February 16, 2022

Mr. Brian Brooks

Chief Executive Officer

Bitfury Group

1015 15th Street NW, Suite 1000

Washington, DC 20005

Dear Mr. Brooks:

Thank you for appearing before the Subcommittee on Oversight and Investigations on Thursday, January 20, 2022, at the hearing entitled "Cleaning Up Cryptocurrency: The Energy Impacts of Blockchains." I appreciate the time and effort you gave as a witness before the Committee on Energy and Commerce.

Pursuant to Rule 3 of the Committee on Energy and Commerce, members are permitted to submit additional questions to the witnesses for their responses, which will be included in the hearing record. Attached are questions directed to you from certain members of the Committee. In preparing your answers to these questions, please address your response to the member who has submitted the questions in the space provided.

To facilitate the printing of the hearing record, please submit your responses to these questions no later than the close of business on Wednesday, March 2, 2022. As previously noted, this transmittal letter and your responses, as well as the responses from the other witnesses appearing at the hearing, will all be included in the hearing record. Your written responses should be transmitted by e-mail in the Word document provided to Austin Flack, Junior Professional Staff, at austin.flack@mail.house.gov. To help in maintaining the proper format for hearing records, please use the document provided to complete your responses.

Thank you for your prompt attention to this request. If you need additional information or have other questions, please contact Austin Flack with the Committee staff at (202) 225-2927.

Sincerely,

Frank Pallone, Jr.

Frank Pallone, Jr.

Chairman

Attachment

cc: The Honorable Cathy McMorris Rodgers

       Ranking Member

       Committee on Energy and Commerce

       The Honorable Diana DeGette

Chair

Subcommittee on Oversight and Investigations

The Honorable H. Morgan Griffith

Ranking Member

Subcommittee on Oversight and Investigations

Subcommittee on Oversight and Investigations

Hearing on

"Cleaning Up Cryptocurrency: The Energy Impacts of Blockchains"

January 20, 2022

<u>Mr. Brian Brooks, Chief Executive Officer, Bitfury Group</u>

<u>The Honorable Frank Pallone, Jr. (D-NJ)</u>

1. When Bitfury's facilities draw power from generation assets that serve other consumers on the grid, does Bitfury have any processes to protect ratepayers from periods of increased costs associated with mining activity?

   Response:
   Bitfury Group operates bitcoin mining data centers exclusively outside the United States in jurisdictions that have their own unique regulatory and ratemaking approaches to energy markets. (Our U.S. affiliate, Cipher Mining (NASDAQ: CIFR), just commenced mining operations at its first site in Texas two weeks ago.) Having said that, market mechanisms generally treat all participants similarly. Below we describe the mechanisms we leverage during peak hours.

   Bitfury is actively managing its portfolio of interruptible loads based on existing market mechanisms and network charges structures. More specifically, Bitfury aims to: (1) shut down a data center fully during system peaks to avoid transmission demand charges; (2) shut down a data center partially when market wholesale energy prices are at their highest; and (3) provide various ancillary services to support grid stability.

   Given this operating framework, Bitfury would be acting as a long-term consumer of base power, most often via short-term power purchase agreements, while adjusting

its fast interruptible load during peak hours as per the relevant market signals and network charges structures.

2. In addition to large amounts of energy use, proof of work (PoW) mining relies on large facilities housing tens of thousands of specialized computers that I understand cannot be repurposed. While upgrading hardware helps improve the competitiveness of mining facilities, it also potentially creates a substantial amount of electronic waste.

   a. Bitfury operates PoW mining facilities that rely on application specific integrated circuits (ASICs).

      i. How long does Bitfury utilize its ASICs on average?

         Response:
         ASICs and servers are utilized on average for about three to five years, although we have a significant number of mining servers that have been profitably operating for substantially longer than that. They are designed with certain reliability specifications, and data centers tend to utilize them for longer periods as long as they are sufficiently energy efficient to be profitable.

