The Honorable Michael S. Regan
Administrator
United States Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Dear Administrator Regan:

This document is intended to respond to the letter, dated April 20, 2022 signed by Representative Huffman and 22 members of Congress, provided to your office for consideration (the "Letter").

Unfortunately, the Letter is premised on several misperceptions about Bitcoin and digital asset mining, that have previously been debunked or conflate Bitcoin mining with other industries. We have highlighted specific sections of text of the Letter that we will address in turn below:

1. *"We have serious concerns regarding reports that bitcoin mining facilities across the country are polluting communities and are having an outsized contribution to greenhouse gas emissions."*

Response:

The statement above unfortunately confuses datacenters with power generation facilities. Power generation facilities are not datacenters. Datacenters which contain "miners" are no different than datacenters owned and operated by Amazon, Apple, Google, Meta, and Microsoft. A "miner" is merely industry terminology for a specialized computer server operating inside a datacenter. All datacenters utilize electricity generated externally. Emissions are created at the power generation source upstream from the datacenters. Digital asset miners simply purchase electricity from the grid, the same as Microsoft and other datacenter operators.

Datacenters engaged in the industrial-scale mining of digital assets do not emit CO_2 or any other pollutants, like other industrial facilities do; they are merely server farms engaged in computation. Aside from logistics packaging, there are no effluents or sources of waste that must be disposed on-site. The inputs to a data center engaged in digital asset mining are electricity and mining computers, and the outputs are units of digital assets that exist on distributed ledgers around the world.

Additionally, numerous digital asset miners also engage in high-performance compute (HPC), which includes use cases as varied as machine learning model training, VFX and graphic rendering, pixel streaming, and batch processing of data. This work supports a wide variety of industries from animation and film studios to AR and VR firms, to weather modeling, financial market modeling, medical diagnostics, synthetic biology, pharmaceutical research & development, and data analytics. Global expenditure on arbitrary computation is growing dramatically given the multiple use cases of this activity.

Some miners toggle between digital asset mining when their machines are idling, and HPC workloads as they come in. In many cases, there is no distinction between high-energy datacenters mining digital assets and those utilizing computation resources for conventional, non-digital asset mining computation. The

rapid growth of digital asset mining as a buyer of electricity and computation has in effect served as a free-market subsidy for a vast array of US-based HPC data centers.

Several operators which support digital asset mining are also exploring other energy-intensive industrial applications which have the same location-agnostic properties as digital assets. Even leaving aside HPC, these alternative industrial applications could include desalination, green hydrogen production (crucial to the renewable transition), and fertilizer production, among others. Demonizing digital asset miners discourages this significant home-grown industry which is identifying stranded energy resources and building industrial energy campuses in remote areas.

As far as 'outsized' contributions are concerned, the best data we have suggests the opposite; that compared to other industrial consumers of energy, digital asset mining is notably sustainable, and transparently so. According to the Bitcoin Mining Council's latest Q1 survey of miners, which consists of a bottom-up analysis of 50% of current hashrate, Bitcoin miners surveyed use 64.6% sustainable energy (defined as wind, solar, hydro, or nuclear). If you extend the analysis globally using conservative assumptions regarding energy mix, Bitcoin mining in the aggregate employs an estimated 58.4% sustainable energy. This is markedly more sustainable than the default US energy mix at 21% sustainable, according to the EIA. Digital asset mining is a fully digital process location agnostic, meaning miners can operate from anywhere in the world and datacenters are able to target stranded or abundant renewable sources of energy.

Moreover, it is well documented that digital asset miners' distinct interruptibility traits enables them to be uniquely suitable to provide grid flexibility in the form of ancillary services to grid operators, which is a crucial component of a renewable transition.

2. *"As digital assets gain popularity, it is essential to understand the environmental risks and pollution associated with this industry."*

Response:

This is deeply misleading: there are no pollutants, including CO_2, released by digital asset mining. Bitcoin miners have no emissions whatsoever. Associated emissions are a function of electricity generation, which is a consequence of policy choices and economic realities shaping the nature of the electrical grid. Digital asset miners simply buy electricity that is made available to them on the open market, just the same as any industrial buyer.

3. *"We commend your recent decision denying extensions for the Ameren and Greenidge digital asset mining facilities to continue operating the coal ash ponds on their properties past a mandatory deadline."*

Response:

It must be noted that the issue described above deals with the energy generation facility NOT the datacenter, containing the digital asset miners. If New York wishes to approve or deny Greenidge's application, it has nothing to do with digital asset mining, it is only related to energy generation.

The Letter misleadingly implies that the coal ash ponds are a consequence of Greenidge's current operation or cryptocurrency mining, which is false. Greenidge utilizes no coal in its current operation. The ponds are a vestige of the plant's prior operation, and Greenidge has committed to eliminating them by 2023.

