《論説》

BBCC: A Climate Solution

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Part 1: White Paper

Abstract

BBCC is short for “Bitcoin Based Carbon Credits.

I first wanted to call it “BCC” but that might be a bit confusing. There is a different project called “Bitcoin Cash”[1] started a couple of years ago and some people might think BCC stands for that.

In contrast to the “Bitcoin Cash” project, I am not proposing a fork or altcoin here. All I propose is to use Bitcoin as it exists right now.

There are several reasons for that. One is that time is short. It is important to solve the climate crisis in time.[2]

Another reason is that it is very difficult to change Bitcoin. It helps increase the chance of success if changing Bitcoin is not necessary for the idea to work.

I will show three ways that Bitcoin may be useful for removing CO2 from the atmosphere. See, trust, and trade. All of these involve mapping credits for carbon removal to individual satoshis（the smallest unit in Bitcoin, with 100 million satoshis in one bitcoin）.

I will call the carbon credits in this system BBCC in short. There will be no schedule of issuing them, the same as there is no system of setting the price of bitcoin, but that is left to the market.

1） Bitcoincash.org.

2） Gore, What the Fossil Fuel Industry Doesn’t Want You to Know, TED Talk, Youtube, July 2023, www.youtube.com/watch?v=xgZC6da4mco.

Naturally there will be few BBCC mined in the beginning and more in later stages of the project. That is the opposite of the Bitcoin schedule, which started with mining of 50 bitcoins every 10 minutes and that number going down by half about every 4 years.

And there will be no cap on issuing BBCCs. We need all the carbon removal we can possibly get.

The value of BBCC on the market will come from the fact that they all come with time stamps. I expect the market to value earlier BBCC higher than later ones. That in turn will be an incentive to mine them early on. If this turns out to be correct, people may be interested in investing early in BBCC.

And even if it does not turn out to be true that the price will be higher for BBCC mined early, the fact that there will be a price on a world-wide secure market will be huge progress over the current state of affairs. Also, recent European Union Law[3] makes it illegal to make any statements about rising prices in a white paper, which is another reason to refrain from doing so here.

The first way Bitcoin may help is making it possible to see the score. Keep an exact and immutable record on how much CO2 has been removed, and when.

The second is improving trust in claims of what has been removed.

The third is making it possible to trade in carbon removal claims more easily.

Part 1 is written with the goal of staying within 3552 words.[4]

Improving the ways climate credits can be trusted and traded using Bitcoin is especially interesting now in Japan since Japan recently started an “Article 6 Implementation Partnership” project, which wants to improve the conditions for international trading of carbon credits under the Paris Agreement.[5] Possibly having Bitcoin based carbon credits would be one

3） Article 6 Paragraph 4 and 5 of Regulation 2023/1114 of the European Parliament and the Council of May 31, 2023.

4） The Bitcoin white paper has that number of words, Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System, October 2008, bitcoin.org/bitcoin.pdf.

way to improve trust and trade in carbon credits, including in situations covered by Article 6.

1. Incentives

Bitcoin has seen success in its first decade of existence. One reason for that is the incentive structure it is designed with.

Miners are paid in new bitcoins. And all participants in Bitcoin have a common interest in keeping Bitcoin decentralized, immutable, and resistant to inflation.

The global warming problem also depends on getting the incentives right to get it solved. Especially as far as removing carbon from the atmosphere is concerned, the question of how to pay for that is important. If there is a good answer to that question, it may be left to normal market forces to build up the necessary industry and start cleaning up the CO2 emissions.

This paper explores how Bitcoin could help.

2. See

We start with A1.

That is the same as the beginning of the Genesis address of Bitcoin, which also started with A1 as the first two digits.[6)]

Which is a lucky coincidence, since for the purpose of this explanation "A" will be Airbus, as the sponsor of a recent large-scale carbon removal deal.[7)] And "1" will be 1pointfive, the other party to the deal, which prom-

5） Ministry of the Environment Japan（MOEJ）,「Concept Paper of the Article 6 Implementation Partnership」November 2022, a6partnership.org/wp-content/uploads/2022/11/Concept-Paper-of-Article-6-Implementation-Partnership.pdf; Institute for Global Environmental Strategies（IGES）, Establishment of the Paris Agreement Article 6 Implementation Center, Press release of 28 April 2023, www.iges.or.jp/en/news/20230427.

