



Nº 6

THE BITCOIN TIMES

ENERGY EDITION

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Editor's Notes

Energy Edition

Welcome to the sixth edition of *The Bitcoin Times*. In the past five years, the publication has matured and become a place where the finest Bitcoin thought pieces are produced. This year's line-up does not disappoint, nor does Makena's design, which continues to push the bounds of Bitcoin aesthetics.

This year's topic is central, not only to Bitcoin, but to life in general: **Energy**.

"The currency of the universe." - Vaclav Smil

Energy is everywhere and permeates everything. While we can harness it, direct it, channel it, harvest it, and measure it, we cannot "produce," create, or destroy it. We are made of it, and so is the world around us. It is the "thing" that animates us and all life - but despite its ubiquity, energy's very nature continues to elude us. Energy defies our attempts to truly define "what" it is, so we approximate as best as we can.

These approximations are extremely valuable, and the past century has been proof of that. We've come much closer, scientifically and mathematically speaking, to a definition, which in turn has transformed how much energy we can harness, harvest, and channel. In doing so, we've increased the carrying capacity of the world we live in.

Two tenets inform our understanding of energy.

First, Life requires energy, and the more we effectively harness it, the more life can be supported. Put simply: More energy capacity leads to the potential for more life. This is fundamental. It's not a matter of opinion or perspective but an axiomatic, a-priori truth.

Second. Energy is effectively infinite. How much is "out there" is beyond our ability to measure, and because of the nature of energy conservation, ie., it cannot be created or destroyed, we will fundamentally never run out of it. The only thing that changes is the "form" the energy is in, and therefore, what matters is the fuel source (density), the entropic cost (waste), and the means we use to harvest, extract, and harness it. In other words, the only real limitation is "innovation."

In this edition, Gideon Powell will introduce you to Julian Simon - perhaps one of the most underrated economists of the 20th century. Simon proved that energy and resources are infinite, and the only limitation is "human ingenuity," which he called "the ultimate resource."

Combining these two axioms, that life requires energy and energy is infinite, you can quickly deduce that any attempt to stifle, impede, or derail humanity's ability to use or extract energy is not only short-sighted and stupid, but fundamentally anti-life. Curtailing energy use is a dangerous way to understand the world and to orient society. Doing so diminishes our mastery over energy, resulting in a lower total "energy capacity," which ultimately impedes our ability to support life.

Yes, waste and entropy are real things. In fact, you will learn about this in detail in Drew Armstrong's piece "Entropy, Time, and Energy," in which he explains that they must be managed, but this doesn't mean one just bows out and recedes. Life is the apex form of energy, and human beings are the apex form of life for a reason. It's because we've continued to grow and expand by using energy. That's what living things do, and in that sense, humans are ultimate "energy channeling beings."

Entropy is as universal and fundamental as energy. When channeled in a particular direction, we create order, but the price paid is entropy, both local and external. The ledger always balances out. The key is to minimize local entropy while maximizing energy usage.

Of course, some of the forms we find energy in are more useful and accessible, while some means of harvest are obviously more effective than others. The careful consideration of these factors is crucial when selecting fuel sources. It's not only about new energy sources; it's also about minimizing local entropy and utilizing energy more effectively and efficiently, while we work out how to find better, more accessible, and abundant sources. In this edition, Marty Bent, Brian Gitt, and Andrew Myers will explore energy density, ESG, nuclear power, energy grids, and what it means to actually "price" energy. Indeed, I argue that although we've become proficient at mathematically measuring energy over the past few centuries — and that has transformed the world — we have yet to accurately measure it economically. Our inability to fully assess energy has resulted in extreme waste and much higher degrees of local entropy. The energy we have access to now should have already sent us to the stars, but our blind economic pricing mechanisms stand in the way.

Pricing energy accurately will unlock our potential more than anything else in the history of mankind has. More than the printing press, more than the transistor, more than the oil revolution, and more than the wheel. It's a step change for humanity. It's the dawn of a "new age." It's why I've taken 3000 words to detail why Nietzsche was right about the coming of the "Übermensch" and that the missing piece of the puzzle - which he could not have predicted - was "Übermoney," aka Energy-Money, aka Bitcoin.

If you're a returning reader, I thank you once again for your continued support. If you're a first timer, I hope you find incredible value here and become a lifelong reader and supporter of the collection. I want to thank Gideon Powell, Ross Stevens, and the team at Unchained once more for their support, along with Andrew Myers from Satoshi Energy, and Kent and the team from Sazmining for helping bring this edition to life!

Aleksandar Svetski

The Bitcoin Times

November 6th, 2023



Foreword

By Parker Lewis

It is fitting that this year's Bitcoin Times—the Energy Edition—sequentially follows the Austrian Edition. Bitcoin is inherently *Austrian* economic in nature, and it depends on the use of energy as a critical input to its security and viability as money. The Austrian Edition focused on the importance of sound money—and bitcoin's role in returning the world to a sound money standard—which is the perfect companion to exploring the fundamental nature of energy and its relationship to bitcoin.

Money and energy exist as the first and second order goods necessary in the production and delivery of virtually all other goods. Money would be of far less value without energy, but energy would be far more scarce without money to coordinate its development and refinement. Everything you consume in your daily life depends on money and energy. I can safely say everything you consume because if you are reading this, it is most certainly true. The same is also not true of any other class of goods, at least not in a practical or functional sense. The complex functions of energy and money are taken for granted, as is the interplay between the two. Each - separate and together - serves as the foundation of the economic structure.

To the detriment of society, both became corrupted in the 20th century (extending into the 21st) in large part due to a socialist economic doctrine, which owes its most proximate origin to John Maynard Keynes. In many ways, the Energy Edition is as much about bitcoin as it is a critique of failed energy policies that the Keynesian economic system has produced. However, it doesn't just criticize the past. It serves as a roadmap - from an energy perspective - of how to course correct and create a better future. It also positions bitcoin as having a critical role in a more hopeful, optimistic future - and in the broader context of human action and

energy abundance.

Bitcoin is a tool that will create a forcing function toward more sound energy policies and ultimately greater prosperity. Its economic incentives will dictate that. However, a key theme you will read about is that bitcoin, as more sound money, is merely a tool to empower human beings. Energy is abundant. What is limited is human time and ingenuity. While bitcoin will help unlock the human potential to achieve energy abundance, a big part of realizing that future is dependent on a shift in culture and mindset, more so than sound money-embracing a culture of innovation and having an abundance, rather than scarcity, mindset as Gideon Powell articulates.

Marty Bent and Aleksandar Svetski write on a similar core theme - albeit from very different angles. In "Humanity at a Crossroads," Marty discusses the dismal track record of ESG energy policy, connecting it to broken economic incentives inherent to the fiat monetary system. More importantly, he warns of the disastrous consequences to come if that policy does not change now. He views ESG as a policy that must consciously be rejected - which is dependent on human action. Bitcoin will make the economic opportunity cost of "common sense" - less energy policy more immediately apparent and more politically costly - but the will to fight back and foster positive change comes from *within*.

Svetski, in true Svetski form, makes a fiery case to embrace the power of the individual. He explains how bitcoin will serve as a tool to reward excellence, allowing those who deliver value to retain the benefits. He describes how power is derived through energy, and why the *will* to power of the individual should be embraced as a necessary

input toward building a prosperous future. Bitcoin aligns economic incentives to drive a culture of excellence, but he makes the point that embracing such a culture must be a conscious human decision - laying out the logical basis as to why rewarding the *best of us* benefits both the individual and society as a collective.

As a whole, the Energy Edition is a balance of how bitcoin will change the course of human history by unlocking energy potential at a cultural and economic level; how humans think about energy at a thermodynamic and metaphysical level; and how bitcoin will incentivize a more abundant and efficient future of energy at a tactical level. To underscore these points, Andrew Myers and Brian Gitt focus on the tactical level.

Andrew discusses how bitcoin solves fundamental challenges in power markets, collectively, due to its permissionless financial settlement rails, the nature of its flexible demand for power, and its ability to effectively store purchasing power. His "Towards Permissionless Power" piece explains why bitcoin is the tool best suited to accurately value energy as a derivative consequence, and similarly, why bitcoin will naturally become the currency through which energy is priced. Ultimately, bitcoin will drive cheaper, more reliable, and more abundant power as a function of its ability to more efficiently price energy, which all derives from its fixed supply.

While Andrew focuses on the properties of bitcoin which are valuable to energy markets, Brian Gitt discusses the importance of nuclear energy as a power source to scale bitcoin mining and more generally, as a means to deliver reliable, safe, and clean power toward an energy abundant future. Through "Bitcoin's Power Problem," Brian introduces small modular reactors and explains how nuclear power is generated, what its advantages are relative to other fuels, why it is objectively safer than most other power sources - despite common misconceptions and misgivings - and where it fits within an abundant bitcoin future.

Gitt's coverage of nuclear power also serves as a great complement and tactical reinforcement to Drew Armstrong's piece, "On Entropy," which sets out the most fundamental, atomic level discussion of energy. He inquires: What is entropy? For that matter, what is energy? Drew's writing covers both the *meta* and the physical nature of energy. He describes bitcoin as an energy technology (and money) that reduces local entropy - creating local order - while at the same time accelerating the world toward its natural state of increasing disorder. Drew also lays a foundation to contemplate the logical consequences of all energy production, or as he explains, all energy refinement (to be more thermodynamically accurate) and its relationship to money, time, and life itself.

The idea that bitcoin wastes energy is a common criticism. However, nothing of value comes without cost. The quantified measure of value - that being *price* - itself is a concept derived from money. When you get through reading this collective work, it will be apparent that any material measure of value is a derivative of both money and energy. Nothing of *value* comes without energy, and anyone who says bitcoin wastes energy likely understands neither.

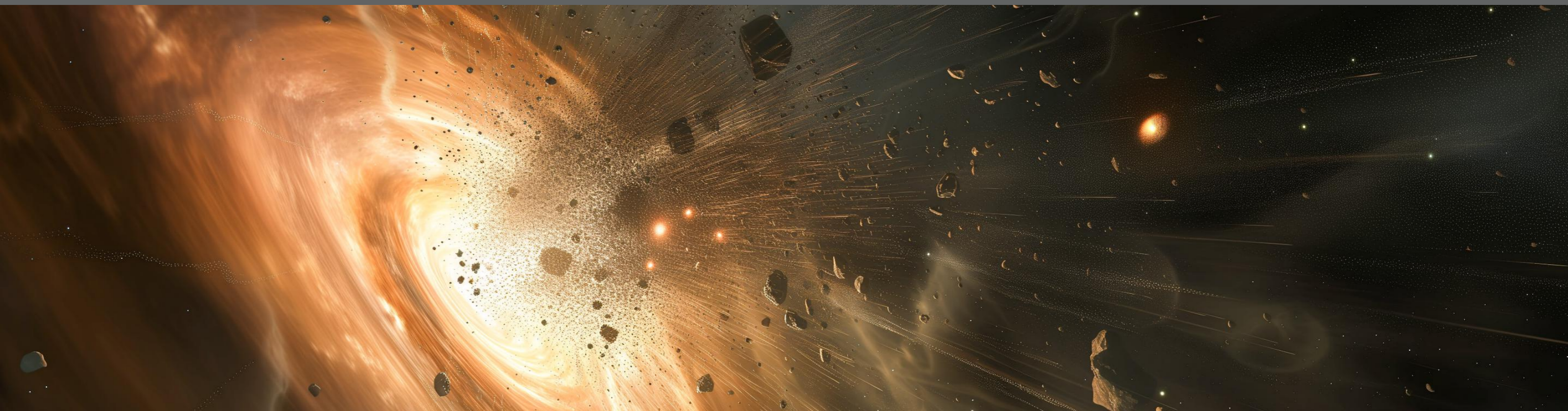
Before you set off on your journey through the Energy Edition, I will leave with a joke about energy and money. It is one of the few I know: What did socialists use before candles? The punchline is, of course, light bulbs. Think about it as you dive down bitcoin's energy rabbit hole. Money, time, energy, life, bitcoin, and a prosperous, abundant future are deeply intertwined.

Parker Lewis

Future Mayor of Austin,

Head of Business Development, Zaprite, Inc.

November, 2023





Bitcoin, Energy, and Human Ingenuity

An Infinite Nexus

By Gideon Powell

What is energy? What value does energy provide, and how does it relate to the ultimate resource of human ingenuity? Is Bitcoin simply an energy-intensive commodity overwhelming limited energy resources, or does it have a role in humanity's never ending march to greater heights and new frontiers?

To gain deeper insight into the relationship between energy, Bitcoin, and the cascade of innovations set in motion by the human mind, we will draw inspiration from the very underrated economist Julian Simon, who wrote: *The Ultimate Resource*.

"Our supplies of natural resources are not finite in any economic sense. Nor does past experience give reason to expect natural resources to become more scarce."

- Julian Simon

Unfounded Fears

Simon was a true pioneer of thought, and one of the first thinkers to merge physics with economics. He showed us that historical fears of energy scarcity almost always underestimate the remarkable abilities of humans to innovate, embodying the adage attributed to Plato, "Necessity is the mother of all invention." This is why he called the human mind, the *Ultimate Resource*.

His thinking could be summed up as the opposite to the Malthusian interpretation of the world. It was, in effect, the innovative and *abundant* interpretation.

When a resource dwindles or is highly valued, a number of possible messages are being communicated by a clear signal known as rising price. One set of messages is a call to innovate. This call to innovate interprets the signal, rising price, as an incentive to problem-solve by:

1. Seeking more of the limited or highly valued resource through exploration and/or innovation; and
2. Exploring new or improved ways to lower the cost of alternative resources.

Alternatively, the rising price signal can also be interpreted with a scarcity (Malthusian) mindset, leading to fear and causing some to look for ways to control resource allocation by broadcasting:

1. We're running out of resource {X}!

2. We need to stop using resource {X}!
3. We need to use governmental control to force the desired outcome!

We've seen this time and again, particularly when oil prices climb. Alarms from media outlets and hired 'experts' proclaim: "*We're running out of oil!*" Yet, despite such claims, price increases have continuously been met with renewed efforts by energy entrepreneurs who invest their time, talents, and treasures to reduce the price of oil, or energy in general, by:

1. Producing more of it through exploration and/or innovation; and
2. Explore new or improved ways to lower the cost of alternative resources to oil.

While history and the innovative interpretation have and continue to contradict the Malthusian, scarcity-driven interpretation of a rising price signal, mainstream headlines continue to bombard us with new messages of resourcelessness. These contemporary narratives caution against consumption. They promote fears about climate change and continue to suggest that nature is brittle. Their rhetoric posits that we lack the tools and incentives to ameliorate our situation, thus necessitating governmental forced intervention and our sacrificing of modern amenities.

We must beware of narrow perspectives and false narratives that have time and again been proven wrong. We must develop an alternative and more actionable, resourceful, vision of the future. While it is undeniable that human activities impact the environment and developed nations consume vast resources, it's myopic to attribute the global population's sustainability issues solely to consumption patterns and short term observations. Scarcity-based observations lead us to misconstrue root causes, in the same way that "looking for red" will cause you to miss all of the blue. Immediate, short-term solutions are often borne from misinterpretations, and they tend to favor restrictive, top-down, centrally planned actions, which in turn require convoluted regulatory frameworks with unclear governing bodies to manage them. Together with a scarcity mindset, we create more problems and begin to mistakenly conclude that no voluntary, mutually beneficial solutions exist.

What's needed instead is a longer-term, innovative, and resourceful perspective. One that recognises, as Julian Simon said, that human ingenuity is the ultimate resource, and its suppression is the ultimate limiter. If we can successfully change this psychological framing, actionable

and mutually beneficial solutions can and will emerge. History has proven this time and again!

The objective of this essay is to do just that. To broaden your perspective and present a more hopeful vision of the future. A future to which anyone can contribute positively. I will demonstrate the power of an abundance mindset by highlighting how principles of human progress have transformed formidable challenges like pollution, waste, and growing populations into opportunities for humans to adapt and innovate not only without sacrificing modern amenities but by enhancing them.

A Brief History of Energy Markets

Problems lead to solutions, which inevitably lead to new problems, which if not interrupted, will lead to new solutions. And so the story goes.

This is reflected in the domain of energy, with Thomas Edison coming to mind as a true pioneer. In the late 19th century, Edison invented the original electricity grid when he opened the Pearl Street Station in lower Manhattan, New York City. The station, which began operations on September 4, 1882, supplied electricity to nearby businesses and homes by illuminating nearby streets and establishments with electric light, is often considered the first practical electricity distribution grid. It was monumental because it replaced less efficient gas lighting and provided a safer and more affordable energy source for more people. Edison's direct current (DC) system was a centralized grid structure that distributed electrical power to consumers within a reasonable distance from the power station. The challenge with DC, however, was that it could not be transmitted over long distances without significant power loss, which became a significant limitation as demands for electric power grew and required transmission over greater distances.

Despite his brilliance, he failed to recognize alternative current (AC) systems as superior for transmission, and also failed to conceptualize the subsequent evolutionary phase – the amalgamation of electricity production within centralized power plants and the birth of a national grid. The grid he was unable to envision at the time emerged naturally, as entrepreneurs came to capitalize on improved economics through increased utilization rates and economies of scale.

Enter Sam Insull. A pioneering energy entrepreneur with an abundance mindset and an ambitious vision. Insull built his company by financing and operating power generation and transmission for manufacturing companies that were previously self-financing their own energy generation. In the same way that the steam engine liberated manufacturers from reliance on waterways, Insull liberated businesses from the necessity to build their own vertically integrated power plants, and in doing so, pioneered the transition towards shared utilities. By bearing the capital expenditure associated with building superior power plants and transmission lines, he liberated capital for manufacturers. This in turn created incentives for manufacturers to stop

wasting time, money, and resources on their own power plants, allowing them to channel investments into their core competencies, instead. In this way, he effectively lowered the cost of electricity and initiated what Joseph Schumpeter coined the “virtuous cycles of mutual benefit.” Insull's thus work laid the foundation for a new wave of rapid innovation and economic growth. It enabled electrified household appliances and spurred new businesses across various sectors like technology, healthcare, and space exploration, which continue to enhance our lives and economies today.

We see this story time and time again.

Prior to the electricity revolution, we had oil. By the mid-19th century, a whole range of whale species neared extinction because of the high value modern, rapidly growing societies around the world placed on the oil extracted from their blubber. Why? Society needed light! More people meant more demand. This was a problem, and it looked insoluble. Ironically, it was the commercialization of kerosene led by Standard Oil that swiftly made whale hunting unprofitable. Oil companies were the original “save the whales” team.

