HASHRATE INDEX

Hashrate Index **Q1 Report:** From Ramen to Ribeye (or at Least a Decent Sirloin)

Authored by: Colin Harper, Jaran Mellerud, Ben Harper

Designed by: Mikołaj Gałęziowski

About Hashrate Index

Hashrate Index is a Bitcoin mining data, analytics and research platform. Our platform offers novel data sets that enable miners, traders, content creators, and investors to gain key insights into the mining industry and generate alpha. Hashrate Index is a product of Luxor Technologies, a mining software and services company.

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From ramen to ribeye

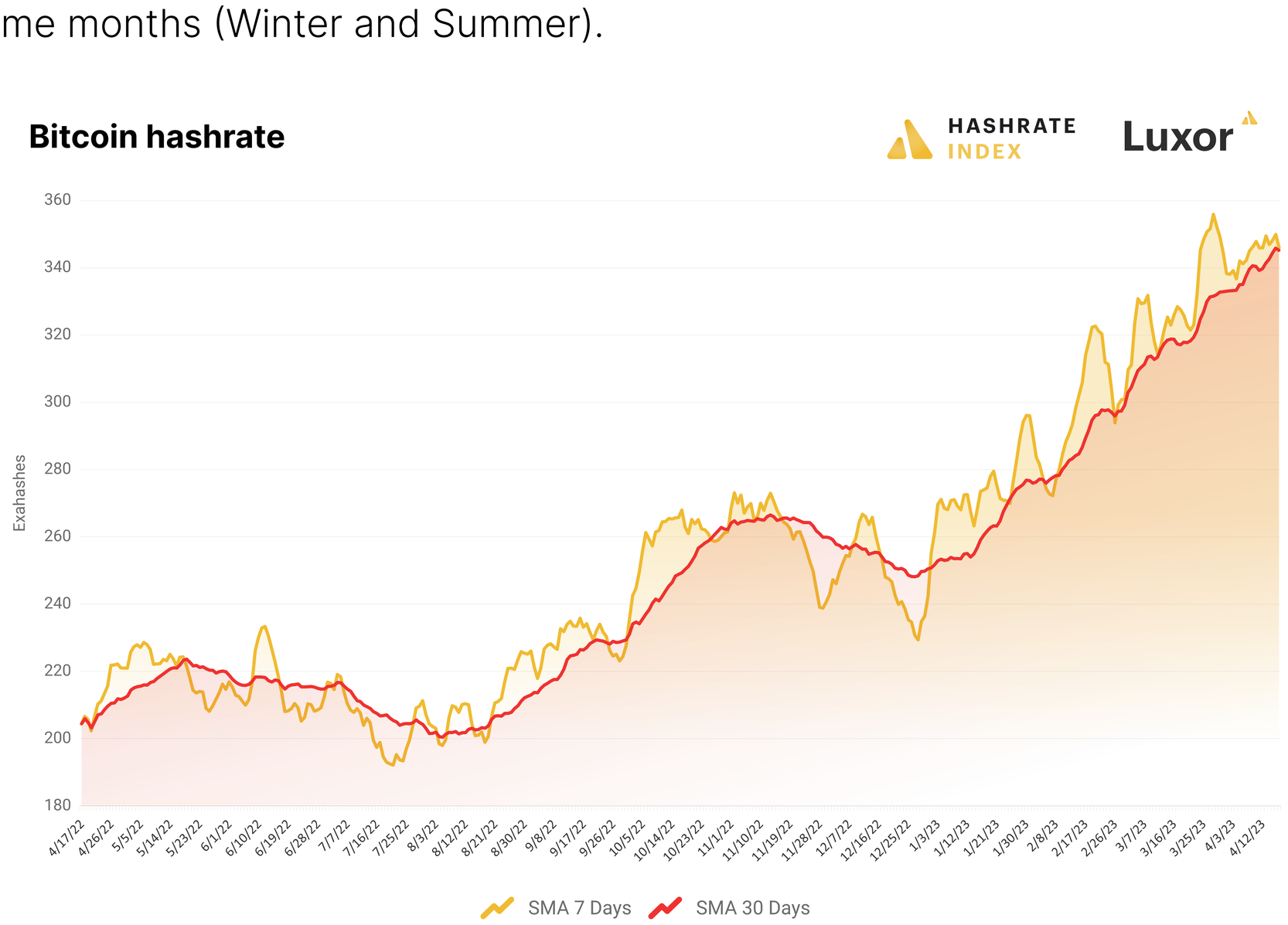
The original (cheeky) title we penned for this report back in February was “Hashrate Index Q1 Report: Sponsored by Maruchan Ramen.” But then March happened and hashprice ripped to $85/PH/day. After chopping around $80/PH/day for a while, it’s now $76/PH/day at the time of publication.

So don’t get me wrong, we’re not exactly back to dining on steak right now – or if we are, it’s the sirloin or the hanger, not the ribeye or the filet. Because miners aren’t totally poor right now, but they’re not exactly killing it.

And it’s unclear what the next 9 months will bring. Bitcoin is in uncharted territory as the global financial system starts to buckle; the everything bubble popping could be moon juice or crater its price.

The year has already been unpredictable, as evidenced by the hashprice surge and, similarly, Bitcoin’s hashrate growth. In our 2022 year-end report, we said that Bitcoin’s hashrate could hit 350 EH/s this year if hashprice stayed at or above $50/PH/day. We didn’t exactly expect Bitcoin’s 7-day hashrate to hit 350 EH/s in the first three months, but that’s what happened.

Hashprice’s rise in 2023 no doubt fed some of this growth, but the past year’s hashrate trends also corroborate a new theory on hashrate seasonality – that is, that hashrate will grow quickly in the milder months (Fall and Spring) and slow down, stagnate, or shrink in the extreme months (Winter and Summer).



As more hashrate has concentrated in North America, we can see this seasonality in Bitcoin’s 7-day average hashrate. In the summer with temperatures blistering, mines may have to shut off to avoid overheating or curtail power for the grid, and the intense heat can hamper expansion plans. Likewise, winter storms can seriously affect operations, not to mention grids, like we saw in Texas with Uri. In such extreme cases, miners can curtail their electricity draw to free up power for residential consumers and essential services.

Prior to 2022, seasonality punctuated the industrial era of Bitcoin mining in China as well. The rains in the wet season (May-September) generate an insane (to call it an "overabundance" would be an understatement) amount of hydro energy in the provinces around the Three Gorges dam, Szechuan, and other regions. Attracted by gobs of stranded, basically-free hydro power, miners would hash in these regions until the wet season ended, and then they would move their hardware to the coal-rich Northern regions (Xinjing, Inner Mongolia, among others) to make use of cheaper power in the winter.

The seasonality we're seeing in the US, coincidentally, is the complete inverse of China, where hashrate would rise in summer and winter and stagnate or drop in winter / fall.

Of course, even with these seasonalities, Bitcoin's hashrate may be more or less resilient if Bitcoin is on a bull run or if miners are deploying the latest generation hardware. For instance, the rise in Bitcoin's price no doubt is greasing the wheels of this hashrate growth, and miners – particularly, industrial-scale ones – are starting to really roll out next-gen hardware like the S19 XP. Additionally, we're hearing reports of serious hashrate growth outside of North America in regions like Russia, the Middle East, and Asia.

Seasonality aside, Bitcoin's hashrate is not letting up, and 2023's growth in Bitcoin's price and hashprice will keep more machines online that were formerly at (or under) breakeven margins.

The actions of the Federal Reserve and other central banks will largely dictate where Bitcoin goes next and whether this profitability level holds. If the Fed continues raising rates, we could see Bitcoin's price correct, maybe even dramatically; if the Fed reverses course (or even pauses, like many are starting to expect), then all bets are off and Bitcoin could continue rising.

"Is the bull run back on?" is a valid question given Bitcoin's price action in Q1. But historic bear markets in traditional markets of the past have often been marked by undulating price swings and major volatility. Of course, like we said earlier, all financial markets are in uncharted financial territory so it's anyone's guess what will transpire in 2023.

But there's one thing we know for sure: whether Bitcoin's price is moon or doom, ***the*** major theme for miners for the coming year is preparing for the next halving in April, 2024.

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Hashprice rises from all-time lows

Q1-2023 Average

$73.08/PH/day
0.003235 BTC/PH/day

Q4-2022 Average

$65.47/PH/day
0.003618 BTC/PH/day

Q1-2023 Low

$59.42/PH/day
0.002749 BTC/PH/day

Q4-2022 Low

$55.85/PH/day
0.003463 BTC/PH/day

Q1-2023 High

$83.73/PH/day
0.003745 BTC/PH/day

Q4-2022 High

$81.59/PH/day
0.004064 BTC/PH/day

The collapse of FTX and the contagion it caused put bitcoin on life-support at the end of last year – and with it, many players in the Bitcoin mining industry.

Bleak as the new year looked at the outset, the lowest day for hashprice on a USD basis in Q1 was January 1. It was only up from there as a 70% rise resuscitated Bitcoin's price over the quarter, and along with it, hashprice.

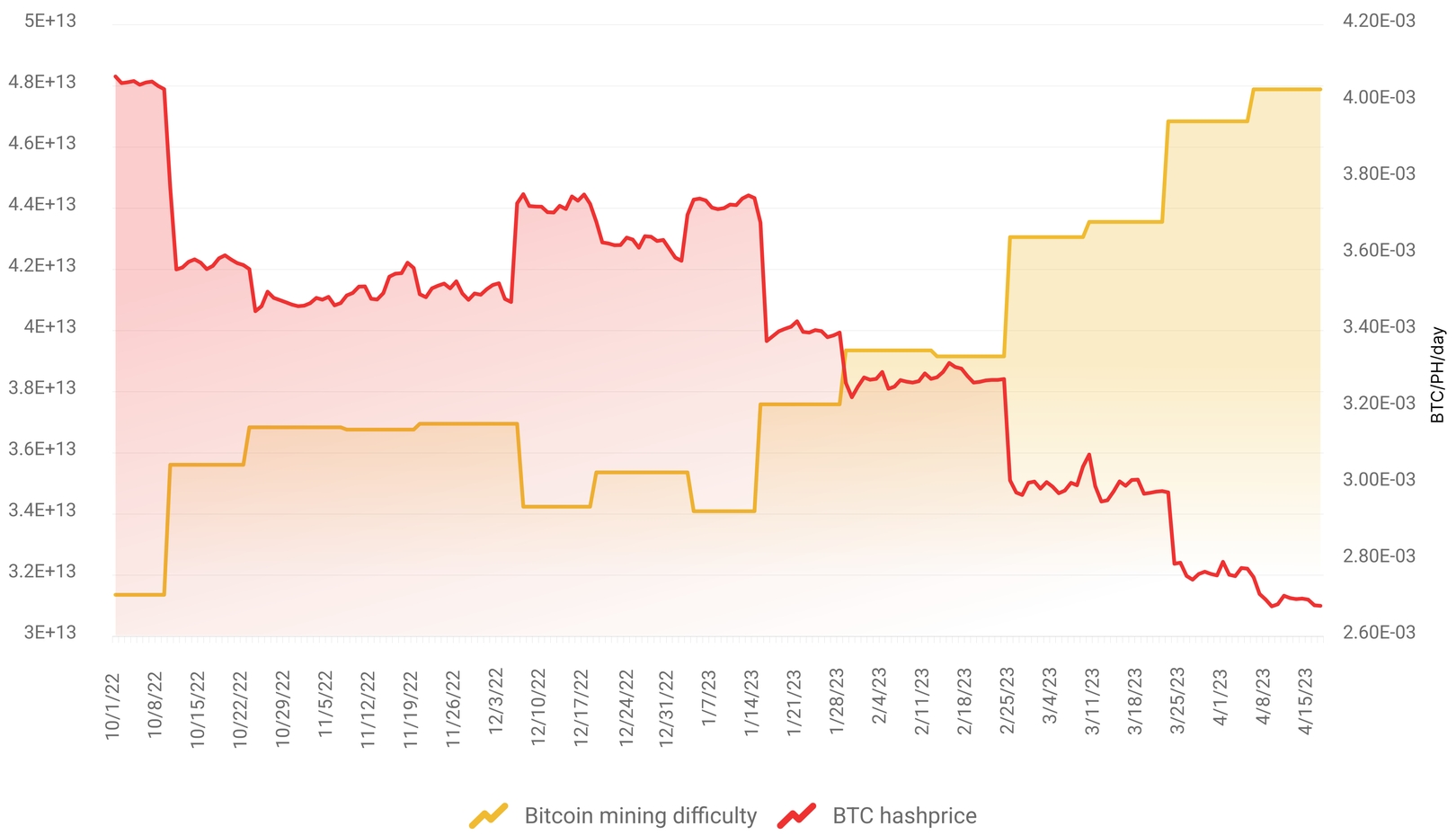
Hashprice rose 31% over the course of Q1-2023 thanks to Bitcoin's price appreciation, but it's still down 58% year-over-year.

Still, Q1's rally gave miners some financial cushion, especially those with middle-of-the-road power costs.

At the turn of the new year, for example, an S19j Pro's breakeven power cost was $0.0812/kWh; by the end of last quarter, the breakeven was $0.10/kWh. Not exactly lavish margins, but it's welcomed breathing room for miners who were underwater at the end of last year.

As ever, the profitability boost means more hardware came online last quarter than miners otherwise would have deployed with a lower hashprice. The 35% increase in Bitcoin's hashrate fed Bitcoin's mining difficulty, which swelled 31.6% over Q1 to an all-time high. In turn, this growth shrank BTC hashprice 23.2% over Q1-2023.

Bitcoin mining difficulty vs BTC hashprice



The average USD hashprice over Q1 was $73.08/PH/day, versus $65.47/PH/day in Q4-2022 and $123.88/PH/day over 2022. So quarter-over-quarter, average hashprice saw a much-needed bump, but relative to the whole of 2022 (a bear market year), hashprice is still down significantly.

If Bitcoin keeps running, then this could offset the inevitable hashrate/difficulty growth and keep hashprice above $80/PH/day.

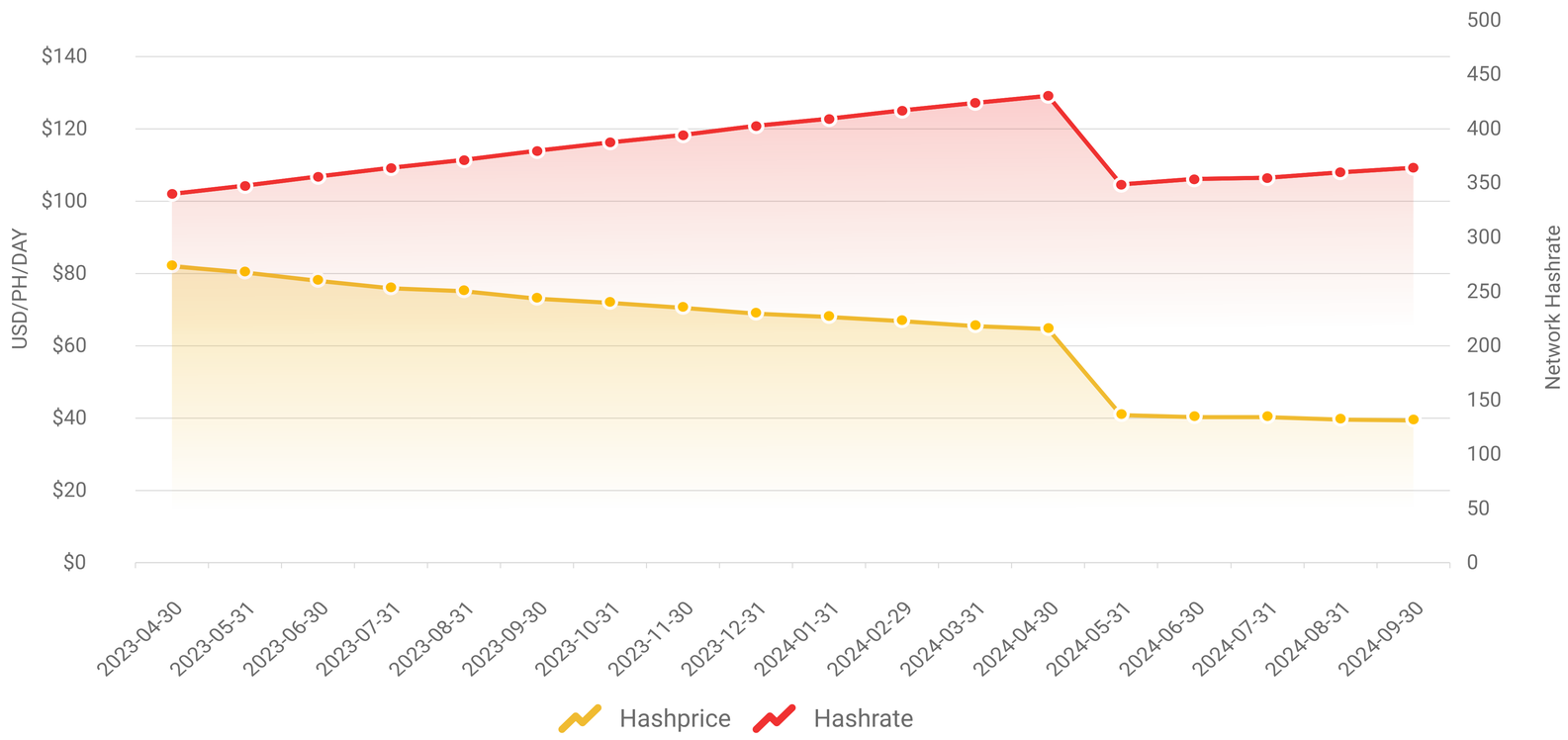
2023 hashprice forecast update

At the end of 2022, hashprice was in the gutter, and the forecast for 2023 looked pretty dark. With hashprice back up, we have revised our hashrate and hashprice supply and demand models to account for the improved mining economics.