         By way of comparison, ASICs designed for smartphones and laptops typically have a shorter life span than mining ASICs because the products containing those chips tend to be upgraded more frequently (about every one to two years for smartphones, and about every two to three years for laptops).

      ii. How many of Bitfury's deployed ASICs are replaced each year?

         Response:
         ASICs and servers are utilized on average for about three to five years. We upgrade them based on business needs. ASICs are designed to withstand a wide range of operating conditions. These include temperatures as well as operating voltages. Our software ensures data centers operate within the designed ranges to increase the longevity of ASICs and servers.

iii.   Do different mining facilities that Bitfury operates have different average ASIC lifespans? If so, have you identified an underlying cause?

Response:
External temperatures are critical to the operations of data center servers. Due to the nature of mobility in silicon-based transistors, different temperature levels impose different levels of stress on the ASICs. Bitfury's experience from years of mining operations at various geographic locations provides us with significant amounts of data in defining guidelines for efficient energy utilization relative to the external conditions and silicon characteristics.

b. When Bitfury replaces deployed ASICs, how does it manage the electronic waste created by the upgrade cycle?

Response:
ASICs and servers are utilized on average for about three to five years. We upgrade them based on business needs. After ASICs are replaced, they are resold in the secondary market. ASICs that are no longer usable are recycled.

Every mining site has an electronics repair workshop, and we reuse certain components for repair purposes.

c. How does Bitfury ensure any electronic waste generated by your company is disposed of safely, both from an environmental and human health perspective?

Response:
We work with companies that are certified, according to local requirements or law, to use an appropriate and safe disposal process.

3. As Bitfury continues to operate mining facilities, has it examined or invested in electronic waste disposal infrastructure?
   a. If so, do these investments currently, or will they in the foreseeable future, have capacity to dispose of Bitfury's annual electronic waste in an environmentally safe and responsible way?

   Response:
   In a growing market, the availability of mining equipment is always an issue. We usually are able to sell outdated equipment to customers or relocate

equipment to another site with unused power. For example, we sold 40MW of immersion mining equipment to a customer, old mining equipment from Iceland has been relocated to Georgia, and old equipment from our Three Hills Canada upgrade is now working at our Sarnia site in Canada. Thus, the amount of wasted mining equipment is comparatively small. We have not, however, developed a proprietary waste disposal infrastructure, and instead rely on local recycling and other disposal protocols in each jurisdiction where we operate.

b. If not, what has prevented Bitfury from making these investments?

Response:
Please see response to question 3.a, above.

c. Is Bitfury's disposed electronic waste recycled, sent to a landfill, or both? How much of Bitfury's electronic waste is recycled? How much is sent to landfills?

Response:
We work with companies that are certified, according to local requirements or law, to use an appropriate and safe disposal process. We do not ourselves track the quantities that are recycled versus disposed of in other ways.

d. Has Bitfury explored ways to reclaim and recycle critical resources found in electronic waste in ways that reduce or capture emissions from those processes, including both greenhouse gas emissions and emissions of any other air pollutants that threaten human health and the environment?

Response:
Our primary strategy is to maximize the useful life of our equipment, to reuse as many components as possible for repair purposes, and to sell older equipment to third parties.

4. Bitfury provides a variety of mining solutions to third parties, including hosting, cooling solutions, blockchain analytics, and Bitfury ASICs. Given that Bitfury is broadly engaged in the PoW mining industry's supply chain, I want to understand the issue of electronic waste from your perspective.

a. According to your testimony, Bitfury has "designed and produced eight generations of ASIC chips." What is the intended lifespan of Bitfury's ASICs, and has the intended lifespan changed over time?

Response:
ASICs are designed with a reliability specification for 24x7 usage for multiple years. The typical lifespan of ASICs is three to five years, but a significant

number of mining servers have been in operation for substantially longer. Bitfury has designed industry-leading energy efficient ASICs that facilitate longer lifespan by lowering the stress on the transistors and increasing transistor retention rate. We design our ASICs to maximize wafer utilization and reduce waste.

