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Renewables and energy efficiency addressing the rising energy usage of cryptocurrency mining

TUESDAY, 27 APRIL 2021 • 10:00-10:30 CEST

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SPEAKERS

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Renewables and energy efficiency addressing the rising energy usage of cryptocurrency mining

Power sector transformation propelled by three trends

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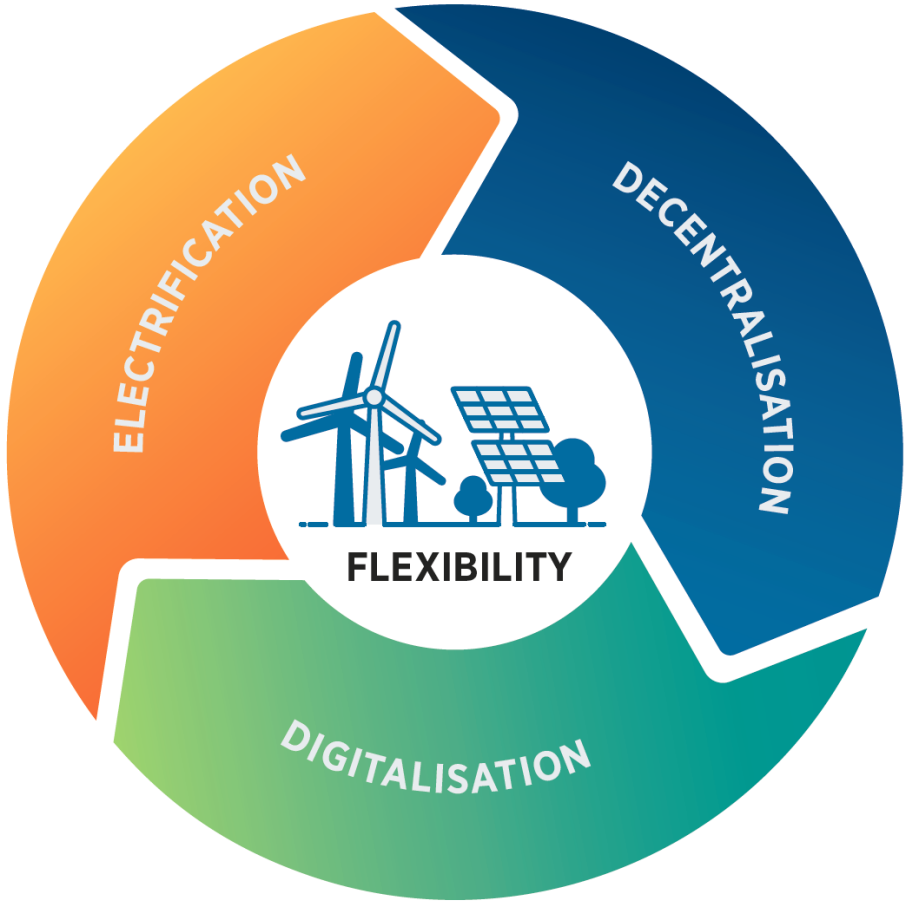
I. **Decentralisation –supply side.** Wind and PV is largely centralised today but distributed generation - notably rooftop PV, ~ 1% of all electricity generation today – is growing, bringing new flexibility opportunities at demand side

II. **Electrification –demand side.** It plays in two ways, may decarbonise end-use sectors through renewable electricity and, if done in a smart way, become a flexibility source to integrate more renewables in power systems

III. **Digitalisation –system integration.** Covert data into value by optimising complex systems with more actors involved, many small generation units and new type of loads



Source: IRENA (2019), Innovation landscape for a renewable-powered future: Solutions to integrate variable renewables

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Blockchain (DLT) – Decentralised RE with smart contracts at the core >> *TRANSACTIONS*

