

Blockchain – A revolutionary and highly disruptive Technology for Future Energy Transactions?

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Introduction:

Blockchain is a distributed, digital transaction technology that allows for securely storing data and executing smart contracts in peer-to-peer networks. The first Blockchain was developed in the financial sector to serve as the basis for the cryptocurrency “Bitcoin”. More and more new applications have recently been emerging that add to the technology’s core functionality – decentralized storage of transaction data – by integrating mechanisms that allow for the actual transactions to be effected on a decentralized basis. These mechanisms, called “smart contracts”, operate on the basis of individually defined rules (e.g. specifications as to quantity, quality, price) that enable an autonomous matching of distributed providers and their prospective customers.



Blockchain has attracted the attention of the power industry with its potential to unleash an energy revolution in which both utilities and consumers will produce and sell electricity. The smart home appliances connected to an energy trading platform could continuously look for the best offer and automatically alternate to a new energy provider through a smart contract. This experience will allow the customers to interact from their home or office directly to energy sellers. Blockchain could offer a reliable, low-cost way for financial or operational transactions to be recorded and validated across a distributed network with no central point of authority. Similarly the “prosumers” can sell their surplus energy to other customer in the network directly through contracts established and validated through Blockchain.

Blockchain is a foundational technology that can be used to create new business models and underpin business, economic, and social infrastructure. While many Blockchain use cases have been proposed for the energy industry, the one gaining the most traction at present is peer-to-peer (P2P) power trading, where owners of small-scale generation can sell excess generation directly to other consumers. Today, centralized control of distributed energy resources (DER) restricts to whom and when DER owners can sell their energy back to the grid. A Blockchain-enabled P2P model allows much greater flexibility and could be a powerful enabler for a customer-centric transactive energy regime. To support the development of Blockchain-based

solutions for the energy sector, a lot of organizations are setting-up Blockchain Labs with the aim of accelerating new Blockchain applications such as distributed ledger solutions and its use-cases. If the new applications are successful for mass adoption, it would have profound impacts on the business models of the entire energy sector value chain.

Europe is the most active region for the Blockchain pilots, with utilities working on EV charging, connected home, wholesale settlement and lab creation efforts. Currently, in Germany many Blockchain pilots are in various stages of progress. The world's first P2P energy transaction took place in New York City in 2016. In the first quarter of 2017, the DoE issued a tender for Blockchain projects with a focus on security. In South Africa, Sun Exchange connects investors to businesses and communities who need access to affordable electricity. In Japan, Marubeni is rolling out bitcoin payments for customers and in China, Wanxiang is planning to invest \$30billion in a Blockchain backed Smart City Project. Power Ledger, a startup in Perth, Australia is working on multiple projects across the region. In a pilot in Netherlands, Vandebroon will work with customers who own an EV to make the capacity of their car batteries available to help the grid operator balance the grid while protecting the battery life. The Blockchain will enable each car to participate by recording its availability and action in response to signals from the grid operator.

Opportunities and Emerging Solutions of Blockchain:

Bitcoin Bill Payments – In 2014, BAS Nederland was the first energy company in the world to accept bitcoin bill payment. That was quickly followed by Enercity in Hannover, Elegant in Belgium and Marubeni in Japan to roll out bitcoin bill pay. In this domain we have also seen Bankymoon in South Africa launched a social innovation project that enables anyone to “send” electricity, water and gas to anybody else in the world, from anywhere, by topping their utility meters. As cryptocurrencies continue to gain traction globally, and as utilities continue to invest in customer engagement strategies, it will be those utilities with jurisdictions and geographies that have high bitcoin penetration that will be able to offer varied payment solutions to their customers.

P2P Trading – The trading of electricity produced by prosumers directly with their neighbors and to microgrids leveraging Blockchain based solutions is by far the only Blockchain application that is gaining public popularity in the sector. While startups such as Power Ledger and LO3 Energy offer solutions to consumers, the advanced utilities such as Alliander and Vector are now beginning to experiment with the technology. Though the potential in this category is large, this market might take time to evolve and will depend heavily on regulation. As the technology gets acceptability, Blockchain may be extended to dynamic pricing. New York State's Reformed Energy Vision (REV) envisages a dynamic market below 115kV and Blockchain solutions could make that possible.

EV Charging and Sharing – The area of EV charging and sharing charging infrastructure could also one of the potential near-term opportunities for the Blockchain technology. In 2016, Swiss Bank

UBS teamed up with German power company innogy (RWE) and automotive technology company ZF to create Blockchain-based eWallets for electric cars that will enable car owners to pay on-the-go for EV charging, parking fees, toll fees and receive car-sharing fees in the evolving sharing economy. In early 2017, innogy partnered with California based 'the Oxygen Initiative' to roll out the technology. This market is expected to grow fast as EV charging infrastructure deployments accelerate.

