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**EU should ban energy-intensive mode of crypto mining, regulator says**

Esma vice-chair criticises method of minting bitcoin that is using more renewable energy

A top EU financial regulator has renewed calls for a bloc-wide “ban” on the main form of bitcoin mining and sounded the alarm over the rising proportion of renewable energy devoted to crypto mining.

Erik Thedéen, vice-chair of the European Securities and Markets Authority, told the Financial Times that bitcoin mining had become a “national issue” for his native country Sweden and warned that cryptocurrencies posed a risk to meeting climate change goals in the Paris agreement.

Thedéen said that European regulators should consider banning a mining method known as “proof of work” and instead nudge the industry towards the less energy-intensive “proof of stake” model to cut down on the sector’s vast power usage.

Bitcoin and ether, the two largest cryptocurrencies by volume, both rely on a proof of work model, requiring all participants on the blockchain digital ledger to verify transactions. Miners, who use sprawling data centres filled with fast computers to solve complex puzzles, are rewarded for recording transactions with newly minted coins.

That requires significantly more energy than the proof of stake model, where the number of parties signing off trades is much smaller.

“The solution is to ban proof of work,” said Thedéen, who is also director-general of Sweden’s Financial Supervisory Authority and chair of sustainable finance for international body Iosco. “Proof of stake has a significantly lower energy profile.”

Mining has become a highly lucrative and competitive business, with the amount of computing power dedicated to the process running at record levels, according to Blockchain.com. China banned the process in May but activity has scattered across the world and there are now several publicly traded companies focused on the practice, such as Canada’s Hut 8.

“We need to have a discussion about shifting the industry to a more efficient technology,” Thedéen said, adding that he was not advocating a wholesale ban on crypto.

“The financial industry and a lot of large institutions are now active in cryptocurrency markets and they have [environmental, social and governance] responsibilities,” he added.

His comments were made after Swedish authorities first floated the idea of banning the practice in November last year, noting the rising amount of renewable energy being devoted to cryptocurrencies while stating that “the social benefit of crypto assets is questionable”.

“[We call for] the EU to consider an EU-level ban on the energy-intensive mining method proof of work,” the Swedish financial regulator said in November.

Cryptocurrency mining has been attracting growing criticism for its impact on the environment. The practice accounts for 0.6 per cent of the world’s total energy consumption and burns more electricity annually than Norway, according to data from the Cambridge Bitcoin Electricity Consumption Index.

Faced with mounting criticism and the ban in China, miners have upped the share of renewable energy they use for powering their computers and pushed into countries with plenty of wind and solar power, such as Sweden and Norway.

“Bitcoin is now a national issue for Sweden because of the amount of renewable energy devoted to mining,” Thedéen said.

Without intervention, he warned, a significant amount of renewable energy would go towards creating units of bitcoin instead of moving traditional services away from coal-powered energy sources.

Swedish regulators, citing estimates from Cambridge university, also noted that mining a single unit of bitcoin consumes the same amount of energy as driving a medium-sized electric car 1.8m kilometres.

“It would be an irony if the wind power generated on Sweden’s long coastline would be devoted to bitcoin mining,” Thedéen said.

Ethereum, the second-largest digital asset, has said it will migrate to the proof of stake model in June.

The market for cryptocurrency functions with suppliers rewarded with cryptocurrency compensation after securely validating cryptocurrency transactions(block).

There is an economic incentive for miners as the ROI(efficiency of investment):

where

***Profit = Compensation(cryptocurrency rewarded after securely verifying a block)***

***Cost = Electricity price***

is greater than 100%.

With the widespread influence that cryptocurrency has in our society, cryptocurrency has proven itself to become a ‘national issue for Sweden’ due to the large amount of renewable energy devoted to cryptomining, which is the act of solving cryptographic puzzles with computing power of energy-hungry computers and verifies blocks.

Thedéen suggests migrating the current cryptocurrency model towards a proof-of-stake(PoS) model, where the network randomly selects supplier while biased towards supplier who invested more, by banning proof-of-work(PoW) model, where all supplier(miner) have one copy of all blocks(blockchain) and miners compete by solving cryptographic puzzles.

