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Bitcoin Mining as a Solution to the EU's Energy Crisis

A policy proposal for the Energy Union and European Commission

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Context

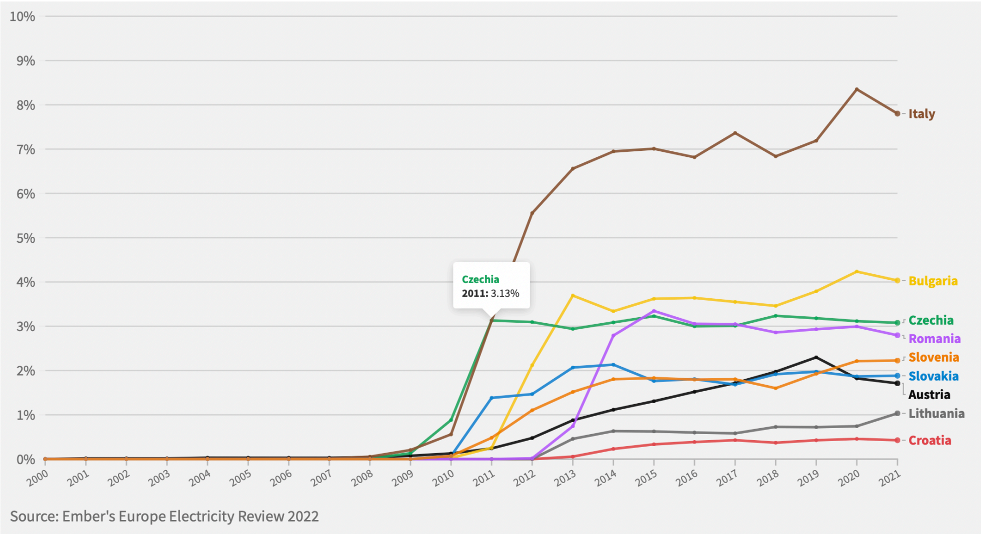
Executive Summary

The EU's energy crisis is a matter of fundamental importance and urgency. In particular, environmental sustainability and energy import dependency are prevailing issues for the region. According the European Commission and the Energy Union, by fostering the growth of the renewables sector across the EU, the grid will become less carbon-intensive, and the EU's dependancy on imported energy will be reduced. Nevertheless, renewables like wind and solar have encountered challenges with economic viability and stability as a result of its intermittent energy generation. Bitcoin mining monetises and stabilises the sector with its flexible demand for energy, rendering the renewable generators more economically viable and investor friendly. For the first time in history, we have a reliable consumer that can turn-up and turn-down their consumption of energy at a moment's notice, providing the grid with funding in times of excess, and with stability in times of strain. The present proposal recommends a policy to integrate Bitcoin mining into the region's energy market, to help achieve the EU's energy policy aims of decarbonisation and dependancy alleviation.