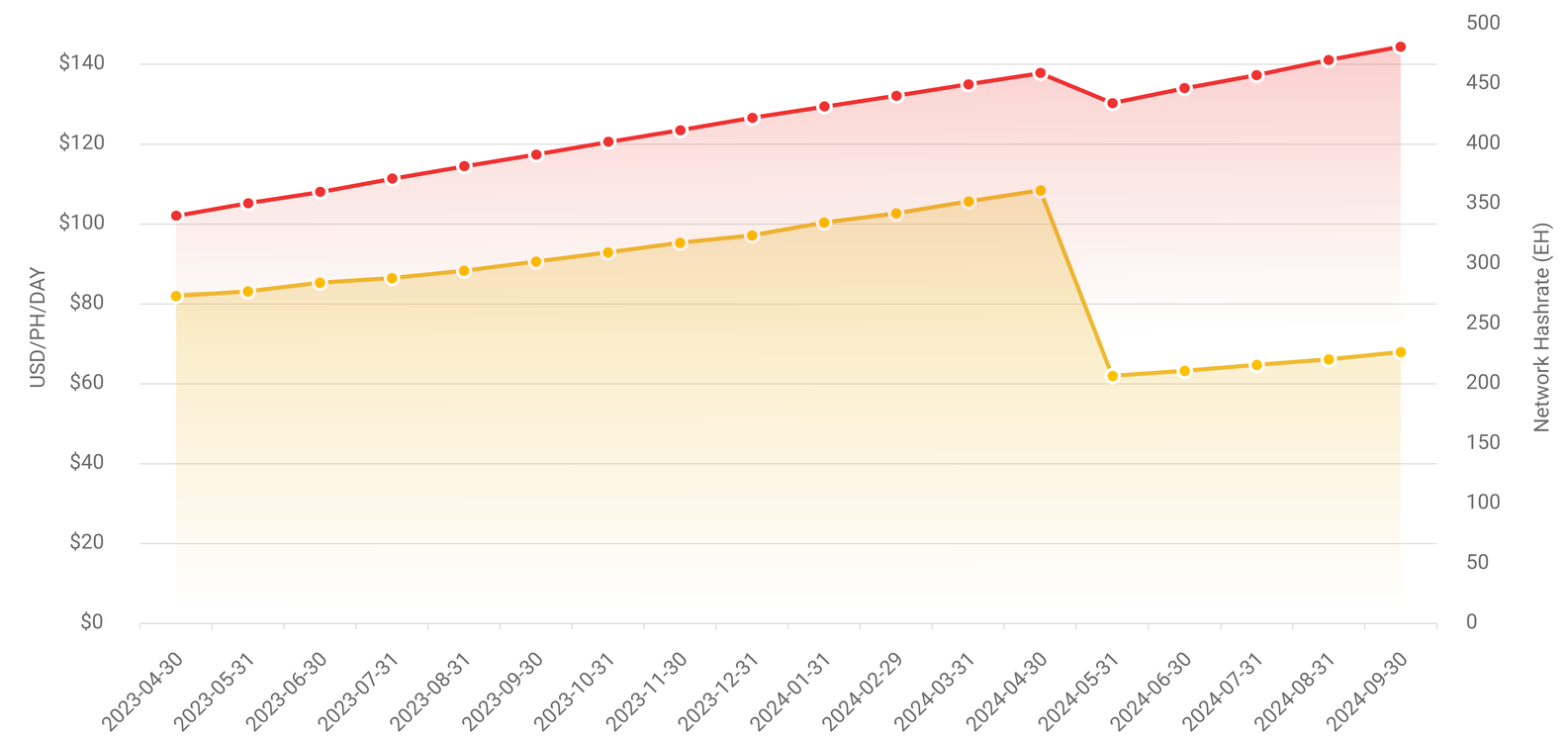
Luxor has developed its own supply and demand model of hashrate and hashprice. It takes Bitcoin price, transaction fees and block subsidy as inputs on the demand side, and internal data on ASIC production estimates and operating cost distributions across the industry on the supply side, to output an equilibrium hashrate, difficulty, and hashprice for every month, 12 months in advance. The model structure reflects reality; hashrate, difficulty and hashprice are endogenous to the system, not exogenous determinants of one another. Sensitivity analysis can also be conducted across all inputs. For example, an equilibrium hashrate, difficulty, and hashprice can be forecasted across a range of Bitcoin prices.

The chart below presents projections from our updated hashrate supply and demand model. It provides estimates for flat, bull, and bear Bitcoin price scenarios. Notably, even in a bullish scenario, we expect the halving to temporarily slow down hashrate growth as we have seen in the past.

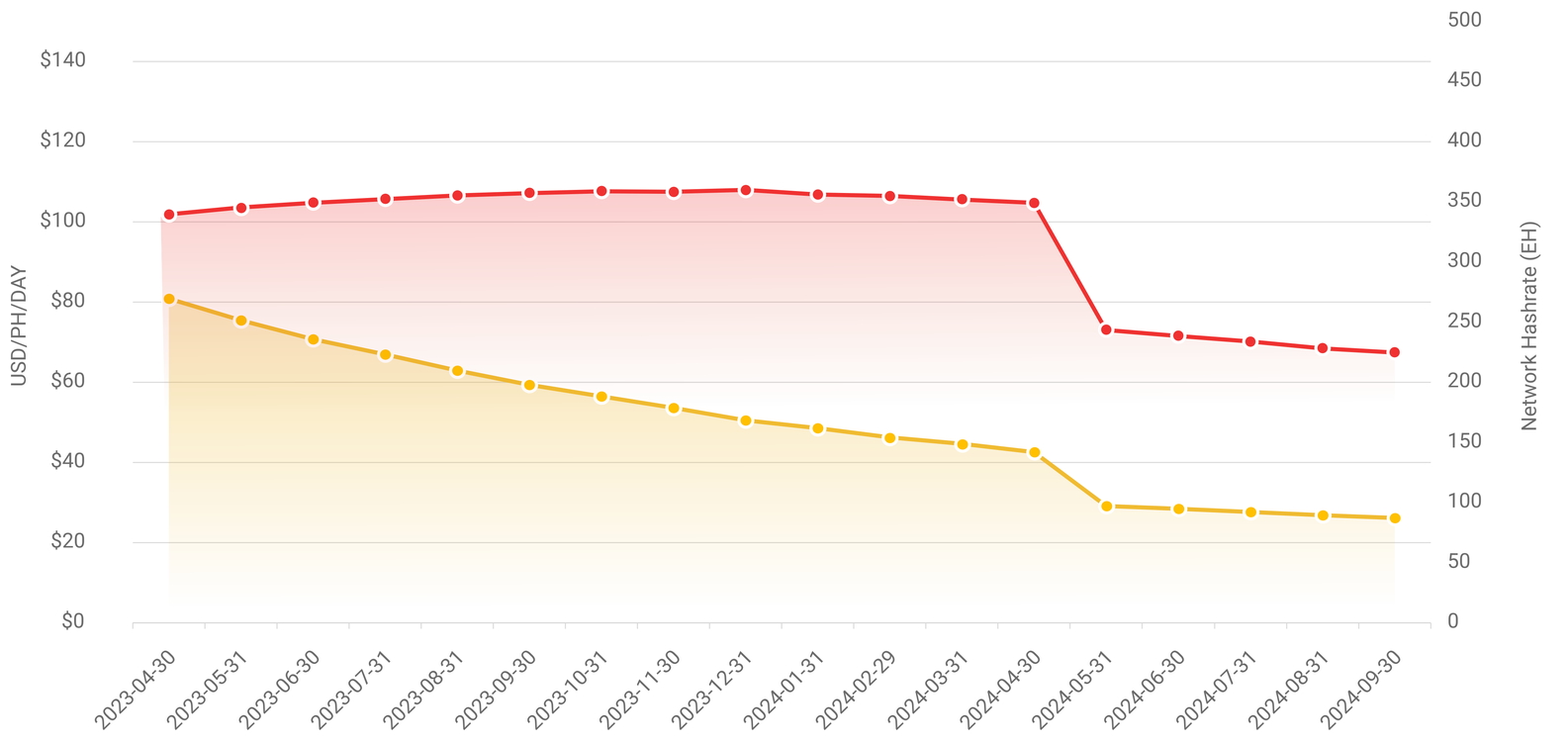
Flat case hashprice and hashrate



Bull case hashprice and hashrate



Bear case hashprice and hashrate



If you like this analysis and would like to see it unpacked further, please be on the lookout in the last week of April for a Hashrate Index report on difficulty forecasting and hashrate/ hashprice modeling!

Hashprice derivatives markets see increased demand

Using trading data from Luxor's Derivatives desk, we can glean insights into how hashrate derivatives are evolving and how miners and other financial actors are trading these contracts.

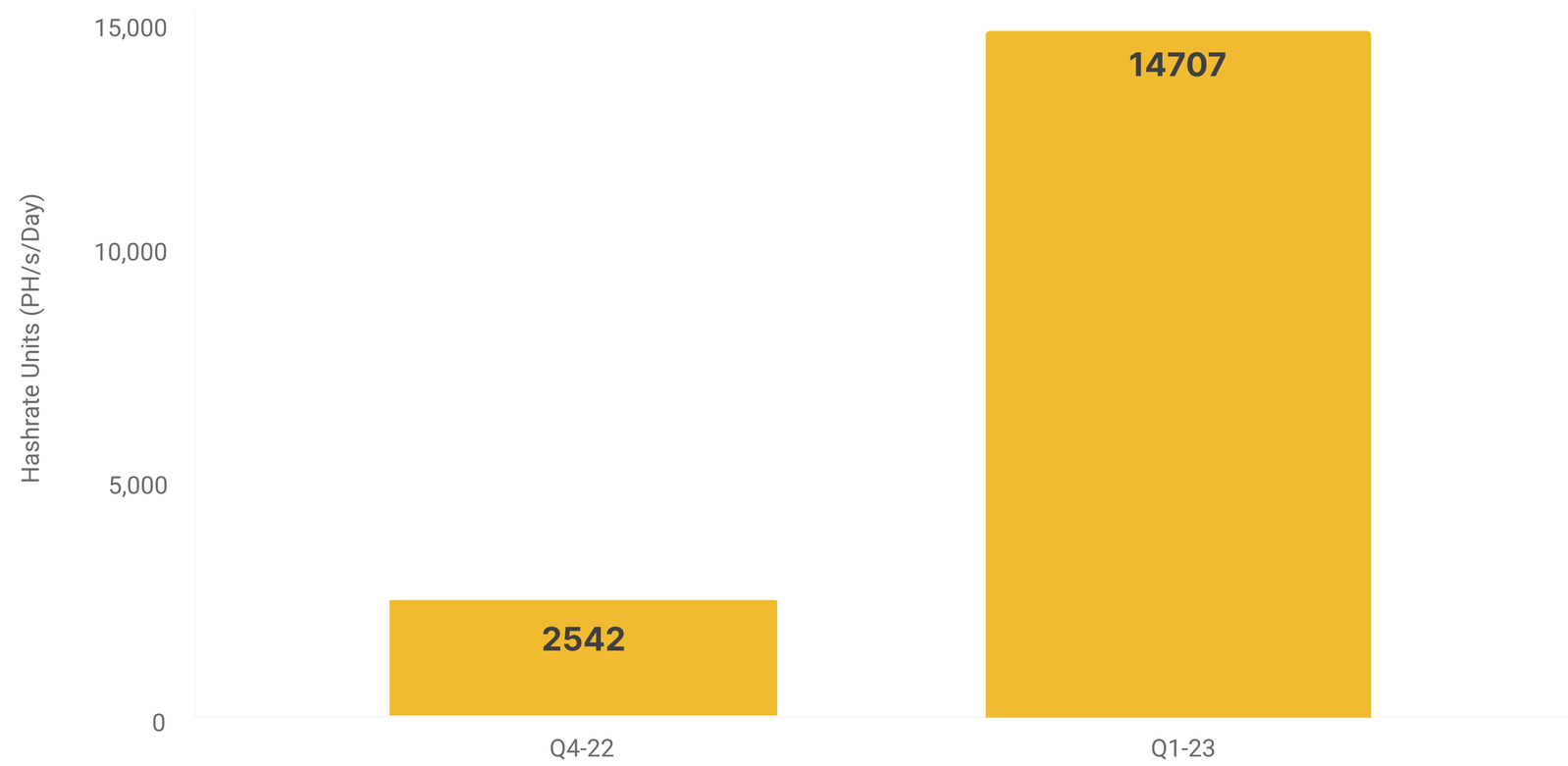
In Q4 2022, Luxor launched the beta version of its hashprice non-deliverable forward contract. In this initial phase, the sizes traded were small and durations were short and limited to 30 days.

In Q1 2023, Luxor rolled out a number of product upgrades, including standardized monthly forwards (in addition to custom contracts) which traded on a monthly basis with 1, 2, and 3 month expiration periods. We also launched BTC-denominated hashprice forward contracts to hedge network difficulty and deploy capital more efficiently.

A diverse set of market participants responded to the roll-outs with record trading volume. On the buy side, there were miners looking for temporary exposure to hashprice while procuring ASICs, speculators looking to profit on falling difficulty and rising bitcoin prices, and hosting companies looking to hedge their hashprice position while curtailing operations for winter storms and elevated electricity prices. On the other hand, the sell side was predominantly miners looking to lock-in hashprice and hedge their revenues

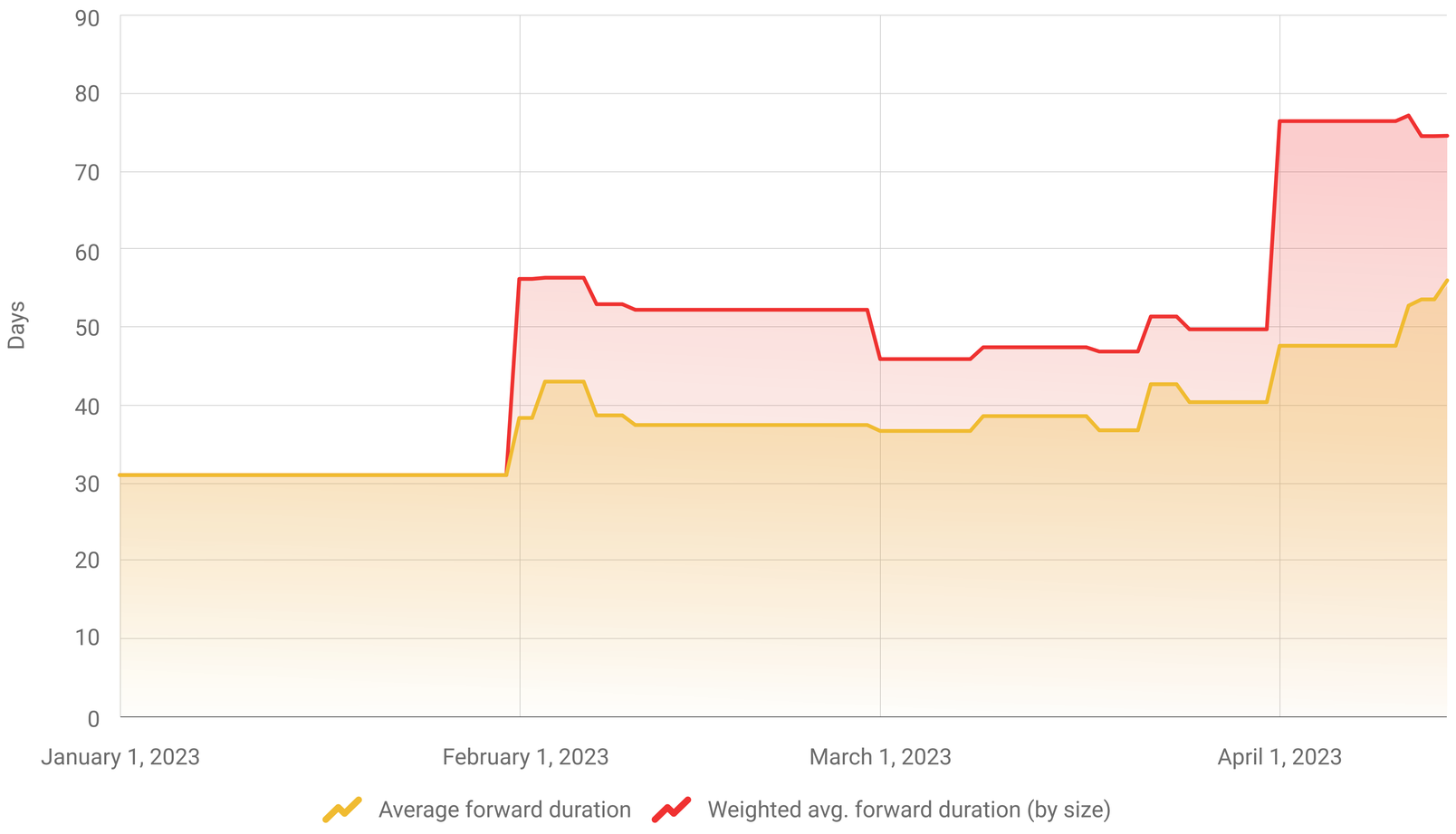
Trading volume totaled 14,707 PH/s/Day units in Q1 2023. This represented a 480% increase in trading volume vs. Q4 2022. Total notional value traded increased even further - a 550% increase vs. Q4 2022.

Luxor Hashprice NDF PH/s/Day traded per quarter



As the quarter progressed, average contract durations expanded as market participants began to take advantage of new contract durations. In January, market participants used the 1-month contract almost exclusively, but this expanded to an average contract duration of 56 days and a weighted average contract duration (by hashrate) of 75 days by mid-April.

Average forward duration and weighted avg. forward duration (by size)



Over the past two quarters hashprice has tended to trade in backwardation, though not exclusively. On the USD-denominated hashprice forward, the discount to spot hashprice averaged about 2.25% on contracts with 31-day durations or less and 5-6% on contracts between 57-91 days. Depending on the month, the average standardized monthly contract traded at a discount or premium in the 5% premium to 6% discount range.

Luxor USD Hashprice Forward, Q4-22 to Present

Contract Duration	Average Premium (Discount) to Spot Hashprice
Less Than 31 Days	(2.25%)
57 Days to 75 Days	(5.76%)
75 Days to 91 Days	(5.08%)

Luxor USD Hashprice Forward, 2023 Standardized Monthly Contracts

Month	Average Premium (Discount) to Spot Hashprice
January 2023	4.86%
February 2023	(4.30%)
March 2023	1.60%
April 2023	(6.07%)

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2022 was a record year for energy price inflation. 2023 could be better

The vice-grip economics of 2022's inflated power costs and shrinking mining revenue put plenty of miners on the brink of breakeven last year. Q1-2023 though, has blessed miners with a complete reversal of fortune. Bitcoin is up 83% year-to-date, and hashprice up 38% with it. The bitcoin mining profitability boost means much more comfortable margins – and it's bought time for miners who were previously on life support.

What's more, natural gas prices are falling and energy price forecasts are favorable for 2023, so there's even more light ahead of what was (at the end of December, 2022) looking like a bleak year.

Natural gas prices fall precipitously from 2022 peak

The global fiscal and monetary stimulus that flushed financial markets in 2020 bubbled into decades-high energy price inflation in the US and abroad, but prices are finally falling in the oil and gas sector and look poised to fall in electricity markets, too.

