

GLOBAL BITCOIN MINING DATA REVIEW

Q2 2022

July 2022

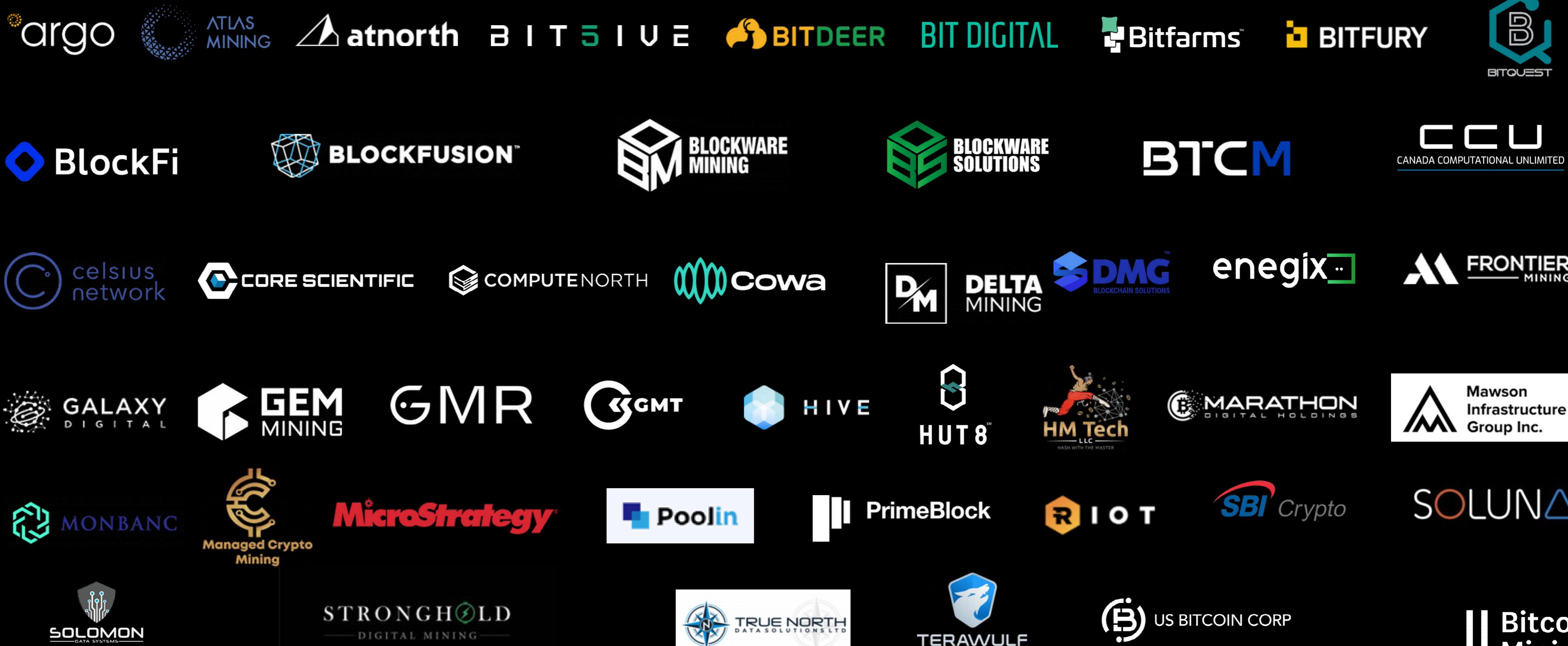
45 MINING COMPANIES REPRESENTING 50.5% OF THE GLOBAL NETWORK

AGENDA

- 1** Introduction: Michael Saylor
- 2** Data Aggregation / Explanation: Taras Kulyk
- 3** Full BMC Q2 2022 Update: Michael Saylor
- 4** Power Situation In Texas: Peter Wall & Jason Les
- 5** The Effects of Bitcoin Price And Network Efficiency: Fred Thiel
- 6** Variance Of Energy Economics In Bitcoin Mining: Ayden Kilic
- 7** Analyzing And Debunking The FUD: Ben Gagnon
- 8** Q & A

BITCOIN MINING COUNCIL

45 MINING COMPANIES FROM 5 CONTINENTS REPRESENTING 50.5% OF THE GLOBAL NETWORK



EXECUTIVE SUMMARY

Bitcoin mining, in Q2 2022:

1. Uses an inconsequential amount of global energy (15bps) and generates negligible carbon emissions (9bps)
2. Bitcoin mining hashrate is up 137% YoY while energy usage is up 63% YoY, due to an increase in efficiency of 46%
3. Bitcoin is the industry leader in sustainability with a 59.5% sustainable energy mix

PRESENTATION OVERVIEW

1. Bitcoin Mining Energy Use Vs Global Energy Use
2. Bitcoin Mining Carbon Generation Vs Global Carbon Generation
3. Global Bitcoin Mining Energy Use Is Negligible
4. Global Bitcoin Mining Has The Highest Sustainable Energy Mix
5. Global Bitcoin Mining Vs Other Industries
6. Q2-22, Mining Efficiency Increased 3% & Sustainable Electricity Increased 2%
7. YoY, Mining Efficiency Increased 46% and Sustainable Electricity Mix Increased 6%
8. Bitcoin Mining Is Technology Intensive, 58x+ In Efficiency In 8 Years
9. Conclusion: Bitcoin Mining Energy Efficiency Is Improving, Rapidly
10. Sources And Methodology

BITCOIN MINING ENERGY USE VS TOTAL GLOBAL ENERGY USE



165,317 TWhⁱ
TOTAL ENERGY UTILIZED WORLDWIDE

253 TWhⁱⁱ
**ENERGY CONSUMED BY BITCOIN MINING
ON THE WORLD'S ELECTRIC GRID**

**GLOBAL BITCOIN
MINING CONSUMES
0.15%**
OF THE WORLD'S ENERGY PRODUCTION

SOURCES: ⁱ BP STATISTICAL REVIEW OF WORLD ENERGY (2021), [HTTPS://WWW.BP.COM/EN/GLOBAL/CORPORATE/ENERGY-ECONOMICS/STATISTICAL-REVIEW-OF-WORLD-ENERGY/PRIMARY-ENERGY](https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/primary-energy).
ⁱⁱ BMC ESTIMATED BITCOIN MINING ENERGY USE (June 30, 2022).

BITCOIN MINING CARBON EMISSIONS VS TOTAL GLOBAL CARBON EMISSIONS



34.8 BMtⁱ

TOTAL ESTIMATED CO² GENERATED GLOBALLY

0.03 BMtⁱⁱ

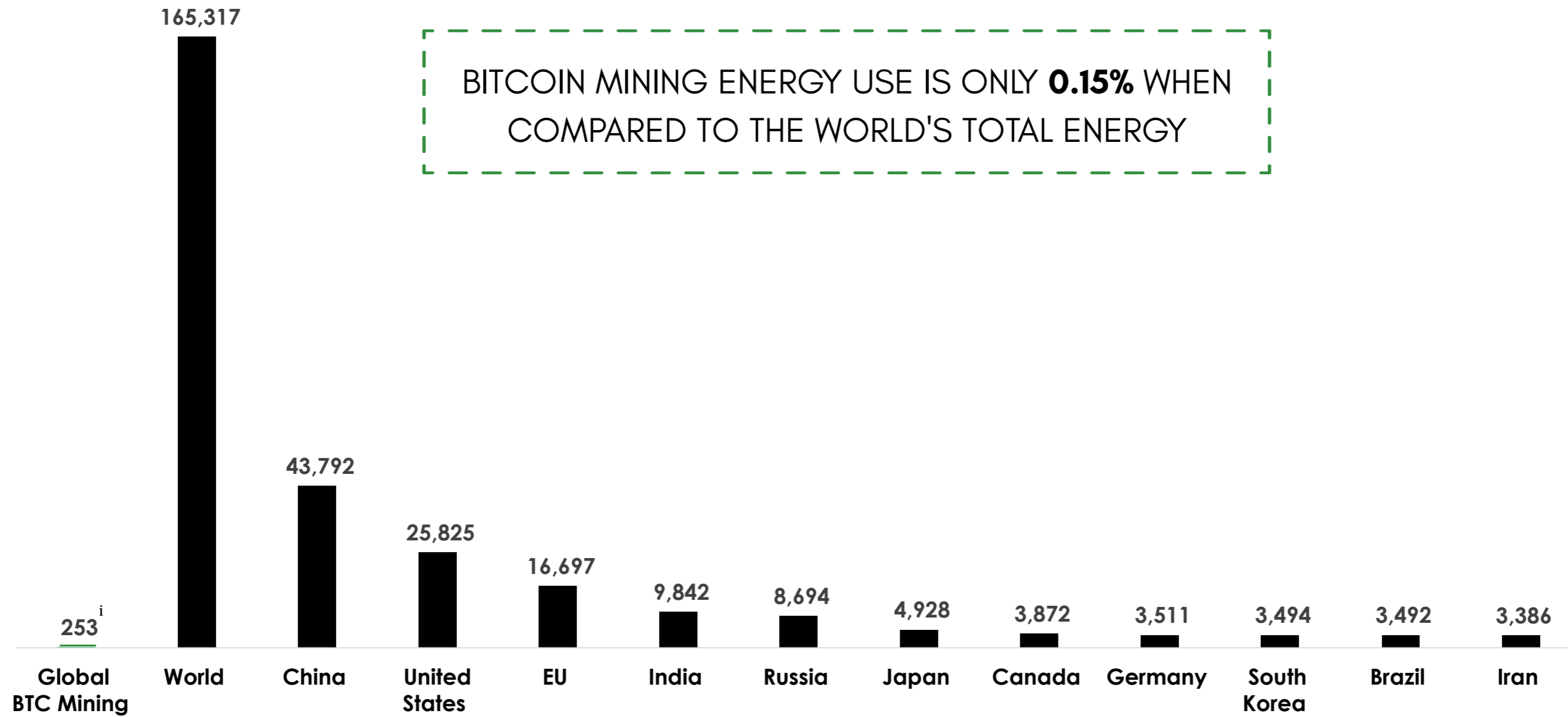
ESTIMATED CO² GENERATED BY BITCOIN MINING ON THE WORLD'S ELECTRIC GRID

GLOBAL BITCOIN MINING IS 0.086% OF THE WORLD'S CO² PRODUCTION

SOURCES: ⁱ CO² EMISSIONS ARE ESTIMATED BY EXTRAPOLATING U.S. CARBON EMISSIONS GENERATED BY ELECTRICAL GENERATION. [HTTPS://WWW.EIA.GOV/TOOLS/FAQS/FAQ.PHP?ID=74&T=11](https://www.eia.gov/tools/faqs/faq.php?id=74&t=11)
ⁱⁱ BITCOIN MINING ESTIMATE IS DERIVED FROM THE Q2 2022 BMC ESTIMATED TWH ELECTRICITY CONSUMED GLOBALLY.

