

## Crypto Mining for Digital Gold is Turning Green

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In an [earlier note](#), Alerian addressed the blockchain and cryptocurrency market as a longer-term play due to its connection with the digitalization of the economy. But investors may wonder how appropriate the industry is for the long-term given environmental sustainability concerns. These concerns are particularly relevant to cryptocurrency miners who have received negative press attention for using electricity 24 hours a day to run vast facilities with large-scale computer systems. Since the industry is relatively new, multi-page sustainability reports for these companies are not as readily available as other public corporations, which may add to the negative perception. There are some misconceptions regarding electricity usage, however, and early signs show that most mining companies have taken steps to move toward renewable energy and become more environmentally friendly.

### Cryptocurrency mining—what is it and how does it take up energy?

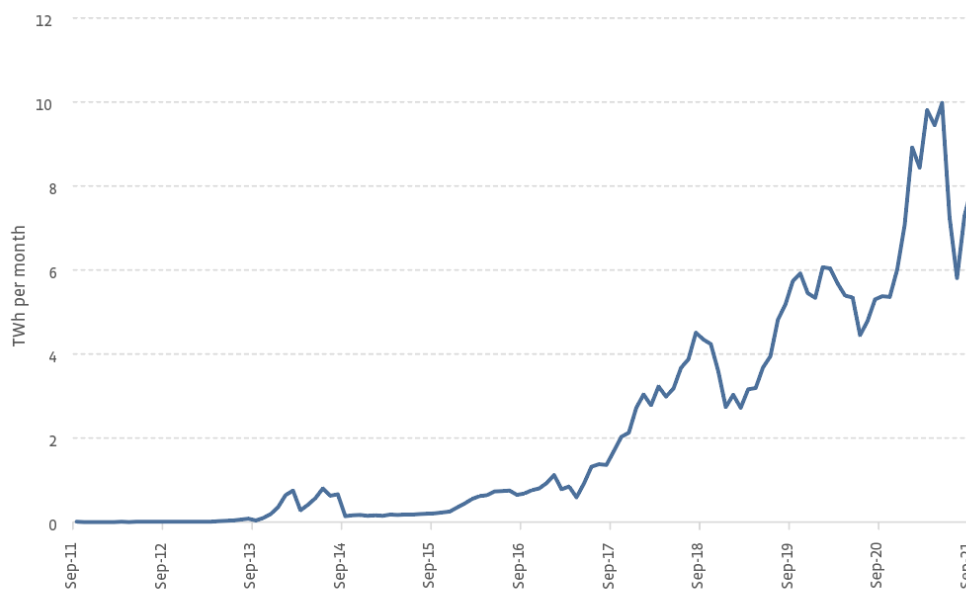
Cryptocurrency mining (usually Bitcoin mining) is essentially the process of verifying blocks of Bitcoin transactions. Miners use computers to “compete” to validate the transactions, which involves running a computer to solve a complex algorithm. Once the algorithm is solved, the transactions are verified by the rest of the network. Miners are incentivized with Bitcoin rewards for solving the problem.

As Bitcoin’s popularity rose, it became more difficult to mine for Bitcoin as more computers joined the network and the algorithms evolved (i.e., more computing power is now required). Previously anyone with a computer could mine for Bitcoin, but now the majority of Bitcoin mining is done by Bitcoin mining corporations or groups of individuals who have joined together to form a mining pool. Bitcoin mining companies often have large facilities with networks of computers that require a significant amount of electricity to both run the systems and cool down the subsequent heat generated from the process.

In May 2021, Elon Musk stated that Tesla (TSLA) would no longer accept Bitcoin payments due to the increasing usage of fossil fuels for mining.<sup>1</sup> Other negative comparisons arose asserting that global Bitcoin mining used more electricity than a small country. But electricity consumption, although increasing, is not as large as many are led to believe.

1. [Elon Musk on Twitter: Tesla & Bitcoin](#)