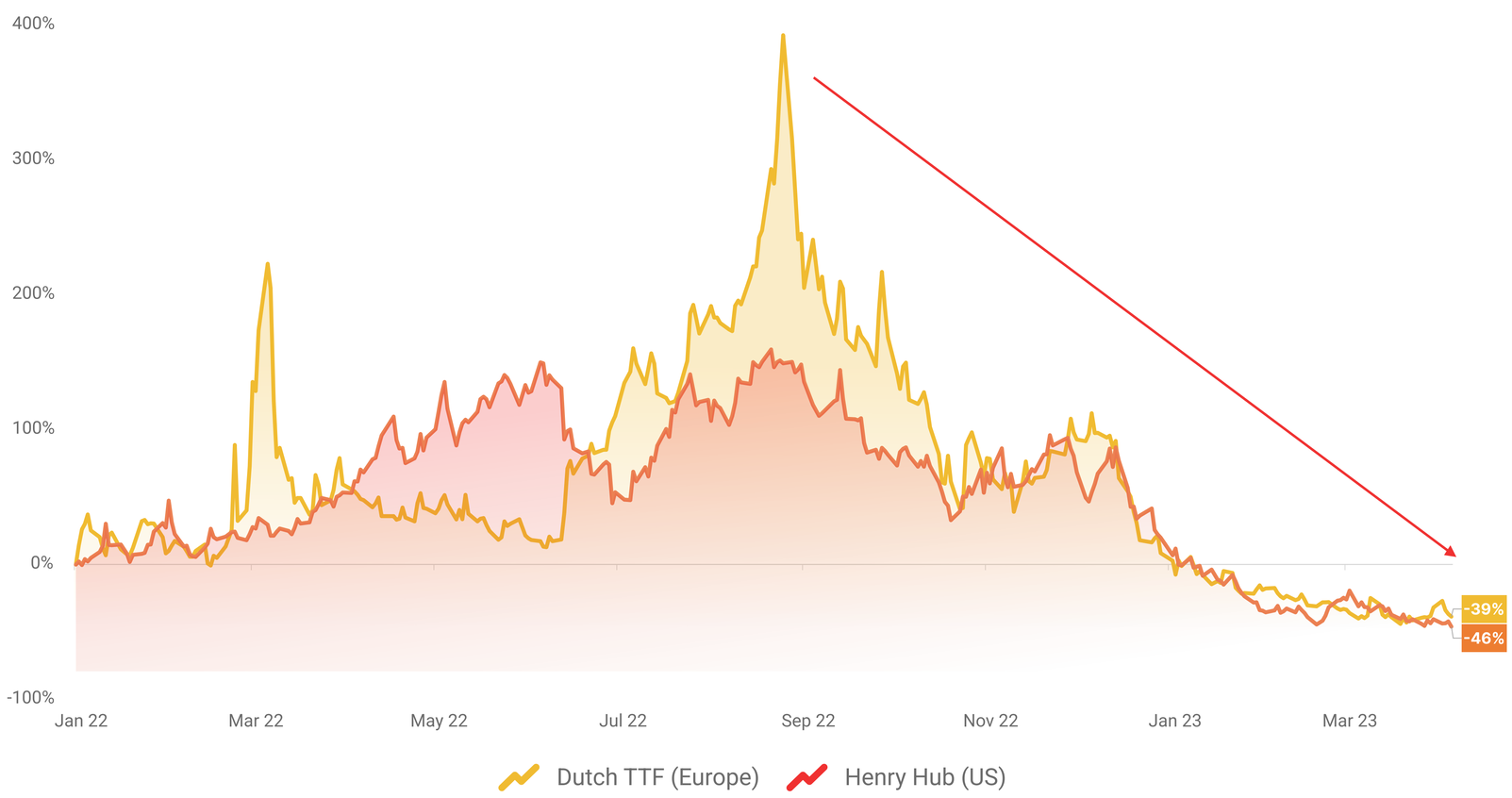
As inflation gripped electricity and oil + gas markets in 2021/2022, the cost of manufacturing, transportation, heating, commercial services, residential power, etc went up all around the world. These price increases were particularly bad in Europe, exacerbated as they were by the war in Ukraine and the sabotaging of the Nordstream pipeline.

The Dutch TTF, the gold standard index for natural gas prices in Europe, rose nearly 400% from January to September in 2022; concurrently, the Henry Hub index, a US equivalent, rose a more-modest-but-still-unfortunate ~120%.

Thankfully, these prices peaked in the summer and trended back to their January levels by the end of 2022. Nat-gas prices have continued trending down so far in 2023, so much so that the Dutch TTF and Henry Hub have fallen 39% and 46% since January 1, 2022.

Natural Gas Prices: Development since January 2022

HASHRATE INDEX Luxor

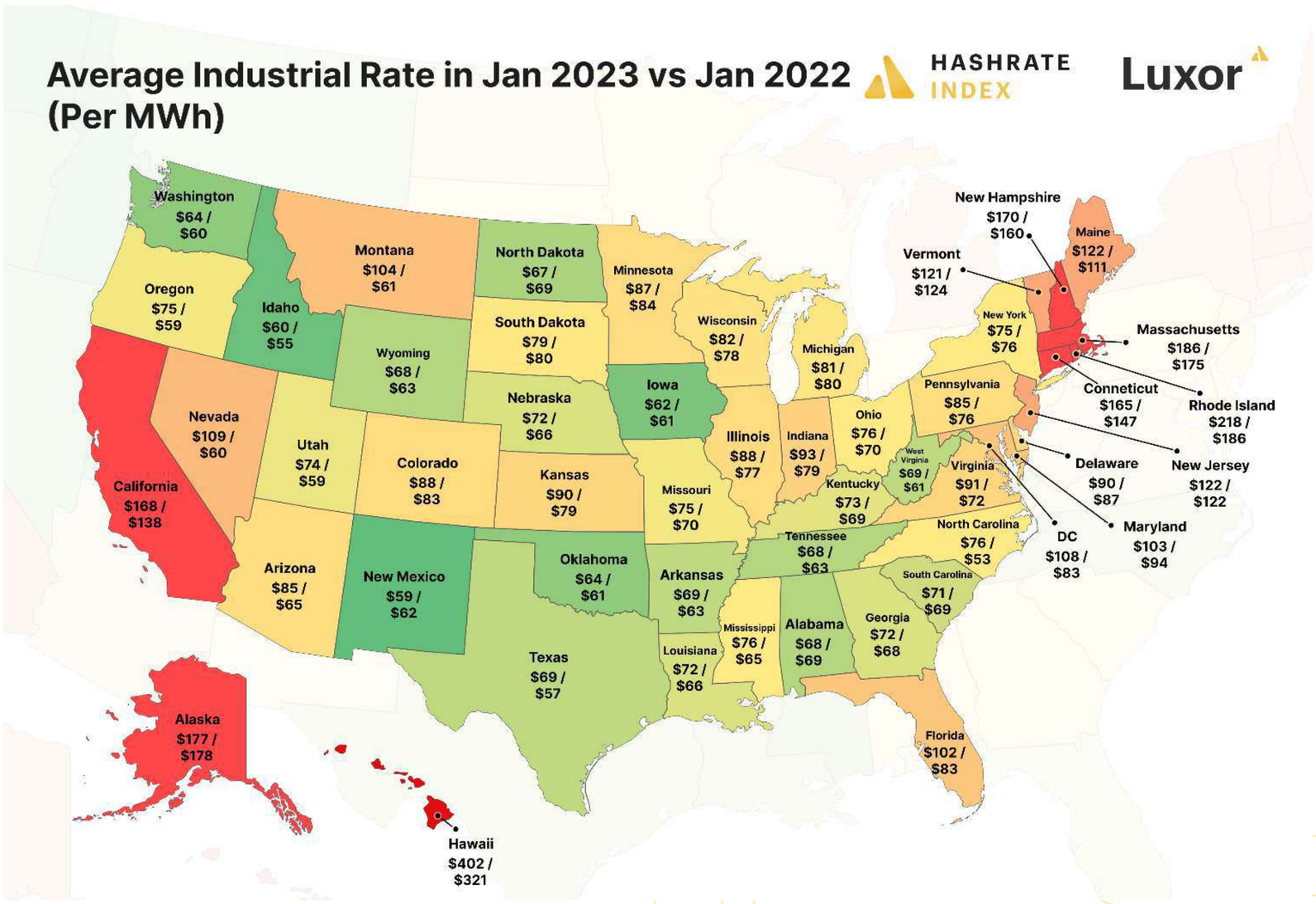


Electricity prices end 2022 at record highs; winter storms exacerbate power price inflation in January 2023

Electricity prices in the US exited 2022 at their highest levels ever after a record year for price increases. The US Consumer Price Index pegged electricity price inflation at 14.3% last year, and if we zoom out a decade or even a few years back, this inflation looks even graver.

Residential rates were $151.20/MWh on average in 2022, a 25% increase from 2013 and 15% from 2020; commercial rates were $125.50/MWh on average, a 22% and 18.5% increase; and industrial rates were $84.50/MWh on average, a 22.6% and 27% increase. Looking state-by-state in the US, many states saw a significant increase in electricity prices from January 2022 to 2023. This winter has been an especially cold and stormy one in the US, particularly in the West where freezing temperatures, heavy snows, ice storms, and strong winds have interfered with power transmission and generation.

This has driven up prices significantly. States that have been battered the hardest by this season's winter storms (e.g., California, Oregon, Nevada, Kansas, Utah, Montana and Arizona) had some of the highest year-over-year changes to power rates.



Each US States' average industrial power rate (Janaury 2023 vs January 2022) | Source: EIA

The EIA will update numbers for February and March this quarter, so we'll circle back to those numbers once published to see how 2023's once-in-a-blue-decade's winter affected power prices in the West and elsewhere in the US.

We anticipate that power prices for the remainder of Q1 in these storm-affected regions will be higher or at the least stay elevated given that more severe winter storms (and their concomitant power outages) occurred in February and March of 2023.

Natural gas, electricity prices could be much lower in 2023 if forecasts hold

Some good news for Bitcoin miners: the US Energy Information Association (EIA) expects electricity prices to drop this year.

The agency forecasts a 1% reduction in electricity demand in Q2-2023 driven by milder weather, according to the IEA Short-Term Energy Outlook. This reduction in demand, in chorus with additional generation from renewable sources and cheaper nat gas prices, could reduce power prices in Q2 and Q3 this year relative to 2022 levels.

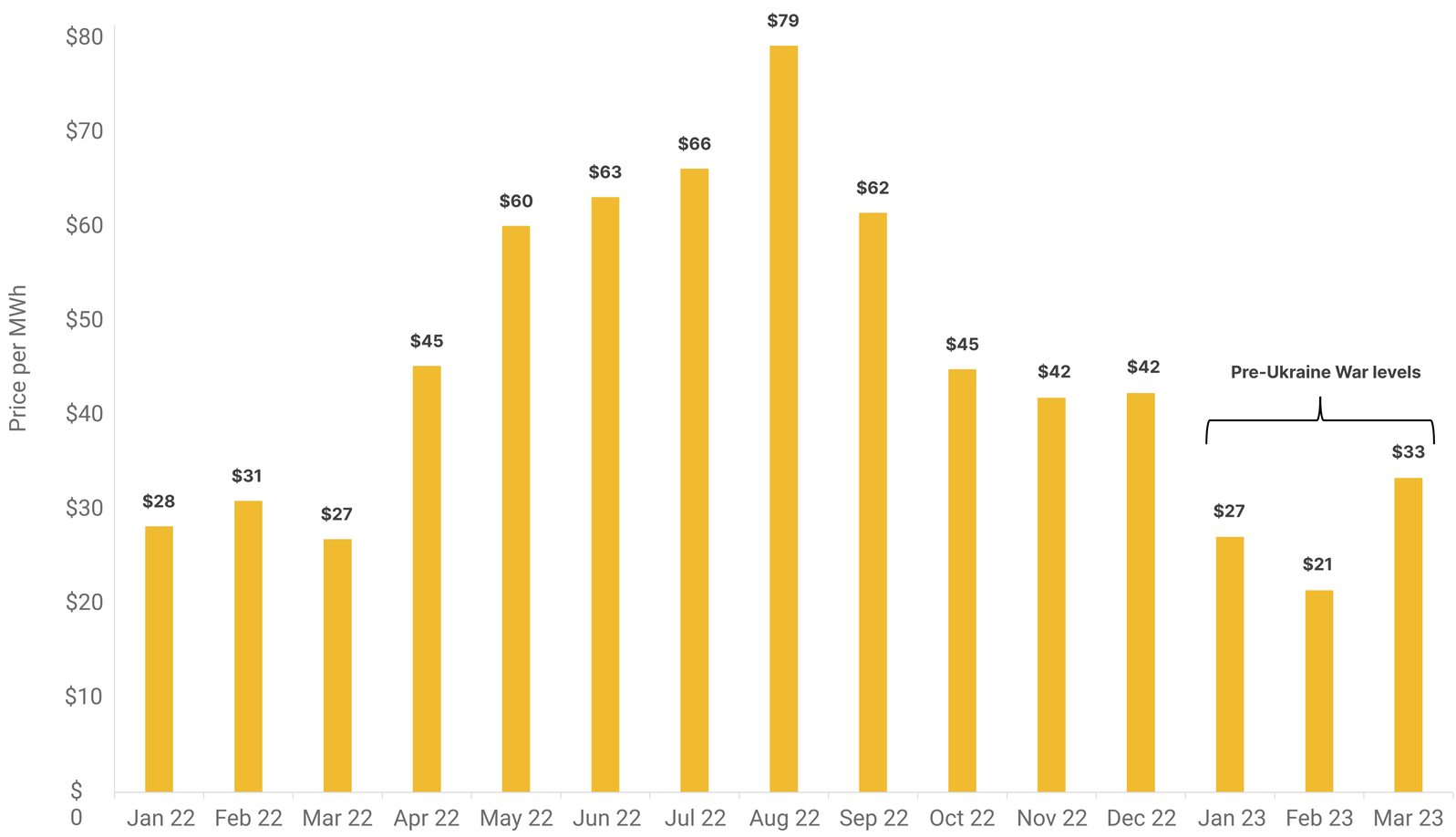
For natural gas specifically, the EIA forecasts that "the Henry Hub natural gas spot price will average about $2.65 per million British thermal units (MMBtu) in [Q2-2023] as natural gas inventories begin to rise." (For reference, the Henry Hub is currently trading for $2.19).

With inventories above their five-year-average, the EIA further anticipates that natural gas prices will stay below $3.00 for all of 2022, a huge haircut from 2022's $6.45 average.

Lower natural gas prices should drive down wholesale power prices too, the EIA says – a lot. **They think that wholesale power rates in Texas, for instance, could drop from 2022's $80/MWh average to $35/MWh.**

Indeed, we've already seen these prices – and lower – in West Texas this Q1.

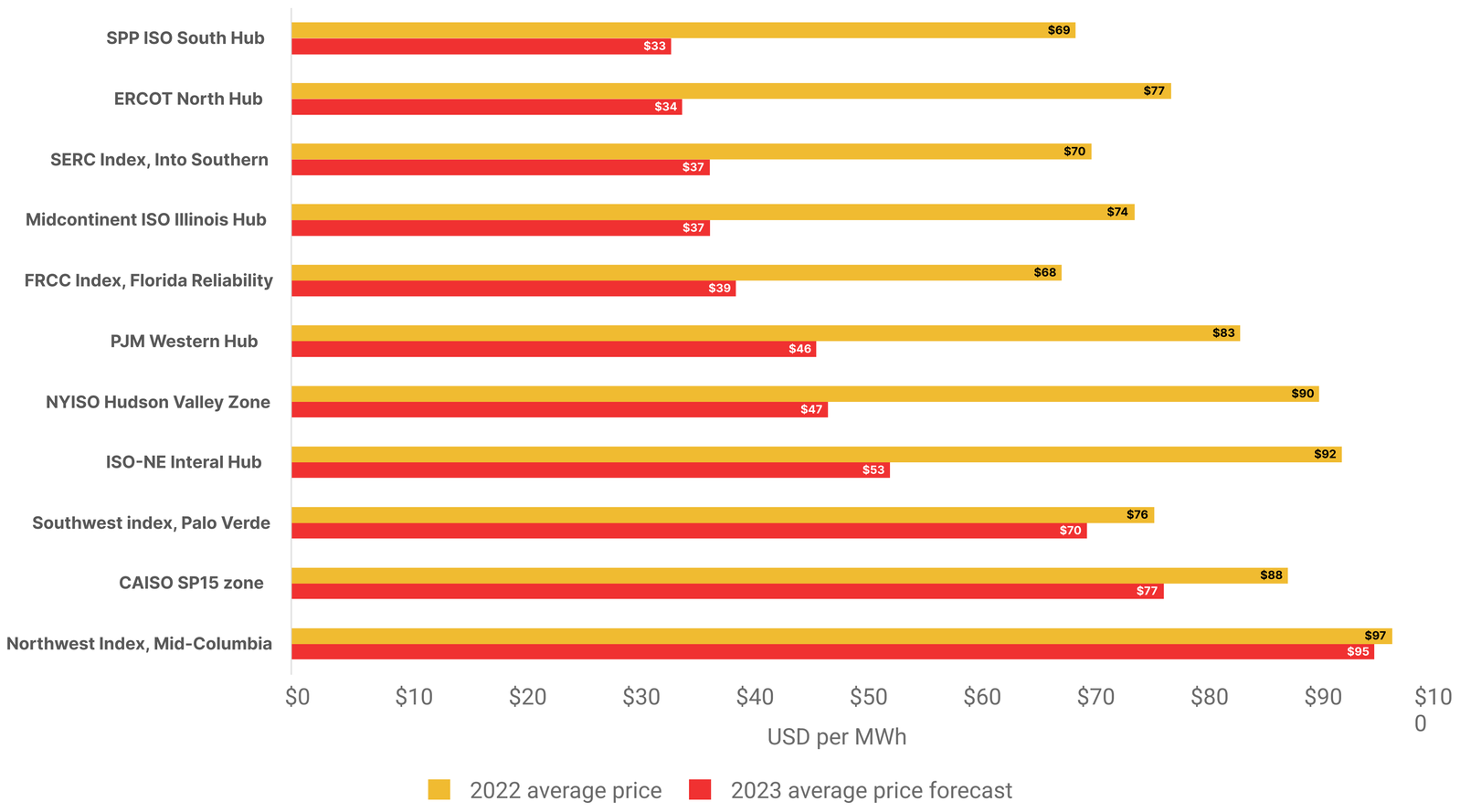
Monthly median electricity price in West Texas



Source: ERCOT

Below, you can see that 2023 wholesale power forecasts are favorable for each power region in the US, though the Southwest, California, and Northwest are forecasted to see less reduction than other regions. (This is likely because forecasts are based on the most recent power pricing data, and as we covered earlier, the Pacific Northwest and parts of the Southwest were wracked by storms in Q1).

Forecasts for wholesale electricity prices in the US

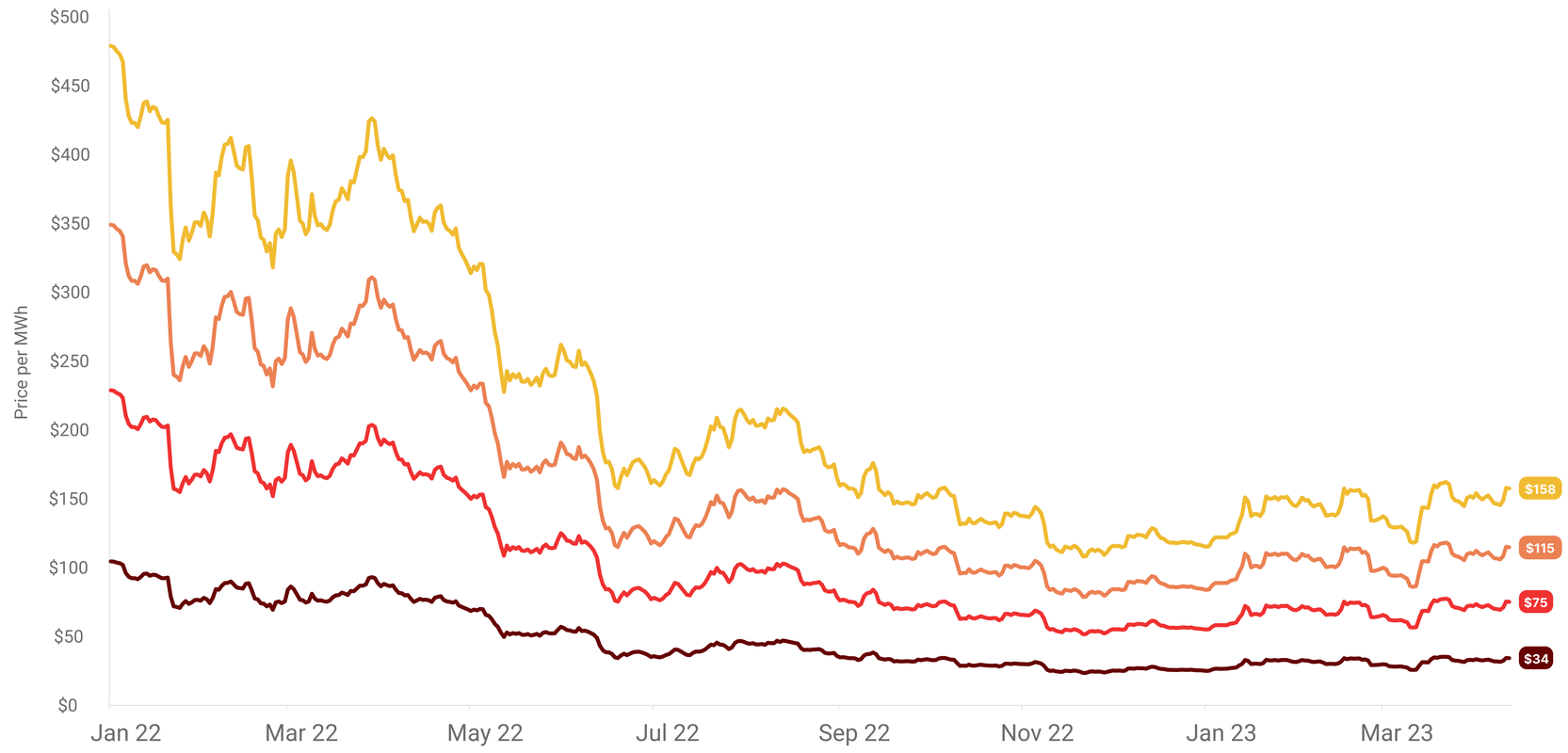


Source: EIA Short-Term Energy Outlook

Time will tell whether or not the EIA's forecast is too optimistic. But if it holds up, the reduction in power rates would further fatten bitcoin mining margins, which have already greatly improved under the influence of 2023's Bitcoin price rally.

