reToken: Tokenized Clean Energy

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Abstract

A renewable electricity stablecoin will accelerate the adoption of both crypto assets and clean energy. Bitcoin currently consumes 0.6% of the world's electricity, and the assumption that this electricity is produced by fossil fuels is slowing the adoption of crypto assets. Crypto's inherent decentralization makes regulations impossible to enforce as mining follows the cheapest cost of production. We propose a solution to enable clean electricity procurement on the blockchain through reToken, an ERC-20 token backed 1:1 by renewable energy credits. Through reToken, it is our mission to decouple the crypto economy from fossil fuels and accelerate the adoption of both crypto assets and clean energy.

1. The Product

reHoldings LLC will act as the issuer and custodian of reToken tokens, and reToken tokens contain the following components:

1) Renewable energy credits ("RECs"), the commodity backing the coin.
2) The auditor of reHoldings, ensuring 1:1 reToken backing with Green-e® RECs
3) The underlying token technology, ERC-20
4) An automated liquidity mechanism
5) The Net Asset Value ("NAV")

Renewable Energy Credits

A renewable energy credit, or REC, is a commodity that represents 1 megawatt-hour (MWh) of clean electricity in North America, or enough electricity to power approximately 800 homes for one hour. As of June 2021, the bitcoin network consumes 66 million MWhs per year, or 3.5 MWhs annually per bitcoin in circulation[i]. RECs are often traded separately, or "unbundled" from the electricity produced from clean energy power plants. RECs are used for both voluntary and compliance purposes by both individuals and corporations to procure clean electricity outside of utility contracts.

Legally, RECs carry all marketing and environmental benefits associated with renewable electricity.[ii] Companies and individuals therefore must purchase and hold RECs to make any claims surrounding renewable energy consumption in the United States.

The Auditor

reHoldings will provide proof of 1:1 REC backing through monthly audits from CohnResnick, a leading auditing firm in the renewable energy industry and an expert in REC markets. CohnResnick will report on reHoldings' REC assets every month and have unfettered access to reHoldings' books and records, ensuring financial transparency.

ERC-20 Technical Standard

reToken is an ERC-20 token, the Ethereum-based standard for crypto assets. reToken will therefore be instantly compatible with existing ERC-20 wallets and decentralized apps in the rapidly growing Ethereum ecosystem. The reToken token will initially trade on Uniswap, the ERC-20 compatible decentralized exchange.

The reToken Net Asset Value

reToken will publish a daily net asset value ("NAV") indicating the underlying USD value of the reToken. This NAV will be equal to the marginal cost of procuring RECs. RECs carry a vintage indicating the year they were produced, and liquidity reduces as RECs age. To manage this risk in the reToken collateral pool, reHoldings will employ a first-in-first-out ("FIFO") method when burning coins and minting coins will include the cost, if any, of rolling a REC from an older vintage to the current vintage. As reTokens

trade at a premium to NAV, reHoldings will issue reTokens and procure additional RECs, expanding the token's marketplace. Should reTokens fall below NAV, reToken will sell RECs and repurchase reTokens, ensuring price stability at the NAV.

2. Benefits

The Crypto Democratization meets Clean Energy

The current REC market suffers from a lack of liquidity and access that handicaps adoption. RECs are currently traded through brokers, often over the phone and via email, reducing price transparency in the market. It is difficult for retail investors to purchase RECs at the wholesale level, often needing to procure specific "green plans" from retail providers at a significant markup[iii]. Clean energy assets soared in 2020 and 2021 as investors embraced the growing likelihood of supportive carbon mitigation policies, such as a national 100% clean electricity mandate by 2035.

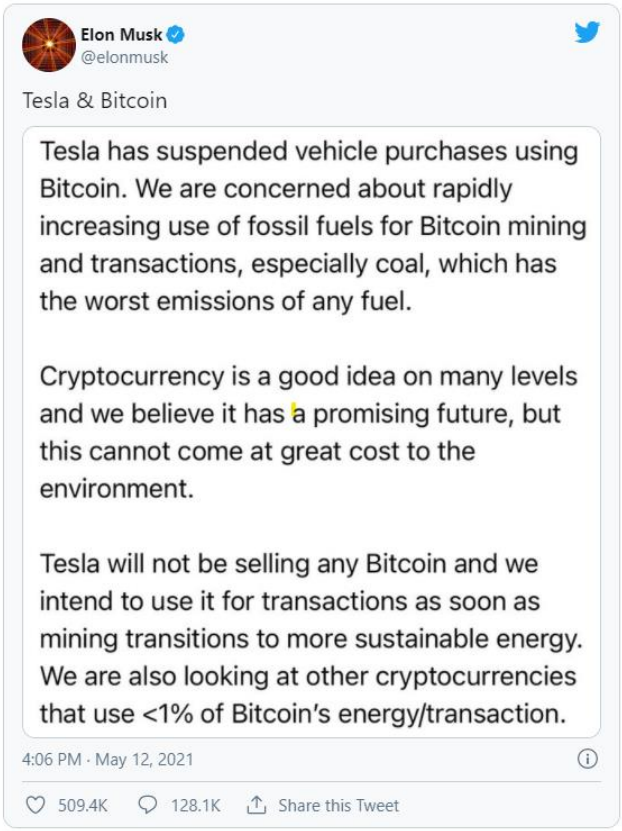
There is no accessible way, however, for retail investors to express a view on the future value of clean energy, the commodity underlying the transition. Purchasing frictions reduce demand for RECs unnecessarily. reToken will enable the clean energy marketplace to expand and accelerate the clean energy transition.

