Bitcoin Policy UK: Response to ESMA regarding the MiCA Consultation Paper 2nd Package

We appreciate the opportunity to contribute to this important consultation. Bitcoin Policy UK is a not-for-profit organisation incorporated in the United Kingdom, with the aim of providing expert advice and guidance on Bitcoin to policymakers and regulators both in the UK and elsewhere.

We are providing a selection of comments to specific questions as highlighted throughout our submission. We refer throughout to the "Technical Standards specifying certain requirements of Markets in Crypto Assets Regulation ("**MiCA**" or the "**Regulation**") - second consultation paper, dated 5 October 2023" (the "**Paper**").

Initial Abstract:

1. We note that the paper and MiCA generally reference and require disclosure of 'adverse' effects and impacts of 'consensus mechanisms used for the validation of transactions in crypto-assets [that] might have principal adverse impacts on the climate and other environment-related adverse impacts'.

2. The central thesis of our submission is that the Regulation should also make reference to and require the disclosure of the **POSITIVE** impacts of consensus mechanisms, and in particular the positive impact that Proof of Work (as opposed to Proof of Stake) can have in relation to methane mitigation, demand response, grid stability, or in making new renewable or sustainable energy projects economically viable from day one - even prior to such projects being connected to the grid. We strongly recommend that the Regulation incorporates requirements for the disclosure of such positive impacts of Proof of Work as in many cases they represent significant untapped potential for the Union to exploit in moving towards net zero and in some cases towards a carbon-negative grid. We will cite relevant examples for consideration throughout the submission.

3. We focus our responses primarily on section 3 of the Paper. In this context, we cite paragraph 3.2.1: "***ESMA understands that the primary objective of a consensus mechanism is to validate transactions in crypto-assets, and that the issuance of a crypto-asset can be the ultimate result of this operation of validation.***"

4. It is important to note that this description is not correct and represents a fundamental misunderstanding of the way in which the Bitcoin network functions. The miners subject to the consensus mechanism do not 'validate' transactions, and nor does the mining process. Transactions are broadcast by users to the network on a 'gossip' basis, and nodes on the network check each such transaction and verify its validity. Valid transactions become pending in a queue known as the 'mempool'. Miners then

determine the correct order of these transactions by hashing transaction data (producing a number) and competing to find a hash that is less than or equal to the Bitcoin network's then current target number. Each block includes a ‘nonce’, being a 32-bit (4-byte) field whose value is adjusted by miners so that the hash of the block will be less than or equal to the current target of the network.

5. Any change to the hashed data produces a completely different result. As it is not possible to predict the correct hash, an incrementing nonce value is tried, and the hash is recomputed for each value until the miner finds a hash less than or equal to the current target of the network. The target required is also known as the difficulty, where a higher difficulty represents a lower target. As this iterative calculation requires time and resources, the presentation of the block with the correct nonce value constitutes proof that the rules were followed. Once a block with a nonce value less than or equal to the target is found, this is again broadcast to the network, where nodes will accept valid blocks and the longest chain (representing the most proof of work) is accepted as having the correct order of transactions and represents the consensus source of truth as to how much value has been transferred. A miner that finds a valid block includes as the first transaction in the new block the ‘coinbase’ transaction, transferring to its wallet address the ‘block reward’, and in addition will receive the transaction fees for all the transactions contained within that block.

6. In absolutely no sense do miners ‘validate’ transactions. It is regrettable that the Regulation contains such a fundamental error in its drafting, and it is hoped that this will be corrected in future amendments. Nodes validate, and miners determine the sequence of transactions. It is in this way that the Bitcoin protocol solves the Byzantine Generals’ problem and allows consensus as to the correct order of transactions to be reached, in the absence of a central party controlling or administering the ledger. Furthermore, this mechanism is the only known means securely to operate a distributed transaction ledger in the absence of a third party and in such a way as to ensure that the ledger is not subject to the overt control or corruption by such third party.

