

Ban of Proof-of-Work protocols: inappropriate answer to legitimate questions

Executive summary

Proof-of-work (POW) is the consensus algorithm that secures many blockchain networks such as Bitcoin, Ethereum, Litecoin, and others. Within the crypto-asset industry, this consensus algorithm is used to validate transactions and generate new blocks on the chain. The POW acts as an incentive mechanism for miners to participate in providing network security, and thus be rewarded for doing so. In POW networks, the objective is to create a hash corresponding to the new block in order to confirm transactions executed on the network.

In this paper, Adan explains why a ban or excessive restrictions on POW protocols in Europe would be inappropriate:

- A ban or inappropriate restrictions on POW will significantly affect Europe's competitiveness in the digital field while Europe already has a long distance to cover in the crypto-asset mining sector, and although it is a strategic industry. Abandoning to non-European entities the capability to secure computing power – therefore to validate the execution of all transactions in the future digital economic world – raises a major risk in terms of sovereignty: Europe will be entirely dependent on foreign players to sustain its digital economy. Among all consensus protocols, POW provides the highest level of security for citizens. This is of major interest if crypto-assets were to be used massively for payment purposes.
Aside from the mining industry, preventing European companies from deploying activities on POW protocols or on crypto-assets issued and tradeable on POW protocols will seriously disadvantage European companies compared to foreign actors, not only on this specific part of their activity but on their whole service offering. This will permanently imperil an entire ecosystem and companies that are creating jobs and opportunities in Europe.
- Nevertheless, crypto-asset players are aware that the ecological transition is a major challenge for our society, and are willing to increasingly take part in it. They have already engaged into several (individual or collective) initiatives to reduce their impact on climate and contribute to improve energy efficiency within the global economy.
- It is necessary to understand the real challenges and opportunities of these consensus systems in terms of sustainable development. If POW networks need a significant amount of energy to operate and to guarantee a level of resilience unmatched by other payment networks, that consumption does not reflect the network's environmental footprint. Therefore the increasing democratisation of crypto-assets will not exacerbate their environmental impact. Indeed, rather than becoming increasingly polluting – as one might think – POW networks will tend to become increasingly green. Proof-of-work networks are an underestimated way to capitalise on wasted energy in the EU.
- A strict ban on proof-of-work or inappropriate restrictions would be at best counter-productive, at worst impossible as POW networks are by nature decentralised. Indeed many physical persons are mining crypto-assets providing their computational power for decentralised pools. Moreover, if the idea is to restrict European companies when they provide activities on POW protocols or use crypto-assets available on POW protocols, excessive provisions will be burdensome and impossible to respect.
- Banning or limiting POW protocols by inappropriate rules should be seen as a violation of the principle of technological neutrality. Adopting such a non-holistic approach will create general legal uncertainty and miss its objective.

Therefore, Adan disapproves any ban on POW and encourages European institutions to have a measured and constructive approach on this topic to better understand the real value of POW in securing the assets of their owners and preserving Europe's digital autonomy. The Association shares some recommendations and is available to go deeper in this topic.

Context: the crypto industry and environmental matters

In recent months, various signals have raised concerns among the crypto industry regarding a ban or restrictions of POW consensus protocols, on sustainability grounds, which does not take into account the full complexity of the subject. In the recent parliamentary debates on the proposed Markets in Crypto-assets (MiCA) regulation, the banning of POW has been mentioned several times¹.

Such positions are increasingly concerning companies in the crypto-asset sector, for which POW networks offer a high value proposition in terms of efficiency, cyber resilience and even ecological transition.

The Association supports EU's international commitments on climate and sustainability objectives and strongly believes in the contribution of the crypto-asset industry in the ongoing transition towards sustainable growth. Crypto-asset players in general are aware that the ecological transition is a major challenge for our society, and are willing to take part in it. This has been already evidenced by the Crypto Climate Accord² initiative, supported by several environmental organisations which has set the goal of achieving zero net emissions in the global crypto industry by 2030. This has also been shown possible: in 2021, Northern Data - a German company - has mined about 26 000 ethers with almost exclusively renewable energy³. Consequently, by January 2025 (envisaged date of application⁴), it is likely that the crypto industry will already have improved its global environmental footprint and be heading towards more ambitious objectives.

