blockchain, discussed above, too has purchased renewable energy certificates to offset its fossil generation.²³²

Separate from RECs, several mining companies rely on purchase of carbon "offsets" to advertise to the public and their investors that they are a sustainable operation. For example, Greenidge Generation LLC has claimed that it is "significantly reducing greenhouse gas emissions now," by purchasing voluntary carbon offsets, despite using a fossil gas plant 24 hours a day to mine cryptocurrency.²³⁴ As a general matter, many carbon offsets programs are unverifiable and hard-to-measure, and in many instances, not actually reducing carbon pollution.²³⁵ That being said, non-proof-of-work blockchain technology could be a key tool in properly verifying whether offsets are achieving reductions in pollution.²³⁶ But, the key is to reduce pollution in the first place, not create a problem and then seek creative new ways to account for the harms.

Myth 2: Cryptocurrency Mining Uses Energy That's Being Wasted From Variable Wind and Solar Output

One of the most common storylines from cryptocurrency mining proponents is that cryptocurrency mining thrives on energy that would otherwise be wasted from "curtailed" solar and wind projects.²³⁷ Curtailment for wind and solar projects occurs when an energy system produces more electricity than can be absorbed by demand at a particular moment, or more electricity than can safely fit on a transmission system. In these circumstances, grid operators will direct to generators to reduce, or cease operations. Wind and solar projects are particularly susceptible to curtailment because they have almost no cost to start and stop, unlike large thermal generators that may take hours to turn off, or even succumb to damage if turned off too quickly.

As renewable energy penetration has grown, so has curtailment. In California's electricity market (CAISO), curtailment has risen to 2.1 million MWh in 2022—or an 81% increase from 2021.²³⁸ At a first glance, it might therefore appear that CAISO could handle a 200 MW cryptocurrency facility to harness the 1.5 million MWh of "wasted" energy in 2021.²³⁹ In reality, curtailments are sporadic. Measured in five-minute increments in California, there were only 15% of hours in which curtailments rose above 200 MW in 2021.²⁴⁰ In other words, a 200 MW mining facility in California could have only operated on "free" just energy 15% of the time, a daunting

prospect for an industry that typically requires mining operations to operate around-the-clock to be profitable. A 2019 paper exploring cryptocurrency use of curtailed resources concluded that a cryptocurrency operation seeking to maximize profit by operating only on curtailed energy would only operate about half the time, and that a cryptocurrency mining operation scaled to consume all of the curtailed energy would lose an extraordinary amount of money.²⁴¹

Even if absorbing curtailed wind and solar worked in theory, in practice it ignores that clean energy developers actively seek to avoid curtailment by integrating into regions not susceptible to oversupply. Further, utilities, states, and the federal government are working quickly to build transmission that would relieve congestion and constraints that can lead to curtailment. And, finally, energy storage (i.e., batteries) work to both absorb any excess clean energy and redeploy it during hours of need, presenting a far superior solution to the problem of curtailment.

Only in the edge cases where an extraordinary amount of clean energy is built without storage or sufficient transmission, or where cryptocurrency miners are willing to locate behind transmission constraints, run at thin capacity factors, and cease operations when transmission and/or storage come online does this thesis hold water. We are not aware of any cryptocurrency mining facilities currently operating in the U.S. that were built—or financed—with these constraints in mind.

Myth 3: Cryptocurrency Mining Incentivizes Clean Energy Development, or Helps to Decarbonize the Grid

Proof-of-work enthusiasts argue cryptocurrency mining will drive clean energy development and decarbonize the grid.²⁴² The most carefully constructed of these arguments essentially stipulates that the primary barrier to massive clean energy deployment is transmission congestion (causing curtailment and reduced economic margins for new renewable development) and integration (lengthy queues to interconnect to regional grids). Proponents argue that the incremental revenue from cryptocurrency mining could incentivize the development of wind and solar energy that would otherwise not be deployed, either because grid revenues are insufficient or because a location is transmission congested.

But this theory rests on the same faulty assumptions as the "waste electricity" thesis: that renewable developers will gamble on long-term transmission build-out and cryptocurrency miners will be willing to forgo mining (and

profits) whenever wind or solar generation dips—and cease operations or limit itself to curtailed electricity once the renewable resource can serve a general load.

The leading thought paper on cryptocurrency mining as a driving force for more clean energy acknowledges that mining operations would likely “still mine with grid electricity during other periods when profitable to do so, so it wouldn’t be entirely green from day one.”²⁴³ But more to the point, if a clean energy facility is built entirely to serve a cryptocurrency mine without respect to its ability to serve the remainder of the grid effectively—or at all—then it has little to no value in decarbonizing the remainder of the grid.

Moreover, there are other constraints to clean energy deployment beyond interconnection delays (or curtailment caused by inadequate transmission infrastructure): supply chain (i.e., materials), state or local policies, land use, and labor availability. To the extent cryptocurrency miners induce developers to locate wind and solar farms at non-grid useful locations that remove clean energy from the critical supply chain, they remove opportunities to decarbonize other elements of the grid.

Even if a mining operation did incentivize new renewable development in a location where interconnection delays were the only barrier to development, to further grid decarbonization, the mining operation would have to go away in a timeframe that is relevant for decarbonization. For that renewable resource to have decarbonization value, it must *offset* existing fossil fuel use in some way, either by reducing utilization of fossil fuel power plants, or enabling electrification of other end uses traditionally powered by fossil fuels, such as transportation or home heating. To realize that outcome, the cryptocurrency mining facility must cease to exist, allowing that electricity to flow to those other purposes. As of yet, no proof-of-work proponents have come forward with a solid plan that would allow a developer to build clean energy for an offtaker that expects to go out of business.

Instead, miners have done the opposite. For example, Compute North has recently announced that it has energized a new 280 MW mining facility near Odessa, Texas, which sits “behind the meter” at a wind farm.²⁴⁴ The wind farm in question is King Mountain Wind Ranch,²⁴⁵ a 278 MW wind farm built in 2001 and owned by FPL (NextEra).²⁴⁶ For the last two decades, King Mountain has contributed to the larger Texas grid, and will now be taken out of circulation for grid use. So, while the Compute North facility may be able to legitimately claim that it uses primarily wind energy, this type of project is not additional

and is not contributing to broader decarbonization of the energy system. Instead, it represents price seeking behavior from the wind farm owner, resulting in less overall renewable energy on the broader grid.

Myth 4: Cryptocurrency Mining “Acts Like a Battery”

Cryptocurrency mining proponents make the perverse claim that “Bitcoin mining is strengthening the grid,”²⁴⁷ and “provide[s] critical grid reliability products usually provided by fossil fuel plants.”²⁴⁸

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.

When miners talk about “grid benefits,” they are actually touting an ability that *all* large-scale customers have: The ability to shut off in emergencies or periods of peak demand. In the middle of a heat wave causing high electricity demand, Texas Bitcoin miners voluntarily shut down their operations, curtailing 1,000 MW of load in mid-July 2022 for 3.5 hours.²⁴⁹

But is cryptocurrency miners’ willingness to pause operations during times of high demand and grid strain really a grid service? As external experts put it: it’s complicated.²⁵⁰

For most grids, the demand for electricity varies hour by hour, day to day, and month to month. On particularly hot or cold days, demand may spike well above normal use. The cost of maintaining capacity to serve those peak hours, and the cost of operating the most expensive generators to serve these peak hours, can be extreme—but failing to serve load during the highest moments of strain can be even more costly for customers. Utilities and grid operators often hold capacity in reserve simply to serve those peak conditions.²⁵¹ Paying a customer with non-essential energy needs to reduce their demand can be a way of aligning demand with supply and retaining reliability, a practice known as “demand response.”²⁵²

Most industrial customers do not adjust their energy use based on the real-time price of electricity, which constitutes a relatively small portion of their overall costs (and thus any savings would be heavily outweighed by disruptions that might have cascading impacts on meeting production deadlines, etc.). Demand response payments help make non-price-responsive customers responsive: a manufacturing plant might incur substantial operational cost and product risk when it stops operation, or other types of data centers may impair customer

services by ceasing operations. But cryptocurrency miners are only responsive to electricity prices, and have no other service provided to customers aside from processing cryptographic puzzles: if the cost of energy rises above their breakeven, they can simply cease operations without experiencing additional costs or inconvenience.²⁵³

Unless a demand response program is carefully calibrated to cryptocurrency miners' extremely low costs of temporality paused operations, miners effectively become energy traders, able to convert cheap electricity into cryptocurrency most hours, while also receiving high prices for foregone electricity during peak periods or emergencies. During this summer's heat wave in Texas,²⁵⁴ Riot Blockchain announced that it received \$9.5 million (equaling the value of 439 Bitcoin at the time) in demand response payments in July alone.²⁵⁵ In addition to this hefty payout, Riot still was able to mine 318 Bitcoin that month.²⁵⁶ In fact, demand response company Voltus estimates that a cryptocurrency mining company can generate up to 10% of its annual revenue by providing shutdown services to the grid.²⁵⁷

By increasing the demand on the grid, miners increase the need for demand response, the cost of such programs, and thus the cost of providing electricity to all other customers.²⁵⁸ ERCOT's independent market monitor expects that Texans could be paying an extra \$1.5 billion for electricity this year alone²⁵⁹ — partially to pay cryptocurrency miners to shut down their operations during high demand.

As explained by Professor Severin Borenstein,

[T]he crypto mining business model is based on buying electricity at wholesale prices or on a real-time variable price tariff. They would already have a strong incentive to cut back during grid emergencies without the additional payments from the demand response program, especially in Texas with its \$5000/MWh wholesale price cap. That means the mining companies get paid for taking demand off the grid that they never would have put on the grid at those high prices anyway.²⁶⁰

Myth 5: Cryptocurrency Miners are No Worse than Any Other Electricity Users

Many miners will respond to critics of its insatiable need for energy by comparing it to other industries such as banking, telecommunications, or to data center operations.²⁶¹ But as described above, the huge premium placed on immediate access to large amounts of electricity without the long-term commitments necessary to finance renewable development attract cryptocurrency miners to fossil fuel sources, such as Hardin, Greenidge, Merom, Scrubgrass, or coal-heavy grids like Kentucky's.