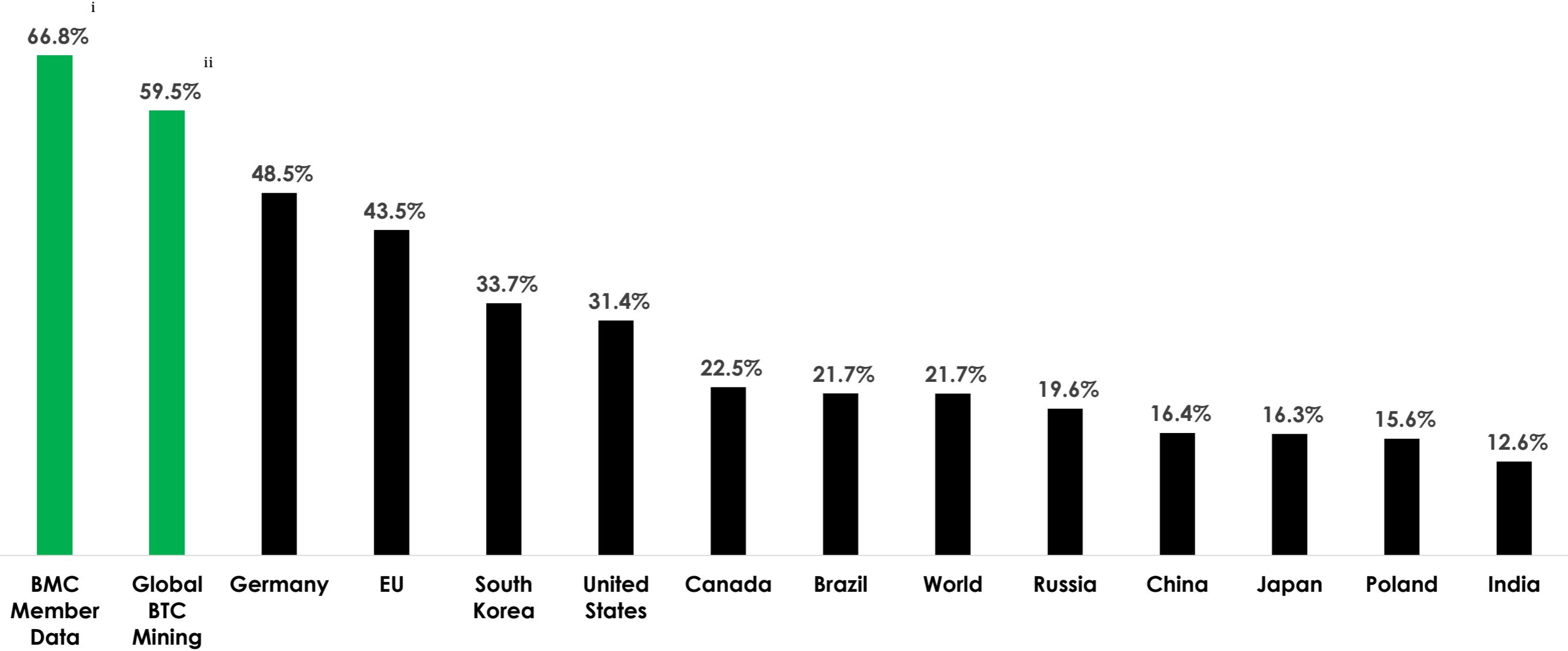
GLOBAL BITCOIN MINING ENERGY USE IS NEGLIGIBLE

BITCOIN MINING VS COUNTRIES (TWh)ⁱⁱ



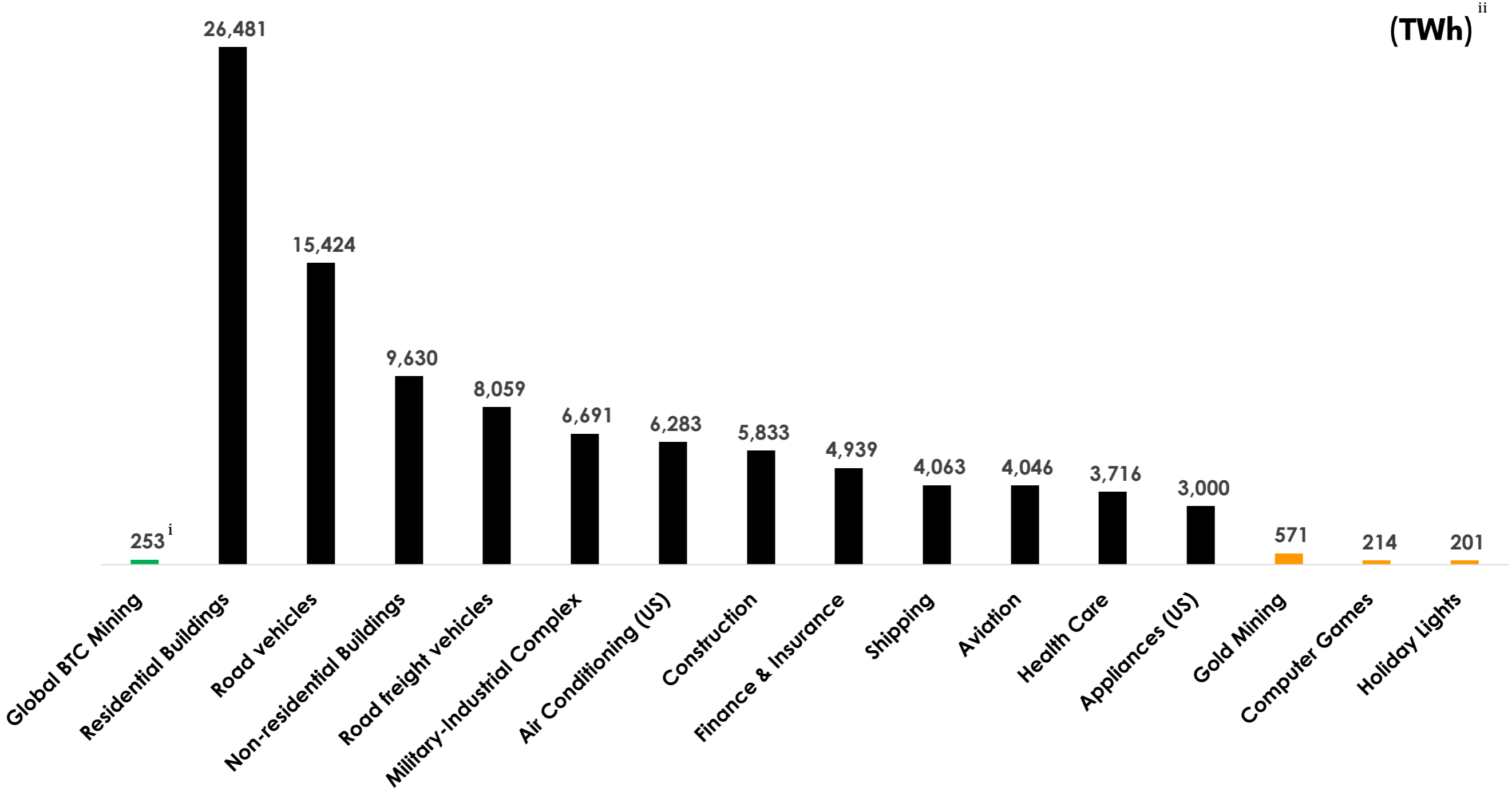
GLOBAL BITCOIN MINING HAS THE HIGHEST SUSTAINABLE ENERGY MIX

SUSTAINABLE POWER MIX: BITCOIN MINING VS COUNTRIES (% OF TWh)ⁱⁱⁱ



SOURCES: ⁱ VALUE REPRESENTS DATA COMPILED FROM BMC ADVISORY COUNCIL MINERS. ANNUALIZED PRIMARY ENERGY USE.
ⁱⁱ ESTIMATED GLOBAL BITCOIN NETWORK ANNUALIZED POWER BASED ON BMC ANALYSIS, ASSUMPTIONS AND EXTRAPOLATION. (June 30, 2022)
ⁱⁱⁱ COUNTRY DATA COMPILED FROM BP'S STATISTICAL REVIEW OF WORLD ENERGY (2021). [HTTPS://WWW.BP.COM/EN/GLOBAL/CORPORATE/ENERGY-ECONOMICS/STATISTICAL-REVIEW-OF-WORLD-ENERGY/PRIMARY-ENERGY](https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/primary-energy).

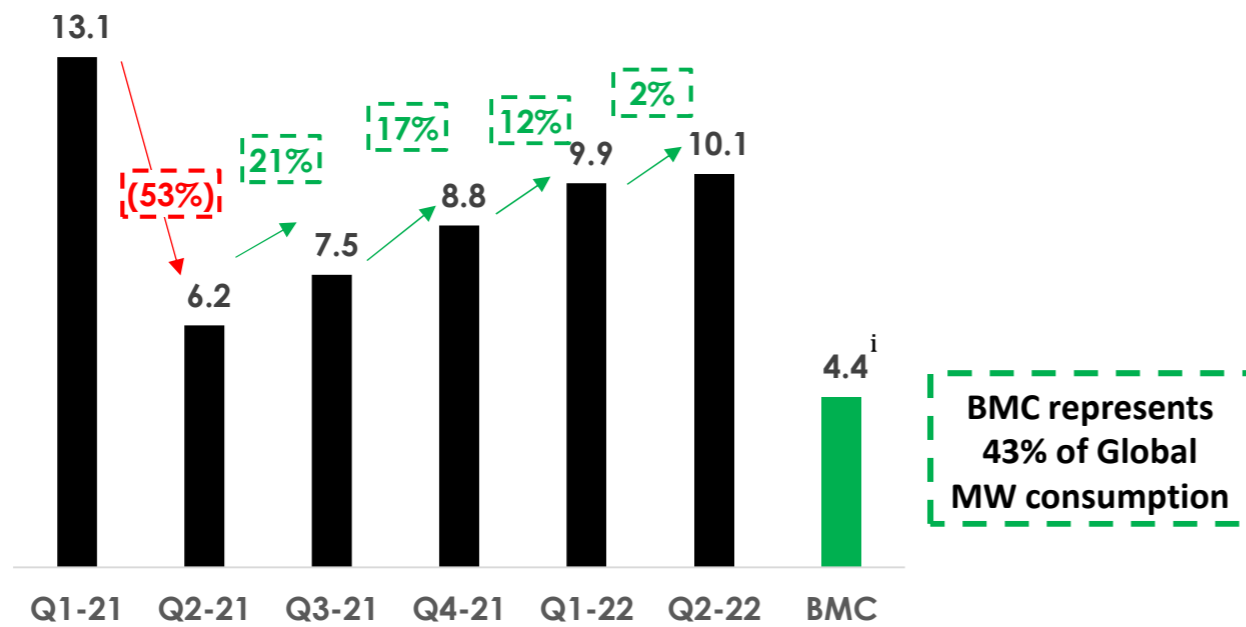
GLOBAL BITCOIN MINING VS OTHER INDUSTRIES



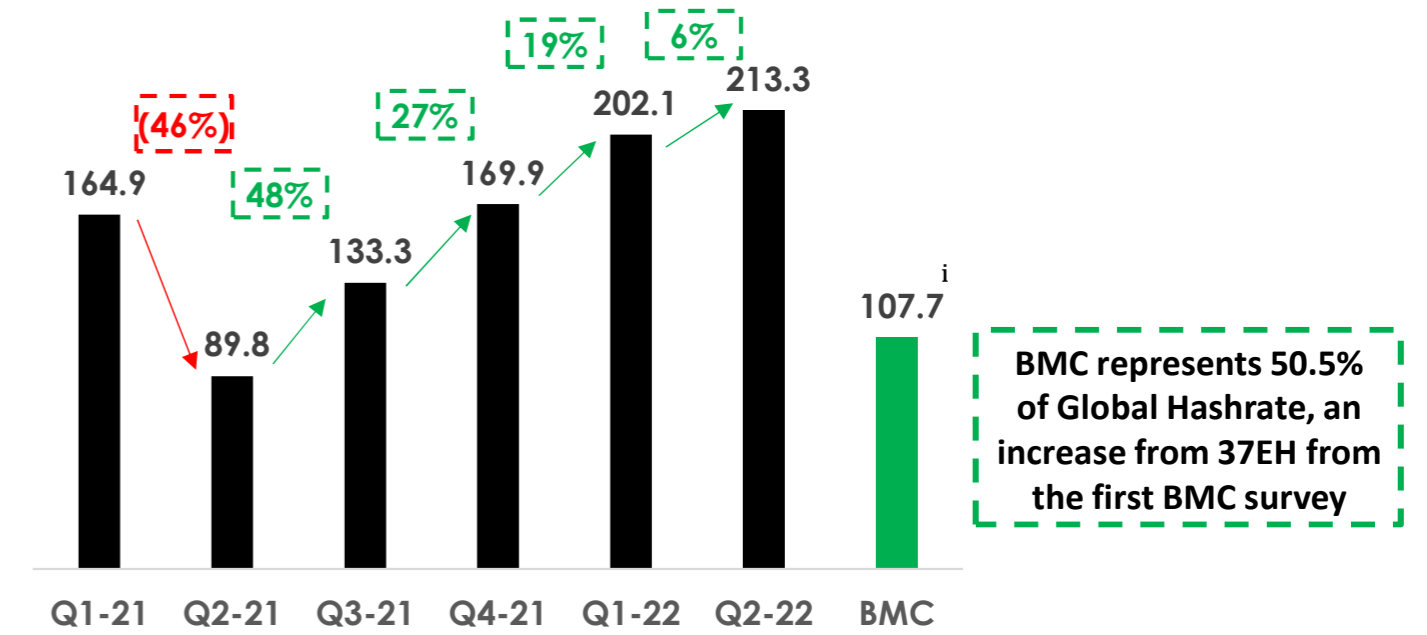
SOURCES: ⁱ BMC ESTIMATED BITCOIN MINING ENERGY USE (June 30, 2022). ANNUALIZED VALUES ARE USED FOR BITCOIN MINING ENERGY & ELECTRICITY USE.
ⁱⁱ ESTIMATED INDUSTRY ENERGY USE BASED ON SEVERAL SOURCES: <https://www.eia.gov/outlooks/ieo/pdf/transportation.pdf> / https://academic.oup.com/eurpub/article-abstract/30/supplement_5/ckaa165.843/5914601 / <https://smccook.medium.com/comparing-bitcoins-environmental-impact-f56b18014f64> / <https://bitcoinmagazine.com/business/introducing-cbei-a-new-way-to-measure-bitcoin-network-electrical-consumption>.