6） I also note that "1A1" is a good way to write "HAL" in code into the start of the genesis block if you are afraid to overtly sign your creation with your real name（Hal Finney）.

7） 1pointfive, 1PointFive announces agreement with Airbus for the purchase of

ised to remove and safely store 400,000 tons of carbon.

1pointfive is owned by an American fossil fuel company, Oxy[8] . It makes sense that a fossil fuel company should be in the lead when starting the large important job of removing CO2 from the atmosphere, and building the industry needed for that job.

Another deal that would fit is ANA, the largest Japanese Airline, agreeing with1Pointfive to buy 10.000 tons of CO2 removals a year from 2025 on for three years（with no price per ton disclosed）.[9]

I just found a Bitcoin address starting with A1. With only 2 digits needed, that was done instantly.

Here is the address I found. I do not care about the private key for it. And it would not be a good idea to report on private keys in public anyway.

1A1Mt9RLWJFdoxuGyiEkfmRVWz5NpniN5K

I tried that once more.

This time I again found an answer immediately. And the answer was different. It was this address:

1A1rJkfx（I removed some parts of the address here）.

And again, I will not report on the private key for that here. That is because I am going to put some money there.

Since the Airbus 1pointfive transaction was about 400,000 tons of CO2, I could put 400,000 satoshis on that address, one for each ton of carbon removed.

At a price of around $30,000 per bitcoin right now, that would work out to around $120 for those 4 millibitcoins.

I note that I am neither Airbus nor 1pointfive. And if I remember correctly, I am not Satoshi Nakamoto either.

400,000 tonnes of carbon removal credits, 2022 March 17 press release, www.1pointfive.com/1pointfive-announces-agreement-with-airbus.

8） See Oxy, 2022 Climate Report, www.oxy.com/siteassets/documents/publications/oxy-climate-report-2022.pdf, 31.

9） ANA, ANA Announces Carbon Dioxide Purchase from 1PointFive, August 1, 2023 press release, www.anahd.co.jp/group/en/pr/pdf/20230801.pdf.

But nothing would stop me from doing a transaction like that. Part of the attraction of Bitcoin is that it resists censorship. Actually, I just did one such transaction, sending 4 millibitcoins to that address.

And the parties of the Airbus 1pointfive contract could do the same thing. They could use any address of the format 1A1 for that. And then proceed to publish that transaction with the associated address. The same is true for the contract between ANA and 1pointfive.

It is an interesting and fortunate coincidence that both Airbus and ANA are well represented by “A”.

They could publish the address used like the press releases I cited earlier. Or maybe just publish the address and transaction over what was formerly called Twitter（now X）. Or just on their respective homepages. Or all of the above.

Since I am talking about the “See” part only now, I recall now what that would do.

For example, the transaction I did for the 4 millibitcoins to my address automatically comes with a timestamp. It was included in block number 800150 at 2023-07-25, 12:16:09 GMT plus 9.

That means that there will be a world-wide immutable ledger showing that the transaction was done not later than that time. The Bitcoin network, among other things, keeps records of when a transaction was done. And short of attacking the blockchain building a different one（not something easily done）, there is no way to change that timestamp later.

By using some block explorer or other, anyone can verify that time, instantly, with no cost.

With carbon removal, there are important issues like quantification, additionality, long-term storage, and sustainability. These are at the center of the 2022 EU Commission proposal for a voluntary framework to reliably certify high-quality carbon removals.[10] Together they are expressed in the

10） EU Commission, Proposal for a regulation on an EU certification for carbon removals, 20 November 2022, COM（2022）672 final, climate.ec.europa.eu/document/fad4a049-ff98-476f-b626-b46c6afdded3_en.

acronym QUALITY.

But there is one other very important factor. That is when the removal is done.

Humanity has been reckless. Pumping oil out of the ground and CO2 into the atmosphere, while removing close to nothing. While eventually humanity may get around to cleaning up the mess, doing so earlier is more valuable than removing CO2 later. Every ton that is removed in 2023 will not be heating up the planet for the next decisive couple of decades.

