



**SIERRA  
CLUB**

Missouri Chapter

Missouri Chapter  
PO Box 432010, Saint Louis, MO 63143  
314-644-1011  
missouri.chapter@sierraclub.org  
www.sierraclub.org/missouri

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Chair Crawford and Members of the Missouri Senate Insurance and Banking Committee,

I submit this testimony on behalf of the over 11,000 Sierra Club members throughout Missouri. In addition to protecting every person's right to get outdoors and access the healing power of nature, the Sierra Club works to promote clean energy, safeguard the health of our communities, protect wildlife, and preserve our remaining wild places through grassroots activism, public education, lobbying, and legal action.

The Sierra Club Missouri Chapter opposes Senate Bill 536.

Senate Bill 536 will increase proof-of-work cryptocurrency mining in Missouri, which will increase electricity use in the state. Missouri's electric grid is predominately coal-fired.<sup>1</sup> The increased use of fossil fuels from cryptocurrency mining will worsen the environmental pollution of everyday Missourians.

Since China banned cryptocurrency mining in 2021, cryptocurrency mining operations have been resurrecting retired or infrequently-utilized fossil fuel-based powerplants across the country. This includes increasing the operations of coal-fired plant, including at Ameren Sioux here in Missouri.<sup>2</sup> Air, water and climate pollution from additional coal-fired power for cryptocurrency mining makes a terrible problem much, much worse. In addition, mining operations are terribly noisy and negatively impact host communities.

## What is proof-of-work cryptocurrency mining?

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 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.

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<sup>1</sup> <https://www.eia.gov/state/?sid=MO#tabs-4>

<sup>2</sup> EPA has denied requests from current and former coal-fired power plants to keep using waste disposal sites filled with coal ash, including Sioux Energy Center in West Alton, MO that currently operate proof-of-work cryptomining operations. ([E&E News](#))

The energy use of cryptomining is out of this world.<sup>3</sup> If Bitcoin were a country, it would rank in the top 30 countries of energy users worldwide. As of last week, Bitcoin mining emissions were the equivalent of

- Carbon Footprint: 51.14 Mt CO<sub>2</sub>, Comparable to the carbon footprint of all of Sweden.
- Electrical Energy: 91.69 TWh, Comparable to all of the power consumption of Philippines.

Bitcoin is the most well-known of proof-of-work currencies. There are thousands of non-proof-of-work cryptocurrencies. In fact, the second most popular cryptocurrency, Ethereum, recently switched from proof-of-work to Proof-of-Stake validation because of its outside energy use and pollution, and now utilizes over 99% less energy than proof-of-work cryptomining.

The Sierra Club is neither opposed to nor supportive of cryptocurrency as a concept – our concerns lie with the hugely energy consumptive practice of proof-of-work cryptomining, which in the U.S. and in Missouri, primarily relies on fossil fuels.

## Local economic impacts regarding cryptocurrency mining

Local economic impacts from crypto mining operations should be carefully studied before allowing Bitcoin operations to proliferate in Missouri.

### A. Cryptocurrency mining harms existing electricity customers.

Some mining operations demand the construction of transmission and distribution lines, substation upgrades, and other infrastructure to support their facilities, with the costs of those upgrades often paid by local electric rate payers.<sup>4</sup>

- For example, 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.<sup>5</sup>
- For example, the Nebraska Public Power District in 2020 spent \$17.6 million, or 18% of its 2020 capital budget, constructing a transmission line and substation to increase the delivery capacity to mining facilities there.

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<sup>3</sup> 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>.

<sup>4</sup> For example, in Idaho, investor-owned utility Idaho Power requested that cryptominers prepay for required infrastructure upgrades to prevent stranded assets on remaining ratepayers when the economics of cryptocurrency change. Idaho Pub. Utils. Comm'n, *Application of Idaho Power Co. for Authority to Establish a New Schedule to Serve Speculative High-Density Load Customers*, at 13–14 & Attach. 1, Schedule 20, Case No. IPC-E-21-27 (Nov. 4, 2021), <https://puc.idaho.gov/Fileroom/PublicFiles/ELEC/IPC/IPCE2137/CaseFiles/20211104Application.pdf>; see also Justine Calma, Texas' Fragile Grid Isn't Ready for Crypto Mining's Explosive Growth, *The Verge* (July 14, 2022), <https://www.theverge.com/2022/7/14/23206795/bitcoin-crypto-mining-electricity-texas-grid-energy-bills-emissions> (“Unfortunately, the costs for building out all this infrastructure are often passed on to consumers — particularly if it’s done at a huge scale under a rushed timeline as crypto mining might demand.”).