Electricity demand in comparable sectors has not increased and, in some cases, even declined as energy efficiency increased.²⁶² For example, electricity demand by data centers has not increased, even though internet traffic and data center workloads have increased significantly.²⁶³ In sharp contrast to cryptocurrency mining, data transmission networks and mobile communications networks are rapidly becoming more energy efficient.²⁶⁴ However, even as ASICs have become more 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.²⁶⁵

Moreover, Bitcoin's ratio of energy consumption to human participation — people actually 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.²⁶⁶ 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.²⁶⁷ By some estimates, a single Bitcoin transaction uses more energy than 100,000 Visa transactions.²⁶⁸

IX. Recommendations to Mitigate the Risks of Proof-of-Work Cryptocurrency Mining

Proof-of-work cryptocurrency mining poses significant risks to grid stability, retail electricity rates, our climate, and local air and water quality. Therefore, policymakers and regulators at all levels of government, as well as utilities and impacted community members, should review proof-of-work cryptocurrency mining proposals carefully with these risks in mind.

Because the type of operations and impacts of cryptocurrency mining vary from community to community, solutions will necessarily be project-specific. As such, we offer the following high-level recommendations to policymakers, regulators, utilities, and impacted community members as they face the risks of proof-of-work cryptocurrency mining.²⁶⁹

LOCAL GOVERNMENTS, DECISION-MAKERS, AND COMMUNITY MEMBERS

Given the significant local impacts and outsized role of local decision-making in the approval process for cryptocurrency mining operations, local governments, including zoning and planning boards, as well as community members are on the front lines of the cryptocurrency mining boom. As such, local actors should approach proposals for new cryptocurrency mining facilities with an eye toward noise pollution, whether they truly create stable, good-paying jobs, what grid and infrastructure upgrades are needed, fire and safety risks, as well as increases in local air, water, and solid waste pollution.

- **Mitigate local air, water, and solid waste pollution.** In addition to any local air pollution from the electricity generated to power mining operations, mining operations can use significant amounts of water for cooling. In water-constrained areas of the country, local regulators should assess the consumptive needs of cryptocurrency mining operations, particularly if the mining operation uses municipal (i.e., treated) water supplies that might impact residential water costs. In addition, mining equipment, after their useful lives are over, contribute to significant e-waste pollution. The initial construction of a mining facility also creates a large amount of solid waste. Preventative measures can be taken to ensure recycling and proper waste handling. States and municipalities with climate laws and regulations on the books are well-situated to make some of these arguments.

- **Calibrate or forego economic development incentives.** Cryptocurrency mining operations offer relatively few local jobs. Prior to offering economic development incentives, local governments should require cryptocurrency miners to provide a guarantee for a high number of local jobs over a sustained period. Any tax incentives or local municipal utility incentives should be carefully weighed against a realistic assessment of job growth potential, as well as other costs borne by the community as a result of the operation.
- **Ensure miners bear their fair share of grid and infrastructure upgrade costs.** Large energy consumers such as cryptocurrency mining operations may require grid and infrastructure upgrades, which may be paid by local governments or all electric utility customers. Utility regulators and local governments should ensure that ratepayers and community members do not foot the bill for these projects unless they benefit the community as well.
- **Protect against fire and safety risks.** Cryptocurrency mining rigs can present a unique risk of overheating and fire risk. Local governments should ensure that facilities have the technical capacity to mitigate fire, and carry appropriate levels of insurance. Additionally, local governments in cold weather climates can require the excess heat from cryptocurrency mining operations to be recycled for local benefit.
- **Consider noise pollution mitigation.** Cryptocurrency mining operations can be extremely loud operations. Local governments can review, update, and enforce noise ordinances to mitigate noise levels.
- **Update local land use codes.** Planners and local leaders are working on model codes for communities. For example, the American Planning Association recently published a Zoning for Data Centers and Cryptocurrency Mining Guide.²⁷⁰ Many zoning codes from communities who have already implemented such codes are available online as well, including from municipalities across the country.²⁷¹

ELECTRIC UTILITY REGULATORS

Cryptocurrency mining operations in the United States have, thus far, sought to build new mining facilities in jurisdictions where energy costs are low and easy to access, and where regulators either encourage electricity consumption as economic opportunity (or supportive

of utilities), or where there is relatively thin regulatory oversight. State and local utility regulators, including officials that oversee municipal utilities and rural electric cooperative board members, public utilities commissions, energy regulators, and regional energy system market monitors can provide critical ratepayer protections.

- Utility regulators should refuse to approve power purchase agreements with cryptocurrency mining operations unless those utilities can demonstrate the agreement will not adversely impact other ratepayers, including by raising rates or otherwise increasing costs. State regulators and lawmakers should work with non-jurisdictional utilities, such as municipal and cooperative utilities, to do the same.
- Utility regulators should ensure that cryptocurrency miners are not provided discounted rates, and instead allocate costs and adopt rates in a manner that protects existing consumers from higher wholesale costs, cost shifting, and stranded assets. In fact, several utilities have argued that cryptocurrency mining operations should face substantially higher rates than other industrial consumers given the short-term view of the industry. In the short run, new utility infrastructure may be required to support mining center interconnection, and over the long-run, utilities may need to procure new generation to serve substantial new load. Utilizing traditional “cost causation” principles, utility regulators should ensure that mining operations pay their fair share over the short- and long-run.
- Utility regulators should critically assess utility plans to increase or maintain obsolete capacity (such as old fossil generators) in response to cryptocurrency mining operations, and ensure that existing ratepayers are held harmless. These reviews can occur in resource planning, procurement, or rate proceedings, and through other regulator inquiries.
- Utility regulators should consider Systems Benefit Charges (SBCs), or on-bill surcharges to cryptocurrency mining operations, to fund mitigation measures and protect ratepayers against stranded asset costs.
- Utility regulators, market monitors, and federal electricity regulators should review the impact of cryptocurrency mining operations on regional resource adequacy and the cost to serve customers. In non-restructured (i.e., non-market-based) regions, utility regulators should assess if cryptocurrency mining impacts utility load forecasts and system costs. In

restructured states, market monitors should assess the impact of mining operations and load increases on the wholesale cost of energy and grid congestion. This necessarily requires a comprehensive reporting requirement for mining operations to ensure accurate data needed for planning.

- State environmental and energy regulators should establish and require best management practices for high-density load energy users, including but not limited to energy efficiency requirements, power density limits that set caps on the number of kW of energy consumption or load per thousand square feet, and take service as fully interruptible load.

ELECTRIC UTILITIES AND GRID OPERATORS

- Utilities should develop rate structures for high-density energy users such as cryptocurrency miners that ensure those operations pay their fair share of infrastructure upgrades at the time of interconnection (either through a deposit requirement or other mechanism); incorporate interruptibility provisions to avoid, where possible, increases to the utility’s capacity obligations necessitating new generation build-out; and protect customers from rate shocks due to either the magnitude of new requests or the sudden departure and resulting stranded assets.
- Independent system operators should develop guidance around the interconnection of large-scale, high-density electricity users, including emergency response rules, that prioritize the integrity of grid operations and treat cryptocurrency mining as the highly interruptible, “flexible” load it claims to be.

FEDERAL AND STATE POLICYMAKERS AND REGULATORS

- States should consider imposing a moratorium on cryptocurrency mining operations until the impacts on climate goals and energy costs can be ascertained and mitigated. New York State is already considering such a moratorium, and several municipalities have already implemented them. In the absence of a moratorium, state environmental regulatory agencies should take a hard look at fossil power plants purchased or primarily serving cryptocurrency operations, including whether those plants are properly operating under previously obtained permits. In states with oil and gas drilling, stronger and more proactive enforcement may be required to stop unpermitted flare mining operations.

- Below are additional options that state policymakers and regulators should consider:
 - Reviewing a cryptocurrency mining facility's local and state environmental permits, including local stormwater and solid waste permits, as well as air and water permits.
 - Establishing revenue assurance or bonding requirements as a way to protect customers in the event that a high-density-load customer does not pay its utility bills.
 - Regulating electronic waste and other solid waste from proof-of-work cryptocurrency mining operations.
 - Creating a registry for proof-of-work mining over a certain megawatt threshold and requiring those operations to disclose their energy source.
 - Establishing minimum energy efficiency limits, for both the mining rigs themselves or one set around a kWh per transaction or block.
 - Requiring public power authorities to halt all discounted energy provided to proof-of work mining operations.

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March 7, 2023

The Honorable Senator Edward J. Markey, Chair,
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts, Ranking Member,
Clean Air, Climate, and Nuclear Safety subcommittee

Dear Chairman Markey and Ranking Member Ricketts:

I am testifying today on behalf of the Sierra Club, the largest grassroots environmental organization in the United States. The Sierra Club is committed to addressing the threat posed by global warming. In collaboration with and at the behest of our hundreds of thousands of members, the Sierra Club devoted extensive resources toward stopping the construction and accelerating the retirement of coal and gas power plants. The Congressional Budget Office estimates that in 2021, emissions from electricity generation accounted for one-third of all greenhouse gas emissions in the United States, making decarbonization of the electricity sector absolutely essential to meeting the United States' commitments under the Paris Agreement.

Although greenhouse gas emissions from the electric sector have begun to decline and we are beginning to see a massive deployment of renewable resources to replace retiring coal plants, the rapid growth of proof-of-work cryptocurrency mining threatens to slow and even reverse these trends. About 38% of all crypto-mining is now estimated to take place in the U.S.¹ The greenhouse gas emissions associated with the sheer quantity of energy consumption that is inherent to proof-of-work cryptocurrency mining has been well documented by journalists and organizations. My testimony will therefore focus on how aspects of the cryptocurrency mining industry have, in the Sierra Club's experience, increased electric-sector greenhouse gas emissions out of proportion to the quantity of electricity those mining operations consume. The dynamics I describe are based on Sierra Club's prior engagement in electric sector decarbonization. Our concern with proof-of-work cryptocurrency mining, specifically, arose from observing its detrimental impact on our efforts to secure coal plant retirements and prevent new gas construction. As I discuss later, one of the challenges we have faced, and which this bill addresses, is gaining a birds-eye view of the overall impact of mining on the generation mix of the electric sector.

¹ Cambridge Centre for Alt. Finance, Cambridge Bitcoin Electricity Consumption Index; Evolution of Country Share (last visited March 6, 2023), https://ccaf.io/cbeci/mining_map.

