



# Blockchain: What Should You Know?

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## What Is Blockchain?

- Distributed Ledger Technology
- Shared Data Network Infrastructure
- Decentralized Platform
- Each transaction is a “block” and they are linked together in such a way that they cannot be altered once finalized, nor can new links be inserted between two “blocks” in the chain.
- Individual new transactions are verified and connected through complex computer calculations (“hashing”).
- Control Identity


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## What is a Distributed Ledger?

John adds \$5 to his account  
Amy adds \$10 to her account  
John transfers \$2 to Amy  
Amy withdraws \$11

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## What Can You Trade With Blockchain?

- Real currency (dollars)
- Cryptocurrency (Bitcoin, Ethereum)
- Property
- Goods
- Services
- Electricity
- Gas
- RECs and other Intangible Goods

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## How Do Bitcoins Fit In?

- Blockchain is a platform that can accommodate virtually any medium of exchange.
- Cryptocurrencies such as Bitcoin or Ethereum are mediums of exchange.
- Using Blockchain does not require using Bitcoins, though Bitcoins could not exist without Blockchain.
- Bitcoin uses Blockchain in a specific way that differs from the way others are likely to use it.

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## Is Blockchain Sustainable?

- Blockchain is different than cryptocurrency.
- Bitcoin mining and transaction verification is energy intensive.
  - Open networks can be accessed from anywhere.
  - Individual mining operations with thousands of computers can add massive, 24-7-365 loads to unsuspecting distribution systems.
  - Some large reliable loads are welcome, but they can also have unfavorable rate impacts if the utility distribution system must buy more expensive power to meet them.

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## Cryptocurrency Loads

- Sometimes new, large loads are easily accommodated.
- However, cryptocurrency operations can pose problems related to safety, reliability and rate impacts to other customers.
  - Safety Requirements
  - Service Moratoriums
  - Differentiated Rates

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## Is Blockchain Sustainable?

- Utility applications are unlikely to use massive open networks.
- Permissioned, limited access will be less energy intensive.
- Some trade-offs in security.

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## Why Is Everyone So Excited About Blockchain?



- Blockchain has attributes that could, in theory, make it possible to do more kinds of transactions, more quickly, more securely and for less cost. Some of the terms you might hear:
  - Trusted Intermediary
  - Verification of Sourcing
  - “Unhackable”
  - Scalable (projected)
  - Cheaper (projected)
  - Smart Contracts

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## Trusted Intermediary



- Examples of Trusted Intermediaries
  - Banks
  - Credit Cards
  - Trusted third parties
  - Government verification of property deeds or legal ownership
- If both parties can see that the other party has the assets and financial wherewithal to do the deal, they can dispense with less efficient, and more costly third party involvement.

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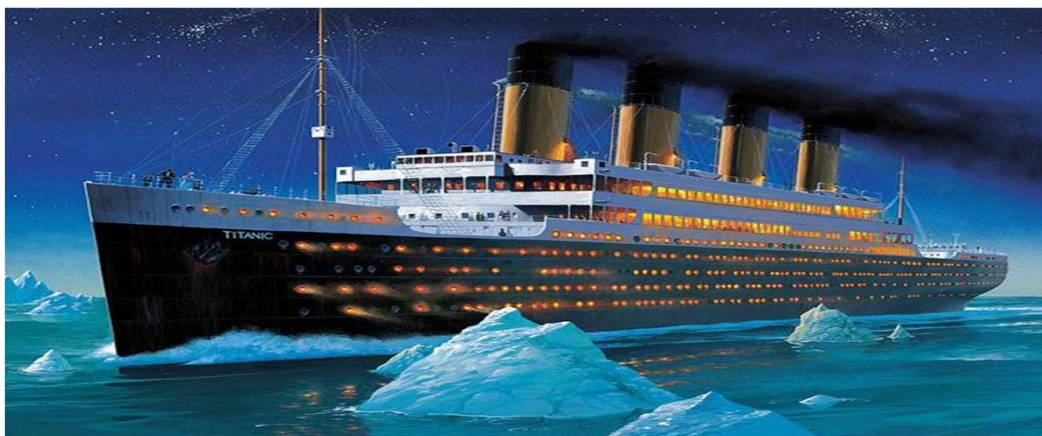


## Verification of Sourcing

- Once verified in the blockchain, it is possible to track chain of title or quality of goods.
  - Does the seller have title?
  - Was the REC created by a source that meets your regulatory requirements?
  - Was the REC sold to more than one party.
  - Issues remain with initial verification. Who certifies legitimacy in the first place?

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## Is “Unhackable” Similar to “Unsinkable?”