Q2-22, MINING EFFICIENCY INCREASED 3% AND THE SUSTAINABLE ELECTRICITY MIX INCREASED TO 59.5%

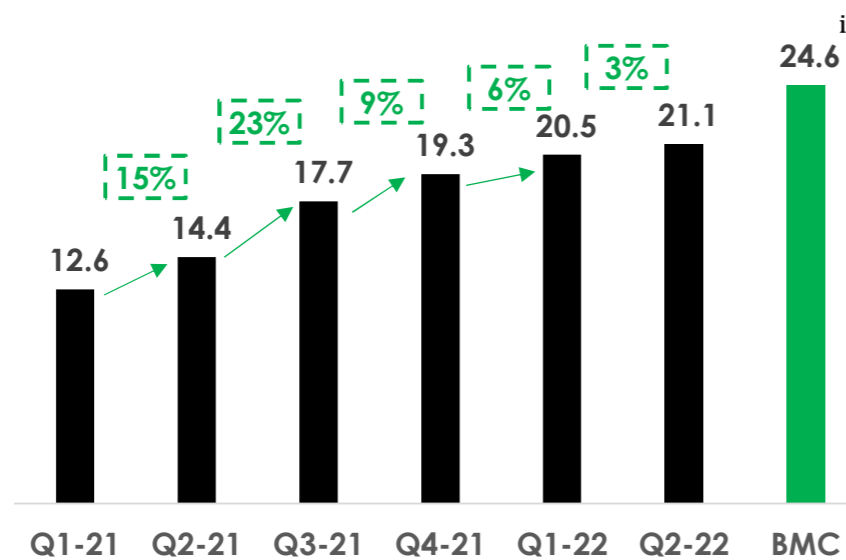
FLEET ELECTRICITY CONSUMPTION (GW)ⁱⁱ



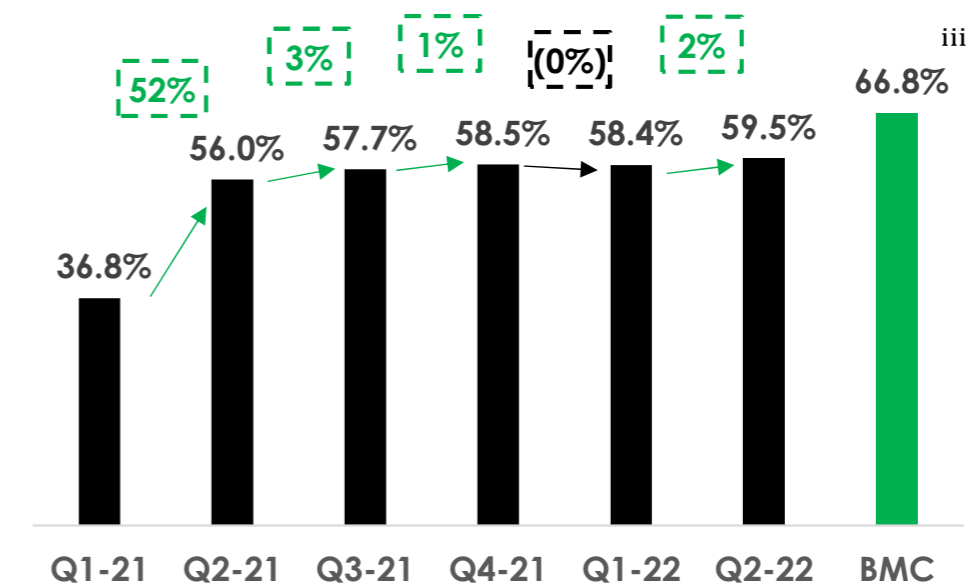
HASHRATE (EH)ⁱⁱ



MINING EFFICIENCY (EH/GW)ⁱⁱ

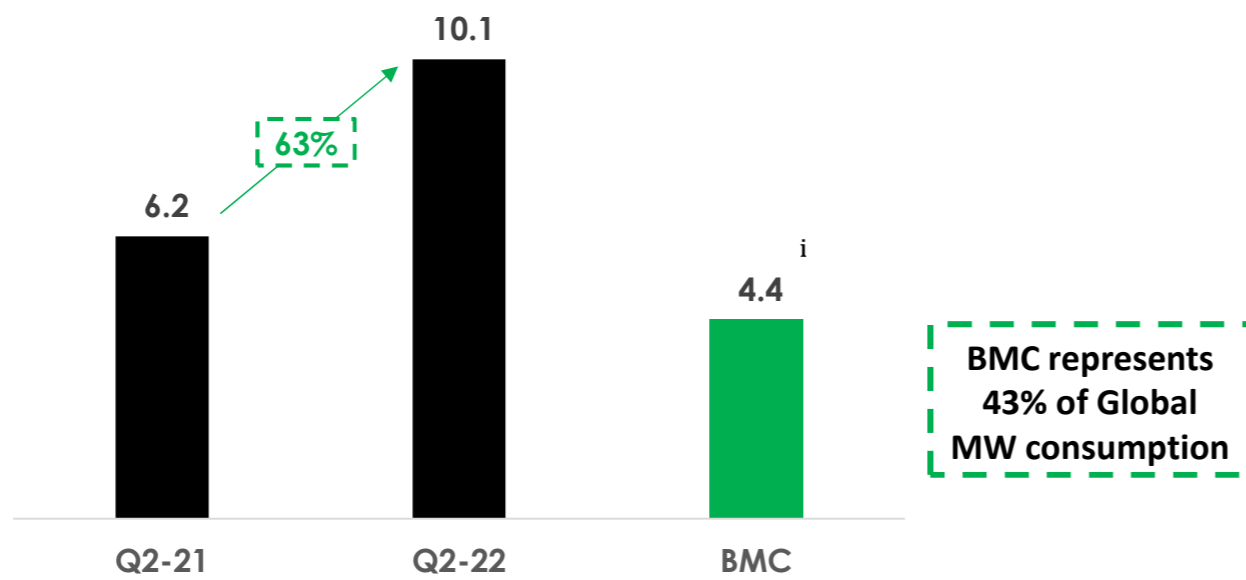


SUSTAINABLE ELECTRICITY (%)ⁱⁱ

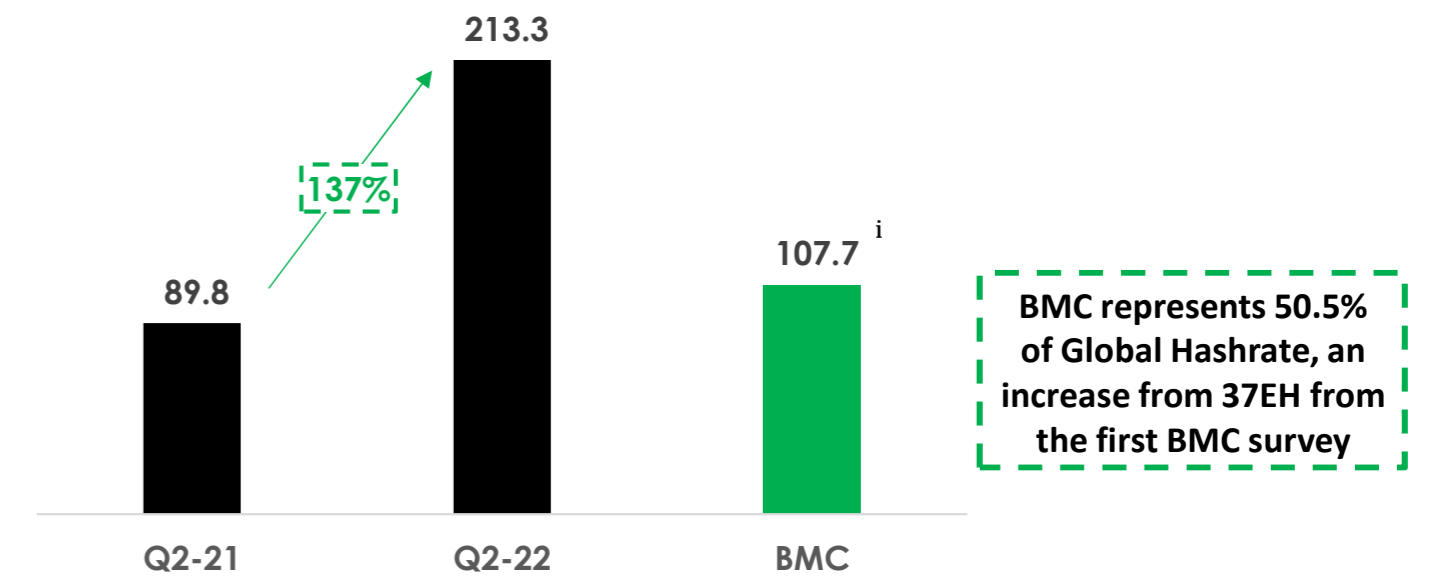


YoY, MINING EFFICIENCY INCREASED 63% AND SUSTAINABLE ELECTRICITY MIX INCREASED 6%

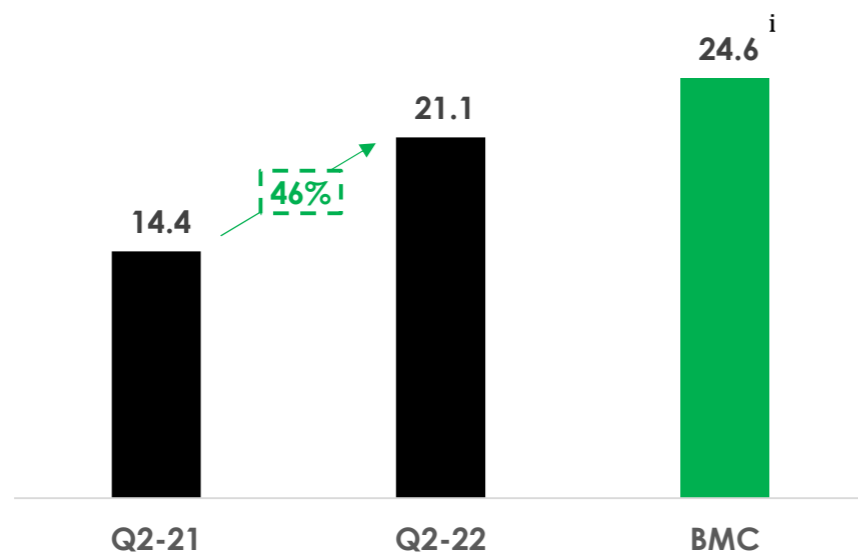
FLEET ELECTRICITY CONSUMPTION (GW)ⁱⁱ



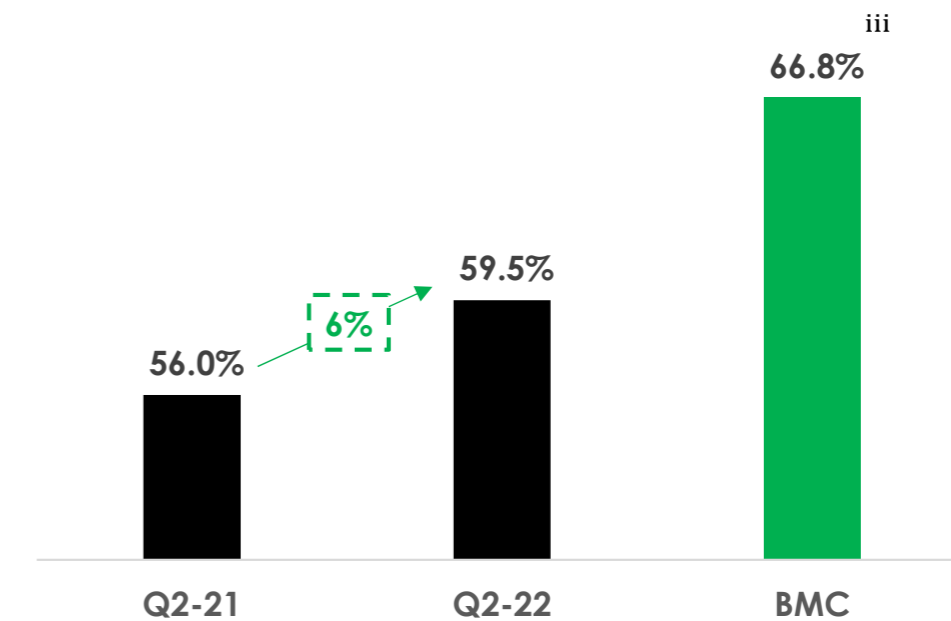
HASHRATE (EH)ⁱⁱ



MINING EFFICIENCY (EH/GW)ⁱⁱ

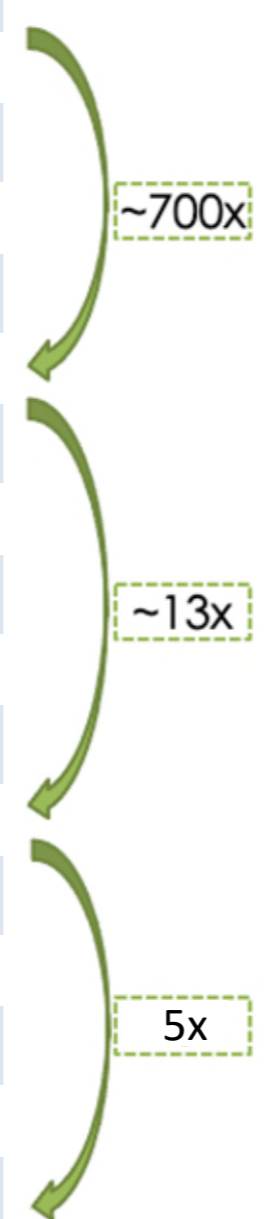


SUSTAINABLE ELECTRICITY (%)ⁱⁱ



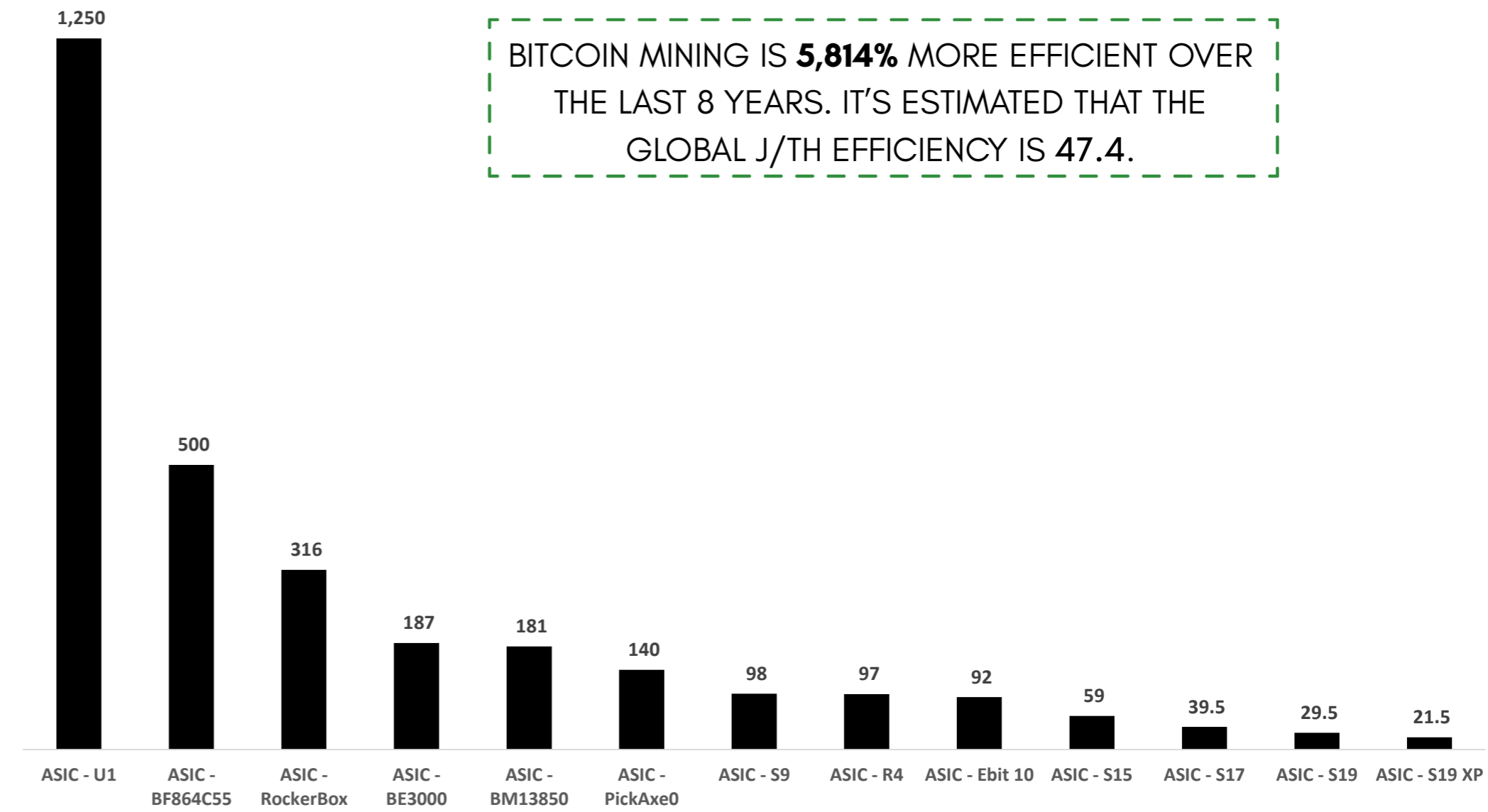
BITCOIN MINING IS TECHNOLOGY INTENSIVE, INCREASING 58X IN EFFICIENCY OVER 8 YEARS

Combined	Hardware name	Date	J/Th
CPU	ARM Cortex A9	3-Jan-09	877,193
GPU	ATI 5870M	23-Sep-09	264,550
FPGA	X6500 FPGA Miner	29-Aug-11	43,000
ASIC - Avalon B1	Canaan AvalonMiner Batch 1	1-Jan-13	9,351
ASIC - Jupiter	KnCMiner Jupiter	5-Oct-13	1,484
ASIC - U1	Antminer U1	1-Dec-13	1,250
ASIC - BF864C55	Bitfury BF864C55	3-Mar-14	500
ASIC - RockerBox	RockerBox	22-Jul-14	316
ASIC - BE3000	ASICMiner BE300	16-Sep-14	187
ASIC - BM13850	BM1385	19-Aug-15	181
ASIC - PickAxe0	PickAxe	23-Sep-15	140
ASIC - S9	Antminer S9 - 11.5TH	1-Jun-16	98
ASIC - R4	Antminer R4	1-Feb-17	97
ASIC - Ebit 10	Ebang Ebit 10	15-Feb-18	92
ASIC - S15	Antminer S15	9-Apr-18	59
ASIC - S17	Antminer S17	9-Apr-19	39.5
ASIC - S19	Antminer S19 Pro	23-Mar-20	29.5
ASIC - S19 XP	Antminer S19 Pro	12-Nov-21	21.5



J/TH - EFFICIENCY OVER TIME ⁱ

BITCOIN MINING IS **5,814%** MORE EFFICIENT OVER THE LAST 8 YEARS. IT'S ESTIMATED THAT THE GLOBAL J/TH EFFICIENCY IS **47.4**.



CONCLUSION: BITCOIN MINING ENERGY EFFICIENCY IS IMPROVING, RAPIDLY



The Bitcoin Mining Council is estimating a 3x and 2x improvement in mining efficiency over the next four and following four years, respectively

6x



Satoshi's protocol reduces energy consumption incentives by 2x every 4 years, for the foreseeable future

4x



Bitcoin mining is guaranteed to be **dramatically more energy efficient** in the next eight years.

SOURCES & METHODOLOGY

BMC SURVEY METHODOLOGY:

THE BMC SURVEYED BITCOIN MINERS AROUND THE WORLD ASKING THREE QUESTIONS;


- 1.) HOW MUCH ELECTRICITY DOES YOUR TOTAL FLEET CONSUME TODAY?;
- 2.) WHAT IS THE TOTAL % OF SUSTAINABLE ELECTRICITY* WITHIN YOUR FLEET'S POWER GENERATION MIX TODAY?;
- 3.) WHAT IS THE TOTAL AGGREGATE HASHRATE OF YOUR FLEET TODAY?

**THE ANNOTATED TERM "SUSTAINABLE ELECTRICITY" WAS DEFINED AS ELECTRICITY GENERATED BY: HYDRO, WIND, SOLAR, NUCLEAR, GEOTHERMAL. THE Q2 2022 BMC SUSTAINABILITY ELECTRICITY VALUE NO LONGER TAKES INTO ACCOUNT RENEWABLE ENERGY CREDITS (REC).*

SOURCES:

- ⁱ BP STATISTICAL REVIEW OF WORLD ENERGY (2021), [HTTPS://WWW.BP.COM/EN/GLOBAL/CORPORATE/ENERGY-ECONOMICS/STATISTICAL-REVIEW-OF-WORLD-ENERGY/PRIMARY-ENERGY](https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/primary-energy).ⁱⁱ BMC ESTIMATED BITCOIN MINING ENERGY USE (June 30, 2022).
- ⁱ CO2 EMISSIONS ARE ESTIMATED BY EXTRAPOLATING U.S. CARBON EMISSIONS GENERATED BY ELECTRICAL GENERATION. [HTTPS://WWW.EIA.GOV/TOOLS/FAQS/FAQ.PHP?ID=74&T=11](https://www.eia.gov/tools/faqs/faq.php?id=74&t=11) ⁱⁱ BITCOIN MINING ESTIMATE IS DERIVED FROM THE Q2 2022 BMC ESTIMATED TWH ELECTRICITY CONSUMED GLOBALLY.
- ⁱ BMC ESTIMATED BITCOIN MINING ENERGY USE (June 30, 2022). ANNUALIZED VALUES ARE USED FOR BITCOIN MINING ENERGY & ELECTRICITY USE.ⁱⁱ BP'S STATISTICAL REVIEW OF WORLD ENERGY (2021). [HTTPS://WWW.BP.COM/EN/GLOBAL/CORPORATE/ENERGY-ECONOMICS/STATISTICAL-REVIEW-OF-WORLD-ENERGY/PRIMARY-ENERGY](https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/primary-energy).
- ⁱ VALUE REPRESENTS DATA COMPILED FROM BMC ADVISORY COUNCIL MINERS. ANNUALIZED PRIMARY ENERGY USE.ⁱⁱ ESTIMATED GLOBAL BITCOIN NETWORK ANNUALIZED POWER BASED ON BMC ANALYSIS, ASSUMPTIONS AND EXTRAPOLATION. (Mar 31, 2022)ⁱⁱⁱ COUNTRY DATA COMPILED FROM BP'S STATISTICAL REVIEW OF WORLD ENERGY (2021).. [HTTPS://WWWBP.COM/EN/GLOBAL/CORPORATE/ENERGY-ECONOMICS/STATISTICAL-REVIEW-OF-WORLD-ENERGY/PRIMARY-ENERGY](https://wwwbp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/primary-energy).
- ⁱ BMC ESTIMATED BITCOIN MINING ENERGY USE (Mar 31, 2022). ANNUALIZED VALUES ARE USED FOR BITCOIN MINING ENERGY & ELECTRICITY USE.ⁱⁱ ESTIMATED INDUSTRY ENERGY USE BASED ON SEVERAL SOURCES: [HTTPS://WWW.EIA.GOV/OUTLOOKS/IEO/PDF/TRANSPORTATION.PDF](https://www.eia.gov/outlooks/ieo/pdf/transportation.pdf) / [HTTPS://ACADEMIC.OUP.COM/EURPUB/ARTICLE-ABSTRACT/30/SUPPLEMENT_5/CKAA165.843/5914601](https://academic.oup.com/eurpub/article-abstract/30/supplement_5/ckaa165.843/5914601) / [HTTPS://HASSMCCOOK.MEDIUM.COM/COMPARING-BITCOINS-ENVIRONMENTAL-IMPACT-F56B18014F64](https://hassmccook.medium.com/comparing-bitcoins-environmental-impact-f56b18014f64)[HTTPS://BITCOINMAGAZINE.COM/BUSINESS/INTRODUCING-CBEI-A-NEW-WAY-TO-MEASURE-BITCOIN-NETWORK-ELECTRICAL-CONSUMPTION](https://bitcoinmagazine.com/business/introducing-cbei-a-new-way-to-measure-bitcoin-network-electrical-consumption).
- ⁱ DATA COMPILED FROM BMC ADVISORY COUNCIL MEMBERS. ANNUALIZED VALUES ARE USED FOR BITCOIN MINING ENERGY AND ELECTRICITY USE.ⁱⁱ ESTIMATED GLOBAL BITCOIN NETWORK ANNUALIZED POWER BASED ON BMC ANALYSIS, ASSUMPTIONS AND EXTRAPOLATION.ⁱⁱⁱ As of Q4-21, BMC SUSTAINABILITY ELECTRICITY VALUE NO LONGER TAKES INTO ACCOUNT RENEWABLE ENERGY CREDITS (REC).
- ⁱ HARDWARE DATA COMPILED FROM RESPECTIVE HARDWARE MANUFACTURER WEBSITES. OLDER GENERATION MODEL EFFICIENCY DATA FROM "THE COST OF BITCOIN MINING HAS NEVER REALLY INCREASED" (2020) [HTTPS://ARXIV.ORG/PDF/2004.04605.PDF](https://arxiv.org/pdf/2004.04605.pdf).