7. In our response, when we refer to ‘mining’, such references should be construed as the process of specialised mining computers repeatedly incrementing towards the target hash using node-validated transactions as the hashed data, not the incorrect description of such that is currently contained in the Regulation. Furthermore, since the Bitcoin network is both decentralised and distributed, it is not possible as a simple matter of fact for any party either to control the behaviour of the network or to provide full disclosure data in respect of the network generally - any one party would only be in a position to provide information in relation to the limited number of machines on the network that they control.

8. In our responses below, we provide more detailed commentary and further references, but by way of example we include here several instances of the positive impact Bitcoin mining is able to have on sustainability, net zero, and humanity's global carbon footprint in general:

   (i) Mini Hydro plants being subsidised by Bitcoin mining in Kenya: https://fd.nl/tech-en-innovatie/1464228/bitcoins-delven-helpt-afrikaans-platteland-te-elektrificeren

   (ii) Bitcoin mining energizing sustainability through green innovation: https://thehill.com/opinion/energy-environment/4315048-bitcoin-mining-is-energizing-sustainability-through-green-innovation/

   (iii) Farms being able to reduce methane emissions using Bitcoin mining: https://www.independent.ie/farming/agri-business/how-this-former-beef-farmer-is-turning-his-grass-into-mining-for-bitcoin/a1236394378.html

   (iv) Nation-state mining being undertaken by Bhutan, in a sustainable way and being used to develop energy independence: https://www.independent.ie/farming/agri-business/how-this-former-beef-farmer-is-turning-his-grass-into-mining-for-bitcoin/a1236394378.html

   (v) KPMG producing a detailed report relating to Bitcoin's role in the ESG imperative: https://kpmg.com/us/en/articles/2023/bitcoin-role-esg-imperative.html

   (vi) Marathon Digital Holdings reducing methane emissions from landfill gas using Bitcoin mining: https://ir.mara.com/news-events/press-releases/detail/1330/marathon-digital-holdings-announces-energization-of-its

   (vii) Cornell University researchers recently investigating planned renewable energy projects across the U.S. and calculating each project's potential to profit from bitcoin mining during the pre-commercial development phase, when a wind or solar farm is generating electricity, but has not yet been integrated into the grid:"From Mining to Mitigation: How Bitcoin Can Support Renewable Energy Development and Climate Action" (https://pubs.acs.org/doi/10.1021/acssuschemeng.3c05445)

Q1: Do you agree with ESMA's assessment of the mandate for sustainability disclosures under MiCA?

9. Particularly in relation to new cryptocurrency projects, launched by an identifiable team and/or set of individuals, we agree with and support the principle that sustainability disclosures should be an integral part of the MiCA rulebook. However, we note that the Regulation and the paper only make reference to the 'adverse' impacts of cryptocurrency mining. This approach does not take into consideration the many and manifold **'positive impacts'** of Bitcoin mining, both on the reduction of greenhouse gas emissions and on the potential of this industry to support the build out of sustainable electricity grids[1], to give just two examples. Requiring a focus only on 'adverse' impacts will result in the loss both of a valuable data-gathering opportunity and likely also result in the Union missing out on the potential for the Bitcoin network to become carbon negative in the future[2]. We elaborate on these opportunities in our responses below, but our key recommendation here is that disclosure requirements apply both to adverse impacts and to positive impacts.

10. As we have said in previous papers, Bitcoin mining is a zero-emissions business, and Bitcoin miners themselves emit zero CO2. The issue that we as a society face is how we generate our electricity, and whether such generation is via sustainable means or not. As we will note below, Bitcoin mining is uniquely placed to support and foster the growth of a sustainable grid and we hope that the Union will not miss the opportunity to take advantage of this fact.

11. We refer to the several examples set out both in our Initial Abstract above and in the remainder of our responses as illustrations of the kinds of positive disclosures that could be requested and made during the reporting process.