First, cryptocurrency mining operations have provided economic incentives to continue operating otherwise uneconomic coal plants nearing retirement. Over the past decade we have seen an accelerating wave of coal plant retirements due not just to coal's health and climate impacts, but economics. A recent study by Energy Innovation found all but one coal plant in the United States could be replaced today with renewable generation at lower cost.² Crypto-miners, unlike utilities or most large electricity customers, do not necessarily look to minimize generation costs. Because the energy requirements to obtain a single bitcoin will only increase over time, and because miners anticipate near-term price increases and long-term uncertainty, crypto-miners place a huge premium on obtaining access to lots of electricity and thus to mining a lot of new coins very quickly. Once source of readily available electricity that miners have turned to is coal plants that were on the verge of retirement, paying above-market wholesale electricity rates or outright buying plants to run mining computers. The most prominent national example of this phenomenon is the Hardin Generating Station in Montana, which operated an average of just 75 days each year between 2017 and 2020.³ After Marathon Digital Holdings moved its mining operations there, the plant operated 353 days in 2021 and greenhouse gas emissions increased by more than 800%.⁴ There are other examples as well: The 1-GW Merom coal plant in Indiana was sold rather than retired last year, around the same time AboutBit announced it would purchase land near the plant and construct a 115-MW crypto-mining facility.⁵ Stronghold Digital Mining has purchased two waste coal plants in Pennsylvania and

² Solomon et al., *Coal Crossover 3.0: Local Renewables Plus Storage Create New Opportunities for Customer Savings and Community Reinvestment* (January 2023), <https://energyinnovation.org/publication/the-coal-cost-crossover-3-0/>.

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⁴ U.S. EPA, Clean Air Markets Program Data, <https://campd.epa.gov/>; see also Montana Env'tl Info. Center, et al., Comments on Montana's Proposed Regional Haze State Implementation Plan for the 2nd Implementation Period (Mar. 21, 2022), https://protectnps.org/wp-content/uploads/2022/03/Combined-MT-Regional-Haze-R2-Comment-LetterExhibits-2022-3-21_reduced-file-size.pdf.

⁵ Hoosier Energy, 2020 Integrated Resource Plan—Public Version Vol. I: Main Report, at 89, 98 (Nov. 2, 2020), https://www.in.gov/iurc/files/HoosierEnergy_IntegratedResourcePlan_Volume1_110220.pdf (discussing 2023 retirement date); Hallador Energy Co., Form 8-K/A, Current Report Amendment No. 1 (Feb. 18, 2022), https://www.sec.gov/ix?doc=/Archives/edgar/data/0000788965/000143774922006045/hnrg20220309_8ka.htm (describing sale); Gerry Dick, Startup to Establish Crypto Mining Facility in Sullivan County, Inside IN Bus. (May 12, 2022), <https://www.insideindianabusiness.com/articles/startup-to-establishcrypto-mining-facility-in-sullivan-county>; see also Haley Cawthon, AboutBit to Open New Crypto Mining Facility in Southern Indiana, KYINNO (May 11, 2022), <https://www.bizjournals.com/louisville/inno/stories/news/2022/05/11/aboutbit-merom-mining.html>.

continues to operate those plants (with a combined nameplate capacity of 188 MW) primarily for crypto-mining.⁶

Second, the sudden influx of huge new electrical loads appears to be a major reason for extensive new gas plant buildout by some utilities. To ensure reliable electricity, the electrical grid has to have enough generation resources to meet demand at the highest peak. The measure of this ability is called capacity, and utilities routinely build more generation than is needed on a day-to-day basis to meet capacity requirements. Crypto-mining operations cause large stepwise increases in demand and thus the need for new capacity. We have seen multiple new mining operations sign contracts for 100MW or more in capacity to be built within a 12-month time frame.⁷ Although renewable resources are the better choice to meet this need in the long-term, when faced with a sudden need for new generation resources utilities often favor gas plants. For example, Basin Electric Cooperative, the country's largest rural electric cooperative, recently announced plans to build 583 MW of new gas generation and attributed the need for the plant, in significant part, to a rapid increase in cryptocurrency mining in its service area.⁸

Recognizing that this intensive energy usage has raised questions about the viability of proof-of-work cryptocurrencies, some in the industry have claimed that mining could be carbon neutral, if powered by entirely renewable resources, or even provide financial incentives for increased renewable buildout, accelerating grid transition. We believe the vast majority of these claims are greenwashing. We have yet to find an example of a mining operation on the scale of the Marathon Digital facility in Montana or Stronghold in Pennsylvania that relies solely on renewable generation. Nor do we think renewables are likely to become the primary source of electricity for proof-of-work mining at a faster rate than the renewables will power the grid as a whole. Miners claim that they can use what's termed "curtailed" electricity from solar or wind, that is, energy generated in excess of load. The problem with this claim is that such curtailment only occurs intermittently; miners would have to commit to leaving their machines idle for much of the day to truly use only curtailed renewable energy. Instead, the relatively small percentage of miners that *do* use behind-the-meter renewable generation are simply displacing residential, commercial, and industrial customers who would otherwise use that electricity, either from the

⁶ Stronghold Digital Mining, Inc., Form 10-K, Annual Report, at 7 (for year ending Dec. 31, 2021), <https://www.sec.gov/ix?doc=/Archives/edgar/data/0001856028/000162828022007706/sdig-20211231.htm>; Stronghold Digital Mining, Inc., Form S-1, Registration Statement, at 4, 7 (July 27, 2021), <https://www.sec.gov/Archives/edgar/data/0001856028/000156459021038087/sdmi-s1.htm>.

⁷ Researchers at Sierra Club and Earthjustice identified eight facilities with more than 150 MW load each built since 2021 in Texas alone: Argo's Helios facility (200 MW), BitDeer Rockdale (170 MW), Riot Blockchain Rockdale (400 MW), Compute North Granbury (300 MW), Compute North McCamey (280 MW), Core Scientific Denton (300 MW), Genesis Digital Pyote (300 MW), and Lancium Abilene (200 MW).

⁸ Dave Thompson, Basin Electric proposes an expansion of its Pioneer Generation Station, Prairie Public Broadcasting (December 2, 2022), <https://news.prairiepublic.org/local-news/2022-12-02/basin-electric-proposes-an-expansion-of-its-pioneer-generation-station>.

same site or because the raw materials and labor for renewable development (which are currently inadequate to meet demand) could be used to install projects elsewhere. Because gas is the marginal generation resource on most grids in the U.S. right now (that is, the source of electricity called upon for the *next* electron when energy use increases), even “green” mining operations increase greenhouse gas emissions from the electricity sector.

Finally, I want to note that in addition to adverse environmental impacts, the installation of large-scale cryptocurrency mining operations can result in higher electricity rates for ordinary residential users as well as other commercial or industrial electricity customers. Increases in marginal load may increase customer cost, both because adding generation is a stepwise function (and so utilities typically overbuild slightly before load catches up) and because in a grid with zero-cost marginal renewables, each additional megawatt needed on an hourly basis draws from more expensive, fossil-fuel-fired resources. Even more troublingly, in numerous instances we have seen utilities spend millions of dollars to upgrade substations or install transmission to support cryptocurrency mining facilities. These costs are borne by *all* ratepayers and in some cases, disproportionately so because the utility will also offer the mining operation a steep discount. Nebraska Public Power District, for example, spent \$17.6 million, or 18% of its total 2020 budget, on transmission and a substation for Compute North, a company that provides technical services for bitcoin miners.⁹ Reporting by Reveal found that NPPD also offered Compute North a steep discount on electricity rates.¹⁰ Because mining operations can be set up and moved so rapidly, there is a real risk that these investments will be entirely stranded as the mining operation departs shortly after interconnection is complete. Utilities in Idaho and Arkansas have articulated this concern in public filings.¹¹

In sum, in our experience closely tracking retirements and electricity generation build-out in all fifty states, crypto-mining as an industry is making it harder to retire coal plants and inducing new gas generation buildout. Crypto-mining’s outsized impact relative to even to its extraordinary volume of electricity consumption is due to the speed at which mining can scale up to literally hundreds of megawatts of energy consumption, the relative price insensitivity of miners to the cost of electricity when cryptocurrency prices are high, and structural aspects of the

⁹ 52 Neb. Public Power District, 2021 Financial Report, at 6, <https://docs.nppd.com/2021FinancialReport.pdf>; Peter Maloney, Bitcoin mining operation to add flexible load to NPPD’s area, Am. Public Power Ass’n (Mar. 17, 2021), <https://www.publicpower.org/periodical/article/bitcoin-mining-operation-add-flexible-load-nppds-area>.

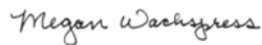
¹⁰ Reveal, Can Our Climate Survive Bitcoin? (March 26, 2022), <https://revealnews.org/podcast/can-our-climate-survive-bitcoin/>.

¹¹ See Application of Idaho Power Co. for Authority to Establish a New Schedule to Serve Speculative High-Density Load Customers, at 5, Idaho Pub. Util. Comm’n Case No. IPC-E-21-37 (Nov. 4, 2021), <https://puc.idaho.gov/Fileroom/PublicFiles/ELEC/IPC/IPCE2137/CaseFiles/20211104Application.pdf>; In the Matter of the Application of Entergy Arkansas, LLC for a Proposed Tariff Regarding Large Power High-Load Density (“Crypto Mining”), Direct Testimony of D. Andrew Owens, at 8 (Jul. 28, 2022), Ark. Pub. Serv. Comm’n, Docket No. 22-032-TF, http://www.apservices.info/pdf/22/22-032-TF_16_1.pdf.

grid such that the marginal megawatt of capacity or kilowatt-hour of energy may tip a utility away from a coal retirement or toward a new combustion turbine. Moreover, despite promises or statements to the contrary, there is little reason to believe mining will go green anytime soon.

Although we understand many of the localized issues around cryptocurrency mining and how it impacts the environment and consumers, we—including federal, state, and local governments—lack basic information about the full scale of mining, the sources of electricity for that mining, how utilities are managing the influx of load (including by instituting demand response programs meant to reduce mining’s *capacity* footprint), or the localized environmental impacts (such as noise and water consumption) of these facilities. Many of the cryptocurrency mining advocates who make misleading claims about renewable-powered mining can do so uncorrected because state legislators lack rigorous data evaluating where cryptocurrency miners actually get their electricity. The Crypto-Asset Environmental Transparency Act is an important first step toward gathering this information, toward ensuring existing mining operations are operating consistent with the Clean Air Act, and toward developing regulations that can address the threat posed to U.S. decarbonization goals by proof-of-work mining. We urge the committee to support the Crypto-Asset Environmental Transparency Act.

Thank you for your time and consideration.



Megan Wachspress
Staff Attorney, Sierra Club
2101 Webster St., Suite 1300
Oakland, CA 94612
(415) 977-5635
megan.wachspress@sierraclub.org



The Honorable Senator Edward J. Markey-Chair
Clean Air, Climate, and Nuclear Safety subcommittee

The Honorable Senator Pete Ricketts -Ranking Member
Clean Air, Climate, and Nuclear Safety subcommittee

Re: Support of the Crypto-Asset Environmental Transparency Act

Dear Chairman Markey and Ranking Member Ricketts,

On behalf of the **National Coalition Against Cryptomining (NCAC)** and the many individuals, communities and states we represent, we appreciate the opportunity to provide a statement for the committee's legislative hearing on the Crypto-Asset Environmental Transparency Act.

