USPTO filing US-20220180374-A1.

This was filed on Feb. 25th, 2019 with a priority claim to Dec. 26th, 2017. I believe this application extends US20200027096A1 and can potentially cover the tokenization of carbon, or any other physical asset, as a digital twin/asset (RWA) on blockchain.

In this filing, I mentioned

"to generate credits, penalties, contracts, or tradeable commodities (such as carbon credits) that are forwarded a cloud server 30A, 30B for secure storage including addition to a block of a blockchain in an embodiment. Then a 3.sup.rd party system may request sensor data or processed data (that represent credits, penalties, contracts, or tradeable commodities".

"various credits, contracts, or commodities, including carbon credits for a participating system"

"A record or block in a blockchain may potentially be the same ledger as the original records, or a separate blockchain that is only utilized for referencing a credit, contract, or commodity including a carbon credit.
[0114] In an embodiment, this distinction may be desired because the ledger collecting data may preferentially store the resulting credit, contract, or commodity. In another embodiment, the credit, contract, or commodity may be stored in an additional ledger. In an embodiment, a credit may form the basis of a smart contract can be used to effectively sell or trade the credit by a 3.sup.rd party system 20A, 20B. The use of blockchain ledger to maintain smart contracts in architecture 10 may enable or form a highly secure environment or architecture 10 for managing noted incentives, penalties, costs, credits, and debits across markets"

[0146] The cryptocurrency model described herein may potentially allow entities that produce renewable energy or energy efficiencies to be issued corresponding cryptocurrency units instead of carbon certificates/allowances/offsets/etc. on a carbon or other desired market, or issued carbon or other desired instruments that can be converted into cryptocurrency. In another embodiment, the carbon or other desired markets may adopt a more fluid environment much like the cryptocurrency markets have enabled. By linking carbon or other desired merit and cryptocurrency, the concept allows digital currency to be ensured by carbon or other desired merit offsets.
[0147] Such an embodiment employs a digital currency that has no limited-availability

commodity associated with it. For instance, most first-world currencies are "backed" by gold, hence the "gold standard". Such currencies have some physical assurance that it has determined value. Although such standard may have not been fully maintained, the concept still applies. However, digital currency is not backed by a limited resource. Accordingly employing a digital currency to be endorsed, or "backed" by carbon allowances/certificates/credits/etc may not be limited as traditional currencies. A digital currency is associated with carbon reduction, may potentially accelerate the reduction of fossil fuels, for example, creating perhaps a "carbon standard".

[0148] In another embodiment each cryptocurrency unit that is generated through "data mining" or computer processing may be done so with the understanding that a certain percentage of it's worth may be applied towards reducing carbon emissions or some undesired activity, or increasing a desirable activity in some capacity. Such an embodiment could serve to promote renewable energy production or energy efficiency efforts. The simplification of carbon allowances/certificates/offsets/etc. would be benefitted if they were normalized on both the renewable energy production side as well as the energy efficiency consumption side for example. If normalized, both the production and consumption side could be represented as a single commodity, or carbon instrument for example.

[0149] In addition to the above embodiments, carbon or other desired merit instruments may be then be converted into a unit of cryptocurrency and stored in a blockchain or other secure, immutable implementation of any of the variations mentioned in this disclosure. The same blockchain or other secure, immutable implementation may also support "data mining" for cryptocurrency creation similar how to "Bitcoin" works. By supporting creation of cryptocurrency units in a single cryptocurrency market via energy efficiencies and/or renewable or "greener" energy production as well as data mining, this market may allow individuals as well as companies such as utilities to participate in a cryptocurrency market that is designed to promote carbon efficiencies and/or renewable or more environmentally safe energy sources, for example.

[0150] Some of the proceeds from the sale and/or trade of this type of cryptocurrency could be used to build and maintain renewable energy production facilities like solar and wind farms, or be used to implement energy efficiency programs on buildings in say, for instance, economically challenged geographic areas. This could in turn facilitate additional carbon offset/certificate/allowance production that could be used to generate additional cryptocurrency units for years to come.

[0151] In another embodiment, a cryptocurrency market may support at any time the cryptocurrency units being converted back into carbon

offsets/certificates/allowances/etc. or other desired merit for use by an entity in achieving carbon reduction goals or to hold as a carbon-based instrument that can later be reconverted back into a cryptocurrency unit, for example. These cryptocurrency units could be referred to as carbon coins, carbon currency, or some similar suitable name that references the association with carbon reduction programs or other desired merit related to other desired activities as described above.