Bitcoin's 80%+ rise year-to-date has pushed hashprice up 38%. By proxy, breakeven power costs are rising back to more comfortable levels: on January 1st, the breakevens for an S19j Pro was $80/MWh, versus $115/MWh at the end of March. (For context, the average industrial power price in the US in January 2023 was $83/MWh, versus $73/MWh in Janaury 2022.)

Break-even electricity price for different ASIC models



*Cashflow breakeven

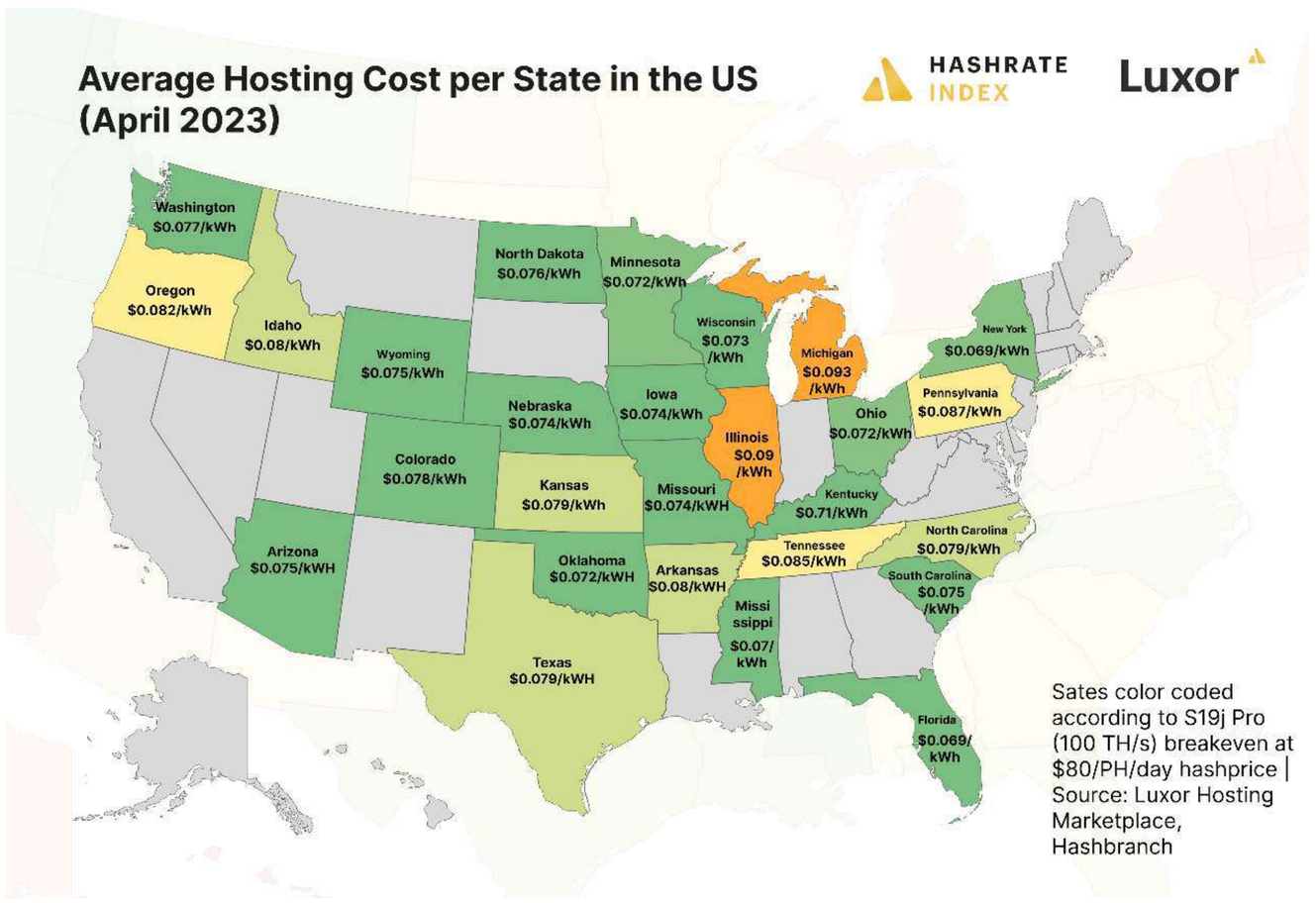
Source: Hashrate Index

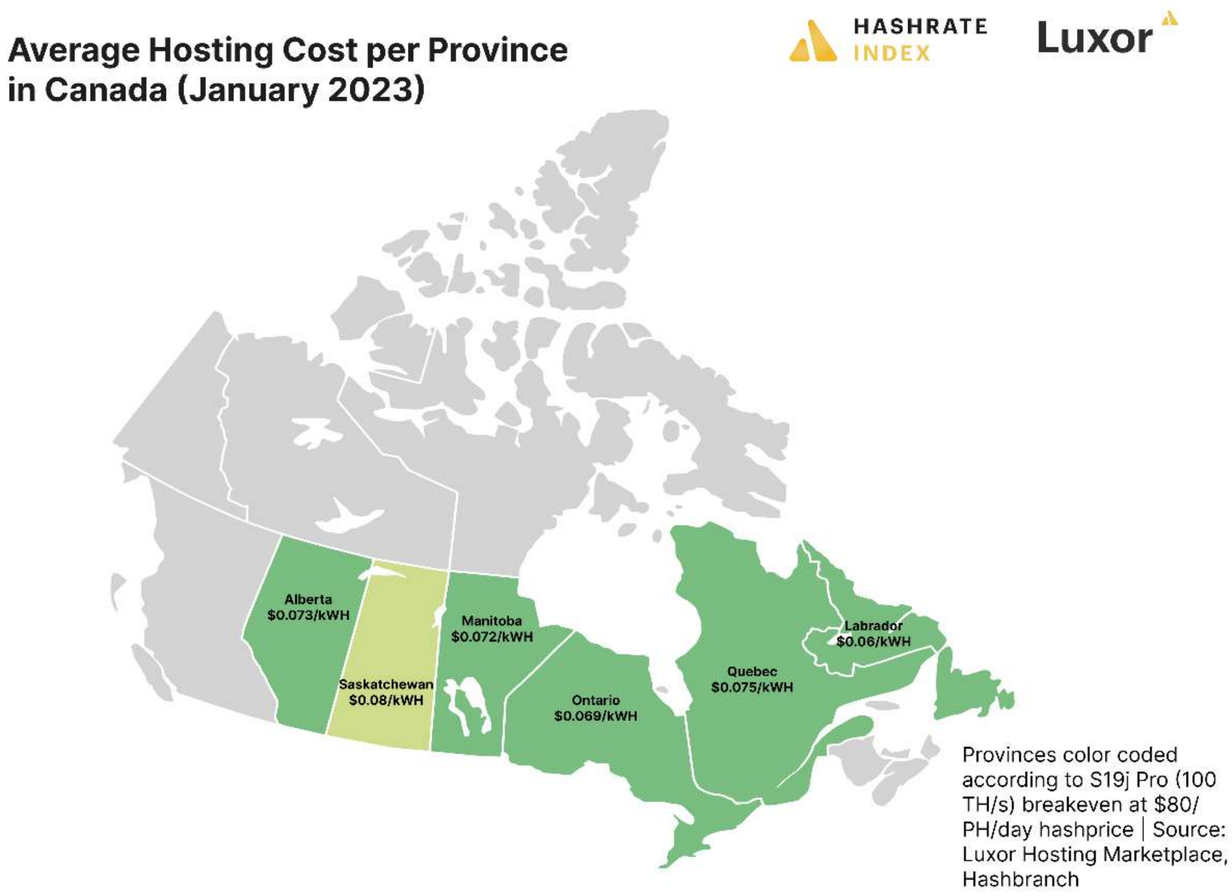
They're not quite bull-market margins, but it's a welcomed reprieve from the chopping-block financials miners suffered through in Q4 of last year.

Average hosting costs per state and province stabilize

As hosting providers become more transparent and networks open up, it’s becoming increasingly easier for miners to geographically distribute hashrate. Hosting marketplaces, like Compass and Blockware, as well as directory/referral sites, like Luxor’s ASIC Trading Desk and Hashbranch, have opened up retail access to bitcoin mining hosts all over the world.

In the US and Canada, hosting prices are stabilizing and, in some regions, coming down after rising with energy costs in 2022. And contrary to Q4-2022, the average hosting cost for every state is below the current breakeven cost for an Antminer S19j Pro.





The halving is nearly a year out, and a looming question is whether or not these average rates will be viable in a 3.125 BTC block subsidy world. On that note, we see room for immersion hosting options to expand as miners search for ways to improve margins post-halving (immersion infrastructure build outs have lagged behind air-cooled).

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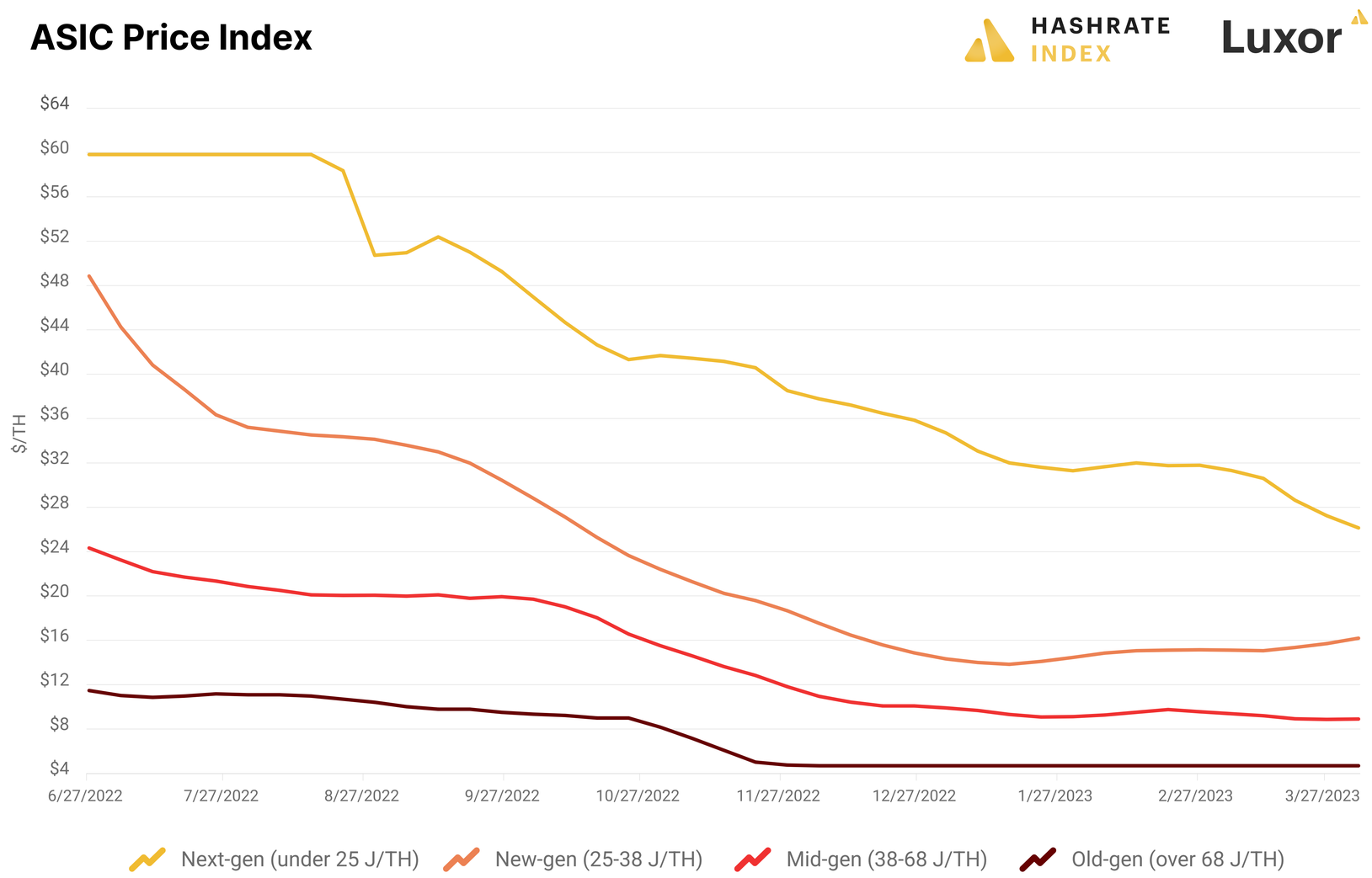
ASIC market sees signs of life

Q1-2023 average:	Q1-2023 low:	Q1-2023 high:
Next-gen: $31.55/TH	Next-gen: $27.29/TH	Next-gen: $33.12/TH
New-gen: $14.76/TH	New-gen: $14.01/TH	New-gen: $15.70/TH
Mid-gen: $9.38/TH	Mid-gen: $9.09/TH	Mid-gen: $9.77/TH

Pushed over the edge by 2022's bear market, Bitcoin mining ASIC prices were in freefall for all of last year. New-gen ASICs lost 86% of their value over the year as hashprice dwindled. By the end of 2022, ASIC prices flatlined, but Bitcoin's price rise over Q1 pumped a (albeit faint) pulse back into the ASIC market.



That pulse came mostly from next-gen machines like the S19j Pro. These ASICs led the recovery, followed by mid-gen machines like the S17 and M20.

Meanwhile, next-gen ASICs like the Antminer S19 XP, the most powerful and efficient models on the market, actually lost value over the quarter. The TLDR (which we unpack below): next-gen machines were largely overpriced in Q4-22, but Q1's rise in hashprice, the increasing availability of these rigs, and Bitmain's repricing of hardware have chipped away the premium next-gen machines carry over other rigs.

S19 XP, other next-gen premiums shrink in Q1

In our 2022 Year-End Report, we showed that the S19 XP carried a significant premium to new-gen rigs like the S19j Pro. That premium worsened over the course of Q1, but it started correcting significantly at the end of March.

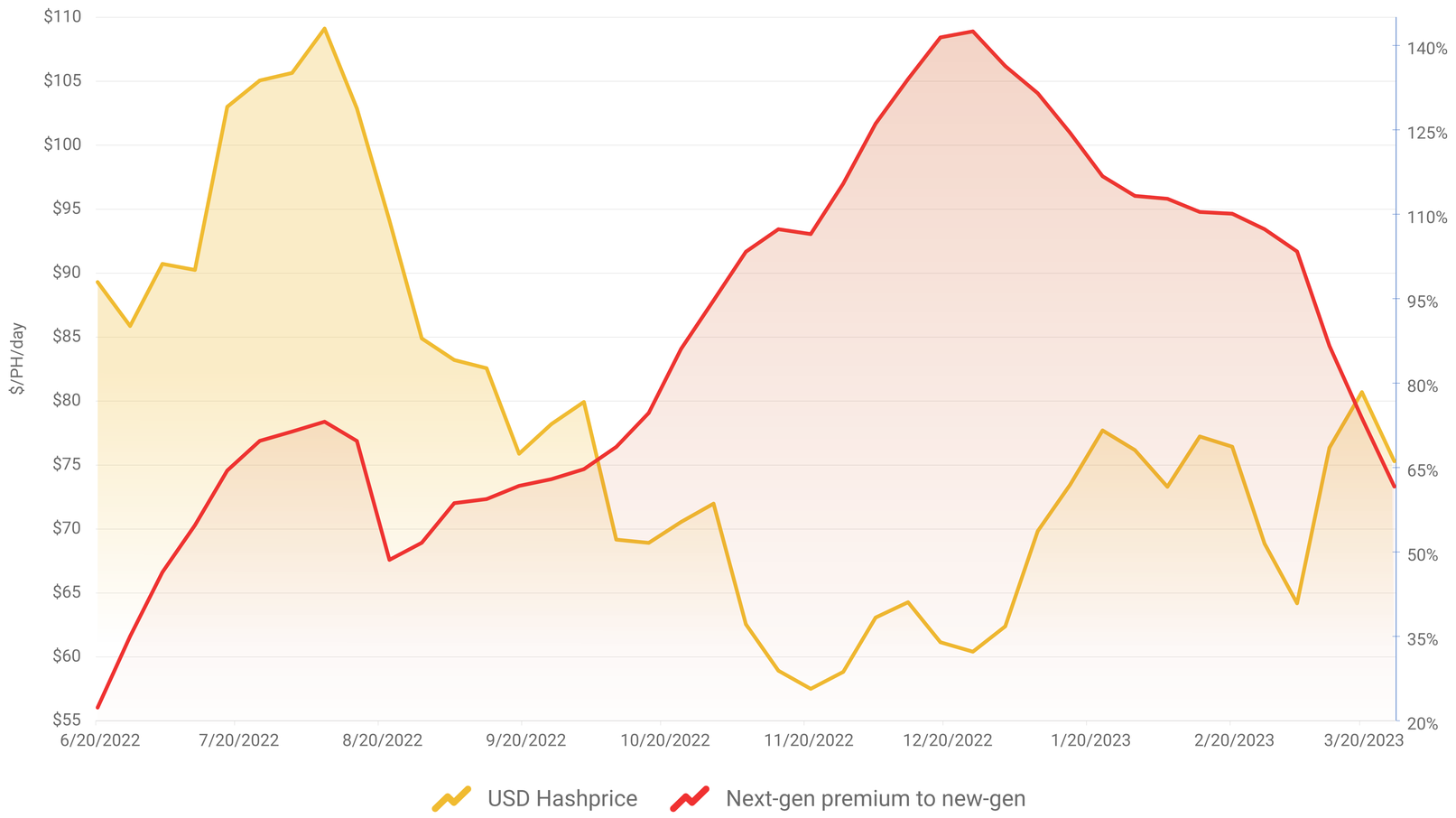
The average premium of next-gen-to-new-gen ASICs per quarter has been growing since Bitmain shipped the Antminer S19 XP in the summer of 2022, and it reached a zenith in Q1.