The article links to the key concepts of **scarcity** and **intervention**. Energy resources in Sweden are **scarce** and governing bodies try to **intervene** the market by distributing **scarce** energy resources to different sectors of the society in a socially optimal way.

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Fig.1 Market for cryptocurrency

From Fig.1, the market for cryptocurrency has a negative production externalities, which is the overallocation of resources to the production of good as *MSC*(Marginal social cost) is smaller than *MPC0*(Marginal private cost) and *Qopt*(Optimum quantity) is smaller than *Qm*(Market quantity), causing an overallocation of resource to the production of cryptocurrency, resulting in a market failure, which is the failure of the market to allocate resources efficiently or provide the optimum quantity of goods and services wanted by the society.

The popular cryptocurrencies Bitcoin(BTC) and Ethereum(ETH) uses a PoS model which uses an unnecessary amount of renewable energy due to too much cryptomining activity, as the energy could be used to move traditional services away from non-renewable energy sources towards **scarce** renewable energy sources.

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Fig.2 Solution to market failure (Thedéen)

To improve the situation, Thedéen proposes **intervening** in the market with an EU-level banning of PoW model for cryptocurrency and adopt the PoS model.

From Fig.2, there is a decrease in suppliers in the market as the PoS eliminates people with little investment and terminates mining activities, which is a determinant of supply.

After the banning of PoW model, supply decreases from *MPC0* to *MSC=MPC1*, *Qm* approaches *Qopt* and market failure is theoretically corrected.

However in a real-world situation, the solution proposed by Thedéen is questionable:

Firstly, the market for cryptocurrency is hard to **intervene** due to the nature of cryptocurrency being decentralized. Cryptocurrency transaction does not pass through any centralized server/bodies but through the copy of blockchain on all miner’s computers.

Secondly, the externality is difficult to quantify. The EU does not have enough data to determine where the *MSC* and *Qopt* is, which may result in overestimating or underestimating the magnitude of externality, leading to an incorrect decision being made.

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Fig.3 Real world situation (externality underestimated)

From Fig.3, if the magnitude of externality is underestimated, the ban may only decrease supply from *MPC* to *S1*, and the new quantity *Q1* is still greater than *Qopt* and the market failure is only partially corrected.

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Fig.4 Real world situation (externality overestimated)

From Fig.4, if the magnitude of externality is overestimated, the ban may decrease supply from *MPC* to *S2* and may cause the market for cryptocurrency to collapse. As Q2 is less than Qopt, it may break the PoS model as the network of blockchain might overload remaining supplier’s computer to continue the validation.

Thirdly, the PoS model is not flawless. The PoS model, when compared to the PoW model, does not check for difference in different blockchains as frequently because it does not require suppliers to compete in solving cryptographic puzzles but instead is randomly selected by the network.

According to Investopedia0F[[1]](#footnote-1), another unlikely but possible problem, 51% attack, may occur if the PoS model is used. If the majority(≥51%) of suppliers work together to alter the blockchain, the network would assume the majority’s blockchain is correct, thus following the altered copy of blockchain and ultimately break the network.

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Fig.5 Market after reduced compensation reward

A probable solution for keeping the PoW model is to reduce the compensation reward per block validation. As there are less economic incentive for miners, there would be a decrease in number of suppliers, which is a determinant of supply.

From Fig.5, supply would decrease from *MPC0* to *MPC1* and the new quantity would be equal to *Qopt*. Market failure is corrected.

Another solution is to set electricity price in an exponential scale. As cryptomining requires a lot of electricity, EU can **intervene** the market for electricity by increasing the price exponentially to deter miners who had previously taken advantage of the cheap electricity price from overmining cryptocurrency.

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Fig.6 Supply for electricity

From Fig.6, typical households would fall into the range of ΔQ0 where price for electricity increases in a small scale ΔP0. Miners, who uses ΔQ1 amount of electricity would have to pay more than double(ΔP0< ΔP1). The PoW model can continue to run while using less energy due to cryptomining being less profitable.

1. Frankenfield, Jake. “Proof-of-Stake (POS).” Investopedia, Investopedia, 7 Feb. 2022, https://www.investopedia.com/terms/p/proof-stake-pos.asp#toc-proof-of-stake-security. [↑](#footnote-ref-1)