Therefore in this document, **Adan explains why a ban or unsuitable restrictions of proof-of-work networks is not desirable and promotes the need to further consolidate Europe's role in the validation of transactions on proof-of-work networks while complying with environmental challenges and ecological concerns.**

¹ <https://www.btc-echo.de/news/bitcoin-spd-gruene-und-linke-fordern-verbot-in-der-eu-135678/>

² <https://cryptoclimate.org/>

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<https://ir.northerndata.de/news/corporate-news/northern-data-provides-operations-update-for-2021-and-confirms-guidance-for-fy2021/>

⁴ <https://u.today/eu-on-track-to-ban-bitcoin-report>

It is necessary to understand the real impact of proof-of-work in terms of sustainable development, which shall not be overestimated

The energy consumption of a POW network does not reflect its environmental footprint.

Various hints show that while the POW networks' energy needs will increase in the coming years – making them more and more resilient – the use of renewable and geographically unused (then wasted) energy will become the norm for validating transactions on POW networks. Currently, 60% to 80%⁵ of the profits made by Bitcoin miners are reinjected into energy costs. This high need for electricity leads miners to look for cheaper electricity. One sustainable solution is found in renewables in geographical areas where energy demand is so low that if the Bitcoin network were not involved, it would be wasted: miners are buyers of last resort. These costs create an incentive mechanism that obliges miners continuously using renewable energy to operate⁶ and leads to an improvement of the energy mix used in the crypto-mining industry.

The growing democratisation of crypto-assets - leading to an increase in the volume of transactions on proof-of-work networks - does not exacerbate their environmental footprint. Indeed, the idea that POW network energy consumption increases with the number of transactions is fundamentally incorrect. Indeed, the environmental footprint of a POW network is more complex to understand and is not correlated to the amount of users on the network and transaction executed. The energy requirement of a POW network may depend particularly on the degree of competition between miners to confirm and implement on the blockchain, which is also affected negatively by energy inflation.

POW protocols provide opportunities both in terms of energy efficiency and security in future digital services

Proof-of-work networks allow better energy efficiency. They help reduce energy waste. In many geographical areas (such as Iceland, Democratic Republic of the Congo, Norway and others), renewable energy production capacity significantly exceeds the energy demand of local populations. In these geographical areas, several companies have already been set up to buy and reuse, for mining purposes, gases (mainly methane) from oil production that have been burned to date and released into the air using the “flaring” method without being used for anything. Crypto-assets would thus contribute to the “zero flaring by 2030” objective set by the World Bank. As a consequence, many initiatives are already emerging to couple mining with other activities to act as a “recycler of wasted energy”. Kryptovault - a Norwegian company - uses the additional renewable energy produced in Norway, and reuses its computers' power to dry wood. Virunga, a region located in the Democratic Republic of the Congo with the world's second largest forest park, has installed hydroelectric power plants to generate green electricity and combat deforestation by local people who use the forest to create carbonated energy. These power stations are currently in overcapacity due to the lack of economic development in

⁵ https://www.europarl.europa.eu/doceo/document/E-9-2021-002852_EN.html

⁶ According to the Bitcoin Mining Council's [2021 Report](#), bitcoin mining has become 53.17% more efficient and 59.78% more sustainable in 2021.

the region and its recent launch. BigBlock Data Center - a French company - has installed a crypto farm sourced from the hydroelectric plants, enabling them to amortise part of their costs. Recently, they partnered with GweenGas to develop international offerings based on low-cost renewable electricity in the crypto-mining field. Finally, on February 17th, the Ukrainian parliament has voted a law that enables to relocate the unused energy produced by its nuclear power plants into crypto-assets to the mining industry, which appears to be a welcome additional financial support in the current situation of war the country is facing

Renewable energies, particularly wind and solar, have a significant potential in this respect, which could contribute to the greening of crypto-assets. Indeed, despite very competitive tariffs, these renewable energies are confronted with major and well-known problems, which are currently holding back their large-scale deployment. Insufficient demand, intermittent production and grid congestion are all difficulties, often compensated for by subsidies, that are difficult to overcome by setting up a viable economic model. A partnership with miners could prove beneficial in this respect. Crypto-asset validators could buy back and consume the energy produced but not sold, in order to meet a dual objective: to prevent this energy from being wasted and to make the construction of infrastructure associated with renewable energy development projects more profitable.