AGENDA

- 1 Introduction: Michael Saylor
- 2 Data Aggregation / Explanation: Taras Kulyk
- 3 Full BMC Q2 2022 Update: Michael Saylor
- 4 Power Situation In Texas: Peter Wall & Jason Les 
- 5 The Effects of Bitcoin Price And Network Efficiency: Fred Thiel
- 6 Variance Of Energy Economics In Bitcoin Mining: Ayden Kilic
- 7 Analyzing And Debunking The FUD: Ben Gagnon
- 8 Q & A

What is **Curtailment?**



Curtailment: Generation

In electric grid power generators, curtailment is the deliberate reduction in output below what could have been produced in order to balance energy supply and demand or due to transmission or demand constraints.

Curtailment: Load

Load curtailment is the removal or reduction of electrical loads for a limited period of time from a utility grid system in response to a request from the utility or electrical grid system operator.

Last week in Texas

July 11th & 13th



[Home](#) > [News and Publications](#) > News Release

News Release

Jul 10, 2022

ERCOT Issues Conservation Appeal to Texans and Texas Businesses

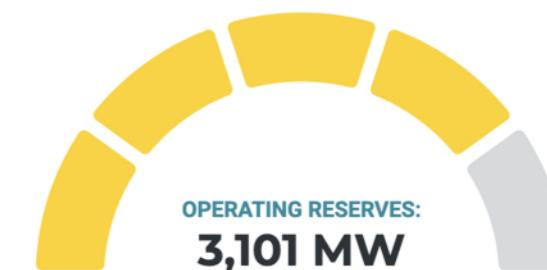
Appeal Effective Monday, July 11, 2022

AUSTIN, TX, July 10, 2022 – With extreme hot weather driving record power demand across Texas, the Electric Reliability Council of Texas (ERCOT) is issuing a Conservation Appeal to residential customers and businesses to voluntarily conserve electricity, Monday, July 11 between 2-8 p.m. ERCOT also issued a Watch for a projected reserve capacity shortage from 2-8 p.m. on Monday, July 11, 2022.

Conservation is a reliability tool ERCOT has deployed more than four dozen times since 2008 to successfully manage grid operations. This notification is limited to the hours of 2-8 p.m. and may last for 30 minutes or more.

ERCOT encourages all electric customers to visit the Public Utility Commission's (PUC) [Power to Save](#) or their electric provider's websites to get important information. Conservation measures during peak times include turning up your thermostat a degree or two, if comfortable, and postponing running major appliances or pool pumps.

ERCOT continues to use all tools available to manage the grid effectively and reliably, including using reserve power and calling upon large electric customers to conserve. Conservation is limited to the hours of 2-8 p.m.



CONSERVATION ALERT
Please reduce power use.

“Bitcoin miners collectively shut down over 1,000 MW”

- Texas Blockchain Council

Bitcoin Miners RESPONDED



16 FIRMS CURTAILED
OPERATIONS

~1,006 MWS WORTH OF
POWER

Miners shut
down in Texas
voluntarily
(like last week)
and also for
**economic
incentives.**



**Why do miners
Curtail?**

Voluntarily

- The right thing to do to support the grid

Economic Incentives

- Self-curtailment, when prices are high and miners aren't hedged / locked-in PPA
- Ancillary services - demand response

These 3 primary tools make Bitcoin miners a **dynamic** and **responsive** participant to the energy market

**Demand
Response in
ERCOT**



4CP – Four Coincident Peak

- Loads that respond to alerts to curtail demand during peak periods, save on transmission charges in subsequent year

Load Response (LR/CLR)

- Committing volume of load to participate in ERCOT's Ancillary Services

Economic Curtailment

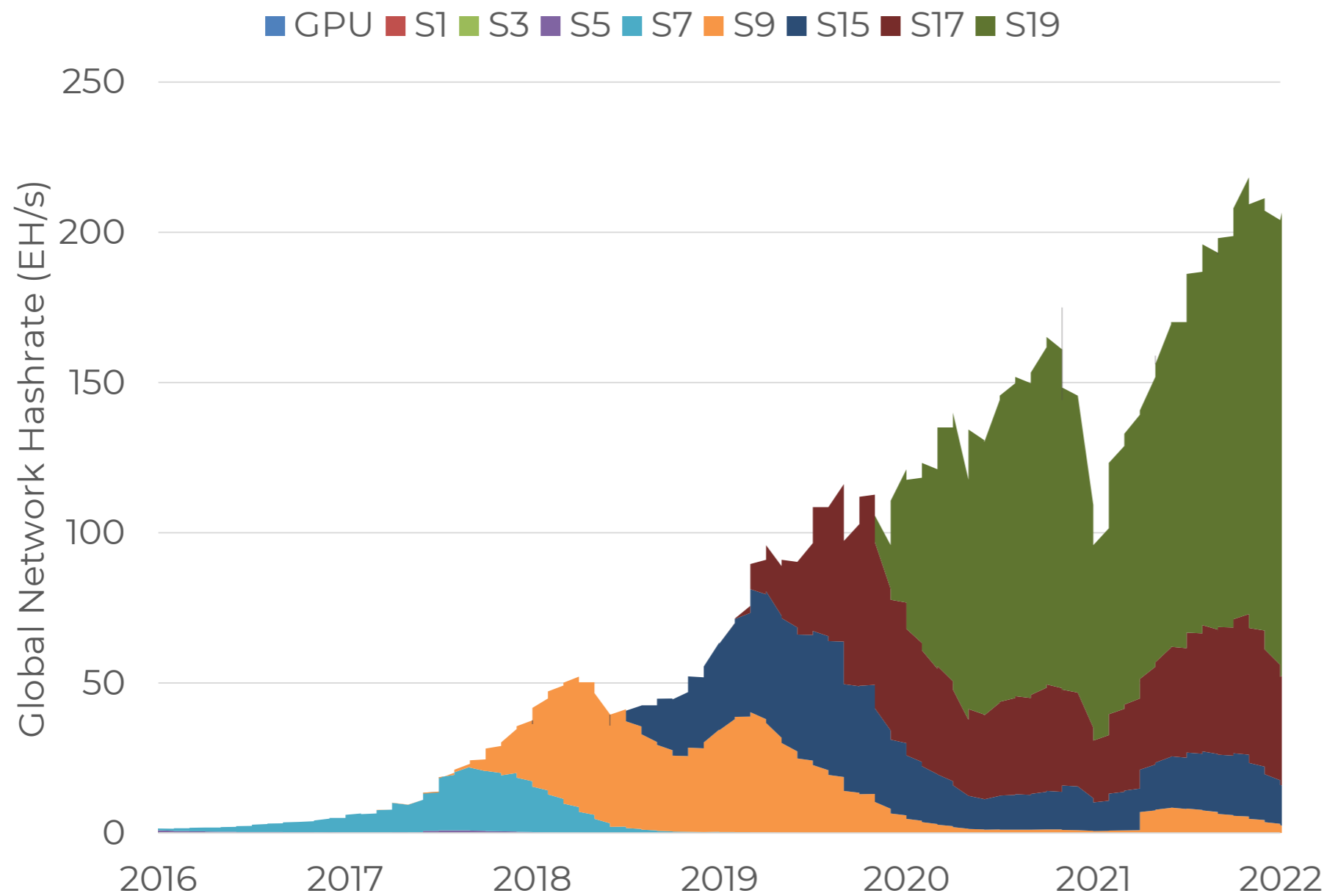
- Selling secured blocks of power in response to surges in spot prices

AGENDA

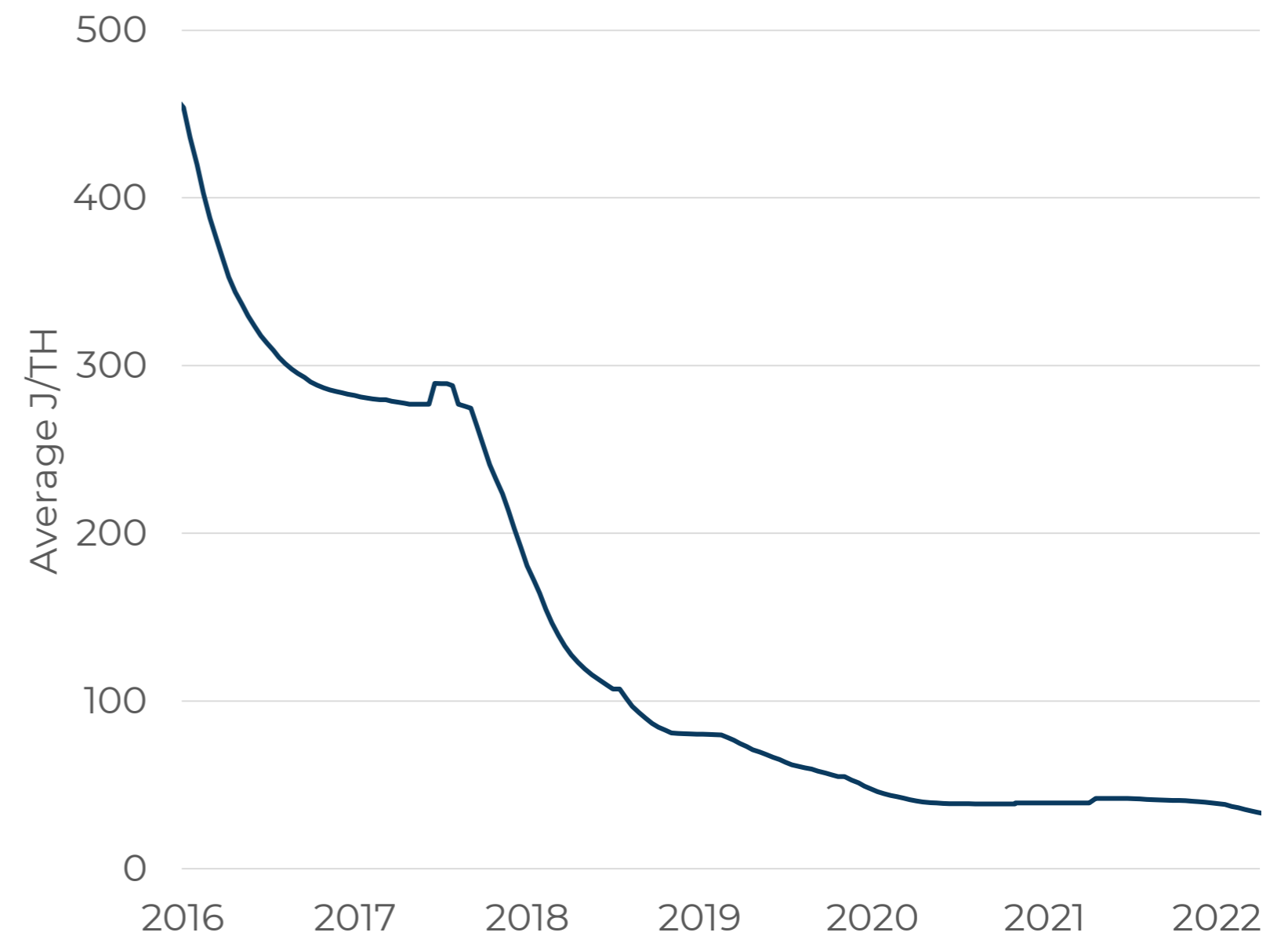
- 1** Introduction: Michael Saylor
- 2** Data Aggregation / Explanation: Taras Kulyk
- 3** Full BMC Q2 2022 Update: Michael Saylor
- 4** Power Situation In Texas: Peter Wall & Jason Les
- 5** The Effects of Bitcoin Price And Network Efficiency: Fred Thiel 
- 6** Variance Of Energy Economics In Bitcoin Mining: Ayden Kilic
- 7** Analyzing And Debunking The FUD: Ben Gagnon
- 8** Q & A