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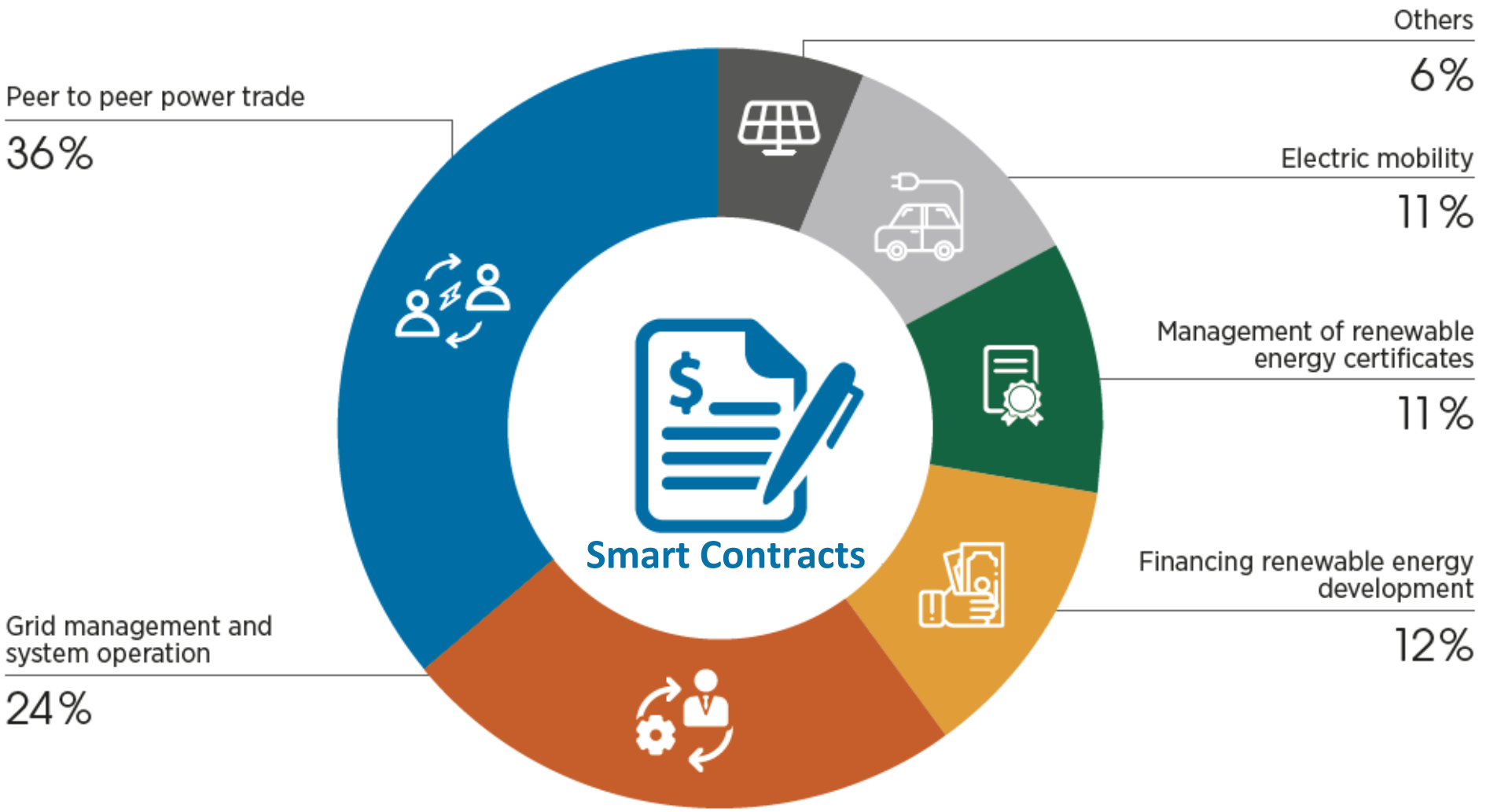

Note: Data as of July 2018.
Based on: Livingston et al. (2018), Applying Blockchain Technology to Electric Power Systems.

Source: IRENA (2019), Innovation landscape brief: Blockchain

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Global power supply projections in a 1.5C scenario
Electrification of end use sectors

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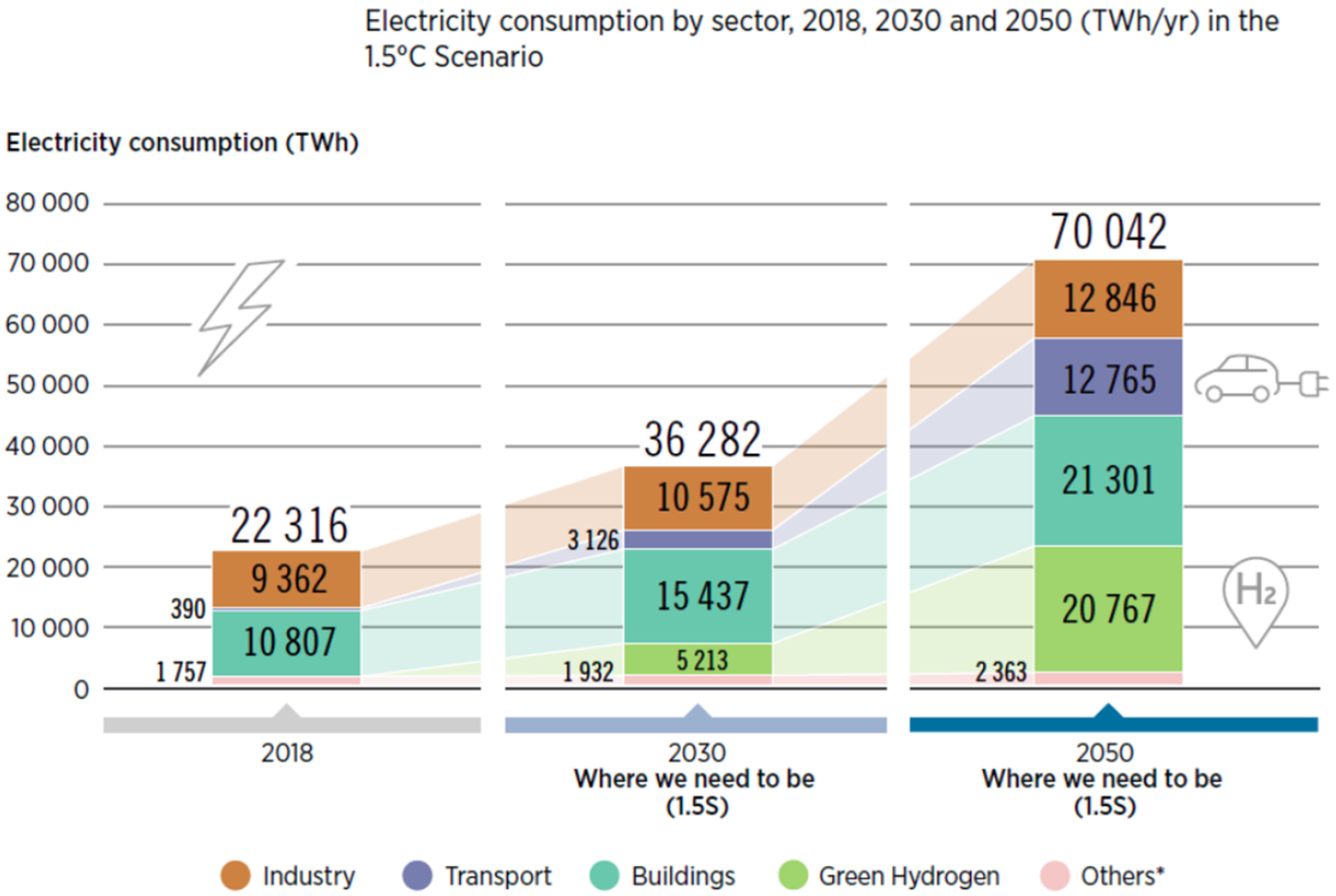