[1] https://gridlesscompute.com/

[2] https://www.forbes.com/sites/digital-assets/2023/07/08/bitcoin-network-to-reduce-more-emissions-than-its-energy-sources-produce/

Q2: In your view, what features of the consensus mechanisms are relevant to assess their sustainability impacts, and what type of information can be obtained in relation to each DLT network node?

12. As noted above, in its practical application the Regulation should attempt to distinguish between a new cryptocurrency project, launched by an identifiable group of persons (natural or non-natural) and subject largely to the founder team's guidance and direction, and Bitcoin - the most well-established and the only truly decentralised and distributed cryptocurrency system. Most simply, Bitcoin should be viewed as a neutral internet money, absent a team and a founder, while all other cryptocurrencies should be viewed as venture capital technology companies, and regulated accordingly.

13. In the case of Bitcoin, it is functionally impossible to request information from or in relation to 'each DLT network node'. We are concerned that this terminology in the Regulation demonstrates a misunderstanding evident on the part of ESMA as to the way in which the Bitcoin network functions (please refer back to our description in our Initial Abstract above). As we set out, Bitcoin nodes are not miners (although miners will typically also run nodes) and while they maintain copies of the distributed ledger and validate transactions, nodes do not timestamp these transactions or determine their order via the mining process. It is estimated that there are currently circa 50,000 global nodes on the network, distributed across the world and across dozens of jurisdictions[3]. Many of these nodes are run by individuals at home and as a starting principle it should be understood that it is completely infeasible to attempt to gather any information (other than freely available transaction data) from these nodes or from the people who run them.

14. Miners, on the other hand, being in large part owned by corporations, can and do provide information to regulatory bodies all the time. Many are listed entities and already subject to market standard disclosure requirements as demanded by the rules of their respective listing authorities.

15. We would suggest that the following **features** be requested in relation to consensus mechanisms in order to assess their sustainability impacts. We shall elaborate on each, and give suggestions as to the type of **information** that may be obtained, below.

    1. **Methane Mitigation**: The extent to which a consensus mechanism is able to use or combust wasted or stranded methane gas either from landfill waste,

[3] https://bitnodes.io/nodes/all/

agriculture[4], or in conjunction with the oil and gas industry. The Union will be aware that methane is a potent greenhouse gas and there is a growing body of evidence to suggest that Bitcoin mining presents a unique opportunity to address and reduce the amount of methane that is released into the atmosphere. We refer to paragraph 7 of the evidence submitted to the United Kingdom Parliament below for additional summary details[5]. We also refer to the recent detailed paper from the World Bank "*Financing Solutions to Reduce Natural Gas Flaring and Methane Emissions*"[6] , which includes a very detailed case study on Crusoe Energy Systems, a Bitcoin mining and flexible compute company that is currently using Bitcoin mining to reduce greenhouse gas emissions in the form of methane, using modular generation units and mobile computing equipment. We highlight chapter 4 of the World Bank's report in particular, and would also cite the recent video case study on Crusoe that was released by the World Economic Forum, further demonstrating the positive impact Bitcoin mining can have on sustainability efforts[7]. We would suggest that Bitcoin mining firms be encouraged to disclose the extent to which their operations are currently mitigating methane emissions, together with estimates of the amount of GHG or CO2E that are mitigated as a result.

2. **Sustainable Grid build out:** Sustainability reporting should include the extent to which a consensus mechanism is able to provide a buyer of first and last resort for the energy generated immediately upon construction of a new sustainable energy plant (whether wind, solar or other), in advance of that plant being connected to the grid and prior to it becoming otherwise economically viable. At present, only Bitcoin (using the proof of work consensus mechanism) is capable of operating at sufficient scale in order to provide this benefit. ESMA will no doubt be aware of the long wait that new low-carbon projects face before being connected to the grid - in some instances in the UK, this wait can be as long as a decade or more[8]. We suggest that appropriate disclosures from mining firms would include the nature and extent of any relevant sustainable grid integrations, and include details as to whether wind, solar, hydro or other sources such as geothermal are involved. Additionally, useful data may be obtained in this way that could highlight where sustainable projects are lacking grid connection or infrastructure and are therefore turning to Bitcoin mining or flexible computing in order to become or remain economically viable.