The **National Coalition Against Cryptomining** formed in 2022. Since then, communities in states from New York to Pennsylvania, West Virginia, North Carolina, South Carolina, Georgia, Tennessee, Kentucky, Montana, Minnesota, Texas, and Washington have joined the coalition and are urging for national legislation on the environmental and climate impacts of Proof of Work cryptomining.

Proof-of-work cryptocurrency mining is an extremely energy intensive process that threatens the ability of governments across the globe to reduce our dependence on climate-warming fossil fuels. Mining requires thousands of machines whirring 24/7 to solve complex equations. The more machines that are running, the faster a coin is mined. Each one of these machines requires energy to run, plus more energy for cooling. Globally, Bitcoin mining consumes more energy each year than the entire country of [Argentina](#)¹. In the U.S. alone, Bitcoin mining produces an estimated [40 billion pounds of carbon emissions](#)² each year. As countries like China are banning

¹ Digiconomist, "Bitcoin energy consumption index": <https://digiconomist.net/bitcoin-energy-consumption>

² Business Insider, "What are the environmental impacts of cryptocurrencies?": <https://www.businessinsider.com/personal-finance/cryptocurrency-environmental-impact>

the industry, crypto miners are moving to the US in droves where they face little, if any, regulation. Cryptocurrency mining facilities are major emitters of air pollutants. And when cryptocurrency miners rely on the public grid, they can stick everyday people with the bill. A [2021 study estimates](#)³ "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."

Meanwhile, Bitcoin has plummeted over the last year, and the [crypto industry is imploding](#)⁴. Bitcoin miners have been similarly struggling — [Compute North filed for bankruptcy](#)⁵, and TeraWulf Inc., which operates a Bitcoin mining facility in New York, saw its stock fall more than 90% in 2022. More Bitcoin miners are [expected to go bankrupt in 2023](#)⁶.

Communities across the country are experiencing many of the same harmful impacts of this industry- from unbearable noise, air emissions, huge water withdrawals, enormous energy consumption, higher electricity costs for everyday people, loss of property values, electronic and packaging waste, increased environmental justice issues for underserved communities and fights against a very subversive and aggressive industry that frequently attempts to start up in a community under the guise of a "data center" or "science center", falsely promising revenue and jobs that never materialize. With powerful lobbying from the crypto industry, the individuals, communities and states that constitute the NCAC are finding it extremely daunting to fight these miners on their own, and are calling for national regulation on cryptomining.

In September 2022, the White House sounded the alarm about cryptomining when the Office of Science and Technology Policy [released a report](#)⁷ about the industry's climate threats and the need for regulation. But cryptomining continues to expand quickly and widely across the country. Earthjustice and the Sierra Club released [a Guidebook](#)⁸ in 2022, finding that in just one year, Bitcoin mining emitted 27.4 million tons of CO2 - equivalent to the emissions of as many as 6 million cars annually. More highlights from the Guidebook:

³ BerkelyHaas, "Power-hungry cryptominers push up electricity costs for locals":

<https://newsroom.haas.berkeley.edu/research/power-hungry-cryptominers-push-up-electricity-costs-for-locals/>

⁴ CNN Business, "Crypto crisis continues. Here's the latest on the FTX collapse": <https://www.cnn.com/2022/11/14/business/ftx-crypto-collapse-updates-hnk-intl/index.html>

⁵ Forbes Digital Assets: <https://www.forbes.com/sites/colinharper/2022/09/30/bitcoin-minings-first-major-bankruptcy-creates-uncertainty-for-key-partners-opportunity-for-others/?sh=3035008657d2>

⁶ Blockworks, "Expect More Bitcoin Miners To Go Bankrupt in 2023": <https://blockworks.co/news/more-crypto-miner-bankruptcy-2023>

⁷ White House Fact Sheet, "Climate and Energy Implications of Crypto-Assets in the United States": <https://www.whitehouse.gov/ostp/news-updates/2022/09/08/fact-sheet-climate-and-energy-implications-of-crypto-assets-in-the-united-states/>

⁸ Sierra Club/Earthjustice "The Energy Bomb-Bitcoin White Paper": https://earthjustice.org/wp-content/uploads/energy_bomb_bitcoin_white_paper_101322.pdf

- Cryptomining has grown explosively in the United States since 2020. An estimated 38% of Bitcoin is mined in the U.S, resulting in nearly 30 million tons of excess CO₂ emissions in one year.
- From mid-2021 to mid-2022, Bitcoin consumed as much as all of the electricity consumed in Maine, New Hampshire, Vermont, and Rhode Island put together.
- Cryptomining can raise costs and risks for utilities and their ratepayers, stress electric grids, and flood communities with noise.
- The cryptomining industry uses half the electricity of the entire global banking sector, and it's on track to overtake the global banking sector in two years if current trends continue. The ratio of Bitcoin's energy consumption to humans who actually have Bitcoin is extremely high.
- Proponents of cryptomining claim that mining is spurring new renewable development. But clean energy allocated to cryptomining doesn't actually do anything to clean up the grid, and there are few mining facilities that are building renewables to even power their own operations, let alone send power to the grid.

While NCAC applauds the introduction of this bill, we are concerned that it doesn't go far enough- in that miners using renewable energy or purchasing carbon offsets (or even those using landfill emissions or fracking sites) would be able to claim they don't have carbon emissions to report. This doesn't get at the meat of the problem or demonstrate how even using renewable resources for crypto mining takes those precious electrons away from the public and just makes us more reliant on fossil fuels. We're hoping that we can work together to amend the bill to be more broad in terms of a study and in reporting requirements.

NCAC appreciates your consideration of these comments and the impacts current legislation could have on cryptomining operations across the US and your constituents. We all share a goal of protecting the health and safety of the communities we serve and welcome further discussions with the Committee on this issue. Cryptomining can't be a town-by-town or state-by-state fight. We need federal action on climate-killing cryptomining, and the Crypto-Asset Environmental Transparency Act is a great start. To protect public health, the environment, and the nation's climate goals, we strongly support swift action on this issue. The impacted communities and the climate can't wait.

Respectfully Submitted,
Yvonne Taylor
On behalf of
National Coalition Against Cryptomining



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](https://www.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/](https://www.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 purposed 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,

Alfonso Pating, Manager, Climate Finance
Cullen Howe, Senior Advocate
Natural Resources Defense Council
1152 15th St. NW Suite 300
Washington, DC 20005



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Testimony for the record
by the Environmental Working Group
Submitted to the Senate Environment and Public Works Subcommittee on Clean Air,
Climate and Nuclear Safety
“Air, Climate, and Environmental Impacts of Crypto-Asset Mining”
March 7, 2023

Chairman Markey and Ranking Member Ricketts, thank you for holding today’s hearing on legislation to address the environmental issues associated with cryptocurrency mining facing communities across rural America. The Environmental Working Group endorses the Crypto-Asset Environmental Transparency Act of 2023 and believes it is necessary to help curb the increasing greenhouse gas emissions and water, air and noise pollution associated with proof of work cryptocurrency mining.

Introduction

Cryptocurrency mining operations in search of low-cost electricity, cheap land and limited local planning or zoning regulations are taking root in rural communities located in pristine natural environments across the country. Bitcoin’s insatiable need for energy has led the crypto-mining industry to revive shuttered coal-fired power plants, siphon energy resources away from more economically productive uses, and even burn piles of waste coal too dirty for coal companies to sell.

The Environmental Working Group does not oppose cryptocurrency. Millions of people own cryptocurrency. We don’t need to eliminate the use of digital currencies, but we do need to increase transparency in a largely unregulated industry and change the way certain types of digital currencies are validated if we want to avoid the worst effects of climate change and keep the U.S. on track to meeting its climate commitments.

Certain types of cryptocurrencies, such as bitcoin, are “mined” using a process known as **proof of work**. The “work” in proof of work comes from using powerful computers in a race to solve complex puzzles to validate cryptocurrency transactions.



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Once puzzles are solved and transactions are validated, new cryptocurrency ledgers are added to the blockchain. The owner of the “winning” ledger is rewarded in cryptocurrency coins or tokens. This process is wasteful by design because each time a new puzzle is solved, the next puzzle becomes even harder, requiring more computing power and more electricity.

Local impacts

Kentucky. Bitcoin mines can appear seemingly overnight and are difficult to track. As the [Kentucky Conservation Committee](#) notes on its website: “Because existing laws, regulations, and/or permits mostly do not require that mining operations make this information available to any government agency or the public, it is notoriously difficult to discover how much a particular entity is using, or even an operation’s fuel source.”

Coal-rich Kentucky is home to almost 20 percent of all proof of work bitcoin mining operations in the U.S., according to the committee. About 66 percent of electricity generated in Kentucky in November 2022 [came from coal](#). And because the energy for bitcoin mining derives mostly from coal-fired power, the state emits more carbon dioxide associated with bitcoin mining than any other state, according to the group.

When crypto mines come to town, they can also affect local residential electricity costs, since ratepayers are often left [paying for the upgrades](#) the grid needs in order to sustain the increased energy load proof of work crypto mining requires. Some mining companies pitch their operations as lifelines for economically hard-hit communities. But they bring very few jobs and often increase electricity bills for locals – all while the state offers the miners significantly discounted energy rates.

Montana. Hardin Generating Station formerly served as a coal-fired power plant generating electricity for the surrounding area. Owned by Beowulf Power, the plant was slated to close by 2018 until Hardin struck a deal with [Marathon Digital Holdings](#) to keep the plant online for the purpose of mining bitcoin.

In 2021, Marathon’s operations at the Hardin plant produced 755,700 tons of carbon dioxide emissions – its highest annual emissions since 2014.



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That year it also generated 304 tons of sulfur dioxide and 245 tons of nitrogen oxides. Last year Marathon announced plans to shutter the plant and move its miners to new locations with renewable power sources.

Without comprehensive federal policy, communities are left on their own to fight multi-million-dollar proof of work mining operations. In a rare victory, Missoula County in 2021 established [first-in-the-nation zoning regulations](#) restructuring where and how crypto mines can be located.

Georgia. Noise pollution associated with crypto mining became a major concern for local residents in Adel when a bitcoin mining company, [Blockstream](#), moved in next door. When Blockstream was operating its miners 24 hours a day, seven days a week, local residents' who lived next door recorded noise levels at or above the 70 decibels, the rate the [Centers for Disease Control and Prevention](#) warns is harmful.