In 2018

- Global electricity demand: 22k TWh
- Electricity consumed in the transport sector: 390 TWh (1.8% of total)
- Data centres demand: 200 TWh (1% of total)

In 2030

- Global electricity demand: 36k TWh
- Transport sector: 3k TWh (8.3%)
- Data centres: 1k to 4k TWh (2.7% to 11%)

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Innovation unlocks flexibility across the power system

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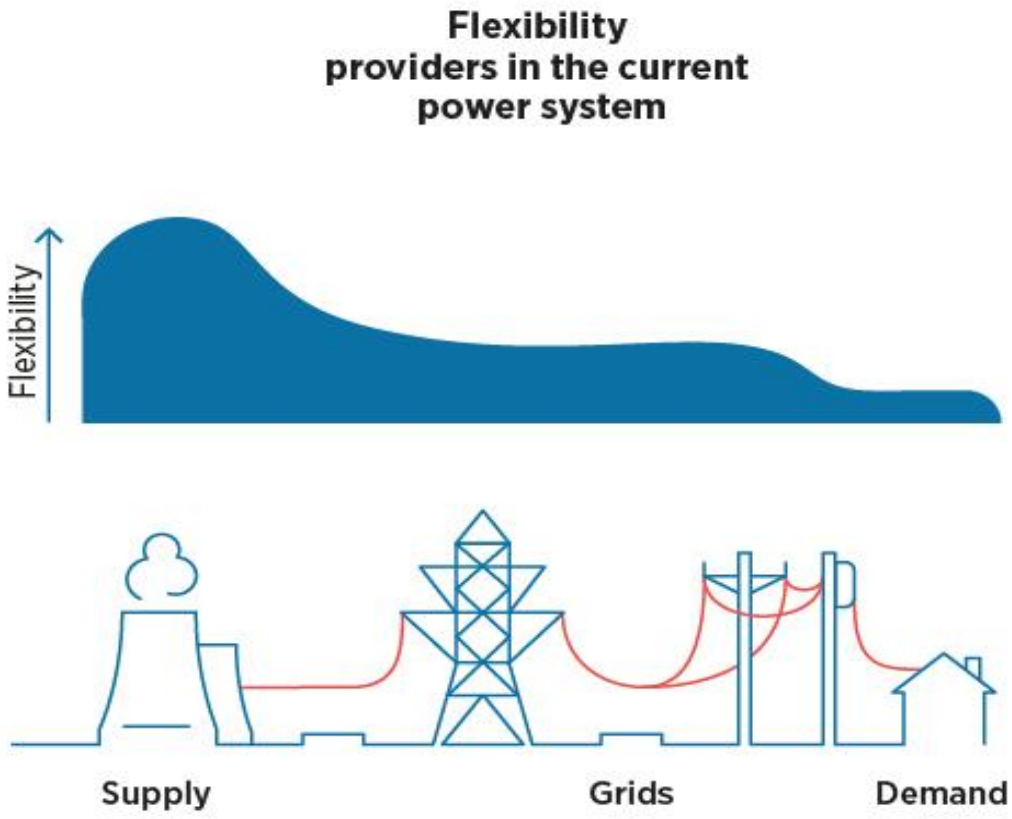

