Welcome to the block party

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Leonardo Botti, Global Head of Product Management ABB, reviews the impact of Blockchain and how digitalization can support the technology's adoption.

In 2009 a new disrupter finance model was launched- BitCoin. It heralded a new era in how currency and transactions were made and transferred globally. The emergence and rising popularity of this new cryptocurrency market reached a defining point in 2017 when the number of B2B enterprises adopting Bitcoin trebled and suddenly attracted the attention of global investors. But what does this decentralized digital currency have to do with the changing energy market?

To answer this question we need to look at the technology that underpins BitCoin - 'blockchain'.

Blockchain is based on a peer-to-peer platform that has created new ways in which we can transact with one another. The underlying transaction model moves us away from a centralized architecture towards a more direct and decentralized system between peers. This reduces the need for a central server, authorization and authentication of transactions by one single authoritative body.

For the energy market, it is presenting new opportunities for innovation within utilities and amongst homeowners. It is redefining how our energy is supplied and potentially creating a sustainable energy community.

Role of the prosumer

Energy transactions have historically been based on a multi-tiered and complex supply and demand business matrix between producers, transmission system operators, distribution system operators, utilities and consumers.

Yet through the emergence of digitalization, the uptake in renewable energy sources and storage - such as rooftop solar connecting to the grid - the energy model is offering potential for a more decentralized and simplified energy management architecture.

The 'Smart Buildings' revolution in modern residential and commercial installations means that today's energy consumers are demanding ever smarter solutions together with greater control. This demand has seen a move away from consumers to what's known as 'prosumers'.

These prosumers will no longer be solely focused on consuming energy but also in producing it at the same time. They will increasingly look at how energy is created, when it's used and how effectively their electricity costs can and will be reduced.

The blockchain technology, coupled with smart metering technology, will take this model one step further. It will allow prosumers to not only chose when and how to use the energy they produce on their own, but also to trade surpluses with peers and neighbours through a token system, thereby creating a sustainable energy sharing economy, based on 'peer-to-peer energy transactions'.

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In this evolution the prosumers will effectively own and create VPP (Virtual Power Plant) which could be combined via aggregators in more consistent batches to better manage and address local needs.

The solar industry is going to be one of the early adopters to take advantage of blockchain and this new wave energy market, particularly as solar outstrips[1] all other sources of renewable energy as the fastest growing and easily viable power source, worldwide.

Pilots of the peer-to-peer energy exchange utilizing solar and blockchain are already underway in major countries from the US to Australia. Through photovoltaic (PV) installations installed on rooftops for example, households and businesses can trade the energy produced through blockchain.

Navigating the data highway

The principle role of blockchain technology is to control and create one distributed ledger of all transactions within it. This offers several advantages including reduced transaction fees, system flexibility, security, easier implementation and greater innovation.

For the energy market, the key determining success factor is the overall system efficiency, security and transparency of all the data interactions within it. This is where the utility sector can evolve and take advantage of the blockchain trend.

Digitalization and the availability of big data are providing greater insight on customers and how they use their energy. Whilst managing and controlling the complex transactions across global energy network and supply chain, along with growing security risks through the Internet of Things (IoT) has resulted in the energy market becoming a data highway.

In recent months there has been an acceleration on the number of investments that utilities and new energy entrants are undertaking to adopt this new blockchain model and it is anticipated to rise over the next 18 months when the pilots deliver tangible results and evaluations are made.

As such, blockchain can represent a creative and innovative opportunity for utilities to adapt and change their business models to manage the data flow, as they have long-standing experience in understanding the dynamics of the network and are able to drill down and undertake analytical reviews to better manage the energy flow through the system. This enables utilities to maximize and optimize their assets, expertise and experience, moving away from being a pure electricity provider to a full energy service provider with added value offering data management and analytics.

Blockchain and the VPP

Photovoltaic plants with next generation inverter technology and digitalization embedded into their systems can adjust and stabilize excess energy even at marginal levels, across multiple sites, and flex according to demand.

A Virtual Power Plant (VPP) collects power units under one central control system. These VPPs would aggregate energy generation sources — including solar plants, microgrids or energy storage installations. Almost all power generation and storage technologies can be part of a VPP including biogas, biomass, combined heat and power (CHP), wind, solar, hydro, diesel and fossil-fired plants.

ABB already delivers these innovative applications, with a strong portfolio in many VPPs across the globe, especially in Europe where the company has installed a large quantity of megawatts for a range of utilities. In these installations, the use of ABB smart inverters with digital capabilities and ABB Ability™ cloud-based services has delivered full interaction with local utility monitoring and control systems, together with advanced remote tools to enable cost effective energy management.

The Internet of Things (IoT) and blockchain can deliver a real and effective VPP across these multiple locations, rather than one central location of a traditional power plant. This will strengthen and enhance the energy system, moving it away from a typical 'production driven' model, which we have seen so far, to one that is focused on an 'energy consumption driven' and likely to be the future.

Coupling blockchain with digitalization monitoring solutions such as ABB Ability™, system architecture is scalable, from a few up to many thousands of units, and it means that these solutions can control and optimize VPP to correlate the excess energy which can be transferred and traded within the blockchain, serving energy communities at a local level, and allowing customers to implement and even create their own business model.

This results in a more efficient energy flow in the network, according to local consumption and the utility's energy strategy (peak-shaving), a better fine tuning of the power quality in the whole local infrastructure and real-time predictive maintenance with troubleshooting and root cause detection.

The emergence of the blockchain energy model is already happening and it will transform the energy supply within the next five years.

As our knowledge of the technology grows, so too does our understanding of its advantages and potential to update the market to meet new customer requirements and deliver an efficient and transparent energy system.

We are moving ever closer to developing a sustainable energy system, focused not just on the fuel that goes into it, but also on how our energy is managed and sold to deliver a reciprocal, community-based market for all.

http://new.abb.com/solar

1 https://www.theguardian.com/environment/2017/oct/04/solar-power-renewables-international-energy-agency