Our new generation ASICs are designed to work with previous generation communication chips to provide flexibility to recycle components from the previous generation of chips.

b. While I recognize it is not possible to design or manufacture a forever chip for any purpose, other chip fabricators[1], electronics manufacturers[2], and retailers[3] have recycling initiatives to reduce electronic waste generated during manufacturing and after end use.

   i. Does Bitfury currently operate a recycling program for electronic waste generated during manufacturing or by Bitfury's end users?

   Response:
   Every mining site has an electronics repair workshop, and we reuse components for the repair of mining equipment. In addition, as noted above, we recycle a certain amount of components where recycling options are available in specific jurisdictions.

   ii. If not, does Bitfury have any plans to create recycling programs for end users or Bitfury's manufacturing facilities?

   Response:
   Please see response to question 4.b.i, above.

The Honorable Diana DeGette (D-CO)

1. In your testimony, you mentioned that cryptomining could help capture natural gas that would be otherwise flared to power mining facilities while converting a "dead-weight loss into economic value." Could you expand on this statement and whether such arrangements are feasible at scale?

   Response:

While this is a relatively new activity in the energy sector, there are multiple examples of extra flare gas being used to power bitcoin mining. I refer you to two examples recently written about in the news media.

First example: ConocoPhillips is selling extra flare gas to bitcoin miners in North Dakota:

https://www.cnbc.com/2022/02/15/conocophillips-is-selling-extra-gas-to-bitcoin-miners-in-north-dakota.html

Second example: Giga Energy Solutions mines energy from stranded natural gas in Texas:

https://www.cnbc.com/2022/02/12/23-year-old-texans-made-4-million-mining-bitcoin-off-flared-natural-gas.html#:~:text=Brent%20Whitehead%20and%20Matt%20Lohstroh,used%20to%20power%20the%20miners.

2. Winter storms recently swept through much of the Midwest and South, with some areas experiencing power outages.

    a. Did these storms affect Bitfury's facilities in any way?

    Response:
    Bitfury currently has no mining operations in the U.S. Our majority-owned subsidiary Cipher Mining, Inc. is in the process of developing and deploying five data centers where bitcoin production is expected to ramp up significantly throughout the course of 2022.

    b. In areas where grid operators needed to use demand response agreements, were any of Bitfury's facilities asked to curtail? If so, how long did it take for you to provide adequate demand response?

    Response:
    Bitfury Group currently has no mining operations in the U.S. Our majority-owned subsidiary Cipher Mining, Inc. is in the process of developing and deploying five data centers where bitcoin production is expected to ramp up significantly throughout the course of 2022.

3. Bitfury is working to develop "controllable load regulation equipment that responds proactively to supply/demand." Depending on their implementation, a smart chip

that provides operators with effective demand response might alleviate some of the concerns that we have heard about the feasibility of cryptomining demand response.

    a. Has Bitfury engaged grid operators during the design of its load regulation equipment to ensure it meets their needs? If so, has this engagement changed Bitfury's approach to this issue in any way?

Response:
Bitfury has been a registered market participant since 2017 in Alberta, Canada. In this geography, Bitfury (a) is curtailing monthly its datacenter load during the monthly system peak, and (b) is providing two market-based ancillary services (e.g., active and supplemental operating reserves) to the grid operator.

    b. Given that any equipment Bitfury develops is only as useful as its commercial deployment allows, can you please explain why and how you believe mining companies will be incentivized to use such controllable load equipment?