- **Q1-2023: 112%**
- **Q4-2022: 99%**
- **Q3-2022: 59%**

As Bitcoin's bear market went from bad-to-worse in 2022, margin-starved miners started seeking out next-gen rigs for power efficiency and hashrate gains. Premiums rose accordingly.

We can see from the chart below that the premiums become particularly pronounced in November and December of 2022 – the collapse and fallout of FTX and a time when Bitcoin was at a multi-year low and hashprice was at an all-time low. These rigs became all-the-more coveted as margins shrunk by the end of the year

Hashprice vs. next-gen ASIC premium to new-gen



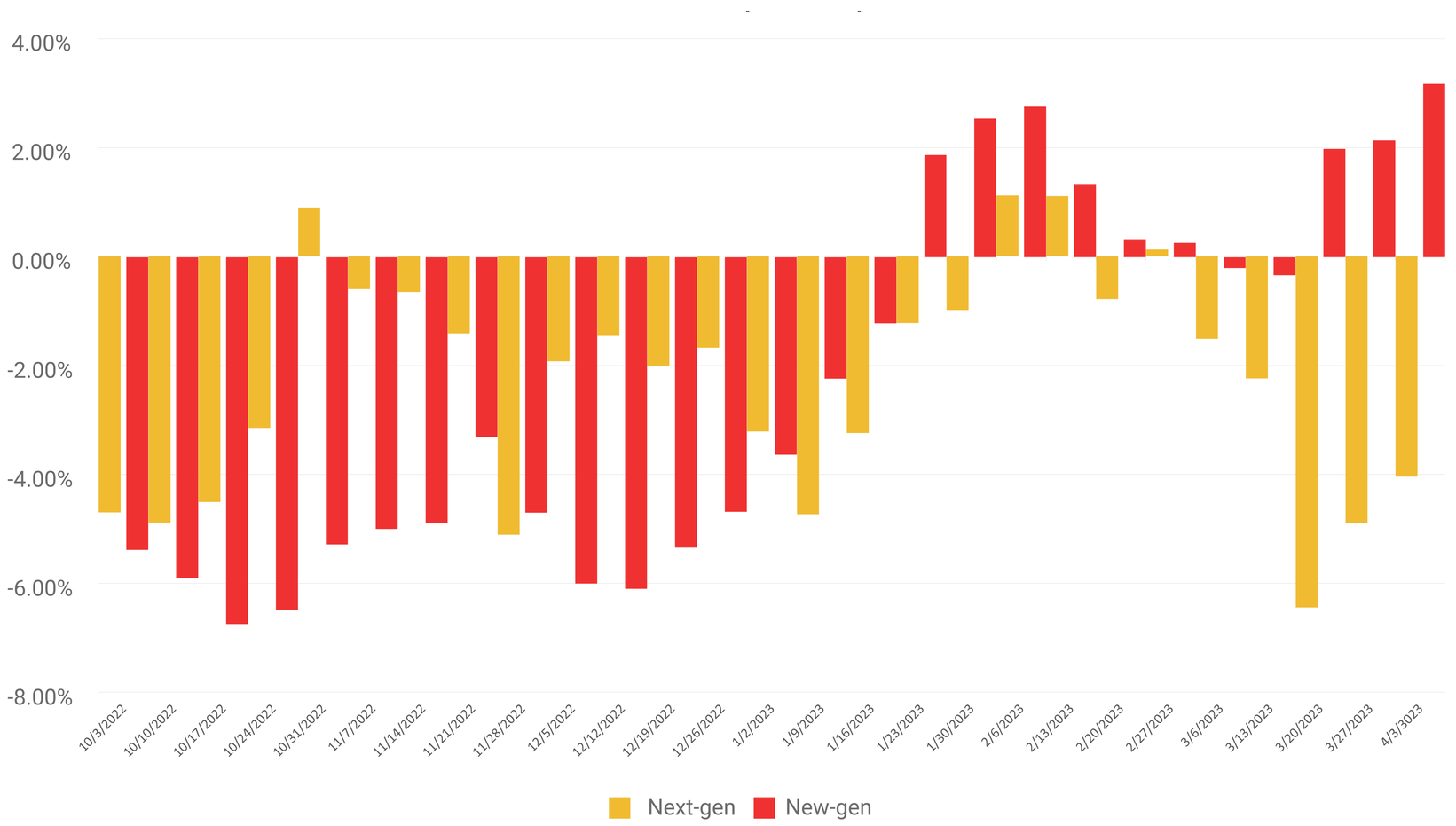
As Q4-2022 and Q1-2-23's premiums suggest, next-gen rigs were more resilient to hashprice changes at the end of 2022, particularly in November. This trend changed by the end of Q3-2023 (at the time of writing, for example,nfollowing our most recent ASIC Price Index update, next-gen rigs only carried a 47% premium to new-gen rigs ($24.30/TH vs $16.53/TH).

Now next-generation rigs are falling in the face of rising hashprice – the opposite of what you'd expect.

To start unpacking this, let's take a look at weekly price changes for next-gen and new gen ASICs over the last two quarter.

We can see that next-gen rig prices fell by fewer percentage points than new-gen ASICs when hashprice crater in Q4 of last year. Next-gen ASICs were less sensitive to changes in hashprice from September through December, and they were particularly strong in November and December, when hashprice was at all-time lows.

Weekly price change of next-gen and new-gen ASICS



With hashprice lower than it had ever been, next-gen ASICs like the S19 XP and M50S+ were clearly in demand at the end of last year. They still are in demand, of course, but prices seem to finally start correcting at the end of March as we can see from the % changes week-by-week in 2023.

Something to highlight here: at the end of March, next-gen ASIC prices started coming down even while hashprice was going up.

The surprise growth of hashprice in March, in fact, could have helped chip away some points from this premium (when margins are thicker, miners don't need to scramble for the most efficient machines). **Corroborating this, so far this year, next-gen rigs have been more sensitive to hashprice changes on the downside and less sensitive on the upside.** At the start of the year, next-gen prices fell by a greater degree than new-gen prices, and they even fell at a time when new-gen prices were rising. **Case in point, next-gen rigs fell 20% over March, while new-gen rigs rose 4%.**

All that said, Bitmain's introduction of the S19K Pro, a new rig with pricing that beats out current S19 XP pricing in the secondary market, is probably the biggest driver of the change to next-gen prices.

Per information from Luxor's ASIC Trading Desk, Bitmain will soon start selling ~$20/TH orders of its forthcoming S19K Pro+. Additionally, high-volume orders of the S19j Pro+ (122 TH/s and 27.5 J/TH) sold for under $15/TH in March (a handful of closed trades on Luxor's RFQ for the S19j Pro+ sold between $13.50-14.40/TH, for example).

Given the attractive pricing and competitive efficiency of these new models, they likely contributed to shaving off premiums for the S19 XP and other next-gen rigs.

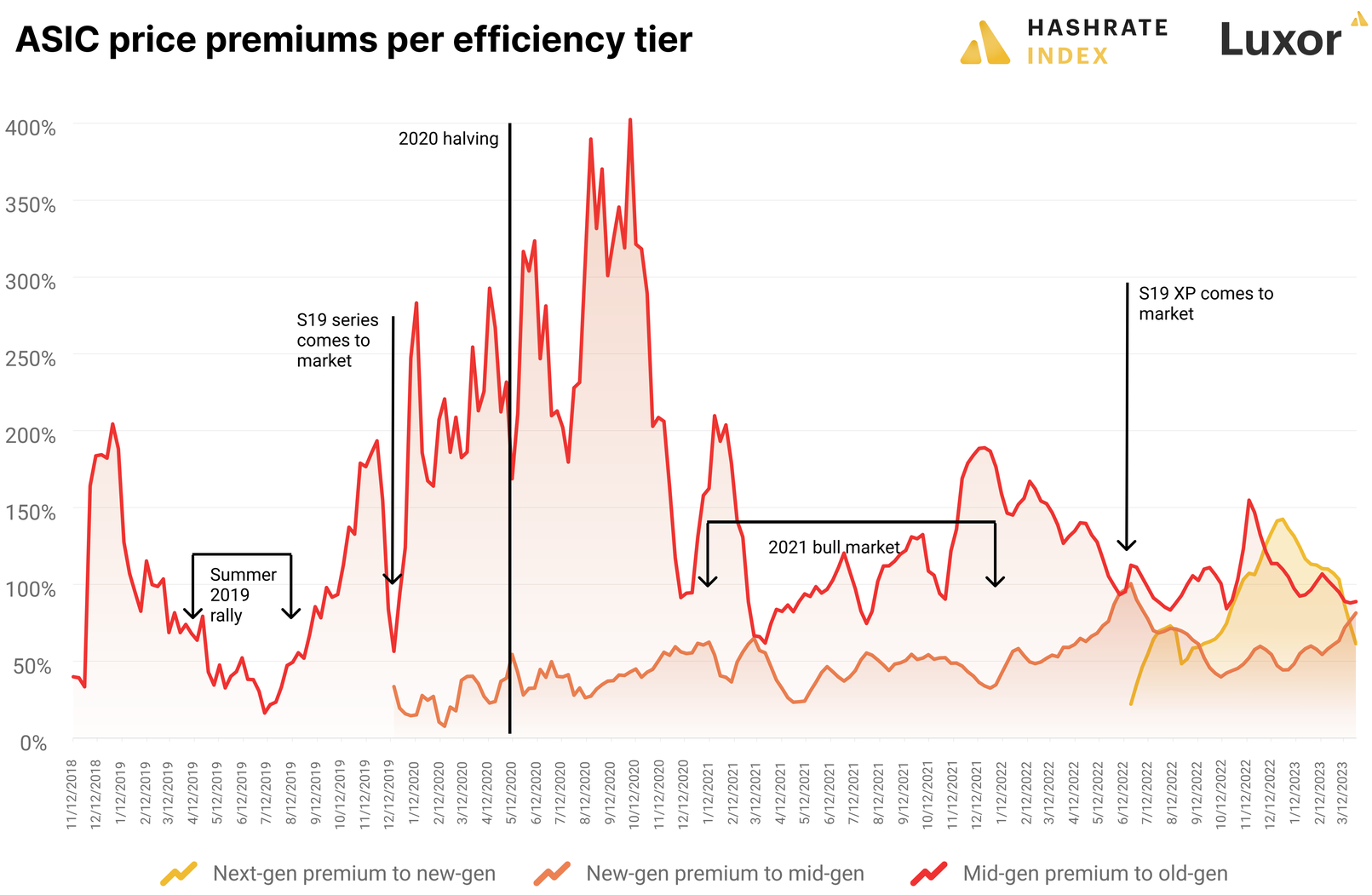
Are the S19 XP, M50S+, and other next-gen rigs still overpriced?

Right now, the market is searching for appropriate pricing for next-gen rigs amid many unknown variables, including hashprice trajectory and equipment repricing from major manufacturers.

Those who purchased S19 XPs and M50Ss at the end of last year almost certainly overpaid for the bleeding-edge hardware. Many of these miners, of course, are preparing for the next halving roughly a year out, so the premium may have seemed justified.

Looking back at Bitcoin mining ASIC pricing trends around the last halving could give us a clue as to where next-gen and new-gen rig prices are headed.

Peeping this historical data, we can see clearly that cutting-edge hardware premiums aren't unique to next-gen rigs like the S19 XP and M50S+. Every time a new Bitcoin mining ASIC comes to market, it carries a premium per terahash to the older models.



A few observations from the above chart:

- Premiums across the board decrease during bullish price action as mining margins increase and inefficient hardware becomes more profitable.
- The premiums have become less severe over time, probably by combination of ASIC market maturation and lesser efficiency gains for each successive generation of Bitcoin mining rigs.
- These premiums typically decrease drastically (at least in the near-term) when a new, more efficient generation of Bitcoin mining ASICs come to market. For reference in the chart above, see Late 2019 when the mid-to-old-gen premium decreases upon the introduction of new-gen models, and mid-2022 when new-to-mid-gen premiums fell with the advent of next-gen hardware like the Antminer S19 XP.

- Historically, when new hardware comes to market, its price premium to the prior generation has been lower than that prior generation's premium to its own predecessor. For example, the premium of new-to-mid-gen rigs has always been lower than the premium of mid-to-old-gen rigs. Next-gen hardware bucked this trend. In the early days of S19 XP trading, next-to-new-gen premiums were lower than new-to-mid-gen premiums, but this trend flipped in mid-September 2022. As next-gen prices came back to earth at the end of March 2023, next-to-new-gen premiums fell back below new-to-mid-gen premiums.

You can see that mid-to-old-gen premiums rise substantially leading up to the May 2020 halving but they plummet directly afterward for the rest of 2020 and into 2021; at the same time, new-to-mid-gen premiums rose steadily from 2020 on as the S19 and M30 series became the gold standard post-2020 halving.

As S19 XP prices react to the S19e an S19 Pro+, you can't help but think that, if Bitmain releases an even more efficient miner in the next year, maybe we could see next-gen rig prices go the same way as mid-gen rig prices last halving.

Out with the new, in with the old, and other ASIC news

Q1 came with plenty of news for the ASIC market

- To kick off the New Year, Luxor launched Luxor RFQ, an open-bid marketplace to buy and sell Bitcoin mining ASICs.
- In March, Luxor launched LuxOS, the first Antminer firmware designed in the US. Currently LuxOS supports the S19 XP, S19j Pro, S19 Pro, and S19.
- Bitmain is now selling pre orders of a new Bitcoin miner called the Antminer S19K Pro. The model's hashrate of 136 TH/s is competitive with the S19 XP, though it's just a hair less efficient at 24 J/TH.
- Additionally, another new miner from Bitmian, the Antminer S19j Pro+, started circulating in the secondary market. Its efficiency doesn't qualify it for next-gen status (under 25 J/TH), but it's more powerful and efficient than many new-gen rigs.
- As stalwarts like Bitmain and MicroBT ramp up production of next-gen rigs, Intel, recently a newcomer to the ASIC fabrication market, is retiring their line of Bitcoin mining chips already.

New Gen Rigs	Hashrate	Efficiency	Wattage
S19 XP	140 TH/s	21.5 J/TH	3010 W
M50S+	136 TH/s	24.0 J/TH	3264 W
M50S	126 TH/s	26.0 J/TH	3276 W
M50	118 TH/s	29.0 J/TH	3422 W
M30S++	112 TH/s	31.0 J/TH	3472 W
S19 Pro	110 TH/s	29.55 J/TH	3250 W
S19j Pro	104 TH/s	29.5 J/TH	3068 W

5

Public bitcoin miners are saved by the bell

Blood was flowing heavily in the public bitcoin sector when we started this year. Many companies struggled to generate sufficient cash flows to service their debts in a sub-$20k bitcoin environment. The biggest public miner by hashrate, Core Scientific, was already bankrupt, and market observers were anticipating a cascade of bankruptcies to follow.

Luckily, Bitcoin's ever-schizophrenic price suddenly decided to go for a mini bull run this quarter, giving bankruptcy-threatened public miners some desperately needed breathing room. The rally has injected a sense of careful optimism into the sector as the bitcoin price hovers around $30k.

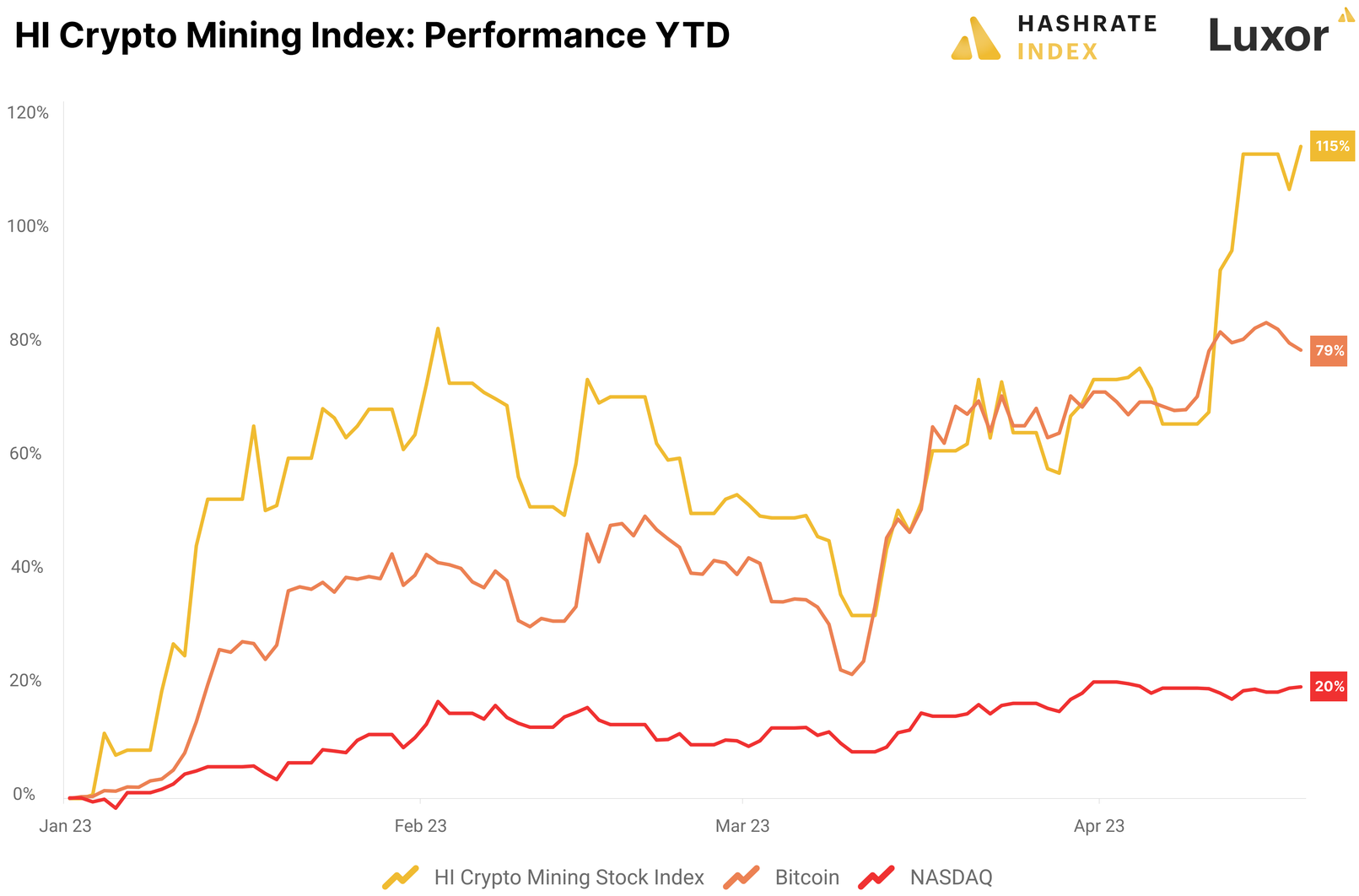
In this chapter, we discuss the most significant trends and happenings in the public bitcoin mining space so far in 2023. We specifically focus on stock performance, mining profitability, balance sheet strength, hashrate growth, treasury management, and also give updates on the big bankruptcies, deals, and lawsuits.

Long-awaited gains come to mining stock investors

Last year, most bitcoin mining stocks plummeted by 80-90%, making this sector one of the worst performers in 2022. However, things change quickly, and bitcoin mining stocks suddenly rallied alongside bitcoin as we rang in the new year, giving wound-licking mining stock investors the opportunity to regain some of their massive losses.