<sup>5</sup> Ky. Pub. Serv. Comm'n, Order, In re: Elec. App'n of Big Rivers Elec. Corp. for a Certificate of Pub. Convenience & Necessity to Construct a 161 kV Transmission Line in McCracken Cty., Ky., Case No. 2021-0027 (Jan. 14, 2022), [https://psc.ky.gov/order\\_vault/orders\\_2022/202100275\\_01142022\\_01.pdf](https://psc.ky.gov/order_vault/orders_2022/202100275_01142022_01.pdf).

- For example, 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.

Ratepayers can also be left on the hook for these investments if and when a cryptocurrency mining operation abruptly leaves (as they are generally capable of doing).<sup>6</sup>

- For example, one cryptocurrency mining operation in Washington that declared bankruptcy in 2018 left more than \$700,000 in unpaid utility and electricity bills.<sup>7</sup>
- For example, after the New York Municipal Power Authority increased rates for supplemental electricity used by miners in Plattsburgh because the rates for local residents there skyrocketed, many cryptocurrency miners moved west to another town, increasing electricity costs there.<sup>8</sup>

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).<sup>9</sup>

#### B. Subsidies or tax breaks in an effort to encourage cryptocurrency mining operations also harm local taxpayers.

- For example, cryptocurrency-specific tax incentives in Kentucky are estimated to cost Kentucky taxpayers at least \$9 million a year in lost revenue.<sup>10</sup>

<sup>6</sup> Naureen S. Malik & Michael Smith, Crypto Mania in Texas Risks New Costs and Strains on Shaky Grid, Bloomberg (Mar. 15, 2022),

<https://www.bloomberg.com/news/articles/2022-03-15/crypto-mania-in-texas-risks-new-costs-and-strains-on-shaky-grid>

<sup>7</sup> U.S. House Committee on Energy & Commerce Staff, Memorandum re: Hearing on Cleaning Up Cryptocurrency: The Energy Impacts of Blockchains, at 8-9 (Jan. 17, 2022),

<https://energycommerce.house.gov/sites/democrats.energycommerce.house.gov/files/documents/Briefing%20Memo%20O1%20Hearing%202022.01.20.pdf>

<sup>8</sup> McKenzie Delisle, Mining operation moves out of city for winter, Press-Republican (Nov. 11, 2019),

[https://www.pressrepublican.com/news/local\\_news/mining-operation-moves-out-of-city-for-winter/article\\_4c86c044-4e1e-5ad6-8e6d-0ad19b875e35.html](https://www.pressrepublican.com/news/local_news/mining-operation-moves-out-of-city-for-winter/article_4c86c044-4e1e-5ad6-8e6d-0ad19b875e35.html)

<sup>9</sup> Ariel Dreihobl et al., How High are Household Energy Burdens? Am. Council for an Energy-Efficient Economy, at ii (Sept. 2020),

<https://www.aceee.org/sites/default/files/pdfs/u2006.pdf>

<sup>10</sup> Avi Asher-Schapiro, Coal to crypto: The gold rush bringing bitcoin miners to Kentucky, Thomson Reuters Found. (Mar. 14, 2022), <https://longreads.trust.org/item/bitcoin-mining-US-coal-country-climate>; see also Igor Makarov & Antoinette Schoar, Blockchain Analysis of the Bitcoin Market, Nat'l Bureau of Econ. Rsch., Working Paper No. 29396, at 4 (Oct. 2021),

[https://www.nber.org/system/files/working\\_papers/w29396/w29396.pdf](https://www.nber.org/system/files/working_papers/w29396/w29396.pdf) (“The top 10% of [cryptocurrency] miners control 90% [of mining] and just 0.1% (about 50 miners) control close to 50% of mining capacity.”).

