September 16, 2022

Skadden

The Distributed Ledger

Blockchain, Digital Assets and Smart Contracts

If you have any questions regarding the matters discussed in this memorandum, please contact the following attorneys or call your regular Skadden contact.

Stuart Levi
Partner / New York
212.735.2750
stuart.levi@skadden.com

Gabriella Manduca
Associate / New York
212.735.3202
gabriella.manduca@skadden.com

One Manhattan West
New York, NY 10001
212.735.3000

The Office of Science and Technology Policy Issues a Report on the Environmental Impact of Cryptoassets

On September 8, 2022, the Office of Science and Technology Policy (OSTP) issued its report on the impact of distributed ledger technology on climate change and U.S. environmental policy, as directed under President Biden's March 9, 2022 Executive Order on "Ensuring Responsible Development of Digital Assets." The OSTP report, titled "Climate and Energy Implications of Crypto-Assets in the United States" (Report), is the first of a series by different government agencies required by the Executive Order.[1]

In the Report, the OSTP recognizes the importance of cryptoassets to American financial innovation, as well as the significant climate and energy effects of distributed ledger technologies (DLTs) and cryptoasset use, with an emphasis on encouraging responsible development. The Report's publication coincides with Ethereum's transition from a proof of work to a proof of stake consensus mechanism — a move that will significantly upgrade the energy efficiency of the Ethereum blockchain's transaction validation method.

The OSTP's Mandate

The Biden Executive Order was designed to support responsible digital asset development in accordance with the U.S.'s policy objectives. It directed the OSTP (in conjunction with various other federal agencies) to analyze the effects of DLTs on the environment, their role in advancing climate change efforts globally, and the connections between DLTs and economic and energy transitions.

In furtherance of this mandate, the OSTP's Report examines concepts, which include the impacts DLTs have on the environment (including the energy impacts of cryptocurrencies' consensus mechanisms), potential alternatives and the relevant tradeoffs those may entail; the connections between DLTs and economic and energy transitions (including such technology's effect on grid management, energy reliability and energy efficiency initiatives); and the industry changes required to further mitigate climate change globally.

Cryptoassets and the Climate

According to the Report, cryptoassets use significant amounts of electricity with a notable carbon footprint, creating tension between U.S. efforts to reduce "climate-driven

[1] The OSTP's mission is "to maximize the benefits of science and technology to advance health, prosperity, security, environmental quality, and justice for all Americans." To that end, the OSTP coordinates interagency science and technology policy and provides scientific and technological analysis in respect of federal programs and policies. More information is available here.

damages" and the financial and other benefits cryptoassets promise. The OSTP cites the U.S.'s commitments to reduce greenhouse gas emissions by 50% to 52% below 2005 levels by 2030; to achieve a carbon pollution-free electricity grid by 2035; to reach net-zero emissions by 2050; and to prioritize environmental justice concerns in accomplishing these goals. However, "[d]epending on the energy intensity of the technology used, crypto-assets could hinder broader efforts to achieve net-zero carbon pollution consistent with U.S. climate commitments and goals."[2]

The Report states that cryptoasset technologies generally require substantial electricity for asset generation, ownership and transaction. The OSTP notes that energy demands in cryptoasset networks arise out of four major functions — data storage, computing, cooling and data communications — with computing using the considerable majority of electricity. In turn, the electricity consumption supporting these functions contributes to greenhouse gas emissions and pollution and causes other local impacts, including stressed power infrastructure, grid instability and energy price hikes for local consumers due to greater demand from cryptoasset miners.

The OSTP also notes in its report that the use of cryptoassets and DLTs continues to expand rapidly, bringing increases in mining and computing activity along with a corresponding increase in energy consumption. U.S. electricity usage for cryptoasset mining is estimated to have tripled since January 2021, and globally, estimates project the annualized electricity consumption for cryptoassets doubling or even quadrupling between 2018 and 2022.[3]

In the Report, the OSTP also compares cryptoassets' energy consumption to that incurred in connection with other, traditional financial transactions. The Report concludes that, although direct comparisons between cryptoasset transactions and Visa, MasterCard or American Express transactions are difficult to draw, those three institutions combined reported about 0.5 billion kWh of electricity usage in 2020, inclusive of all operations (including electronic payments), whereas Bitcoin was expected to use 68 billion kWh and Ethereum 8 billion kWh in the same year: "[I]n other words, these three entities consumed less than 1% of the electricity that Bitcoin and Ethereum used that same year, despite processing many times the number of on-chain transactions and supporting their broader corporate operations."[4]

Consensus Mechanisms and Varied Electricity Usage

As noted, the Report states that energy use in a cryptoasset network is largely concentrated in the computing function, but concedes that, within the computing space, energy usage varies depending on the consensus mechanism the cryptoasset uses to validate transactions, and has the benefit of creating high barriers to fraudulent transactions and achieving overall system reliability.