Also, the removal industry is nascent. Growing fast, but still much too small. Any removal financed now by Airbus will also contribute to developing the sector. Such contributions are most important at early stages. China jumped on the solar power industry bandwagon early on. That lowered costs massively, paving the way for solar becoming the cheapest option for electricity already before 2020.

So spending around $120 to keep a marker of the timing for this historic step Airbus and 1pointfive did looks like a good idea to me.

Along with the automatic timestamp, that record also is immutable. If you say you removed 400,000 tons in 2022, it may be open to doubt if that actually happened. But if there is some way to trust that claim, it is impossible to change the claim later. Once it is public on the blockchain, it becomes immutable.

By default, the record on the blockchain is a global register. There is no need to wait for politicians to come up with national registers and developing that to an international register later on.

Again, time is important for dealing with the climate crisis. So having a system already in place and the only thing missing is people actually using it is an important advantage.

I hear that IBM is developing a blockchain-based climate reporting system together with Mitsubishi Heavy Industries in Japan.[11] It is called

11）See the press release（in Japanese）:「三菱重工と日本 IBM、CO_2 流通を可視化するデジタルプラットフォーム「CO_2NNEX™」構築へ、取引サイクルを活性化しカーボンニュートラルの早期実現に貢献」、2021 年 5 月 6 日発表、www.mhi.com/jp/news/210506.html.

“CO2NNEX”（trademark）. If that is developed and catches on, it may help with the issue of accurately making removal efforts visible.

But it has to be developed first. Then it needs to attract users. And then it will not be global by default.

On all these points, just using Bitcoin for the purpose is a superior solution to whatever they plan with that CO2NNEX system.

Here is another potential use case. Medals.

For example, I hear that El Salvador is actively using Bitcoin in various ways. The government could be a sponsor of carbon removal. Maybe using some of the volcano energy left after much of it is used for mining bitcoins. It would be interesting to see a CO2 removal facility right next to a Bitcoin mining rig.

While I am at it, issuing BBCCs requires removing CO2 first. I want to call that first part of the process mining. Removing CO2 from the atmosphere is the opposite of digging it out in the form of oil or coal in the first place.

Again, it would be interesting to see a facility mining CO2 right next to a Bitcoin mining operation powered by a volcano. Then go ahead and record the tons of CO2 removed by that facility, numbering in the order they were done. A low number in that system would have a higher value than a higher number.

Let’s say you own a record for ton number 7 removed by the volcano project. And also assume a way in which you can transfer that record to any person.

In that case, you could assign that record as a substitute for a medal or other such honor. There could be competitions and the winner maybe could get assigned such a record. I will discuss in more detail if and how that kind of thing is possible in a later section below.

One other thing one could imagine would be competition between nation states. Have national teams do something more useful than kicking some ball into some goal or other. Have them remove carbon from the atmosphere and decide on who wins by using this kind of system. It is after all, only a way of reporting and keeping scores.

Another advantage of using Bitcoin is how reliable it is.

The history of the Bitcoin system is still only a bit longer than a decade. But in that decade, there were zero times where you could not access the records. And zero times where you could not write new records. It has been very stable.

The reason for that is the redundancy that comes from having no single point of failure. The design wants to have no central entity responsible for administrating it, sharing the effort between many participants. That makes it resilient. There is no central entity some state or other could shut down, as the United States shut down e-gold. But at the same time, there is no central entity that could go down. With the number of sites participating in the network, there is very strong resilience against outages.

The fight against global warming is a serious issue. Countless lives and possibly the survival of humanity depend on the system working. For that kind of use case, robust and resilient are essential qualities. This is not the place for using untested or easily attackable altcoins.

It is true that if you do not need a blockchain system, using proof of work will cost you more in energy than a simple database. If you could achieve the same thing as proof of work with less energy consumption, that would be progress.

But the extra cost for using Bitcoin in this case is justified by the robustness and resilience necessary for this essential purpose.

One more advantage of Bitcoin is that nobody can stop anyone from using it. There are lots of people who think that global warming is not a real problem or do not understand how serious the issue is. Others think they have a financial interest in keeping the fossil fuel business model alive.

There may be an incentive to disrupt any solution for the climate problem.

But again, there is nothing anyone can do about using Bitcoin for this purpose. There is no way to censor the use of Bitcoin. That is one of the big advantages over the traditional services where governments were able to censor their use.