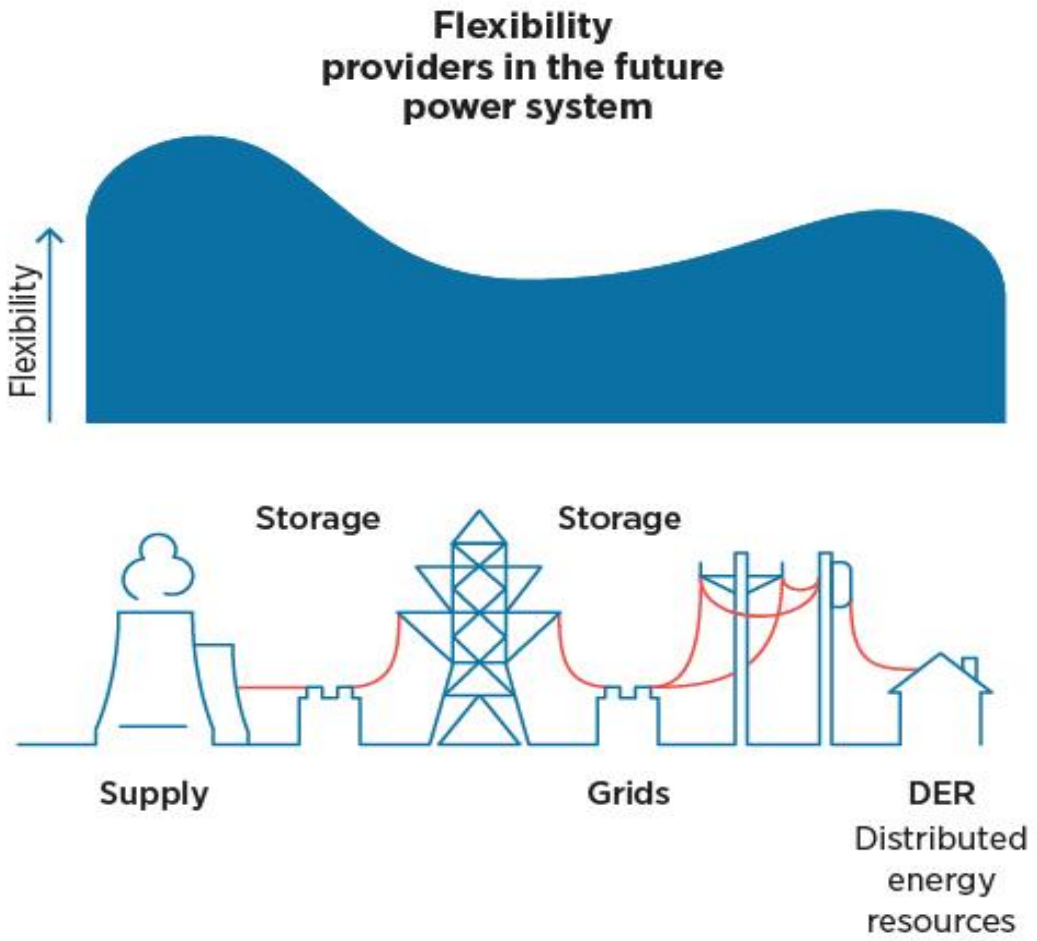

Flexibility sources: Flexible generation

Flexibility sources: Flexible generation; Regional interconnections and markets; Demand response; Storage; Power to X

Issues

1- Annual Energy demand: must come from renewables

2- Load profile: peak demand

Smart vs dumb electrification

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The New York Times

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In Coinbase's Rise, a Reminder: Cryptocurrencies Use Lots of Energy

The company's stock market arrival establishes Bitcoin and other digital currencies in the traditional financial landscape. It also elevates a technology with astonishing environmental costs.

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Wildlife Energy Pollution

Forbes

Mar 10, 2021, 06:00am EST | 20,293 views

Bitcoin's Energy Consumption Is A Highly Charged Debate – Who's Right?

Lawrence Wintermeyer Contributor

Fintech

I cover fintech, digital assets, and sustainable investments.

Mining rigs of a super computer are pictured inside the bitcoin factory 'Genesis Farming' near ... [+] AFP VIA GETTY IMAGES

How much power does bitcoin consume? It is a question that has

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How Bitcoin's vast energy use could burst its bubble

By Justin Rowlatt
Chief environment correspondent

27 February

Climate change

This article is more than **1 month old**

Electricity needed to mine bitcoin is more than used by 'entire countries'

Bitcoin mining - the process in which a bitcoin is awarded to a computer that solves a complex series of algorithm - is a deeply energy intensive process

A man uses a bitcoin ATM in Hong Kong. Photograph: Kin Cheung/AP

Bloomberg

Cryptocurrencies

Cathie Wood's ARK Says Bitcoin Mining Is Good for the Planet

By Joanna Ossinger
April 22, 2021, 10:06 AM GMT+2

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Bitcoin mining is often decried as a highly energy-intensive activity. But Cathie Wood's ARK Investment Management LLC has done some new research that maintains it isn't as environmentally damaging as some claim.

The argument is that Bitcoin mining could encourage investment in solar energy systems, enabling renewables to fulfill a higher percentage of demand from the energy grid at a constant cost of electricity, according to a

TC

The debate about cryptocurrency and energy consumption

GMT+1 • March 21, 2021

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Why does Bitcoin need more energy than whole countries?

Running the cryptocurrency Bitcoin requires more energy than New Zealand and Belgium put together. How can something virtual keep power plants around the world so busy? DW's Timothy Rooks looks into the numbers.

Why is energy required for blockchains

Reaching consensus, securing the network

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Proof of work • **Bitcoin** • **Ethereum** • Others	Many miners	Decentralised, energy-intensive, difficult to scale
Proof of stake • Ethereum 2.0 • Others	Many validators	Decentralised, energy-efficient, easier to scale
Proof of authority • Hashgraph • Energy Web • Others	Few validators	Centralised, energy-efficient, easiest to scale

Proof of work mining

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Miners use specialised mining equipment to solve complex mathematical problems in order to receive rewards (Bitcoin, ETH, others).

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Estimated Bitcoin network electricity consumption (2015-2021)
TWh (annualised)

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Data source:
Cambridge Centre for
Alternative Finance