RECs also struggle with criticisms of greenwashing, as RECs legally carry the environmental marketing benefits associated with clean energy. Placing RECs on the Ethereum blockchain with reToken will enable REC holdings will be visible on-chain, and therefore any claims of clean energy procurement will be easily verifiable. A public block explorer will show token creation and removal transactions, the number of holders, and the rules of transfers. This level of transparency is unique for any traditional asset, and particularly for an intangible commodity like renewable energy credits.

Clean Energy meets Crypto

Owners of crypto assets cannot purchase clean energy directly in their crypto wallets. This will change with reToken.

Elon Musk tweeted on May 12th, 2021 that Tesla was pausing further use of Bitcoin until mining and transaction processing is powered by cleaner energy.



Square and ARK Invest, among others, made well-publicized arguments in response to ESG criticisms. In their papers they noted that crypto mining provides substantial flexible demand and is therefore a natural partner to intermittent renewable energy supply. They correctly point out that crypto mining can therefore act as a clean electricity buyer of last resort that the electric grid desperately needs to support higher penetration levels of renewable energy[iv].

However, the papers miss that the symbiotic relationship between crypto and clean energy does not represent the economically optimal strategy for crypto miners. While mining crypto for 6 hours a day is currently profitable, it is not more profitable than running the mine 24 hours a day. Realized 2020 Texas power prices, while extraordinary at times, would have led crypto mines to curtail for only 102 hours out of the annual 8,760 (~1%). The substantial upfront cost of hardware and short payback periods required from mining investors point to continued high utilization rates for crypto miners. In the absence of natural economic forces, tokenizing clean energy procurement is an immediate solution that can scale quickly and independently of crypto miner economics.

3. Future Products

Clean Energy Crypto Wallet App

Widely cited public data like the Cambridge Bitcoin Electricity Consumption Index will enable reToken app users to link third-party existing wallets and estimate the electricity usage from both mining and processing the bitcoin and other cryptos in your wallet. 4.25 MWhs, and therefore reTokens, are needed per bitcoin per year to power the wallet with renewable energy. The app will direct the user to purchase the associated reToken using this data directly in the app.

Tokenized Carbon Credits

While RECs cleanly and verifiably represent the electricity consumed in crypto mining and transactions, a carbon token will be needed to ensure a net-zero emission wallet. Many crypto assets are also hardware intensive and have associated emissions beyond electricity. reToken will source carbon offsets sourced

from OECD cap and trade markets. We will purchase carbon allowances in these markets, thereby reducing the credits available to existing emitters. This strategy simplifies calculation and verification issues currently associated with carbon offsets from reforestation or other natural solutions.

reToken bundled Bitcoin (reBTC)

Wrapping RECs with Bitcoin will cleanly bundle reTokens with BTC. Using the proven distributed merchant and custodian model of Wrapped BTC[v], clean energy MWhs can be efficiently tied to energy-intensive BTC mining. Public wallet addresses will verify the amount of BTC and reToken in custody, providing the required transparency.

4. Potential Issues

ERC-20 Scalability

The maximum practical gas limit on Ethereum's mainnet is 15,000,000 gas per block as of June 2021[vi]. Several scalability solutions in process will fortunately increase transaction gas limits by several orders of magnitude (Proof-of-Stake, Sharding). Unfortunately for many users, this gas is priced in Ethereum and therefore all scaling solutions are measured against the historically exponential growth in ETH/USD. This is a problem for decentralized apps and users of the network as many use cases, such as small transactions, can get priced out of the ecosystem during periods of high trading activity.

Despite the potential for ongoing transaction fees, reHoldings still maintains the ERC-20 standard as the universal standard for the reToken. However, as the product scales, reHoldings may facilitate bridges to other protocols (Polygon, Algorand, Solana), through seeding liquidity on decentralized exchanges supporting those protocols.

Renewable Energy Additionality

RECs are not perfect instruments to procure clean energy. They only represent units of clean energy generated in the United States. It is difficult to make claims that specific electrical consumption was powered by renewable energy on a 24/7 basis and that the clean energy purchased would not have been generated without the credits. reHoldings encourages large consumers of electricity to go beyond reToken purchases and co-locate their consumption with clean energy power plants to directly increase renewable energy penetration on the grid.

5. Conclusion

The tokenization of RECs through reToken will provide global liquidity and transparency to the clean energy market, enabling all holders of crypto assets to power their wallets with clean electricity.

6. References

[i] Cambridge Bitcoin Electricity Consumption Index (CBECI)
[ii] http://resource-solutions.org/wp-content/uploads/2015/07/The-Legal-Basis-for-RECs.pdf
[iii] https://www.terrapass.com/product/productres-recs
[iv] BCEI_White_Paper.pdf (ctfassets.net)
[v] Wrapped Bitcoin (WBTC) an ERC20 token backed 1:1 with Bitcoin
[vi] https://www.coindesk.com/ethereum-gas-limit-eth-price-soars