If you use a vanity address to map individual satoshis to some carbon removal project as in the Airbus and ANA examples above, it may be of interest to find a vanity address with a low number. Any address of the format “A1” starts out low. Of the two addresses I mentioned above, the first one starts with “1A1Mt9RL” and the second one with “1A1rJkfx”. M comes before r in the alphabet, so the first one would be the lower number.

One could imagine searching for a vanity address of this format with a low number, like one starting with “1A111111”. That would be both easy to remember and have a low number. One could imagine using this kind of low number for early mining of BBCCs, for the symbolic value of having a low number.

If it turns out that the market values early removals higher than later ones, doing this would make sense.

And it would add an element of competition. ANA could try to have a lower “1A1” address than Airbus.

3. Trust

One problem with the legacy financial system is all the trust that is required to make it work.[12] When there is a central institution like a bank, you need to trust that bank. And the bank maybe will abuse that trust.

With Bitcoin, the point is to have no need to trust anyone. The peer-to-peer architecture is necessary to make it work without trusted parties.

But nothing stops anyone from having trusted parties when using Bitcoin as a climate solution.

And trust is essential for carbon removal. A recent article at the Guardian pointed out that many of the carbon removal credits issued until now were not trustworthy.[13] That is bad news if you are selling those credits.

12） Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System, October 2008, bitcoin.org/bitcoin.pdf.

13） Greenfield, Revealed: more than 90% of rainforest carbon offsets by biggest certifier are worthless, analysis shows, Guardian, 18 January 2023, www.theguardian.com/environment/2023/jan/18/revealed-forest-carbon-offsets-

Their worth depends on the market being able to trust the removal claims.

Here is how Bitcoin can help with that.

For example in the Airbus 1pointfive case, some third party could do an endorsement of the claim by 1pointfive of having removed 400,000 tons. They could apply whatever criteria they have for validating such a claim, like those discussed at the EU level right now.[14)]

The way to validate would be to simply send one satoshi to the address that 1pointfive has published, and then publish that fact one way or other.

The address used for sending this would be another vanity address that makes it easy for anyone to verify the origin of the payment. This kind of endorsement would work like a link on the web, which boosts the Google pagerank of the page linked to at no financial cost to the person doing the link.

Or as a follow or like on Twitter or Youtube or a similar service. Lots of followers and likes means lots of attention. In a similar way, lots of endorsements would mean high rates of credibility for the claim of having removed carbon made by 1pointfive.

In the same way as a link from a page with high pagerank boosts more, an endorsement coming from a source with high trust would boost trust more.

But it should be possible too for anyone to endorse at the cost of one satoshi（plus transaction fees）, just as anyone can follow an account or leave a “like” on a post to boost it.

It may require some attention to develop interfaces for handling the resulting collective trust in an adequate manner. That may very well happen under the hood without the users of the system having to check each endorsement and adding up scores. Just like Google handles pagerank under the hood and the user only gets to see the resulting rankings in search results. Or Twitter adds up their scores automatically and the user only gets

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biggest-provider-worthless-verra-aoe.

14） EU Commission, Proposal for a regulation on an EU certification for carbon removals, 20 November 2022, COM（2022）672 final, climate.ec.europa.eu/document/fad4a049-ff98-476f-b626-b46c6afdded3_en.

to see the resulting ranking in accounts and posts worthy of more attention.

The question is not only to avoid criticism of energy use and being framed as part of the problem, as in the Greenpeace US campaign wanting to change the Bitcoin code.[15] The real question is how Bitcoin can become part of the solution instead.

Twitter also uses energy. That is a net positive for the climate if and as far as the use of Twitter helps with the solution of the problem more than the extra tons of CO2 emitted because of Twitter existing. If you have some influence on the direction of Twitter and are interested in the climate crisis, it would be a good question to ask: What can Twitter do to help with the solution.

With the original Bitcoin design, whatever happens on second layers like Lightning is based on a solid fundament. It is impossible to double-spend. It is impossible to later change the date of any transaction.

These properties of the basic Bitcoin layer come in handy when we are interested in building a robust accounting system for carbon credits. Whatever we come up with on the second layer dealing with that particular use case can rely on the very robust fundamental properties of Bitcoin.