The Energy Crisis

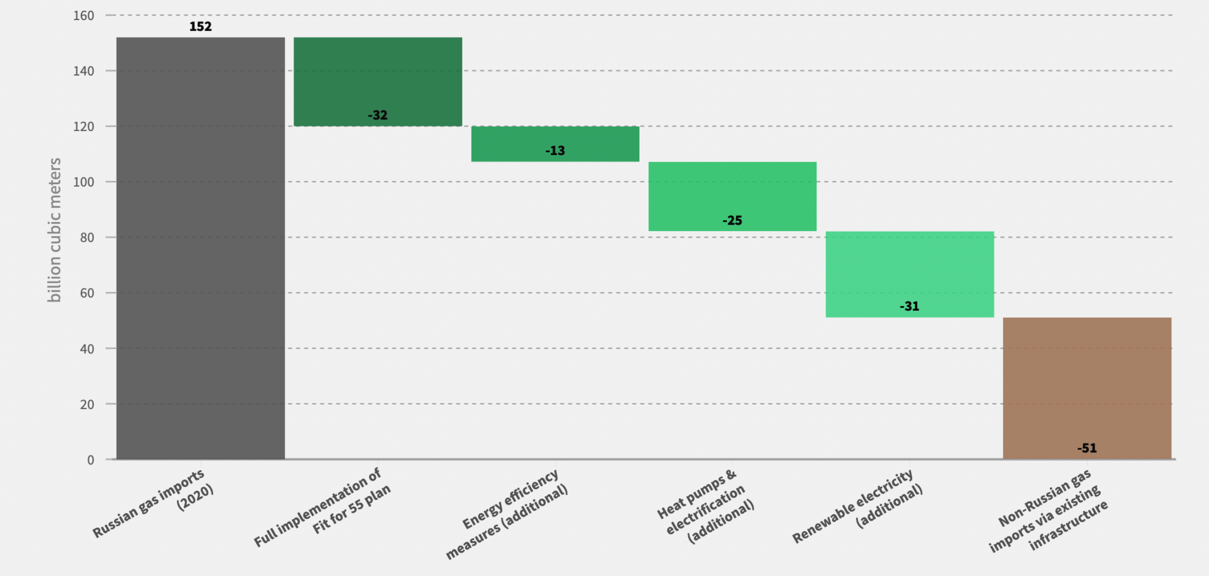
Environmental sustainability

With regard to the environmental hazards of carbon-emitting fossil fuels, a foundational policy aim of the EU's Energy Union is to decarbonise the energy grid and move towards a low-carbon economy in line with the Paris Agreement (Energy Union, 2021). Currently, just over 22% of Europe's energy is sourced from renewables. According to an Ember report on the EU power sector in 2020, the rate at which the EU is shifting to renewables needs to triple in order to meet its 2030 goal of 32% (Jones, 2022). It is widely accepted that the grid is currently too carbon intensive, and research and development is required to encourage the buildout of renewable energy infrastructure. Below is a chart which illustrates the slowing rate of renewables adoption in many EU countries (Jones, 2022).



Dependancy on Imports

Another important policy aim of the Energy Union is to reduce the EU's dependancy on energy imports from external countries, like Russia (Energy Union, 2021). The region imported approximately 155 billion cubic metres of natural gas from Russia in 2021. This figure amounts to 40% of the EU's total gas consumption, with Germany's dependancy reaching upwards of 65%. The EU's need for Russian energy is funding Moscow's military operations in Ukraine, illustrating the urgent need for independence (Ferris, 2022). According to the European Commission, the growth of the renewables sector will be prioritised to assist the EU in becoming more independent, as more energy will be produced within the region. As a consequence, the European Parliament is set to push for the 2030 renewables target to be increased to 45% (Simon & Taylor, 2022). Below is a chart which shows how Russian gas imports can be off-set by 2025 through shifting to clean energy (Jones, 2022).



Sources: Analysis by Bellona, E3G, Ember and Regulatory Assistance Project (RAP) • EU Commission model-based projections supporting the Fit for 55 policy initiatives (MIX scenario)

Thus, for the EU to address the prevailing energy issues of environmental sustainability and import dependancy, the Energy Union seeks to propose policy that prioritises research and innovation to drive the transition to renewable energy. The subsequent sections of this paper will outline the existing problems in the renewable sector, and will propose bitcoin mining to be a clean, sophisticated and technologically sound solution.

Renewable Energy

1. Challenges with Renewables
2. Existing Solutions

Challenges for Renewable Energy

Stemming from the nature of renewable energy production, the sector has faced problems with general economic viability and grid stability. A common example can be seen with the generation of energy by wind/solar, whereby energy yields are inconsistent. The demand for energy by the grid is also unpredictable, in that at different times of the day and/or year, more or less energy is required by consumers. The net effect is that oftentimes, a spread between the demand and supply of energy emerges, which means that an excess amount of energy must be dealt with.

Grid stability

From a grid stability stand point, relatively decarbonised European countries like Germany and Denmark are finding that, counterintuitively, too much renewable power poses problems for the supply-side of their energy. When electricity is generated, it must be used instantaneously, and therefore the amount of generation and the amount of demand must be in perfect equilibrium at all times. A disequilibrium (spread) can cause surges in the grid and so a means of storing or diverting this excess is vital (Relph, 2020).