4. *"Efforts are currently underway to re-open closed gas and coal facilities to power the digital asset mining industry and undermine our battle to combat the climate crisis."*

Response:

While we disagree with this statement, the statement above refers to two examples which comprise less than 2% of the Bitcoin Network. In reality, the majority of digital asset miners are migrating away from fossil fuel-based electricity generation and increasingly targeting renewables. One example is Marathon Digital Holdings, one of the largest public miners in the U.S., which has declared their intention to shutter their coal-based Hardin facility in Montana and move to a fully sustainable model by year end of 2022.

Additionally, digital asset miners are allowing for the remediation of formerly polluting sites to be cleaned and turned into sources of economic activity. Stronghold's waste coal power generation facilities are explicitly sanctioned by the EPA and exist to mitigate an existing ecological hazard.

Within the cohort of North American miners, the trend is towards renewable generation wherever possible. A number of miners exist which explicitly target sustainable energy in their corporate mandates: these include Argo Blockchain, Bitfarms, Bit Digital, Cleanspark, Core Scientific, Iris Energy, Galaxy Digital and Terawulf, among others. In the U.S., the fastest growing region for digital asset mining is West Texas, which is blessed with abundant renewables but has limited local load sources.

ERCOT boasts the most abundant wind resources in the U.S., and boasts the highest wind and solar share of generation of any major RTO/ISO. The interconnection queue of generation in ERCOT consists almost entirely of wind, solar, and batteries, and miners are eager anchor tenants of these renewable resources, monetizing them as they are waiting for interconnection or for transmission to be built to link the generation with load centers. Miners are also increasingly developing a mutualistic relationship with nuclear plant operators, as evidenced by Terawulf's joint venture with Talen Energy, which operates a 2.6 GW nuclear plant in PA. Because nuclear plants cannot easily dispatch down their generation, having an uncorrelated additional buyer of energy aside from the grid is highly supportive of their economics.

5. *"A single Bitcoin transaction could power the average U.S. household for a month."*

Response:

This is patently and provably false. Bitcoin transactions do not carry "energy payloads". Bitcoin transactions cannot be "redeemed" for energy. Broadcasting a transaction requires no more energy than a tweet or a Google search. Bitcoin miners collect revenue based on the issuance of Bitcoin (currently 99% of their revenue mix) and fees associated with individual transactions (which can involve thousands of distinct, separate transfers). Causally speaking, it is the high price of Bitcoin combined with its yearly new issuance (328k BTC this year) which induces miners to consume energy.

By design, Bitcoin issuance is trailing off, and will be reduced by 50% in two years' time. Over 90% of all Bitcoins that will ever exist have already been emitted. Even optimistic models which see Bitcoin matching the value of gold forecast Bitcoin's energy consumption to peak in the late 2020s and then decline.

The 'per-transaction' energy cost analysis is a deeply flawed way to reason about Bitcoin, since projecting future energy growth is not a function of transaction count, but instead of value of Bitcoin issuance (which is a function of price and supply growth), together with the fees users are willing to pay to transact. Bitcoin's transaction count is strictly limited by the protocol, and long-term scaling will come from a layered model, with many individual transfers being associated with a smaller number of final settlements. Already, the Lightning Network built atop Bitcoin allows an arbitrary number of transfers to be processed while requiring only infrequent 'on-chain' settlement transactions.

This layered model mirrors almost exactly how established payments systems work. Bitcoin processes a similar number of yearly transactions to the Fedwire settlement system, which settles trillions of dollars' worth of value daily. It is therefore eminently plausible for Bitcoin to grow into a utility-scale settlement system without changing its parameters at all.

Thus, even if the number of payments settling to Bitcoin increase by many orders of magnitude, that does not imply a commensurate increase in energy consumption. The bulk of the incentive for miners to consume energy will continue to be issuance-related for the foreseeable future, and so forecasting Bitcoin's energy cost requires assessing the interplay between a potentially rising unit price and a declining issuance rate. It therefore makes no sense to associate energy consumption with individual transactions, since Bitcoin's energy usage is not related to transactions, and Bitcoin can scale arbitrarily without increasing its transaction count or energy usage.

6. *"Less energy intensive cryptocurrency mining technologies, such as "Proof-of-Stake" (PoS), are available and have 99.99 percent lower energy demands than PoW to validate transactions."*

Response:

This is, once again, misleading. Proof of Stake is not a 'mining technology', it is a technique to determine authority over a distributed ledger, but it does not achieve decentralized distribution. Moreover, it has a much more limited track record, is controlled by founders, has single points of failure and it remains dubious as to whether Proof of Stake can effectively govern a global, apolitical monetary system, in a manner like Proof of Work.

