



The Honorable Frank Pallone, Jr.
Chairman, Committee on Energy and Commerce
2125 Rayburn House Office Building
Washington, DC 20515-6115

February 23, 2022

Dr. Mr. Chairman:

Mr. Chairman, Chair DeGette, Ranking Member Rodgers, and Ranking Member Griffith thank you for inviting me to appear before the Subcommittee on Oversight and Investigations. I appreciate the opportunity to provide testimony at the January 20 hearing titled, "Cleaning Up Cryptocurrency." It was my pleasure and honor to serve as a witness before the Committee on Energy and Commerce.

At Soluna, we share your desire to build a more sustainable computing and cryptocurrency mining industry. As a developer of green data centers, we have incorporated three key sustainability practices into our business model as a part of our climate and energy goals. Our mission at Soluna is to make clean energy a global superpower by solving the wasted energy, or curtailment, problem that holds back the renewables industry. We do that by converting otherwise wasted clean energy into valuable computing services like cryptocurrency mining. The second principle we use is to "reuse," that is, we repurpose discarded miners from our higher-cost peers, which extends the useful life of that equipment, and reduces e-waste. Our third principle is to build data centers that are intentionally designed to reduce energy consumption, maximize airflow and optimize systems through tailored engineering that allows the miners to run efficiently, and effectively.

I appreciate the additional questions you have asked, and I am submitting my responses for the record in the attached document. I understand that my responses will be included in the hearing record pursuant to Rule 3 of the Committee on Energy and Commerce. You will find my written responses in the Word document attached which uses the format you provided.

Sincerely,

John Belizaire
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Additional Questions for the Record

**Subcommittee on Oversight and Investigations Hearing on
“Cleaning Up Cryptocurrency: The Energy Impacts of Blockchains”
January 20, 2022**

John Belizaire, Chief Executive Officer, Soluna Computing, Inc.

The Honorable Frank Pallone, Jr. (D-NJ)

1. 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. Soluna operates PoW mining facilities that rely on application specific integrated circuits (ASICs).

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

Because of Soluna's unique business model, cost structure, and efficiency, our historical practice has been focused on the use of lightly used equipment discarded by higher-cost, less efficient peers, which helps address the issue of e-waste and extend useful lives.

We use our ASICs on average for 4 - 6 years.

The total average lifespan on ASICs in the past 10-years of crypto history is about 7 years, with failure rates around 3% - 5% annually.

Please note a couple of additional points:

- Ancillary pieces of hardware (power supplies, onboard cooling, and ancillary control units) are the leading cause of failure and as OEMs improve these components, we expect the useful life of the equipment to increase
- Machines are typically retired due to economic obsolescence before the microchips no longer work. Soluna's model of monetizing curtailed renewable energy results in lower power costs and will allow us to use our equipment longer compared to our market peers.

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

As of today, it is less than 1%. We have been in operation at a utility-scale for close to one year. So, this metric may change over time as we grow.



(Note: a large portion of our equipment is used, so we do have a higher failure rate than peers.)

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

Our facility's unique design is made with this very challenge in mind. We have designed our facilities to maximize airflow, reduce dust, and safely manage high-density energy loads.

Our experience indicates that other mining facilities that focus on minimizing upfront capital costs on their infrastructure have significant opportunities to improve their ASIC lifespans through operational excellence.

Some of the typical causes of early decommissioning of ASIC equipment include:

A) Airflow:

- i) improper filtration of air intake resulting in dusty operations
- ii) improper regulation of input temperature (too cold, too hot)
- iii) failure to vent output air

B) Electrical:

- i) operating at voltages outside OEM spec (e.g., 480/277V is the most common operating voltage though machines run at 416/240V)
- ii) neglecting accepted industry standards for operating industrial loads (operating without derating appropriately, operating on single phase instead of 3-phase power, use of aluminum wires instead of copper without sufficient de-rating, no power distribution units for stepping down the voltage at ASIC plug).
- iii) inappropriate controls for managing machine power draw and heat loads, leading to harmonics and inefficiencies in the power system, leading to failures.
- iv) Machines/infrastructure overheats, and machine PSUs receive harmonics causing failures.