Economic viability

From an economic standpoint, the intermittent nature of renewables energy like wind/solar produces a tremendous inefficiency. There is significant input costs to generating renewable energy (infrastructure, logistics, land, labour etc) and so excess wasted energy represents a cost with no return. Trillions of euros of investment in renewables is expected in the coming decade, particularly across the European region, and so if we cannot find a suitable way to deal with the excess energy, there is a risk that billions of euros of renewable electricity could be wasted (Fraser, 2009). The converse of this idea is that, if we had a way to harness the excess energy and convert the generated electricity into economic value, the industry's profitability would augment significantly. This would attract investors and incentivise the buildout of more infrastructure and generators.

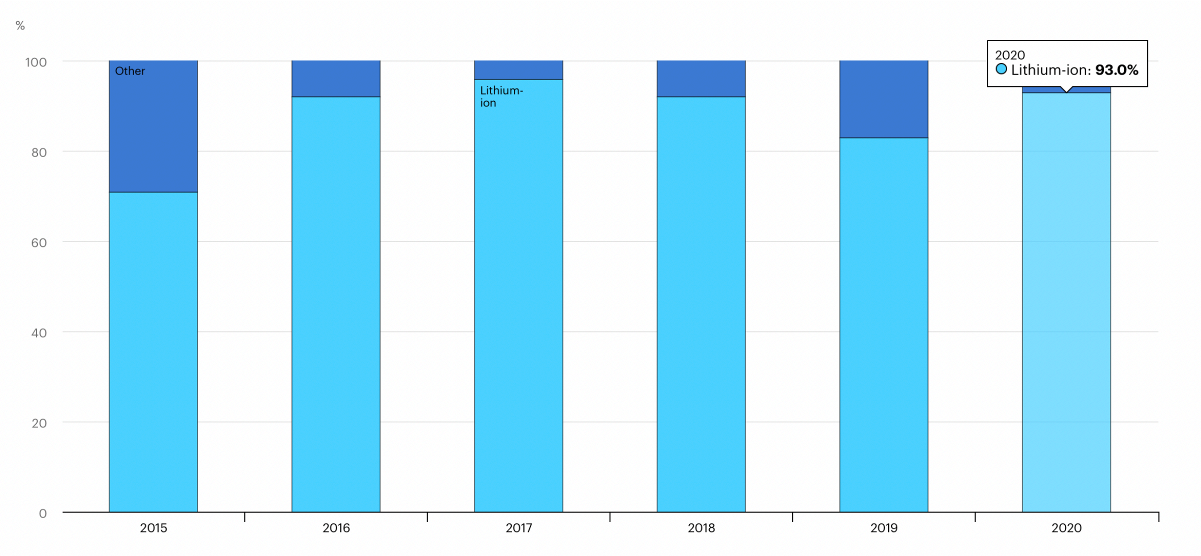
In sum, the excess energy produced by wind and solar generators poses a challenge for grid stability and economic viability. The following section will address the existing ways in which this problem has been approached.

Existing Methods for Grid Stability and Economic Viability

To ensure that the grid is in equilibrium and that energy isn't entirely wasted, some existing methods include the following: 1. Storing energy in batteries when there is excess energy generated 2. Curtailing the demand for energy by taxing the consumer when there is a lack of energy. Both methods are relatively costly and inefficient.