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## “Unhackable”



- Phishing for credentials (access to your virtual wallet) still a potential problem.
- Large enough networks make it virtually impossible for someone to hack into the system and take control.
- For business purposes, however, you are more likely to use small, private, permissioned networks rather than huge public networks (such as Bitcoin). More need for security.

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## Scalable



- Blockchain can potentially handle voluminous transactions, no matter how small.
- Peer-to-Peer microtransactions become practical.
- In fact, it may only make sense to use blockchain when large amounts of transactions are contemplated.
- Processing time could be an issue.

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## Cheaper and More Efficient

- In addition to volume issues, microtransactions would incur significant fees under standard bank or credit card type models.
- In theory, Blockchain settlements avoid that, or at least do so for minimal fees.
- Doing away with the middlemen and so-called “back room” personnel also could allow for much faster settlements using less staff.

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## Smart Contracts

- In essence, a smart contract is a self-executing computer program.
- Terms are specified in advance.
- If an offer to buy and an offer to sell with the same conditions connect, transaction can be automatically implemented and settled with minimal human interaction.
- Standard Form Contract on steroids.

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## Examples of Blockchain Pilots and Projects in the Utility Industry



- Over the past year, blockchain pilot projects in the energy and utility space have become increasingly common.
- These examples demonstrate some of the potential applications for blockchain technology.

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## Peer-to-Peer Microtransactions



- In Brooklyn, customers in the same neighborhood can sell each other excess kilowatts from their rooftop solar panels, without leaving the distribution grid.
- So long as the energy remains on the distribution grid, such transactions are probably not FERC-jurisdictional.
- What kinds of metering, notice and reliability requirements would have to be in place on the distribution system to make this concept work?

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## Utility Microtransactions

- A distribution company can buy and sell kilowatts with customers using EV charging facilities.
  - Retain control of equipment, mechanisms and accounting.
  - Not likely FERC-jurisdictional.
  - Eases need for staff time and resources for numerous settlements of small transactions.
  - What kinds of equipment, requirements and processes need to be in place to implement such a program on the distribution system?

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## Wholesale Power Contracting

- Using blockchain arrangements and smart contracts, wholesale utilities in a European pilot can solicit, transact and reconcile wholesale electric and gas transactions automatically.
- Private, permissioned network (Enerchain) using Ethereum.
- Probably FERC jurisdictional
- Smart contracts with credit risk and other parameters.
- Controlled identities with regulatory exceptions.
- Purely bilateral transactions—not an RTO.

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## Ensure validity of regulatory assets

- A blockchain data can track a renewable energy credit from creation to use for regulatory compliance, allowing buyers to be certain they are getting what they pay for, to avoid fraud and to prevent double-counting.
  - The problem of initial verification.
  - GIGO is still a problem.
  - What if there is a dispute?

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## Combination Projects

- APPA member Silicon Valley Power is working on a project to use blockchain to track the production of energy at a solar and battery-equipped parking garage, and to digitize EV transactions to earn Low Carbon Fuel Standard credits, which can then be sold to fossil fuel refiners. The accounting process for LCFS credit creation is so complex that only Investor Owned Utilities could obtain the credits previously.

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## Energy Management

- Walmart has applied for a patent that would allow the use of blockchain to set a capped power budget (for a store, say) and allocate power to individual appliances. Blockchain could purchase electricity separately for each appliance account, share unused power with other appliances or bank for future months, and maximize usage to save money at peak times. It also provides a trove of data to analyze and improve a customer consumption profile.

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## Retail Competition

- A marketer wants to sell your customers tokens in the forward market which they can redeem for a set amount of electricity in the real time market.
  - “Tokenization”
  - Changes the regulatory construct.
  - Initial Coin Offerings

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## Legal Issues

- Regulatory Framework
- Federal-State-Local?
- Regulatory Windows
- Digital Identities
- Know Your Customer and Regulatory Reporting



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## Questions to Ask When a Blockchain Pilot is Proposed

- Focus on the commercial transaction—who is the buyer? who is the seller? what is the product?
  - Blockchain is just a technology that enables a transaction; understanding the nature of the transaction helps to identify the relevant regulatory frameworks.
- How does blockchain improve the transaction?
  - E.g., facilitates transactions that were previously infeasible (peer-to-peer sales), reduces transaction cost (wholesale sale without an intermediary), improves confidence (confirming validity of renewable credits).
- Does using blockchain create additional regulatory requirements over what the commercial transaction would have?
  - Hint: the answer may be yes. E.g., buyer pays with cryptocurrency instead of USD, Tokenization.



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