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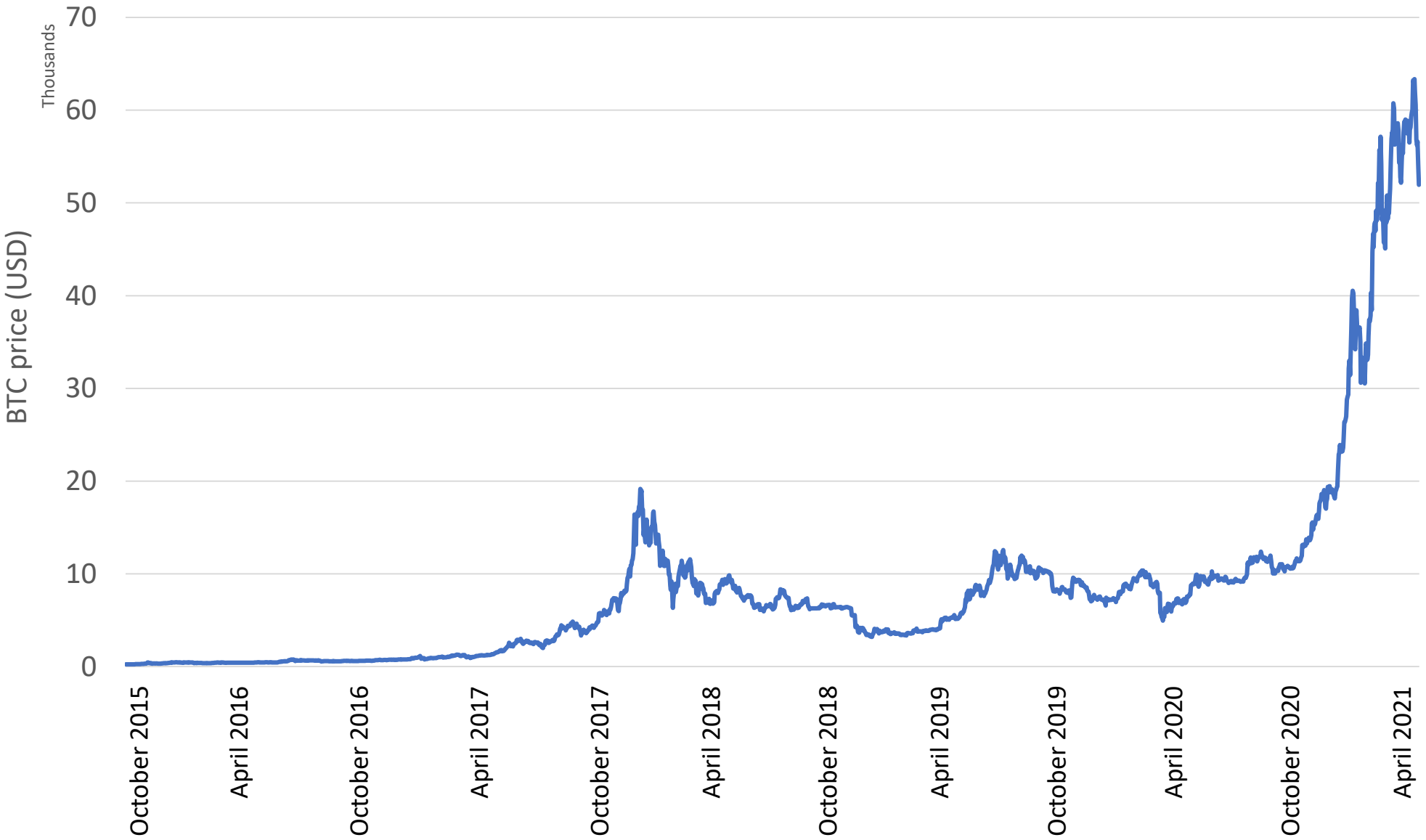
Bitcoin price



Data source: coindesk

Estimated Ethereum network electricity consumption (2017-2021)
TWh (annualised)

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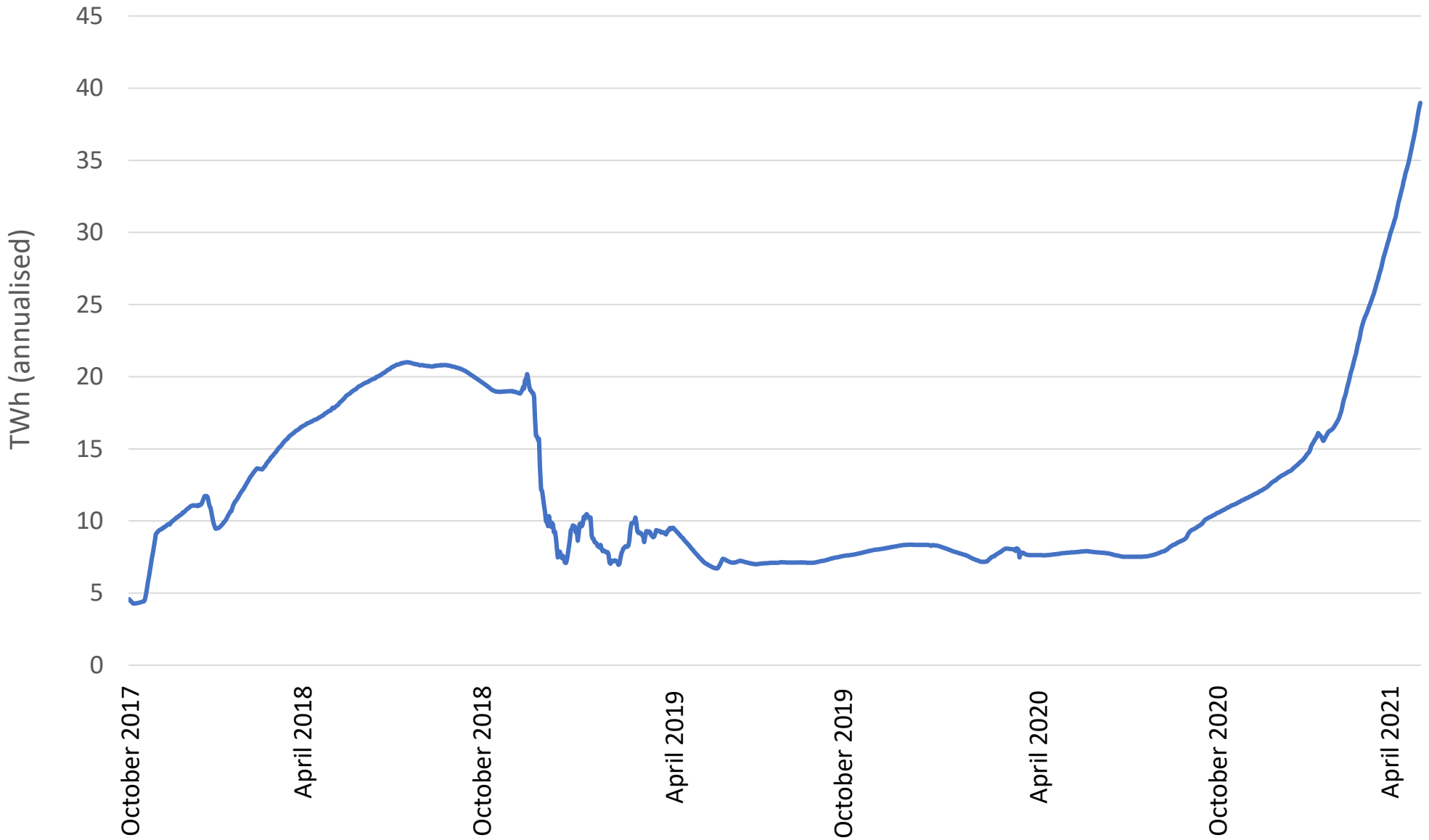

