# Blockchain: Future of Renewable Trading?

**Blocking and Tackling**

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Fortnightly Magazine - September 2018 (/node/30431)

What's blockchain? No, it's not the pseudonym of the latest rapper. If you haven't heard of it, the editors of *Public Utilities Fortnightly* should be thanking you, because it probably means you've chosen to read *PUF* rather than *Computer World*.

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Why it should matter to you, though, is that blockchain, the technology behind bitcoin, stands to become one of the next disruptive forces in the energy industry — at least if Big Tech has it their way.

## Blockchain, What Is It?

Blockchain is a peer-to-peer digital ledger that can be used to automate a wide range of transactions, making them more transparent, secure, verifiable, and, ideally, cost-effective. When parties conduct a transaction using blockchain, the details of the transaction are broadcast to all authorized computers in the network, which verify the validity of the transaction.

A blockchain ledger network can be public, as is the case when it is used to record cryptocurrency transactions, or private where only specific stakeholders have specific permissions.

Parties can enter into transactions through mutual agreements or through Smart Contracts — lines of code that execute automatically if certain conditions are met — to automatically conduct transactions. If the nodes agree that the requested transaction is valid based on the distributed ledger, it is approved, time-stamped, and recorded to the ledger, thereby enhancing the transparency and authenticity of transactions recorded on the blockchain. Thus, the blockchain makes transactions more transparent and easier to authenticate.

*Macklin Henderson: Blockchain essentially automates every step of the tracking, verification, and auditing process without the need for human interaction.*

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This process makes transactions easier to verify by reducing the risk of human error, given that it allows all parties to the transaction to utilize the same ledger, and by automating transactions that otherwise involve human inputs.

The blockchain is also a more secure method for recording transactions, because as a distributed ledger, it does not have a single centralized point of storage that can be manipulated, that is, hacked. In addition to enhancing the transparency and security of transactions, by automating the tracking and verification process associated with complex and high-volume transactions, blockchain technology stands to drastically reduce transaction costs. Ideally, blockchain will eliminate the need to maintain duplicative ledgers, serve as a replacement for time consuming due diligence processes, and allow parties to transact without unnecessary negotiation.

Furthermore, because transactions are timestamped and recorded to a ledger based on the sequence in which they occur, blockchain can provide verifiable and valuable details about a good or instrument being traded, such as the precise time and location it was created.

## Potential and Challenges in Energy

While blockchain has already been successfully deployed across a number of industries, like the shipping industry, technology companies across the globe are beginning to introduce blockchain technology into the energy space.

In the Park Slope community of Brooklyn, homeowners and L03 Energy developed the Brooklyn Microgrid project, which relies on solar photovoltaic cells to generate power. In 2016, L03 managed a sale of renewable energy credits, RECs, between two neighbors connected to the Brooklyn Microgrid using smart meters and blockchain technology.

In Australia and Germany, residential communities similar to Park Slope are using blockchain to trade physical energy generated from home solar systems on relatively large scale. Companies have also begun to develop blockchain software for energy efficiency, electric vehicle, and battery applications.



Significant regulatory and operational barriers make it hard to envision peer-to-peer retail energy transactions occurring in the United States anytime soon. Most states only allow utilities or qualified retail electric providers to sell at retail, and the thought alone probably gives most distribution operators reading this a mild heart attack. That said, a potentially overlooked area ripe for blockchain disruption, or at least experimentation, is the renewable-energy and emissions-trading market.

There are a number of trading platforms that already trade RECs and other, similar instruments. Blockchain makes it easier to track the authenticity of these credits and simplifies the audit process. Most of the tracking systems charge notable transaction fees, which can include issuance fees as high as five cents per REC, transfer and retirement fees upwards of ten cents per REC, and export fees of five cents per REC.

Alternatively, companies may elect to hire a portfolio manager, which will usually charge percentage-based management and commission fees. These fees can be significant, particularly for high-volume REC players like PG&E, who retired some twenty-two million renewable portfolio standard-eligible RECs in 2016.

In addition to regulated utilities, corporations are becoming increasingly sophisticated players in voluntary REC and carbon markets, demanding more scientific and cost-effective approaches to their energy transactions.

Because credits are detached from actual electricity distribution, and current tracking systems do not record the time of day when the renewable electrons were produced, there is currently no way to easily tell if the energy associated with a renewable resource offset a carbon resource, or to what extent.

Hence, the common criticism that while all RECs are not in fact created equal, they are nonetheless assumed to have the same intrinsic value. Conversely, credits created and tracked using blockchain can easily track the time, date, and location they were created, meaning it's easy to decipher whether a wind REC was created at 6 p.m. in Dallas in July, or at 2 a.m. on the Kansas plains in January.

This data point stands to fundamentally shift the way in which RECs or similar credits/offsets are valued, from monetary, social, environmental, and operational perspectives.

Given the benefits of blockchain and increasing demands from voluntary market participants — such as Amazon, Microsoft, and Google — the voluntary markets appear well-positioned for disruption.

Given the lack of automation, to buy and sell unregistered credits today, parties often use expensive audit companies to validate items like whether a seller has the right to sell the credit, that the credit is what it claims to be, and that it has not been previously retired. Because parties must keep their own ledgers, disputes can arise when organizations use different ledgers, requiring them to manually correct mistakes. Blockchain, on the other hand, essentially automates every step of the tracking, verification, and auditing process without the need for human interaction.

Each power producer would be a permissioned user on the network and have a node at its generating station. Every time that power producer produced a megawatt-hour of electricity, the node would record the production of a REC or carbon offset, including the underlying resource and time of production. The generator could then retire the credit itself or allow other permissioned members on the network to purchase it and then retire or resell it, eliminating the need for cumbersome audits and verifications in the voluntary REC markets.

If every REC were recorded on the blockchain, each permissioned user would have an accurate record of that REC's contract path and any transaction for an invalid REC would be automatically rejected by the network. Furthermore, because each REC would have a timestamp indicating when it was produced, each could be more accurately valued.

While there is undoubtedly potential for blockchain in the compliance REC markets, unlocking its full potential anytime soon seems like a little more than a pipe dream due to numerous regulatory barriers.

First and foremost is the inherently state-centric nature of state renewable portfolio standards. Most states, for instance, can't agree on a uniform definition of renewable energy resource. Some states recognize hydro, waste heat, or biofuels as renewable resources, while others do not.

Likewise, many states have developed different policies regarding whether out-of-state renewable generation can count toward their RPS. Adding further complexity, most states have similarly developed their own approach, often by law, rule or regulation, governing how compliance RECs are to be tracked, monitored, verified, and certified, usually relying on one of ten regional tracking systems in the United States, such as W-REGIS or PJM-GATS.

## Future of Blockchain

The benefits of a distributed peer-to-peer ledger will only materialize if market participants make the necessary initial investments in software and hardware and trust the platform. Nonetheless, it appears to be less a question of if blockchain will disrupt renewable energy trading markets, but when it will occur.



While there inevitably remain several practical hurdles to implementing a large-scale voluntary blockchain-trading market, at this point, it seems only a matter of time before some mix of tech and utility companies band together to experiment with a voluntary blockchain market, particularly given the level of interest tech giants like Oracle, IBM and SAP have displayed.

As this happens, regulators and policymakers should take note, as successes and lessons learned in the voluntary markets may inspire reforms in the REC compliance markets, ideally to the benefit of consumers.

Examples include reduced transaction, audit and verification time and costs, and enhanced security. Moreover, because blockchain unlocks more granular data about the true environmental and operational attributes of a given REC, compliance markets could be reformed to more accurately reflect the true operational, social and environmental values a given REC provides.

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