Renewable Cryptocurrencies – SolarCoin is cryptocurrency for renewable energy which aims to motivate solar prosumers by rewarding them with SolarCoins, a take on how bitcoin incentivizes miners to commit processing power to the network by rewarding them with bitcoins for each block of transactions mined. SolarCoin is incentivizing 97,500 TWhs of global solar energy production over the next 40 years. 99% of the currency is distributed to solar energy generators providing a proof of work. This space is witnessing interesting collaborations emerge with home energy management and thermostat providers. One example is Smappee users with solar panels can earn SolarCoin in a seamless fashion as this is integrated into their meter technology.

Wholesale Trading and Settlement – Wholesale electricity trading and settlement market is another emerging area for Blockchain technology. This space has the scope for radical process improvement opportunities. In the EMART Energy Trading conference in Amsterdam in November 2016, the first European energy trade using Blockchain technology was demonstrated. The trades were executed by Yuso and Priogen Trading and both traders used the Enerchain trading tool, developed by PONTON. PONTON aims to deploy a Smart Market Blockchain solution with a vision to use Blockchain technology as a joint data layer to coordinate market activities such as the submission of buy or sell orders and the execution of trades. System users will be DSO, TSO, industrial and private prosumers. Similarly, in 2017 in Austria BTL launched a pilot with Wien Energie for trading with two other utilities. Qiwi, a Russian payment system operator has launched a pilot to track energy transactions using Blockchain technology in partnership with Tavrda Electric. Activities in this space is expected to gain momentum faster.

Consortia, Labs & Research – Since Blockchain technology is still in its infancy, the technology is currently too slow for majority of the energy industry's large scale use cases. There are several research labs and think-tanks working on development solutions based on Blockchain for the energy industry. Work of Grid Singularity and the Rocky Mountain Institute on the Energy Web Foundation is a notable example. The aim of this effort is to act as a collaboration platform to bring together energy-focused Blockchain efforts and accelerate the pace of Blockchain development through a combination of hackathons, boot camps, and other gatherings. Endesa Energía is establishing a Blockchain Lab in Spain. In China, Wanxiang is planning to invest \$30 billion in a project that will integrate Blockchain technologies with smart city innovations in Hangzhou.

Startups to Watch – There are some notable startups in different geographies working on innovative solutions based on Blockchain technology for the energy sector. For example, Volt

Markets in the US aims to use Ethereum smart contracts to issue and track Renewable energy certificates (RECs), UK startup Electron is working on solutions for the UK market with a focus on a meter registration platform, a flexibility trading platform and smart meter encryption techniques. M-PAYG, a Danish startup is working on a solution to improve access to renewable energy for people living below the poverty line in developing countries. Using Blockchain they are developing prepaid energy solutions through small-scale mobile money installments. Entrepreneurial activities around Blockchain in the energy sector is expected to evolve and gain maturity around business models.

Risks and Challenges of Blockchain Technology: As Blockchain technology matures and applications evolves, there are different challenges to be addressed for mass adoption. Few of them are listed below:

- Energy Laws and Regulatory Framework in different countries and states needs amendments to support new applications and services
- Issue with Trust: Still most users are not comfortable having money in their electronic/mobile devices - building trust and credibility will take time
- Industry Mindset: Traditional players in the energy industry may view Blockchain as 'disruptive' because it can attach a traditional business model with a lower-cost solution and overtake incumbent firms quickly. But Blockchain can be leveraged as a foundational technology to create new business models and underpin business, economic, and social infrastructure
- Acceptance: While Bitcoin is the most well-known Blockchain application, energy trading through Blockchain is being presently experimented in many places; and these players are looking to improve efficiencies with cross-border transactions
- Adoption: The process of adoption will be gradual and steady; and it could take time for Blockchain to seep into economic and social infrastructure

Conclusion:

Blockchain is still in its early stages for Energy (Electricity, Oil and Gas and Green Energy), and new crypto technology applications and advancements are regularly occurring. Big changes are expected over the next few years in the energy industry as more and more companies are doing Blockchain Proof of Concept (PoC), creating a business case and building a startup team for this disruptive technology. Regulators, Policy Makers and Utilities should watch developments in this space closely. The utility operations, business models and organization structure should be made as flexible as possible to adopt to fast changing circumstances brought about by the new applications around Blockchain technology.

Source: <https://www.indigoadvisorygroup.com/blog/2017/3/6/global-energy-utilities-Blockchain-pilots-and-use-cases>

Picture Source: <https://www.newscientist.com/article/2101667-Blockchain-grid-to-let-neighbours-trade-solar-power-in-australia/>