Data source:
Digiconomist

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Renewables make economic sense for mining

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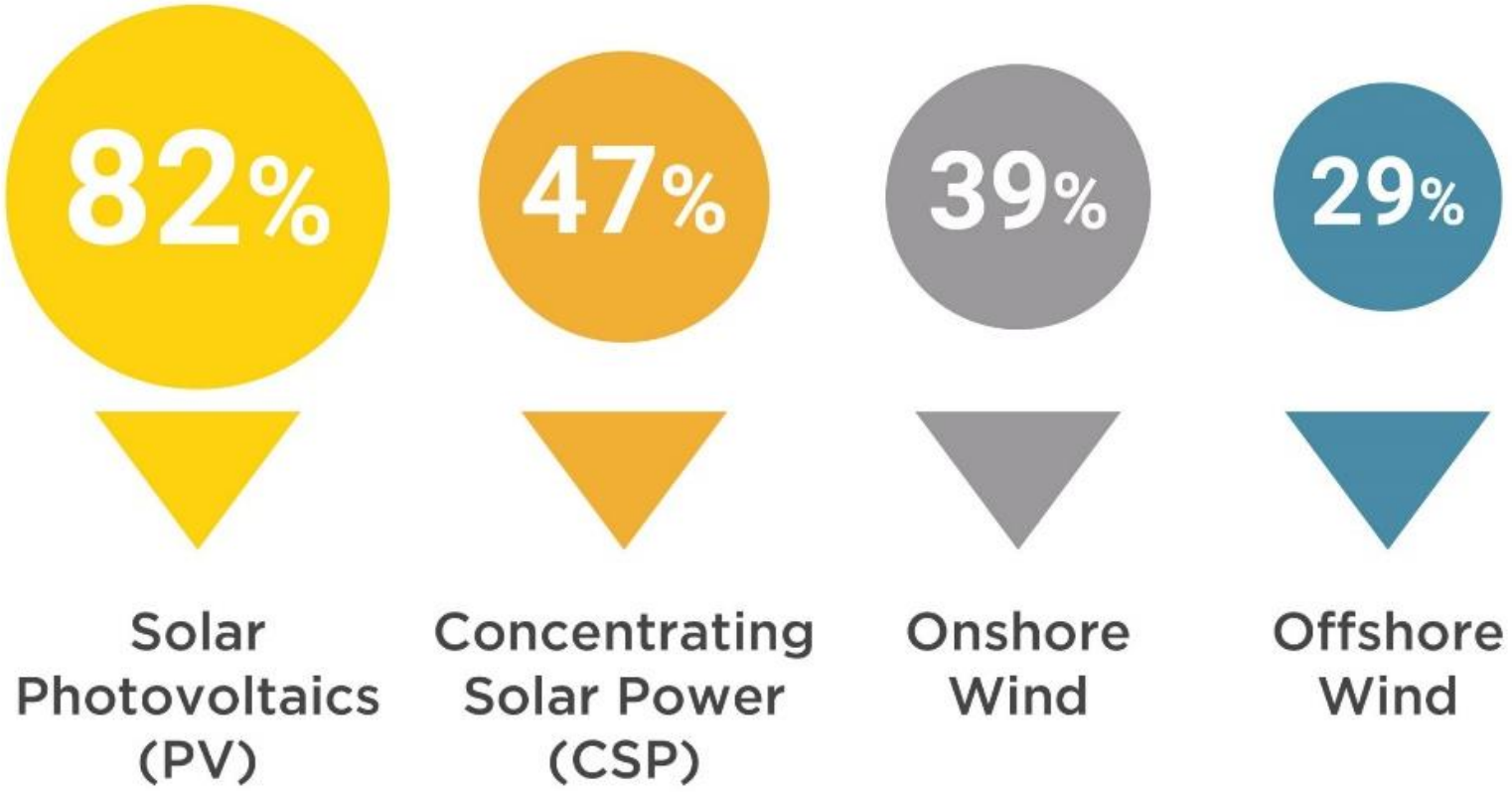
Renewable energy costs declined rapidly over the last 10 years (2010-2019)



Opportunities for grid flexibility

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Matching peak load with peak renewables supply

- Changing the profile of consumption of miners through price signals

Battery storage

- Integrating battery storage into mining operations to store renewable electricity during periods of peak supply
- Consume or sell power back to grids when renewables production falls

District heating

- Use waste heat from mining rigs to produce hot water local minimalities

We explore these options and more in IRENA's Innovation Landscape report

https://www.irena.org/publications/2019/Feb/Innovation-landscape-for-a-renewable-powered-future

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Learning from related sectors: Strategies to integrate higher shares of renewables and increase efficiencies