Fast-forward many decades to the solar energy revolution. Whatever your position on this technology, there's no doubt that human ingenuity, the ultimate resource, has driven the unit cost of solar energy down significantly. When first introduced, solar panels were prohibitively expensive. Yet, energy entrepreneurs kept innovating, and today they are accessible to remote villages around the globe. You might argue that this is only because of artificial subsidies, and while you might be right, the reality is that the subsidies merely fuelled human ingenuity. They redirected the focus of people's actual efforts, and later, when we discuss subsidies, we will discover that this shift also comes with hidden costs.

Another, more concrete example arose in the mid-2000s, when concerns about America's dwindling natural gas reserves and surging prices sparked the horizontal fracking revolution. Much like how Standard Oil “came out of nowhere” during an age of crisis flooding the United States with abundant energy, so too did fracking. A surge in horizontal fracking led to an abundance of natural gas, causing prices to plummet 80-90%, breathing new life into the American, and global, economies. This new energy source, literally and metaphorically speaking, bolstered American manufacturing and redefined geopolitical dynamics. It saved Americans and their trading partners more money than any tax cuts or other cost-curbing measures have ever done.

A similar thing happened with oil. Following the alleviation of natural gas scarcity in about 2010 and amidst growing concerns about depleting oil reserves, nimble, independent oil and gas companies turned their attention toward finding solutions. Companies didn't respond as some conglomerate with a centrally planned and dictated directive. Rather, they simply heeded the call to action, motivated by the prospect of profit, and applied their expertise to the development of innovations in this new sector. This transfer of knowledge triggered a domestic oil production renaissance, driving down oil prices and transforming America from a net importer to a dominant oil producer. This further enhanced America's energy independence, lowered fuel prices,

fostered job growth not only in the sector, but beyond, and bolstered the nation's geopolitical position on the global stage. It was another major “saving” for the American people and the world.

The ramifications of all these advancements are profound. Not only do they enable already complex and affluent societies to continue growing and manage demand, but they also create a blueprint for emerging economies to learn and benefit from.

Access to affordable power facilitates everything from clean drinking water through electrified purification, to better education for more children by making it possible for schools to use digital tools. Affordable electricity supports businesses of all sizes. It enhances safety with well-lit streets, enables improvements in public health, bridges the digital divide by connecting remote areas to the wider world, and offers access to previously unattainable information and online markets. In essence, affordable energy becomes a transformative tool that elevates our quality of life, propelling prosperity, health, safety, and vast growth opportunities, all of which steer individuals toward envisioning and working for a better, brighter, and more sustainable future.

Zeal and Innovation

While early pundits could only see as far as “illumination” (if they could see that far at all), the appeal of abundant electricity ultimately went much further. It became a pivotal catalyst for a wave of innovation that shaped and improved the quality of life in the 20th century, literally molding the contemporary world we live in today.

The same went for energy discovered or extracted from other means. Energy abundance made household appliances like refrigerators and washers ubiquitous, the entertainment industry blossom, and cinema and radio broadcasting take off. The manufacturing sector was revolutionized by the electrification of assembly lines, propelling the automobile and aviation sectors. The tech arena burgeoned, paving the way for the digital revolution that spawned transistors, computers, telecommunications, and the internet. Consistent power amplified R&D, spurring advancements in medicine, chip technology, and space exploration.

I often ask: What new industries and valuable opportunities might emerge, if we get out of our own way? What will catalyze yet another transformative wave across the global landscape? And what needs to happen for that to occur?

One can find answers to these questions by traversing the stories of successful energy transitions from the past. By reviewing history, you will find a series of common threads emerging:

1. An unwavering spirit of entrepreneurial zeal,
2. Permissionless innovation, and
3. A relentless pursuit toward progress and profit.

Thomas Edison, who we discussed earlier, and whose

inventive prowess laid the foundations for the electric grid, wasn't solely driven by a mere aspiration to innovate; he was propelled by a potential profit motive. The undercurrents of America's culture, built on robust property rights and intellectual property safeguards, offered fertile ground to sow and reap the benefits of his inventiveness. This ecosystem inherently supported bottom-up solutions, where individuals, buoyed by self-agency and a permissionless cultural spirit, found pathways to create value and enact change. Sam Insull's pursuit to democratize electricity also relied heavily on these principles. He didn't seek overt permission or prodding to innovate but was motivated by a raw profit incentive and a compelling vision. His model, a confluence of profitability, re-investment, and bottom-up solutions, unlocked a cascade of economic vitality and innovation that changed the world.

Standard Oil, too, emerged as a formidable entity not in spite of the whale oil industry, but perhaps because of it. John D. Rockefeller's ability to grow Standard Oil rested not merely on predatory pricing but was built upon his capability to innovate, reduce costs, and subsequently, prices — all while enhancing the quality of his products. In essence, Rockefeller was sustained by a profit motive validated by consumers and an environment conducive to entrepreneurship.

The American fracking revolution shared a similar spirit. What stands out is not necessarily the superior geologies of the regions, but a clearly superior cultural and regulatory environment that supports and cultivates the entrepreneurial spirit. This is why such revolutions didn't occur in regions like California or Saudi Arabia. Their regulatory and cultural environments often stifle entrepreneurship and impede bottom-up, permissionless innovation.

We are now at the dawn of a new age, and in it, we encounter the new frontier of Bitcoin mining – an arena that, like its predecessors, thrives on innovation and the raw profit motive. A place where anyone, regardless of stature, can become an energy entrepreneur. Bitcoin as a tool — permissionless and accessible — and mining as a means, together create a paradigm where lowering the price of power translates to direct, tangible rewards. Principles of human progress: profit motives, permissionless innovation, bottom-up solutions, and unwavering adherence to creating mutually beneficial value for consumers, are once more present.

In the same way prior entrepreneurs navigated their respective epochs, Bitcoin energy entrepreneurs will today leverage the same principles to pave pathways that significantly uplift societal standards and increase economic potential.

But why such an emphasis on Bitcoin? We will answer that in a moment. But before we do, let us first attend to the question of subsidies.

What about subsidies?

Human beings are human beings. We are always looking to tinker, learn, manage, and create toward some end. Our interventions typically result in a mix of externalities,

often positive, but when we try to micro- or over-manage complex processes such as economics or innovation, we generally create more negative outcomes.

The tricky thing is that sometimes it's hard to notice or measure the impact of human tinkering. Interventions in the form of subsidies are such an example. They often look great on the surface but can have unforeseen ramifications or create new problems. As with most complex systems, the truth is more nuanced. The history of energy development is full of interesting examples. Government subsidies were extended to whalers in the 19th century, and they fueled the rise of crude oil in America and more recently, helped to make solar and wind more affordable to end users. And while it's true government subsidies have helped stimulate energy innovations by providing an initial thrust, and thus helped catalyze the industries, they've also resulted in negative consequences. For example, whaling subsidies almost drove whales to extinction. Similarly, government intervention, despite attempting to do the opposite, stifled competition in the early oil markets, making Standard Oil a greater monopoly than it otherwise may have been had the market been freer and subject to natural competition. Solar and wind energy markets are a more recent example of how intervention can lead to negative consequences. While costs have come down significantly, subsidies have led to not only acute environmental damage with the mining of rare earth minerals, but they also have given us a false sense of the true cost of these forms of energy. This discrepancy has resulted in increased dependency on weather events and thus decreased reliability in the energy grids millions rely on.

Many things are ultimately more complex than they seem at first glance, and we must understand this as we move forward on our journey toward energy abundance. We must remember that genuine, sustained propulsion towards progress in any energy sector—be it in whaling, oil, nuclear, or solar—comes not from “subsidies” but from the undeterred innovativeness of humans and their persistent quest for efficient and novel solutions, which are oftentimes motivated by profit.

We must recognize that the only real sustainable solution to problems is human ingenuity. We must salute human inventive prowess and recognize that, though subsidies may set the stage, it is our inherent innovative spirit that converts opportunities into substantial progress, crafting our future energy and environmental tapestry.

We must develop a narrative that posits a future where policies ensure equitable competition, absent of preferential subsidies, to cultivate a terrain where innovations are organically birthed, unfettered by fiscal aids and uninhibited by taxpayer burdens, which can chisel a pathway toward a self-sustaining and abundant energy future.

Money & Energy

We don't have to go deep into economics, semantics, metaphysics, and philosophy to make the connection between energy and money. We work for money. “Work” in and of itself implies an energy expenditure or an input of

energy. Currency, like electrical and tidal currents, convey a movement of energies over time. Energy applied over time is power, and money also represents purchasing power, an economic energy. A battery stores energy. But you can also get charged with or prosecuted for battery. That is projection of energy, or in this case, unlawful projection of energy. Bitcoin is a battery of ever-expanding encrypted energy in cyberspace. It consumes energy to empower the human spirit. It stands with the wheel, the printing press, electricity, and oil as one of the most powerful and greatest human discovery-inventions ever.

Bitcoin has revolutionized the way we understand money. In fact, some might argue that Bitcoin is truly the first ‘sound money’ because it intertwines monetary value and energy. In his 2017 book *Energy and Civilization*, distinguished Czech-Canadian scientist, policy analyst, and author Vaclav Smil aptly stated: “Energy is the universal currency.” Bitcoin's synthesis of money and energy allows us to re-prioritize and re-examine our relationship with energy itself. Energy powers everything, in and out of our world. The proliferation of reliable and affordable energy is the foundation for which liberated, peaceful, civil, and affluent societies are built.

Complex economic structures can be built and sustained when signaling mechanisms (like price) function well and energy can flow between nodes. In such an environment, growth is a natural phenomenon. Life wants to expand. Furthermore, in an ecosystem devoid of paper accounting's ability to mimic growth, genuine innovation becomes imperative. Economic agents are propelled by the pressing need to produce, create, and innovate because demand literally demands it.

Bitcoin mining is one such example of this demand. It is a manifestation of Julian Simon's notion that the rising price of a resource sends a signal to economic actors to reduce that resource cost. There is a clear incentive and reward: If you want to keep more of your bitcoins, lower the price of energy. As such, price signal is an incredibly under-appreciated innovation in the realm of energy production and utilization. Historically, clarity on electricity pricing remained elusive, and the signals that would call for action were obfuscated, whether through the many steps or intermediaries between production and consumption, or through bureaucracy. As a result, the permissionless and bottom-up innovation found in other, simpler industries remains absent in the energy industry. Bitcoin changed this by more tightly tying together energy and money, and is therefore leveraging the principles of human progress by putting the tools of innovation back into the hands of individuals or groups that want to contribute.

Bitcoin: The Apex Load

Bitcoin isn't only a digital currency; it is an APEX energy load. What do I mean by that?

Historically, innovating in power markets demanded monumental capital, and the prowess to navigate labyrinthine regulations and long lead times, all without the assurance of a profit in the chance of success. With Bitcoin, this all changes.

Bitcoin can absorb excess energy production that might otherwise go to waste, by ramping up and down quickly in response to fluctuating energy supply and demand. Unlike traditional energy loads that require a consistent and steady supply of electricity, Bitcoin's energy needs are flexible. Miners can relocate to areas where cheaper or underutilized energy is abundant. This adaptability makes Bitcoin an ideal consumer of energy sources that are otherwise hard to store or transport, such as wind or solar energy produced at times when demand is low.

Bitcoin mining combines flexible capacity, direct monetary reward, a growing market full of innovation, and the opportunity to profitability push the boundaries of computation, cooling technologies, and power systems. Bitcoin makes possible a future where energy entrepreneurs across the globe, from the remote regions of Africa to the expansive plains of West Texas, are able to rise above geographical and bureaucratic barriers so they can innovate, derive value, and potentially propel the world into the next era of energy utilization and management.

Bitcoin mining is already turning underutilized and stranded energy assets into more profitable ventures. This is shifting the very landscape of power markets and is particularly transformative for remote or impoverished areas with untapped energy resources. Bitcoin mining offers a novel way to monetize these assets without the need for heavy infrastructure investment. This is a revolutionary departure from the traditional barriers to entry in power markets, reducing the risk and cost involved in tapping into these resources.

Bitcoin is the catalyst for a more decentralized and efficient energy market. With it, the kind of principles that shaped America's energy history are now able to scale worldwide and shape the future of the global energy landscape. And in this, I argue that we're just warming up, preparing to embark on an exciting, transformative journey that could, once again, redefine our societal structures, economic modalities, and the very way we interact with and perceive energy. Bitcoin is not just a chapter in the annals of energy history; it's a continuum of a story that finds its roots in the very principles that have perennially fueled progress, innovation, and entrepreneurial success.

Our world is rich, brimming with untapped energy resources. Long-recognized potential across the globe, from the stranded gas of Alaska's north slope, tidal energy located far from population centers, and Indonesia's undrilled geothermal to the gargantuan solar resources of Chile's Atacama Desert and the Western Sahara's windy plains. Though these abundant energy opportunities have always harbored latent potential, their full realization remains unattainable without an economic catalyst.

Bitcoin fixes this.

Helping fuel and incubate the ideas in our minds is the velocity of modern communications and the power of the internet. It allows information, knowledge, and ideas to be shared with other energy entrepreneurs and iterated on. Such a process can breathe economic vitality into the untapped energy resources of this world and beyond. Just as James Insull envisioned using economies of scale to increase utilization and lower costs, so too should energy

entrepreneurs today be encouraged to dream big and envision a world with greater energy abundance. And with Bitcoin, they can because, if they can successfully innovate and lower the cost of energy, profit is assured.

Like the steam engine liberated manufacturers and enabled them to locate away from running water, Bitcoin's location-agnostic load, untethered to any region of this world (and beyond) makes it possible for energy entrepreneurs to innovate anywhere. The best opportunities will be found where the greatest of human ambitions lie.

Such an alliance between money, energy, and ingenuity won't just reduce costs; it will spark further exploration, innovation, and development. Success breeds further success, just as the first oil well in West Texas, a barren flatland, lowered the risk and improved the economics of other visions to join in the journey of nearby explosion. And, as these ventures find their footing, mature, and flourish, they hold the promise to redirect their power, lighting up the lives of both remote villages and teeming metropolises.

Even the concept of subsidies is being re-imagined. In Texas, ERCOT uses ancillary payments as a financial lever, or an insurance of sorts, for grid operators to ensure resilience in times of low generation or high demand. With the advent of Bitcoin mining, a new, flexible load has entered the space and created upward pressure for the generation of more total energy - a good thing - while simultaneously allowing for data-driven, real-time adaptation. In other words, Bitcoin mining demands more energy, it sucks up any excess energy being produced, and if energy is needed for other things (heat on freezing cold day, A/C during a super hot week) then miners can shut off, as they are incentivized to do so! This demand response or economic curtailment has become an inherent part of a bitcoin miner's operational playbook. It is mutually beneficial for grid operators, ratepayers, and bitcoin miners themselves, and is not possible at scale with any other power-consuming alternative.

As this process continues, the entire industry gathers hard, empirical data that will further refine this resilient, flexible, and robust energy infrastructure. Combined with a real monetary incentive and instant payment technologies like Lightning, we can ensure money is allocated in a way that best serves the grid stakeholders' need for resilience, while also lowering the financial burden imposed on ratepayers to ensure resilience. Bitcoin mining, thus, transcends its primary function as a decentralized monetary network and slowly integrates with energy grids. It becomes a symbiotic catalyst, nudging us towards an age where subsidies and incentive structures are not just established and abolished overnight, but are intelligently and efficaciously developed, re-examined, and applied to best allocate resources and achieve reliable and affordable power for the lowest cost to ratepayers. In this light, we envision a future where policy, innovation, and decentralized flexible loads coalesce, leading to more benefits for grid operators, ratepayers, and bitcoin miners alike. With Bitcoin mining operating at scale, we can anticipate bigger, better, smarter and more efficient energy infrastructure and regulatory frameworks that reward all stakeholders

A bigger, better, brighter future

Bitcoin is more than just a technological renaissance. It's a socio-economic upgrade that is accelerating our path toward energy abundance. We now have tools to set energy entrepreneurs free. They can seek out new domains and territories; they can develop or adopt new methods and technologies; and they can transform energy directly into money, all without asking for permission.

Bitcoin is a true zero-to-one innovation, expanding human potential. Bitcoin mining is not only about harnessing computational power but something deeper. It's about reflecting on what the decentralized and permissionless ethos stands for. Just as we weigh the value of any industry by its contributions versus its consumption, it's imperative to gain an understanding of the multifaceted benefits Bitcoin offers its users in exchange for the energy it consumes, i.e., a permissionless, decentralized, borderless, and secure monetary system, underpinned by an energy framework that rewards efficiency and efficacy. Think about how powerful that is.

With the growth of Bitcoin's size comes a signal to more energy entrepreneurs to focus their resources on energy innovation. This is the *ultimate* resource. As miners globally compete, they are inexorably drawn to regions abundant with the lowest cost energy opportunities, and they are continually optimizing for cost and efficiency.

As mentioned earlier, this is transforming the energy landscape. Energy companies, that yesterday were traditional powerhouses, are today transitioning into becoming monetary validators! And much like the early wildcatters, today's "compute-cowboys," armed with expertise and experience, like the pioneers who came before them, wield the tools and knowledge to shape the future. They draw inspiration from the likes of Satoshi Nakamoto, Thomas Edison, and Sam Insull. They are modern-day trailblazers, best equipped to reimagine a bigger, better, brighter energy future. They can envision a world where nascent power technologies, bolstered by Bitcoin mining, can scale to foster synergies that extend benefits beyond just mining and production, blazing paths to the heart of the communities they serve. Today, we stand at the edge of an age of unprecedented energy abundance. This isn't merely a continuation of the past; it's the dawn of a new revolution, promising a future that will eclipse the marvels of the Industrial and Technological Revolutions combined.

The power to innovate energy is in the hands of the people, and as Julian Simon aptly noted:

"The ultimate resource is people—especially skilled, spirited, and hopeful young people endowed with liberty—who will exert their wills and imaginations for their own benefits, and so inevitably they will benefit the rest of us as well."

Let's champion this future. Together we can drive the principles of human progress and innovation, sharing a vision of prosperity and energy abundance for all. We are just getting warmed up.

Gideon Powell

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October, 2023

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On Entropy

An enquiry into the essence of energy, information and time

By Drew Armstrong

"Everything flows and nothing stays" - Heraclitus

Things change. As I type this, I watch words emerge before my eyes. Pixels evolve into recognizable symbols. Which is to say, time passes. It's later now than when I first sat down at this table a few minutes ago. My coffee cooler. Laptop battery less charged. Though I can't observe it, I'm sure there's been some minute change in my cells as well. And the cells of those I love.