Battery storage

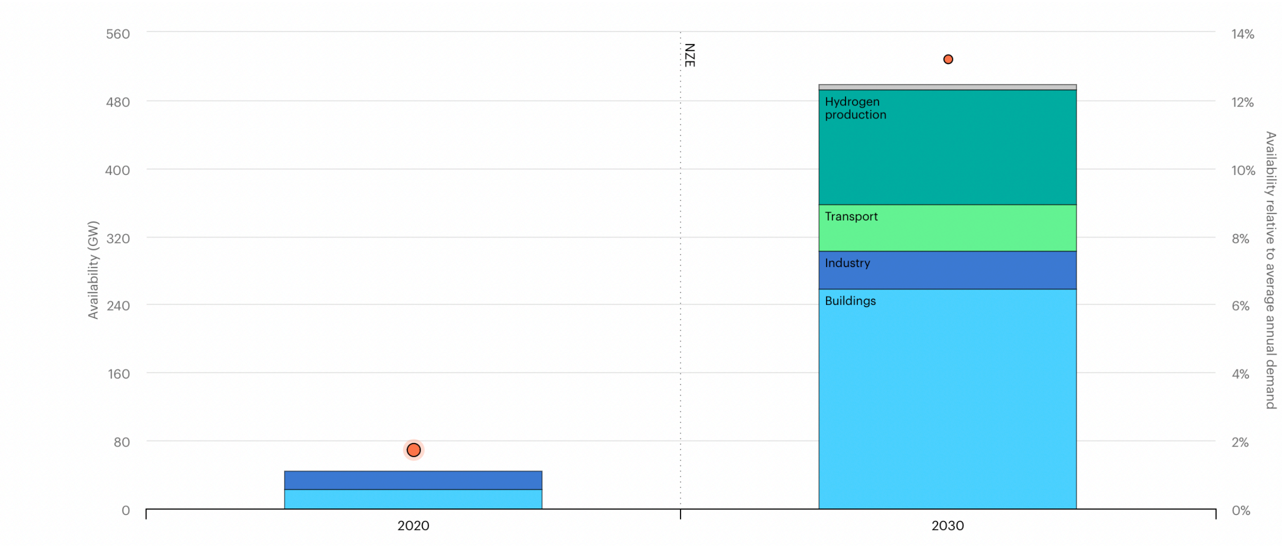
Up until this point, storing excess energy has been the primary approach to solve the imbalance between demand and supply of energy. The idea is simple, when there is excess energy which is not required by the grid, it can be stored in batteries and sold at a later point in time. In practice though, to realise the conversion of renewable energy into a storable energy carrier and to build the necessary storage capacities and distribution networks is a technical, economic and environmental challenge (Züttel, 2022). While battery technology is improving, it is still relatively inefficient and extremely costly. The chart below shows the proportion lithium-ion batteries vs other types of batteries.



The constituent materials of lithium ion batteries can be ethically and environmentally problematic. Only a small percentage of lithium ion batteries are recycled and the cobalt needed to make them is mined using child labor in some cases (Thompson, 2021).

Curtailing demand

To stabilise the grid when there is too little supply and too high demand, consumers increasingly face methods of curtailment. Electricity taxes that exist in many countries today were set as a result of a deliberate policy to reduce electricity consumption for environmental concerns/grid stability. However, taxation also discourages the use of renewables, and so demand-side policies should rather be designed in a way that minimises both costs to consumers and their carbon footprint. The optimal policy may no longer be to encourage electricity conservation. Instead, demand-side policies that encourage carbon conservation by providing an alternative and viable use for energy is more sustainable (Fraser 2009). The below chart illustrates the required level of demand-side flexibility of the grid from 2020 to 2030. Evidently, demand-side policies are fundamentally important for the future of grid stability, and flexibility is absolutely imperative.

