

# Understanding Crypto's Role in the Energy Transition

Updated March 2023  
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## Summary

- The energy grid is facing significant challenges related to grid instability, energy transfer & storage, and harmful byproducts.
- Crypto data centers have a unique mix of flexibility, consistency, and transparency that can help with some of these challenges.
- There are already projects focused on using crypto data centers to mitigate some of these challenges; they 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 gas flaring 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 New projects are stalled or withdrawn due to interconnection challenges – and [over 90% of US requests](#) are for zero-carbon energy sources.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 over [400 million tons of CO2 equivalent emissions](#) annually.

Source: Cambridge Bitcoin Electricity Consumption Index (CBECI); March 5, 2023

### T&D electricity in the USA



### Global gas flaring recovery potential



### Renewables curtailment in China



## How can crypto help?

The need for action on the energy transition is urgent – and crypto can be an important bridge to much needed investments and market support. Crypto data centers are uniquely suited to address some of these challenges due to their unique combination of:

- (1) **Flexibility:** Studies have found that a flexible load on renewable grids can be a solution minimizing the mismatch of supply and demand. Crypto data centers are flexible on two critical axes: Location and Demand. This means that they can access “stranded” sources of energy and quickly power up and down based on grid conditions.
- (2) **Consistency:** Sustained demand at-scale is important. Typical demand for energy varies based on time of day, population, etc. Markets for renewable energy sources can face periods of low demand, affecting market prices and business models. Crypto can serve as a consistent source of demand, reducing the need for costly curtailment.
- (3) **Transparency:** Crypto provides a new model for financial services and data centers more broadly. The transparency that the industry brings: (1) data that can be used to inform decision-making and (2) a model for greater accountability and transparency. The industry is actively moving towards increased information sharing and aims to set the example for others.

## What are examples of this in action?

In over 20 sites across the United States there are data centers taking various approaches to sustainable operations. This includes:

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- [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 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?

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.

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 dis-incentivize fraud.

Recent events have also shown how crypto can be used as a tool for humanitarian assistance. Crypto raised over [\\$12.5 million](#) in aid for Turkey and Syria.

Shortly after Russia's invasion of Ukraine, over [\\$100 million](#) in crypto assets was mobilized for much needed supplies and services. Over [\\$1 billion](#) was raised in crypto for COVID relief in India through a [Twitter-based grass-roots effort](#). We also see powerful stories coming from those who live in environments of [strict financial controls](#), [political disruption](#), and [currency volatility](#). We have seen time and time again, crypto can be a critical lifeline in the face of instability. More routinely, it offers more choice to consumers in areas like [remittances](#). We are seeing this in [high levels of adoption](#) in developing and emerging economies.

Furthermore, recent 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-surg-ing following a short gap.

## What can be done?

We underscore that the crypto industry is not asking for special treatment. Rather, there are many in the crypto industry that want to work collectively with the broader ecosystem to understand the holistic impact of data centers. Crypto projects 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 crypto'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.