With Bitcoin's price up 79% year-to-date, it is no surprise that mining stocks are soaring. These stocks are heavily correlated with Bitcoin, albeit with significantly higher volatility. Traders are taking advantage of this feature by using these stocks as high-beta, leveraged bets on Bitcoin's price.

HI Crypto Mining Index: Performance YTD

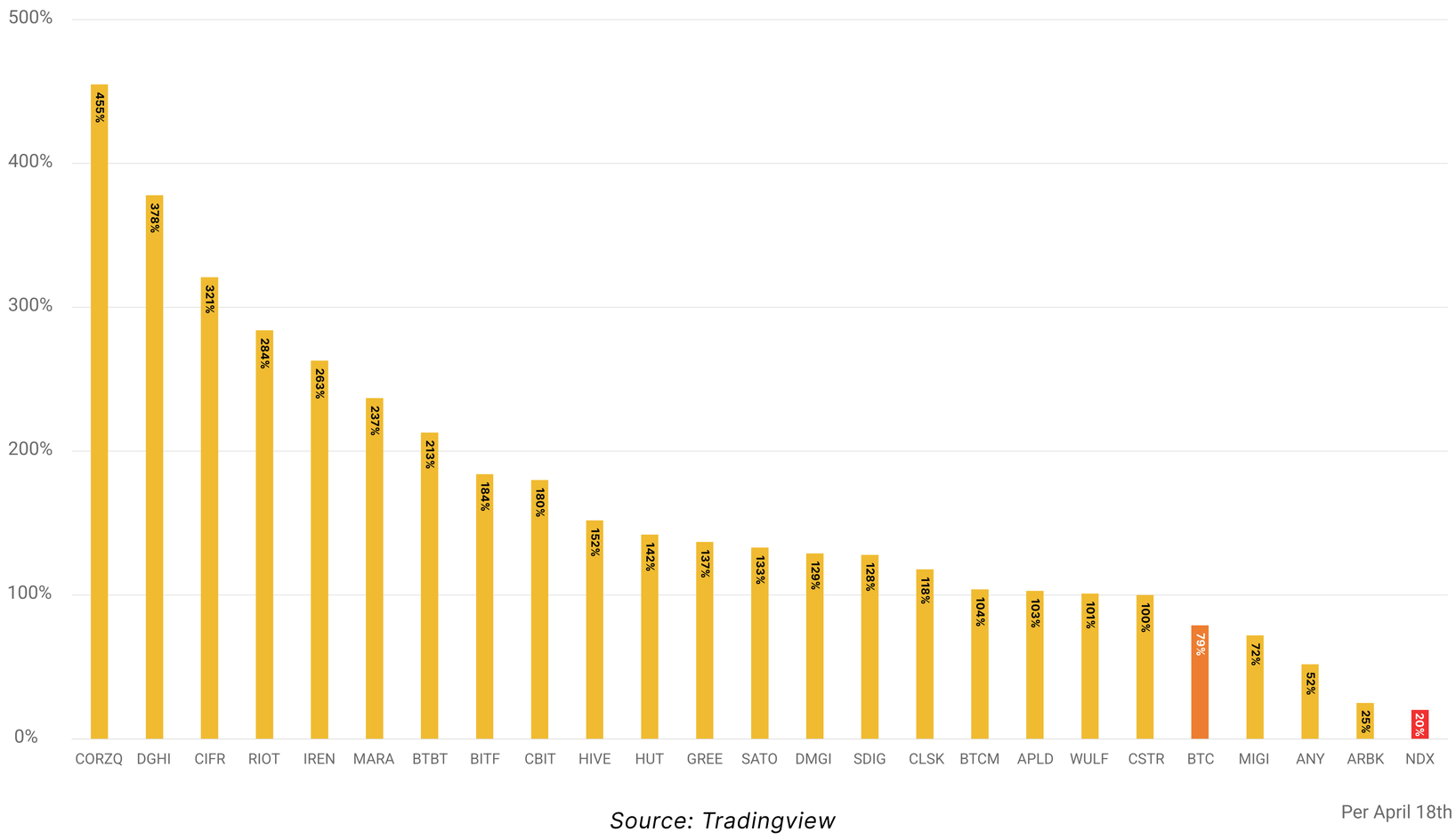


Source: Hashrate Index, Tradingview

The HI Crypto Mining Stock Index has gained 115% so far in 2023, significantly more than bitcoin's 79% increase. Simultaneously, the Nasdaq is up by 20% - a microscopic gain for risk-loving bitcoin mining stock investors, but still considered a massive quarterly increase in traditional finance.

While the bitcoin mining sector has performed terrifically year-to-date, there are substantial performance differences between individual stocks. They all beat the Nasdaq's 20% increase though, and 20 of 23 mining stocks outperformed bitcoin. Let's look at who were the best performers.

Bitcoin Mining Stocks: Performance in 2023



Source: Tradingview

Core Scientific is the best performer so far in 2023 after gaining 455%. Its massive debt has given its equity a boost during the up-only market environment so far in 2023. To the benefit of Core Scientific, current mining economics have disproportionately affected cash flows relative to equity.

Digihost, Cipher, Riot, Iris Energy, and Marathon also performed exceptionally well. Interestingly, most of these companies have relatively low debt levels relative to equity and are thus significantly less financially leveraged than Core Scientific. The outperformance of these stocks is likely caused by company-specific factors, as they have all delivered solid monthly operational updates exceeding expectations this quarter.

While the bitcoin mining sector has performed terrifically so far in 2023, it is critical that investors understand the importance of diversifying their mining stock exposure. The massive performance differences between these stocks in 2023 prove that simply buying one or two mining stocks and hoping for them to deliver leveraged bitcoin exposure is not an optimal strategy. If you solely held stocks like Argo, Sphere 3D, or Mawson, you would not even have beat the bitcoin price this quarter. Therefore, investors using mining stocks as a leveraged bitcoin upside play should own a diversified basket of a minimum of three mining stocks. You can learn more about getting financial exposure to bitcoin mining in this article.

How could bitcoin mining stocks perform during the remainder of 2023?

So far we have only been looking at past performance, which is fun, particularly when everything is going up. Still, the real alpha is only gained by projecting the future, bringing us to the million dollar question: How will bitcoin mining stocks perform during the rest of 2023?

The boring answer is that it all depends on the bitcoin price action and the general risk sentiment of broader financial markets. If Nasdaq and Bitcoin keep rallying, bitcoin mining stocks will keep outperforming them. The author of this analysis is bullish on the bitcoin price in the short term, and thus optimistic about continuous upward price action for bitcoin mining stocks as well. He believes that Bitcoin is repeating its mini bull cycle of 2019, where bitcoin increased by 260% from its 2018 bear market low to a local top in July 2019. If this cycle repeats, bitcoin would top out at $42k sometime this year. Therefore, he is ready to gradually reduce his mining stock exposure as bitcoin ticks towards $40k.

If the bitcoin price was to increase by an additional 40% to reach $42k this year, most mining stocks would rise by more than 50% from today's level, while the four-to-five biggest gainers would soar by more than 150%. The author holds a semi-diversified portfolio of the three bitcoin mining stocks he believes will be the most positively impacted by a continuous bitcoin price increase.

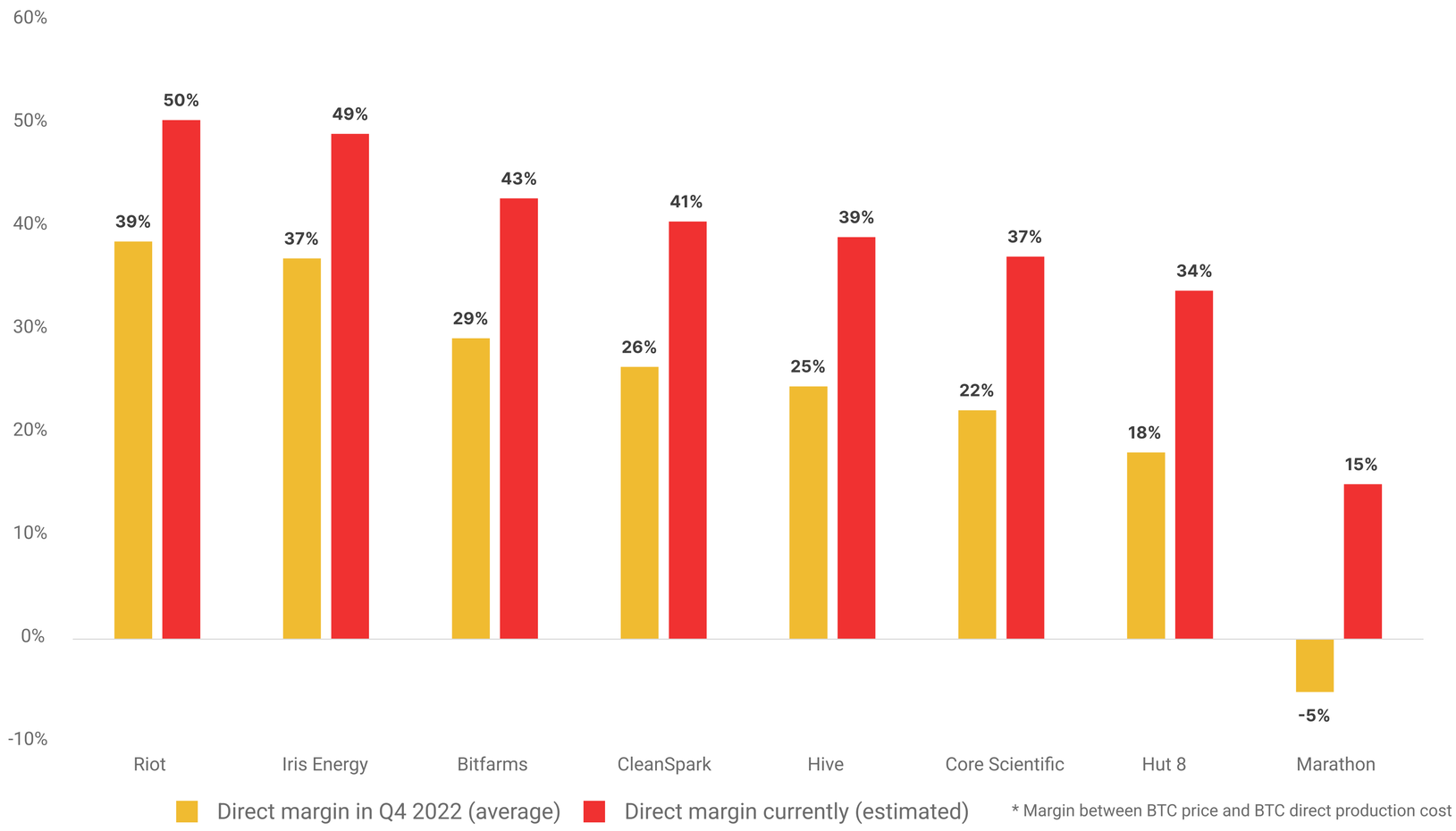
Public miners are no longer on life support

In the previous section, we discussed the terrific performance of bitcoin mining stocks during the previous quarter. These phenomenal gains were primarily due to the extreme increase in mining profitability caused by an increase in hashprice. We will now quantify the impact of the hashprice increase on these companies' direct margin, which is the margin between the bitcoin price and their direct bitcoin production cost.

During the final quarter of 2022, when bitcoin stayed depressed in the $16k to $20k territory, most public miners barely generated cash flows from their bitcoin production. A combination of minimal recurring cash flows and millions of dollars in monthly debt payments led to Core Scientific's bankruptcy and nearly killed several others. If the bitcoin price fell below $15k for an extended period in Q1, many more of these companies would certainly be bankrupt now.

Luckily, in typical fashion, Bitcoin made a last minute upward move, saving several public miners from their seemingly inevitable bankruptcy. The bitcoin price's 79% increase led to a phenomenal rise in the public miners' revenues, although ever-increasing difficulty levels somewhat dampened the effect of the price increase.

Public Miners: Improvements in direct margin since Q4 2022



Source: SEC filings, Hashrate Index

The chart above shows the estimated direct margin of public miners in Q4 2022 and now. For those wondering: the direct margin is the difference between Bitcoin's price and the direct cost of producing one bitcoin. This metric is useful for estimating cash flows from bitcoin production. For example, Riot's 50% direct margin at a bitcoin price of $30k means the company pockets $15k of cash flow per bitcoin produced after paying for electricity and other direct production expenses. Last month, Riot produced 695 bitcoin, corresponding to a cash flow from operations of approximately $10.4 million at the current $30k bitcoin price.

Meanwhile, in Q4 2022, Riot's direct margin was only 39%, while the average bitcoin price during the quarter was only $18k, giving Riot a cash flow per bitcoin of $7k. In December, Riot mined 659 bitcoin, corresponding to a cash flow of $4.6 million - less than half of what they make currently.

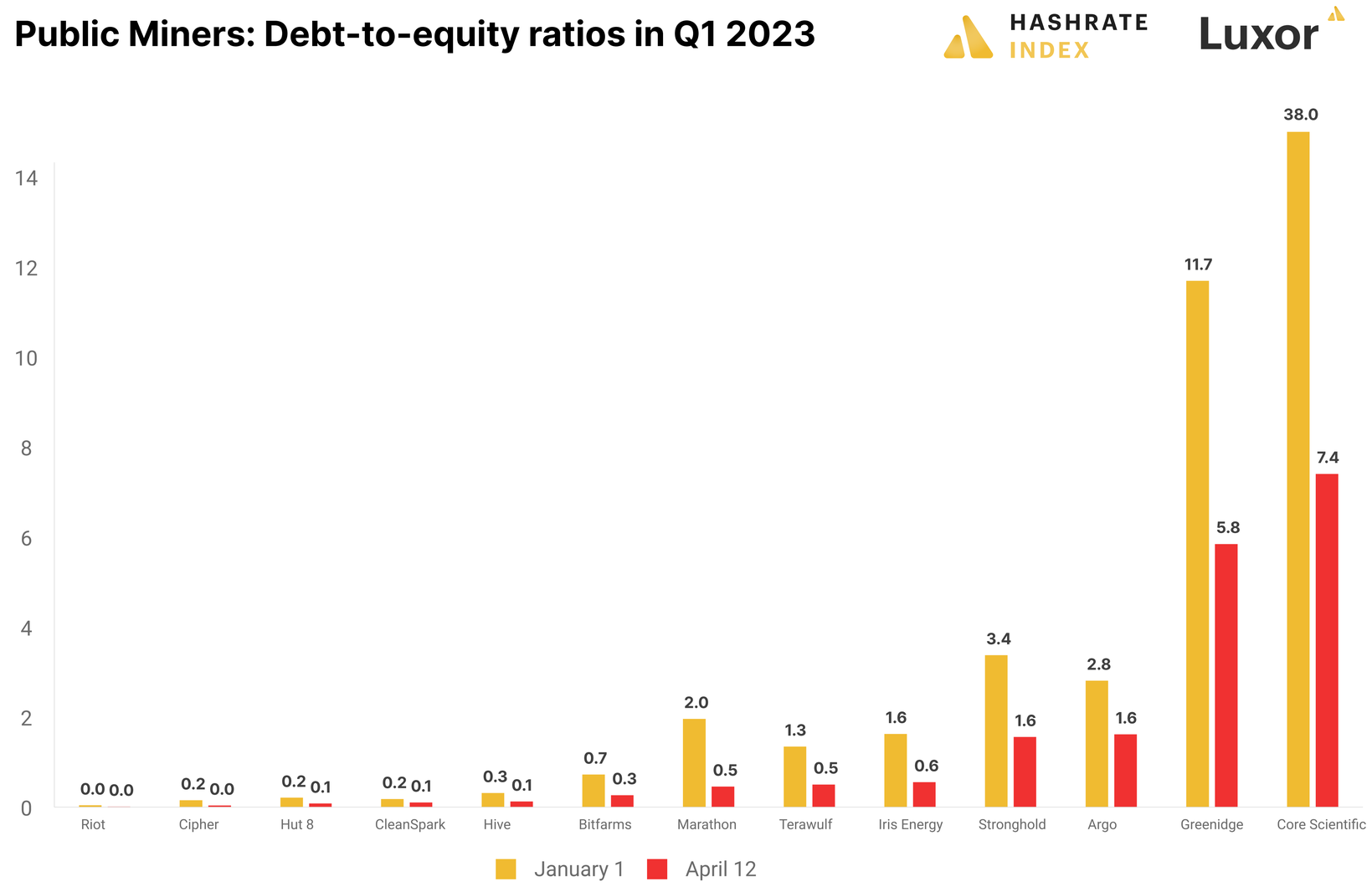
Other companies with high direct margins include Iris Energy and Bitfarms. Although their direct margins have significantly improved in 2023, they are still a long way from the 80% levels that were common in late 2021 and early 2022. Still, at the current margins, most public miners generate sufficient cash flows to service debts and have now climbed out of the life support territory.

Interestingly, Marathon had a slightly negative direct margin in Q4 2022. Now it is an estimated 15% - not something to brag about, but still enough to keep the lights on. Marathon struggled to deploy its hashrate efficiently in 2022, but it is off to a great start in 2023. More on that in the next section.

All else being equal with improving cash flows, it should be easier for these companies to service their debts. But how much debt do they have relative to equity? Let's take a look.

The debt-to-equity ratio directly measures the proportion of equity and debt financing a company's assets. Some levels of debt can leverage return on equity, but it is a double edged sword since the company may go bankrupt if it fails to generate enough cash flows to service this debt. A healthy debt-to-equity ratio for a bitcoin mining company is lower than 0.5.

Public Miners: Debt-to-equity ratios in Q1 2023



Source: Tradingview

As you can see on the chart above, some of these companies had extreme debt levels relative to equity at the start of the year. The situation has now materially improved, as equity valuations have exploded at the same time as many of them have restructured their balance sheets and shed debt.

Even after seeing their financial situation improve considerably, some public miners are still struggling under a mountain of debt. Core Scientific, Greenidge, Argo, and Stronghold, sure should pray for the bitcoin price to continue its upward trajectory. At the same time, companies like Riot, Cipher, Hut 8, CleanSpark, Hive, Bitfarms and Marathon, look rock-solid and will have no problems surviving even if the bitcoin were to revisit $20k.

Bitfarms particularly has worked diligently to strengthen its balance sheet by paying down debt. With a debt of $165 million at the peak in June 2022, the company started to look like a potential bankruptcy candidate. Its situation looks materially better now, as it only has $25 million in debt. Other miners restructuring or paying down debt in 2023 include Terawulf, Iris Energy, Stronghold, Argo, Greenidge, and Core Scientific.

