

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CRUSOE ENERGY SYSTEMS, LLC
Petitioner

v.

UPSTREAM DATA INC.
Patent Owner

Case PGR2023-00039
Patent No. 11,574,372

DECLARATION OF STEPHEN BARBOUR

EX2011

I, Stephen Barbour, hereby declare as follows:

1. I am the majority owner, President and CEO of Upstream Data Inc. and have also acted as the principal designer for our prototypes and commercial products since we incorporated in January 2017. I am a named inventor on U.S. Pat. No. 11,574,372 (the “’372 patent”).
2. I have personal knowledge of the matters set forth herein, and, if I am called upon to testify, I could and would testify competently thereto.
3. I herein provide information regarding Upstream Data’s products, including our “HashGen” or “Hash Generator” and “Hash Hut” systems and installations. I understand that the information I am providing may be relevant to certain issues pertaining to secondary considerations of non-obviousness. While I am not an attorney, I have been informed that factors such as commercial success, long-felt need, skepticism and industry praise may be objective evidence of nonobviousness. Moreover, I understand that such secondary considerations may have greater weight when they are tied to a product that embodies the claimed features and is coextensive with them. With this in mind, below I discuss how Upstream Data’s systems embody certain claims of the ’372 patent. I have been informed that Upstream Data’s technical expert, Dr. Fengqi You, may provide additional

explanation regarding how Upstream Data's systems the inventions claimed in the '372 Patent.

I. BACKGROUND

4. I have over 14 years of experience in the field of oil and gas production technology, and I have over 7 years of experience in the field of blockchain mining technology. My interest in oil and gas production technology started when I was hired as a production engineer for Husky Energy in Lloydminster, Saskatchewan in 2011. In this role I was responsible for the maintenance and optimization of upstream oil and gas production facilities, both downhole artificial lift systems and the associated surface facilities. My interest in blockchain mining technology started when I learned about bitcoin in the summer of 2016, after I had left Husky and started my own business (Activate Artificial Lift Inc.) to develop innovative improvements and IP for oil and gas technology, which I still run presently with multiple licenses for commercially successful inventions. While I was working on IP licensing for my innovations in artificial lift systems, I spent my free time learning about Bitcoin and Bitcoin mining technology. It was at this time in 2016 that I first formulated novel ideas regarding using the energy of stranded gas to power Bitcoin mining. As I discuss in more detail below, at that time the oil and

gas production industry was not aware of Bitcoin mining technology. The industry was venting or flaring so-called “stranded” gas – gas which could not profitably be delivered to a counterparty due to the absence of a gas line or an electric grid connection. On the other hand, the Bitcoin mining industry did not know much if anything about the oil and gas industry and was not aware of stranded gas and the associated financial liabilities it causes, such as regulatory-enforced rate limits to the oil production. Instead, the Bitcoin mining industry believed that hydroelectric power was the optimum solution because it was generally inexpensive and reliable to power high cost, hyper-depreciating and energy-intensive industrial miners.

5. I attended Memorial University of Newfoundland from 2005 to 2011. In 2011, I earned a bachelor's degree in Mechanical Engineering. During my studies I participated in six (6) separate co-operative work placements (each being 4 months in duration) in various industries and roles. In no particular order, two of my six placements were completed working for Memorial University where in my first placement I was tasked to help a local slate quarry automate their cutting machines, and in my second placement I was tasked to build a new lab for the Mechanical Engineering department to dyno test engines with locally developed biodiesel. I also was fortunate enough to obtain two co-op placements with Husky

Energy, the first work placement in central Alberta with a team of gas field operators and the second work placement downtown Calgary, working with the engineering team on asset integrity and surface facility planning. My last two work placements were with Suncor Energy and both were focused on subsea asset integrity of Suncor's offshore Newfoundland subsurface facilities.