- For example, Corpus Christi is forgoing \$7 million annually in sales tax and franchise fees, equating to \$70,501,509 over ten years, to accommodate a mining operation there.<sup>11</sup>

### C. Cryptocurrency Mining operations create few jobs.

As one professor 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.”<sup>12</sup> Fitch Ratings found “Crypto mining operations typically bring in very little additional economic benefits in the form of jobs or ancillary business to a local economy.”<sup>13</sup>

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.”<sup>14</sup> “I’m pro-economic development, but the biggest mine operation has fewer jobs than a new McDonald’s.”<sup>15</sup>

## Environmental concerns regarding cryptocurrency mining

Environmental concerns regarding cryptocurrency mining can be summarized as the following, which we detail further in subsequent sections of our testimony:

### A. Proof-of-work crypto mining is very loud

Noise pollution is a very real concern for communities that host crypto mining operations. For example:

At a mining facility in Limestone, Tennessee, residents have described the noise as “like a jet engine idling on a nearby tarmac.”<sup>16</sup> A commissioner who

<sup>11</sup> City of Corpus Christi, Agenda Memorandum re Disannexation and Amendment Industrial District #2 Boundaries, at 2 (Mar. 3, 2022)

<https://corpuschristi.legistar.com/View.ashx?M=F&ID=10666001&GUID=E7BE68AC-B0F7-4198-B758-739D20E1814D>.

<sup>12</sup> Laura Counts, Power-hungry cryptocurrency miners push up electricity costs for locals, Berkeley Haas (Aug. 3, 2021),

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

(quoting Assistant Professor Giovanni Compiani, one of the co-authors of Matteo Benetton et al., When Cryptocurrency Comes to Town: High Electricity-Use Spillovers to the Local Economy, SSRN, at 3 (Aug. 2022),

[https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3779720](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3779720)).

<sup>13</sup> Fitch Ratings, Crypto Mining Poses Challenges to Public Power Utilities (Jan. 24, 2022),

<https://www.fitchratings.com/research/us-public-finance/crypto-mining-poses-challenges-to-public-power-utilities-24-01-2022>.

<sup>14</sup> Pia Singh, Bitcoin miners flocked to an upstate New York town for cheap energy — then it got complicated, CNBC (June 24, 2021). <https://www.cnbc.com/2021/06/24/bitcoin-miners-flocked-to-upstate-new-york-for-cheap-energy-then-it-got-complicated.html>.

<sup>15</sup> Lois Parshley, How Bitcoin mining devastated this New York town: Between rising electricity rates and soaring climate costs, cryptocurrency mining is taking its toll on communities, MIT Tech. Review (Apr. 18, 2022), <https://www.technologyreview.com/2022/04/18/1049331/bitcoin-cryptocurrency-cryptomining-new-york/>.

<sup>16</sup> Kevin Williams, An Appalachian town was told a bitcoin mine would bring an economic boom. It got noise pollution and an eyesore, Wash. Post (Mar. 18, 2022), <https://www.washingtonpost.com/business/2022/03/18/bitcoin-mining-noise-pollution-appalachia/>.

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.”<sup>17</sup>

- 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.”<sup>18</sup>
- 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.”<sup>19</sup>
- 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.”<sup>20</sup>

## B. Proof-of-work crypto mining jeopardizes water quality.

Many mining facilities require large quantities of water to generate energy or cool the machinery on site. Water returned to water bodies is significantly hotter than the water withdrawn. 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.<sup>21</sup>

## C. Proof-of-work crypto mining jeopardizes air quality.

Cryptocurrency mining that relies on fossil fuel combustion for energy generation 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 oxides.

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<sup>17</sup> Id.

<sup>18</sup> Kevin Williams, A neighborhood’s cryptocurrency mine: ‘Like a jet that never leaves’, Wash. Post (Aug. 31, 2022), <https://www.washingtonpost.com/business/interactive/2022/cryptocurrency-mine-noise-homes-nc/>.