The facility has reduced its operations so its noise level now ranges between 30 and 40 decibels, in keeping with the trend of mines slowing down as the price of bitcoin fluctuates. But the noise is still deafening. Not everyone can afford to install insulation to drown it out, or afford to move – nor should they have to.

New York. Water pollution associated with large-scale bitcoin mining operations have sparked an outcry from local residents of Seneca Lake, part of New York's pristine Finger Lakes region. [Greenidge Generations Holdings](#) has been using a former coal-fired power plant that they hooked up to natural gas in Dresden since 2020 to power its bitcoin mining operations.

In addition to the air pollution associated with the use of natural gas – another dirty fossil fuel that emits greenhouse gas emissions – Greenidge's proof of work bitcoin mining requires millions of gallons of water. At its peak, Greenidge can discharge as much as 134 million gallons a day into the lake at temperatures up to 108 degrees. This can distress local aquatic life, including trout, and could contribute to [toxic algae blooms](#).

Gov. Kathy Hochul recently signed into law a bill that imposed a [two-year pause](#) on new proof of work cryptocurrency mines powered by fossil fuels. It is intended to last until

Greenpeace USA
Written Testimony
on
Crypto-Asset Environmental Transparency Act of 2023

Submitted Friday March 17, 2023
to the
Subcommittee on Clean Air, Climate, and Nuclear Safety

Greenpeace USA offers the following testimony on the Crypto-Asset Environmental Transparency Act of 2023 (hereinafter, the "Act"). By mandating an interagency study on the environmental impacts of crypto-asset mining and reporting of carbon dioxide emissions from crypto-asset mining operations, the Act is an important step toward greater transparency in the cryptocurrency mining industry. For this reason, Greenpeace USA is pleased to support Senator Markey's bill.

This written testimony outlines some of the negative impacts Bitcoin and other cryptocurrencies have on the environment and local communities. Furthermore, because there is a tremendous amount of misinformation about mining, we will address some of the myths that miners and other vested interests perpetuate. We also highlight the international scale of the environmental damage from the industry and how other governments are working to regulate and clean up the industry.

Proof of Work Cryptocurrencies Incompatible with U.S. Climate Goals

Proof-of-work (PoW) cryptocurrencies, of which Bitcoin is by far the largest with a market cap of \$452.1 billion,¹ are uniquely energy and carbon-intensive. To maintain a consistent hash-rate, the PoW code produces increasingly complex algorithms for miners to solve. For this reason, PoW cryptocurrency mining declines in efficiency over time, in contrast with how most industries behave. This makes cryptocurrency mining a major barrier to decarbonization and achieving goals laid out in the Paris Climate agreement to reduce greenhouse gas emissions by 50 to 52% by 2030. The design of this type of digital asset uses increasing amounts of energy for the same amount of economic output.

The Bitcoin PoW system relies on miners using specialized hardware known as application-specific integrated circuits (ASICs) to guess the correct number to a

¹ Tretina, Kat. February 16, 2023. "10 Best Cryptocurrencies Of March 2023." *Forbes*.
<https://www.forbes.com/advisor/investing/cryptocurrency/top-10-cryptocurrencies/>.

complex algorithm. The first miner to guess the correct number is rewarded with new Bitcoin and transaction fees, and can validate and add a new block to the blockchain. To increase their chances of winning, miners compete against each other to guess the most numbers in the least amount of time, which incentivizes them to use more computing power and electricity.² As more miners join the competition or the computers become faster and more efficient, Bitcoin's system automatically adjusts to make it more difficult to guess the right number, thus requiring even more computing power and electricity.³ PoW cryptocurrencies are unique because they inherently use large amounts of electricity and use increased energy over time. Miners have an incentive to continuously increase their workload since the more Bitcoin they can mine for a unit of energy, the higher their profits.⁴

In PoW mining, a significant amount of energy is expended on powering trillions of incorrect guesses, unlike other industries where energy consumption is more productively allocated. For example, manufacturing automobiles is energy intensive, but all of the energy being expended goes toward creating a tangible product. By contrast, PoW mining uses thousands of terawatt hours, more than all of the refrigerators in the United States, to power what is essentially a large-scale guessing game.⁵ As a result, the majority of energy used in PoW mining is wasted.

Many industries and technologies improve their energy efficiency over time through technological improvements and incentives to reduce energy consumption. For example, traditional data centers that support cloud data storage and essential services for the Internet have decreased their electricity usage despite an increase in demand.⁶ Similarly, mobile communication and data transmission networks, and the equipment used in these systems, are becoming more energy efficient.⁷ However, energy efficiency improvements in ASICs computers designed for cryptocurrency mining has

² de Vries, Alex. 2021. "Bitcoin Boom: What rising prices mean for the network's energy consumption." *Joule* 5(3), 509–513. <https://doi.org/10.1016/j.joule.2021.02.006>.

³ Huang, Jon, Claire O'Neill, and Hiroko Tabuchi. September 3, 2021. "Bitcoin Uses More Electricity Than Many Countries. How Is That Possible?" *The New York Times*.

<https://www.nytimes.com/interactive/2021/09/03/climate/bitcoin-carbon-footprint-electricity.html>.

⁴ Dhanesha, Neel. April 18, 2022. "The Daunting Task of Making Cryptocurrency Climate-Friendly." *Vox*. <https://www.vox.com/recode/23005493/cryptocurrency-bitcoin-climate-friendly>.

⁵ Cambridge Digital Assets Programme (CDAP) at the Cambridge Centre for Alternative Finance. "The Cambridge Bitcoin Electricity Consumption Index (CBECI)." <https://ccaf.io/cbeci/index>.

⁶ Kamiya, George. November 2021. "Data Centres and Data Transmission Networks." *International Energy Agency*. <https://www.iea.org/reports/data-centres-and-data-transmission-networks>.

⁷ Aslan, Joshua, et al., 2017. "Electricity Intensity of Internet Data Transmission: Untangling the Estimates," 22(4) *Journal of Industrial Ecology* 785, <https://onlinelibrary.wiley.com/doi/10.1111/jiec.12630>; Fehske, Albrecht et al., August 2011. "The global footprint of mobile communications: The ecological and economic perspective," 49(8) *IEEE Communications Magazine*. <https://ieeexplore.ieee.org/document/5978416>.

not led to a corresponding decrease in overall energy consumption in the crypto-mining sector. This is largely due to the increased scale of mining activity and miners simply using more ASICS when the equipment becomes more efficient, which has offset any gains in efficiency.⁸ Even an industry like manufacturing that uses large amounts of electricity has seen declining energy consumption over time while still increasing outputs.⁹

An additional challenge unique to the cryptocurrency mining industry is that it provides a lifeline to outdated fossil fuel infrastructure. Limiting global warming to 1.5 C degrees will require emissions reductions by about 45% from 2010 levels by 2030 and net-zero by 2050 which means rapidly phasing out fossil fuels and cutting emissions across all sectors, including crypto assets.¹⁰ Decommissioning old fossil fuel power plants is a critical part of that. Meanwhile, cryptocurrencies have given power plants a lifeline at the worst possible time, reviving shuttered fossil fuel power plants, even coal-powered facilities—the dirtiest among them.¹¹ Bitcoin mining could make coal and natural gas more profitable, delaying necessary transitions.¹²

Improving Transparency: An Important First Step In Industry Reform

The Bitcoin mining and cryptocurrency industry has responded to rising alarm about the environmental and climate impacts of the industry. Unfortunately, many of their claims lack real-world examples, evidence, and data, and fail to address the scale of the problem. Greater transparency and reporting about mining facility locations, energy use, carbon emissions, and other environmental impacts is a necessary step towards understanding and addressing the problem. Ultimately, cryptocurrencies that use a PoW consensus mechanism, like Bitcoin, are not compatible with a renewable energy

⁸ Dhanesha, Neel. April 18, 2022. "The daunting task of making cryptocurrency climate-friendly." Vox. <https://www.vox.com/recode/23005493/cryptocurrency-bitcoin-climate-friendly>.

⁹ U.S. Energy Information Administration. 2018. "2018 Manufacturing Energy Consumption Survey Consumption Results." <https://www.eia.gov/consumption/manufacturing/>.

¹⁰ Intergovernmental Panel on Climate Change. 2018. "Global Warming of 1.5°C: An IPCC Special Report." Eds. Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield. Cambridge University Press, <https://doi.org/10.1017/9781009157940>.

¹¹ Roeck, Martin, and Thomas Drennen. 2022. "Life cycle assessment of behind-the-meter Bitcoin mining at US power plant." *International Journal of Life Cycle Assessment*. 27, 355–365. <https://doi.org/10.1007/s11367-022-02025-0>; Holzman, Jael. March 4, 2022. "EPA Tackles Coal-to-Crypto Industry Trend." *E&E News*. <https://www.eenews.net/articles/epa-tackles-coal-to-crypto-industry-trend/>.

¹² McKenzie, Jessica. July 4, 2022. "How Bitcoin Makes Burning Fossil Fuels More Profitable than Ever." *Bulletin of the Atomic Scientists* 78, no. 4: 203–7. <https://doi.org/10.1080/00963402.2022.2087379>; McKenzie, Jessica. May 17, 2022. "This gas would have stayed in the ground if it wasn't for bitcoin." *Bulletin of the Atomic Scientists*. <https://thebulletin.org/2022/05/this-gas-would-have-stayed-in-the-ground-if-it-wasnt-for-bitcoin/>.

transition. To truly address the industry's environmental impacts, it is necessary to develop alternative consensus mechanisms that use less energy, resulting in less emissions.

Below are some common myths about Bitcoin that merit additional transparency.

Myth 1: Bitcoin can reduce its climate impact by using methane flaring and fugitive emissions from oil and gas wells

Methane emissions from oil and gas drilling is a major problem which Greenpeace USA and many other organizations are working to address. There are real solutions to fugitive emissions from methane leaks in the extraction, transportation, and production process for fossil fuels but they do not include Bitcoin miners profiting from burning the gas to power energy-intensive mining rigs. Instead, regulators can require oil and gas companies to capture and cap methane. And, as scientific research and government data show, oil and gas production needs to be phased out quickly in the first place.¹³

Some Bitcoin miners claim they are "carbon neutral" or "carbon negative" because they use excess methane from oil and gas operations. However, this approach may actually incentivize oil and gas companies to expand their operations and do more drilling, even in locations where it might be otherwise unprofitable.¹⁴ Thus, Bitcoin miners using methane may lead to expanded fossil fuel production, undermining their sustainability claims. In addition, burning methane still generates carbon emissions and other forms of air pollution. There are also other uses for captured methane like heating and electricity for the grid that society actually needs. Furthermore, despite claims by some in the industry, coal remains the top source of electricity for Bitcoin mining, and there is little evidence to support claims regarding widespread use of fugitive methane for Bitcoin mining.¹⁵

¹³ Gambhir, Ajay. February 2023. "Powering Past Coal Is Not Enough." *Nature Climate Change* 13, no. 2: 117–18. <https://doi.org/10.1038/s41558-022-01574-4>; International Energy Agency. October 2021. "Net Zero by 2050 A Roadmap for the Global Energy Sector." https://iea.blob.core.windows.net/assets/deebef5d-0c34-4539-9d0c-10b13d840027/NetZeroBy2050-ARoadmapfortheGlobalEnergySector_CORR.pdf.