6. Upon graduation from Memorial University I landed a job in the role Production Engineer for Husky Energy, based in Lloydminster, Saskatchewan. It was in this role that I was introduced to upstream oil and gas production facilities (both downhole artificial lift systems and associated surface production facilities) and it was my primary task to optimize the performance of Husky's upstream production operations for my assigned area. Here I quickly became passionate about the role and especially the related artificial lift systems technology I was tasked to optimize. I subsequently filed numerous patents for Husky Energy during my first few years in that role. During the development of this IP I was made aware by Husky management that I was the only employee company-wide (a 75+ year old company with 4000+ employees at the time) who was generating IP relating to artificial lift systems, a mature technological field which I was only recently introduced to. I stood out from my peers as an exceptionally passionate engineer

with an intense desire to innovate and improve our company's operations with demonstrable "outside-the-box" style thinking. During this time I was introduced to the long standing problem of venting and flaring of associated natural gas, a problem that has persisted since the first oil well was drilled in 1859. I was introduced to the adjacent issue of stranded energy, whereby oil and gas production facilities were forced to remain shut and non-productive due to regulatory restrictions on allowable venting and flaring volumes.

7. On January 1, 2017, I founded and incorporated Upstream Data Inc. ("Upstream Data" or "Upstream"). Upstream Data is an energy services business with a focus on optimizing the production and generation of energy by incorporating controllable bitcoin mining loads directly at the source of energy, such as oil and gas wells, or the source of power such as generators and power plants associated with oil and gas production. In my role at Upstream, I developed numerous prototypes and commercial products with my team. We design and manufacture our prototypes and products at our facilities in Alberta and Saskatchewan, Canada and large percentage of our sales are shipped to our customers in the United States of America. I filed a provisional patent application which matured as the '372 patent on February 8, 2017. It described the technology

we were developing at Upstream Data. Our first prototype, deployed in October 2017, we called a “Hash Generator,” or “Hashgen.” It incorporated a natural gas generator, a bitcoin mining system, and an associated control system to regulate the bitcoin mining load on the generator, all housed within a portable shipping container. The purpose of this product was to be placed on oil wells with stranded associated gas, the gas would be used to fuel the generator and power the blockchain mine. Today, the newer commercial iterations of the Hash Generator continue to be Upstream’s bestselling product. Since 2017 we have also designed and built numerous other prototypes, custom projects and commercial products including the Hash Hut which makes use of an external generator, such as an existing generator powering the oil and gas facility.

8. My full curriculum vitae is attached hereto as Exhibit EX2013.

II. UPSTREAM’S PRODUCTS EMBODY THE ’372 PATENT CLAIMS

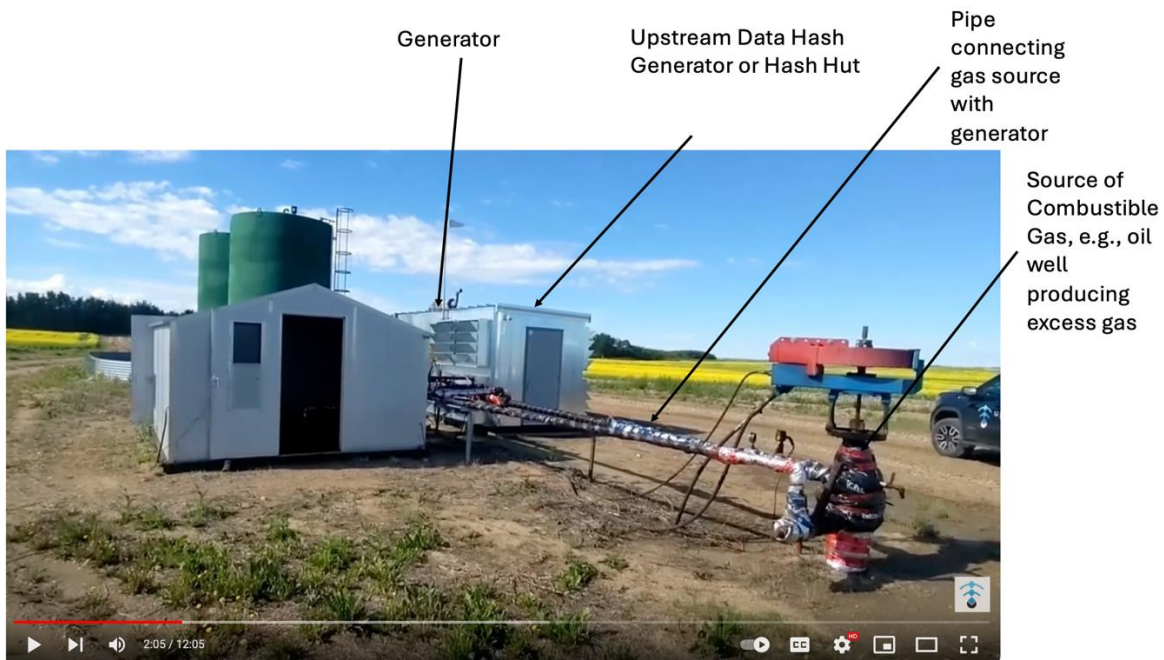
9. As the CEO of Upstream, I have personal knowledge of the system and its operation. As the inventor, I also have personal knowledge of the claims of the ’372 Patent. In connection with preparing this declaration, I reviewed the challenged independent claims of the ’372 patent as well as certain dependent claims and verified that Upstream’s Hash Generator and Hash Hut systems practice