Innovation has improved efficiency over time

Estimated Distribution of Global Hashrate by ASIC Class



Estimated Average Network Efficiency



Source: Blockware Solutions, MARA Analysis

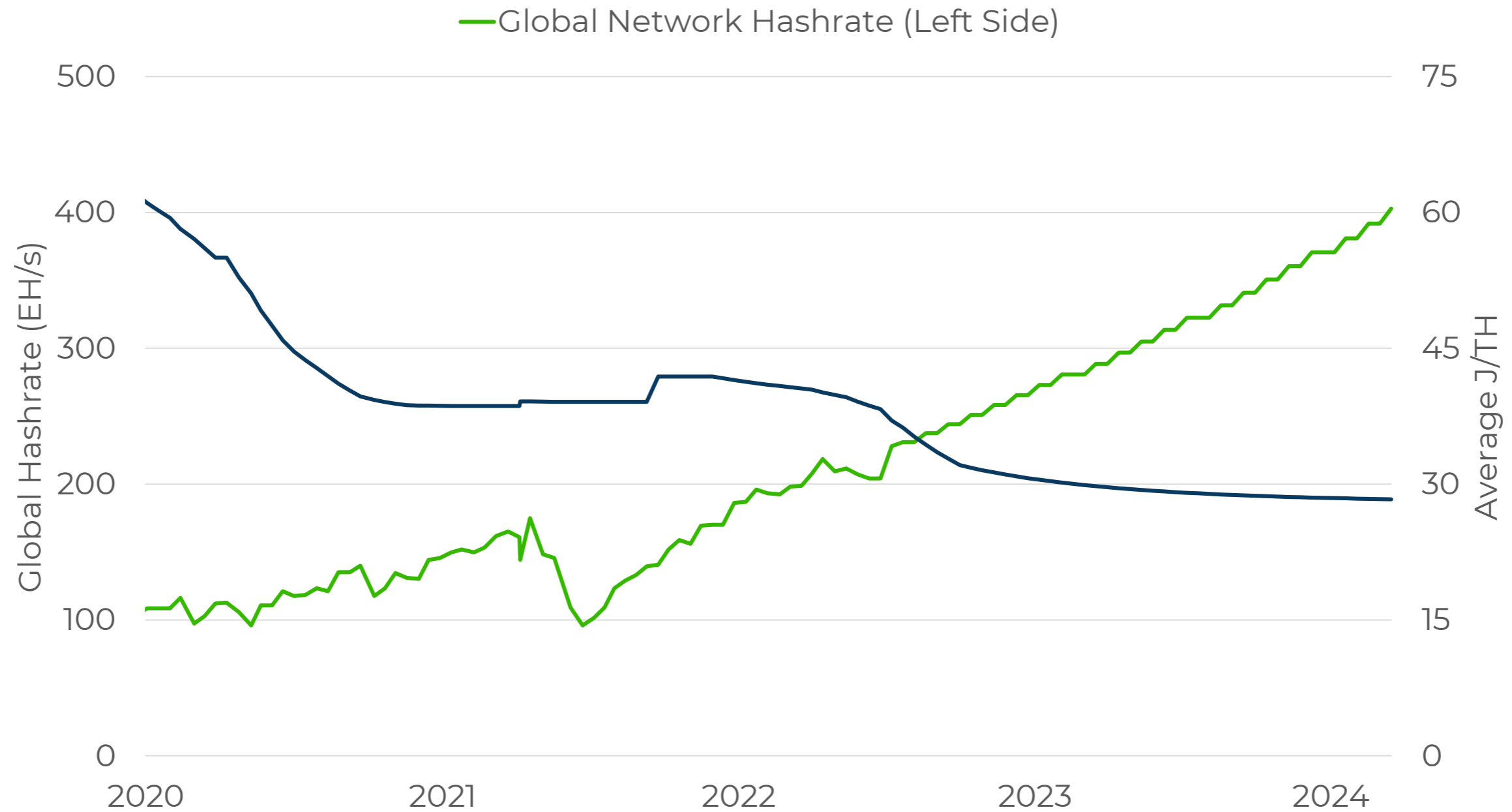
| NASDAQ:

| MAR

**Bitcoin
Mining
Council**

Efficiency continues to improve over time

Network Hashrate & Efficiency Projections



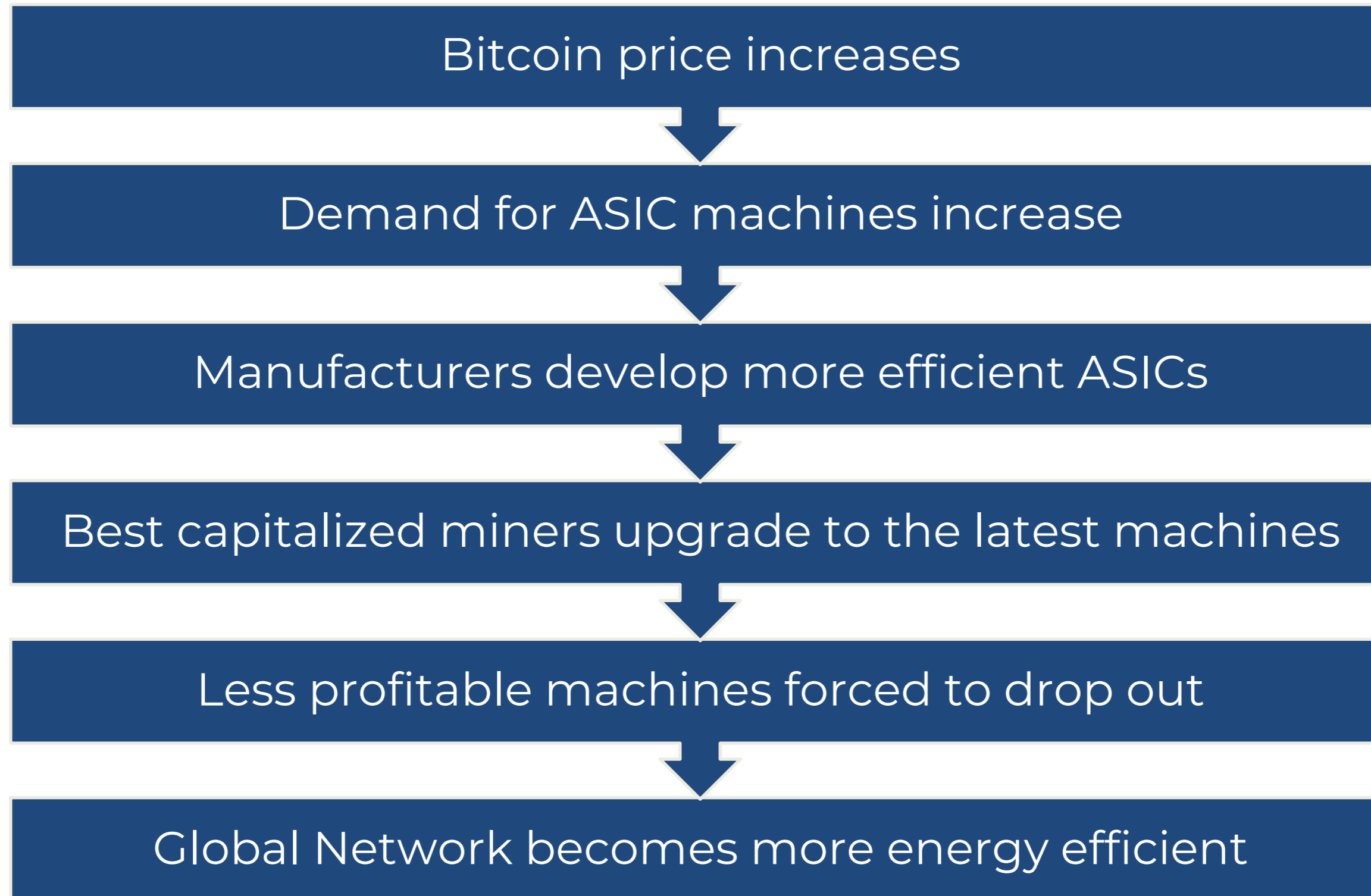
Source: Blockware Solutions, MARA Analysis

| NASDAQ:

| MAR

Bitcoin
Mining
Council

Bitcoin Price drives Network Energy Efficiency



AGENDA

- 1** Introduction: Michael Saylor
- 2** Data Aggregation / Explanation: Taras Kulyk
- 3** Full BMC Q2 2022 Update: Michael Saylor
- 4** Power Situation In Texas: Peter Wall & Jason Les
- 5** The Effects of Bitcoin Price And Network Efficiency: Fred Thiel
- 6** Variance Of Energy Economics In Bitcoin Mining: Ayden Kilic ←
- 7** Analyzing And Debunking The FUD: Ben Gagnon
- 8** Q & A

AXIOMS OF BITCOIN MINING

- ASIC MINERS ARE RATED IN **JOULES PER TERAHASH**
 - THE AMOUNT OF ENERGY (JOULES) REQUIRED TO GENERATED ONE TRILLION (TERA OR 10^{12}) HASHES OF THE SHA-256 CRYPTOGRAPHIC HASH FUNCTION
- NETWORK BLOCK REWARD IS RELATED TO HASHES BY: THE **NUMBER OF HASHES PER BLOCK = DIFFICULTY X 2^{32}**
- THE MORE HASHES A MINER CONTRIBUTES, THE LARGER PORTION OF THE BLOCK REWARD THEY RECEIVE
- AS DIFFICULTY INCREASES, MORE HASHES PER BLOCK ARE REQUIRED TO SOLVE A BLOCK
 - IF DIFFICULTY DECREASES, LESS HASHES PER BLOCK ARE REQUIRED TO SOLVE A BLOCK
- AS MORE MINERS ENTER THE ECOSYSTEM, THE TOTAL NUMBER OF HASHES ON THE NETWORK WILL INCREASE, THIS MEANS BLOCKS WILL GET SOLVED FASTER

AXIOMS OF BITCOIN MINING cont'd

- DUE TO THE SELF-HEALING NATURE OF THE BITCOIN MINING NETWORK, THE TIME TO SOLVE A BLOCK IS KEPT CONSTANT AT 10 MINUTES. THIS IS DONE BY INCREASING/DECREASING THE NETWORK DIFFICULTY
- THIS IN TURNS DIRECTLY IMPACTS BITCOIN MINING ECONOMICS; THE **BITCOIN MINER REVENUE DECREASES**, AS A FUNCTION OF THE ENERGY THEY CONSUME, **AS DIFFICULTY INCREASES**
- SIMILARLY, AS BITCOIN MINING IS A TECHNOLOGY DRIVEN INDUSTRY, AS NEWER BETTER ASIC MINERS COME OUT, LESS JOULES ARE REQUIRED PER TERAHASH; THE **BITCOIN MINER REVENUE INCREASES**, AS A FUNCTION OF THE ENERGY THEY CONSUME, **WITH MORE EFFICIENT ASIC HARDWARE**
- THE BEAUTY OF BITCOIN MINING IS IT PURELY QUANTITATIVE AND WE CAN MATHEMATICALLY MAP OUT THESE HORIZONS