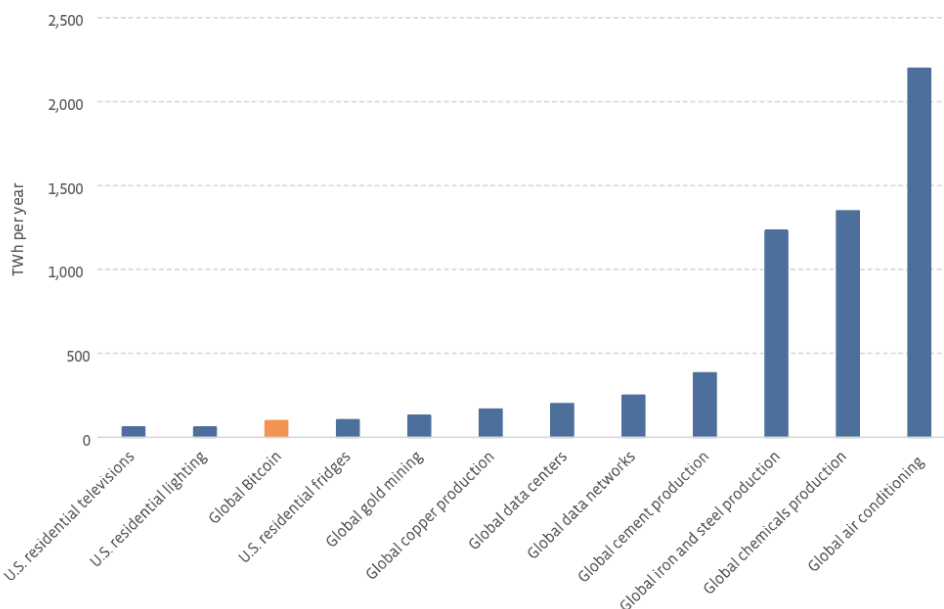
Monthly Global Bitcoin Electricity Consumption Has Risen as More Bitcoin is Mined



Source: Cambridge Bitcoin Electricity Consumption Index, Alerian and S-Network Global Indexes as of October 8, 2021

According to the University of Cambridge, Bitcoin mining consumes about 0.5% of the world’s electricity – around 99 terawatt hours (TWh) per year globally.<sup>2</sup> To put this into perspective, gold mining consumes 131 TWh per year. Other industrial processes such as iron and steel production and chemical production consume over 1,200 TWh per year.<sup>3</sup> While it is true that global Bitcoin mining consumes more electricity annually than smaller countries like Kazakhstan and the Philippines, electricity consumption is nowhere near annual usage of developed countries like China and the United States. China and the United States generate close to 65x and 40x, respectively, the amount of electricity as Bitcoin does globally. The University of Cambridge study also found that renewable energy accounts for only 39% of total energy consumption for miners; however, 76% of miners utilize some portion of renewable energy—mostly hydroelectric—as part of their energy mix. This illustrates that while total energy consumption may not be as high as opponents may imply, there is still more progress to be made in the industry.

Annual electricity consumption of Bitcoin is still significantly lower than many related processes



2. [3rd Global Cryptoasset Benchmarking Study by the University of Cambridge](#)

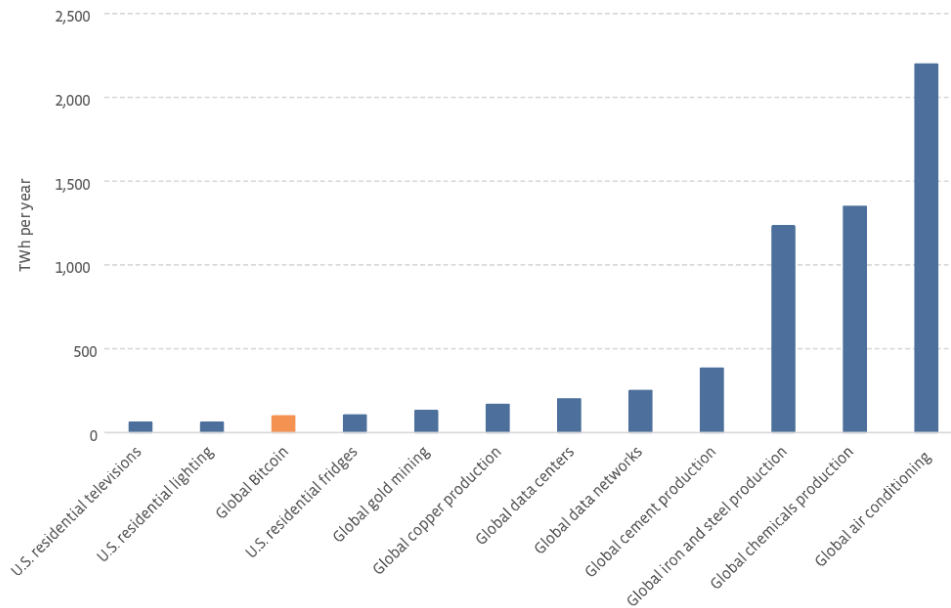
3. [Cambridge Bitcoin Electricity Consumption Index \(CBECI\)](#)

## Industry standards are still in early stages of fruition.

The Paris Climate Agreement inspired the Crypto Climate Accord (CCA) in April 2021 in an effort to decarbonize the cryptocurrency and blockchain industry. Its objective is to transition the entire crypto industry to net-zero greenhouse gas emissions by 2040.<sup>4</sup> Over 150 companies have joined as CCA Supporters, which help develop solutions in support of the CCA but have not necessarily made a commitment to decarbonize. Over half of these supporters are also CCA Signatories that commit to achieve net-zero emissions from crypto operations by 2030. As shown in the table below, several crypto mining constituents within the Alerian Galaxy Global Blockchain and Crypto Index Family have signed the CCA—most notably Dmg Blockchain Solutions (DMGI CN) and Argo Blockchain (ARGO), which were the first to sign.