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[4] https://www.scillingmining.com/
[5] https://committees.parliament.uk/writtenevidence/110956/pdf/
[6] https://openknowledge.worldbank.org/server/api/core/bitstreams/27e9b31f-c8bf-5fa4-aee3-3576d60e1a48/content
[7] https://www.weforum.org/videos/this-start-up-catches-waste-methane-to-power-data-centres/
[8] https://www.theguardian.com/business/2023/may/16/grid-connection-delays-low-carbon-projects-ofgem-energy

3. **Grid Stability**: The extent to which a consensus mechanism is able to provide a buyer of first and last resort in order to ensure that a sustainable grid is able to maintain consistent power output during times of both oversupply and undersupply. Bitcoin miners are able to do this by ensuring that sustainable grids are built with sufficient oversupply, yet remain economically viable - and miners are able to act as the perfect interruptible load to release power to the grid when it is required[9].

4. **Sustainable use of waste heat**: Bitcoin mining as a process generates significant heat, as do all data centers.It is a truism, however, that a large number of human activities require heat, and the mining industry is beginning to integrate with many such activities in order to provide a more cost-effective way of providing heat - since the costs of generating the required heat may be offset against the Bitcoin earned from the mining process. There are many such examples, several of which we set out here:

    a. Mining heat being used to dry timber: https://cointelegraph.com/news/sustainable-bitcoin-miner-uses-waste-heat-to-dry-wood
    b. Breweries and distilleries using mining heat: https://d-central.tech/breweries-and-distilleries-can-reduce-heating-costs-and-increase-profits-with-bitcoin-miners-heat/
    c. Domestic heating appliances coming to the market for use in the home: https://heatbit.com/ or https://hestiia.com/en
    d. A New York spa that is heating its pools with Bitcoin mining: https://www.datacenterdynamics.com/en/news/brooklyn-bathhouse-heats-water-with-bitcoin-mining/ .

16. If and to the extent that a Bitcoin mining operation is involved in a comparable activity, we would recommend that relevant disclosures also be made as part of the disclosure process. If nothing else, this will illustrate the ongoing synergy between the Bitcoin mining industry, the energy sector, the heating industry and the financial services industry. It is relatively unique for such synergies to form and such disclosures will doubtless provide great insights for ESMA into the ongoing and nascent innovation in the space. By way of additional example, certain Bitcoin miners are also diversifying their business into generative AI[10]. It is likely that in the near future Bitcoin mining, AI computation and other data centre functions may be co-located, using the same power source and the same geographical data centres. The Union should therefore consider

[9] https://k33.com/research/archive/articles/bitcoin-miners-can-strengthen-electricity-grids
[10] https://news.bitcoin.com/bitcoin-miner-iris-energy-dives-into-generative-ai-investing-10m-in-nvidia-gpus-amidst-soaring-demand/

whether it is either equitable or economically sensible to block or restrict some forms of computing but not others, let alone whether this is even practically feasible.

17. Again, we emphasise that at present only the location agnostic and interruptible proof of work consensus mechanisms can offer these positive sustainability benefits. Proof of stake as a consensus mechanism is entirely dissociated from the real and tangible world and is essentially useless for any such purposes.

18. More generally, in considering ***'what kind of information can be obtained from each network node***' it is essential for ESMA to note that Bitcoin is a decentralised, distributed and leaderless network. Some corporations, such as Ripple, have their own token (XRP in the case of Ripple) and they dedicate time and monetary resources to lobbying for and promoting their own tokens and consensus mechanisms. Bitcoin has no lobbying budget and no comparable commercial organisations devoting balance sheet resources to its promotion (Bitcoin Policy UK is by way of contrast a self-funded, not for profit organisation that is staffed entirely by volunteers). Given this consideration, ESMA should consider whether and how it might be at all possible to make disclosure demands of those operating in the Bitcoin space, given that there is no central authority or company to whom the disclosure request may be made or who would be capable of providing a response.