the inventions claimed in at those challenged claims. To be sure, our systems embody many more dependent claims than I discuss herein but I have been asked to focus on a subset of exemplary claims in this declaration.

10. In my understanding, Upstream Data systems, such as the Hash Hut and Hash Generator (from the present to the 2017 prototype) embody claims 1 and 24 of the '372 patent. For example, as illustrated in the following annotated diagram using a screenshot from an Upstream Data promotional video available on YouTube,¹ Hash Hut and Hash Generator systems are installed with a source of combustible gas such as gas produced at an oil wellhead (limitations [1 *pre*], [1*a*]).² A continuous flow of this gas is supplied to a generator through a pipe where the generator may be co-housed with blockchain mining equipment as illustrated in the screenshot (Hash Generator model), or located in a separate adjacent enclosure (Hash Hut model) (limitations [1*b*], 1[*c*]):

¹ https://www.youtube.com/watch?v=q_1jrIzTvMQ. EX2014 is a true and correct copy of this video, which shows me conducting a walk-through of a 180kW Hash Generator system installed at a remote oil facility.

² For clarity I have used the same limitation numbering scheme as Crusoe's Petition and Dr. You's declaration.



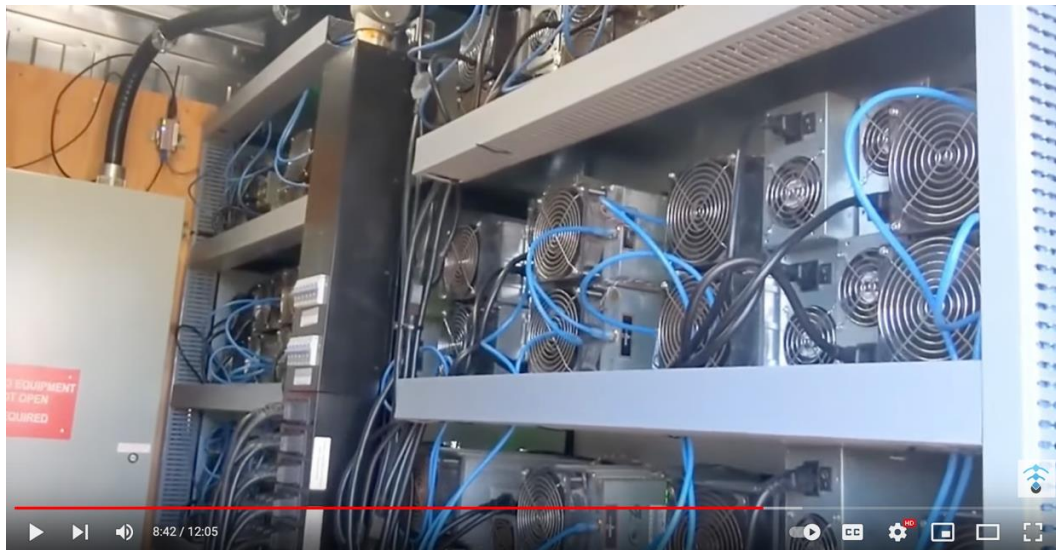
11. While the above example shows an installation with a single Upstream Data system, many such installations comprise multiple systems. The following photograph taken by Upstream Data staff shows an installation with multiple Hash Generator systems running on stranded gas at an oil production facility ([1b], [1c]):