Conversely, heat produced through mining can also be reused. KryptoVault (as aforementioned) reuses its computers' power to dry wood. A partnership realized with a British Columbia heating and hot water provider will, from this year, recycle the heat produced by crypto mining to heat about 100 homes and businesses in the municipality of North Vancouver in Canada. WiseMining - a French company - is developing a boiler that recycles the heat emitted by mining equipment. These boilers called "Sato" will be compatible with existing and future graphics card models. In this way, the company wishes to participate in the advent of a new generation of decentralised miners.

Cyber resilience provided by POW protocols is unequaled compared with other payment networks, which is necessary for the future economy. POW networks are based on the power expenditure to operate, as it determines the tamper-proof nature of the chain and the new assets created. In this context, miners play a key role in the functioning and resilience of POW networks. Miners receive transactions from users and include them in blocks. They attach these new blocks directly to the blockchain network by solving a complex mathematical equation that requires the expenditure of electrical energy: this is why this method is called "proof-of-work". The way POW networks work is such that it is almost impossible to attack these networks, unless a person – natural or legal – would hold more than half of the crypto-assets available on the network, this is called the 51% attack. The energy need of POW networks is therefore justifiable, especially if in the future these assets will be used massively as daily micro-payments by European citizens. Moreover, the energy cost of attacking the network makes such practices unprofitable then discourages malicious initiatives. In this respect, this is highly valuable for the security of payment systems.

A ban or restrictions on proof-of-work would be at best counter-productive, at worst impossible

Proof-of-work networks are inherently decentralised, so a total ban is very difficult – if not impossible – to enforce. POW networks are decentralised architectures⁷ and are more complex to prohibit and suppress as they do not have sensitive central points that can be identified. To date, a significant portion of the validators on the Bitcoin network remain unknown⁸ and the vast majority of the computing power deployed is provided by natural persons who have adapted computers at their homes. Several mining pools even offer individuals the opportunity to invest in their company to buy computers and be rewarded in this way.

In practice, if mining was banned in the European Union, the only way to implement such a ban would be to find through extensive investigations every person – legal or natural – who has the capacity to participate in POW networks and repress them. Such a measure could require disproportionate and unrealistic actions (such as blacklisting people or confiscating their machines) and lead to an abusive surveillance system for European citizens. The impossibility of banning POW networks has already been understood across the Atlantic by assimilating the fact that banning Bitcoin and POW networks would be like banning the internet⁹.

Moreover, if the idea is to restrict European companies when they provide activities on POW protocols or use crypto-assets available on POW protocols, complying with strict criteria could be impossible to prove and monitor in real time. Detailed data on Bitcoin's energy consumption, energy mix, etc. are available, but they lack on all other networks. Moreover, companies will need to frequently check every change in the protocols of each crypto-asset on which they provide services, which will be disabling, burdensome and difficult to respect. European companies will thus be at a severe disadvantage.

Finally, banning crypto mining in Europe would not be efficient to reduce the global footprint of POW protocols as miners would simply move elsewhere. Ultimately, a European mining ban would only lead to a short and temporary drop in the global hashrate (the hashrate represents the overall level of computing power and *a fortiori* energy deployed to secure a POW network). Indeed, if the POW were banned or severely restricted, a proportion of miners would simply choose to move to other jurisdictions (or they would operate clandestinely in countries that do not have the capacity to enforce such controls¹⁰). As a comparison, while China's mining ban resulted in a decrease of global hashrate¹¹, in just a few months, the redistribution of computing power returned to its previous levels and even broke its historical records. A European ban would only lead to a small drop (Europe only accounts for

⁷ <https://medium.com/@VitalikButerin/the-meaning-of-decentralization-a0c92b76a274>

⁸ <https://www.blockchain.com/charts/pools>

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https://twitter.com/MWietersheim/status/1381184035469283331?ref_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Ctwterm%5E1381184035469283331%7Ctwq%5E%7Ctwcon%5Es1_%ref_url=https%3A%2F%2Fbitcoinmagazine.com%2Fculture%2Fwhy-governments-cant-ban-bitcoin

¹⁰ According to CNBC, despite the mining ban in China, some studies estimate that 20% of the world's hashrate has remained in China: <https://www.cnbc.com/2021/12/18/chinas-underground-bitcoin-miners-.html>

¹¹ <https://www.blockchain.com/charts/hash-rate>

about ~15% of the hashrate¹²) which would be filled very quickly by other more competitive countries. However this is not desirable for the European digital economy (cf. next section).