Response:
Bitfury controls its portfolio of loads to minimize power costs, which represent the main datacenter operating expenditure. The minimization of the power costs is based on (a) transmission and distribution cost avoidance strategies or avoiding system peaks, (b) day-ahead and real-time monitoring of high wholesale energy prices to curtail during peak hours, and (c) revenue generation by participating in various ancillary services. The curtailment associated with these three strategies is usually far more economically beneficial than the avoided revenues derived from the lower uptime.

    c. Have leading mining companies approached Bitfury about potentially deploying its controllable load equipment when it becomes available? Do these inquires generally appear to be for specific projects or holistic implementation across a miner's facilities?

Response:
Bitfury does not currently provide these services to other miners.

The Honorable H. Morgan Griffith (R-VA)

1. One of the criticisms of cryptocurrency mining is that the activity produces a large volume of electronic waste in a short period of time. Why is it often not currently cost feasible for these particular types of computers to be repaired?

   Response:

Computer equipment becomes redundant due more to obsolescence than repair issues. As noted in the response to Committee Chair Pallone's question 2.b. above, every mining site has an electronics repair workshop, and we reuse components to repair mining equipment.

2. What particular types of repairs are needed to keep these computers operational?

   Response:
   Equipment becomes redundant due more to obsolescence than to repair issues. As noted in the response to Committee Chair Pallone's question 2.b. above, every mining site has an electronics repair workshop and we reuse components for the repair of mining equipment. The technicians performing this repair are skilled in the work.

   a. Are the workers who perform these specific types of repairs considered highly skilled?

      Response:
      Equipment becomes redundant due more to obsolescence than repair issues. As noted in the response to Committee Chair Pallone's question 2.b. above, every mining site has an electronics repair workshop and we reuse components for the repair of mining equipment. The technicians performing this repair are skilled in the work.

   b. Do you believe that a vocational certification, college degree, or lesser training would be required to work in this field?

      Response:
      Equipment becomes redundant due more to obsolescence than repair issues. As noted in the response to Committee Chair Pallone's question 2.b. above, every mining site has an electronics repair workshop and we reuse components for the repair of mining equipment. The technicians performing this repair are skilled in the work. Skills and knowledge are necessary; formal credentials are less so.

   c. There is currently a cryptocurrency computer repair business in the 9th District of Virginia, how can Congress encourage these types of businesses and ensure that a potential electronics workforce is available?

      Response:
      Revitalizing America's vocational education system would be a good place to start, including at the high school level. More broadly, competitors such as

India and China have created STEM-focused education programs that could provide a useful roadmap for American policymakers as we seek to ensure continuing economic competitiveness. Finally, focused legal immigration opportunities for skilled workers may play a role in future growth in this sector.

3. In your opinion, do you believe that as the use of blockchain increases and cryptocurrency mining activities mature that it will become more cost feasible to repair these computers?

Response:
Equipment becomes redundant due more to obsolescence than repair issues. As noted in the response to Committee Chair Pallone's question 2.b. above, every mining site has an electronics repair workshop and we reuse components for the repair of mining equipment. In addition, as noted in responses to questions about chip longevity, we design our ASICs to maximize wafer utilization and reduce waste.

The Honorable Michael C. Burgess (R-TX)

1. During my time as the Chairman of the Commerce, Manufacturing, and Trade Subcommittee in the 114th Congress, now the Consumer Protection and Commerce Subcommittee, I held an educational hearing about digital currency and blockchain technology.

   a. How far has cryptocurrency and blockchain technology come since this hearing in 2016?

   Response:
   What has come the greatest distance is: (a) the sheer number and scale of use cases for blockchain technology; and (b) the steadily-growing acceptance of crypto and blockchain by a diverse range of institutions from entire countries such as El Salvador to legacy financial players such as banks. For a publicly-available and general overview of this evolution, I refer you to two articles:

   First: What has changed since the Satoshi White Paper in 2008
   https://www.investopedia.com/tech/return-nakamoto-white-paper-bitcoins-10th-birthday/#toc-what-changed-since-2008-and-2009

   Second: Banks tried to kill crypto and failed; now they are embracing it (slowly)

https://www.nytimes.com/2021/11/01/business/banks-crypto-bitcoin.html

b. What do you see as the role of the Federal government in these
    technologies?