12. The next screenshot shows the generator in its section of the enclosure (limitation [1b]):



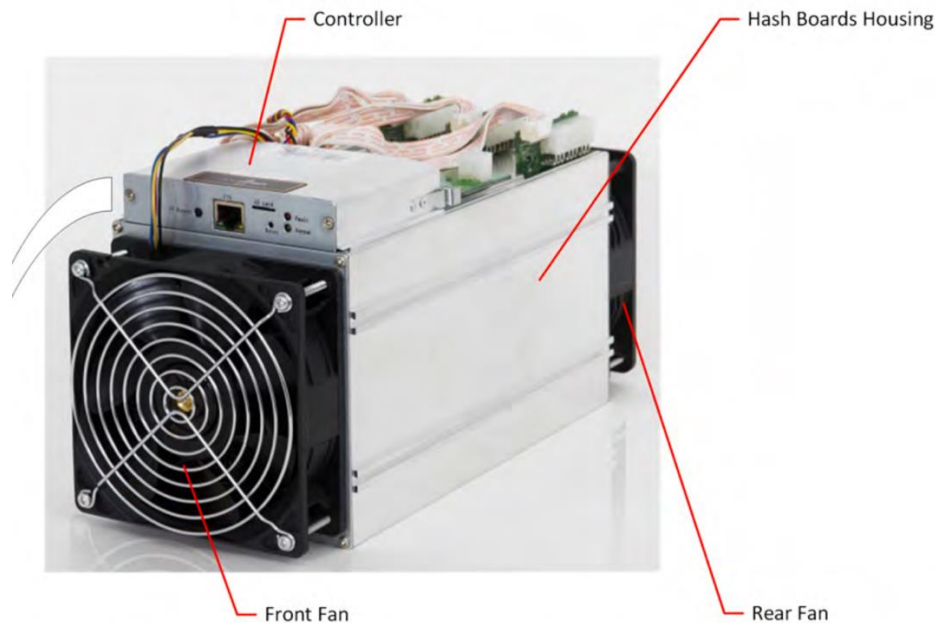
13. Each Upstream Data system such as a Hash Generator or a Hash Hut houses a number of blockchain mining servers - shown in the next screenshot are racks of blockchain miners inside the enclosure, in this case Bitmain Antminer S9 ASIC miners (limitation [1c_i]):



14. Each miner is connected to the Hash Generator's or Hash Hut's network interface as illustrated by the blue Ethernet cables in the screenshot above. The network interface typically comprises a cellular or satellite modem, including the corresponding antennas visible in the photograph of a multiple Hash Generator installation above. (limitation [1c_ii]). The modem comprises an internet connection with access to nodes comprising a blockchain database.

15. A miner such as the S9 comprises hash boards with dedicated blockchain mining ASICS and a controller performing a number of functions, including

network communication with blockchain database nodes as illustrated in the following diagram from an S9 installation guide³ (limitation [1c_iii]):



EX2015, 5.

³ EX2015 is a copy of a Bitmain AntMiner S9 Installation Guide version 0.1 dated June 2016. I am familiar with the S9 miner, its components, and operation, as it was installed in Upstream Data systems like those I discuss in my declaration. EX2015 correctly identifies and describes S9 components relevant to my declaration.

16. Bitcoin protocol defines a peer-to-peer network for accessing nodes of a distributed blockchain database storing Bitcoin transactional information (limitations *[1c_iv]*, *[1c_v]*, *[1c_vi]*).