A proof-of-work ban could significantly affect Europe's competitiveness in the digital field

Europe already has a significant distance to cover in the crypto-asset mining sector. For example, while France represents only 0.2% of the world's hashrate, Germany – the European leader in mining – is hardly more successful with a participation of less than 5% of the world's hashrate¹³. Once again, the crypto-asset mining "market" is largely dominated by the US and the Asian region and Europe is trying to make a place for itself in this competition. Thus, rather than not restricting POW networks, they should be encouraged as these protocols are clearly strategic and geopolitically important.

A strict ban on POW would lead to the failure of many promising companies in the digital sector. Europe has made the digital sector a core objective for the coming years. Indeed, on 9 March 2021, the European Commission presented a vision and roadmap for Europe's digital transformation by 2030¹⁴. Europe's involvement in blockchain technologies – in which POW networks is a key instrument – is undoubtedly one of the *sine qua non* conditions for successfully achieving these goals. However, banning POW would lead to the closure, or departure, of startups specialising in the mining of crypto-assets. These startups contribute to the diversification of the European technology sector and also create synergies with the objectives set for sustainable development – in particular the fight against energy waste.

Aside from mining, preventing European companies from deploying activities on POW protocols or on crypto-assets issued and tradeable on POW protocols - due to disproportionate provisions - will create additional competitive disadvantages compared with foreign actors, not only on this specific part of their activity but on their whole service offering. This will prompt European users to shift to foreign actors which are likely to be either unregulated or much less regulated (then secure) than European crypto-asset service providers (CASPs). In the end, this will be detrimental to both European competitiveness and user protection.

Banning proof-of-work would certainly lead to a lack of harmonisation by the different EU Member States. The only solution to formally prohibit the use of POW would be to close down the European companies specialised in securing these networks, which would require costly interventions by repressive authorities in terms of human and financial resources. Such a situation would necessarily lead to a different level of prohibition from one Member State to another since some Member States would not have the necessary means to crack down on clandestine companies. This type of situation

¹² https://ccaf.io/cbeci/mining_map

¹³ https://ccaf.io/cbeci/mining_map

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https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en

can already be observed in Europe in other regulatory frameworks: protection of personal data, anti-money laundering and combating the financing of terrorism, etc.

Finally, we should consider that limiting the use of POW protocols through regulation is a breach of the technological neutrality principle which could have major impacts. This will set a precedent which is likely to create legal instability for all businesses as we could expect that other technologies be subject to similar bans in the future. In respect to this technological neutrality, challenging POW with a ban, based on environmental motivations, would imply adopting the same approach regarding other technologies (such as AI and 5G¹⁵ which are also energy intensive). However current reflections on POW protocols do not extend to a broader extent at this stage.

Adan's recommendations

For all these reasons, Adan recommends not to ban POW protocols in the European Union. On the contrary, Europe should not prevent the development of sustainable POW network companies (*a contrario*, the market will be taken over by foreign companies) in order to preserve and reinforce its sovereignty. We should rely on European actors which are the best to help implement the EU Sustainable finance strategy.

Therefore, in consideration of the growing adoption of crypto-assets in the next few years, the Association would like to share some material for consideration and recommendations:

- to create adapted incentive mechanisms to ensure the transition of European mining companies to decarbonised energy by 2030. Reaching such objectives (for example in terms of quality of energy mix or investment in renewables infrastructure development) could allow miners to get a distinguishing “green label” as a comparative advantage.
- to allow miners to use the surplus energy produced by the power plants and help them connecting with such producers of wasted energy
- to incentivize directing part of the mining yield towards financing renewable energy
- to encourage partnerships so that companies can reuse the heat produced by mining

Adan is available for any question on this paper and to go deeper into our recommendations.

¹⁵ According to a French High Council for the Climate report, the carbon impact of the deployment of 5G could amount to between 2.7 MtCO_{2e} and 6.7 MtCO_{2e} by 2030:
https://www.hautconseilclimat.fr/wp-content/uploads/2020/12/haut-conseil-pour-le-climat_rapport-5g.pdf

About Adan

Adan (Association for the Development of Crypto-Assets) is a non-profit bringing together and representing crypto-assets and blockchain professionals in France and Europe. Adan's members cover a wide range of activities: crypto-asset markets, custody, payments, investment management, blockchain analysis tools, support for crypto/blockchain projects, IT security, etc. Adan's mission is to promote the development of the crypto-assets industry in favour of a new digital economy. To this end, the Association has technical and regulatory expertise in the digital assets sector and maintains a close dialogue with public authorities and industry associations.

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