Entropy underlies all of this. A concept that has permeated my mind over the last 5 years, slowly diffusing into my core beliefs. Entropy manifests itself in many fields yet remains profound in each of them. And somehow, despite these varied contexts, it remains powerfully coherent. The following pages are a brief exploration of those contexts — the ones that seem most important to me at least. Bitcoin, as an agent of entropy, will invariably be discussed. But this is not an essay about Bitcoin. It is an essay about energy, the engine of life, and time itself. Let us begin.

The Laws of Thermodynamics

There is energy. It's not a thing, but a quality. A capacity to do work. Three laws seem to govern its behavior.

The first is conservation. Energy is neither created nor destroyed. It can be converted into other forms, but the aggregate amount is conserved.

The second describes energy's natural flow. In simple terms, the energy in a system will naturally disperse to become more evenly distributed, diffuse, and less-ordered over time. *Entropy* is a measure of this disorder; a term derived from the Greek word "tropē," translated as a "turning" or "transformation."

Examples remain the best way to illustrate the concept. A hot body touching a cold one will give off heat until the two are the same temperature (equilibrium). Ice melts.

Or instead, imagine a box with gas particles bundled tightly in a corner. Over time the particles will spread out, becoming more diffuse, randomly bouncing around the container until it appears as though they are evenly distributed.

Importantly, this flow is probabilistic. We cannot predict the exact position of these particles after a given unit of time, but we can determine the probability of different distributions. And if the gas is diffuse, it is very improbable that its constituent particles will regroup into that initial tight bundle in the corner.

Entropy therefore tells us how the energy of a system is distributed among its parts. Heuristically speaking, low

entropy states have a high variance in energy content and composition. Dense pockets and empty space. A cold body surrounded by heat. Or the opposite. Both alike in that they are thermodynamically improbable. Both far from equilibrium. We call this order because there is distinction. On the other hand, high entropy states are composed of matter and energy that are diffuse, spread out, randomly distributed, perhaps to the point of seeming homogeneity. Words like disorder and chaos are often used to describe them, lacking in distinguishable complexity and structure. In this way, thermal equilibrium is itself the state that has the highest possible entropy for a given system; the heat has nowhere else to flow.

So then entropy is the natural tendency for things to flow from more to less ordered states. Order... naturally gives way to more diffuse, random, and chaotic disorder.

There is also a third law that tells us of the theoretical minimum temperature (absolute zero, a state at which entropy is at its minimum), but it is less relevant to this essay. With these laws in mind, we can proceed.

Energy Conversions & Entropy

Every energy conversion comes with a loss of useful energy, which is to say, an increase in entropy. Waste heat is an inevitable byproduct of doing useful work.

A boulder rolls down a mountain; the potential energy of its elevated position is converted not only into motion but also to heat — the friction as it brushes past other rocks. Gasoline vapor combusts, a piston moves, the engine turns; at most 30% of the fuel's energy is used to rotate the wheels forward, the rest is *lost* as heat and exhaust, radiating out into the universe. The most efficient power plants (combined cycle natural gas) only harness 60% of the fuel's energy; even recapturing the waste heat from the turbine for a second cycle of electricity generation leaves 40% of the methane's energy unutilized. With each energy conversion, more and more waste heat is produced; entropy inevitably continues to increase.

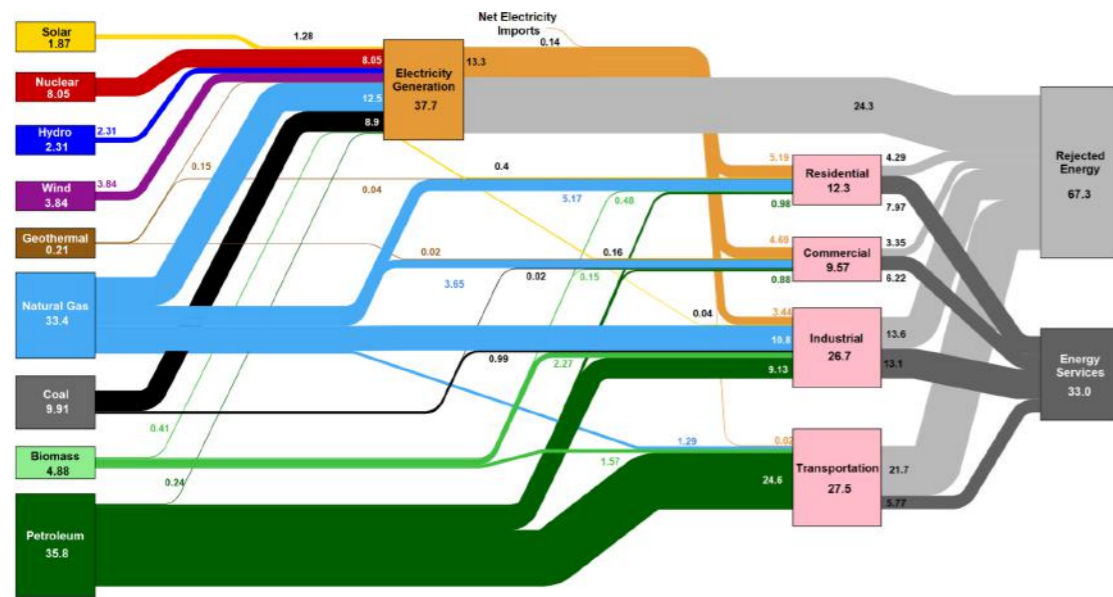
So energy is preserved, but its order decreases. That is, unless we add energy to the system.

It's a hot summer day. To cool down your living room, fuel in a distant power plant is burned to energize your air conditioning. Place a hand on either side of the AC unit; again we find entropy in action, albeit at a smaller scale. When we build the next great cathedral, joules of some kind will go to *waste* as we lift the stone to craft the spire. It is only from the calories Sisyphus consumed that he is able



Estimated U.S. Energy Consumption in 2022: 100.3 Quads

Source: Lawrence Livermore National Laboratory



to push a boulder up the mountain in the first place

Energy is never actually “produced.” It is refined. This refinement is a local reduction of entropy, while even more entropy (waste heat) is shed elsewhere. Energy technologies make this possible. As the above examples illustrate, energy can be more or less easy to use. To this end, we have developed a global apparatus of infrastructure to channel energy into more servile forms. This already happens today, everywhere around us.

Energy Technologies

The gas in your car is the end product of a long supply chain. The hydrocarbon is extracted, refined, and transported to where you want it, when you want it; much heat is shed in the process. Your “renewables” are no different; minerals extracted from around the world shipped via diesel freighter to coal-powered factories where they’re fashioned into panels and blades to catch diffuse sunshine or the intermittent breeze, shipped again via hydrocarbons to a site near you, where it converts a fraction of that “renewable” energy to electricity, at least part of the time, until they need to be replaced. Again, much heat is shed in the process, and much carbon as well (to say nothing of forced labor). This too is a dirty little secret of the green movement: The West is not eliminating carbon emissions, just outsourcing them. The entropy must go somewhere.

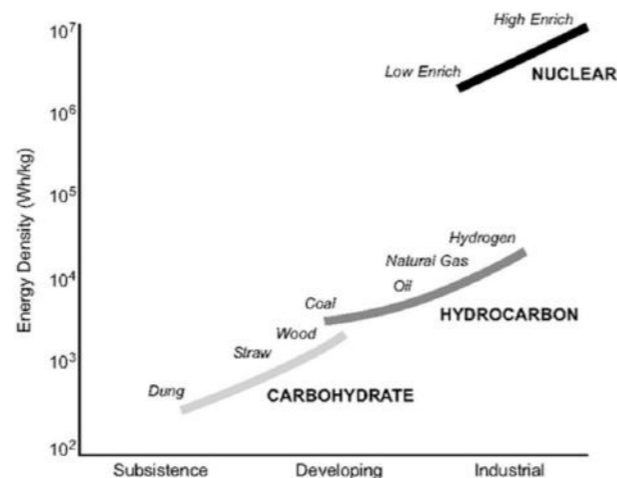
The telos of these technologies is to channel energy to our benefit. Since man first harnessed fire, we have continued to tinker, finding better and better tools to do so. These tools and the knowledge of how to apply them are the key differences between Alexander the Great walking past a curious black liquid oozing from the earth and the multi-trillion dollar hydrocarbon industry today. In that time and because of these energy technologies, we have grown from being able to support some 200 million human lives to 8 billion.

The lens of entropy can also be applied to these energy

resources themselves (both technologies and fuels). Some are inherently lower entropy than others. Lower entropy in two senses: density and control.

Density: if entropy tells us how the energy of a system is distributed among its parts, then dense energy resources are inherently lower entropy. Density can be defined in multiple ways, but the two most relevant are the energy content per unit of mass (joules/kilogram) and the rate of energy flow per unit of land use (watts/meter²). A kilogram of wood contains 16 megajoules of energy. That same mass of natural gas, 55 megajoules. A kilogram of Uranium-235, however, contains 3,900,000 megajoules, or 3.9 terajoules. In terms of land use, the last nuclear power plant in California, Diablo Canyon, utilizes 12 acres to produce an average of 2.0 GW (6% of the state’s electricity generation). The state’s largest wind farm, Alta Energy Wind Center, is spread across 32 thousand acres and produces less than 1/5 the kilowatt-hours.

Control: the extent to which we can dispatch the energy resource also relates to entropy. Nuclear power plants can be energized on demand, but we cannot call on the wind to blow. Alta Energy Wind Center boasts an average capacity factor of less than 25% (meaning despite its 1.6GW nameplate capacity, the production of the wind



Source: Bottomless Well, Mark Mills Peter Huber

farm averages less than 0.4MW over the course of the year). Diablo Canyon, on the other hand, maintains an average capacity factor of ~90%. It’s no surprise grids often maintain substantial back-up generation just in case these intermittent resources fail to deliver. But more on randomness and entropy later.

These dimensions make the historical trend toward dense and reliable energy resources all the more obvious, and the recent resurgence of high entropy infrastructure all the more puzzling.

Among other things, Bitcoin itself is an energy technology. Proof-of-work offers a way to monetize electricity (that most fungible form of energy) anywhere at any time. The engine of Bitcoin seeks to maximize its own adoption and security by offering everyone in the world the prospect of a financial return. Such competitive commodity production has caused a global arms race for the lowest-cost energy, revolutionizing the way humans think about waste and energy systems. An ASIC is a heat sink for the energy sector in the most literal sense. It is dense and controllable, soaking up highly ordered energy that might otherwise be wasted, shedding hot air in the process.

But whether from Bitcoin or other technologies, this waste heat isn’t for naught. It is the cost of preserving order. It keeps us alive. In a thermodynamic sense, life is a process that consumes energy to maintain and create order. This is as true within our bodies as it is without. Whether the final fuel be ATP (Adenosine triphosphate) or electricity. Perhaps, as Gigi previously observed, Bitcoin’s ceaseless use of energy to grow and preserve itself is proof that Bitcoin is a living organism.

The global technological habitat we’ve created is no different. Buildings, bridges, roads, and hospitals all decay. So, too, do power lines and power plants. It is only by converting energy to repair and maintain this infrastructure that we can preserve that which keeps us alive. Energy is the cost of homeostasis. And there is no conversion without waste.

Complexity

So to create order is to reduce entropy locally, thereby shedding an even greater amount of entropy elsewhere. It follows that increasing levels of order (complexity) require increasing levels of energy use. For this reason, physicists like Eric Chaisson measure complexity using energy rate density, or the flow of energy per unit of matter (measured in nanoJoules per second per gram).

As I’ve written elsewhere, “life is order.” And Chaisson notes that life seems to increase its rate of energy use as it evolves, as it becomes more complex. Plants as they evolved from gymnosperms, to angiosperms, to tropical grasses. Societies as they mature from hunter-gatherers, to agriculturalists, to industrialists, and now technologists. With each successive step in evolution, a higher rate of energy usage per unit mass. He even notes a similar trend among stars.

In the context of entropy, this is intuitive. To create and

preserve increasing degrees of order, more and more energy must flow into (and out of) the system.

The Fourth Law of Thermodynamics

But to what end? If there is a natural tendency towards disorder, towards increasing entropy, why does order develop at all? Years ago, Dhruv Bansal blessed me with another life-changing idea (he’s done this before). Perhaps there is a fourth law of thermodynamics: that the universe solves for the path of steepest entropy ascent. In his words, perhaps the universe maximizes the rate of entropy production by creating ordered, hierarchical structures within an ever-growing space of possibilities. Order is a means to this end. To reduce entropy locally is to increase entropy globally. Perhaps life builds upon itself, with the unstated objective of accelerating the natural journey toward disorder.

If true, this fourth law has some interesting implications.

First, there is a definitive direction of the universe (even if we do not fully understand the path).

Second, the most dense energy technologies will eventually be selected for, as they are most adept at increasing entropy.

Third, order will accelerate. Life will continue to climb on top of itself, harnessing more and more energy, shedding more and more entropy, more and more heat. To create order. To create itself. The project is Sisyphean, but we are that project.

And if our civilization returns to dark ages anew, it will only be a temporary detour. The unused fuels will just be combusted at a later date when our successors have redeveloped the tools and collective will to do so.

Such a law makes a technology like Bitcoin seem all the more inevitable. The game theory of harnessing moar energy to create money is such an effective way to increase entropy that its emergence feels inevitable. Perhaps once again, Dhruv saw further in predicting the inevitability of proof-of-work-based moneys for sufficiently intelligent life forms.

Entropy & Information

There is yet another dimension of entropy to consider: information. Here, entropy refers to randomness or noise. Still disorder, just in bits not joules.

We rely on this entropy when generating private keys. We roll die and look to other forms of natural randomness (“adding entropy”) to ensure the secret that unlocks our bitcoin is sufficiently unpredictable. Security through obscurity. This same randomness is also supposed to keep our personal information private and our bank accounts secure from malicious third parties; though, of course, we cannot verify this for ourselves.

And so if informational entropy is randomness, its opposite is order. To reduce entropy is to parse out the signal from the noise.

Again, we must look to bitcoin mining. ASICs dig through mathematical space to find valid blocks, rolling the dice of the cryptographic hash function until they produce the order of a hash below the difficulty target. Much hot air is shed from heat sinks on hash boards (as can be felt in mining farm “hot aisles” around the world). But it is through this process that Bitcoin verifiably links the digital and physical worlds. The nonce is the residue of this process; proof that energy was in fact “spent.” And once this block is added to the chain, the nonce lives on through the energy consumption of full nodes. One can only preserve the order of bits by consuming joules. Storage too comes at a cost.

Intelligence

This idea extends to intelligence, which can be defined as the ability to reduce informational entropy. Gigi first enlightened me with this idea over red lagers in a Latvian basement; my appreciation for its power has only grown since. Considering entropy in the thermodynamic sense, the idea is intuitive. Much like plants distill sunlight and matter into more dense carbohydrates, intelligence distills vast amounts of information into dense, useful theories. Intelligence is finding signal in the noise. In Gigi’s words, “It is the lossless compression of truth.”

This is perhaps what Plato was after when he introduced his theory of the Forms. That there exists a pure, unadulterated essence of what a thing is. The expression of an idea with least possible entropy. The theoretical lower bound. Even if we, as humans, can never access it.

Forms aside, we still strive to reduce informational entropy. To create intelligent theories that are dense, useful, and true.¹

“Yet without obscurity or needless explanation the true prophet signifies.” - Heraclitus

We spend our whole lives processing stimuli so that we can become more intelligent, more adept at bringing about desired outcomes. We project ourselves out into the future to ensure a desirable state of the world, reflecting on the past to inform such projections. Much sweat is shed in the process; much heat. Our brain consumes 20% of our energy intake despite only amounting to 2% of our body mass. And as this nutritional energy is processed and converted, global entropy increases.

The power of such intelligence is obvious. So of course people attempt to abstract concepts incorrectly. We must be wary of the human urge to oversimplify. One need only peruse an airport bookstore to see this in the real world, the vast wasteland of pop non-fiction, countless pages expressing singular, pedestrian ideas that lack robust, explanatory power. Such elongated blog posts could hardly be accused of being dense — or perhaps they could.

Taking a Breath

Once you see entropy, it’s hard not to see it everywhere.

I’m sitting outside on a Saturday morning, thinking about how to make this essay less shit; which is to say, higher signal. My cup of coffee is again cooler now than when I poured myself a refill. The cigarette in my hand dissolves, slowly incinerating to ash. The smoke dissipates in undulating currents until the breeze blows it away altogether, irreversibly mixing with the atmosphere. The smoke, ash, and butt are far less ordered than they were when I opened the pack. I consider the energy that grew the tobacco via photosynthesis, the fuel and machines that powered its harvesting, the distillation of paper and plant into a fully-formed dart. And if something doesn’t kill me first, one day the carcinogens will mutate my genetic code, wreaking the havoc of entropy on my biological information, until my body consumes itself.

I take one last drag. The entropy has to go somewhere.²

But there are still more aspects to entropy, more secrets to uncover.

Entropy & Economics

“All forms of wealth are alike in that they are thermodynamically improbable”

- John Constable

Encyclopedia Britannica defines “economics” as the “social science that seeks to analyze and describe the production, distribution, and consumption of *wealth*.” As tends to happen with rabbit holes, this definition leads us to yet another: “wealth.” Here we look to John Constable (**emphasis added**):

“When we talk about... valued objects we are talking about ‘wealth,’ in the archaic Anglo-Saxon meaning of something that augments human well-being, wealth. So, “Wealth” is a state of the world that increases wellbeing, in other words that satisfies or is likely to satisfy some human requirement (or “demand” to use the standard term in economics). These states of the world vary in character to an extraordinary degree, from a glass of cool water in the desert, to a mug of hot tea on a cold night in Northumberland, from a roof over your head, to the floor beneath your feet; from the engine that makes your car move, to the brakes that stop it; from the sandwich on the shelf in the supermarket when you want it; to the sewerage that carries the digested remains safely away when you have finished with it.”

This broad definition includes intangible forms of wealth such as language, intellectual traditions, and information itself. Elsewhere, Constable notes that one commonality underlies all such examples: “They are all, without exception, improbable.” They are all “physical states far from thermodynamic equilibrium, and the world was

brought, sometimes over long periods of time, into these convenient configurations by energy conversion, the use of which reduced entropy in one corner of the universe, ours, and increased it by an even larger margin somewhere else.”

That is to say, all wealth creation is entropy reduction, in the most literal sense. Consider the chair you are sitting on. The non-human world rarely solves for lower back support. The chair was made using energy and raw materials. If wooden: A tree somewhere in the world was chopped down, transported many miles, and fashioned into a shape that so pleases the human tush. If another material: Hydrocarbons were likely used either to power the factory that made the chair or even produce the material of the chair in the first place. Each link in this supply chain was thermodynamically improbable.