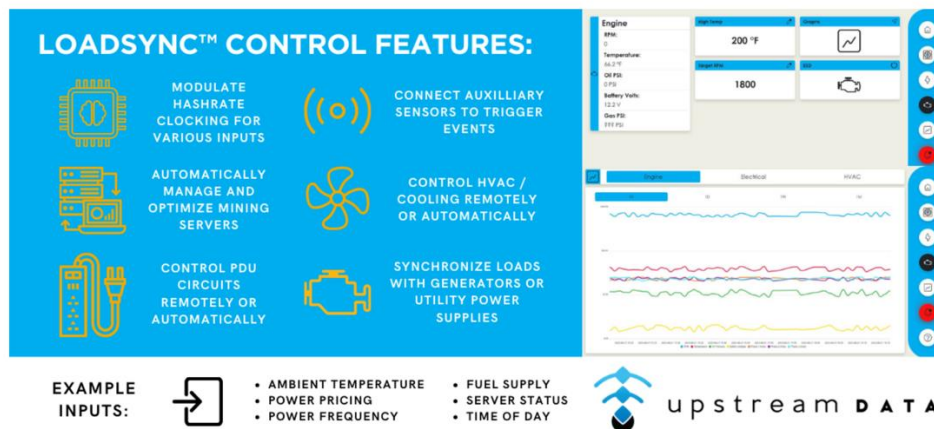
17. In my understanding independent method claim 24 is substantially similar to claim 1 and is embodied in Upstream Data's products for the same reasons as claim 1.

18. Our systems such as the Upstream Data Hash Hut and Hash Generator also embody exemplary claims 10-12 and 29, 34-37 of the '372 patent. These systems are available with an optional controller to perform load balancing by increasing or decreasing mining activity (claims 10 and 35). This was done by controlling circuits to increase or decrease number of active servers (claims 11 and 36), including in response to variable gas production rate (claims 12 and 37). The current generation controller (LoadSync, illustrated in a capture from Upstream Data's website and reproduced below⁴) continues to offer these functionalities, e.g., "automatic load balancing... to align variable natural gas fuel supply with generator loading:"

⁴ <https://upstreamdata.com/technology/loadsync/>

"Our patented LoadSync™ controller can be seamlessly integrated into any Hash Hut™ or Hash Generator™ loadcenter. This controller adjusts the hashrate (loading) on the energy system to maintain a perfect balance with energy supply and demand based on user requirements. LoadSync™ offers full remote management of the loadcenter while also automating loading to balance the power system. For example, it can be used to align variable natural gas fuel supply with generator loading in order to conserve vented or flared gas, or it can be employed to regulate energy consumption in accordance with fluctuating power prices from utility providers. The LoadSync™ controller is adaptable to all scenarios requiring load matching to variable energy supply! Additionally it functions as a mining server management tool, facilitating user set up, monitoring and optimization of their mining farm from anywhere in the world."

- Steve Barbour, President



19. As seen in the images above, Upstream Data systems are connected to gas sources comprising remote oil and gas wells (claim 29). Hash Generator and Hash Hut systems mine Bitcoin transactions with their ASIC mining servers such as Antminer S9 and communicate wirelessly through cellular or satellite modems (claim 34).

III. COMMERCIAL SUCCESS

20. Upstream Data's pioneering and industry-defining products embodying the '372 patent have achieved substantial commercial success. The following discussion is based on my personal knowledge of Upstream Data's systems,

research and development, and sales. I have reviewed our sales documentation to confirm that the sales data I discuss herein is correct.

21. As I've already discussed, the first prototype embodying the technology of the '372 patent was deployed in October 2017 and called a "Hash Generator," or "Hashgen." It incorporated a natural gas-powered generator, a bitcoin mining system and associated control system, all housed within a portable shipping container. The purpose of this product was to be placed on oil wells with stranded associated gas, the gas would be used to fuel the generator and power the blockchain mine and the control system would regulate the blockchain mining load on the generator to keep it within operating spec. Today, the newer commercial iterations of this Hash Generator continue to be Upstream Data's bestselling product.

