National Insurance Alliance Limited

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The Bitcoin Paradox: Can Bitcoin ever be Net Green?

If the phrase "sustainable Bitcoin" seems like an oxymoron to you, you are not alone. Bitcoin, the world's largest cryptocurrency with a combined market value of US$1.2 trillion, is known to be notoriously energy-inefficient. According to the Cambridge Centre for Alternative Finance (CCAF), Bitcoin uses more electricity annually than in countries like Ukraine or Pakistan, with much of the energy derived from fossil fuels. Critics have argued that even when Bitcoin miners use renewable energy, they are expending clean energy for more productive uses.

Bitcoin Utilises Energy Sources that Other Industries Cannot

Considering the negative light that has been cast on the cryptocurrency industry, one positive aspect of Bitcoin is that it can be mined anywhere on Earth. Majority if not all energy forms consumed globally have to be produced within proximity of its end users. However, Bitcoin is not constrained by proximity limitations which has allowed miners to utilise power sources inaccessible to other parties. For example, flared natural gas, which is a byproduct of oil extraction, is produced in large amounts and pollutes the environment without being utilised. This gas is often found in remote oil mining locations, making it challenging for traditional applications to harness it effectively. Consequently, Bitcoin miners from North Dakota to Siberia have seized the opportunity to monetise this otherwise wasted resource. Although this method is still not commonly practised by Bitcoin mining players, industry experts have suggested that the global Bitcoin network could potentially be powered by flared natural gas only from Canada and the US.

Another prominent channel for carbon-neutral mining is hydropower. Hydropower produced in Sichuan and Yunan, China accounts for the largest stranded energy resource on Earth, making these locations highly suitable for Bitcoin mining. During the rainy seasons, vast amounts of hydro energy is wasted attributable to a severe lack in local demand with respect to the production capacity and a lack in advancement of battery technology for storage and transportation to urban areas. Consequently, these rural areas have contributed to 50% of global Bitcoin mining in the wet season and just under 10% in the dry season. In a similar vein, the smelting industry, specifically aluminum, shares some parallels with Bitcoin. Aluminum smelting is characterised by high energy consumption and transportation costs. Consequently, energy-producing geographies like Iceland and Yunan that have surpluses often build smelters to capitalise on the excess production capacity. As such, similar circumstances that encouraged investment in aluminum smelting have made rural energy production sites ideal for Bitcoin mining. Some smelters that previously processed aluminum have been repurposed into Bitcoin mines to capitalise on the excess energy.

Carbon Emissions are not a Function of Energy Consumption

There is a significant difference between energy consumption and carbon emissions which has been a widely held misconception. While it is relatively easy to derive energy

consumption, accurately deriving carbon emissions is tricky owing to the need to know the exact mix of energy sources. Therefore, even though it is straightforward to derive Bitcoin's energy consumption, it is much harder to calculate carbon emissions attributable to their highly competitive operating environment and secretive nature of how cryptocurrency miners operate (miners would not want to disclose the energy mix as the respective energy sources can be deduced).

The CCAF which is widely regarded to have the best estimates of energy production locations (the energy mix can then be derived) rely on data that is provided by major mining pools to derive miner locations. However, the data is often incomplete and outdated, leaving the industry unknown about Bitcoin's actual energy mix more often than not. Additionally, it usually portrays countries with highly diverse energy landscapes like China in a negative light. Consequently, estimates of the percentage of Bitcoin mining using renewable energy differ significantly. In 2019, it was estimated that 73% of Bitcoin's energy consumption was carbon neutral, in part owing to the abundance of hydroelectricity in major mining hubs such as Southwest China and Scandinavia. Conversely, the CCAF estimated in 2020 that only 39% of Bitcoin's energy production was carbon neutral which has evidently demonstrated that using energy consumption to estimate carbon emissions is unreliable.

Energy Footprint Unlikely to Skyrocket

Given Bitcoin's meteoric rise over the past decade, its energy footprint growth has followed suit, which was the basis of a widely reported 2018 study claiming that Bitcoin had the potential to contribute significantly to global warming. However, after taking a closer look, there are logical reasons to believe that the scenario described in said report would not materialise. For one, the cryptocurrency industry has taken steps to transition its operations to be more environmentally friendly, evident through the launching of the Crypto Climate Accord the Sustainable Bitcoin Protocol which are committed to reduce the carbon footprint of Bitcoin. Additionally, the energy mix for Bitcoin has seen a steady decline in the reliance on fossil fuel energy sources, resulting in ESG-focused miners gradually gaining market share. Moreover, miners are unlikely to continue expanding their operations indefinitely due to the nature of the Bitcoin protocol. Presently, miners have two main revenue streams namely profit margins from the sale of mined Bitcoins, and transaction fees for verifying transactions while mining. However, as the Bitcoin protocol reduces the number of daily Bitcoins available to miners every four years (halving event), revenues of said miners will only dwindle with time (it is impossible for Bitcoin prices to double at every halving event) which is a natural limit on growth expansion for Bitcoin miners. Consequently, there still will be miners that operate solely for transaction fees but as the financial incentive declines, so will the number of active Bitcoin miners.

Fundamentally, it is paramount to accept that environmental concerns of Bitcoin are often based on flawed assumptions stemming from a misunderstanding of the Bitcoin protocol and its negative impact is usually blown out of proportion. There are numerous factors that can influence Bitcoin's environmental footprint but one key question remains: Is Bitcoin worth it? Sure there has been proof that Bitcoin can bring about more equitable outcomes for society (decentralised financial services for individuals that do not have access to the

modern banking system), however, like almost everything else that value adds to society, Bitcoin consumes resources; we as a society will then have to decide for ourselves if the benefits outweigh the costs. The cryptocurrency community must first acknowledge these environmental concerns and work in good faith to address these concerns through the reduction of Bitcoin's carbon footprint. Ultimately, the industry must prove that the resources required to sustain Bitcoin is contributive and worth its societal value.

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