\$/KWHR BITCOIN MINING REVENUE: EFFICIENCY vs DIFFICULTY



—	INPUTS	BTC (\$)	Operating Cost										
		\$20,000	\$ -										
DAILY PROFIT \$/KWHR	Variance of Difficulty												
		2.20E+13	2.30E+13	2.40E+13	2.50E+13	2.60E+13	2.70E+13	2.80E+13	2.90E+13	3.00E+13	3.10E+13	3.20E+13	3.30E+13
Variance of Efficiency [W per TH]	20	\$ 0.238	\$ 0.228	\$ 0.218	\$ 0.210	\$ 0.201	\$ 0.194	\$ 0.187	\$ 0.181	\$ 0.175	\$ 0.169	\$ 0.164	\$ 0.159
	25	\$ 0.190	\$ 0.182	\$ 0.175	\$ 0.168	\$ 0.161	\$ 0.155	\$ 0.150	\$ 0.145	\$ 0.140	\$ 0.135	\$ 0.131	\$ 0.127
	30	\$ 0.159	\$ 0.152	\$ 0.146	\$ 0.140	\$ 0.134	\$ 0.129	\$ 0.125	\$ 0.120	\$ 0.116	\$ 0.113	\$ 0.109	\$ 0.106
	35	\$ 0.136	\$ 0.130	\$ 0.125	\$ 0.120	\$ 0.115	\$ 0.111	\$ 0.107	\$ 0.103	\$ 0.100	\$ 0.097	\$ 0.094	\$ 0.091
	40	\$ 0.119	\$ 0.114	\$ 0.109	\$ 0.105	\$ 0.101	\$ 0.097	\$ 0.094	\$ 0.090	\$ 0.087	\$ 0.084	\$ 0.082	\$ 0.079
	45	\$ 0.106	\$ 0.101	\$ 0.097	\$ 0.093	\$ 0.090	\$ 0.086	\$ 0.083	\$ 0.080	\$ 0.078	\$ 0.075	\$ 0.073	\$ 0.071
	50	\$ 0.095	\$ 0.091	\$ 0.087	\$ 0.084	\$ 0.081	\$ 0.078	\$ 0.075	\$ 0.072	\$ 0.070	\$ 0.068	\$ 0.065	\$ 0.063
	55	\$ 0.087	\$ 0.083	\$ 0.079	\$ 0.076	\$ 0.073	\$ 0.071	\$ 0.068	\$ 0.066	\$ 0.063	\$ 0.061	\$ 0.060	\$ 0.058
	60	\$ 0.079	\$ 0.076	\$ 0.073	\$ 0.070	\$ 0.067	\$ 0.065	\$ 0.062	\$ 0.060	\$ 0.058	\$ 0.056	\$ 0.055	\$ 0.053
	65	\$ 0.073	\$ 0.070	\$ 0.067	\$ 0.064	\$ 0.062	\$ 0.060	\$ 0.058	\$ 0.056	\$ 0.054	\$ 0.052	\$ 0.050	\$ 0.049
	70	\$ 0.068	\$ 0.065	\$ 0.062	\$ 0.060	\$ 0.058	\$ 0.055	\$ 0.053	\$ 0.052	\$ 0.050	\$ 0.048	\$ 0.047	\$ 0.045
	75	\$ 0.063	\$ 0.061	\$ 0.058	\$ 0.056	\$ 0.054	\$ 0.052	\$ 0.050	\$ 0.048	\$ 0.047	\$ 0.045	\$ 0.044	\$ 0.042
	80	\$ 0.060	\$ 0.057	\$ 0.055	\$ 0.052	\$ 0.050	\$ 0.049	\$ 0.047	\$ 0.045	\$ 0.044	\$ 0.042	\$ 0.041	\$ 0.040
	85	\$ 0.056	\$ 0.054	\$ 0.051	\$ 0.049	\$ 0.047	\$ 0.046	\$ 0.044	\$ 0.043	\$ 0.041	\$ 0.040	\$ 0.039	\$ 0.037
	90	\$ 0.053	\$ 0.051	\$ 0.049	\$ 0.047	\$ 0.045	\$ 0.043	\$ 0.042	\$ 0.040	\$ 0.039	\$ 0.038	\$ 0.036	\$ 0.035
	95	\$ 0.050	\$ 0.048	\$ 0.046	\$ 0.044	\$ 0.042	\$ 0.041	\$ 0.039	\$ 0.038	\$ 0.037	\$ 0.036	\$ 0.034	\$ 0.033
100	\$ 0.048	\$ 0.046	\$ 0.044	\$ 0.042	\$ 0.040	\$ 0.039	\$ 0.037	\$ 0.036	\$ 0.035	\$ 0.034	\$ 0.033	\$ 0.032	

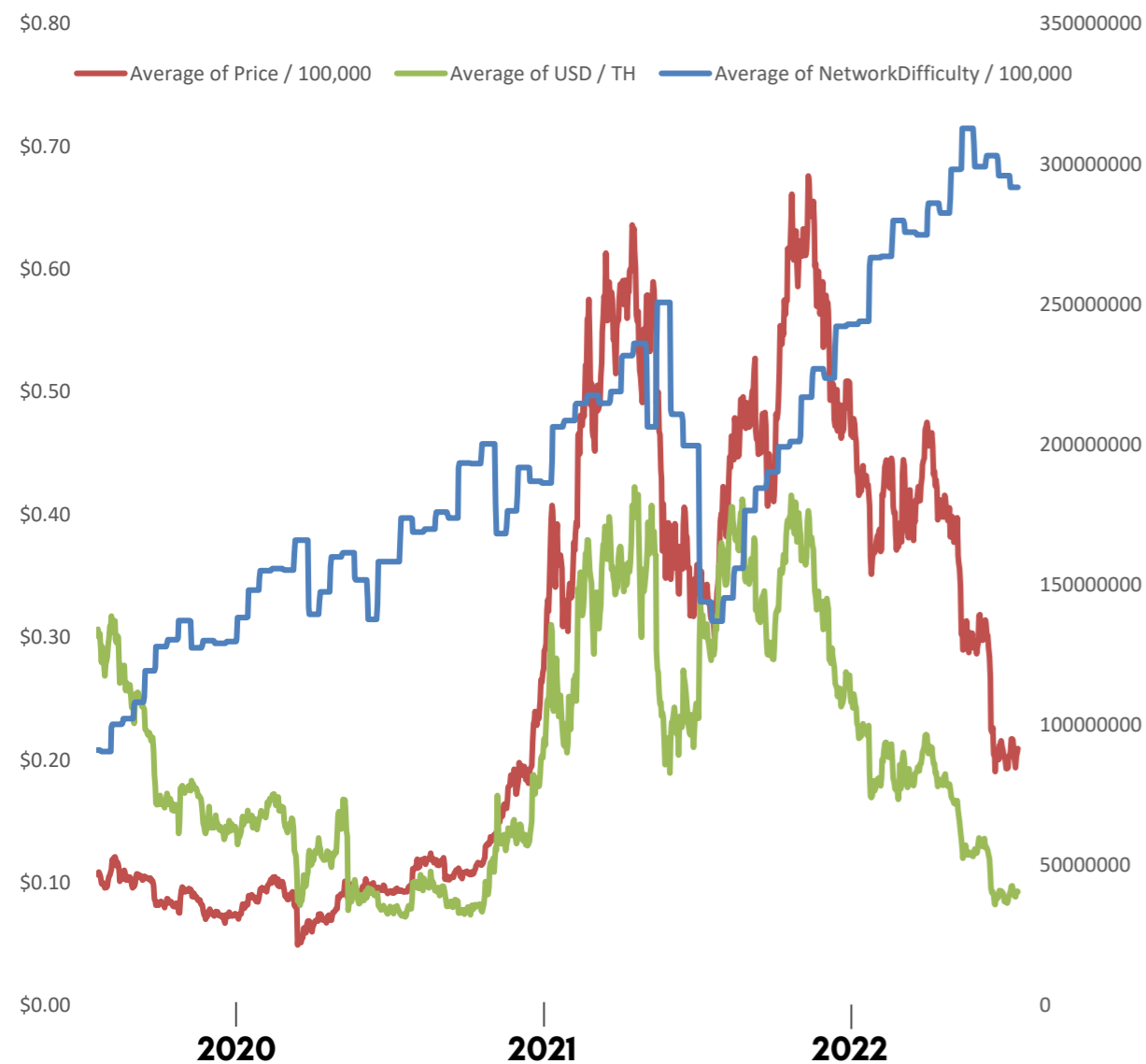
CURRENT LANDSCAPE OF BITCOIN MINING

- WITH BITCOIN AT \$20,000 USD, and DIFFICULTY AT 29.1 TRILLION, THE BITCOIN MINING REVENUES ARE
- APPROXIMATELY 12 CENTS PER KWHR FOR NEWEST GENERATION HARDWARE 30 J/TH **BITMAIN S19 PRO**
- APPROXIMATELY 9 CENTS PER KWHR FOR NEWER GENERATION HARDWARE 40 J/TH **MICROBT M30S**
- APPROXIMATELY 7 CENTS PER KWHR FOR OLDER GENERATION HARDWARE 50 J/TH **CANAAN**
- APPROXIMATELY 4 CENTS PER KWHR FOR OLD GENERATION HARDWARE 90 J/TH **BITMAIN S9**
- **THE MINING NETWORK HAS MATHEMATICALLY DEFINED LIMITS OF REVENUE, WHICH WILL CAUSE OPERATORS USING LESS EFFICIENT ASICS TO WIND DOWN THEIR MACHINES (THUS NOT CONSUME ENERGY)**
- **THIS DRIVES INNOVATION SO MORE ENERGY EFFICIENT MACHINES ARE DEVELOPED AND OPERATED**
- **AS DIFFICULTY INCREASES, REVENUE PER KWHR WILL DECREASE, THUS THE BITCOIN MINING NETWORK WILL TREND TOWARDS CONSUMING LESS ENERGY, AS OPERATORS WILL HIGH POWER COSTS WILL WIND DOWN**

AGENDA

- 1** Introduction: Michael Saylor
- 2** Data Aggregation / Explanation: Taras Kulyk
- 3** Full BMC Q2 2022 Update: Michael Saylor
- 4** Power Situation In Texas: Peter Wall & Jason Les
- 5** The Effects of Bitcoin Price And Network Efficiency: Fred Thiel
- 6** Variance Of Energy Economics In Bitcoin Mining: Ayden Kilic
- 7** Analyzing And Debunking The FUD: Ben Gagnon 
- 8** Q & A

RECENT HEADLINES



The Guardian

Electricity used to mine bitcoin plummets as crypto crisis widens

Consumption down by third since 11 June, with even sharper falls among other cryptocurrency networks

THE VERGE

Bitcoin's energy use drops following price plunge

It's taken a prolonged price plummet to get to this point

BUSINESS INSIDER

Crypto bear market has brought Bitcoin's energy consumption to a one-year low



INDEPENDENT

Bitcoin energy use suddenly drops after price collapse

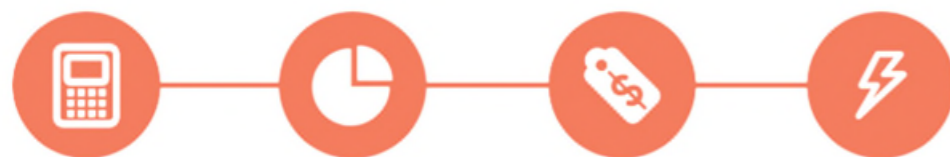
Figures suggest cryptocurrency's electricity demands dropped by a third in the space of a week in June

THE SOURCE MATERIAL

How does it work?

Bitcoin Energy Consumption Index

Steps to determine Bitcoin's energy consumption



- #1** Calculate total (USD) mining revenues
- #2** Estimate what part is spent on electricity
- #3** Find out how much miners pay per kWh
- #4** Convert costs to consumption

Variables

XX%

The Index assumes that miners will spend 60% of their revenues on operational costs on average in equilibrium (see below).

\$5 cents

For every 5 cents that were spent on operational costs it is assumed that 1 kilowatt-hour (kWh) was consumed.



Production takes time

Price movements can be small or large, but new energy-hungry machines won't all appear overnight. Realistic behaviour is introduced by linking price dynamics to the expected time required for producers to fully respond to a changing situation.