4. Trade

It would also be possible to trade BBCCs.

Once Airbus has bought those 400,000 tons, they could transfer those claims to some other party. They would stop being sunk costs for Airbus and become an asset.

The same is true for ANA. In their case, they have customers who buy airline tickets. Such a costumer may be interested in buying some of the carbon credits for the purpose of offsetting whatever CO2 emissions are caused by their flight.

15） Kruse, Change The Code – Not The Climate, March 29, 2022, www.greenpeace.org/usa/news/change-the-code-not-the-climate-greenpeace-usa-ewg-others-launch-campaign-to-push-bitcoin-to-reduce-climate-pollution/.

ANA is not generating any income from paying 1pointfive to remove CO2. But they do generate income from selling tickets. And if they can sell the carbon credits they buy wholesale from 1pointfive to their passengers, they might actually be able to charge more than they paid, making financing carbon removal profitable for them.

Of course, for the very least, there would be the value of the bitcoins used in the system.

But the idea would be to have a secondary market. It would be left to normal market forces to figure out how many dollars per ton would be the value of these Bitcoin based carbon credits at that particular time on that secondary market.

And maybe it would be a good use of taxpayer resources to buy some Bitcoin based carbon credits.

The United States recently announced plans to buy carbon removal credits for 35 million dollars.[16] Other states should follow that lead. There should be competition in which state contributes the most in the earliest stages. Carbon Removal Olympics. Would be more important than contests in sports.

And robust score-keeping would be essential in such a competition.

The next day after the above announcement the United States published plans of subsidies for two direct air capture projects of up to 1.2 billion dollars.[17] One of the two projects selected is by 1pointfive and will be selling their carbon credits to Airbus and ANA, as mentioned before.

Doing that would certainly be a better use of public funds than paying subsidies for fossil fuels. There are still a surprising amount of those left.[18]

16）Amador, August 10, 2023 Tweet, twitter.com/GianaAmador/status/1689753477847678977.

17）Department of Energy, Biden-Harris Administration Announces Up To 1.2 Billion For Nation`s First Direct Air Capture Demonstrations in Texas and Louisiana, August 11, 2023, www.energy.gov/articles/biden-harris-administration-announces-12-billion-nations-first-direct-air-capture.

18）Hans-Josef Fell, Deutschland gibt jährlich 70 Milliarden Euro an

Paying for cleaning up the mess is exactly what one should expect as a use of taxpayer funds, as long as the producers of fossil fuels are shirking their responsibility for removing the CO2 they put into the atmosphere.

Alternatively, the EU could change the existing Emission Trading System to accept carbon removal claims into it（something not possible in the existing system）.

This section has the main purpose of developing some ideas on how to use Bitcoin as a method of accounting for carbon removal and increasing trust in the system. I will discuss the relation to carbon removal claims in the existing ETS in a later section of this paper.

When using Bitcoin in this way, the satoshis that represent the carbon removed would not be fungible to other satoshis which do not. They would be worth more in the market. The difference would be whatever the market thinks is the value of one ton of carbon removal at the time it was registered in the blockchain（remember, the system comes with an automatic time stamp）.

The price Airbus and 1pointfive have agreed upon was not disclosed, but it may have been something like 600 dollars per ton. Assuming that for the sake of this explanation, that would be 600 dollars per satoshi, which is obviously much more than their value as fungible bitcoin. At the time I am writing this, one bitcoin is valued at about $29,000, which results in the value of one satoshi being only a small fraction of a cent.

If you are Airbus and paying 600 dollars for that satoshi, obviously almost all of the price would be for the carbon credit. And if people are able to trade those carbon credits claims, maybe some other party might pay 700 dollars for it. Maybe it will take a decade for the price to reach those 700 dollars.

If so, Airbus could actually make a profit by selling at a higher price than buying the carbon credits in the first place.

Steuergeldern aus, um fossile statt erneuerbare Energien zu fördern, 4. August 2023, hans-josef-fell.de/2023/08/04/70-milliarden-euro-an-steuergeldern-fuer-fossile-energien/.

And it would be possible for the market to find a fair price for a trustworthy claim of removing one ton of CO in 2022.

One thing that Bitcoin does better than the existing EU ETS is enable a world-wide market.