19. In summary, we acknowledge the benefits in a data-gathering exercise as proposed by the Regulation, but only if and to the extent that such an exercise is relevant to the way in which the consensus protocol actually functions and the extent to which a demand for information is reflective of the reality of the participants involved - that is, it must be both proportionate and made in recognition of the nature of the relevant protocol.

20. It is one thing to make disclosure requests relating to a blockchain like the XRP protocol, which has only 35 trusted validation nodes, of which a corporate entity (Ripple) both controls 6, and also determines which parties are able to become trusted validators. A new participant cannot become a validator without the initial network (including Ripple) trusting the new validator, effectively granting gatekeeper powers to the corporation[11]. In this case, it is entirely fair and proportionate that disclosures regarding XRP may be requested from, and given by, Ripple.

21. However, there is no Bitcoin team, no controlling entity, nor any natural or non-natural person with significant control in a position to give a similar reply in relation to the Bitcoin network. It is entirely without a single voice or point of control, and there are tens of

[11] https://www.coindesk.com/tech/2023/07/19/xrp-blockchain-still-faces-centralization-caveats-as-ripple-regulatory-threat-recedes/#:~:text=Centralization%20concerns,mine%E2%80%9D%20blocks%20and%20earn%20rewards.

thousands of Bitcoin nodes spread across the world and in many cases owned and operated by individuals.

22. It is therefore neither logical nor proportionate to expect a small VASP provider in one jurisdiction, perhaps one that provides simple wallet software, to give details regarding the entire global Bitcoin network. Doing so would be equivalent to asking a small software provider in Berlin to provide disclosures on the state and energy consumption of the entire internet. It cannot be equitable for the VASP provider in our example to be asked to provide details regarding the adverse or positive sustainability impacts of a network that operates in Norway drying woodchips, in El Salvador running on geothermal power, or in the Republic of Ireland running on farm biogas.

Q6: Do you agree with ESMA's description on the practical approach to assessing the sustainability impacts of consensus mechanisms? If not, what alternative approach would you consider suitable to assess these impacts?

23. We note that ESMA in paragraph 43 refers to "*the impact of use of equipment by DLT network nodes on natural resources*". We refer back to the description of the proof of work mining process in our Initial Abstract above and note that this terminology is once again erroneous. Nodes on the Bitcoin network consume almost no energy, being as they are in many cases small single board computers such as a Raspberry Pi, frequently running behind Tor and therefore unlocatable in any case. Additionally, as described earlier in our submission, the sustainability disclosures here once again appear to focus solely on the negative impacts of consensus mechanisms and not on the positives, a number of which we have suggested in our response to Q2 above.

24. We would highlight in particular the erroneous but often quoted 'energy cost per transaction' metric. This has been repeatedly debunked as a faulty indicator of energy use, not least by the University of Cambridge Judge Business School. We quote: "*Bitcoin's energy footprint is linked to block production, not transaction processing. This means that the number of transactions within a block has no impact on its energy expenditure: for a given difficulty level, a full block containing thousands of transactions has the same electricity footprint as an empty block with no transactions. The widespread misconception that Bitcoin's energy consumption rises with a growing number of transactions seems to have its origins in the popular energy cost per transaction metric. Often used to compare the 'energy efficiency' of different payment systems, it is a purely theoretical measure that has little practical relevance without additional context*."