So wealth, too, is a function of energy. We rearrange matter to a more improbable configuration so that we might satisfy our desires. This, without exception, requires energy. Therefore, all existing wealth embodies past energy conversions.

Such realizations shed new light on other foundational economic concepts.

Capital

If all economic growth is entropy reduction, then the capital stock of the economy (“K” in economic notation) represents not only previous (local) reductions in entropy but also our capacity for yet more. This is particularly true in the case of energy infrastructure. We can only reduce entropy to the extent we have power plants and supply chains to fuel them. By shutting down dense base load generation, we are limiting our ability to create wealth. Even to preserve our own existing order.

Money

Even money becomes just another reflection of entropy.

If all wealth creation is entropy reduction, then “financial wealth” under a sound money standard can be thought of as a measure of the entropy you have reduced for others, which is the value you have provided. AJ Scalia, CEO of Cathedra Bitcoin, was first to see this connection.

Money itself is also a means for reducing informational entropy. It helps us communicate useful economic information via the pricing mechanism. Under sound money, this communication is emergent, organic, and high signal so that economic calculation can be more accurate.

But the key function of money is to transfer value into the future. In AJ’s words, it is that good which minimizes uncertainty for the possessor. And, to quote founder and CEO of GoldMoney Inc., Roy Sebag, we want money that is “superior in its resistance to entropy through time.” This entropy can take many forms: physical decay, human conflict, and inflation among them.

From the entropy of fiat, Bitcoin instantiates order.

Time Preference

But whether money is sound or not, we are still forced to grapple with the future.

We work today, so that tomorrow we don’t have to. We save any surplus for future consumption. And we only invest our money if there is a sufficiently attractive rate of return to forgo instant gratification or the optionality of savings. Even if, as in our current system, “sufficiently attractive” might mean a return high enough to avoid losing purchasing power to inflation. Such is the treadmill of fiat.

This relative valuation of the present to the future is referred to as time preference. The only reason we have the capital necessary to reduce entropy in the human sphere is because, in the past, individuals’ time preferences were sufficiently low to invest for tomorrow.

But what does it mean? Past, present, and future. Once again we find entropy in the answer.

Time

All of the above concepts are mediated through time.

Energy is the capacity to do work, an act that can only be done over time. Of the five primary mathematical expressions of the *joule*, all contain a variable expressing time. Power is energy over time (a watt is one joule per second). The second law of thermodynamics itself is defined as entropy’s increase over time; or more precisely, the fact that it does not naturally decrease (in mathematical notation: $dS/dt > \text{or} = 0$, where S = entropy and t = time.)

It is only from experience (time) that we are able to parse out the signal from the noise, which is to say intelligence also is a function of time (a point Kant would contest, despite his punctuality).

And “the production, distribution, and consumption of wealth,” the focus of the field of economics, is also time-dependent. The former three nouns refer to processes over time, while the latter (“wealth”) refers to states of the world at different points in time. Perhaps this is obvious, as economics is a human study, and we ourselves are temporal beings. We are inherently situated in time.

Consequently, humans have long wrestled with the concept of time. Does anything exist outside of the present? Or is time just another dimension to be mastered and traversed, if only we had the tools? Many careers have been devoted to these and other profound questions. But I will once again frustrate the philosophic reader by sidestepping the rigor these questions deserve and - like the smooth brain I am - go back to the things themselves.

Time. What is it? That thing that passes. But we are so steeped in the concept that we often mistake its measure for the thing itself. Time is not to be found in seconds; seconds are just a tool we invented to understand it.

*"Time is not a reality [hupostasis], but a concept [noêma] or a measure [metron]..." - Antiphon the Sophist - **Gigi***

Things change. And we measure this change through regularly repeating mechanisms, which is to say, changes we understand. It seems likely this is how humanity first measured time: night and day, winter and summer. The same is true for all clocks. The sun moves, casting a shadow in its wake. Gears go round, turning the hands of a watch. Electrons jump, moving digits. These marginal processes define what we call time.

*"The sun, timekeeper of the day and season, oversees all things." - **Heraclitus***

And by the seventeenth century AD, we were so familiar with the concept of time - using predictable change to quantify other changes - that Newton abstracted it to better predict the movement of bodies (earthly and celestial). In doing so, he invented time with a capital "T."

*"Absolute, true, and mathematical time, of itself, and from its own nature flows equably without regard to anything external" - **Isaac Newton***

Relativity

But it now appears this abstraction was not as universal as Newton had thought.

The special relativists say that time moves faster or slower depending on the speed of the clock and the massive bodies surrounding. Two twins are born. One travels near the speed of light to distant lands, the other stays tending to his crops. When the prodigal son returns, he is far younger than his brother; his watch has ticked far fewer times. We even see this phenomenon on planes traveling far slower than the speed of light.

Not only does this mean that time can move at different speeds, it also renders the idea of a singular "now" throughout the universe obsolete. What would "now" mean to someone millions of light years away? There is no hope of synchronizing due to the inherent latency in any communication that would verify the experience shared. While this doesn't much affect our lives today, it does reveal the true nature of what we mean when we ask "what time is it?"

Clocks were invented for human coordination. Clocktower bells once rang throughout towns to synchronize human activities. Now, the "correct" time is pushed to our phones and laptops from centralized servers. But how can we trust the clock of another?

Again we look to Gigi. In *Bitcoin is Time*, he explains Bitcoin's role as a decentralized clock. The chain of blocks imposes chronological order in a trustless way. It establishes a verifiable now with the chain tip. The difficulty adjustment self regulates to ensure this now doesn't move forward too quickly. And anyone in the world can run a node and see it for themselves. It is the most trustless now we have.

Things change. And time is the tool man invented to

measure it. Time, capital T, is an abstraction, but one that surely has proven useful.

Entropy & Time

So there is no universal Time. But surely time still mediates our experience, it still flows. Or at least seems to. We call this flow the "arrow of time." But where does it come from?

Most of the fundamental laws of physics are symmetrical with respect to time. The equations discovered to explain gravity, motion, the conservation of mass and energy, and electricity would all work just as well if the arrow of time was flipped; if the world moved backwards.

What then gives time its direction? The second law of thermodynamics may once again hint at an answer.

The only fundamental law of physics that is not symmetric with respect to time is entropy. As time passes, entropy increases. As we've discussed previously, entropy is probabilistic. It's not that the gas particles can't naturally regroup into a tight bundle in the corner of a box, it's just that they don't. While this might not be causation, this correlation might be the best clue we have.

*"Energy and time are conjugates. They are tied to each other." - **Carlo Rovelli***

So entropy, the flow that powers life, is the tendency for order to degrade over time; and the arrow of time might itself just be the arrow of increasing entropy. The astute reader will notice the circularity. Perhaps it is an indication of incomplete knowledge. Perhaps an indication of great mysteries beyond our comprehension.³ The answer might be found tomorrow, that sweetest of things that never comes.

"Whence all creation had its origin, the creator, whether he fashioned it or whether he did not, the creator, who surveys it all from highest heaven, he knows — or maybe even he does not know."

- **The Nasadiya Sukta, The Rigveda**

Back to Energy

And as it turns out, energy suffers from a similar problem. There is no method for measuring energy directly. Again, it is a quality and not a substance.

Despite our ceaseless use of it, we can only attempt to understand energy through indirect means. In electricity, we use volts and amps to derive it. In nutrition, the calorie (literally how much heat is created by burning the food). But we still can't see energy, the thing itself.

My conversations with Rete Browning, CTO at Cathedra Bitcoin, often result in me staring at equations I haven't considered since college (and worse still, doing algebra). Chatting with him about this essay proved no exception. As Rete revealed, if you drill into the maths, you see that four of the five primary mathematical expressions of the joule boil

down to the movement of some mass over some distance during some time period (with the exception requiring the inclusion of electric charge). Our measurements boil down to what we can see. All else is an abstraction. Energy is no exception.

Perhaps this makes sense. Energy is potential. When we think about energy, about power, we really are thinking about the potential for useful work. How we might rearrange matter to our benefit. And if "energy is the only universal currency," then the universe as a whole is shaped by this potentiality, by what could be. Potentiality takes shape and is reshaped, degrading with each transformation but—in rare instances—becoming manifest as order.

Life has mastered harnessing this potentiality to increasing degrees over time. We as humans have so excelled at this, that we can sit on the couch while our energy infrastructure refines the lifeblood of the universe for us; supporting billions of lives, creating tremendously improbable states of matter, and shedding many zetawatt-hours of waste heat as a result.

Things change. We have spent all of human history trying to understand this change. And, if such things exist, that which doesn't change. Our measurements and "laws" are downstream of this endeavor. They are imperfect, but they are the most perfect tools we have. The strongest signal we can induct. To paraphrase the 13th century Buddhist teacher, Dōgen Zenji, "before one studies... mountains are mountains and waters are waters; after a first glimpse into the truth... mountains are no longer mountains and waters are no longer waters; after enlightenment, mountains are once again mountains and waters once again waters."

Conclusion

So where does this leave us?

Time passes, which is to say, things change. As they change, the amount of energy is conserved but its order decreases; the energy becomes more diffuse, more random. Amidst this backdrop, we enjoy these brief instances of order. We harness energy so that we might sustain and increase them. Both in number and complexity. In doing so, perhaps we are fulfilling our pre-ordained mission as agents of entropy, shedding greater and greater amounts of disorder into the universe. But these precious instances of order remain brief nonetheless.

A son is born. A father is told he will soon die. This is the way of the world.

"I am Time, the mighty cause of world destruction; Who has come forth to annihilate the worlds."

- **The Bhagavad Gita**

And as time passes, we live and create. We accelerate the inevitable trend of entropy, only to find that entropy - this trend toward disorder - might actually lie at the heart of time itself.

This - to me at least - seems to be the nature of things. We are riding the past energy conversions of mankind. We are

left to decide whether we want this to be a local maximum before returning to a new dark age, or if we have the will to flourish, to create beautiful, ordered complexity—an endeavor that necessitates the acceleration of entropy elsewhere. Perhaps the decision has already been made for us. Only time will tell.

Drew Armstrong

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October, 2023

1. *The philosophically astute reader must forgive me for sidestepping epistemological rigor here, but perhaps this heuristic discussion is intelligent enough.*
2. *Let this too be a lesson, never look in the closet of someone who appears too ordered. The second law also applies to human psychology.*
3. *Or perhaps we need not think so hard. Perhaps we should just trust the world is as it appears, that the direction of the flow is inherent to time itself. Perhaps the simplest explanation is once again true.*



Toward Permissionless Power Markets

Bitcoin's impact on the price, stability and sustainability of global power markets

By Andrew Myers

"I always try to solve problems by some artifact, some tool or invention that makes what people are doing obsolete so that it makes this particular kind of problem no longer relevant. My answer would be to develop a world energy grid, an electric grid where everybody is on the same grid. All of a sudden there would be no problems anymore, no international troubles. Our new economic basis wouldn't be gold or dollars; it would be kilowatt-hours."

- R. Buckminster Fuller

Introduction

Life is an exchange of energy. A warm hug from a loved one after time apart. The vibration of a high five with your teammate after the big win. A hot sip of coffee in the morning before deep work on your given craft. Each of these simple interactions exchanges energy for a unique purpose. On a larger scale, humans leverage electrical energy to enhance our way of life and survive as a species — from washing our clothes to powering the free flow of information over the internet. The architecture of our very civilization is built upon electrical energy. Despite its ubiquitous and fundamental nature, investment in the world's electrical energy supply is, in no uncertain terms, constrained by government overreach and misallocation of capital from central banks. While intelligent, hardworking engineers and tradespeople build and operate one of the world's most sophisticated machines, i.e., the power grid, they are constantly called into question by non-technical bureaucrats "looking out for public safety."

It is well understood that the essential condition of power markets, as compared to other types of commodity markets, is the need to keep supply and demand in close balance at all times to prevent blackouts and damage to vital infrastructure. For the last century, engineers have had the tools and systems to perform this balancing act in a safe and reliable manner. Yet, for just as long, the fear of such consequences has been exploited to enact layers of rules and regulations "to protect public safety" and "to keep the lights on." In the real world, from the most free and open markets to the most heavily regulated power markets, the only thing that actually keeps the lights on is the price of electricity -- the equilibrium of supply and demand. When supply matches demand and the price signal is clear, the power grid operates in near perfect harmony to deliver much needed electrical energy to homes and businesses around the world.

Today, however, the price of electrical energy is distorted across disjointed, heavily regulated markets and is unpredictably inflated year over year by fiat money. In the future, bitcoin will be the only objective measure of price and the only form of money that can measure the unconstrained wealth humanity is able to create with free flowing energy.

How Power Markets Function Today

Physical & Financial Flows in Power Markets

Power markets exist to provide the lowest cost, highest quality electrical energy by facilitating the real time balance of supply and demand. Today, most power markets perform this balancing function through a primary energy market and a secondary ancillary services market.

- Energy Market – Primary real time sale of electricity produced by power plants and consumed by residential, commercial, and industrial loads.
- Ancillary Services – Secondary services such as frequency, voltage control, and reactive power management supporting the operation of the system when electrical energy supply and demand are out of balance.

To create a primary energy market, operators must provide real time price signals to both sellers and buyers. This process is generally referred to as Security Constrained Economic Dispatch (SCED). In simple terms, SCED means the market is trying to deliver (dispatch) the lowest cost (economic) electrical energy to consumers while also being limited by transmission and generation capacity (security constrained). More specifically, the power market continuously runs an optimization model with a) the objective of achieving the lowest cost price of power, and b) the dynamic constraints of supply, demand, and transmission capacity for each location (generally referred to as nodes) on a vast regional network. In most power markets, the market operator will publish a per megawatt-hour price for each node every five minutes. The price signal informs:

- a buyer if they should continue operating or shut down if prices are too high, and
- a seller if they should continue operating or shut down if prices are too low.

During real world operation, supply and demand are always changing due to events such as transmission line outages, dynamic loads coming on and offline, and unexpected weather events. When these occurrences create a divergence between supply and demand that is too large, the market resorts to ancillary services. These ancillary services and protection systems can operate in milliseconds to keep the system operational while supply and demand find a new equilibrium.

As time passes and the SCED model runs, power market operators meter all production and consumption at a given price for each node. Market operators then facilitate the financial settlement of these trades between the market participants. By necessity, power is being produced and delivered in real time. Yet, the cash payment for this power lags by days, weeks, and months. As we'll show, the implications of this mismatch in the timing of delivery and payment are enormous.

Challenges With Today's Power Markets

Market conditions become challenging when supply and demand change rapidly. Take the example of a hot afternoon when people are arriving home from work, turning up their home air conditioning, starting their laundry, cooking dinner, and consuming television programming. Demand has now increased. Now suppose one of the nearby coal-fired power plants shuts down for unexpected maintenance. Supply has now decreased. Under these conditions, energy prices can rise three orders of magnitude in minutes, from a few dollars per megawatt-hour to thousands of dollars per megawatt-hour. For energy buyers, this change in price provides a clear signal to immediately cease operations so as not to incur a massive operating expense in a short amount of time. For energy sellers, the price change provides a clear signal to deliver more energy and capture more revenue. However, as power markets are currently designed, balancing supply and demand is not so simple.

First, power markets are more volatile than they should be due to government-controlled price fixing over the last century. In most of the world, government controlled monopoly utilities offer only a single fixed price for electricity, regardless of supply and demand, causing consumer response to price signals to atrophy or never blossom in the first place. In microeconomics 101 terminology, the market is seriously lacking in demand side elasticity. In reality, the majority of electrical loads are highly interruptible and could be shifted based on real time price signals, thus significantly decreasing the magnitude and volatility of demand.

Second, the real time pricing and delivery of energy does not actually constitute real time revenue and expenses. Electrical energy must be delivered in real time, but once delivered, the money remains idle for days, weeks, or even longer as sellers and buyers effectively accumulate IOUs. As prices increase and time passes, distrust between market participants compounds. The higher the prices and the longer the time period, the higher the risk of the buyer defaulting becomes, the more the opportunity cost increases, and the more inflation erodes any remaining

value. With complex contractual obligations between layers of buyers and sellers, significant coordination is needed to ensure that those obligations will be met, and at the speed power markets move there is little time for such coordination.

Third, most market participants are dependent on a handful of highly leveraged and increasingly insolvent banks, making conditions even more challenging. Power market operators must be cautious of where market participant funds are held in order to not concentrate too much risk in a single bank. The constant need to monitor the overall credit health of the market while operating on antiquated and risky banking systems adds cost and complexity to the operations of the market.

The result is a patchwork of manual processes, added requirements, and added costs to keep the lights on. Fortunately, many of these challenges are being solved with modern technologies and common sense thinking. Real time power metering, advanced control systems, energy storage, demand response, real time pricing, and real time money are all moving us toward a world where reliability is fully automated and energy flows freely.

How Bitcoin Fixes This

Sound money is essential for equitable and innovative global trade. Bitcoin is energy backed sound money -- built to be a reliable store of value, a super fast and efficient medium of exchange, and an unchanging measurement of price or unit of account aligned perfectly with humanity's ambitions for abundant sustainable energy.

Bitcoin Creates Unprecedented Purchasing Power (Store of Value)

As the world moves toward sound money on a bitcoin standard, economic decisions in the energy market will flow back to the individual. Rather than competing with big pockets full of cheap money, the individual innovator and investor will be operating on a level playing field. Political and banking relationships will matter less, and creativity, hard work, and perseverance will matter more. Rather than having a growing lower class and hollowed out middle class late on energy bills, we will see a growing class of entrepreneurs, investors, and every day people eager to produce and consume more energy to make their dreams a reality.

Bitcoin as a 24/7 Real Time Financial Settlement Protocol (Medium of Exchange)

With bitcoin, money can be sent anywhere in the world at any time of day, any day of the week, and any day of the year with only a few lines of code. What does this mean for power markets? It means a fundamentally more accurate price signal. At present, power markets have a stated real time price, yet the true price is unknown due to the slow and unreliable banking rails where you must either send

money in advance or in arrears. These price distortions impact economic decisions between sellers and buyers, thus affecting the balance of supply and demand, and ultimately power grid reliability. With bitcoin, the price of energy, the delivery of energy, and the settlement of energy payments can all happen within milliseconds of each other. The market operator (or algorithm) publishes a price, the seller transmits the electricity at the speed of light, and the buyer pays for the electricity also at the speed of light. If the buyer fails to pay, the seller or market operator can simply disconnect all non-essential load via a circuit breaker. With perfect pricing and real time controls, supply and demand can remain in perfect balance. As Buckminster Fuller suggested, bitcoin makes the need for trust between buyers and sellers of electricity obsolete. Instead, buyers and sellers can focus on what they do best.