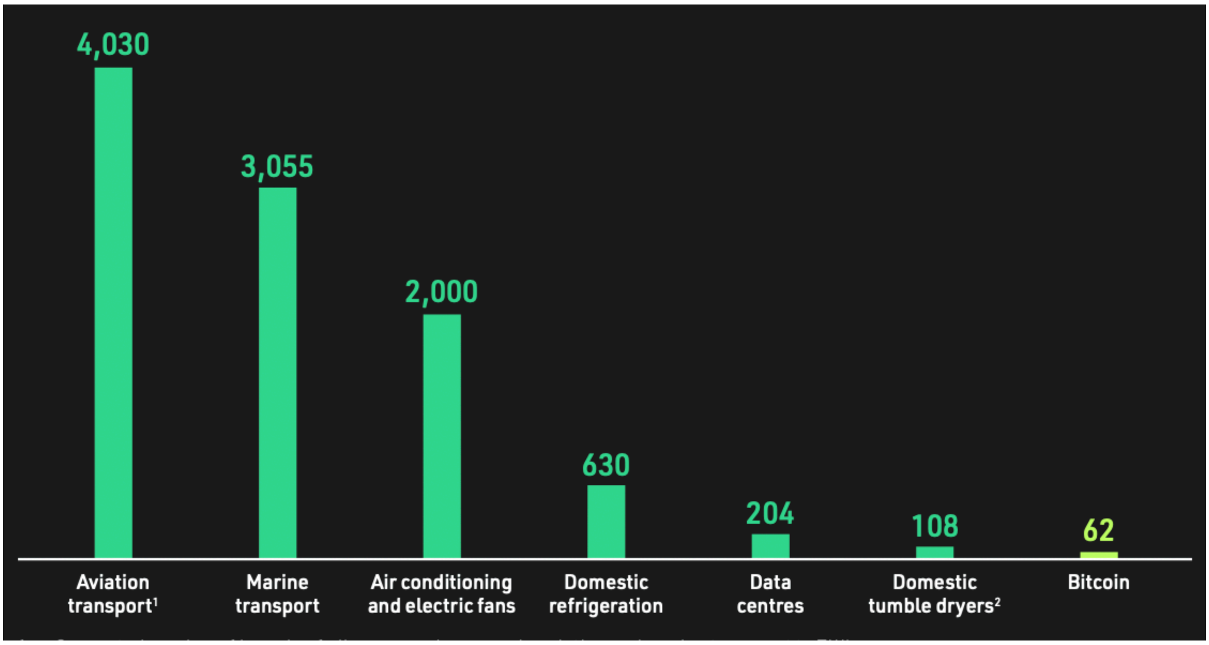


Bitcoin Mining

The Bitcoin Mining Solution

How bitcoin mining works

In order to propose the notion that bitcoin mining monetises the buildout of renewable energy infrastructure and stabilises the grid, it is first necessary to explain the basic functioning, purpose and incentive structure of bitcoin miners. Without unpacking the intricacies of the technical dimension, the emphasis of this section is that bitcoin miners *must* consume energy to maintain the network. The proof-of-work (PoW) protocol determines how miners assemble transactions and produces a competitive environment in which miners compete by spending electricity and computational resources (Carter & Stevens, 2021). The role of miners is in essence to validate transactions, to produce more bitcoins at a predictable rate, and to reach a decentralised consensus on the structure of the blockchain. The steady addition of a constant amount of new coins is analogous to gold miners expending resources to add gold to circulation (Nakamoto, 2009). In return for securing the network and validating transactions, miners are rewarded with coins and/or transaction subsidies. The miners are profitable when their rewards exceed their cost of energy consumption. The result is that the miners flexibly push the marginal price of power downward for the grid. Put differently, they do not push the marginal price higher than their breakeven (Braiins, 2022). The chart below shows Bitcoin's energy consumption compared with other industries and sectors globally (Carter & Stevens, 2021).



The flexibility of bitcoin mining

Bitcoin miners are unique because of how fast, transparent, and flexible their response can be to grid demands, in that they can increase and decrease their energy consumption in an instant and at no cost. New renewable infrastructure development could be underwritten in part with a bitcoin miner as a colocated and contractually bound energy buyer. When there is excess energy produced by the renewable generators, the bitcoin miner would ramp up their consumption and monetise the energy that would have otherwise been stored or wasted. Conversely, when there is strain on the grid, the miner could switch off their machines to ensure that energy first goes to prioritised consumers.

From and economic perspective, this colocated mine could produce enough revenue for the generation site to shore up financing and augment investor confidence. In other words, the fact that excess energy would be translated into profit as opposed to costs, the financial outlook of owning/building/investing in renewable infrastructure becomes substantially more appealing. From a stability perspective, the fact that miners can feed energy back into the grid in times of high demand, renders the grid more stable and more flexible (Braiins, 2022).

For the first time in history, we have an energy consumer with a purely flexible demand. The bitcoin network therefore presents an innovative and novel way to address concerns regarding the economic viability and stability of renewable energy generation.

Recommendation

1. Roadmap
2. Regulatory Clarity
3. Bitcoin Mining Guidlines

Policy Recommendation

The central recommendation is to integrate Bitcoin mining into the EU energy market to help achieve the EU's energy policy aims. The form of policy is at the discretion of the Energy Union and the European Commission, and so the subsequent sections will advise specifically on the *content* of the policy. The aim of the policy is to establish a roadmap, regulatory clarity and to foster an environment which is bitcoin friendly, to attract miners into the European region and ultimately to harness the new technology in the pursuit of decarbonisation and independence.