22. I made the first commercial sale on December 31, 2017 when the prototype Hash Generator was sold to a software engineer in the bitcoin mining industry who informed me that he was interested in this novel application of bitcoin mining after observing me publish information about our novel technology and application on Twitter. An image of this first system deployed in an oil field is below:



23. Two more sales followed in 2018. Ten units were sold in 2019, including a first U.S. sale. During this time Upstream Data continued to improve its systems, including developing the Hash Hut system for use with existing generators. As the market realized the advantages of Upstream Data's technology, thirty two sales followed in 2020, even as competitors entered the field. Thus, the sales of Hash Generator and Hash Hut systems embodying the technology of the '372 patent grew sixteen-fold from 2018 through 2020. Notably, during this time Bitcoin prices fluctuated and trended downward from \$20,000 to \$8,000 range by end of 2019. Accordingly, the increased sales were due to the superiority of our systems and a developing acceptance of the paradigm-changing approach to gas venting

and flare reduction offered by Upstream Data, rather than a substantial rise in Bitcoin value.

24. Since 2020 and through today Upstream Data has delivered at least an additional 284 systems embodying the '372 patent. Of the delivered systems, approximately 219 (~66%) were deployed in multi-system configurations. Approximately 101 systems (~30%) were deployed with an optional controller.

25. As discussed with regard to industry praise below, Upstream Data has been recognized as a leading company and a pioneer in the industry, underscoring the commercial success of our systems. Our success has been well-reported in the media. For example a 2022 CNBC article regarding crypto-mining with flare gas described Upstream Data's business as booming following the industry's embrace of our technology: "Fast forward four years, and business at Upstream is booming. It now works with 140 bitcoin mines across North America." EX2016, 7.

III. LONG-FELT, UNMET NEED

26. For as long as humans have been drilling and completing oil wells since the Drake well in the 19th century, associated gas capture has been a challenge. Oil wells are often too remote to economically ship natural gas via pipelines. Therefore oil companies continue to vent excess natural gas to atmosphere, or dispose of it in flares or similar devices. Flaring is preferable to venting to atmosphere for safety

and environmental reasons, methane is an explosive hazard and has a higher global warming potential than its combusted byproducts.

27. At the time of my invention, no such technology or product existed that could be moved directly to the source of the excess associated gas and economically consume it in a way that returned the investment. At that time the oil and gas production industry was not aware of Bitcoin mining technology. The industry was venting or flaring gas unless there was a counterparty such as a gas line or an electric grid connection to which the gas could be delivered. On the other hand, the Bitcoin mining industry did not know much if anything about the oil and gas industry and was not aware of the operational problems caused by stranded gas, such as rate-limited oil production (due to regulatory limitations on gas venting or flaring); or of the potential use of stranded gas as a Bitcoin mining energy source that could also solve the operational problems. Instead, the Bitcoin mining industry believed that hydroelectric power was the optimum solution because it was generally inexpensive and reliable to power energy-intensive industrial miners.

28. Our pioneering products solved this widely recognized and long-standing problem of stranded gas that was either released or flared at oil and gas production

facilities. The problem was well-described in a 2022 CNBC article regarding Bitcoin mining powered by stranded gas: “For years, oil and gas companies have struggled with the problem of what to do when they accidentally hit a natural gas formation while drilling for oil. Whereas oil can easily be trucked out to a remote destination, gas delivery requires a pipeline. If a drilling site is right next door to a pipeline, they chuck the gas in and take whatever cash the buyer on the other end is willing to pay that day. But if it’s 20 miles from a pipeline, drillers often burn it off, or flare it. That is why you will typically see flames rising from oil fields.” EX2016, 2-3.

29. As further noted in my ’372 patent, “[v]enting gas to atmosphere is the most cost effective option for the operator but may have the most negative impact on the environment.” EX1001, 7:61-64. Flaring gas is likewise problematic because it is expensive and wasteful. EX1001, 8:1-10. Yet, in the absence of a counterparty (a pipeline or electric grid), venting or flaring were the only practical stranded gas disposal methods recognized before my invention.