In our analysis, none of these impose significant risks to health and human safety or to the electrical grid system. However, they do result in shortened equipment lifespans and greater e-waste.

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

E-waste is a concern for all industries that rely on information technology equipment to conduct business. In response to the inherent challenges of safely handling end-of-life electronics, specialist IT asset disposition (ITAD) companies have evolved over the past 25 years to provide robust and compliant electronic waste disposal infrastructure.

To date, Soluna has retained its decommissioned ASICs in order to recycle the reusable parts into other machines when repairs are needed. Later this year, in anticipation of its evolving e-waste needs, Soluna plans to partner with ITAD companies to handle end-of-use /end-of-life dispositions for our inventory. This ITAD provider will manage the rest of the e-waste process, including the recycling of ASIC components.

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

Soluna does not and will not dispose of any electronic waste without going through an ITAD provider that is certified and compliant with regulations and industry standards.

In light of the complex nature of ITAD, Soluna will work with established and accredited ITAD providers to provide the necessary infrastructure, security, environmental health and safety, and tracking functions for e-Waste disposition.

ITAD providers ensure compliance with all international, federal, state, and local regulations surrounding e-waste tracking, handling, and disposition. Formal certifications and guidelines are in place – e.g., the e-Stewards® 4.0 or R2 (Responsible Recycling) standards – to ensure proper handling and



tracking of e-waste as well as compliance to worker health and safety guidelines.

Utilizing an ITAD partner, specifically one that holds industry certifications (e.g. eStewards® 4.0), gives us confidence that our electronic waste is properly disposed of or recycled once it leaves our facilities. As part of our vendor management process, our ITAD provider will be subject to audit on a regular basis to ensure that they are meeting our requirements and those of the industry.

2. As Soluna continues to operate mining facilities, has it examined or invested in electronic waste disposal infrastructure?

d. If so, do these investments currently, or will they in the foreseeable future, have the capacity to dispose of Soluna's annual electronic waste in an environmentally safe and responsible way?

Beginning this year, Soluna will leverage a third-party IT Asset Disposition (ITAD) partner to manage its electronic waste safely and responsibly.

As outlined in the response to the previous question, well-established and accredited specialist IT Asset Disposition (ITAD) companies are available to provide the necessary waste disposal infrastructure to Soluna facilities.

Soluna will conduct due diligence in selecting our partner for this critical piece of our overall operations, and any partner we select will be well-established and financially sound and will hold either e-Stewards® 4.0 or and R2 certification, comply with environmental safety standards, and provide a documented audit trail for all materials they handle on our behalf.

e. If not, what has prevented Soluna from making these investments?

This is a 2022 investment given the emergent nature of our business and we plan to follow the steps outlined above.



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

Soluna's strategy of monetizing curtailed energy, which would otherwise be wasted. As a benefit, we can use the equipment longer than others and prolong its useful life.

Our plan is to maximize the amount of recycling from any electronic waste we generate. This will be a requirement for us when evaluating ITAD partners in 2022 and providers invited into the RFP process must meet certain certifications and standards to ensure the best e-waste outcomes.

A key benefit of using an established, environmentally-certified IT Asset Disposition provider is that they use best practices to ensure e-Waste is recycled to the full extent it's possible to do so.

Standards like e-Stewards® define and promote responsible electronics reuse and recycling best practices worldwide with stringent requirements for recycling Materials of Concern (MOC). Certified ITAD providers follow comprehensive standards to route MOC - Hazardous Electronic Waste (HEWs) and Problematic Components or Materials (PCMs) - to vetted downstream recycling partners and track MOCs for reuse in future manufacturing where possible.

The e-Stewards® standard prefers plastics from electronic equipment be sorted, cleaned, and pelletized for reuse, and further requires plastics with halogenated materials (fire retardants) to be recycled. With the current worldwide recycling challenges around plastics, e-Stewards standard designates landfilling as the preferred alternative if recycling options are unavailable because incineration releases organic pollutants and increased CO2 in the atmosphere. Waste-to-Energy incineration is conditionally allowed with appropriate environmental controls in place to capture resulting gasses.

g. Has Soluna 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?