Additionally, these large public companies have taken steps to utilize more green energy in their mining operations. Many of these also have mining facilities in colder regions like Western Canada. Canada is abundant with land, wind energy, and natural gas—ranking in the top 5 natural gas producers behind the United States, Russia, and Iran.<sup>5</sup> Canada, however, is thought to be the most ideal out of these locations because of more relaxed crypto regulations and freezing temperatures. Operating mining facilities in colder weather regions helps cool the large amount of heat generated by the miners, which lowers the electricity cost.

Annual electricity consumption of Bitcoin is still significantly lower than many related processes



Largest Cryptocurrency Miners By Weighting in CRYPTO/BCHAIN Indexes

		CRYPTO Weighting	BCHAIN Weighting	CCA Supporter	CCA Signatory	Environmental Sustainability Commitments
Hut 8 Mining Corp	HUT CN	4.0%	1.8%	Yes		Utilizes gas, wind, green energy Hired Head of Power and Sustainability
Bit Digital Inc	BTBT US	3.7%	1.7%	Yes	Yes	U.S. operations 47% carbon free; Canada operations 100% repurposed natural gas Also working with ESG consultant to receive an independent ESG rating
Dmg Blockchain Solutions Inc	DMGI CN	3.7%	1.7%	Yes	Yes	Flagship Christina Lake Data Center is 100% hydroelectric Launched first clean energy Bitcoin mining pool "Terra Pool" with Argo Blockchain Blockseer's upcoming software platform will be energy compliant
Marathon Digital Holdings Inc	MARA US	3.5%	1.6%			Aims to have 100% carbon neutral mining by end of FY2022
HIVE Blockchain Technologies Ltd	HIVE CN	3.2%	1.5%			Utilizes 100% green energy to mine both Bitcoin and Ethereum
Bitfarms Ltd	BITF CN	3.1%	1.4%			Utilizes 100% green hydroelectricity
Riot Blockchain Inc	RIOT US	2.8%	1.3%			Mining operations based out of facility with 88% zero-emission sources
Argo Blockchain PLC	ARB LN	2.6%	1.2%	Yes	Yes	Operations "climate positive" for greenhouse gases Launched first clean energy Bitcoin mining pool "Terra Pool" with Dmg Blockchain
<b>Total:</b>		<b>26.7%</b>	<b>12.2%</b>			

Source: Company filings, Alerian and S-Network Global Indexes. Weightings as of October 8, 2021

4. [Crypto Climate Accord](#)  
5. [Natural Gas Facts \(nrcan.gc.ca\)](#)

## Bottom Line:

As investors consider cryptocurrency and blockchain equities as a long-term thematic investment, they should be aware that environmental sustainability standards are still evolving for this relatively new industry. Although there has traditionally been a negative perception of the Bitcoin mining process, crypto mining companies have started taking steps to address environmental sustainability, which will likely become a much larger topic of interest as the industry grows.

*The Alerian Galaxy Global Blockchain Equity, Trusts & ETPs Index (BCHAIN) is the underlying index for the Invesco Alerian Galaxy Blockchain Users and Decentralized Commerce ETF (BLKC).*

*The Alerian Galaxy Global Cryptocurrency-Focused Blockchain Equity, Trusts & ETPs Index (CRYPTO) is the underlying index for the Invesco Alerian Galaxy Crypto Economy ETF (SATO).*