Bitcoin Dampens Power Market Risk & Volatility (Unit of Account)

The growth of bitcoin mining at the utility scale is the perfect complement to the growth of abundant renewable energy in our global power markets. The current lack of demand side elasticity is challenging enough for maintaining system frequency. When you add an unreliable and intermittent form of power generation (i.e., wind and solar) to the grid, you further stress the systems tasked with balancing supply and demand. With bitcoin mining colocated behind-the-meter of renewable power generation, we are now able to absorb spikes in renewable energy production before they reach the grid by converting that energy into bitcoin. Bitcoin mining is also leading the market in providing demand response at scale by turning off in order to not contribute to peak demand and providing ancillary services with frequency and voltage modulation. In effect, bitcoin dampens market volatility by putting a price on all energy. As bitcoin becomes widely used, its fixed supply will make it the most reliable way to measure the value of energy. In other words, bitcoin is already the unit of account for surplus energy and in the future will become the unit of account for all energy.

Permissionless Power Markets

Imagine a world where the government tries to stop you from hugging, i.e. exchanging human energy, for your safety. It's not so hard to imagine because if you were paying attention, you would have already lived this experience. The constraints placed on power markets today come from the same worldview. Bureaucrats thousands of miles away from the problem who think they know what is best for someone else. They come from politically appointed public utility commissions reminiscent of the old Soviet Central Control Commission to monopoly utilities with footprints analogous to gang territories. The constraints placed on how economic decision makers can buy and sell energy are reducing power grid reliability, raising prices for the end consumer, and slowing the pace of industry innovation.

Moving forward, the system must be rebuilt from the ground up. As bitcoin brings unprecedented purchasing

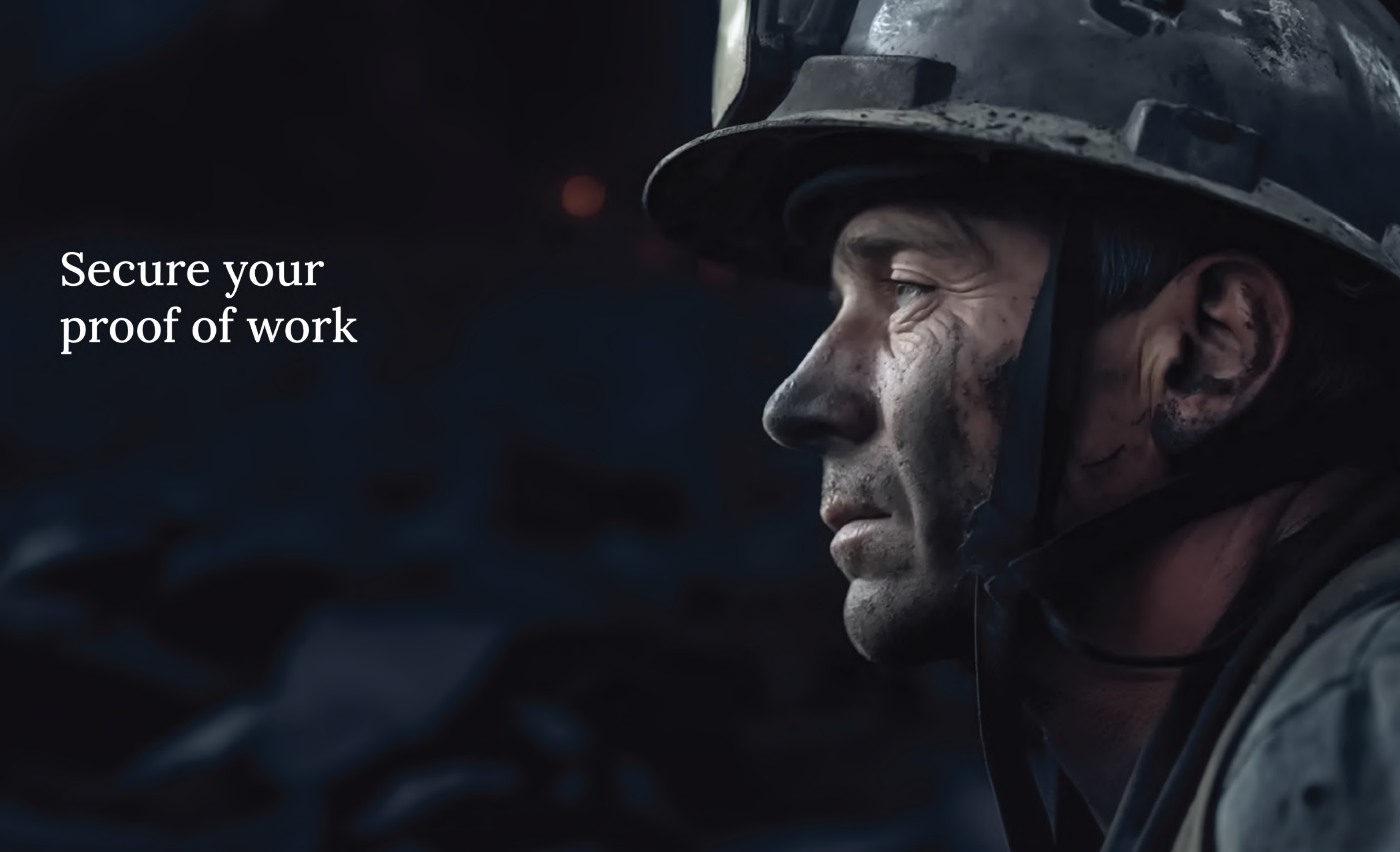
power back into the hands of sovereign individuals and local communities, they will have the opportunity to build decentralized and permissionless micro grids and micro markets where any seller or buyer of electrical energy can contribute to the market without gatekeepers. As micro markets grow to connect with local markets, and those with regional markets, and those with international markets, the world will begin to operate not only on a common currency but also a common frequency.

An unconstrained global energy standard is necessary for humanity's full potential to be realized. This can only happen if energy is priced accurately, in real time, in a form of money that is incorruptible and energy backed. In other words: **Bitcoin**.

Andrew Myers

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October, 2023



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Humanity at a Crossroads

It's time to come back to reality

By Marty Bent

The world has become completely detached from reality, and if productive individuals do not take action with a sense of urgency, they could soon wake up in a world where the luxuries they have taken for granted simply do not exist anymore. The root cause of the collective disconnection from reality is the existence of the debt-fueled fiat monetary system that the global economy operates on. When central banks can manifest new monetary units out of the ether with the click of a button, governments can fund spending with the issuance of government bonds, and commercial banks can further expand the monetary base via credit creation; it is easy for the world to become disconnected from reality. Things may seem all well and good for a period of time, but reality, as dictated by the laws of economics, always has the last laugh.

One of the most pernicious aspects of humanity's collective detachment from reality is the temporary obfuscation of opportunity cost. This illusion persists for a finite but unknowable amount of time, as easy money lulls most people into a false sense of security. However, if one squints hard enough, they can begin to see opportunity cost peeking its head from beyond the veil. Taunting humanity with a shit-eating grin that says, "I cannot believe you actually believed you could escape me." One sector of the economy that is experiencing the wrath of a neglected opportunity cost, now decades long, is the energy sector. The illusion is beginning to falter -- which, if one thinks about it, is not all surprising.

Energy is the base from which everything operates. Life itself would not exist without energy. The most important thing that humans have done as a species is figure out ways to harness energy and leverage it to be more productive. The journey from the age of the hunter and gatherer to the agrarian age to the industrial age to the digital age has been marked by inflection points at which humans discovered novel ways to utilize energy sources to enhance their productive capabilities. This essay you are currently reading was made possible because of the tools I have been afforded by harnessing energy over the course of millennia. Collectively, they provided me with the education, tools, and personal connections necessary to articulate these thoughts and share them with you.

It is truly miraculous that, over the course of time, humanity has accrued the necessary knowledge and skills, resulting in the digital world it enjoys today. Man's ability to harness nature in the ways he does is something that should be celebrated and marveled at. Unfortunately for today's generation, the hubris and complacency of man has reached a critical tipping point that many do not appreciate or understand the importance of energy in our

everyday lives. Energy usage is villainized, and some men are actively trying to ensure that humanity digresses back to a less advanced stage in hopes to save itself from the weather. The shame that these types of people feel is truly perplexing, and if action is not taken with urgency, this generation of virtue signaling dolts will be responsible for setting humanity back generations.

The truth about ESG

One of the main drivers on our road to self-immolation these last few decades has been the emergence of ESG mandates popularized by capital allocators. ESG stands for Environmental, Social and Governance and serves as an investment framework to determine which companies reap the benefits of large slugs of capital allocations. It is one of the most subversive investment frameworks that has ever been devised, and it completely inverts how businesses should operate in a sane economy. Let me tell you why.

In a well-functioning economy, an entrepreneur identifies an opportunity to bring a good or service to market that currently doesn't exist but has demand. That entrepreneur spends his time and capital to produce that good or service, bring it to market, and hopefully - if he correctly identified the demand, that it was not being met, and produced the good or service that successfully meets the demand - he makes a profit, allowing him to produce more and serve a larger customer base. One can argue that the most important aspect of this feedback loop is the entrepreneur's recognition of the market dislocation that provides an opportunity to fulfill needs and bring in more revenue than the amount of money that was spent to fulfill demand. The entrepreneur is able to accomplish this because he is closest to the source of information in the market that signals what is and isn't needed in the market. Once the signal is received and a business plan is created, the entrepreneur then figures out a way to finance his business with outside capital so that he can service the market with what it needs.

Over the last decade, ESG - largely fueled by fiat money - has completely flipped the script. Instead of the entrepreneur identifying a problem and taking risks to solve it, the large capital allocators of the world have deemed themselves the sole arbiters of what is considered a "good idea" or what "problems" need to be solved and have made it their jobs to fund "entrepreneurs" to bring their ideas to life. What should be an emergent market phenomena has mutated into top-down diktat controlled by the largest capital allocators on the planet. This has resulted in the largest misallocation of capital in human history, which in turn,

has put the global economy in a very precarious situation. While ESG mandates span the domains of environmental issues, social justice, and corporate governance, I think it is safe to say that the damage done to the energy sector in an effort to be "environmentally friendly" has been the most pronounced, because it actually carries the burden of all of this misallocation.

The Energy Sector

Energy is the most important sector of the economy. This is not an opinion or a perspective, but a fact. Every end product that you interact with on a day-to-day basis, and every service you use, was made possible through the utilization of energy at every part of the supply chain. When the energy sector is materially hindered, it creates ripple effects on everything else throughout the economy. The first four years of the 2020s have made this abundantly clear. Decades of poor decision-making driven predominately by ESG mandates and subsidies, made possible by the money printer and government debt, have led to over-investment in unreliable energy infrastructure and the deconstruction of reliable infrastructure.

The illogical concept of "net-zero carbon emissions by [insert a date that keeps extending further into the future]" permeated the mainstream consciousness and erected an industry of grift that has revealed a shocking amount of ignorance in regard to how life actually works on this planet. Humans emit carbon dioxide. Plants feed on carbon dioxide. Carbon is one of the fundamental elements of what makes our world inhabitable. And yet, the "experts" and their lapdogs in the mainstream media, together with tone-deaf governments around the world, have successfully convinced many people that carbon dioxide is a pollutant that should be eradicated from our hyper-industrialized economy. This surge of collective insanity was an opportunity Wall Street took full advantage of:

"If everyone believes we need to fix the climate, there is a financial product we can sell them."

Enter ESG: wokeness applied to capital allocation. It combines everything that is wrong with modern society's rejection of reality with everything that is wrong with the opportunistic and parasitic way in which Wall Street operates.

To be an upstanding corporate citizen in the eyes of the largest capital allocators in the world within an investment landscape dominated by ESG mandates, companies have to prove that they care about the environment, care about diversity, and care about social justice. This has forced companies to allocate time and capital toward endeavors that not only lead nowhere, but are proven to be detrimental to productivity, longevity, and profitability, resulting in more negative externalities for the entire global economy.

The "net-zero carbon emissions" goals have corrupted capital in two ways: governments have created trillions of dollars of subsidies that favor particular forms of energy generation (mainly wind and solar) and the BlackRocks and Vanguards of the world have dangled their massive purchasing power as a carrot to force energy companies down the path toward unreliable energy generation and unproductive carbon accounting gimmicks. At the same time, states and countries fully bought into the grift and began dismantling reliable base load generation provided by nuclear, natural gas, and coal power plants while investing heavily in wind and solar projects. This has led to unreliable grid infrastructure which has, quite literally, resulted in the loss of human life. One must simply look to Germany to witness the plight of disastrous ESG energy policies.

The Germans made a strategic miscalculation at the turn of the century that will be used as a case study for centuries to come. They were the first to embark on a net-zero/renewable energy transition and began actively decommissioning reliable energy generation (i.e., nuclear, natural gas, and coal) in favor of unreliable generation (i.e., wind and solar). In 2002, Germany had an installed electricity generation capacity of 115.9 gigawatts. Over the next two decades, they would expand that installed

capacity by more than 108% to 241.1 gigawatts. On paper, this seems like an incredible amount of progress. The type of progress that would lead you to believe that Germans are significantly better off than they were at the turn of the century - especially considering the fact that the German population has grown by only 2.7% over the same period of time.

However, nothing could be further from the truth. While the numbers may look impressive on paper, when overall capacity is marked to market - as determined by the actual generation that is occurring within the German grid system at any given point in time - a very different image is presented. In 2002, the German power industry generated 586.7 terawatt hours of electricity. By 2022, it generated only 577.3 terawatt hours. In other words, while capacity has more than doubled on paper, alongside a mild 2.7% population growth, actual generation has declined over a two decade period! The result of all of this? The average German household is paying 187% more for electricity per month than it was in 2002. **187%**. And they call this progress?

You might ask - "How the hell is that possible?"

The answer is simple: *Being completely disconnected from reality.* A nation can build as much generation capacity as its heart desires, but if the generation doesn't actually materialize, it is all for naught. You've built the electricity equivalent of Chinese ghost cities that will never house a single person. No amount of virtue signaling or browbeating can force the sun to shine or the wind to blow, and the Germans are learning this lesson the hard way.

This is a great shame because Germany's energy infrastructure was considerably robust in 2002 with nuclear, coal, and natural gas making up 97.7 gigawatts or ~84% of the overall generation capacity mix. Since the German government made the bold decision to transition their energy system to a predominately "renewable" energy mix, the capacity of nuclear, natural gas, and coal has fallen by more than 21% to 77 gigawatts, or ~32% of the overall capacity today.

The effects of this nation-state level virtue signal have been catastrophic for Germany and neighboring countries - especially in the wake of the war between Russia and Ukraine, during which the Nord Stream 2 pipeline was bombed and disrupted the flow of Russian natural gas to Eastern Europe. It has been reported that the EU energy crisis killed more people than "COVID" during the winter of 2022-2023. Luckily, it was a mild winter last year. If it had been colder, some were estimating that European deaths caused by the energy crisis would have exceeded 300,000, surpassing the cumulative deaths caused by both "COVID" and the Russia and Ukraine war.

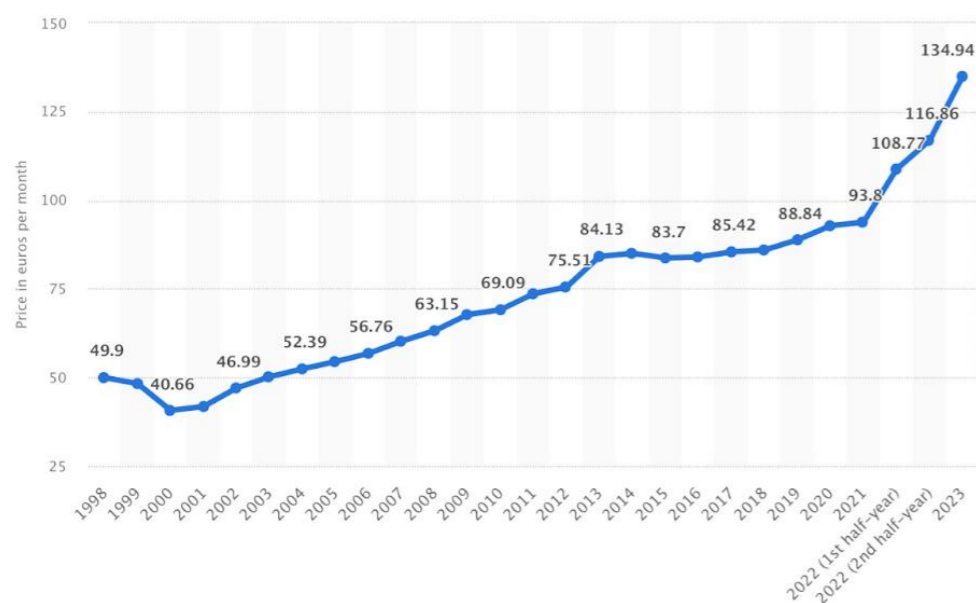
The point being, energy accessibility is not only important for human flourishing, it is essential to survival. especially in a world where the average human has become completely accustomed to the luxuries of living in a hyper-industrialized and digital economy. The Common Man is too far removed from the era of log-gathering-to-stay-warm and cannot deal with such an abrupt shock to the system. This is a very scary reality to come to grips with, and it would take another essay to walk through why this simple fact is something that should be properly addressed to ensure the robustness of humanity moving forward, but - for the purposes of this essay - it is a core fact that needs to be recognized and internalized.