25. Given the fact that such data is 'purely theoretical' and has 'little practical relevance', we would suggest that this erroneous metric is not used or requested as part of the disclosures. Instead, we might suggest some or all of the following sustainability requests to be made of DLT networks:

    (i) How and to what extent are miners using sustainable, renewable, or stranded energy?[12]
    (ii) Are the miners co-located with new renewable energy plants in order to act as providers of flexible load/demand response so as to balance the renewable energy grid?[13]

[12] https://www.winston.com/en/insights-news/abls-bitcoin-miners-and-monetizing-stranded-energy
[13] https://www.cnbc.com/2021/12/04/bitcoin-miners-say-theyre-fixing-texas-electric-grid-ted-cruz-agrees.html

(iii) How and to what extent are miners using and repurposing the waste heat generated by the mining process, whether in heating pools[14], growing crops in greenhouses[15], or heating homes[16]?
(iv) Are miners actively contributing to GHG reduction by mining using landfill methane or generated from anaerobic digestion on farms? (We refer to Crusoe and Scilling as cited in our response to Q2).

Q7: Do you agree with the definitions proposed in the draft RTS, in particular on incentive structure and on DLT GHG emissions? If not, what alternative wording would you consider appropriate?

26. Any consideration regarding the incentive structure for Bitcoin miners should first and foremost consider that miners are commercially incentivised above all else to find the cheapest and most plentiful source of electricity possible[17]. It is for this reason that they tend to co-locate near sources of surplus, wasted and stranded energy, for which there is no other buyer, and which without Bitcoin mining cannot be commercially exploited[18]. Additionally, as we have noted elsewhere in our responses, Bitcoin mining goes further and can incentivise further investment into solar and wind power generation[19]. The latest data shows that the global Bitcoin mining industry's sustainable electricity mix is 59.9%, making it one of the most sustainable industries globally[20]. We would therefore support the ESMA proposal that detailed information regarding energy mix be requested, albeit from individual miners rather than in respect of the entire network, and then only those miners operating in a jurisdiction where the Regulation is applicable.

27. Given the increasingly important and well-documented trend for Bitcoin mining to reduce GHG emissions, whether mitigating flaring on oil fields[21], reducing methane emissions from landfills[22], or cutting farm biogas emissions[23], we would also recommend that the ESMA disclosure indicators also provide an opportunity for miners or networks **to disclose the extent to which they or their operations are actively involved in reducing methane gas emissions**. ESMA will be aware that methane has more than 80 times the warming power of carbon dioxide over the first 20 years after it reaches the

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[14] https://kotaku.com/bathhouse-nyc-spa-bitcoin-asics-1850958168
[15] https://d-central.tech/bitcoin-miners-the-surprising-solution-to-greenhouse-heating-costs/
[16] https://hestiia.com/en
[17] https://www.woodmac.com/news/opinion/how-bitcoin-mining-can-support-the-energy-transition/
[18] https://www.linkedin.com/pulse/new-renewable-energy-minigrid-bitcoin-mining-co-location-brian-n-?trk=public_post
[19] https://www.independent.co.uk/tech/bitcoin-mining-solar-wind-renewable-energy-b2454666.html
[20] https://bitcoinminingcouncil.com/bitcoin-mining-council-survey-confirms-year-on-year-improvements-in-sustainable-power-and-technological-efficiency-in-h1-2023/
[21] https://k33.com/research/archive/articles/bitcoin-mining-using-stranded-natural-gas-is-the-most-cost-effective-way-to
[22] https://www.forbes.com/sites/digital-assets/2023/07/08/bitcoin-network-to-reduce-more-emissions-than-its-energy-sources-produce/
[23] https://irishtechnews.ie/the-bitcoin-farmer-bitcoin-mine-biogas-powered/

atmosphere and that cutting methane emissions represents the most efficient means available to us of immediately slowing the rate of global warming, as we decarbonize our economy[24]. At present, and particularly since the shift of the Ethereum network to a proof of stake consensus mechanism, the Bitcoin mining industry is the only real-world example of an electricity buyer capable of reducing methane emissions at scale and in such a flexible way. ESMA and the Union should therefore gather data on this capability with a view to promoting and supporting the Bitcoin mining industry as a potent tool in the Union's wider efforts to meet net zero targets.