As of 2023, a world-wide market for carbon credits does not exist. There are many markets in many countries, but they are not necessarily linked. Some countries like the United States do not even have an emission market in the first place（except for the California regional market）and therefore obviously lack links to other markets.

The carboncredits.com site lists 9 different carbon credit markets, with 9 different prices as of September 2023. The EU ETS price is the highest of these, at over 84 Euros now. The voluntary market “Aviation Industry Offset” in contrast trades at only about 80 cents US right now.

One ton of carbon removed is worth the same for the climate. So if the market would work, there should not be a difference in price of over 100 times.

One of the strong points of using Bitcoin as an accounting method is that it works on the whole planet in the same way. No need to wait for politicians in hundreds of jurisdictions to enact legislation. And then to link those different national legislation in one big planetary market.

The problem with global warming is not only getting new emissions to zero fast and to negative from there on. It is also getting there fast enough.[19)]

Speed is important. So, while using Bitcoin may be a long shot it is something worth at least thinking about.

5. Ordinals

The above way of doing things would be to use a bitcoin address as the base of distinguishing between normal satoshis and those that are also representing carbon credits.

The problem with that is that if you transfer satoshis away from the ad-

19）Gore, supra note 2.

dress in question, it becomes more difficult to keep that quality attached to them in a way that is easily verified by anyone without much effort.

So this may be an interesting use case for the relatively new idea of ordinals.[20)]

That idea is: assign identifiers for each satoshi ever created. Give them ordinal numbers defined by the number of the block they were mined in and the place they occupy in the coinbase reward of that block.

It is easy to understand that no amount of changing ownership or addresses will change that number.

Also, with numerals it is possible to associate “inscriptions” with individual satoshis. One such inscription may be “1 ton of CO2 removed by 1pointfive”. It may be possible to do this on chain, making the whole thing work like a NFT（non fungible token）issued on and backed in security by the Bitcoin blockchain.

That is a good thing. If you pay 600 dollars for one ton of carbon credits, you want to have the record of that immutable and simple to verify. You also want it resisting hacking strongly.

I am not sure yet if this would work well. But I think it may be a possible idea. Of course the ordinals idea is relatively new and software in the field is experimental. Making it work well for this purpose may require some effort.

I will just note the potential and leave the details for later. Even if this particular idea does not work out, the basic idea is still just using Bitcoin as a mechanism to keep score and to enable trading of removal credits. The numerals way of doing it may be a possible improvement, but it comes at a cost of developing new software and teaching it. Bitcoin is well established and known by now.

Part 2 Phase Out Profit

This is not the first time I try to solve climate change.

20） See ordinals.com, Rodarmor, Draft-BIP, Ordinal Numbers, February 2 2022, lists.linuxfoundation.org/pipermail/bitcoin-dev/2022-February/019975.html.

I have developed an idea called Phase Out Profit over 10 years earlier before.[21] It goes like this.

One problem with solving climate change is that many in the fossil fuel industry are trying hard to stop solutions.[22] They lie. They buy politicians（many of those are for sale to the highest bidder）.

The reason is that the fossil fuel industry wants to make money. There is nothing wrong with that motive. It works in most cases. Market forces require such motivation.

And if you think fossil fuel is the cause for global warming（true）and you will be out of business if people start to act, then becoming defensive is the natural thing to do.

We end up with some powerful interests opposing meaningful restrictions of fossil fuel use. As far as they get their way, the climate suffers.

But it could be the other way round.

The fossil fuel companies could be leading the call for phasing out fossil fuel.

And my previous idea was exactly that.

I will take a couple of lines to explain this.

The first thing I note is that less fossil fuel supply means higher prices.

I will not explain much what that means for profits. It does not need much explanation that of course profits will be higher with higher prices. From two different reasons.

One is that profit depends on selling prices being higher than production costs. So obviously with higher selling prices you get higher profits.

The other is that the valuations of fossil fuel reserves that fossil fuel companies own also go up with price. That will mean higher valuations for those reserves, which increases profits before even the first barrel of oil is actually sold. Yes, I do think an extra $ 520 trillion in profits might be of interest for the fossil fuel industry.[23]

21） Lenz, Bitcoin as a Metaphor for Fossil Fuel, 2013, medium.com/@kf02/bitcoin-as-a-metaphor-for-fossil-fuel-af27ce289486.