Given that Proof of Stake and Proof of Work are qualitatively different, it's misleading to refer to Proof of Stake as a more 'efficient' form of Proof of Work, since it does not achieve the same thing. A bicycle uses less energy than a plane, but it achieves something different, and so cannot be considered more efficient. Similarly, Proof of Stake only pertains to maintaining a nominally decentralized consensus over the state of a ledger (although it remains to be seen whether Proof of Stake systems can remain meaningfully decentralized).

Proof of Stake does not, for instance, provide a way to achieve decentralized distribution of a digital asset, as Proof of Work does. This is part of the reason Ethereum, which intends to move to Proof of Stake, began with Proof of Work – to fairly distribute a significant fraction of its supply in an ongoing auction. Proof of Work allows anyone globally to effectively "purchase" new units of digital assets using only electricity and computation – achieving a laudably widespread initial distribution without relying on a single authority figure to determine who gets what. Additionally, since Proof of Work is a perfectly competitive free market competition, miner economic margins tend to be slim at equilibrium, meaning that no entity has a disproportionate, enduring advantage when it comes to creating new units of currency. For new monetary commodities like Bitcoin, this provable fairness of issuance is an important property in establishing credibility. A system in which the creator of Bitcoin simply doled out new units of the currency to their friends and associates would have no such legitimacy.

More importantly, Proof of Stake should be understood as an industry term of art for a shareholder-governed financial consortium. In contemporary Proof of Stake systems, it is the largest holders of the tokens that ultimately determine the governance of the ledger, even if 'tokenholder' governance is not explicitly encoded into the protocol. Digital asset users have a revealed preference for holding their coins with intermediaries like exchanges and custodians, and in practice these intermediaries tend to accumulate the bulk of supply. More aggressive regulatory dynamics in major digital asset jurisdictions mean that barriers to entry for these custodial entities will increase, intensifying an already ongoing trend of consolidation. Thus, the risk of corporate capture is extreme in Proof of Stake systems. There are already clear instances of this happening, such as the takeover of Proof of Stake system STEEM by entrepreneur Justin Sun using the voting power of the largest exchanges. By partnering with large custodians, Sun was able to alter fundamental rules of the STEEM digital asset, including confiscating the balances of users he disagreed with. Put simply, Proof of Stake transforms these novel financial systems into pure plutocracies – an outcome that is incompatible for tools that are meant to be decentralized, global, and completely void of political barriers to entry.

Since Bitcoin was founded specifically to disempower intermediaries, it's imperative that it remain on Proof of Work. Given how contrary Proof of Stake would be to the objectives of Bitcoin, the prospects for transitioning Bitcoin to Proof of Stake are completely impracticable.

Non-crypto financial consortia are not considered "energy efficient" by virtue of their contrast to monetary commodities like Bitcoin and gold. Proof of Stake digital assets might share a common ancestor with Proof of Work systems like Bitcoin, but they should be understood as wholly taxonomically different, with different objectives and capabilities. Thus it's highly misleading to compare the energy demands. Systems like Paypal or Venmo also use very limited amounts of energy, but these are not more "efficient" than Bitcoin, because they provide users with completely different assurances. Proof of Stake systems should be understood in the same way.

7. *"PoW mining relies on massive server farms, which, in addition to contributing to significant greenhouse gas emissions, results in major electronic waste challenges due to the highly specialized and short-lived computing hardware needed to secure the network. Millions of devices quickly become obsolete, leading to large amounts of electronic waste. According to estimates by researchers, Bitcoin mining alone produces almost 30,700 tons of electronic waste every year."*

Response:

While certain claims made in the letter are highly misleading, this one is straightforwardly false. The only citation the letter offers for this extravagant claim around e-waste is the De Vries and Stoll paper. It's worth mentioning that De Vries works for the Dutch Central Bank and has been widely criticized for his flawed and wildly over-aggressive estimates regarding Bitcoin's energy consumption. Prior to Digiconimist, and employment at the Dutch Central Bank, De Vries promoted Dogecoin. His handle was Dogeconomist; he is certainly not a neutral, academic source.

The De Vries and Stoll paper relies on an assumption of a 1.3 year period for ASIC depreciation. Based on this extremely short assumed depreciation period, the authors naively infer that the entire fleet of Bitcoin ASICs are periodically junked, deriving the shocking e-waste figure. However, this is a purely academic proposition, as there is no evidence anywhere of massive junkyards containing obsolete ASICs. To be clear: the claim that Bitcoin miners produce enormous quantities of e-waste is a purely academic fantasy. The De Vries/Stoll paper is trivially debunked by considering the simple evidence that even 7-year-old ASICs trade at a nonzero value on secondary marketplaces. Hashrate from older vintages of ASICs, like Bitmain s7s and s9s (released in 2015 and 2016, respectively) is empirically visible on the blockchain, proving that these units are still actively used. In the last year, s9s, now over 6 years old, have accounted for as much as 40% of hashrate, proving that miners will keep using them as long as they are economically productive.