¹⁴ Kearney, Laila. May 21, 2021. "Oil Drillers and Bitcoin Miners Bond over Natural Gas." *Reuters*. <https://www.reuters.com/business/sustainable-business/oil-drillers-bitcoin-miners-bond-over-natural-gas-2021-05-21/>; McKenzie, Jessica. 2022. "This Gas Would Have Stayed in the Ground If It Wasn't for Bitcoin." *Bulletin of the Atomic Scientists*. <https://thebulletin.org/2022/05/this-gas-would-have-stayed-in-the-ground-if-it-wasnt-for-bitcoin/>.

¹⁵ Cambridge Digital Assets Programme (CDAP) at the Cambridge Centre for Alternative Finance. "The Cambridge Bitcoin Electricity Consumption Index (CBECI)." <https://ccaf.io/cbeci/index>.

Myth 2: Bitcoin mining is using renewable energy

Industry reports about Bitcoin mining using large amounts of renewable energy are unfortunately based on faulty assumptions and data. There is no evidence that the industry is using or funding renewable energy at the necessary scale. Estimates from independent and academic research continue to show that fossil fuels provide a majority of the electricity used by Bitcoin mining.¹⁶ In 2022, the Cambridge Center for Alternative Finance estimates that Bitcoin mining globally received 62% of its electricity from fossil fuels, with the largest amount from coal.¹⁷ Only 26% originated from renewable energy sources.¹⁸ Yet, getting accurate and reliable data on the energy sources and locations of Bitcoin mining operations is difficult, and much more reporting is needed to ensure transparent information about the location, energy use, and operations of mining facilities.¹⁹ Emissions reporting requirements and further study would give policymakers, investors, utilities, customers, and impacted communities a better understanding of the environmental, climate, and community impacts of cryptocurrency mining, which is vital for planning and ensuring climate targets are met.

Crypto mining companies have claimed that they are using and supporting renewable energy sources by simply being near renewable energy production. But, this appears to happen despite the miner not having contracts or other formal agreements to procure power from the nearby solar panels or wind turbines.²⁰ Building a crypto mining facility in a region with significant renewable energy generation does not mean the new demand is met with renewable sources and may actually be supplied by fossil fuel sources and lead to an increase of fossil fuels in the grid mix to accommodate the new demand.²¹

¹⁶ Cambridge Digital Assets Programme (CDAP) at the Cambridge Centre for Alternative Finance. "The Cambridge Bitcoin Electricity Consumption Index (CBEI)." <https://ccaf.io/cbeci/index>; Vries, Alex de, Ulrich Gellersdörfer, Lena Klaaßen, and Christian Stoll. March 16, 2022. "Revisiting Bitcoin's Carbon Footprint." *Joule* 6, no. 3: 498–502. <https://doi.org/10.1016/j.joule.2022.02.005>; Vries, Alex de. April 17, 2019. "Renewable Energy Will Not Solve Bitcoin's Sustainability Problem." *Joule* 3, no. 4: 893–98. <https://doi.org/10.1016/j.joule.2019.02.007>.

¹⁷ Cambridge Digital Assets Programme (CDAP) at the Cambridge Centre for Alternative Finance. "The Cambridge Bitcoin Electricity Consumption Index (CBEI): Bitcoin electricity consumption by source (yearly)." <https://ccaf.io/cbeci/index>. Data available at: https://ccaf.io/cbeci/api/v1.1/download/yearly_bitcoin_power_mix.

¹⁸ *Ibid.*

¹⁹ Podhorsky, Andrea, and Henry M. Kim. October 15, 2022. "Addressing the Data Gap in Modeling Bitcoin's Carbon Footprint." *SSRN*. <https://doi.org/10.2139/ssrn.4248993>.

²⁰ DeRoche, Mandy, Jeremy Fisher, Nick Thorpe, and Megan Wachspress. September 2022. "The Energy Bomb: How Proof-of-Work Cryptocurrency Mining Worsens the Climate Crisis and Harms Communities Now." *Earthjustice and The Sierra Club*. https://earthjustice.org/wp-content/uploads/energy_bomb_bitcoin_white_paper_101322.pdf.

²¹ Voorspools, Kris R. and William D. D'haeseleer. 2000. "The Influence of the Instantaneous Fuel Mix for Electricity Generation on the Corresponding Emissions," 25 *Energy* 1119–38.

Using renewable energy for the accelerating electricity demands of Bitcoin mining is still a problem because there is not enough renewable energy being produced, currently about 20% of U.S. electricity, to supply the needs for housing, industrial use, and transportation.²² The demand for clean energy will also expand with increased electrification, like EV cars.²³ Clean energy should be focused on core societal and economic needs, not Bitcoin mining. And there are no indications that, in a distributed global system, a large percentage of Bitcoin mining will not continue to use dirty fossil fuels if they remain cheap and subsidized by some governments.

Using renewable energy also fails to address the many other negative environmental impacts of crypto mining. The industry produces large amounts of electronic waste (e-waste) because the specialized computer hardware quickly wears out or becomes obsolete. Globally, Bitcoin mining is estimated to produce 45.51 kt of e-waste in a year, equivalent to the e-waste generated by the Netherlands.²⁴

Myth 3: Bitcoin mining can help expand renewable energy

A common argument used by the Bitcoin mining industry is that miners can use curtailed (i.e., unused) renewable energy since Bitcoin mines operate 24/7 and could use electricity whenever wind or solar sources are active but demand is low. Yet, miners cannot profitably operate on curtailed energy alone. In addition, renewable energy developers work to reduce and avoid curtailment in part by connecting to regions that do not tend to have oversupply while utilities and states and the federal government are working to create transmission lines to relieve bottlenecks and other barriers leading to curtailment in the first place.²⁵

[https://doi.org/10.1016/S0360-5442\(00\)00029-3](https://doi.org/10.1016/S0360-5442(00)00029-3); Holland, Stephen P., et al., February 14, 2022. "Why Marginal CO2 Emissions Are Not Decreasing For US Electricity: Estimates and Implications For Climate Policy," *Proceedings of the National Academy of Sciences*. <https://www.pnas.org/doi/10.1073/pnas.2116632119>.

²² U.S. Energy Information Administration. February 2023. "What is U.S. electricity generation by energy source?" <https://www.eia.gov/tools/faqs/faq.php?id=427&t=3>.

²³ International Energy Agency. 2022. "Electrification." Paris. <https://www.iea.org/reports/electrification>.

²⁴ Vries, Alex de, and Christian Stoll. December 1, 2021. "Bitcoin's Growing e-Waste Problem." *Resources, Conservation and Recycling* 175: 105901. <https://doi.org/10.1016/j.resconrec.2021.105901>.

²⁵ DeRoche, Mandy, Jeremy Fisher, Nick Thorpe, and Megan Wachspress. September 2022. "The Energy Bomb: How Proof-of-Work Cryptocurrency Mining Worsens the Climate Crisis and Harms Communities Now." *Earthjustice* and *The Sierra Club*. https://earthjustice.org/wp-content/uploads/energy_bomb_bitcoin_white_paper_101322.pdf.

Case Studies: International Impacts and Government Responses

The cryptocurrency industry operates across international boundaries, and mining facilities can be quickly moved within and between countries. Thus, the industry has brought pollution to communities around the world and led governments to enact a range of regulations to manage or even ban the industry. While the United States now has the largest share of Bitcoin mining operations in the world, with an estimated 37% share of global mining capacity, many other countries are and have been affected by the industry.²⁶

Since Bitcoin's launch in 2009, the mining industry has shifted around the world. China emerged as the epicenter until 2021, when the government limited the industry partially due to environmental concerns, prompting miners to relocate to other jurisdictions around the world. Many miners chose locations with cheap fossil fuels, such as Kazakhstan and parts of the former Soviet Republic. Others chose countries such as Norway, with abundant hydro and geothermal power, and the United States for its cheap natural gas and coal. The net impact was that Bitcoin's carbon intensity increased and the share of renewable energy used in the mining sector dropped.²⁷ Other countries have restricted crypto mining in response to the environmental and social impacts, and strain on electricity grids and infrastructure. However, because the United States has taken little action, it has become the new epicenter of this carbon- and energy-intensive industry.

Below are examples illustrating global shifts in the crypto mining industry. By enhancing transparency in the large U.S. component of this global industry, studies and data reporting mandated by the Act will provide a clearer picture of the industry's local and global impact on climate targets.

Canada

Canada has become a major site for Bitcoin mining, rising to the 4th largest host of Bitcoin mining, with estimates ranging from around 7% to 10% of global mining capacity.²⁸ Residents living near mining facilities have complained about the loud noises

²⁶ Cambridge Digital Assets Programme (CDAP) at the Cambridge Centre for Alternative Finance. "Bitcoin Mining Map." https://ccaf.io/cbeci/mining_map.

²⁷ Vries, Alex de, Ulrich Gellersdörfer, Lena Klaußen, and Christian Stoll. March 16, 2022. "Revisiting Bitcoin's Carbon Footprint." *Joule* 6, no. 3: 498–502. <https://doi.org/10.1016/j.joule.2022.02.005>.

²⁸ Cambridge Digital Assets Programme (CDAP) at the Cambridge Centre for Alternative Finance. "Bitcoin Mining Map." https://ccaf.io/cbeci/mining_map; Attlee, David. March 4, 2023. "Can Canada Stay a Crypto Mining Hub after Manitoba's Moratorium?" *Cointelegraph*. <https://cointelegraph.com/news/can-canada-stay-a-crypto-mining-hub-after-manitoba-s-moratorium>.

while officials are concerned about the increased energy demand and lack of local economic benefits.²⁹ In Alberta, local governments and regulators are concerned about crypto mining rigs that are operating alongside oil and gas wells, and reopening old fossil fuel facilities which will increase carbon emissions and create barriers to achieving carbon emission reduction targets.³⁰ An organization representing municipalities within the province published a brief that discusses how cities need to consider how new cryptocurrency mines might impact climate change actions, use large amounts of electricity, and create nuisance problems for nearby residents due to the noise.³¹ Canada also lacks systematic and rigorous data collection and reporting on crypto mining operations and energy use which makes it difficult for regulators, citizens, industry, and advocates to assess the scale and impacts of the sector.