"Back to Reality" if we want a future

The individuals living on this planet today do not have the luxury to virtue signal when it comes to energy production. The stakes are simply too high, and any significant deviation from the norm can and will produce deadly consequences. This is why the ESG movement should be met with as much scorn and ridicule as humanly possible. If successful, it will lead to the dismantling of critical energy infrastructure that will end with hundreds of millions of lives lost. The negative consequences would be far graver than any increase in the average temperature of the planet could cause. If urgent

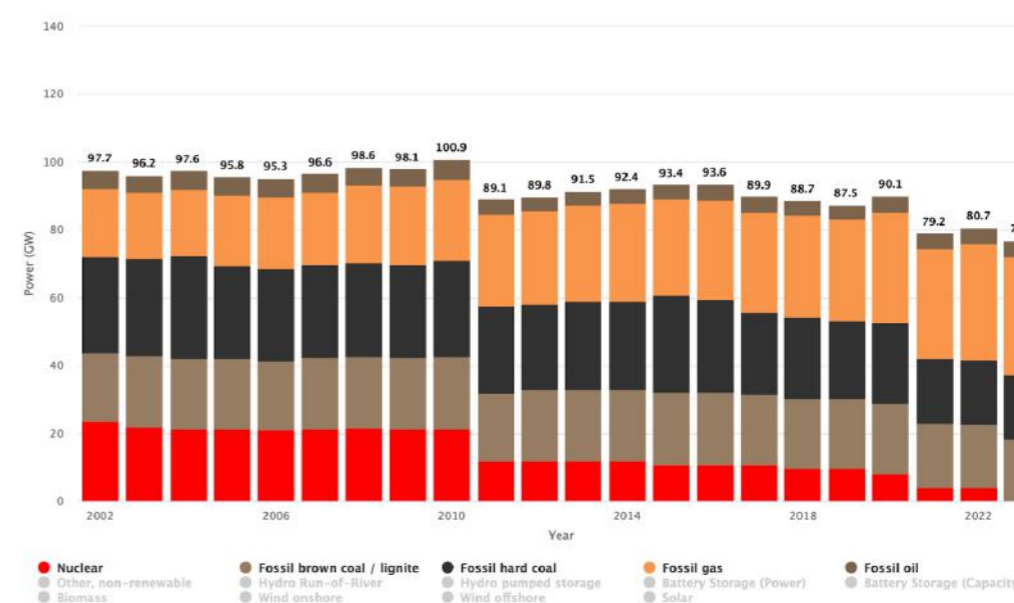
Average Electricity Bill for a 3-person Household in Germany

in euros per month



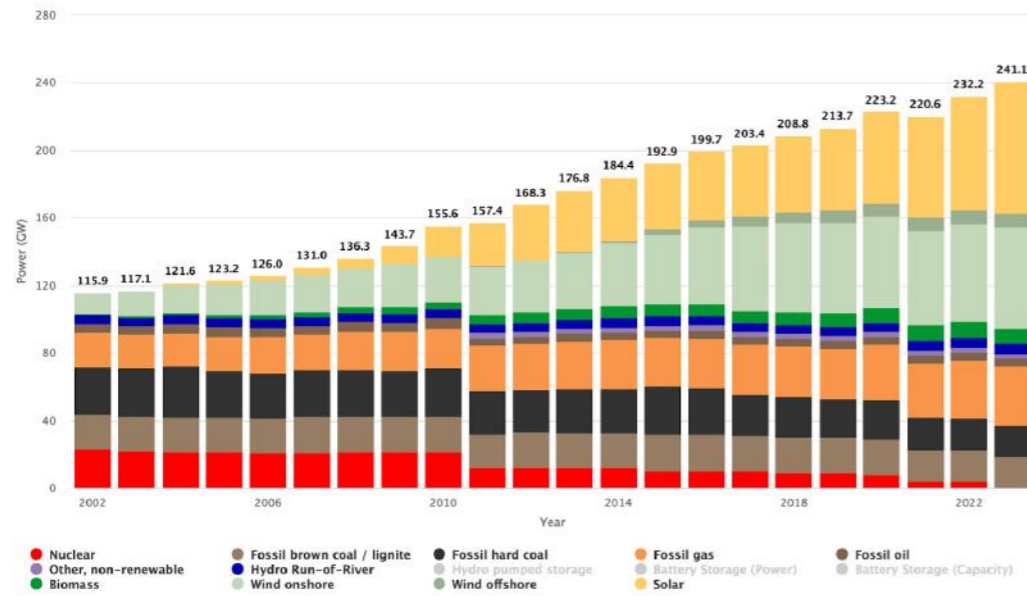
Net Installed Electricity Generation Capacity in Germany

Energy-Charts.info - last update: 10.24.2023



Net Installed Electricity Generation Capacity in Germany

Energy-Charts.info - last update: 10.24.2023



action isn't taken, things could spiral out of control rather quickly.

The German case study is just that, a case study — a microcosm of a larger trend that has evolved into a mind virus encapsulating the world. Texas, one of the energy capitals of the world, has fallen prey to the mind virus and elected to forgo the construction of reliable nuclear, natural gas, and coal generation in favor of wind and solar. So far, the consequences have not been as deadly as they have been in Europe, but if the tide doesn't turn soon, they may certainly prove to be more deadly.

The last few years have brought with them major tests for a grid system that has favored unreliable capacity at a time when demand on the grid has exploded due to population growth and the weather during the middle of summer and winter were extreme. During the winter storm of 2021, 246 people lost their lives because they were unable to keep themselves warm. Rolling blackouts literally prevented them from accessing proper heating systems. Temperatures plummeted because a polar vortex crept down into the Southern part of the United States. This resulted in the clouds covering the sky -- rendering solar panels useless and freezing wind turbines --making it impossible to generate electricity from massive wind farms. In fairness, natural gas lines froze, and temperature sensors at nuclear power plants malfunctioned, causing those generation sources to be rendered moot as well. But one can make a very strong case that the reliable generation sources wouldn't have fared so poorly if capital wasn't diverted to wind and solar projects and was instead dedicated to weatherizing pipelines and temperature sensors. Those are things that are completely controllable. Clouds covering the sky and temperatures falling to the point where water freezes and locks up wind turbines are not.

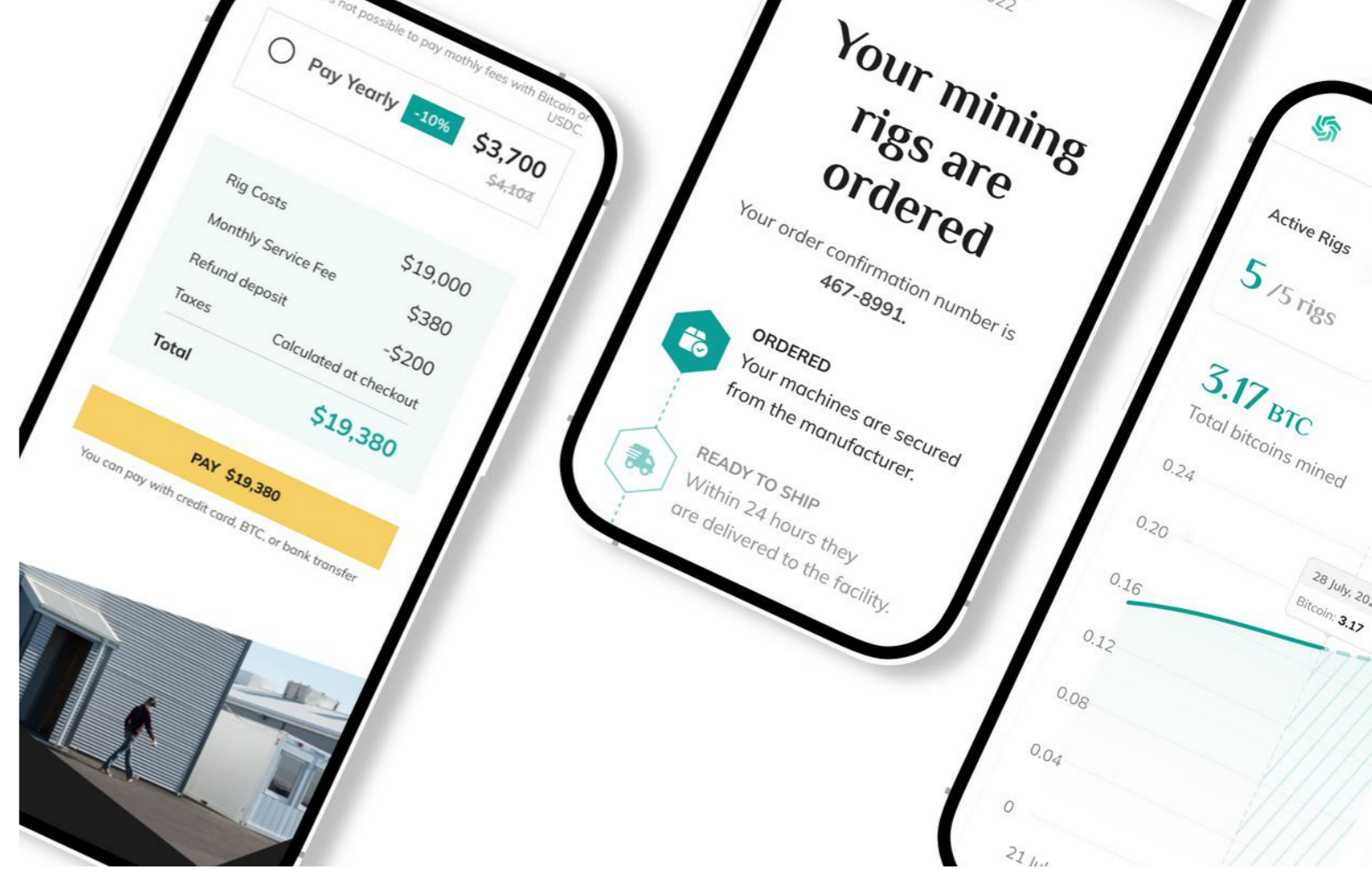
This is the reality of the situation. Unfortunately, the combination of government subsidies and ESG mandates that favor unreliable wind and solar generation over the reliable generation found with nuclear, natural gas, and coal has introduced an unnatural market force that puts

humanity in harm's way. The easy money enabled by the fiat system has incentivized entrepreneurs to take the easy way out and cater to the capital allocators and subsidy distributors centrally mandating wind and solar. It is much easier, and even economically rational in the short- to medium-term, to cater to the BlackRocks, Vanguards, and governments of the world pushing the "energy transition" on everyone, and the fat sacks of cash they control, than it is to go against the grain by building reliable generation infrastructure. While things may be good in the short- to medium-term for those spinning up unreliable infrastructure, it is a one way trip to destruction, impoverishment and death.

We must see through the mirage! The energy transition being pushed by every major government and capital allocator in the world is not sustainable or desirable. It will lead to the destruction of our modern economy.

Easy money has enabled society's detachment from reality to persist for a considerable amount of time. Recognize that the "considerable amount of time" is part of the unknowable, yet finite amount of time that opportunity cost hides in the shadows waiting to pounce. ESG and government subsidies are mechanisms to help that opportunity cost find a better hiding spot until it is ready to pounce. And if those pushing these policies get their way, the opportunity costs will pounce at the most inopportune time.

Marty Bent
@MartyBent
November, 2023



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Bitcoin's Power Problem

Bitcoin, Nuclear, and SMRs

By Brian Gitt

Bitcoin has the potential to transform society as radically as the internet did. It enables people to securely store value and send it instantly anywhere in the world 24/7/365 with almost no cost and without relying on banks or governments. Not to mention, Bitcoin's capped supply protects your money from inflation, and the very nature of the network means that seizure from a government that doesn't like what you're saying is practically impossible.

But Bitcoin can fulfill its potential only if the data centers that enable Bitcoin mining can access enough energy. As it is, data centers are already struggling to find enough energy. Their demand for power has outgrown our current system's capacity to both generate and transmit electricity to the data centers that use it.

Adding Bitcoin data centers into the mix only exacerbates the problem without the additional problem of its public perception. Most people realize we need data centers to search the internet, stream movies, and scroll social media—services people are familiar with and want. But fewer people are familiar with or want Bitcoin. So they see it as a waste of energy and attack Bitcoin's power usage.

Of course, they're wrong to see it that way. In reality, Bitcoin mining currently uses less than 0.1% of global energy. Even if billions of people end up using Bitcoin, its energy usage will be a rounding error as far as global energy usage is concerned. But because public perception says otherwise, new data centers for Bitcoin mining face community opposition and limited power access.

Off-grid Bitcoin mining can help. The energy sources it uses are disconnected from the central power grid, often in remote or hard-to-reach locations. That's an exciting, growing trend, but it doesn't provide a scalable solution to fix the core problem. We're still going to need large, grid-connected Bitcoin data centers to allow Bitcoin to fulfill its potential.

This brings us to the next problem. Data centers can't be built just anywhere, nor be powered by just any energy source. They're best situated near power plants that have adequate transmission lines, and they're best served by power that is reliable, affordable, and clean. This is essential for data centers that support critical systems - hospitals, national defense, GPS, communication, traffic lights, water, and wastewater treatment. These services need energy 24/7/365 in every type of weather and every type of circumstance.

While Bitcoin data centers are more flexible in their demand for power, to be economically viable they still need to operate most of the time, so they still need reliable power. Solar and wind are en vogue energy solutions, but they depend on the weather to cooperate and are sited in remote locations rather than in the population hubs where

data centers are commonly located. As a result, solar and wind require new transmission lines, and building new transmission lines takes time - often ten or more years. Most Bitcoin investors and mining operators don't want to wait until slow-moving utilities have built out the needed infrastructure before they start their operations. For these reasons, a Bitcoin data center powered by solar or wind would be at a significant economic disadvantage.

Natural gas and coal are reliable power sources, but new EPA air-quality restrictions make it hard to get permits for new fossil-fired power plants. PJM, a Northeast grid operator serving 65 million people in 13 Mid-Atlantic and Midwest states, says fossil-fuel power plants are retiring much faster than alternative energy sources are getting developed. This means that Bitcoin data center developers will likely face energy shortages and need to use low-emission energy sources to build new capacity.

With all this in mind, how do we solve Bitcoin's power problem? The solution needs to provide unrestricted access to reliable, clean, affordable energy in every type of weather without waiting for utilities to build new transmission lines.

Enter Nuclear

Nuclear power can solve the problem: It's reliable, affordable, and clean. Commercial nuclear plants have operated safely around the world for 70 years. There are currently 436 nuclear reactors worldwide, and the US itself has 93 active nuclear reactors, which together provide 19% of America's electricity and 50% of its *clean* power.

The reliability of nuclear power is second to none. Reliability is availability on demand: The ability to get people the electricity they need when they need it. US nuclear plants operate 24/7/365. Moreover, the electricity they produce is affordable; utilities that rely on nuclear power offer lower-than-average utility rates. And nuclear plants produce no air pollution and zero CO2 emissions.

If that's the case, then you might ask, why doesn't the US build more? The answer requires us to dig a few layers deeper. On the surface, US utilities aren't currently willing to do it because typical nuclear plants require massive upfront investments and take a long time to build. New reactors in Georgia ran \$16 billion over budget and six years behind schedule. Few (if any) US utilities are willing to take on that level of capital risk.

But the truth is, nuclear plants don't have to be so expensive. The nuclear plants that the US built during the 60s and 70s, for instance, required much less capital than we need to build nuclear plants today. What makes nuclear power

expensive today are onerous government regulations that extend the timeline for building new nuclear plants far beyond what's necessary to ensure safety. The longer the timeline, the higher the cost of complying with regulations and the higher the cost of financing nuclear projects.

What's driving these onerous regulations are fears and misunderstandings about the safety of nuclear power. This is the real, underlying reason why nuclear is underdeveloped. Many people falsely believe nuclear energy is dangerous — similar to people who falsely believe airplanes are more dangerous than cars. But, when we look at the actual data, we see that nuclear is one of three sources of energy whose safety record is truly outstanding: solar, nuclear, and wind, in that order. No other energy sources even come close.

Many people fear nuclear power because they fear radiation. But, EPA data shows that the average US home exposes you to 228 times more radiation than you get from living near a nuclear power plant.¹ Airline flight crews are exposed to ~5 times more radiation flying from New York to Tokyo than workers at nuclear power plants.² The nuclear power industry accounts for less than 0.1% of background radiation.³

Some people worry about nuclear waste. But there's never been a single recorded case of a human dying or being harmed from exposure to civilian nuclear waste. That waste takes the form of spent nuclear fuel. Contrary to what you may have seen on *The Simpsons*, spent nuclear fuel is solid (not glowing green liquid). It consists of metal tubes containing small pellets of uranium. These pellets are an extremely dense energy source. Ten of them can fit in the palm of your hand and store enough energy to power an average US household for a year.⁴ The pellets are placed in steel tubes, which are gathered into bundles and loaded into the reactor. After the fuel has been in use for a couple of years, it's removed from the reactor and placed into water to cool for another five years. After that, it's placed inside concrete and steel containers, which are stored in rows next to the reactor. The radioactivity of spent nuclear fuel diminishes with time. About 40 years after a fuel bundle

is decommissioned, the heat and radioactivity of the fuel bundle will have fallen by over 99%.⁵

Spent nuclear fuel requires care and attention to ensure it's safely contained, but nuclear plants generate a small amount of waste compared to other energy sources. For example, nuclear plants produce 300 times less waste than solar plants.⁶ All the nuclear waste generated in the US since the 1950s could fit in a single Walmart Supercenter.⁷ In addition, nuclear is the only energy source that prevents waste from going into the environment.

Despite the impressive safety record of nuclear plants, regulators continue to respond to public misgivings about nuclear power. People often associate nuclear weapons with nuclear energy, and this confusion can lead to misconceptions and fears. As a result, they've overcorrected to avoid even the smallest chance of something going wrong. By focusing on minimizing any potential risks, they've unwittingly ignored any offsetting harms and benefits.

Imagine by analogy, the government over-regulated the airline industry after a crash. Crashes do happen, but they're rare. It's reasonable to take precautions to avoid them, but those precautions need to account for other potential harms. If regulations are too onerous, the results end up harming both the airline industry and consumers. Over-regulation would freeze out new investment in the industry. Airlines wouldn't seek to expand in ways that benefit consumers, and few if any investors would be attracted to the idea of starting a new airline. Consumers, for their part, would pay more and have fewer travel options. This has, in fact, happened in the airline industry over the last decade or two, and we've seen the quality of service, experience, and flight offerings diminish. Over-regulation consistently does more harm than good.

That kind of harmful over-regulation is, in fact, what's happened in the nuclear power industry. It has not only made it difficult to invest in new nuclear technology and infrastructure, but it's also harmed ordinary people. When Japan shut down all its nuclear power plants after the

Fukushima accident, electricity prices soared up to 40%. That decision ended up causing over 1,280 deaths during cold temperatures from 2011 to 2014.⁸ To this day, only one death from radiation is attributed to Fukushima: a man who died of lung cancer many years after the accident. He was a smoker.

With all this in mind, we're probably not going to get a positive shift in consciousness or decrease in regulation, or large plants proliferating anytime soon. So, we need another solution.

Enter Small Reactors

Large nuclear plants are extremely safe, but small nuclear plants are even safer.

If you've ever driven through an agricultural state, you might have noticed the containers they use to store grains - cylindrical steel tanks a bit taller than a house. Small modular reactors (SMRs) are about the same size and shape. SMRs differ from large conventional nuclear plants as much as modern smartphones differ from old rotary phones.