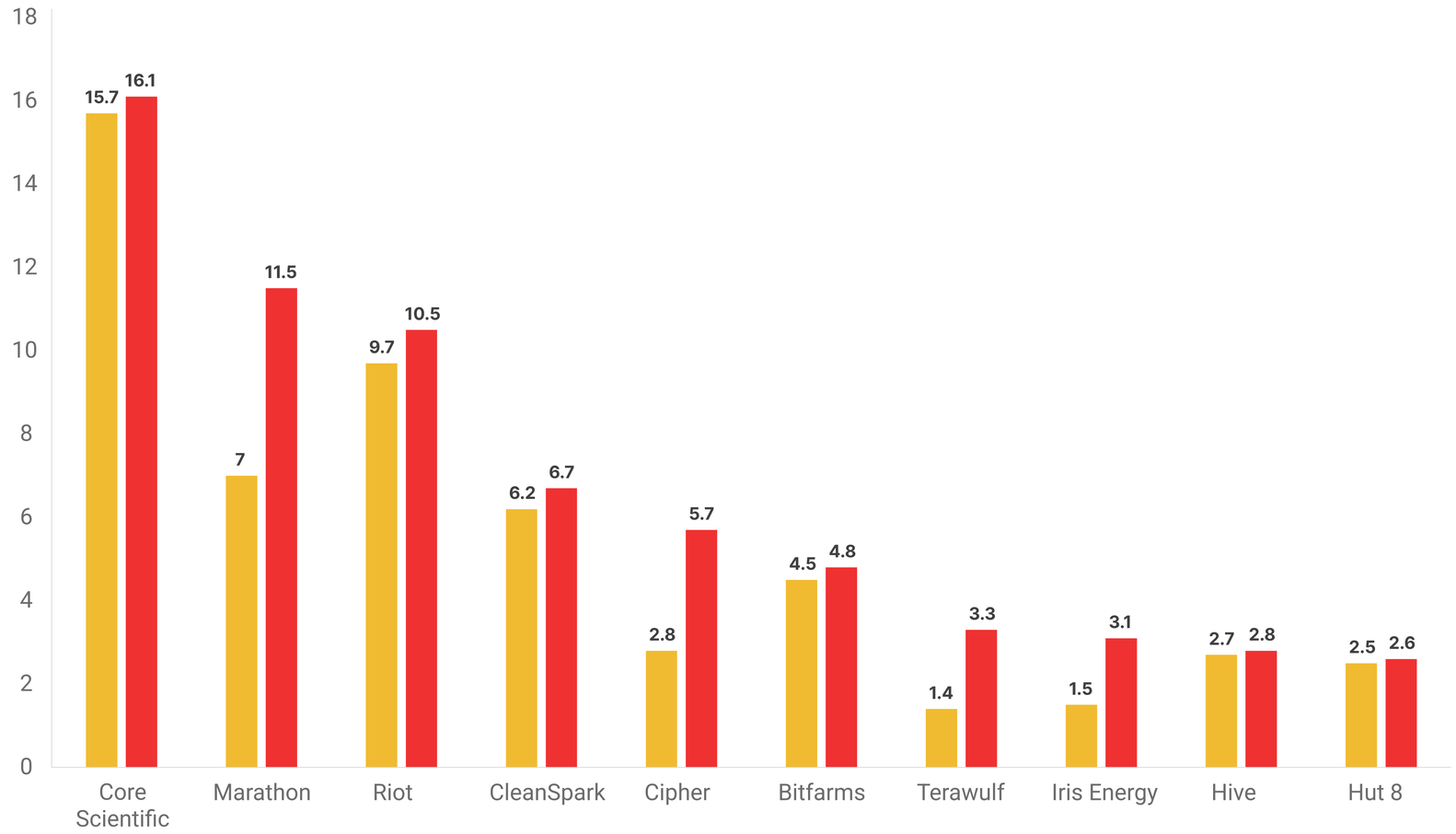
Bitcoin's recent bull run has been a godsend for public miners, saving many of them from bankruptcy and giving them the time to improve their balance sheets. With public miners in shock from almost going belly up in 2022, debt reduction and balance sheet restructuring will likely be an ongoing trend in 2023.

Public miners are growing despite the bear market

We all know the story. The public miners took advantage of the frothy stock market in late 2021 and early 2022 and raised a massive amount of money that they spent on ASICs which they planned to deploy over the remainder of 2022. Fast forward to December 2022, and it became evident that many of these companies had overestimated their ability to plug in ASICs, as their deployment had taken much longer than expected.

Sluggish deployments were mainly caused by slower-than-expected buildouts of mining infrastructure in North America. Much of this infrastructure is now coming online, so public miners significantly ramped up hashrate deployments in the first quarter of 2023.

Public miners: Hashrate growth in Q1 2023



Source: Production updates

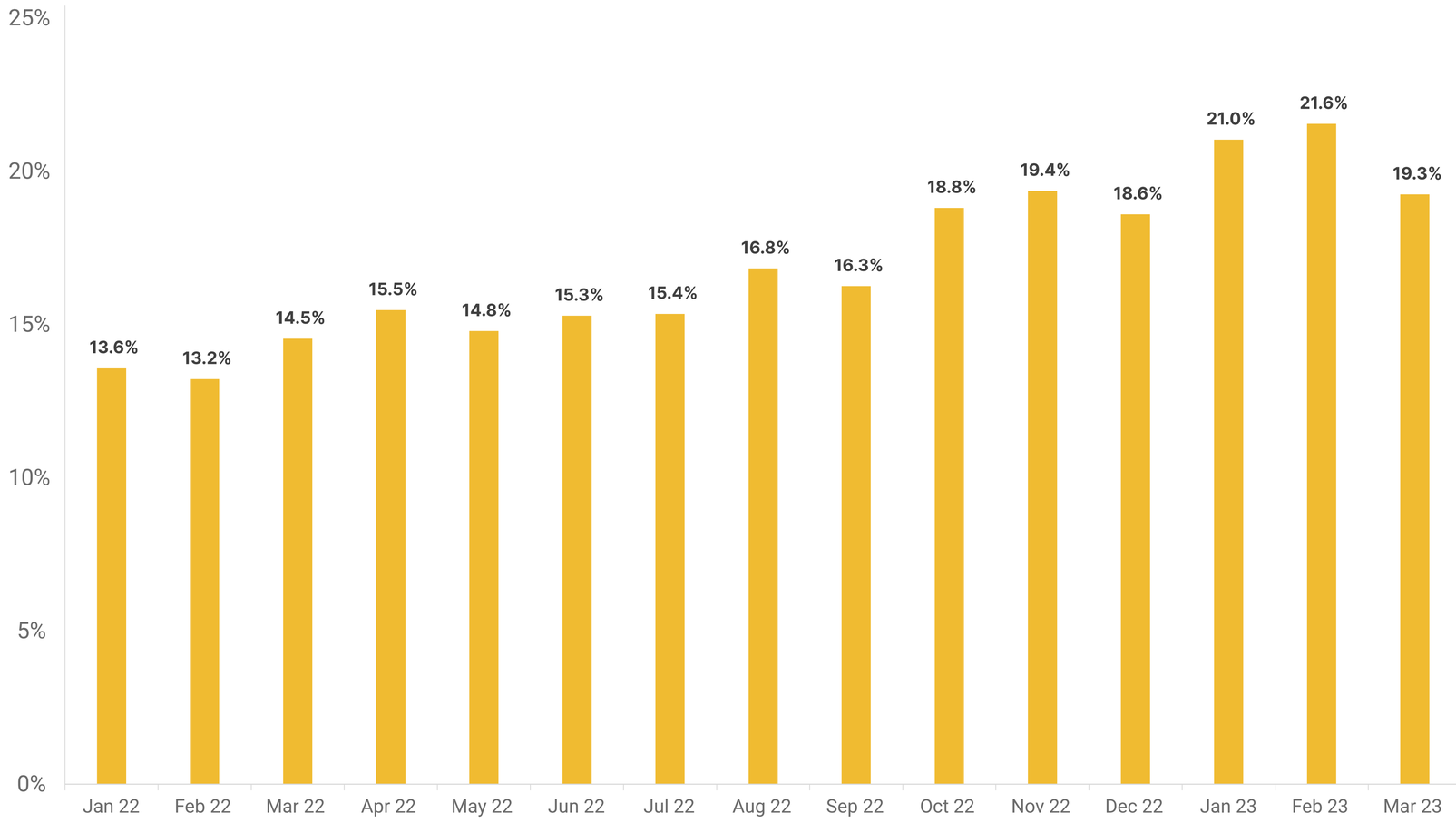
As you can see on the chart above, all public miners have grown their self-mining hashrate so far in 2023, albeit some more than others. The biggest deployers are Marathon and Cipher Mining.

Marathon, the biggest underperformer in 2022 in terms of hashrate deployment, seems to have finally figured out its step. The self-proclaimed capital light miner grew its hashrate from 7 to 11.5 EH/s in Q1 2023. If Marathon keeps up this pace of quarterly hashrate growth, it could reach its 23 EH goal by the end of this year.

Cipher Mining's hashrate growth during the first quarter of 2023 was also impressive. With 5.7 EH plugged in, this new Texas mega miner has now joined the big boys club. Unlike most public miners, Cipher has been good at following its expansion plans.

In aggregate, public miners grew their hashrate by 21% from 69 to 83 EH in Q1 2023. Meanwhile, global hashrate soared by 36% from 255 to 346 EH. Many observers have claimed with a seemingly rock solid confidence that the recent hashrate explosion has come from North American and particularly public miners plugging in machines like never before. We're not so sure about the validity of that hypothesis.

Public miners: Percentage of total bitcoin production monthly



Source: Production updates, CoinMetrics

Firstly, as explained, public miners grew their hashrate considerably slower in Q1 than the global average. In addition, public miners' share of the total bitcoin production has been relatively stable since October of last year, although it saw a slight increase this January and February.

Therefore, hashrate growth is likely coming from other parts of the world, like Russia, the Middle East, and Southeast Asia. There's a significant amount of mid-to-old-gen equipment in these locations which is now cash flow positive after bitcoin's recent price increase.

Let's try to give some alpha here: What is our hashrate prediction of the end of the year? As usual I will give my boring answer - it all depends on the bitcoin price. Still, as I explained previously in the chapter, I'm short-term bullish on bitcoin and believe it could climb above $40k this year, so let's assume that happens.

The public miners have approximately 30 EH of inventory waiting to be plugged in this year, and I expect that they will be able to plug in 20 EH/s of this. Add 40 EH/s on top of that of deployments by private miners, as well as 15 EH/s of already plugged in capacity being turned on due to higher profitability levels, and global hashrate could be 421 EH/s by year-end.

Worryingly, if bitcoin increases by 33% to $40k and hashrate then grows by 22% to 421 EH/s, difficulty increases would eat up a lot of the hashprice growth, and mining profitability wouldn't be too far off from current levels.

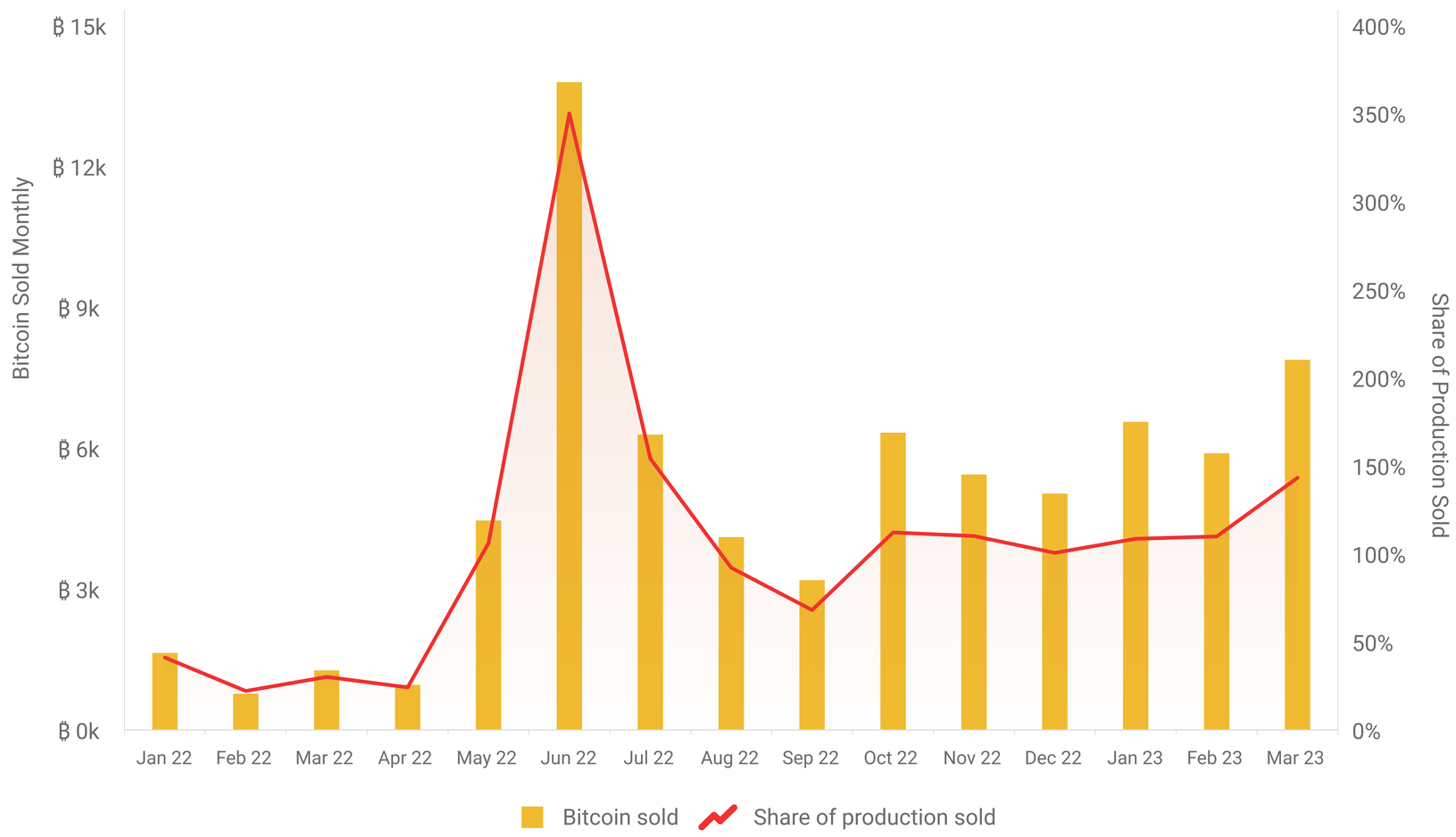
Is the public miner hodl narrative dying?

The bear market of 2022 forced the public miners to start selling their mined bitcoin, and we expect this trend to continue.

In late 2021 and early 2022, virtually all public miners followed the hodl strategy, where a miner keeps as much of its mined bitcoin as possible. Most of them only sold a fraction of their production and built up huge treasuries consisting of thousands of bitcoin. A couple of public miners even made a point out of never selling a single satoshi, instead funding operations through diluting shareholders or taking on debt.

The chart below shows how many bitcoin the public miners collectively sold per month since January 2022. As you can see, when bitcoin's price started collapsing in May 2022, public miners sold more than 100% of their production for the first time. They have since kept dumping their inventories, selling 120% of their production in Q1 2023.

Public miners: Bitcoin sold by month and share of production sold



March was the second-biggest selling month in the history of public miners. The rising bitcoin price this month incentivized these companies to liquidate bitcoin holdings to pay down debt and other obligations. This behavior is in line with our prediction that price-shocked public mining companies will use the opportunity to strengthen their balance sheets. Another reason why miners are selling an increasing amount of bitcoin is due to the closure of other fundraising taps, as raising equity and debt has become much harder than in 2021 and early 2022.

So, does this signal an end to the hodl narrative? We believe so -- at least, all out hodling. Learning from the mistakes of the previous cycle, the bitcoin miners of tomorrow will be much more sophisticated when it comes to risk management.

Holding massive amounts of bitcoin not only makes a miner even more exposed to bitcoin price volatility, but it also entails a considerable alternative cost, as this bitcoin could have been spent on capacity expansion instead of just sitting idly.

Updates on bankruptcies, mergers, and acquisitions

There are a number of private miners looking to go public through SPAC deals, as well as one merger and one bankruptcy proceeding. In this section, we will give you a short update on these deals.

Hut 8's and US Bitcoin's merger

On February 7th, public miner Hut 8 and private miner US Bitcoin announced a merger-of-equals that will join these companies under the Hut 8 brand. The combined company will have 5.6 EH of installed self-mining capacity at five sites in the US and Canada, as well as 220 MW of hosting infrastructure and 680 MW of managed infrastructure.

The companies are working on legal and accounting matters related to the merger and expect the transaction to close in Q2 2023.

Read this article to learn more about the merger.

Griid's SPAC-deal

Griid's long-anticipated reverse merger with Adit EdTech is on the fritz once again. Originally announced in November 2021, Griid and Adit EdTech have delayed the merger several times, once at the beginning of the year on account of Adit EdTech's reported inability to meet New York Stock Exchange listing requirements.

Adit EdTech published an 8-K on April 5 that stated they are delaying the merger once again, the fourth time they've done so this year. The new tentative finalization date is May 14. The duo only has two more extensions – one month each, so the absolute latest time they could complete the merger process would be July 14.

Bitdeer's SPAC-deal

Cloud mining giant Bitdeer went public on April 14th through a merger with the special purpose acquisition company Blue Safari Acquisition Corp. The company is now tradeable on the Nasdaq under the ticker BTDR.

The stock had a tough debut on the Nasdaq, falling by 20% on its first trading day. The deal was originally planned to close in November 2021 at a $4 billion valuation, which has now fallen to $450 million due to deteriorating market conditions.

Bitdeer is now one of the largest public bitcoin miners, operating six mining facilities in the US and Norway with an aggregate power capacity of 775 MW and a hashrate of 16.2 EH/s.

BitFuFu's SPAC-deal

Bitmain-affiliated cloud miner BitFuFu plans to go public through a SPAC deal on May 22nd this year. The firm originally intended to go public in the third quarter of 2022, but it has postponed the listing several times due to difficult market conditions.

If the deal closes in May, investors will have the option to pick and choose between two cloud mining stocks.

Rhodium's SPAC-deal

Rhodium is expected to go public through a SPAC deal by the end of this year. The Texas-based immersion-focused miner first announced its intent to go public through an IPO in January 2022 at a $1.7 billion valuation, but it postponed those intentions just one week later.

Last September, Rhodium announced new plans to go public through a SPAC deal with SilverSun Technologies before the end of 2022. Just as last time, these plans didn't materialize on time. Neither of the two companies has released statements on the progress of this merger.

Core Scientific's bankruptcy

The once bitcoin mining king was dethroned during the bear market of 2022. The company declared bankruptcy in December 2022 after being crushed under the weight of its massive debt amid a falling bitcoin price and rising electricity prices. The US-based company is still operating during the bankruptcy proceedings, but its shares have been downgraded from Nasdaq to OTC markets.

Core Scientific is a massive company with a combined self-mining and hosting hashrate of 21.8 EH/s. Bankruptcies at this scale will be a complicated processes, and we still don't have any clear indications for what will ultimately happen to this company. The company's stated goal is to pursue a restructuring backed by creditors who hold over 50% of the company's convertible notes.

Sue City Blues

A couple of prominent lawsuits popped up last quarter among the publicly-traded miners.

Sphere 3D vs. Gryphon Mining

In perhaps the strangest of all the suits, Sphere 3D is suing Gryphon Mining, its business partner, which it merged with last year, for losing $500,000 worth of BTC. A Gryphon Mining employee accidentally sent 26 BTC in January to a hacker pretending to be Gryphon Mining's CEO, Rob Chang.

Additionally, Sphere 3D claimed that Gryphon provided inadequate services as part of their merger and that Gryphon misrepresented its own hashrate by publicly stating that it owned hashrate that belongs to Sphere 3D. Sphere 3D is seeking damages in excess of $75,000.

SBI Crypto vs. Whinstone

SBI Crypto, the Bitcoin mining and crypto arm of Japanese internet company SBI Holdings, is suing Riot Platforms' subsidiary, Whinstone (the Rockdale, Texas mining facility that Riot acquired in May 2021).

The Japanese company is seeking damages for what it claims are operational delays and inadequate operating conditions for hosted ASICs at Riot's Whinstone site.