Growth of the industry has prompted Canadian national and provincial governments to enact legislation and take regulatory action to address its environmental impacts and strain on the energy system. In 2021, Canada's national energy regulator pointed out that the energy demands of new cryptocurrency mining facilities could impact climate goals.³² In 2022, Manitoba passed an 18-month moratorium on new crypto mines, referencing electrical grid and supply constraints.³³ British Columbia followed suit with a similar 18-month moratorium on connecting new mining facilities to the electrical grid.³⁴ In Quebec regulators and public utilities are looking to scale back energy sold to Bitcoin mines. The government-owned utility Hydro-Quebec asked a provincial regulator to re-

²⁹ Zmudzinski, Adrian. November 19, 2019. "Quebec Mining Firm Expands Despite Protests of Local Population." *Cointelegraph*.

<https://cointelegraph.com/news/quebec-mining-firm-expands-despite-protests-of-local-population>; Ma, Kevin. April 21, 2022. "Cryptocurrency mines to be allowed in Sturgeon County, with rules." *Rocky Mountain Outlook*. <https://www.rmoutlook.com/beyond-local/cryptocurrency-mines-to-be-allowed-in-sturgeon-with-rules-maga-berry-toms-tian-5285006>; CBC News. March 24, 2018. "Wary of cryptocurrency mining centres, some Quebec municipalities impose 90-day ban."

<https://www.cbc.ca/news/canada/montreal/wary-of-cryptocurrency-mining-centres-some-quebec-municipalities-impose-90-day-ban-1.4589264>.

³⁰ Meyere, Carl. November 5, 2022.. "Can Bitcoin Breathe New Life into Alberta's Oil and Gas?" *The Narwhal*. <https://thenarwhal.ca/bitcoin-mining-alberta-oil-gas/>.

³¹ Korassa, Tamara. 2021. "Municipal Considerations of Cryptocurrency Mining." *Alberta Municipalities*. <https://www.abmunis.ca/news/casual-legal-municipal-considerations-cryptocurrency-mining>.

³² Canada Energy Regulator. February 23, 2021. "Market Snapshot: A closer look at Canada's use of fossil fuels."

<https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/market-snapshots/2021/market-snapshot-closer-look-canada-use-fossil-fuels.html?undefined&wbdisable=true>.

³³ Monga, Vital. December 8, 2022. "Quebec Shuns Bitcoin Mining in Bid to Conserve Power." *Wall Street Journal*.

<https://www.wsj.com/articles/quebec-shuns-bitcoin-mining-in-bid-to-conserve-power-11670514921>.

³⁴ CBC News. December 21, 2021. "B.C. suspends new cryptocurrency mining requests over power, environmental concerns." <https://www.cbc.ca/news/canada/british-columbia/british-columbia-cryptocurrency-suspended-1.6693976>.

allocate 270 megawatts of energy that had been reserved for Bitcoin mining facilities because of growing energy demand from other users and higher priority areas.³⁵

European Union

The EU as a whole is a major site of crypto mining. In 2021, one source estimates 10% of global mining originated from EU-based sites, and regulators are taking action to address the industry's environmental impact as well as the broader concerns about consumer protections, financial stability, privacy, and security.³⁶ On June 30 2022, the new EU Market in Crypto-assets Regulation (MiCA) was agreed on between the European Commission, the European Parliament, and the Council of the European Union, and will get a formal vote by the Parliament later in 2023 with expected adoption by the second quarter of 2023.³⁷ Within this extensive piece of legislation are provisions requiring disclosure about cryptocurrency companies' approaches to environmental and climate issues, including their energy use and climate impacts.³⁸

Kazakhstan

When China restricted cryptocurrency mining in 2021, much of the industry left and sought other countries with low-cost energy and few regulatory obstacles to constructing and operating their facilities.³⁹ Kazakhstan, with an abundance of cheap but polluting coal power, quickly became a hub for Bitcoin miners and rose to be the second largest host of mining capacity.⁴⁰ But the rapid expansion meant problems for the country's electrical system and for the local and global environment. By the end of 2021, crypto mining was using 7% of the country's electricity which overloaded the

³⁵ Monga, Vital. December 8, 2022. "Quebec Shuns Bitcoin Mining in Bid to Conserve Power." *Wall Street Journal*.

<https://www.wsj.com/articles/quebec-shuns-bitcoin-mining-in-bid-to-conserve-power-11670514921>.

³⁶ Andersen, Derek. October 18, 2022. "Europe moves toward regulatory action on crypto's environmental impact, energy use." *Cointelegraph*. <https://cointelegraph.com/news/europe-moves-toward-regulatory-action-on-crypto-s-environmental-impact-energy-use>.

³⁷ Di Palma, Federico. February 6, 2023. "An Overview of the EU Crypto-Asset Regulatory Framework (MiCA)." *Fordham Journal of Corporate and Financial Law*. <https://news.law.fordham.edu/icfl/2023/02/06/an-overview-of-the-eu-crypto-asset-regulatory-framework-mica/>.

³⁸ Browne, Ryan. June 30, 2022. "EU Agrees on Landmark Regulation to Clean up Crypto 'Wild West.'" *CNBC*.

<https://www.cnbc.com/2022/06/30/eu-agrees-to-deal-on-landmark-mica-cryptocurrency-regulation.html>.

³⁹ CNBC. June 15, 2021. "China is kicking out more than half the world's bitcoin miners – and a whole lot of them could be headed to Texas." <https://www.cnbc.com/2021/06/15/chinas-bitcoin-miner-exodus.html>.

⁴⁰ Cambridge Digital Assets Programme (CDAP) at the Cambridge Centre for Alternative Finance. "Bitcoin Mining Map." https://ccaf.io/cbeci/mining_map; Guest, Peter. January 12, 2023. "Bitcoin mining was booming in Kazakhstan. Then it was gone." *MIT Technology Review*. <https://www.technologyreview.com/2023/01/12/1066589/bitcoin-mining-boom-kazakhstan/>.

system creating a deficit of energy and led to localized blackouts and other supply disruptions.⁴¹ This sparked protests and led the Kazakhstan government to severely restrict crypto mining. Mining companies quickly left the country, leaving behind lots of stranded assets, from empty warehouses to useless computer equipment. Kazakhstan's crypto mining boom also led to increased carbon emissions because much of the country's electricity is generated by carbon-intensive anthracite coal and old, inefficient power plants.⁴²

Norway

Norway has abundant geothermal and hydropower, and hosts many crypto mining facilities. Residents living near mining operations have complained about the loud noise from the computers running 24-hours.⁴³ Municipal governments have also complained about miners operating without proper approvals and permits.⁴⁴ The government had offered data centers, including crypto mining facilities, reduced electricity rates in 2016 but by 2022 the government was seeking to rescind those favorable rates due to increasing demand and rising energy prices.⁴⁵ Norway's parliament even considered a ban on crypto mining but the proposal wasn't passed.⁴⁶

Sweden

Sweden is one of the largest hosts of Bitcoin mining in Europe, but the country's leaders are pushing back as they seek to prioritize supplying other essential industries, like steel and auto manufacturing which create more jobs. Accelerating electrification of industrial production, transportation, and buildings has meant more demand for electricity. The Swedish Energy Agency is considering prioritizing new grid access, giving preference to those who benefit society and create jobs, and eliminating preferential tax treatment for

⁴¹ Guest, Peter. January 12, 2023. "Bitcoin mining was booming in Kazakhstan. Then it was gone." *MIT Technology Review*. <https://www.technologyreview.com/2023/01/12/1066589/bitcoin-mining-boom-kazakhstan/>.

⁴² Tully, Shawn. January 5, 2022. "Kazakhstan internet shutdown sheds light on a big Bitcoin mining mystery." *Fortune*. <https://fortune.com/2022/01/05/kazakhstan-internet-bitcoin-mining-mystery-crypto/>.

⁴³ Marinoff, Nick. August 23, 2018. "Noise Complaints May Cause Norwegian Bitcoin Mining Center to Shut Down." *Bitcoin Magazine*. <https://bitcoinmagazine.com/business/noise-complaints-may-cause-norwegian-bitcoin-mining-center-shut-down>.

⁴⁴ *Ibid.*

⁴⁵ Wright, Turner. October 6, 2022. "Norway's government proposes eliminating reduced electricity tax for Bitcoin miners." *Cointelegraph*. <https://cointelegraph.com/news/norway-s-government-proposes-eliminating-reduced-electricity-tax-for-bitcoin-miners>.

⁴⁶ *Ibid.*

data centers which currently includes crypto mining.⁴⁷ Some Swedish officials view Bitcoin mining as an impediment to reaching emission reduction commitments under the Paris Climate agreement.⁴⁸ Sweden considered a ban on crypto mining and prohibiting companies that invest in crypto currencies from describing their businesses as environmentally sustainable, and advocated for an EU ban, although both proposals appear to have been dropped.⁴⁹

⁴⁷ Paulsson, Lars and Niclas Rolander. July 17, 2022. "Sweden Prefers Steel Over Bitcoin Miners as Power Gets Scarce." *Bloomberg News*. <https://www.bloomberg.com/news/articles/2022-07-17/sweden-prefers-steel-over-bitcoin-miners-as-power-gets-scarce>.

⁴⁸ *Ibid*.

⁴⁹ Bateman, Tom. December 11, 2021. "Europe must ban Bitcoin mining to hit the 1.5C Paris climate goal, say Swedish regulators." *Europe News*. <https://www.euronews.com/next/2021/11/12/europe-must-ban-bitcoin-mining-to-hit-the-1-5c-paris-climate-goal-say-swedish-regulators>.

118TH CONGRESS
1ST SESSION

S. _____

To require an interagency study on the environmental and energy impacts of crypto-asset mining, to assess crypto-asset mining compliance with the Clean Air Act, and for other purposes.

IN THE SENATE OF THE UNITED STATES

Mr. MARKEY introduced the following bill; which was read twice and referred to the Committee on _____

A BILL

To require an interagency study on the environmental and energy impacts of crypto-asset mining, to assess crypto-asset mining compliance with the Clean Air Act, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “Crypto-Asset Environ-
5 mental Transparency Act of 2023”.

6 **SEC. 2. DEFINITIONS.**

7 In this Act:

2

1 (1) ADMINISTRATOR.—The term “Adminis-
2 trator” means the Administrator of the Environ-
3 mental Protection Agency.