SMRs are the safest nuclear plants ever designed. They can cool themselves without relying on people, pumps, or mechanical systems to remove heat. This means the type of accidents that happened at Chernobyl, Fukushima, and Three Mile Island are physically impossible. In addition, SMRs can be designed to recycle spent fuel - both their own fuel and fuel from large nuclear plants.

SMRs have all the benefits of large nuclear plants - they're reliable, affordable, and clean - but they're less than one-tenth the size of traditional nuclear plants. Traditional plants require, on average, 800 acres of land, but the smallest SMRs can operate on just two acres. In addition, while traditional reactors need to be built near a lake, river, or ocean because they use water for cooling, most SMRs don't need to be near a body of water. They can be sited almost anywhere - including on site at a Bitcoin data center or at a nearby location.

Since SMRs are so much smaller than traditional nuclear plants, they're also faster and much less expensive to build. Off-the-shelf components and factory prefabrication allow some SMRs to be built in less than a year. Finally, and perhaps best of all, developers do not need to risk capital because some SMR companies offer power purchase agreements (PPAs). One example is Oklo, who builds and operates SMRs and sells the power it generates at costs equal to or lower than traditional energy sources. The expected timeline from a signed PPA to powering servers - including licensing, permitting, and constructing - is two to three years. This is often well within the planning for data center campuses.

In Closing

A future that unlocks the benefits of Bitcoin needs to solve Bitcoin's power problem. Reliable, affordable, clean

energy is the bottleneck that will ultimately prevent us from realizing Bitcoin's full potential. SMRs offer a clear and compelling solution. They promise Bitcoin miners and data centers of all kinds, a path to energy independence — a plentiful source of reliable and affordable power that doesn't harm the environment and doesn't affect the surrounding communities. Such an energy source can provide data centers with power to unlock the benefits of Bitcoin and transform modern society.

We're at the dawn of the nuclear age. It's time to wake up and begin acting like the technologically advanced, energy abundant civilisation we have the potential to be.

It's time to build nuclear power.

Brian Gitt

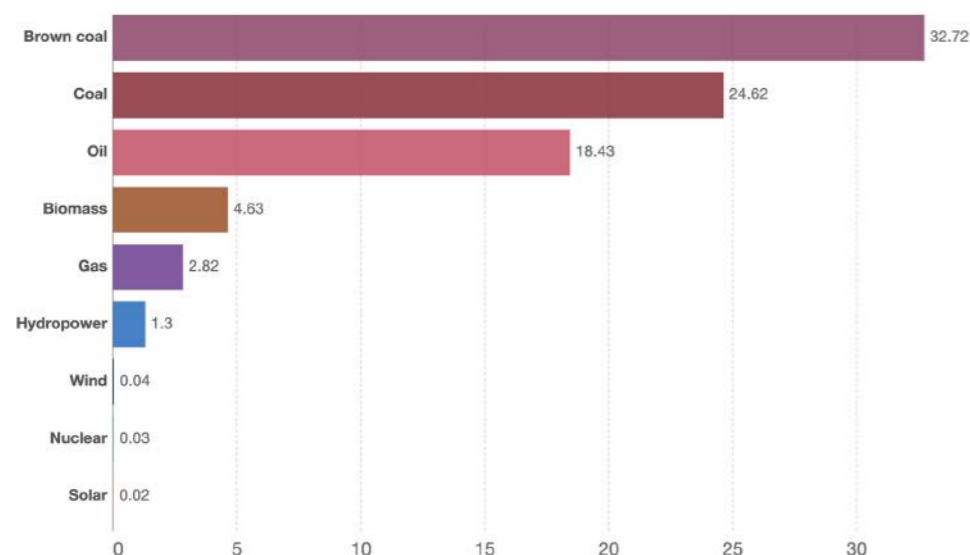
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Death Rates per unit of Electricity Production

Death rates are measured based on deaths from accidents and air pollution per terawatt-hour (TWh) of electricity.



Source: Markandya & Wilkinson (2007); Sovacool et al. (2016); UNSCEAR (2008; & 2018)

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Nietzsche's Missing Ingredient

By Aleksandar Svetski

"For believe me! — the secret for harvesting from existence the greatest fruitfulness and the greatest enjoyment is: to live dangerously! Build your cities on the slopes of Vesuvius! Send your ships into uncharted seas! Live at war with your peers and yourselves! Be robbers and conquerors as long as you cannot be rulers and possessors, you seekers of knowledge! Soon the age will be past when you could be content to live hidden in forests like shy deer! At long last the search for knowledge will reach out for its due: — it will want to rule and possess, and you with it!"

- Friedrich Nietzsche, *The Gay Science*

Energy Money

What is Energy? It's not necessarily a substance or a thing, but more, as Drew Armstrong calls it in his piece on Entropy, a "quality." — a capacity to do work. Nietzsche didn't directly define energy, or conceptualize it in the way modern physics or even common parlance might, but his idea of the "will to power" shares a similar essence. For Nietzsche, this will is the fundamental drive that underlies all human actions and those of the living, natural world. It is an "energy," in the sense that it propels individuals, societies, and indeed all life forward, driving them to overcome obstacles, assert their own existence, and flourish. It's a sort of metaphysical energy that constitutes the essence of life and governs its dynamics.

Why does this matter, and what does it have to do with Bitcoin?

First, Bitcoin is money that in many ways resembles the kind of "quality" that energy is.

Both energy and Bitcoin:

- Are conservative in that neither can be created nor destroyed;
- Have a direction and relationship to order and entropy; and
- Have absolutes — zero being the asymptotic minimum for energy and 20,999,999.977 being the asymptotic maximum supply of Bitcoin.

Bitcoin has been called "Energy Money" for a reason. It has its own will to power; its own direction and heartbeat. Not only does the concept imply something that's in some way alive — see Gigi's "Proof of Work" essay from 2020 — but it also implies truth, soundness, and universality. You cannot fake, decree, or ignore energy. Vaclav Smil, one of the greatest physics and engineering minds of our time, called energy the "universal currency" because it serves as

the fundamental unit that powers all interactions, processes, and transformations in the universe. Bitcoin has the power — pun intended — to do the same in the more abstracted world of human civilization. With it, we enter a new age. One where energy is increasingly channeled, harnessed, and mastered.

Quality over Quantity

Second, Bitcoin is money with a high degree of quality. The quantitative element is fixed and predetermined, making it something with an increasing quality (and therefore value) over time.

That which has quality has weight and energy. Bitcoin, like gold, has gravitas. It means something because it is scarce. The quantity is finite. When someone hands you a gold coin, you can feel it. There is something visceral about it. Bitcoin already carries a similar charge, despite having existed for only 14 years. Imagine the charge it will carry in another half century? It's the same reason a mountain has presence.

Contrast that with fiat money, the abstract, flimsy promissory note that can be created out of thin air and changed on a whim. It lacks both weight and substance. It's conceptual and theatrical in nature. Think about the term "Quantitative Easing," for example. It's the process of increasing the **quantity** of the money by making it **easier** to produce. This, of course, occurs at the expense of its **promise** and **quality** and makes the money "easy" or "soft." People rightly do not 'trust' fiat money like they do a metal, and even less so when it's just digits on a screen. This is why fiat money is in a death spiral. It is hollow and devoid of life-force. It carries nothing but the empty promise of a group of bureaucrats.

Why is this important?

It's my belief that the quality of the money is a reflection of the quality of the culture and civilization it enables. Soft, easy, low quality money makes for a soft, cheap, dysfunctional low quality society, and conversely, sound, hard, high quality money makes for a strong, rich, functional and high quality society.

History has proved this again and again, with the modern world being the most evident example. We live in a world of excessive quantities, and ever receding quality. Everywhere you turn, mass media, mass retail, mass politics, mass food, mass markets, mass social media, mass consumption, mass hysteria, mass medicine, mass money, mass *everything* surrounds you. As a result, few things carry weight or value anymore. They contain no charge. They have no **energy**. They are like worthless Zimbabwean, hyperinflated toilet paper money, and from this kind of world, high quantities of

low quality character people emerge.

Nietzsche predicted the rise of the low character man and called him "The Last Man." I've called them the lemmings, and the "masses." Those who lack a will to power. The NPCs who want to be herded, who lack vitality and are almost devoid of the energy that makes life possible. Look around. This is the world now, and it's a sad state of affairs. The very measure of life, pro-creation, is plummeting in every developed country. These regions are aging and dying.

But, as they say: "The night is darkest before the dawn." Nietzsche also predicted the coming of the "Übermensch." The one who would transcend the sorry state of the last man. The breed of man whose character would represent the highest potential, pulsating with vitality and the raw will to power. The one "overflowing with abundance and power."

Power and Energy

Who is this Super-man, and what needs to happen for him to arrive?

I believe he is a new archetype. Some blend of the Warrior, the Entrepreneur, the Explorer and the King. A modern Alexander the Great meets Steve Jobs, who will rise, lead, and bend the universe to his will. I don't speak of a single man but an archetype. This "Superman" will sprout in different corners of the world. But...

For this to happen, for a plant to bear fruit, the soil must provide. The analogy is apt in many ways. Both the seed and the fertilizer must exist. Our current age provides both. The seed of life, energy, and greatness exists, and in the

form of Bitcoin, has been planted, on a world with plenty of fertilizer. The next stage our civilisation now embarks upon is the age of "Energy Money — one where the means by which we measure action, time, energy, and resources is quantitatively fixed, making arbitrary "easing" impossible. One where quality, not equality is the North Star, so that excellence, nobility, honor, and all virtues necessary for such a civilisation to prosper, are rewarded.

This is what lies ahead, and ironically, it is also the environment that Nietzsche foresaw the birth of Übermensch. It is this kind of seizure that may be what allows Bitcoin to gain a foothold.

Most think Bitcoin's greatest contribution will be to help the weak and "lift up the masses". While that will likely occur — and not for the reasons you think it will — it's my (unpopular) belief that the more important contribution and impact to mankind will be that Bitcoin makes **the strongest stronger, the best better, and the most powerful, more powerful.**

I can already feel you squirming as you read that line, so please read it again, then allow me to clarify why this is a **good** thing and of utmost importance.

First, I think we can agree on the following: *You get more of what you reward.* If you reward theft, you will get more theft. San Francisco is a perfect case study. If you hand out participation awards in school, you reward mediocrity, not those who excel. ESG and DEI (or DIE as I like to call it) in the workplace result in hiring for politics instead of competence, and giving people money for staying home results in more people staying home, getting fat, lazy, and less productive.

The converse is also true. When we reward people for doing a great job, they not only feel recognised, but feel

a drive (or will) to do a great job once more. Therefore, my point is simple. If we want a strong society, with competent people who are doing their best, then we must reward strength, competence and those individuals who are the best in their chosen vocation. If we want society to grow, then its people must grow, so we must reward them for growing. If we want strong characters, with high energy, it is these attributes we must reward.

The formula is simple:

Strong individuals = strong society.

Weak individuals = weak society.

Contrary to popular Bitcoiner belief, it's not the broken money at the root of all problems — it's what we reward. A decline in culture is upstream of a decline in the quality of money — although their relationship is deeply intertwined. To fix the world, we have to fix both. One is a check on the other.

If you want a powerful, meritocratic society, you must encourage powerful people and reward them for winning, i.e., for merit! Not for cheating, lying, or stealing. Not for quitting or for just participating, but for *achieving*.

This might sound harsh, and in some ways, it is. But it's life. It is the hard pill to swallow that, if you come to understand, shall set you free — because it's true — and that's precisely what the truth does.

Still not convinced?

Allow me to clarify further...

When I say make the strongest stronger, and the best, better, I mean the people who are genuinely strong. Strength is a virtue, and true strength seeks not to trample the weak, but to test itself against a worthy opponent, whether that is a person, mountain, or barbell.

Let's pull on that thread. Picking up a 10-pound barbell doesn't make you strong, but standing under 500 pounds, squatting down, and raising it back up does. Climbing three steps doesn't make you strong, but hiking a 10,000-foot mountain does. It's not the exact number that is important. It is the challenge and the burden you carry. To get better, to get stronger, you don't contend or compete with less than you are. A strong man doesn't punch down. He doesn't go into a ring and beat up a small kid or a woman to prove himself. He doesn't ask for his opponent's hands to be tied behind his back. The strong man seeks out a fair fight with someone as good or *better*.

This is why responsible men are the strongest men. You carry your responsibility, and the amount you can carry is the true determinant of strength. A strong man who is responsible for his territory — a father who bears the responsibility for his family; a man who runs a company and thus bears responsibility for his employees; a man who mentors young men in his community thus bears responsibility for the development of their character. This man is strong. This man is **powerful**.

This concept, of course, scales up. The man who bears the responsibility for his people or for an idea that changes the way the world works is that much stronger. The Nikola

Teslas, Steve Jobs, and Alexander the Greats of the world. These men were the truly powerful.

Notice I did not say "Christine Lagarde" or "Janet Yellen" or "Joe Biden." When I talk about strength, I am not talking about the man who steps on the ant and calls himself a hero. I am not speaking of the heads of central banks, petty politicians, and meddling bureaucrats who exist only to suck wealth out of the system. These people are too weak to actually build something, so they lie, cheat, and steal from others. They are the most dangerous kind. *The weak, who have access to power, by fiat* — those with unearned authority. Ayn Rand called them the moochers and the looters. None of these people are "strong." None of these people are "elite." None of them are "the best."

Such people are parasites, and so, by my above admonition — that bitcoin will make the best better, the strong stronger and the powerful more powerful — it is precisely this kind who will not be rewarded.

This is a fundamentally important psychological paradigm shift we must make if we are to lead the world to a better place. It's in the very words! To get to a better place, we must be better, which means we must reward, better. To make the world exceptional and excellent, we must be exceptional and excellent. We must, in fact, be elite. We must take this and other keywords back.

The word "Elite" comes from the Latin word "elitus," which means "choice" or "selected." The PIE root of the word "elite" is "leg," which means "to collect" or "to gather." To be elite, then, is to be selected, which means the best. To be distinguished and to be outstanding. In short, to be excellent.

The word "Aristocrat" originates from the Greek words "aristos," meaning "best," and "kratos," meaning "rule" or "power." Therefore, etymologically, the term "aristocrat" essentially means "rule by the best." In ancient Greek society, "aristocracy" originally referred to a form of governance where the most virtuous, skilled, or noble individuals would rule. The concept was closely tied to the idea that these individuals possessed certain superior qualities, whether in wisdom, bravery, or moral virtue, that made them the most fit to govern. Over time, however, the term has taken on other, less noble, and guilt-laden connotations that we must shed.

The word "Noble" originates from the Latin word "nobilis," deriving from the root "gnō-" which is connected to "gnoscere," meaning "to come to know." In its original context, "nobilis" referred to someone who was notable or distinguished, often due to virtue, bravery, or social standing. A person who possessed excellent qualities of mind and character—known for some sort of excellence or virtue. In 2021, I wrote "Fire, Bitcoin, Teleportation," *The Bitcoin Times*, Edition 4. In it, I discussed how society will likely bifurcate into 'Homo-Bitcoinicus' and 'Homo-Hystericus'. The former being a species superior in mind, body, and spirit, while the latter emulates more of a Roomba vacuum cleaner with chatGPT installed on it. I didn't know about Nietzsche at the time, but perhaps I was channeling the same 'energy' he was — the difference being that he was prophetic, and I was merely being contrarian.



I stand by this statement today, but with a deeper, more nuanced understanding of the situation: *Homo-Bitcoinicus is the Übermensch*. He is the new archetype that integrates the essence of greatness that's spanned across all of time, with a new vitality, energy, technology, and knowledge — making him a superman in comparison to those who came before. We do not go back. We move forward to a new age.

A new dawn

If we want a fair, functional, sound, and strong society, we must encourage excellence, strive to be elite, develop nobility, and behave aristocratically, once more. These are all attributes of maturity lost in a world drowning in easy money, cheap plastics, fake food, mass media, and constant lies. Reject this. We've been fed a never ending diet of "power is evil" and "power corrupts, and absolute power corrupts absolutely," but I've come to realize that this is false. We must reject this, too.

Power only corrupts the weak. Power like technology is agnostic. You put technology in the hands of a sadist, and they will use it to dominate those weaker and to bring down those who are better. This is communism in action. It's why everything that comes from communism is ugly. It's anti-life. It's an attempt to make everything the same.

The truth is, power is a measure of the rate at which work is done or energy is transferred. Power is the capacity to channel energy. Power is vitality and youth. What does this have to do with evil? This is life-force for God's sake. What's evil is to be against life. What's evil is to convince everyone that the life-force inside of you, that your Will to Power is wrong. *Reject this.*

It's not power itself, but those who wield it. It's not that power corrupts, but rather that the corrupt can attain power. This is the paradigmatic mental shift you must make.

And *this* is why Bitcoin is so important. It makes it more difficult for the corrupt, the parasitic, and the weak of spirit and character to amass power. Like King Arthur and Excalibur, only the worthy and noble can draw the sword from the stone. Not the weak and corrupt. It rewards the best in us, which in turn inspires the rest of us to be better, to be stronger, to be more powerful.

In such a civilisation, with such a character of man, with such power and *thumos*, we may actually harness the energy to travel to the stars. Without it, we will wither away and recede into the dark ages.

Powerful individuals = powerful society

Energetic individuals = energetic society

A rising tide

I should make clear that none of what I've said suggests that the masses will or should be trampled. First, strong people don't step on weaker people. Second, a rising tide does and will continue to lift all boats. What matters is the

focus for individuals and civilisation. You go where you look. If you're always looking down, that's where you will find yourself. If you focus on or cater to the masses, don't be surprised if you get more "average." In contrast, if you set your sights on excellence, you might just discover greatness instead.

This has everything to do with the almost hippie-sounding "energy" or "vibration" of people. Groveling in the dirt comes from a different place in both the mind and the soul than does reaching for the stars. It's a different *quality* of energy. It's the difference between life affirming and life-denying.

As Bitcoiners, we must operate on a higher energetic plane, even more so than we have been. We need a grander perspective. We must climb the mountain -- which is, in fact, where the word "excellence" originates. For too long, we've been defensive, parroting much of the same defeatist garble that the political parties of weakness and lack have promoted for the last few centuries. We've been tricked into believing that average is ok because it represents the little guy. But the truth is that there is nothing aspirational about being average.

Average doesn't require courage, passion, drive, responsibility, or self-control. Average asks that you do just enough to get by. It is a low energy state, and a small story designed to make you give up on your dreams — to trade all you could possibly be for what you're told you should be. An average man, content with the crumbs and scraps brushed off the table. I say, reject this narrative! Reject calling oneself a "pleb." Embrace becoming aristocratic, in the true sense of the word. Make it your duty.