IV. INDUSTRY SKEPTICISM

30. As I’ve discussed, the oil and gas industry did not know about crypto mining and did not consider it as a way to reduce the stranded gas problem. Instead, the

industry believed that a counterparty such as a grid or pipeline were necessary if flaring was to be avoided. On the other hand, the Bitcoin mining industry believed that industrial mining required running miners at full hashrate and minimum downtime. Therefore, that industry only considered power sources such as hydro that could support this model. Accordingly, when we first started, Upstream Data faced a wall of skepticism. Below are just some examples of feedback that was received and articulated about the idea:

31. ***“Laughed out of the room:”*** as discussed in a 2022 CNBC article, in 2018 Adam Ortolf, Upstream Data’s current sales manager, ““got laughed out of the room when I talked about mining bitcoin on flared gas:” ‘The concept of bringing hydrocarbons to market without a counterparty was laughable.’” The article then noted: “Fast forward four years, and business at Upstream is booming. It now works with 140 bitcoin mines across North America.” EX2016, 7.

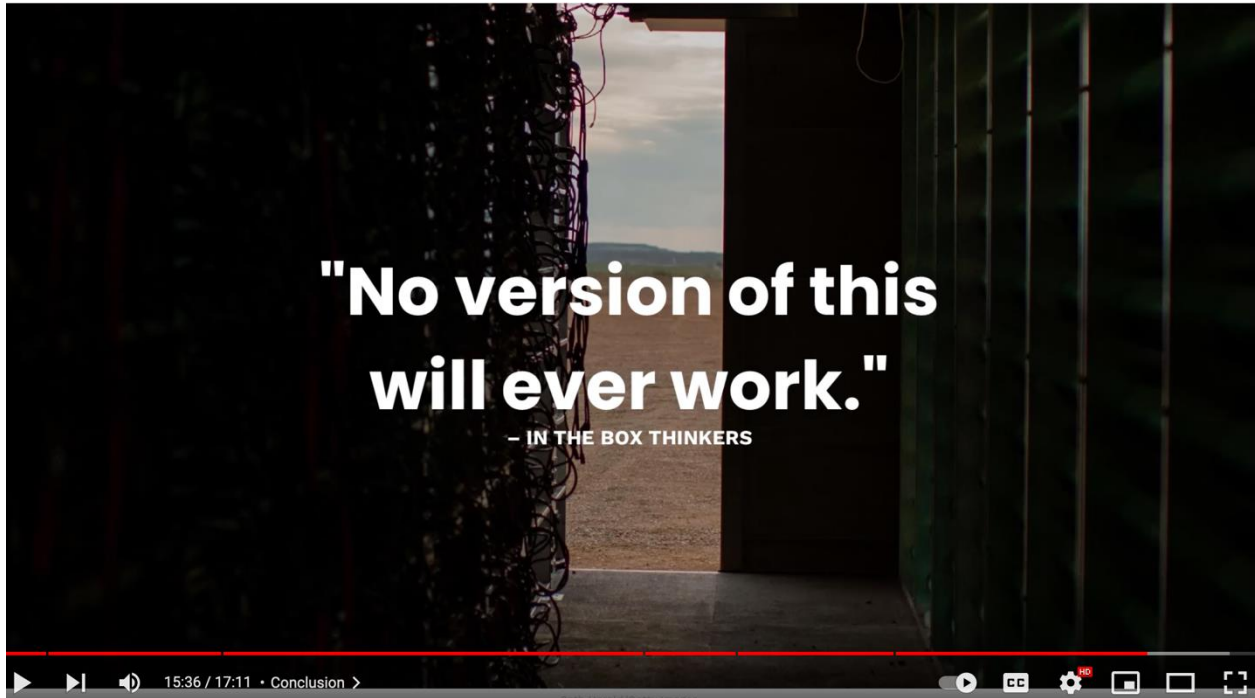
32. ***“Stupidest thing I’ve ever heard:”*** the same CNBC article included an interview the founders of Giga, one of my early customers and current competitors. They described their interactions at a 2020 industry conference when they handed out materials describing powering Bitcoin miners with stranded gas: “A lot of people didn’t know about it. Most people laughed at us. Most people said, ‘It’s the

stupidest thing I've ever heard.” EX2016, 9. Notably, Giga's founders also described the idea of crypto-mining with stranded gas as an “obvious solution” to them in 2019 after they purchased Upstream Data's system, three years after the '372 priority date. EX2016, 3, 7-10.