4 (2) AIR POLLUTANT.—The term “air pollutant”
5 has the meaning given the term in section 302 of the
6 Clean Air Act (42 U.S.C. 7602).

7 (3) BLOCK.—The term “block” means a group
8 of data stored as a single record in a blockchain.

9 (4) BLOCKCHAIN.—The term “blockchain”
10 means a distributed ledger technology in which—

11 (A) the data are shared across a network
12 that creates a digital ledger of verified trans-
13 actions or information among network partici-
14 pants; and

15 (B) the data are typically linked using
16 cryptography to maintain the integrity of the
17 ledger and execute other functions, including
18 transfer of ownership or value.

19 (5) CONSENSUS MECHANISM.—The term “con-
20 sensus mechanism” means a process to achieve
21 agreement among network participants on the cur-
22 rent state of a blockchain.

23 (6) CRYPTO-ASSET.—The term “crypto-asset”
24 means a digital asset, which may be a medium of ex-
25 change, a representation of value, or both, for which

3

1 generation or ownership records of the digital asset
2 are recorded in a distributed ledger technology that
3 relies on cryptography.

4 (7) CRYPTO-ASSET MINING.—The term “crypto-
5 asset mining” means the process of performing com-
6 putations to add a valid block of data to the
7 blockchain, typically in exchange for a reward or fee.

8 (8) POWER LOAD.—The term “power load”
9 means the amount of electrical power, in megawatts,
10 that can be consumed by a qualifying crypto-asset
11 mining operation.

12 (9) QUALIFYING CRYPTO-ASSET MINING OPER-
13 ATION.—The term “qualifying crypto-asset mining
14 operation” means—

15 (A) an individual crypto-asset mining facil-
16 ity that has a power load that is greater than
17 or equal to 5 megawatts; or

18 (B) multiple crypto-asset mining facilities
19 that—

20 (i) are owned by the same company;

21 and

22 (ii)(I) each have a power load that is
23 less than 5 megawatts; but

4

1 (II) have a cumulative power load
2 that is greater than or equal to 5
3 megawatts.

4 (10) SCOPE 1 EMISSIONS.—The term “scope 1
5 emissions” means greenhouse gas emissions directly
6 from sources that are operated, controlled, or owned
7 by an individual or entity performing a qualifying
8 crypto-asset mining operation.

9 (11) SCOPE 2 EMISSIONS.—The term “scope 2
10 emissions” means indirect greenhouse gas emissions
11 associated with the purchase of electricity, steam,
12 heat, or cooling by an individual or entity per-
13 forming a qualifying crypto-asset mining operation.

14 (12) SECRETARY.—The term “Secretary”
15 means the Secretary of Energy.

16 **SEC. 3. COMPLIANCE WITH THE CLEAN AIR ACT.**

17 (a) RULEMAKING REQUIRED.—

18 (1) PROPOSED REGULATION.—Not later than 1
19 year after the date of enactment of this Act, the Ad-
20 ministrator shall, pursuant to section 114(a) of the
21 Clean Air Act (42 U.S.C. 7414(a)), issue a notice of
22 proposed rulemaking to revise part 98 of title 40,
23 Code of Federal Regulations (as in effect on the
24 date of enactment of this Act)—

5

1 (A) to require qualifying crypto-asset min-
2 ing operations to report as covered facilities
3 under subpart A of that part;

4 (B) to add a new subpart to that part that
5 includes qualifying crypto-asset mining oper-
6 ations as a source category;

7 (C) to include in the new subpart created
8 under subparagraph (B) appropriate calculation
9 methodologies, reporting guidelines, and moni-
10 toring operations of, with respect to qualifying
11 crypto-asset mining operations, scope 1 emis-
12 sions and scope 2 emissions; and

13 (D) to designate the qualifying crypto-
14 asset mining operations source category estab-
15 lished pursuant to subparagraph (B) as a
16 source category that is subject to greenhouse
17 gas reporting requirements and related moni-
18 toring, recordkeeping, and reporting require-
19 ments under section 98.2 of that title, regard-
20 less of whether a qualifying crypto-asset mining
21 operation emits at least 25,000 metric tons of
22 carbon dioxide-equivalent.

23 (2) FINAL RULE.—Not later than 180 days
24 after the date on which the public comment period
25 on the proposed rule under paragraph (1) closes, the

1 Administrator shall issue a final rule revising part
2 98 of title 40, Code of Federal Regulations.

3 (b) ASSESSMENT.—Not later than 1 year after the
4 date on which the Administrator finalizes the rule required
5 under subsection (a), the Administrator shall, pursuant to
6 section 114(a) of the Clean Air Act (42 U.S.C. 7414(a)),
7 issue requests for information for the purpose of con-
8 ducting an assessment of, with respect to qualifying
9 crypto-asset mining operations, the permit programs
10 under the Clean Air Act (42 U.S.C. 7401 et seq.), which
11 shall include identifying the extent to which any qualifying
12 crypto-asset mining operations are improperly operating
13 without a valid and current permit under that Act.

14 (c) AUTHORIZATION OF APPROPRIATIONS.—There is
15 authorized to be appropriated to the Administrator to
16 carry out this section \$5,000,000 for fiscal year 2023, to
17 remain available until expended.

18 (d) SAVINGS PROVISION.—Nothing in this section
19 limits the ability of the Administrator to require the re-
20 porting of emissions of any type in another source cat-
21 egory.

22 **SEC. 4. IMPACT STUDY.**

23 (a) IN GENERAL.—Not later than 1 year after the
24 date of enactment of this Act, the Administrator, in con-
25 sultation with the Secretary, the Administrator of the En-

1 ergy Information Administration, the Federal Energy
2 Regulatory Commission, and the head of any other Fed-
3 eral agency the Administrator or the Secretary determines
4 appropriate, shall conduct a study on the environmental
5 impacts of crypto-asset mining in the United States.

6 (b) STUDY REQUIREMENTS.—The study required
7 under subsection (a) shall include—

8 (1) the number and location of any existing or
9 planned qualifying crypto-asset mining operation;

10 (2) the amount of greenhouse gas emissions
11 and other air pollutants that are—

12 (A) released by an onsite energy source;
13 and

14 (B) attributable to offsite-generated elec-
15 tricity, steam, heat, or cooling provided to a
16 qualifying crypto-asset mining operation;

17 (3) the anticipated increase of new, and expan-
18 sion of existing, qualifying crypto-asset mining oper-
19 ations;

20 (4) the potential impacts of electric energy con-
21 sumption by qualifying crypto-asset mining oper-
22 ations, including by prolonging the use of fossil fuel
23 generators, on the ability of the United States to
24 achieve the greenhouse gas emission reductions nec-

8

1 essary to keep global warming below 1.5 degrees
2 Celsius compared to pre-industrial levels;

3 (5) the ecological impacts, including ecological
4 impacts associated with electronic waste generation
5 and the use or discharge of cooling water, caused by
6 qualifying crypto-asset mining operations;

7 (6) the potential public health impacts due to
8 the reduced air and water quality and increased
9 water stress on communities near qualifying crypto-
10 asset mining operations;

11 (7) the potential public health impacts from
12 greenhouse gas emissions released by qualifying
13 crypto-asset mining operations;

14 (8) the potential public health and ecological
15 impacts from noise generated by qualifying crypto-
16 asset mining operations;

17 (9) the amount of electric energy consumed by
18 each qualifying crypto-asset mining operation, in-
19 cluding the time of use of electricity and the poten-
20 tial grid stress posed by the power load of the quali-
21 fying crypto-asset mining operation;

22 (10) the source of electric energy consumed by
23 each qualifying crypto-asset mining operation;

1 (11) the aggregated energy-use statistics and
2 greenhouse gas emissions statistics for qualifying
3 crypto-asset mining operations in the United States;

4 (12) an analysis of energy use and greenhouse
5 gas emissions by type of consensus mechanism;

6 (13) an analysis of demand-response programs
7 negotiated between qualifying crypto-asset mining
8 operations and electric utilities;

9 (14) an analysis of potential rate-design meas-
10 ures that could be implemented by State and local
11 regulators to reduce the energy consumption and de-
12 pendence on fossil fuel energy sources of crypto-
13 asset mining operations;

14 (15) a geospatial assessment of the extent to
15 which crypto-asset mining operations are located
16 within environmental justice communities, as defined
17 by the Administrator or within the Climate and Eco-
18 nomic Justice Screening Tool of the Council on En-
19 vironmental Quality; and

20 (16) an identification of, and recommendations
21 for, best practices for data types, data sources, and
22 methodologies for accurately measuring, modeling,
23 and tracking the environmental impacts of crypto-
24 asset mining operations in the United States in the
25 future.

10

1 (c) PUBLIC COMMENT.—Before conducting the study
2 required by subsection (a), the Administrator shall provide
3 an opportunity for public comment and advice relevant to
4 conducting the study.

5 (d) REPORT TO CONGRESS.—Not later than 18
6 months after the date of enactment of this Act, the Ad-
7 ministrator shall submit to the Committees on Energy and
8 Commerce and Science, Space, and Technology of the
9 House of Representatives and the Committees on Environ-
10 ment and Public Works and Energy and Natural Re-
11 sources of the Senate, and publish on the public websites
12 of the Environmental Protection Agency and the Depart-
13 ment of Energy, a report that contains the results of the
14 study required by subsection (a).

15 (e) AUTHORIZATION OF APPROPRIATIONS.—There is
16 authorized to be appropriated to the Administrator to
17 carry out this section \$5,000,000 for fiscal year 2023, to
18 remain available until expended.

19 **SEC. 5. ENERGY EFFICIENCY OF DATA CENTER BUILDINGS.**

20 Section 453(a)(1) of the Energy Independence and
21 Security Act of 2007 (42 U.S.C. 17112(a)(1)) is amend-
22 ed—

23 (1) in subparagraph (A), by striking “or” at
24 the end after the semicolon;

11

1 (2) in subparagraph (B), by striking the period
2 at the end and inserting “; or”; and
3 (3) by adding at the end the following:
4 “(C) a facility in which 2 or more com-
5 puters perform logical operations to mine or
6 create crypto-asset (as defined in section 2 of
7 the Crypto-Asset Environmental Transparency
8 Act of 2023).”.

Senator MARKEY. All Senators will be allowed to submit written questions for the record through the close of business on March 14th. We will compile those questions and send them to the witnesses and ask each witness to reply to the Senators by March 28th.

With that, this hearing is adjourned.

[Whereupon, at 4:19 p.m., the hearing was adjourned.]