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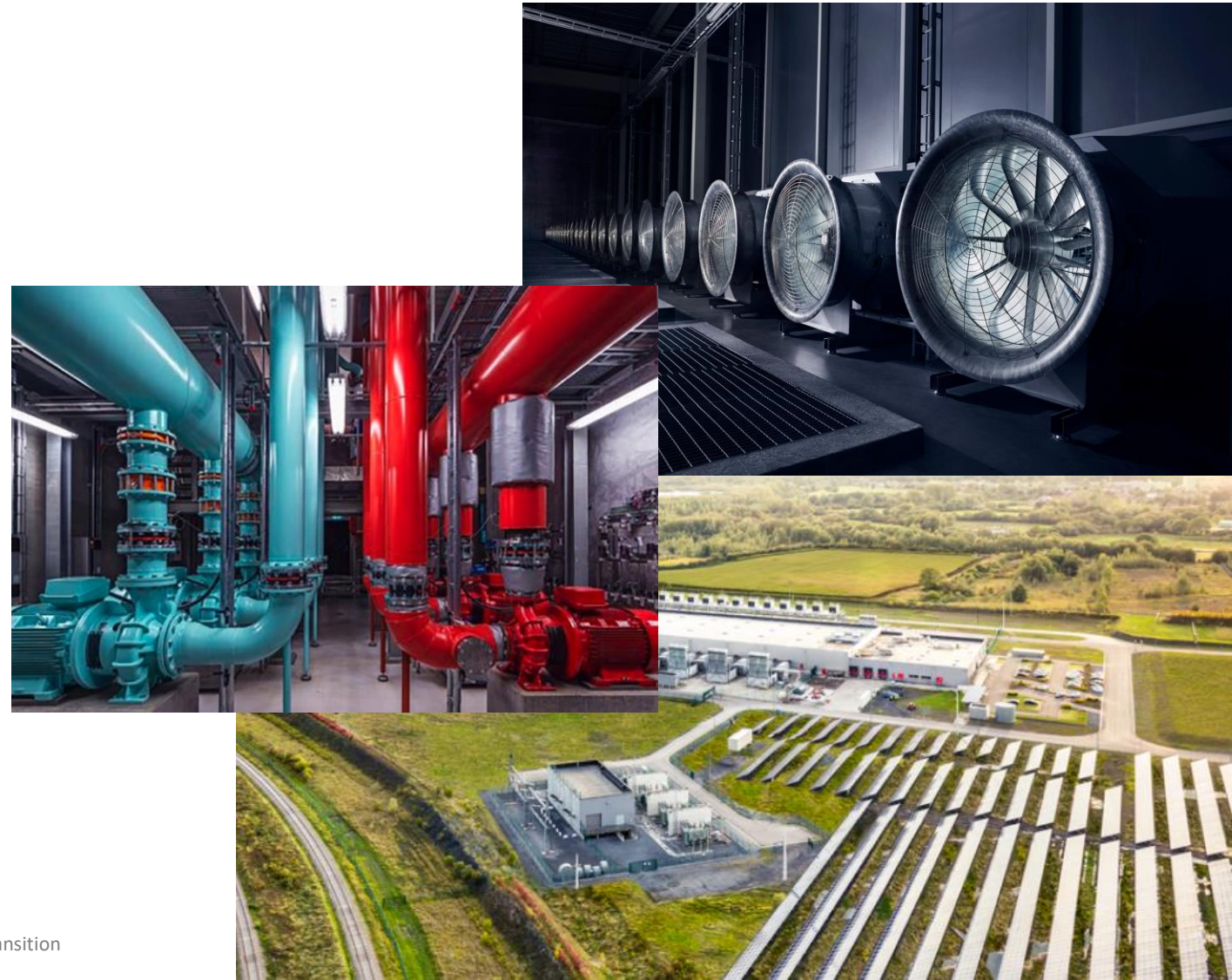
A few key strategies employed by data centres which may prove useful for PoW mining include, among others:

- Locating data centres in locations with abundant and cheap renewable electricity
- Enabling data centres to provide services in power flexibility markets
- Leveraging sector coupling
- Integrating battery storage
- Using machine learning to optimise operations and increase energy efficiency



https://energycentral.com/c/cp/nexus-between-data-centres-efficiency-and-renewables-role-model-energy-transition

Example: Intelligent load shifting

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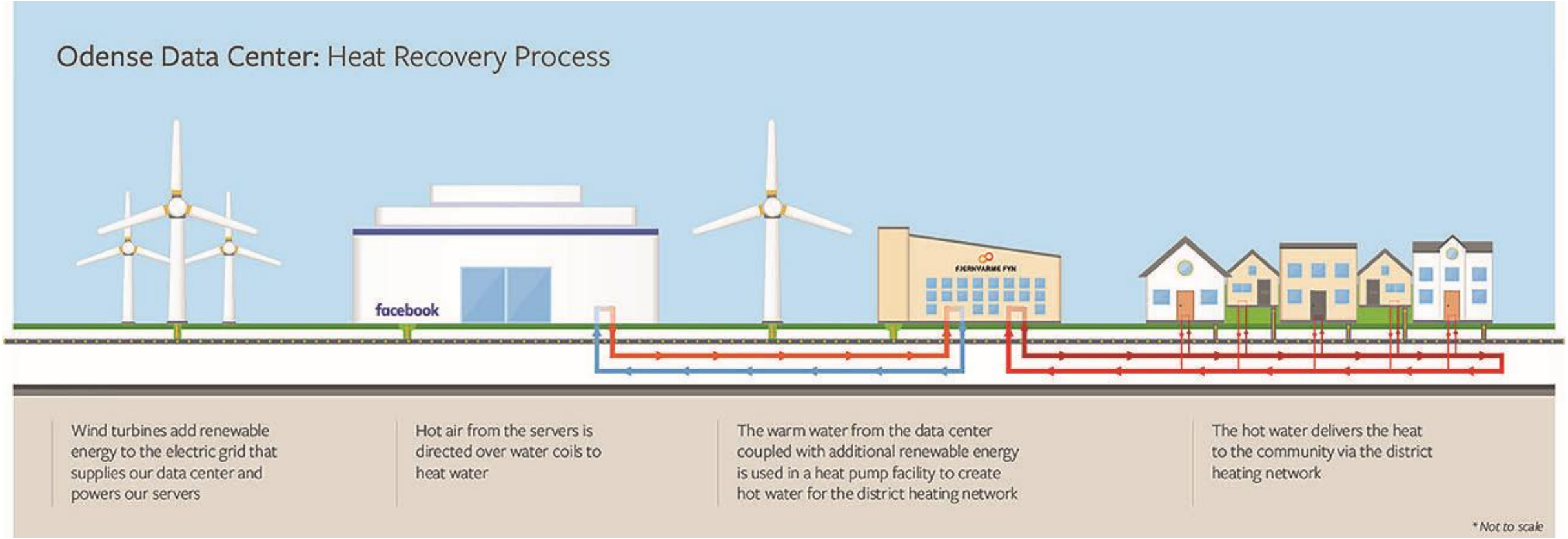
Source: Google