<sup>19</sup> Brian D. Stockman, Bitcoin mine brings heated residents to Ridgway Township meeting, Ridgway Record (Jun. 22, 2022),

[https://www.ridgwayrecord.com/news/bitcoin-mine-brings-heated-residents-to-ridgway-township-meeting/article\\_00184b60-f27e-11ec-8220-134307a1c971.html](https://www.ridgwayrecord.com/news/bitcoin-mine-brings-heated-residents-to-ridgway-township-meeting/article_00184b60-f27e-11ec-8220-134307a1c971.html);

<sup>20</sup> Vipal Monga, Bitcoin Mining Noise Drives Neighbors Nuts—a Giant Dentist Drill That Won’t Stop, Wall Street Journal (Nov. 12, 2021), <https://www.wsj.com/articles/bitcoin-mining-noise-drives-neighbors-nuts-giant-dentist-drill-that-wont-stop-11636730904>.

<sup>21</sup> U.S. EPA, Nat’l Pollutant Discharge Elimination System – Cooling Water Intake Structures at Existing Facilities & Phase I Facilities, 76 Fed. Reg. 22,174, 22,246 (proposed Apr. 20, 2011), <https://www.federalregister.gov/documents/2011/04/20/2011-8033/national-pollutant-discharge-elimination-system-cooling-water-intake-structures-at-existing>; U.S. EPA, Harmful Algal Blooms and Drinking Water Factsheet (last visited July 11, 2022) [https://www.epa.gov/sites/default/files/2016-11/documents/harmful\\_algal\\_blooms\\_and\\_drinking\\_water\\_factsheet.pdf](https://www.epa.gov/sites/default/files/2016-11/documents/harmful_algal_blooms_and_drinking_water_factsheet.pdf) see generally Steven C. Chapra, Surface Water Quality

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.<sup>22</sup>

D. Proof-of-work crypto mining jeopardizes our ability to mitigate the worst impacts climate change.

A study published in Nature Climate Change last year found that Bitcoin mining alone has the potential to push the planet past the targets set by the Paris agreement.<sup>23</sup>

E. Proof-of-work crypto mining generates enormous levels of electronic and solid waste.

Cryptocurrency mining results in enormous amounts of electronic waste.<sup>24</sup> 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.<sup>25</sup> A recent estimate found that in 2021 alone, proof-of-work mining generated more than 30,000 metric tons of waste,<sup>26</sup> which is comparable to the e-waste produced by the whole country of the Netherlands.<sup>27</sup> 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 without significant costs to the municipality.<sup>28</sup>

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<sup>22</sup> World Health Organization, New WHO Global Air Quality Guidelines aim to save millions of lives from air pollution (Sept. 22, 2021), <https://www.who.int/news/item/22-09-2021-newwho-global-air-quality-guidelines-aim-to-save-millions-of-lives-from-air-pollution>; see also U.S. EPA, Research on Health Effects from Air Pollution (last updated Feb. 16, 2022), <https://www.epa.gov/air-research/research-health-effects-air-pollution>

<sup>23</sup> Nature Climate Change, Bitcoin Emissions Alone Could Push Global Warming Above 2°C, <https://www.nature.com/articles/s41558-018-0321-8>.

<sup>24</sup> For background into the public health and environmental concerns surrounding electronic waste, see generally Megan Avakian, E-waste: An Emerging Health Risk, Nat'l Inst. of Env't Health Scis. (Feb. 2014),

[https://www.niehs.nih.gov/research/programs/geh/geh\\_newsletter/2014/2/spotlight/ewaste\\_an\\_emerging\\_health\\_risk.cfm](https://www.niehs.nih.gov/research/programs/geh/geh_newsletter/2014/2/spotlight/ewaste_an_emerging_health_risk.cfm); U.S. EPA, Cleaning Up Electronic Waste (E-Waste) (last updated Nov. 2, 2021), <https://www.epa.gov/international-cooperation/cleaning-electronic-waste-e-waste>.