33. **“Bewildered Crowd:”** In an interview with the Wall Street Journal in March, 2019, I noted continuing industry skepticism even as late as September, 2018: “But he has struggled to get oil-industry veterans interested in mining cryptocurrencies. In September, he showcased a rough version of his mining container at an oil show in Lloydminster, a city on the Alberta and Saskatchewan border, to a bewildered crowd. ‘Locally, pretty much nobody knows what bitcoin is,’ he said. EX2017, 4.

34. **“Pipe Dream:”** a 2018 article with that title describes Wall Street analysts with a “unique idea” to mine Bitcoin with stranded gas in the Permian basin: “shale producers would capture the excess natural gas and use it to produce electricity, which would then be used to power an on-site Bitcoin mining operation.” EX2018. However, bowing to ingrained conventional wisdom in the industry the analysts concluded that such a project “will remain, for now, a dream.”

35. ***“No version of this will ever work:”*** I have met Crusoe’s (Petitioner’s) co-founder Cully Cavness at a number of industry events. Crusoe is a competitor to Upstream Data, and its technology and patents are also directed to powering crypto miners with sources of stranded gas. Crusoe also happens to be leveraging their IP portfolio to threaten and sue Upstream Data customers for patent infringement. However, Upstream Data and my patents predate Crusoe’s earliest patent filings by over a year. Mr. Cavness gave a presentation at a TEDx event, a video of which is available on YouTube at <https://www.youtube.com/watch?v=0CerPYbKx78>. Mr. Cavness discussed Crusoe’s technology which, like the earlier invention of the ’372 patent, comprised powering Bitcoin miners with energy generated from stranded gas; at approximately the 15:36 mark Mr. Cavness described pitching this concept to an early potential partner whose reaction was “No version of this will ever work:”



EX2019.

V. INDUSTRY PRAISE

36. Upstream Data and our technology embodying the '372 patent invention have been recognized as industry pioneers. As just one example, a September 5, 2022 report by K33 Research, an industry publication, asserted in its title that "Bitcoin mining using stranded natural gas is the most cost-effective way to reduce emissions." EX2019, 7. The report acknowledges Upstream Data as a "leading company" and credits us with having "pioneered the concept in 2017." *Id.* (emphasis added).

37. Writing five years after the '372 patent priority date, K33 Research noted the advantages of Bitcoin mining as a way to profitably soak up stranded gas: “Because bitcoin mining is an unconstrained location-agnostic process, bitcoin miners can come directly to oil wells to eat up the excess natural gas. In addition, since oil sites typically produce declining amounts of excess natural gas as they mature, an offtaker must be able to scale down its operation modularly. Bitcoin mining is a modular process since you can combine different numbers of machines into varying energy usage levels.” EX2019, 7.

38. Our pioneering technology is what allowed the industry to recognize these advantages in the face of pervasive industry skepticism. As discussed above, the oil and gas industry believed that only a traditional counterparty such as an electric grid or gas pipeline made it worthwhile to invest in equipment to offload stranded gas. The cryptocurrency mining industry believed that industrial miners such as CryptoKube or Polivka needed to run at maximum hashrate and minimum downtime to make a profit, therefore fixating on hydroelectric and general utility power as the low-cost and reliable solution. Upstream Data’s Hash Generator and Hash Hut technology embodying '372 patent claims changed the paradigm of both industries, thereby giving rise to what the K33 Research report characterized as

“massive oil field bitcoin mining growth over the past few years” and creating a “valuable tool in our toolbox for mitigating gas flaring.” EX2019, 7-8.

IV. CONCLUSION

39. In signing this Declaration, I recognize that the Declaration will be filed as evidence in a case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

40. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1034 of Title 18 of the United States Code.

DATED: April 15, 2024

By: Stephen Barbour
Stephen Barbour