I also stated the following aspects of a token:

“A blockchain facilitates secure online transactions. A blockchain is a decentralized and distributed digital ledger that is used to record transactions across many computers so that the record cannot be altered retroactively without the alteration of all subsequent blocks and the collusion of the network. This allows the participants to verify and audit transactions inexpensively. They are authenticated by mass collaboration powered by collective self-interests. The result is a robust workflow where participants' uncertainty regarding data security is marginal. The use of a blockchain removes the characteristic of infinite reproducibility from a digital asset. It confirms that each unit of value was transferred only once, solving the long-standing problem of double spending. Blockchains have been described as a value-exchange protocol. This blockchain-based exchange of value can be completed more quickly, more safely and more cheaply than with traditional systems. A blockchain can assign title rights because it provides a record that compels offer and acceptance.

A blockchain database consists of two kinds of records: transactions and blocks. Blocks hold batches of valid transactions that are hashed and encoded into a Merkle tree. Each block includes the hash of the prior block in the blockchain, linking the two. Variants of this format were used previously, for example in Git. The format is not by itself sufficient to qualify as a blockchain. The linked blocks form a chain. This iterative process confirms the integrity of the previous block, all the way back to the original genesis block. Some blockchains create a new block as frequently as every five seconds. As blockchains age they are said to grow in height.

Sometimes separate blocks can be produced concurrently, creating a temporary fork. In addition to a secure hash based history, any blockchain has a specified algorithm for scoring different versions of the history so that one with a higher value can be selected over others. Blocks not selected for inclusion in the chain are called orphan blocks. Peers supporting the database have different versions of the history from time to time. They only keep the highest scoring version of the database known to them. Whenever a peer receives a higher scoring version (usually the old version with a single new block added) they extend or overwrite their own database and retransmit the improvement to their peers. There is

never an absolute guarantee that any particular entry will remain in the best version of the history forever. Because blockchains are typically built to add the score of new blocks onto old blocks and because there are incentives to work only on extending with new blocks rather than overwriting old blocks, the probability of an entry becoming superseded goes down exponentially as more blocks are built on top of it, eventually becoming very low. For example, in a blockchain using the proof-of-work system, the chain with the most cumulative proof-of-work is always considered the valid one by the network. There are a number of methods that can be used to demonstrate a sufficient level of computation. Within a blockchain the computation is carried out redundantly rather than in the traditional segregated and parallel manner.

By storing data across its network, the blockchain eliminates the risks that come with data being held centrally. The decentralized blockchain may use ad-hoc message passing and distributed networking. Its network lacks centralized points of vulnerability that computer crackers can exploit; likewise, it has no central point of failure. Blockchain security methods include the use of public-key cryptography**. A public key (a long, random-looking string of numbers) is an address on the blockchain. Value tokens sent across the network are recorded as belonging to that address. A private key is like a password that gives its owner access to their digital assets or otherwise interact with the various capabilities that blockchains now support. Data stored on the blockchain is generally considered incorruptible.**

Every node or miner in a decentralized system has a copy of the blockchain. Data quality is maintained by massive database replication and computational trust. No centralized "official" copy exists and no user is "trusted" more than any other. Transactions are broadcast to the network using software. Messages are delivered on a best effort basis. Mining nodes validate transactions, add them to the block they are building, and then broadcast the completed block to other nodes. Blockchains use various time-stamping schemes, such as proof-of-work, to serialize changes. Alternate consensus methods include proof-of-stake and proof-of-burn. Growth of a decentralized blockchain is accompanied by the risk of node centralization because computer resources required to operate bigger data become more expensive.

The blockchain mechanism could be used for registering users of the IoT implementation, as well as registering all the equipment necessary to implement the carbon credit generation and monitoring software platform, potentially in a Cloud-computer based environment. One could foresee the blockchain implementation within a single Cloud-computing environment, or spanning across two or more Cloud-computing environments. If the blockchain implementation was spread across multiple Clouds, this would increase

security as well as availability and stability of the entire system. All transactions could be recorded by the blockchain so that the entire IoT implementation benefits from the blockchain's benefits."

I believe this should cover any physical asset tokenized into a digital twin/asset (RWA) on blockchain.