Q8: In your view, are the proposed mandatory sustainability indicators conducive to investor awareness? If not, what additional or alternative indicators would you consider relevant?

28. We refer to our responses in relation to Q7. It is key that investors understand the sustainability mix of the BItcoin mining network, and the potential it has to monetize both pre-existing and early stage renewable and sustainable energy generation projects, and additionally to understand its great potential as an industry capable of greatly reducing harmful GHG emissions in the form of methane.

Q9: Do you consider the proposed optional sustainability indicators fit for purpose? If not, what additional indicators would you consider relevant? Would you agree to making these optional sustainability indicators mandatory in the medium run?

29. We refer to our responses in relation to Q7 and Q8 above and earlier in our submission. Table 2 does not currently include provision for industry participants to include details on the positive impacts that the Bitcoin mining industry has on the environment and on sustainability in general. Given the many and manifest examples provided in our submission, we recommend that these be included as additional indicators in future.

Q10: Do you consider the principles for the presentation of the information, and the template for sustainability disclosures fit for purpose? If not, what improvements would you suggest?

30. We refer to our responses to Q7, Q8 and Q9. ESMA must include provision for industry participants to provide disclosures on the positive impact the Bitcoin mining industry does and will have on sustainability targets, GHG emission reduction, and net zero goals in general.

[24] https://www.edf.org/climate/methane-crucial-opportunity-climate-fight

Q29: Is there any other information, specific to crypto-assets, that should be included in the tables of Annex II of the draft RTS? Please provide reasons for your answers.

31. We refer to our responses to Q7, Q8, Q9 and Q10. Positive impacts on sustainability must be included as well as any negatives.

Q30: Do you expect any challenges for trading platforms in crypto assets to obtain the data fields required for publication to comply with pre- and post-trade transparency requirements under Annex I and Annex II of the draft RTS?

32. We agree with the observation that block confirmation time is an irrelevant consideration when determining the time period for relevant disclosures. However, this also masks an important point - if digital assets are 'transferred' between two parties on an exchange, for example Coinbase, there is typically no actual transfer taking place at this time - at least not in a way that would be recognised by the digital asset protocol. A 'coin' for the purposes of the Bitcoin network is defined as a chain of digital signatures. If one Coinbase customer purportedly transfers Bitcoin to another, all that has happened in reality is that Coinbase has adjusted its internal ledger to show a change in the respective balances of these individuals. Crucially, no digital signature has happened, and no Bitcoin has been 'moved' from one unspent transaction output to another. This highlights another important point when considering these issues - ESMA should also note that requirements to disclose 'transactions' and 'transfers', especially in the context of sustainability metrics, should as a matter of good practice automatically exclude any and all exchange transfers and include only those that are made on the base layer of the Bitcoin blockchain, and then only when a custodial wallet is being used. In the case of a non-custodial wallet, there is no relevant person on whom the disclosure obligation would fall. In short, 'transfers' of Bitcoin on Coinbase are in fact no such thing; all that occurs in this context is an exchange of paper claims on Bitcoin that takes place in the Coinbase customer ledger and not on the base layer.

33. Given this fact, any and all transactions purportedly 'transferring' Bitcoin from one party to another, which are made on a single centralised platform like Coinbase, must be excluded from any overall assessment of the energy consumption of the network - noting at the same time the fallacious nature of the 'energy cost per transaction' metric that we discussed above. None of these 'transfers' are in fact anything of the sort, and if we are to concede that there is even the slightest connection between the energy used in mining and transactions made on the network (a position that is highly contentious at best[25], and at worst completely false) then we must also concede that on-platform transfers use little to no energy and must be excluded. The same is true for transfers

[25] https://www.lynalden.com/bitcoin-energy/

made using second layer protocols such as Liquid and Lightning, where no transaction is recorded on the base chain until, in the case of Lightning, a channel is closed.