For example, the Report explains that under a proof of work (PoW) consensus mechanism, cryptoasset transactions are verified through mining. PoW requires participants in the network (miners) to race to perform and solve energy-intensive computations, with the "winner" allowed to propose a block of new transactions to the other participants for purposes of achieving consensus. The winning miner receives compensation in the form of newly minted cryptoassets. While this process ensures miners are willing to spend significant computational and energy resources to validate transactions, and makes it far more difficult for a malicious actor to have an inaccurate transaction validated, it means that miners use large and energy-intensive data centers to perform this work. According to the Report, as of August 2022, the Bitcoin and Ethereum PoW blockchains are estimated to account for most global cryptoasset electricity usage (60% to 77% for Bitcoin and 20% to 39% for Ethereum).[5]

In contrast to PoW, under a proof of stake (PoS) consensus mechanism, participants stake an amount of their cryptoassets for the chance to be chosen to validate new transactions, and similarly add them to the blockchain and receive a reward. The more cryptoassets a participant stakes, the greater the chance of becoming the selected validator. Because the initial stake investment can be relatively high, individuals may join staking pools to participate in the PoS network without contributing an entire stake.

PoS blockchains are associated with much lower energy consumption than their PoW counterparts because they do not require miners to compete to solve an energy-intensive complex math formula.[6] The OSTP notes that the global electricity usage for analyzed PoS cryptoassets is estimated to comprise less than 0.001% of global energy usage (compared to the 0.4% to 0.9% of annual global electricity usage for all blockchains supporting cryptoassets in 2022), and about 0.25% of the lower bound of total global PoW electricity usage.[7] The Report includes positive statements about the transition of the Ethereum blockchain from PoW to PoS.[8]

[2] Report, page 4.

[3] Report, page 4.

[4] Report, page 16.

[5] Report, page 14.

[6] The Report includes a table summarizing the most recent published electricity usage estimates of selected Proof of Work and Proof of Stake blockchains. *See* Report, page 31.

[7] Report, page 6.

[8] Report, p. 14. Additional consensus mechanisms beyond Proof of Work and Proof of Stake include Proof of Capacity and Practical Byzantine Fault Tolerance, both of which according to the Report are expected to have greater energy efficiency than Proof of Work (but do not have as widespread adoption). Beyond the relevant electricity burdens, factors including security, decentralization and scalability may weigh into a consensus mechanism's adoption or revision.

Suggestions and Alternatives

The Report suggests that, in order for the U.S. to achieve its climate policy objectives, cryptoasset policy during the continued energy and climate transition should focus on the following key factors: reducing greenhouse gas emissions and pollution, and avoiding operations that impact local communities by increasing the cost of electricity to consumers, reducing electric grid reliability or negatively impacting underserved communities that unequally bear climate damages. The Report recommends that federal agencies provide technical assistance and initiate a collaborative process with various stakeholders in and around the DLT and cryptoasset spaces "to develop effective, evidence-based performance standards for the responsible design, development, and use of environmentally responsible crypto-asset technologies."[9] The OSTP further recommended that these standards include very low energy intensities, low water use and noise generation and clean energy deployment.

In the event federal agency involvement proves ineffective at reducing the impacts of cryptoasset innovation on the U.S.'s climate and energy goals, the Report noted that "the Administration should explore executive actions, and Congress might consider legislation, to limit or eliminate the use of high energy intensity consensus mechanisms for crypto-asset mining,"[10] again bringing PoW applications (and in particular, the Bitcoin blockchain) into the heart of the discussion of cryptoasset energy reform.

Conclusion

The Report comes on the heels of discussions in other jurisdictions about the energy consumption of blockchain technologies, and particularly PoW. For example, there were news reports earlier this year that Swedish financial regulators and the European Commission discussed the possibility of banning Bitcoin's PoW mechanism outright due to its environmental impact.[11] No such bans are suggested in the Report, which instead focuses on the costs and benefits associated with DLT and cryptoasset development relative to the environmental burdens: "Responsible development of digital assets would encourage consensus mechanisms that minimize energy usage and environmental impacts while maximizing benefits to customers."[12]

[9] Report, page 7.

[10] Report, page 7.

[11] *See, e.g.*, Billy Bambrough, "'Target the Bitcoin Price'—Internal Documents Reveal How the EU Could Crack Down on Bitcoin and 'Protect' Ethereum," *Forbes.com*, April 24, 2022.

[12] Report, page 11.