Roadmap

The roadmap will provide member states with a timeline to integrate and transpose the bitcoin regulations into their national law. Further, it will provide various checkpoints along the timeline that breakdown the adoption of bitcoin into steps. The timeline is 2 years, as integrating a new technology to support the growth of renewables is a matter of urgency.

Regulatory clarity

It is important to establish regulatory clarity on bitcoin so that institutional actors in the EU can operate and interact with the technology, without questions about compliance and legal grey areas. Currently, the Markets in Crypto-assets (MiCA) Regulation provides a draft legal framework for crypto-asset markets to grow within the EU, by outlining the legal treatment of crypto-assets that are not covered by existing financial services legislation. The draft legislation distinguishes between crypto assets in general, asset referenced tokens (ARTs), also called "stable coins", and e-money tokens primarily used for payments (Deloitte, 2022). Interestingly, the EU parliament held a vote in March of 2022 pertaining to bitcoin mining in the MiCA bill, and voted in favour of 'not' banning mining for concerns of environmental sustainability (Attlee, 2022). This is a positive step for the EU and for bitcoin integration prospects.

Nevertheless, the present recommendation is to separate and distinguish between crypto-assets and bitcoin. If regulators understood the core properties of bitcoin, they would realise that bitcoin is a 'property' and most other crypto-assets and cryptocurrencies are 'securities'. In a financial context, a security is an instrument which is managed by a centralised group of people, and so they are required to provide investors with extensive disclosures. A property or a 'commodity' on the other hand, is not controlled by a particular entity. This definitional distinction is absolutely necessary to achieve a fair and friendly environment for bitcoin and bitcoin miners. Clarity will also foster the general adoption bitcoin as an asset and a medium of exchange.

In sum, the recommendation to draft an additional bill to the already existing (MiCA) proposal, which provides legal and regulatory clarity for bitcoin specifically. Bitcoin's unique qualities means that it should be treated by the regulators as practically, philosophically and legally distinct from other crypto assets.

Bitcoin mining guidelines

In addition to the regulatory framework in the previous section, this proposal recommends regulators to provide clear and coherent guidelines which are addressed to bitcoin miners as well as existing grid constituents, like renewable generation companies. Guidelines will primarily focus on 1. The form and content of power purchase agreements (PPA's) 2. The use of non-renewable energy for bitcoin miners 3. The energy limits of colocation with renewable generation.

Power purchase agreements are essentially contracts between the energy seller and the energy consumer. These agreements play a vital role in the financing of independently owned generation assets. For example, If a bitcoin miner concludes a five year deal with a solar farm, that solar farm will be more attractive to investors as it has a predetermined 5-year guarantee of income. The guidelines will establish various contractual limitations, such as, minimum length of contracts, maximum energy use, demand-response obligations etc. Demand response obligations would set the rules for bitcoin miner energy consumption in times of excess or strain on the grid. This would tie into the maximum energy draw from colocated miners, which will be put in place to ensure grid stability and viability.

The use of non-renewable energy for bitcoin miners should be restricted so to encourage the transition to primarily renewables. While this an important factor, the market dictates that miners will veer toward renewables irrespective of regulation, as ESG investors will finance those miners who stay clear of non-renewable sources.

Conclusion

Conclusion

The EU currently faces an energy crisis which requires increasing the rate at which the region shifts to renewable energy. In order to achieve the Energy Union's goals of decarbonising the energy grid in line with the Paris Agreement, and to reduce the EU's dependancy on energy imports from external countries, innovative solutions are required to make this process possible. The present proposal outlined the existing challenges with the viability of renewable energy, which focused predominantly on the issues arising from the intermittent nature of wind/solar generators. To dampen the concerns of grid stability and economic viability, the astounding demand-side flexibility of bitcoin mining was presented as a unique solution. Finally, the policy recommendation established the need for a roadmap, regulatory clarity and specific bitcoin mining guidelines to foster an environment that legally renders the European region bitcoin-friendly, and enables Europe to harness the positive externalities of bitcoin mining to provide aid in the urgent pursuit of decarbonisation and independence.

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