Texas bill takes aim at Bitcoin mining demand response

The most significant state action against the Bitcoin mining industry actually came in April, but the planning certainly took place in Q1.

We're talking about **Texas Senate Bill 1751**, which would cap how much power Bitcoin miners in the state can provide to ERCOT in demand response programs.

The Texas Senate actually passed the bill while we were writing this report, and it is currently headed to the Texas House of Representatives. If it passes there and Governor Greg Abbott doesn't veto it, the bill would restrict the total percentage of demand response Bitcoin miners can provide to 10% of total demand response at a given time. It would also prevent miners from using certain property tax breaks.

5

NFTs are back on Bitcoin, but don’t call them NFTs

Every once and a while, a new idea comes to Bitcoin, usually in the form of major technical innovation. Sometimes, these ideas come in the forms of a breakthrough solution to an old problem (e.g., Lightning). Other times, a little-known feature that has been sitting quietly in the shadows of public attention gets an upgrade.

Ordinals / Inscriptions were the latter.

Ordinals (also called Inscriptions and vice versa, though the terms refer to two separate things) are a new way to make NFTs on Bitcoin. While inscriptions have always been possible (and the idea of ordering satoshis using ordianl theory dates back to 2012), Bitcoin developer Casey Rodarmor introduced a new method to produce inscriptions using Taprscript (and he doesn't like calling them 'NFTs,' so he opts for 'inscriptions' or 'digital artifacts').

An ordinal is any number that defines a position in a series (e.g, first, second, third). In this case, the ordinal is the unspent transaction output (UTXO) for a specific satoshi. This satoshi includes an inscription with the NFT's content, which could be txt, an image, an HTML, or even an MP3 file, and the ordinal marks this inscribed sat as a special transaction so users can identify and track them. Notably, an ordering system for sequencing satoshis was proposed as early as 2012.

Inscriptions have a few primary building blocks:

- Transaction witness field: The witness field of a transaction is where the NFT's data and content live.
- Inscription: The inscription is the NFT's substance – the actual content being minted onto the Bitcoin blockchain and of which the NFT represents ownership. Inscriptions are engraved on the transaction witness section of a UTXO and are ascribed to the first satoshi of the first output in a transaction. You'll also see people refer to digital artifacts/ordinal NFTs as inscriptions – the three terms have become synecdochally interchangeable.
- Envelope: Inscriptions are stored in what Rodarmor calls an "envelope" that consists primarily of the Opcodes OP_IF and OP_FALSE. Like OP_RETURN, these operational codes are used to give instructions to the Bitcoin blockchain. In this case, OP_IF stores the file that is inscribed, while OP_FALSE makes sure that this data is never actually executed and pushed through the stack **(so despite some fearmongering, full nodes don't need to process and validate an inscription, just the UTXO set it is tied to).**
- Ordinal numbers: The mathematical theory of numeric sequencing, which in this case is used to distinguish individual satoshis as 'digital artifacts.' Ordinal sequencing marks a specific satoshi of the first output of a transaction as the inscription; once marked, this satoshi can change hands and be traded like any other NFT.

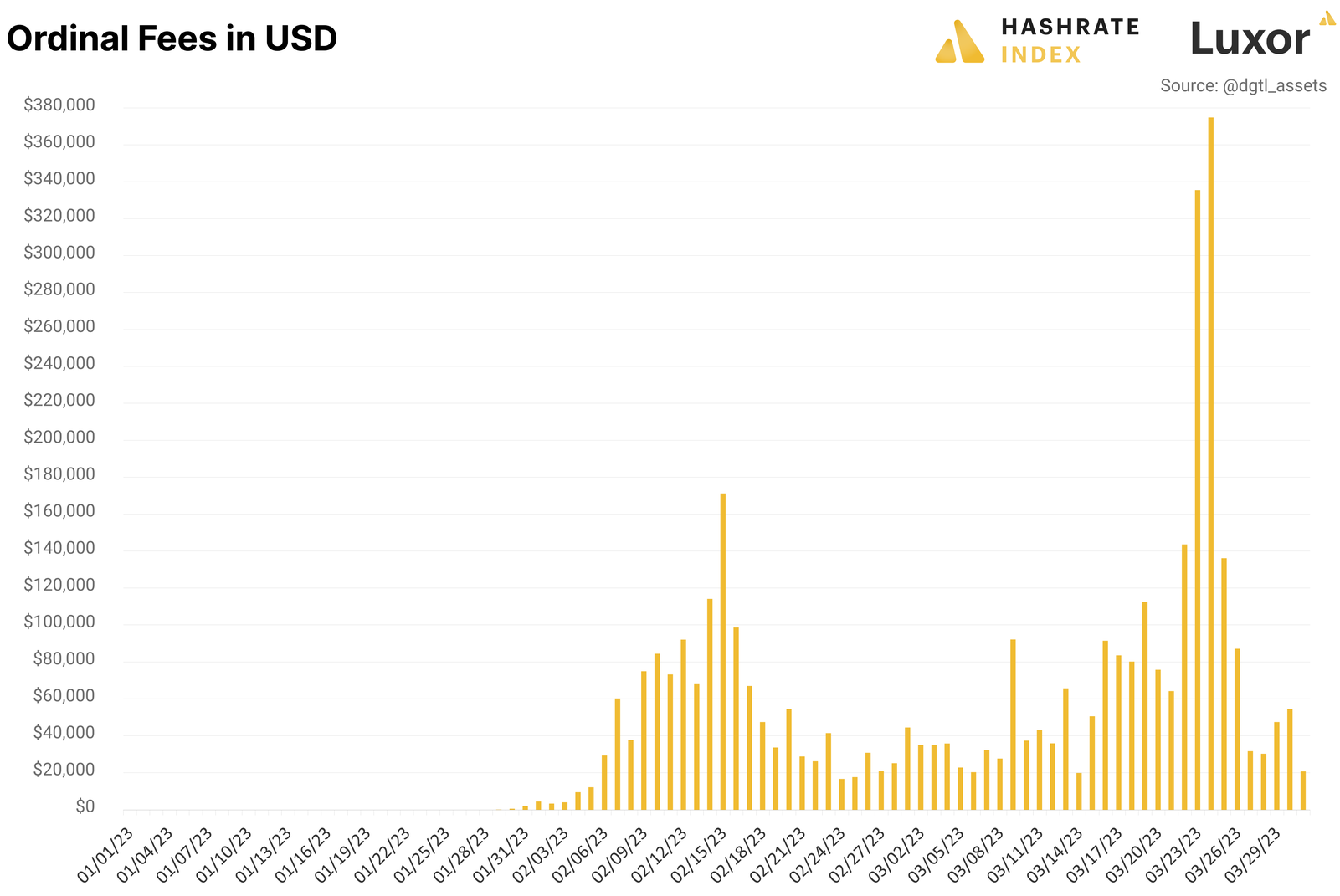
Unlike Counterparty NFTs, which are limited to 80 bytes, **inscriptions have no data limit besides the 4 MB data limit of the transaction witness field.** So if you have a file big enough, you could theoretically mint an ordinal NFT that fills up an entire Bitcoin block on its own (Luxor put theory into practice in February by mining the first 4 MB block).

At the time of writing, there are over 1.1 million inscriptions.

Inscriptions boost transaction fees for Bitcoin miners

The inscriptions craze has undoubtedly been a good a thing for Bitcoin miners.

Per a Dune Analytics dashboard from dgtl_assets, inscription transactions netted miners 150.32 BTC worth $3,731,429 in Q1. All transaction fees in Q1 paid miners 1904.69 BTC worth $45,808,197, so inscriptions represented 7.9% of all transaction volume in Q1.

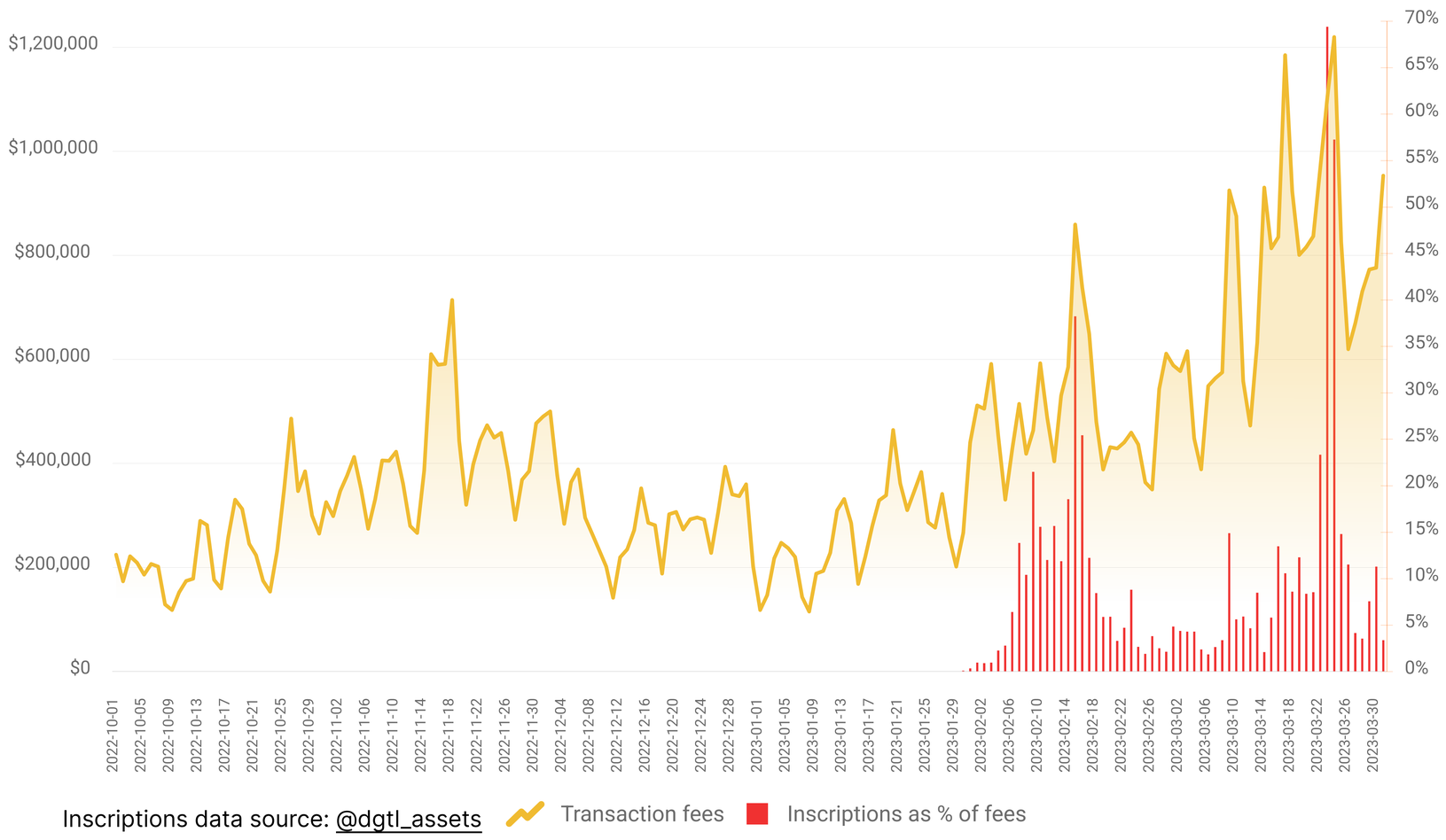


All said and done, the inscriptions craze led to an increase in transactions and demand for block space, and this propelled transaction fees to their highest levels since July 2021, the onset of the Great Hashrate Migration.

Indeed, inscriptions are netting miners more fees than they otherwise would earn. They have driven demand for blockspace and created ***direct pressure*** on transaction fees with their own fees and ***indirect pressure*** by raising the floor for average fees for other transactions. If all of the blockspace demand were economic transactions without the SegWit discount, then the fees miners are earning would be much higher.

But that demand doesn't exist right now and demand for inscriptions does, so miners will welcome the increased fee revenues they earn from these inscriptions even if it isn't exactly a fortune right now.

Bitcoin daily transaction fees vs. inscriptions as a percentage of transaction fees

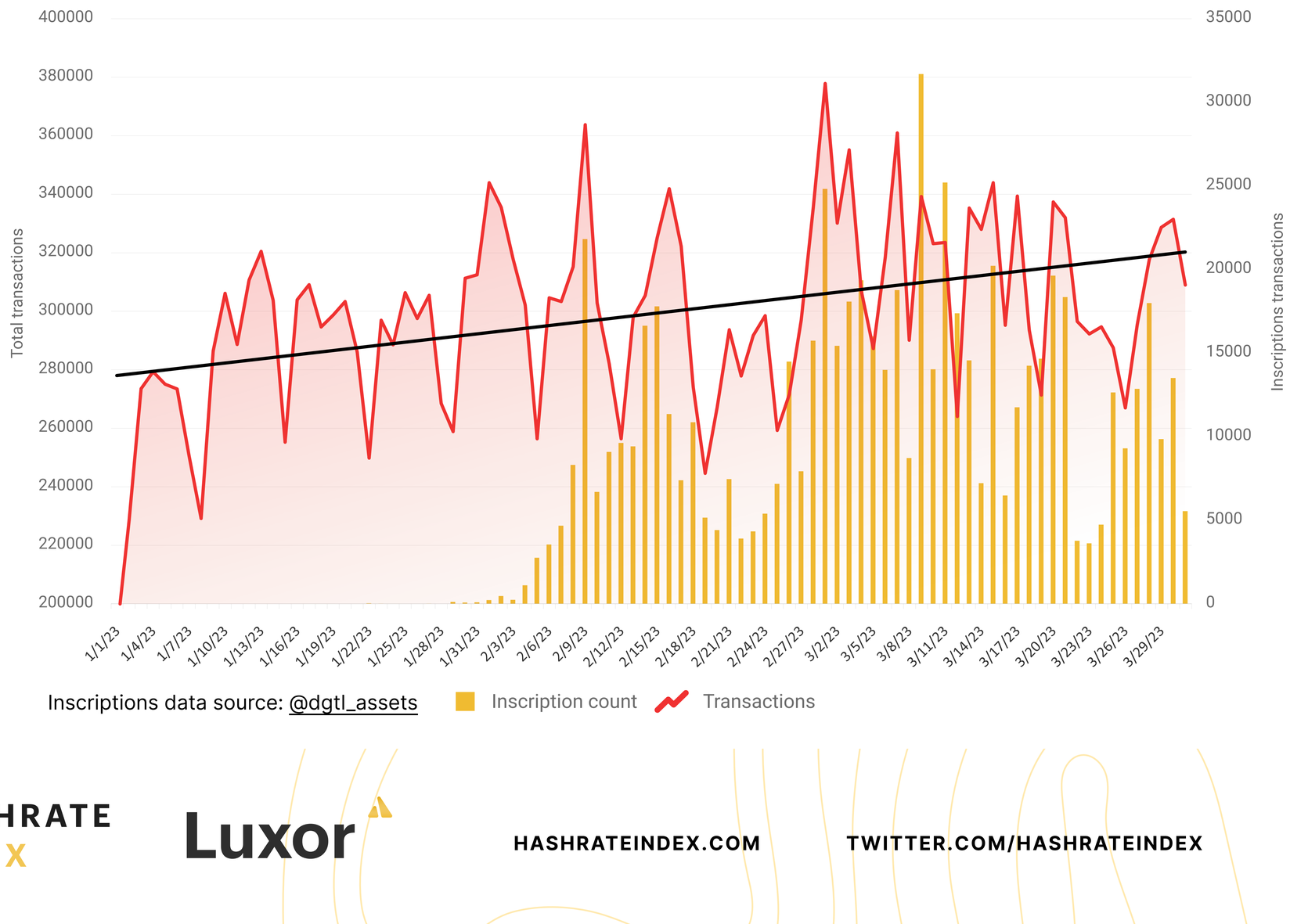


Even on days when both transaction and inscription volume were not high, inscriptions set a floor for transaction fees and kept them higher than they otherwise would be. Case in point, Q1's average for transaction fees as a share of block rewards was 2.30%, versus 2.02% in Q4-2022 -- a 13.8% increase.

Driving the increase in fees, we can clearly see that inscriptions raised the floor on daily Bitcoin transactions in the chart below.

Inscriptions themselves are a novel use case for Bitcoin transactions that carry utility outside of normal economic transactions. What's more, these inscriptions are driving new users to Bitcoin from the multi-chain universe of NFTs, so inscriptions/ordinals offer not only a new use for blockspace, but they also widen the net of Bitcoin's influence to users who otherwise may not have downloaded a Bitcoin wallet or signed a transaction.

Bitcoin daily inscription count vs daily transaction count



Naturally, when NFTs start flooding Bitcoin's blockchain, inscriptions have been controversial, so much so that some Bitcoiners call the transactions spam and have started devising ways to filter such transactions from their nodes.

The long-term viability of NFTs is another conversation entirely, but if they do remain a fixture of our increasingly digitized culture, then they will be active on Bitcoin, too. This has implications for a future when Bitcoin mining needs to subsist solely on transaction fees, particularly if we look at out-of-band payments for inscriptions and inscriptions collections as a proto form of Bitcoin miner/maximal-extractable value (MEV).

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2023: Countdown to the Halving

2023 has certainly caught us by surprise so far, and Bitcoin's current rally has us reevaluating our projections for the coming year.

Whether or not the rally lasts is on every miner's mind. Right now, the profitability boost has suspended the mining industry in something of a limbo. Miners who were at or under breakeven costs last year have a second wind now; public bitcoin miners who were on the brink of bankruptcy, if they were not outright bankrupt, now have some extra runway; miners who wanted to expand at the end of last year when the economics didn't make sense are wondering if now is the time.

The question looming in this limbo is, "Is Bitcoin's rally just giving us more borrowed time, or is this a real reversal?"

The question is as pertinent as ever given that the halving is almost exactly a year away as we write this.

With that and other factors in mind, some things we'll be keeping an eye on for the rest of the year:

- Hashrate growth in the summer. Will we see the same trend as last year, where hashrate stagnated during summer heatwaves and curtailment events? Or will hashrate growth outside of North America mute the significance of this trend?
- Continuing this thought, where is all of the new hashrate growth coming from if not North America? We're hearing reports of big growth in Russia, as well as expansion in the Middle East and Asia. We need more data before we can be certain how much is where, so this will be a focus for our research team in the coming months.
- As we approach the halving, will the premium for next-gen rigs over new-gen rigs rise as we have seen in the past? We think this is a likely scenario.
- Will the Federal Reserve and other central banks pause or lower rates in the coming months? If they do and Bitcoin's price runs up through the year, how does this affect how miners prepare for the halving with regard to expansion, changes to OPEX/ CAPEX, etc?
- Will Q1's hashprice reversal be enough to resuscitate beleaguered miners (looking particularly at the public ones that were (or near) bankrupt). And/or does it last, or is this just a moment of reprieve before the bottom ***really*** drops out?

That last point really hits on the anxiety underpinning this latest Bitcoin price / hashprice movement and whether it lasts. It's hard to believe that the bear market is over and that this isn't just a significant relief rally following 12 brutal months of near endless selling (like in 2019).

Don't get us wrong, we'll take the reprieve. But with the April 2024 halving and hashrate growth ahead, we'll no doubt revisit hashprice all-time lows sometime within in the next year or two. So we'll take $70-80/PH/day hashprice (or higher if we're really lucky) for as long as we can get it, and we'll enjoy the sirloin while it lasts -- because the ramen days could be just around the corner.