22） Gore, supra note 2.

So, is there any way to reduce fossil fuel supply?

Examples of trying this include OPEC and the Texas Railroad Commission. Both are systems to reduce supply below what the market would do without intervention.

And global warming is potentially solved if all producers of oil agreed to reduce their supply in a coordinated way compatible with what is necessary to achieve the Paris Agreement goals. For example, if they all decided on a schedule to reduce production like the Bitcoin schedule for issuing new coins（halving about all four years）, supply would be reduced fast. That in turn would mean higher prices.

And since fossil fuel companies make more money with higher prices, they should be the first in line asking for regulation to force their production down. Doing this kind of thing without involvement of government may possibly be illegal under antitrust law.[24)]

Just as we should ask what Bitcoin can do to contribute to solving the problem, fossil fuel companies should ask the same question for themselves. Reducing production is the first thing they should think about as an answer to that question. The fact that they would make more money by reducing production would be a powerful incentive to do the right thing.

It is way past time to have a reliable, world-wide schedule for reducing fossil fuel production. But the industry has not shown any meaningful ability to set that up.

Time is running out. Going with a coordinated phase out of fossil fuels would maybe have been enough a decade or two ago. But now, any solution needs to be fast, above all else.

So how can using Bitcoin help?

Step one would be to have reliable records for removals. See.

Step two would be for every fossil fuel company to disclose how much CO2 emissions they caused by their products and what percentage of that

23） Lenz, supra note 21.

24） Lenz, European Green Deal and Climate Exemption in EU Antitrust Law, Aoyama Law Journal, Vol. 19, 2020, 5−31, doi.org/10.34321/21390.

they remove now.

Step three would be to increase that percentage.

And in step three 100 percent would not be the final, but only an intermediate goal. Just as the EU has a goal to go carbon negative after 2050,[25] each fossil fuel company should have a goal of more than 100 percent of removals.

If some company reaches a goal of 200 percent, every ton of CO2 caused by its fossil fuel production removes 2 tons from the atmosphere. In that case, climate advocates would and should cheer them for producing more.

The interesting thing about using Bitcoin is that it does not require coordination. Every company could set their own goals.

That in turn means you would have an automatic exemption from antitrust rules.

That could be a powerful motive for the industry to start mining BBCCs and increasing the percentage of removals.

It is true that consumers of gasoline would end up paying more. Some people might object. The question would be if you want to get serious about reducing global warming while at the same time increasing profits for fossil fuel producers. I have no idea if it could actually work. But business as usual has not shown much success at reducing emissions.

In my view, the interest in solving the climate crisis is much more important than having low gasoline prices for consumers who still insist on using a gasoline car, so antitrust rules should not be allowed to interfere with solving global warming. But it is much better if the whole question is mute, because there is no coordination involved in the first place.

Bitcoin itself is an interesting example. The production of new bitcoins is reduced in a very predictable way. About every 4 years, the coinbase reward is cut in half. That means less new bitcoins and higher prices and values for individual bitcoins.

25） European Climate Law, Article 2 Paragraph 1, Regulation 2021/1119 of the European Parliament and of the Council of 30 June 2021.

I am not aware of any other industry that has this kind supply schedule. In all other commodity markets, supply is a function of price. If for example the price of gold goes up, producers have an incentive to mine more.

In contrast, nobody can produce more bitcoins when the price goes up. That is a big reason why bitcoins are scarcer than anything else used as money.

But as far as I know, nobody ever complained that Bitcoin miners are in violation of antitrust rules for restricting supply in that way. That is because there are no individual miners who coordinated any move to restrict supply. The whole thing was always in the schedule since the beginning of Bitcoin.

Part 3 Existing carbon trading systems

The rest of this paper will briefly describe and discuss existing systems, like the EU ETS.

Judging by the results, these are still not enough to solve the problem.

2022, quite some time after the Paris Agreement, saw a new record in carbon emissions, with 36.8 billion tons.[26] In contrast, “almost 0.01 million tons” was the amount of CO2 removed per year in 2022.[27] 36.8 billion tons are more than removals by a factor of 3.68 million, even if removals were at 0.01 million instead of “almost” that amount.