Example: District heating via waste heat



Source: Facebook

Increasing energy efficiency via new consensus mechanisms

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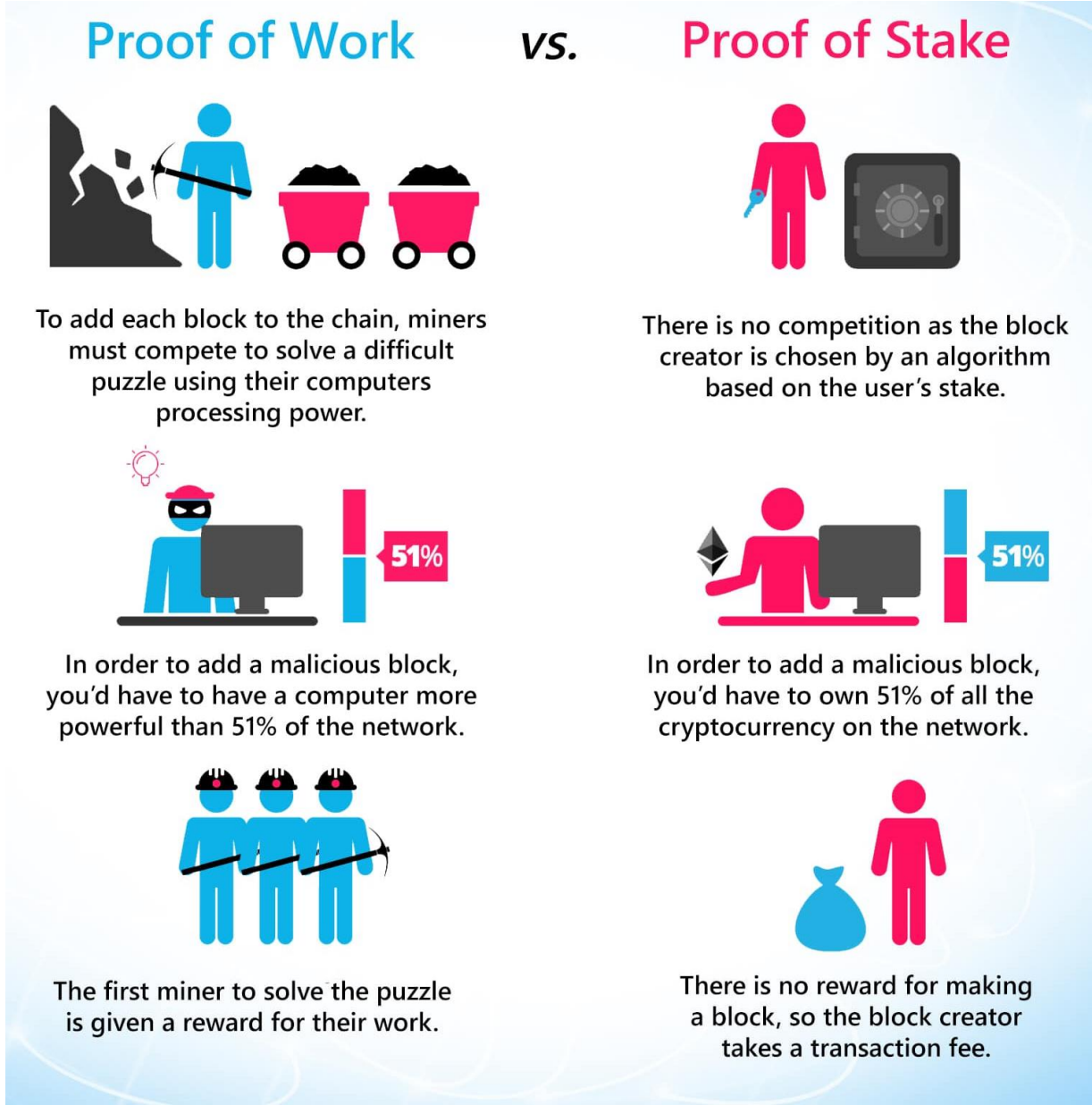
- **Ethereum's imminent shift from PoW to PoS is set to reduce the network's energy demand by around 99%.**
- **Layer 2 innovations reducing energy needs**
  - ETH L2
  - BTC Lightning Network



Source: Blockgeeks

Way forward

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Many uncertainties remain, threats and opportunities

Switch to energy-efficient means of consensus wherever possible, decarbonise PoW where needed

Adopt strategies from similar, power-hungry, sectors to manage energy consumption more effectively

Climate targets are not doomed but that depends on how we move forward

Contact us

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If you have thoughts on this topic please reach out to

innovation@irena.org

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Q & A
10 min

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