Bitcoin aligns us with excellence because it puts a real and accurate price on time and energy. Like life itself, it is unforgiving. There is no rewind button. Those who waste and squander it must pay a real price for doing so. Those who save, invest, and deploy it, along with their time and energy, will reap the rewards (notwithstanding luck, as the one factor we cannot account for).

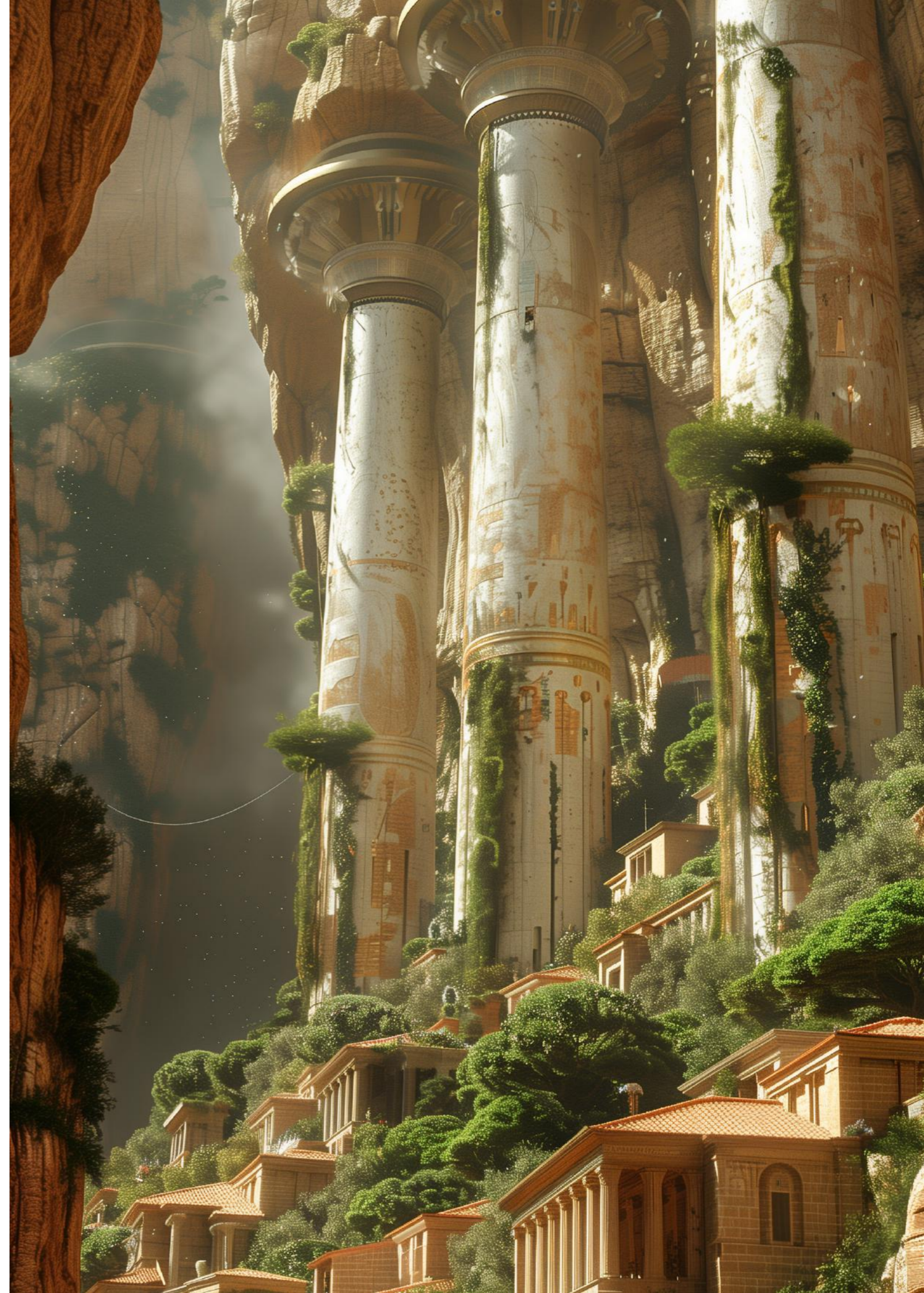
It has and always will be *Great Men of Energy* who change the course of history. Alexander, Caesars, Christ, Newton, Tesla, Jobs, and most recently, Satoshi. Now, with the dawn of a new age, what will you do? What seeds will you plant? What foundations will you establish? How will you show up? Who will you raise that might change the course of history and drive humanity to a higher energetic standard?

Bitcoin is *Energy Money* not only because it's in some ways alive, but because it encourages a life-affirming approach to living. This is the reason why, with a nod to Nietzsche, I consider Bitcoin *ÜberMoney*. Bitcoin is a framework for excellence, and excellence is the soil from which the *Übermensch* shall spring.

Aleksandar Svetski

@SvetskiWrites

October, 2023





Closing Thoughts

We stand at the precipice of a profound transformation, driven by the relationship between money, energy, and time — the three most fundamental currencies, forces, and qualities that humans must contend with. I hope this year's edition has deepened your understanding of each and their intrinsic link to Bitcoin.

Bitcoin represents more than a technological marvel; it symbolizes a paradigm shift in how we understand and utilize energy. It forces us to rethink and rebuild our economic structures, pushing us toward a future where energy is not just efficiently harnessed but also accurately priced. This shift holds the potential to propel humanity forward like nothing before it, unlocking untapped possibilities.

When you realize that energy is boundless, and that the limiting factor is human ingenuity, you come to find that we have the capacity to literally transform the world around us and solve any problem — if only, we can be honest with ourselves and get out of our own way. Bitcoin, by pricing energy accurately, enables this. It encourages us to move beyond myopic, Malthusian, entropy-fearing narratives that stifle progress and instead, to embrace our role as the ultimate energy-channeling beings. It reminds us that by harnessing our ingenuity, we can navigate and maximize the vast ocean of energy that surrounds us.

This edition is more than a collection of thoughts on Bitcoin; it's a call to action for embracing a new era of human innovation and progress. It's an invitation to join a journey toward mastering energy, expanding our capabilities, and stepping confidently into a future where Bitcoin as "Übermoney" sets the stage for the rise of the "Übermensch."

Thank you for joining us on this year's journey. The support and engagement of our community, partners, and contributors have been the driving force behind our continued evolution. As we look forward to the next edition, rest assured that *The Bitcoin Times* will relentlessly pursue excellence in content and presentation, echoing the spirit of Bitcoin itself.

Here's to a future where we not only reach for the stars but also have the means to get there.

See you in 2024.

The End

Edition 05

Contributors

This amazing set of individuals made the fifth edition of The Bitcoin Times possible. Follow them on their socials, support them in their endeavours, reach out to thank them, and share their work around.



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Formerly at Unchained, Parker is the future Mayor of Austin, author of the essay series and book: "Gradually then Suddenly" and head of business development at Zaprite.



Gideon Powell
@GideonOPowell

Gideon O. Powell is the CEO of Cholla Inc. Under Gideon's leadership, Cholla has continued a tradition of hydrocarbon exploration while expanding into other pioneering industries like Bitcoin mining, Data center development, and venture capital. From 2013-2017 Gideon was the Director of Acquisitions & New Ventures at Cholla, where he led the company's entrance into the Permian basin of West Texas, leading to a step change in growth for Cholla and later a substantial exit. After the divestiture Gideon pivoted to study the global power markets for investable CO2 utilization projects. Through this work he and his team identified bitcoin mining and high performance computing as an opportunity to provide dispatchable electrical capacity to local grids.



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Drew Armstrong is the Chairman and President of Cathedra Bitcoin (TSX-V: \$CBIT), a bitcoin mining company that believes sound money and abundant energy are the keys to human flourishing.



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CEO @ Satoshi Energy, Andrew Myers has been researching and working in energy markets since 2009. Upon grasping the importance of bitcoin in 2014, he recognized that electric power markets buying and selling energy 24/7/365 will benefit from a 24/7/365 digital financial protocol. He started Satoshi Energy in 2018 with a mission to accelerate bitcoin adoption in the electric power industry through bitcoin mining and real time finance.



Brian Gitt
@BrianGitt

Brian leads business development for Oklo, a startup developing next-generation nuclear technologies to deliver reliable low-cost clean energy 24/7. He spent over two decades building companies in the clean energy industry—first as executive director of a green building trade association, then as CEO of a consulting firm specializing in clean energy. More recently he founded UtilityScore, a software startup that estimated utility costs and savings for 100M+ homes, and he led business development at a hard tech company developing wireless power. He now writes and speaks about the need for energy that's clean, reliable, and affordable.



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Marty Bent is the founder of TFTC.io, a media company focused on bitcoin, freedom tech, culture and actionable advice in the digital age, and Managing Partner at Ten31, a leading bitcoin investment platform.



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Author and Entrepreneur.

Together with Mark Moss, Aleksandar wrote and published the best selling "UnCommunist Manifesto" and is now working on the Bushido of Bitcoin.

He founded The Bitcoin Times in 2018, along with the world's first Bitcoin-only savings app: Amber. He is currently working on a number of new books, and building open source AI tools, with a focus on the "Spirit of Satoshi" - the world's first Bitcoin-centric Language model.

You can learn more about Aleksandar's work at: <https://svetski.info>



Makena Rhodes
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Coming from a traditional background in architecture, Makena is looking to apply the design process to all things Bitcoin. The technical aspects of Bitcoin were resolved in full by Satoshi himself; the rest is left to us. Reaching mass adoption will require products, art and diagrams that are both aesthetic and intuitive. This is where he comes in.



Satoshi Nakamoto

Founder @ Bitcoin.

Whoever you are, wherever you are, Thankyou and stay hidden.

Acknowledgements

The Bitcoin Times is available free online thanks to the contributions of the writers, and the support of our incredible partners, Unchained Capital, Cholla Inc, Stone Ridge Holdings, SazMining, Blockware Solutions, and Satoshi Energy.



Unchained Capital
www.unchained.com

At Unchained, our mission is to put every bitcoin holder securely in control of their assets. Our collaborative custody vaults make it easy to set up and manage multisig bitcoin storage, while providing a foundation to financial services for the long-term bitcoin holder, including trading, loans, and retirement accounts.

We guide our clients through their bitcoin journey, equipping them with the knowledge, reassurance, and tools they need to secure their financial futures in ways that a traditional financial services institution cannot.

Join us at [Unchained.com](https://www.unchained.com)



Cholla Petroleum Inc.
www.chollapetro.com

Cholla, Inc.'s vision is to facilitate energy abundance so all humans can flourish. Energy is the input for human flourishing. We are committed to serving today's needs and ensuring a future where everyone is empowered to realize their potential. Rooted in the remarkable journey of L.W. "Slim" Powell, our founder, rose from cotton fields to a key figure in the Texas oil industry.

Following Slim's passing, Loyd Powell Jr. took over operations at the age of 29 growing Cholla's operation and exploration expertise over the next 50 years until his passing in 2021. Loyd cemented Cholla as one of Texas's largest independent oil and gas exploration companies, personally overseeing the drilling of more than 1,150 wells. To reflect our expanding scope,

in 2021 we rebranded as Cholla Inc., clarifying the divisions that provide exploration expertise (Cholla Petroleum), power innovation (Cholla Energy), and investment capital (Cholla Ventures) to pursue reliable and affordable energy. We continue to embody Slim's and Loyd Powell Jr.'s grit, perseverance, and foresight in our pursuit of energy abundance. Cholla Inc. is driving reliable and affordable energy solutions, shaping a future where all individuals can thrive.



Holdings Group

Stone Ridge Holdings Group
www.stoneridgeam.com

Stone Ridge Holdings Group was founded in 2012 with the mission of financial security for all. The group has three operating businesses: Stone Ridge Asset Management, NYDIG, and Longtail Re. Stone Ridge Asset Management manages more than \$15B of assets on behalf of individuals, insurance companies, and institutional investors across alternative strategies that provide valuable, uncorrelated returns. NYDIG is the leading bitcoin company providing institutional investors and companies safe, secure, regulatorily compliant ways of accessing bitcoin via investment solutions or technology integrations. Longtail Re is an operating reinsurance company focused on casualty reinsurance.

For more information, visit: [Stoneridgeam.com](https://www.stoneridgeam.com)



SAZMINING

SazMining
www.sazmining.com

Sazmining is a sustainable Bitcoin mining-as-a-service provider for regular people looking to acquire Bitcoin the native, cost-efficient way. Sazmining connects intelligent investors like you to renewable energy Bitcoin mining facilities in a simple, fully managed, white-glove experience. Our vision is to transform how people relate to money and energy.

Our process is simple: After you purchase Bitcoin mining rigs through our platform (with no markup), they are shipped to our hosting facility, where we maintain and optimize your miners. Once your miner is up and running, you collect your mining rewards directly to your Bitcoin wallet of choice.

In a nutshell, we make Bitcoin mining with renewable energy profitable and accessible to anyone with an internet connection.

For more information, visit [Sazmining.com](https://www.sazmining.com)

With numerous bullish Bitcoin catalysts on the horizon, now is the time to position yourself to benefit from the coming bull market, and the best way to do that is with Bitcoin mining.

During bull markets, hashrate and mining difficulty simply cannot grow at the same pace as the Bitcoin price. There's a significant lag between BTC price growth and when new mining infrastructure finally gets built, during this time mining profitability (hashprice) soars. Incumbent miners, those that are already hashing before the bull market begins, benefit the most.

The Blockware Marketplace cuts out lengthy lead times, allowing users to buy ASICs turnkey, and start receiving mining rewards in minutes. The Blockware Marketplace eliminates the friction and hassle of Bitcoin mining with:

1. Same-day hashing
2. Transparent analytics
3. Minimum order quantity of 1

No matter what your mining needs are, Blockware Solutions is ready to help! Founded in 2017, Blockware is among the most trusted Bitcoin mining companies in the world, having sold over 400,000 ASICs and placed over 400 MW since inception. With top-tier, United States-based data centers and competitive ASIC pricing, Blockware is the ideal Bitcoin mining partner.

To learn more, email sales@blockwaresolutions.com



Blockware Solutions
www.blockwaresolutions.com

At Satoshi Energy, our mission is to enable every electric power company to use bitcoin. We are enabling electric power companies to sell power to bitcoin miners and leverage the bitcoin protocol to solve numerous credit and finance challenges across the broader electric power industry. We do this because sound money and sustainable energy are fundamental to a flourishing human society.

For more information, visit [Satoshienergy.com](https://www.satoshienergy.com)



Satoshi Energy
www.satoshienergy.com

About

The Bitcoin Times is a publication with a mission:

To produce, collect and publish rare, timeless and unique content from the best minds in and around Bitcoin.

The goal is **Quality over Quantity**, so we will do one annually, for 21 years.

Pure Signal across 21 Editions, available in multiple formats:

The Collectible

The ultra-high quality, uniquely numbered, limited edition print run.

Only 2100 of each Edition will ever be printed. Period.

The Paperback

Bitcoin education must spread far and wide.

We decided to leverage Amazon and the traditional book format to help with this.

The Audible

As the name suggests, each Edition of The Bitcoin Times is available as a professionally edited audiobook on Audible.com.

The Podcast

Episodes discussing each essay, with each Author.

Reads of each essay by Guy Swann, Aleks Svetski and others,

The PDF

The digital version of The Collectible, available in exchange for an email or some Sats.

We want everyone to get access to this content, no matter their financial position.

The Essays

Each individual essay, by each author, from each Edition is available in The Essays section of the site.

The Flame represents energy. The universal currency. It also represents fire; the discovery-invention which arguably started humans down the path of sentience. The elemental force Prometheus stole from the gods. Bitcoin is the information element. It is an energy that may well be as significant to humans as fire.

The Knight represents the Defender, the Warrior, the Noble and the Propertied, Sovereign Individual. Knights were the original property owners and Vanguard's of Civilisation. Bitcoiners are their modern equivalent.

The North Star represents Truth and Righteousness. If there was ever a technology that embodied these ideas, it is Bitcoin. The map not only represents the territory, in high fidelity, but those individuals who discover Bitcoin are compelled toward the endless discovery of greater Truth.

TB represents Time, Bitcoin, Truth, Beauty, Trust and of course, The Bitcoin Times.

The Shield embodies all of these and represents the wall of defense created by each individual and node on the network. We are each individually, and together collectively; Bitcoin.

21 is the magic number. It is one half of the ultimate answer to "Life and the Universe", in the same way money is one half of all transactions and value. It is the elegant figure chosen by Satoshi and made sacred by the instantiation of a global network of consensus.

Infinity represents Time; our most valuable asset. It represents the ineffable. The infinite potential of humanity and of what we can achieve on a Bitcoin Standard. Coupled with the number 21, it represents the ultimate equation. Everything there is, divided by 21 million; coined by Knut Svanholm.

Resources

The Bitcoin Times

Follow The Bitcoin Times on Twitter (X) at:

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Download a free pdf version and buy a limited edition hard copy online at:

<https://bitcointimes.io>

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36reYaTXLMEKnCmz1Pg92Sm8KWWAqYSUB4



Everything helps, and we thank you in advance for helping us continue to create content, and also get it out to more people.

Other Brilliant Resources

Always too many to list, but here's a short overview:

Guides

- <https://nakamotoinstitute.org>
- <http://unenumerated.blogspot.com>
- <https://bitcoin-only.com>
- <https://dergigi.com>
- <https://bitcoinrabbithole.org>
- <https://hope.com>
- <https://ministryofnodes.com.au>
- <https://svetski.medium.blog>
- <https://bitcoinmagazine.com>

Highly Recommended Reading

- *The Bushido of Bitcoin*, by Aleksandar Svetski
- *Man and Technics*, by Oswald Spengler
- *The Virtues of War*, by Steven Pressfield
- *Shogun*, by James Clavell
- *Warspeak*, by Lise Van Boxel
- *Atlas Shrugged*, by Ayn Rand
- *The UnCommunist Manifesto*, by Mark Moss & Aleksandar Svetski
- *The Sovereign Individual*, by Lord William Rees-Mogg & James Dale Davidson
- *For a New Liberty*, by Murray Rothbard
- *Democracy: The God that Failed*, by Hans Herman Hoppe
- *Skin in the Game*, by Nassim Taleb
- *12 Rules for Life*, by Jordan B Peterson
- *The Bitcoin Standard*, by Saifedean Ammous
- *Man's Search for Meaning*, by Viktor Frankl
- *21 Lessons*, by Der Gigi



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