Crypto Council for Innovation

# Understanding Bitcoin's Role in the Energy Transition

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## Summary


- The energy grid is facing significant challenges related to grid instability, energy transfer and storage, and harmful byproducts.
- Bitcoin mines have a unique mix of flexibility, consistency, and transparency that can help with some of these challenges.
- There are projects focused on using new tech to mitigate challenges; these miners should be viewed as partners in the energy transition.


## What Challenges is the grid facing today?

As the world faces an energy transition, investments in energy infrastructure are critical. However, there are several challenges that stand in the way:

- Grid Instability: Renewable resources like wind and solar have a variable supply. That is, there are "intermittency" issues that result from the fact that these resources are sensitive to factors like time of day and weather.
- Energy Transfer and Storage: There is a geographic mismatch between zero-carbon energy resources and energy demand. Power generation often takes place in remote areas because they are optimal in terms of space and resource. However, energy is difficult to transfer to the end consumer.
- Harmful Byproducts: Byproducts of energy production, such as gasaring have significant negative environmental impacts. However, this has been a persistent challenge given that oil production frequently takes place in remote and inaccessible locations.

Mismatches in supply and demand has been curtailment, which is costly & results in wasted energy. New projects are stalled or withdrawn due to interconnection challenges - and over 90% of US requests are for zero-carbon energy sources.

Energy producers are being forced to sell at low or negative costs. Unmitigated gas flaring emits more than 400 million tons of CO2 equivalent emissions annually.


## How can Bitcoin help?

The need for action on the energy transition is urgent - and Bitcoin mining can be an important bridge to much-needed investments and market support. These mining operations, which are - in essence simply data centers that power the Bitcoin network - are uniquely suited to address some of these challenges due to their unique combination of flexibility, consistency, and transparency. Specifically:

(1) Flexibility: Numerous studies have found that a flexible load on renewable-powered grids can be a key solution minimizing the mismatch of supply and demand. Bitcoin mining operations are flexible on two critical axes: (1) location and (2) demand. This means that they can access stranded sources of energy and power up and down, depending on grid conditions.

(2) Consistency: Similarly, sustained demand at-scale is important. Typical demand for energy varies based on several factors such as time of day, population, etc. Consequently, markets for renewable energy sources can face periods of low demand, which affects their market prices and business models. Mining can serve as a consistent source of demand, reducing the need for costly curtailment.

(3) Transparency: Bitcoin, and crypto more broadly, provide a new model for engagement with energy more broadly. The transparency of the industry means that data that can be used to inform decision-making – and, it can provide a model for greater accountability.

## What can be done?

In over 20 sites across the US there are sites taking various approaches to sustainable operations:

- Utilizing flared gas as a power source to mitigate the effects of methane emissions – which has over 80x the warming power of CO2 over 30 years (GWP30).
- Experimenting with new technology for cooling, which makes up an estimated 40 percent of energy consumed by data centers
- Balancing grid instability by powering data centers up or down within a 5-15 second timeframe.
- Building brand-new, renewable energy infrastructure, representing over 3 GW of added renewable energy to the grid in the long-run.

The companies in this report have made hundreds of millions of dollars of investments in sustainable infrastructure supported by local communities. They have added hundreds of jobs in areas facing the effects of industrial decline. Throughout these examples, one thing is clear: such business models are powered by the unique properties of data centers. While other use cases may follow, data centers have to be the starting point to make the economics work for investing in these zero-carbon energy sources.

## What is Proof of Work & why does it matter?

We underscore that the industry is not asking for special treatment. Rather, many want to work collectively with the broader ecosystem to understand the holistic impact of data centers. Miners are willing and able to serve as partners, and leaders, in advancing new economic and environmental models.

This requires taking a detailed and nuanced view of the ecosystem. Getting to an accurate understanding of Bitcoin's impact requires going beyond simplified measures of energy use and accounting for the energy mix used, how it may support the market for renewables, and how the underlying technology may be used to aid climate efforts . The industry is interested in being a part of the solution and has already invested significant resourcing into research and innovation on this front.

This enables: (1) Openness: Allowing anyone to join as the network to validate transactions and (2) Integrity: Providing on-chain rewards to incentivize miners to behave in line with the shared interests of the network and disincentivize fraud.

Academic research showed that actions taken by China to ban data centers worsened its environmental impact – increasing its carbon intensity by 17%. This is unfortunate, given that data centers' flexibility allowed them to consume excess hydroelectricity during Sichuan's rainy season. Moreover, these efforts were not effective in curbing this activity. New data from the Cambridge Centre for Alternative Finance showed that the quelling effects of the ban were temporary, with data center activity re-surging following a short gap.

## What can be done?

Through economic incentives, consensus mechanisms simultaneously dis-incentivize malicious behavior, by making "cheating" expensive, and incentivize honest behavior, by providing rewards to honest network operators.

The best-known example is Proof-of-Work (PoW). Under PoW, nodes "work" to add new records to the ledger by conducting mathematical computations. The quickest receives compensation called a block reward, which includes two parts – a block subsidy of newly-minted coins and transaction fees. PoW is currently used by the Bitcoin network, the largest crypto by market cap.