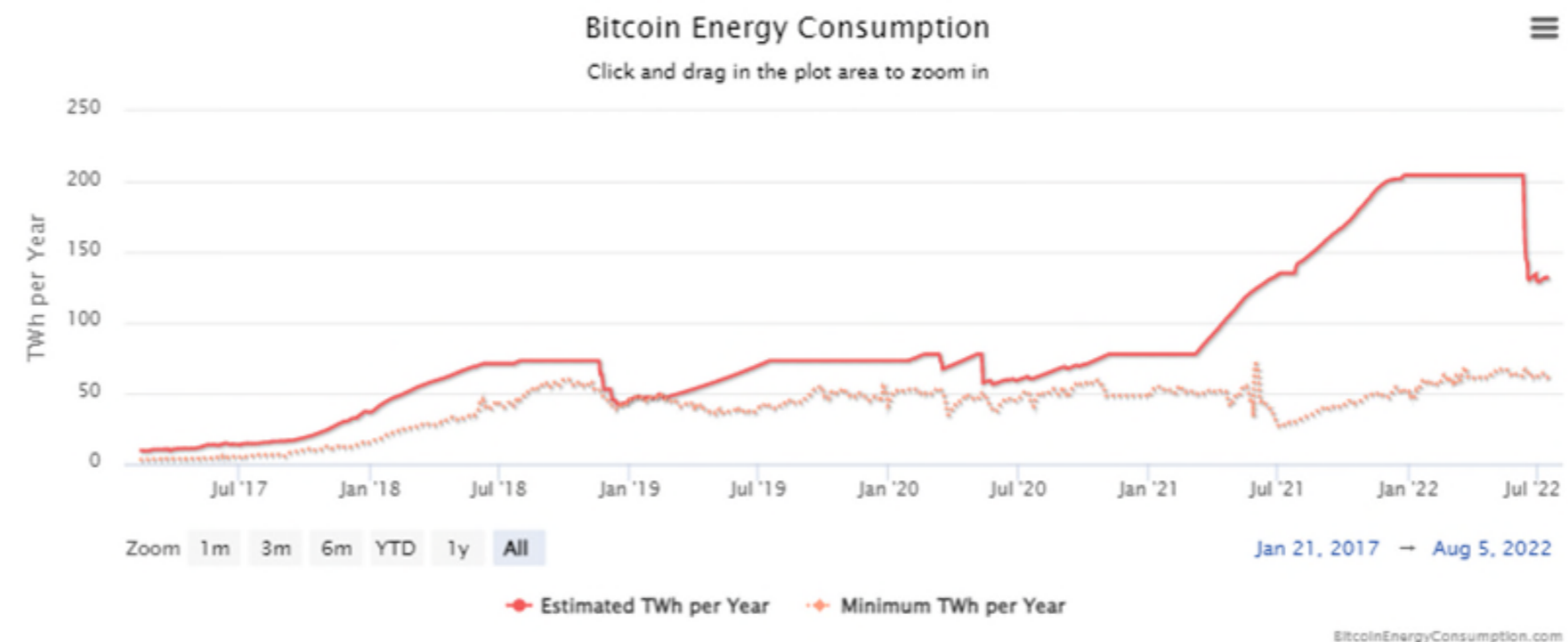
The index is built on the premise that new machines will continue to be produced for as long as it's profitable to do so, until the market reaches an equilibrium where making a profit is no longer possible.

Source: <http://bitcoinenergyconsumption.com/>

Bitcoin Energy Consumption Index

The Bitcoin Energy Consumption Index provides the latest estimate of the total energy consumption of the Bitcoin network.

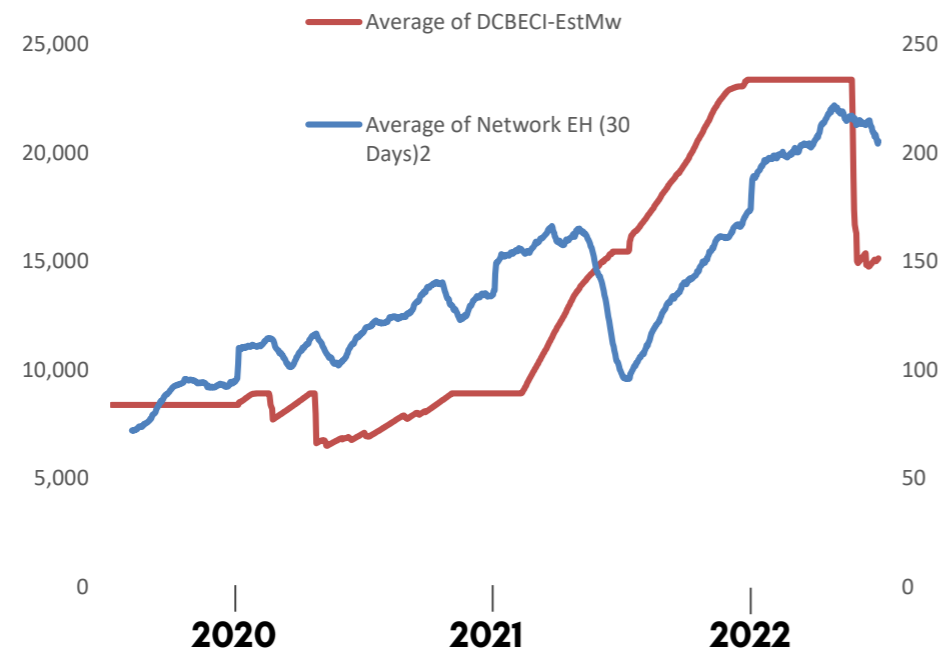
NEW RESEARCH: "Revisiting Bitcoin's carbon footprint" (February 2022); how Bitcoin got dirtier after the Chinese mining crackdown in 2021.



1. **Miners Revenue = blocks rewards + transaction fees * Bitcoin price**
2. **Total Electricity Cost = Miners Revenue * 60%**
3. **Total kwh = Total electricity cost / 5c per kwh**
4. **Total kw = Total kwh / hours**

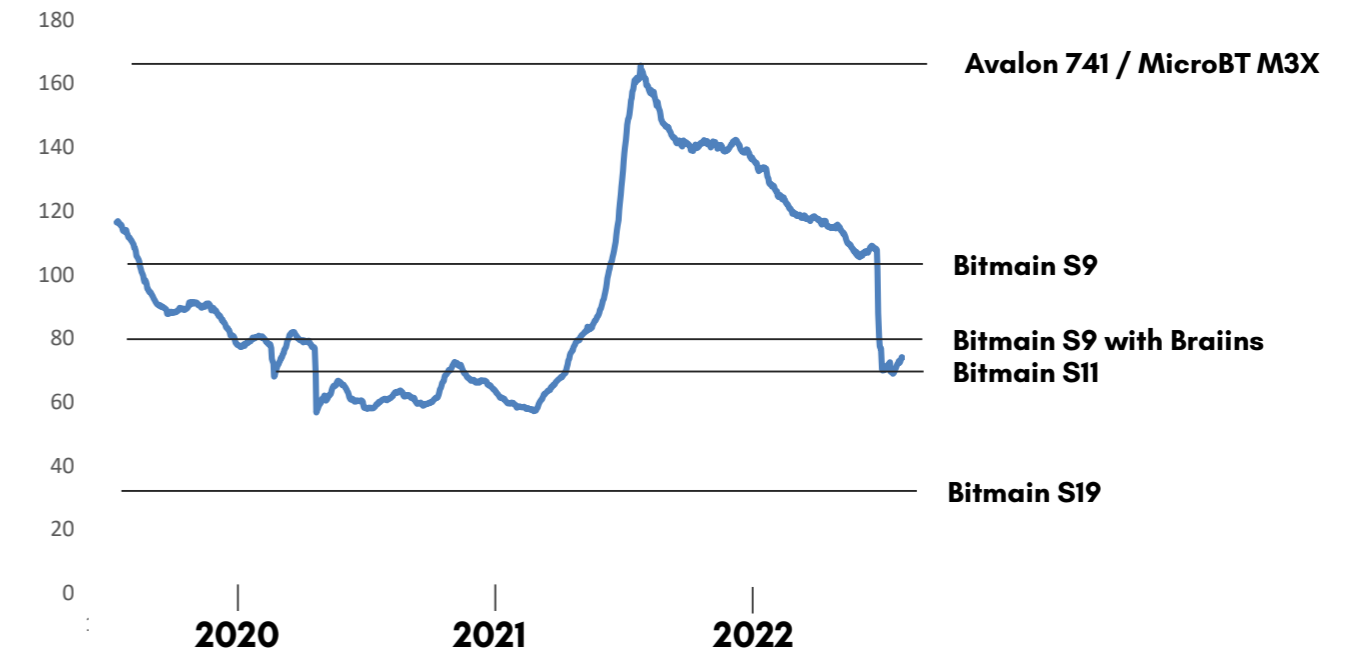
DEBUNKED 4 WAYS

1. Model doesn't change with respect to network hashrate

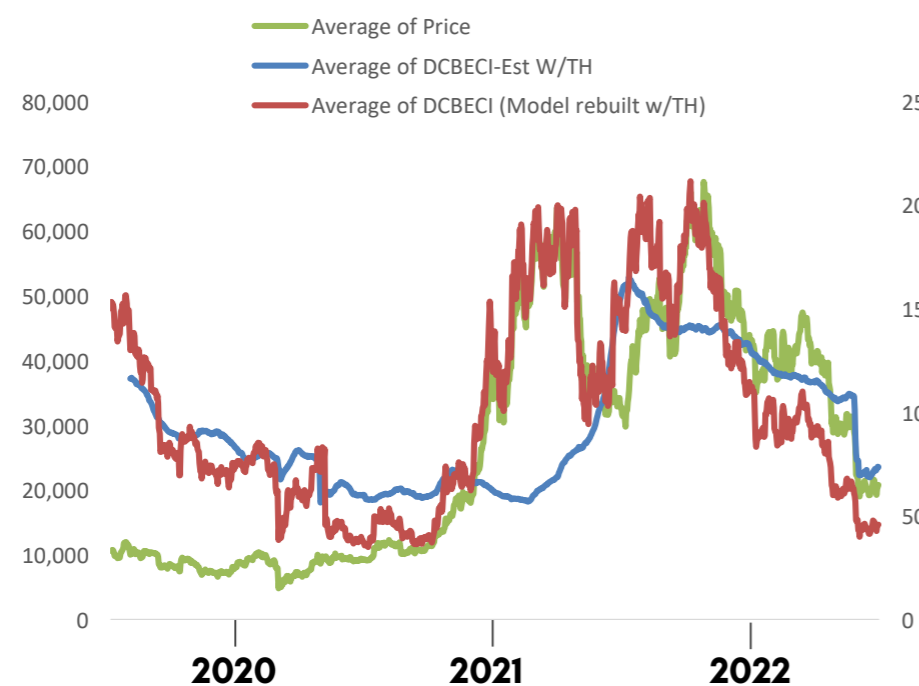


2. Combining power estimates and network hashrate gets network efficiency, w/TH

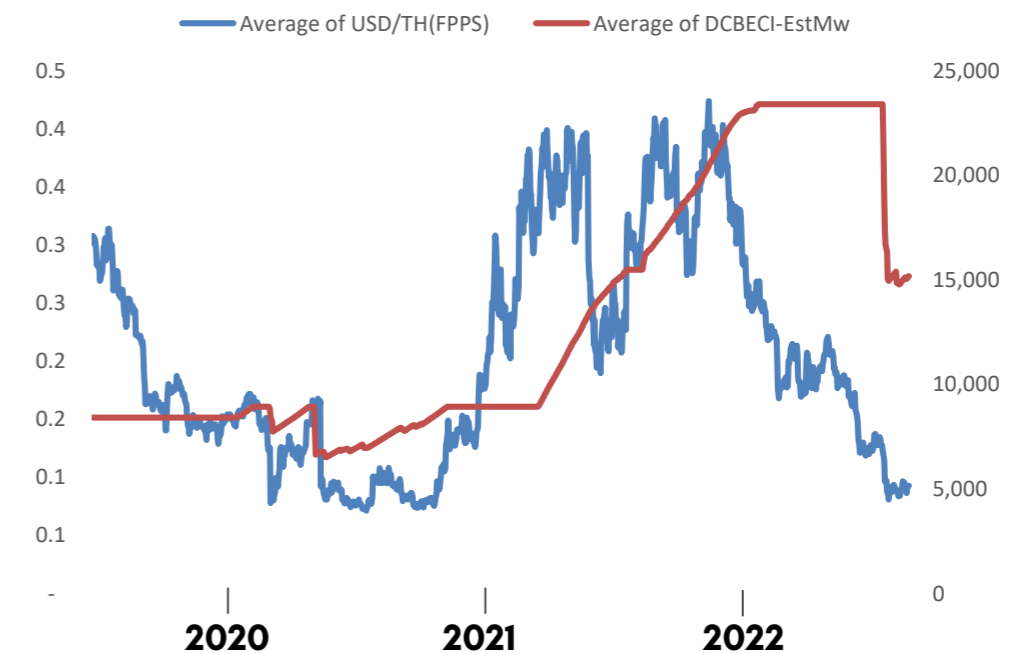
At peak showed an average efficiency 5.5x less efficient than the majority of miners being produced since May 2020, Bitmain S19s



3. Rebuilding the original model shows the stated methodology is not followed



4. Model doesn't change with respect to miners revenue (the stated methodology)





THANK YOU