<sup>25</sup> Joachim Klement, Geo-Economics: The Interplay between Geopolitics, Econ., and Investments, CFA Inst. Rsch. Found., at 200 (Apr. 2021), <https://www.cfainstitute.org/-/media/documents/book/geo-economics-full.pdf>; Mark Peplow, Bitcoin poses major electronic-waste problem, Chem. & Eng'g News (Mar. 14, 2019), <https://cen.acs.org/environment/sustainability/Bitcoin-poses-major-electronic-waste/97/i11>; Economic Times, Bitcoin mining generates tonnes of e-waste: Study (Sept. 21, 2021), <https://economictimes.indiatimes.com/markets/cryptocurrency/bitcoin-mining-generates-tonnes-of-e-waste-study/articleshow/86391133.cms>

<sup>26</sup> Alex de Vries & Christian Stoll, Bitcoin's growing e-waste problem, 175 Res., Conserv. & Recycling 105901 (Dec. 2021),

<https://www.sciencedirect.com/science/article/abs/pii/S0921344921005103?dgcid=author>

<sup>27</sup> Id.; BBC, Bitcoin mining produces tons of waste (Sept. 20, 2021), <https://www.bbc.com/news/technology-58572385>; Digiconomist, Bitcoin Elec. Waste Monitor (last visited Aug. 29, 2022), <https://digiconomist.net/Bitcoin-electronic-waste-monitor/>.

<sup>28</sup> Cherokee Scout, Landfill cracking down on 'foam' from crypto mining (July 26, 2022),

<https://www.cherokeescout.com/local-newsletter/landfill-cracking-down-foam-crypto-mining> ("The revisions include language that bans materials such as polyethylene, polypropylene and similar types of packing

These environmental impacts should be carefully studied before allowing cryptocurrency mining operations to proliferate in Missouri through Senate Bill 536.

## Ameren Sioux Coal Plant example

Ameren Sioux Coal Plant mined crypto behind the meter in 2020 and 2021. The "The St. Louis Dispatch first reported that it became known when Ameren tried to recover about \$8000 in costs from ratepayers ...." <sup>29</sup> for 309,000 kilowatt-hours of energy usage related to bitcoin mining into its fuel costs recovery formula.<sup>30</sup>

A 2019 Environmental Integrity Project report found that the Sioux Energy Center exceeded 'safe' pollutant levels on boron (by nine times), cobalt (two times), lithium, and sulfate (two times). Molybdenum emissions were 181 times over safe levels. The plant has 29 groundwater monitoring wells, 15 of which have been polluted above federal advisory levels based on samples collected between March 16, 2016 and November 15, 2017.<sup>31</sup>

## “Right to Mine”- means that communities can’t protect themselves from the externalities of the mining industry

These so called “right to mine” laws, like Senate Bill 536, are an attempted end-run around local regulations that protect communities from for-profit (usually out-of-state) polluters.

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 well-capitalized mining companies. Long gone are the days where the majority of crypto mining was happening in garages, basements, or home offices. A 2021 paper from the National Bureau of Economic Research tracing rewards within a subset of those pools found that 90% of

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materials from commercial haulers from any nonresidential point of origin. . . . [since this] ‘incompressible foam cannot be compacted with our compactor.’”).

<sup>29</sup> Associated Press: **Critics question utility’s bitcoin mining center** (Oct. 24, 2021) <https://apnews.com/article/technology-business-missouri-utilities-ameren-corp-c546ca9f1f84fa0536d2b6299c63633b>.

<sup>30</sup> <https://www.eenews.net/articles/coal-to-cryptocurrency-an-answer-to-grid-volatility/> Ameren withdrew the request at the Public Service Commission after the state’s consumer advocate questioned it earlier this year. “If Ameren Missouri wants to enter into speculative commodities, like virtual currencies, then it should do so as a non-regulated service where ratepayers are unexposed to the economics of them,” Geoff Marke, chief economist for the Missouri Office of the Public Counsel, said in a filing. “This endeavor is beyond the scope of intended electric utility regulation, and, if allowed, creates a slippery slope where ratepayers could be asked to put up capital for virtually anything.”

<sup>31</sup> <https://www.datacenterdynamics.com/en/news/ameren-deploys-bitcoin-mining-data-center-at-coal-power-plant/>

rewards (Bitcoin blocks) were received by just 10% of miners—nearly 70% were received by just half a percent of miners.

We oppose any attempt by the mining industry to preempt existing laws and local regulation of an industry that has serious consequences on communities, ratepayers, the environment, and climate. Please oppose Senate Bill 536.