Yes. Working with certified ITAD providers ensures that all materials that can be recycled are and that all recycling is conducted in accordance with secure and environmentally responsible best practices.

Processes for material reclamation are validated during certification resulting in materials being prepared for reuse as manufacturing feedstock, and as part of the recycling process mechanisms are in place to avoid greenhouse gasses and capture potential by-product pollutants so they are not released into the environment.



The Honorable Diana DeGette (D-CO)

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

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

Yes. Soluna has two facilities in Kentucky, which were impacted by the tornadoes in December. Thankfully none of Soluna's employees or their immediate families have been affected apart from power loss.

After the tornadoes passed through the region, we released our 50 MW of load back to the grid for two days to provide additional resilience to the grid.

Soluna also leaned in to support Kentucky in its hour of need by sourcing an industrial backup generator for the emergency services Mayfield, Kentucky area.

Soluna was able to leverage contacts in the energy industry to secure a 2-megawatt generator in less than a day. The asset was used as a redundancy asset for Mayfield's wastewater treatment facility.

Through that outreach, it was clear that the crypto community wanted to support victims. Kentucky is a state - that unlike others - has embraced bitcoin mining and other crypto businesses.

Soluna used the momentum to launch a campaign "Crypto Helps Kentucky" to raise funds for the local firefighters and Kentucky Feeding America Affiliate.

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

Yes. As described above, Soluna has two facilities in Kentucky, which were impacted by the tornadoes in December. After the tornadoes passed through KY, we released our 50 MW of load back to the grid for ~2 days to provide additional resilience to the grid. . We also provided substantial curtailments during the February 2021 freeze, which impacted KY power markets substantially.



John Belizaire, Chief Executive Officer, Soluna Computing, Inc.



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?

Cryptocurrency and blockchain technology has advanced a tremendous amount since 2016.

Here are a few 2021 metrics on Bitcoin specifically from the researchers at ARK Investments, which will give you a sense of how cryptocurrency has begun to absorb scale in its adoption:

- Bitcoin reached a \$1 trillion dollar market capitalization in 2021
- Bitcoin became an even more utilized source of money transfer:
 - Cumulative annual transfer volumes: \$13.1 trillion
 - Average daily transfer volume: \$35.9 billion
 - Average transaction value: \$136,555
- 2021 Bitcoin miners generated revenue of \$16.7B
- 35% of all hash rates were generated in the USA

With regards to bitcoin's power use, here are a few metrics from the Bitcoin Mining Council:

- 220 TWh of electricity used, estimated to be 0.14% of world energy production
- 58.5% of global bitcoin mining electricity is from sustainable power sources, which compares to 31.4% in the USA

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

The federal government plays an important role in spurring innovation and investment in new technologies.

To this end, we believe that the government plays a vital role in i) providing clear rule of law, and predictability in regulation, ii) encouraging investments



in innovation, iii) and where prudent encouraging deregulating mailable regulations to allow new business models to expand.

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

We believe that the federal government can attract crypto mining investment and jobs to the USA through the following routes:

- Continue prudent investments in innovation such as funding the ARPA-E program
- Provide clarity and guidance on tax, money transmitter, and other laws which govern the crypto industry; where appropriate ensure that reporting requirements are not onerous and encourage ease-of-doing business
- With regards to electricity – encourage large TSOs to provide market reforms that allow more creative participation in power markets and allow for the development of new business models, such as including availability price signals in bulk power markets, improved net-metering rules, and allowing off-takers to provide certain ancillary services.
- Extend Tax Credits – Incentivize green energy project developers to integrate computing or crypto mining operations through extended PTCs (wind) and ITCs (solar).
- Flexible Load Resources – Incentivize crypto mining facilities to ramp up or ramp down their consumption during peak demand through premium prices for serving as a Flexible Load Resource.
- Investment Tax Credit – Create a special ITC for crypto mining operations that use green energy AND serve as Flexible Load Resources to the grid.
- DOE Loan Guarantee – DOE loan programs geared toward renewable energy transmission and batteries could be extended to encourage the development of green crypto mining operations and other flexible computing. This encourages infrastructure funds to invest in the industry catalyzing the growth of batchable computing as an alternative or additional solution for wasted energy.