If you consider public miner activity, industry standard depreciation periods are in the 3-5 year range (analysts at Galaxy Digital call a 3-year depreciation period "conservative"); and when these units become uneconomical, they are resold, not destroyed. Given the lingering economic value for even old ASICs (assuming a sufficiently cheap cost of power), it makes no economic sense whatsoever to destroy them. This is evident based on a cursory look at index data provided by ASIC brokers.

The comically short 1.3 year depreciation period claimed by De Vries and Stoll is based entirely on the naïve application of a generic law around transistor growth to a context where it does not apply. The law, known as "Koomey's Law", states that the number of computations per kilowatt-hour doubles every 1.57 years, using historical computation data from 1947 to 2010. This law is a general observation around computing efficiency growth, and has nothing to do with digital asset mining. The creator of the law, Jonathan Koomey, has actually urged caution regarding academic criticism of Bitcoin mining and criticized wayward estimates of Bitcoin's energy use. Empirical data from the industry itself, which the authors did not consider, completely repudiates this depreciation assumption.

Further, Bitcoin ASICs are almost entirely recyclable, and contain no toxic or hard-to-recycle components, unlike conventional sources of e-waste like cell phones (which contain troublesome LI

batteries and toxic chemicals in the display). The largest component of ASICs are aluminum heat sinks, followed by the cases, which both are eminently recyclable and resellable, even if the ASICs themselves do become obsolete.

The Bitcoin e-waste claim is not based on evidence of huge quantities of miners in junkyards. These simply do not exist. It is a chimera derived from an idle academic fantasy which failed to incorporate any relevant industry data. We would challenge the author of the Letter to identify any significant sites where Bitcoin e-waste has accumulated in vast quantities. They simply don't exist.

8. *"While some facilities claim to be "cleaner" by creating energy from coal refuse, these coal-fired power plants still emit hazardous air pollutants and leak toxic contaminants into our waterways. Cryptocurrency mining is poisoning our communities."*

Response:

The Letter again confuses "cryptocurrency mining" and power generation facilities. If there is an issue with power generation facilities, regulatory frameworks exist in which to contest and regulate those facilities. Power generation can be used to power any industry, or provide energy back to electrical grids, in this instance it is unfair to look at power generation facilities which are connected to datacenters running less than 2% of the Bitcoin Network and ascribe that activity to an entire industry.

Conclusion:

1. There is a difference between a datacenter and a power generation facility. This difference is material and was completely ignored by the Letter.
2. There is no meaningful difference between a "digital asset mining facility" and datacenters run by Google, Apple, Microsoft. Each is just a building in which electricity powers IT equipment to run computing workloads. Regulating what datacenters allow their computers to do would be a massive shift in policy in the United States.
3. Some datacenters run only blockchain workloads. Other datacenters run none. Still other datacenters, including many owned by industry giants like Amazon Web Services and Microsoft Azure, run some of each. Censoring blockchain activity isn't practical.
4. The EPA and other regulatory and law enforcement agencies should require all power generation facilities to adhere to all applicable laws and regulations.
5. The EPA and other regulatory and law enforcement agencies should require all datacenter facilities, which emit no pollutants, including CO_2, to also adhere to all applicable laws and regulations.
6. If a data center is violating noise ordinances, their operators should be forced to comply with local and regional noise and nuisance ordinances.
7. If a data center is failing to dispose properly of obsolete circuit boards, whether the circuit boards contain chips that secure voice communications or chips that secure the Bitcoin blockchain, is

irrelevant. The data center operator should dispose of them in an environmentally responsible manner.

8. If a datacenter is abiding by all laws and regulations, the content or type of computational workloads should be irrelevant.

It is clear that education is required to ensure that public officials understand that the digital asset mining sector does not contribute to the environmental issues raised in the Letter. It is imperative that elected officials in the United States recognize that bitcoin, and the innovation of Proof of Work, is the most important financial, economic, and accounting innovation in the history of humanity.

The undersigned individuals agree that by embracing the Bitcoin Network and bitcoin mining, the United States of America will be more innovative, economically resilient, and ultimately stronger into the future.

Sincerely,

MicroStrategy	**Castle Island Ventures**	**Core Scientific**
Michael Saylor Chairman | CEO	Nic Carter Partner	Darin Feinstein CVO | Co-Founder

AiProEnergy LLC

Anton Galvas
Co-Founder | Managing Partner

Alpine Fox

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