I will not spend much time or words on this part. The main purpose of this part is to learn about these existing solutions and to contrast their weaknesses with the advantages Bitcoin would bring to the table, explaining those in more detail in the process.

1. EU ETS

The EU ETS is the largest regulated market for carbon credits.

And the starting point for the European Climate Law[28] is to require net

26） IEA, CO2 emissions in 2022, www.iea.org/reports/co2-emissions-in-2022.

27） IEA, Direct Air Capture 2022, April 2022, www.iea.org/reports/direct-air-capture-2022.

28） Regulation 2021/1119 of the European Parliament and of the Council of 30

zero emissions by 2050 with negative emissions thereafter by balancing emissions and removals in Article 2.

That obviously requires some method of scorekeeping for removals.

Possibly Bitcoin could assist with such scorekeeping.

Article 4 of the European Climate Law puts a ceiling on including removals toward the 2030 goal of 55 % reductions compared to 1990. As is apparent from recital 27 of the European Climate Law, that ceiling is derived from the existing commitments under Article 4 of Regulation 2018/841. These add up to 225 million tons of CO2 equivalent in 2030, so that is the ceiling for the intermediate goal.

Regulation 2018/841 is about carbon sinks by land use. Article 4 requires that for the land accounting categories like forest and croplands that are scope of the Regulation the land use leads to at least carbon neutral results, but the existing commitments under that Regulation sum up to minus 225 million tons of CO2 equivalents in 2030, which is why that number was chosen as a ceiling.

The idea is to have reduction of emissions be the priority goal and removals only play a secondary role. It does make sense to stop emitting CO2 in the first place instead of removing it later requiring extra effort and cost.

2. Carbon Credits Based on Removal Under the EU ETS

Could Airbus or ANA be paid for the tons removed under their contract with 1pointfive in the EU ETS system?

The answer is no at the moment. The Commission proposal of November 2022[29] comes with a FAQ document.[30] In that document the Commission notes that carbon removal claims can not be used for demonstrating

June 2021.

29） EU Commission, Proposal for a regulation on an EU certification for carbon removals, 20 November 2022, COM（2022）672 final, climate.ec.europa.eu/document/fad4a049-ff98-476f-b626-b46c6afdded3_en.

30） EU Commission, Questions and Answers on EU Certification for Carbon Removals, ec.europa.eu/commission/presscorner/detail/en/qanda_22_7159.

compliance with the ETS（see answer to question 4 at the end）.

The legislation process is not finished at the time of this writing, but for now there is no clear link to the EU ETS. And there is no answer on whether Bitcoin based carbon credits could be used in the EU ETS. I think the answer should be yes. But it is impossible right now to predict how that legislation proposal will end up after Parliament and the Council are done with it.

3. Carbon Credits Under Article 6 of the Paris Agreement

Another possible link to existing systems is Article 6 of the Paris Agreement.

That Article makes it possible to internationally transfer mitigation outcomes on a voluntary basis requiring authorization by participating Parties. It is still far from clear how authorization will work and if it will be possible to have carbon credits from CO2 removals like those paid for by Airbus and ANA be counted in such cooperation efforts.

Article 6 Paragraph 2 of the Agreement requires that all cooperation applies robust accounting to avoid double counting. I recall that double counting is exactly the problem that Bitcoin solved by using proof of work. If you are interested in avoiding double counting the same ton of removal for multiple Parties, basing the carbon credits on Bitcoin might be of interest.

Just as in the case of the EU ETS, there still needs to be a lot to be worked out until Article 6 of the Paris Agreement can serve as a solid source of funds for removing carbon at the necessary scale.[31)]

In contrast, the BBCC idea is ready to go. There is no need to wait for regulation or the next international conference. ANA could put the BBCCs under their contract with 1pointfive on the blockchain tomorrow. And start selling them to passengers once the carbon is actually removed in 2025.

31） Lo Re, Ellis, Greiner, The birth of an ITMO, Authorisation Under Article 6 of the Paris Agreement, 2022, IEA OECD Climate Change Expert Group Papers, Paper No. 2022（3）, 1-46, doi.org/10.1787/3d175652-en.

I for one would be happy to buy. Living in Japan as an expat, the ability to fly to Germany is important. And being able to offset the carbon cost of such flights in a reliable way would be attractive for passengers.