    Response:
    In my December 8, 2021 testimony before the House Financial Services
    Committee, I extensively discussed what I see as the Federal government's
    role in crypto. Treating "crypto" as a single unitary activity whose main
    feature is a need for financial regulation would be like treating the original
    Internet in the 1990s as primarily a tax policy issue. We did not do that then.
    What we had in the 1990s – in the administration of a Democratic U.S.
    president -- with respect to Web 1 that we lack today with respect to crypto
    is *a comprehensive national policy predicated first on the notion of do no
    harm to the emerging Internet*. In addition, crypto policy should take into
    account not only any new risks introduced into the system, but also the risks
    in the present system that are being solved by decentralization. And finally, a
    national policy agenda that takes crypto compliance seriously should assess
    whether it makes more sense to continue to keep crypto activities largely out
    of the regulated financial system, or to bring them *inside* the system *precisely
    so they can be supervised and operated with appropriate levels of risk
    management*.

c. How can the United States assist Bitcoin mining domestically in being cleaner
    and more productive?

    Response:
    As I noted in my January 20, 2022 testimony before this Subcommittee, from
    a U.S. public policy perspective, the most relevant question should be energy
    production rather than energy consumption. If the people's representatives
    decide we should eliminate or reduce a particular source of energy such as
    coal or oil, you were elected to do that. But once the energy mix has been
    established, in a market economy like the United States, markets – meaning
    the aggregate decisions of American consumers and businesses – should
    decide the most productive use of the energy that is produced. More
    relevant than Bitcoin's current energy use is the incentive effect it has on the
    future production of renewable energy. Bitcoin miners seek low energy
    costs, and the lowest cost always comes from excess capacity, which can
    include wind and solar energy, and energy lost in the transmission and
    distribution process, among other things. Because bitcoin miners are easily
    able to locate near the source of production, these kinds of excess capacity
    sources can be turned into economic value through bitcoin mining. And this
    has the effect of taking what can be an unprofitable business -- for example,

solar -- and making it profitable. If we want more wind and solar in this country with less need for government subsidy, bitcoin can be part of the solution.

2. Mr. Brooks, Bitcoin allows for the anonymous transfer from one person to another without the use of a bank. While there are upsides to this type of deregulated system, the ransomware cyberattack on Colonial Pipeline cost the company about 75 Bitcoins, or $4.4 million, in ransom.

    a. How can companies avoid paying criminals in cryptocurrencies?

Response:
As an initial matter, it is critical to understand that the cause of ransomware hacking is not cryptocurrency but criminal conduct by hackers – much as the cause of other financial crimes is not the banking system, but rather than criminal actors themselves. Having said that, public blockchains are highly transparent by design, which is why law enforcement and intelligence agencies around the world generally agree that the development of cryptocurrencies and associated blockchain networks have improved their ability to identify and catch malicious actors (and, as in the Colonial Pipeline case, often recover significant amounts of the ransoms paid). Of course, malicious actors may use special techniques and tools designed to obfuscate the movement of assets, but blockchain analysts (such as those at Bitfury's Crystal blockchain analytics business) armed with tracking software are also able to identify and untangle so-called "mixers" with a substantial success rate.

The U.S. government does not support paying ransom in the event of a ransomware attack. The positive outcome of such action is never guaranteed. Moreover, in 2021, in 80 percent of cases those who paid extortion fees have experienced a subsequent attack, and 46 percent experienced data corruption even when they regained system access.

A counter-ransomware plan must be developed by every company. Some vendors even provide cyber insurance policies for their customers, but it rarely covers more than 40 percent of the requested payment. The list of actions that need to be continuously undertaken by every company to sustain possible extortion attack includes segregated backup management, anti-phishing training, penetration testing, regular security overview of all existing accounts and comprehensible incident response plans.