Index	Ticker	Total-Return Performance				
		30 Days	YTD	1-Year	3-Year	5-Year
<b>Healthcare</b>						
S-Network Healthcare Technology Index	HLTHX	-6.69%	-7.64%	9.36%	100.01%	193.97%
S-Network Medical Breakthroughs Index	PMBI	-2.09%	-10.93%	2.93%	31.28%	90.34%
S-Network Healthcare Innovation Index	PHIX	2.79%	-11.79%	-0.49%	45.60%	116.94%
<b>Technology</b>						
O'Shares Global Internet Giants Index	OGIGX	-6.06%	-0.46%	17.84%	152.03%	282.88%
S-Network North American Disruptor Index	SNNADX	-3.85%	17.71%	47.73%	89.68%	N/A
S-Network US Disruptor Index	SNUSDX	-3.60%	12.50%	48.41%	90.28%	185.57%
S-Network Tech Target Index	SNTECH	-1.41%	9.57%	37.94%	52.36%	143.14%
<b>Water</b>						
S-Network Global Water Index	JGI	-6.34%	12.88%	25.29%	51.69%	79.24%
S-Network Global Water Works Index	JWW	-6.31%	8.42%	17.46%	47.87%	74.24%
S-Network Global Water Technology Index	JWT	-6.42%	17.44%	33.34%	50.97%	78.27%
<b>Smart Climate Risk</b>						
S-Network Smart Climate Risk 50 Index	SNSC50	-1.56%	12.43%	18.90%	47.11%	120.72%
S-Network Smart Climate 250 Index	SNSC250	-1.33%	15.92%	25.40%	50.99%	124.41%
<b>Blockchain and Crypto</b>						
Alerian Galaxy Global Blockchain Equity, Trusts & ETPs Index	BCHAIN	-3.52%	36.57%	109.39%	N/A	N/A
Alerian Galaxy Global Cryptocurrency-Focused Blockchain Equity, Trusts & ETPs Index	CRYPTO	-4.65%	68.81%	437.48%	N/A	N/A
<b>Other</b>						
S-Network Streaming & Gaming Index	STREAM	-4.82%	3.56%	21.63%	101.05%	N/A
S-Network Emerging Infrastructure Builders Index	EIBI	-8.48%	5.91%	28.41%	26.99%	46.77%
S-Network Space Index	SPACE	-3.95%	21.08%	41.58%	13.53%	51.80%
S-Network MicroSectors Gold Miners Index	MINERS	-4.31%	-17.68%	-22.48%	61.33%	N/A
S-Network Global Travel Index	TRAVEL	1.79%	9.94%	35.46%	N/A	N/A

Source: S-Network Global Indexes. All performance data as of October 8, 2021.

## Related Research:

[Investing in the Digital Transformation: Accessing Blockchain and Crypto Through Equity Investments](#)

[Strong Airline Demand Gives Wings to the Travel Industry](#)

[Investing in Water: Water Brings the Heat in a Defensive Summer](#)

[Investing in Global Infrastructure: Building the Future Economy](#)

[Investing in Biotechnology: Disrupting the Healthcare Space](#)

## Underlying Index | Associated Product/Direct-Indexing Platform Availability

### Healthcare

[S-Network Medical Breakthroughs Index \(PMBI\)](#) | ALPS Medical Breakthroughs ETF (SBIO)

[S-Network Healthcare Innovation Index \(PHIX\)](#) | SmartTrust Healthcare Innovations Trust; Available on the C8 platform and the SMARtX platform

### Technology

[O'Shares Global Internet Giants Index \(OGIGX\)](#) | O'Shares Global Internet Giants ETF (OGIG)

[S-Network North American Disruptor Index \(SNNADX\)](#) | SmartTrust Technology Revolution Trust – Includes 30 stocks from SNNADX

### Water

[S-Network Global Water Index \(JGI\)](#) | Invesco Global Water Portfolio – Includes 25 stocks from JGI; Available on the C8 platform

### Smart Climate Risk

S-Network Smart Climate Risk 50 Index (SNSC50) | Available on the C8 platform and the SMARtX platform

S-Network Smart Climate Risk 250 Index (SNSC250) | Available on the C8 platform

### Blockchain and Crypto

[Alerian Galaxy Global Blockchain Equity, Trusts & ETPs Index \(BCHAIN\)](#) | Invesco Alerian Galaxy Blockchain Users and Decentralized Commerce ETF (BLKC)

[Alerian Galaxy Global Cryptocurrency-Focused Blockchain Equity, Trusts & ETPs Index \(CRYPTO\)](#) | Invesco Alerian Galaxy Crypto Economy ETF (SATO)

### Other

[S-Network Infrastructure Builders Index \(EIBI\)](#) | Available on the C8 platform

[S-Network Space Index \(SPACE\)](#) | Procure Space ETF (UFO)

[S-Network MicroSectors Gold Miners Index \(MINERS\)](#) | MicroSectors Gold Miners 3x Leveraged ETN (GD XU), MicroSectors Gold Miners -3x Inverse Leveraged ETN (GD XD)

[S-Network Global Travel Index \(TRAVEL\)](#) | ALPS Global Travel Beneficiaries ETF (JRNY)

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