

Blockchain potential in the energy sector

Blockchain technology is claimed to have the potential to transform the energy market – from microgrids to the Internet of Things (IoT) in upstream and downstream operations. Leading analysts put the picture in perspective, reports *Brian Davis*.

Blockchain is a data-management technology that can be shared, validated and updated by participants on a network. Instead of maintaining duplicate databases on respective infrastructure, participants on a blockchain network manage one synchronised record that is accessible by all parties at any time, but is unalterable without consensus.

Blockchain underpins the development of cryptocurrencies (a form of digital currency), but this is only part of the picture. Blockchain promises to become a foundation information management structure that could be deployed across entire enterprises more economically than conventional infrastructure. But what lies behind the hype?

According to a recent IBM survey, 80% of banks aim to initiate blockchain projects by the end of 2017. Over 90 major corporations have joined blockchain consortia to date. About 90% of government leaders, and a high percentage of major corporations, plan to have some involvement with blockchain consortia by 2018.

Over \$1bn has been invested in blockchain to date, mostly by the financial sector (\$429mn) and companies building the IT/comms backbone. As Jonathan Robinson,

Senior Consultant at Frost & Sullivan, pointed out in a recent webinar entitled *Blockchains transforming the energy sector*: 'We haven't seen much activity going on in particular segments yet. But we think this will be transformed in the next few years.'

Only \$19mn has been invested by the energy and the environment sector to date. But the picture is likely to change as businesses create solutions that can be used and scaled across various industry segments. A lot of the start-up activity is in the UK (38%) and US (23%), with the rest divided between other countries and regions.

Robinson defines blockchains as 'a new data structure that creates trusted, distributed digital ledgers for assets and other data'. Essentially blockchains offer a digital decentralised ledger, where the data is unmodifiable. It enables development of 'smart contracts', which can be activated under certain conditions or remain non-activated if flagged up as non-compliant. 'This is expected to be a significant challenge for the legal industry,' says Robinson.

Blockchain is very much peer-to-peer. 'There is no central organisation (like a financial clearing house) running a blockchain. It is very decentralised and encourages relationships with

anybody, anytime in a secure environment,' says Robinson.

How blockchain can be used

It is a way to create and have secure digital assets. So you can trade without any physical property going through the blockchain, ie there is no real currency, hard cash or paperwork. It has the potential to be used in the stockmarket and other trade markets, because you can automate transactions and the resilience ensures there are no security threats.

Being peer-to-peer, blockchain removes asset and data transaction intermediaries. It can also create a new ecosystem for open source services. For legal contracts, it can replace business logic with specific code to carry out certain activities.

There are definitely challenges to developing blockchain applications. Robinson points out: 'The transparency aspect will need to be addressed, with some data available publicly and other data protected, much like the difference between an internet or intranet.'

There are also marketing challenges, in terms of awareness and encouraging people that blockchain is sensible to use. 'However, many people simply won't realise they are interacting with blockchain. Generally, people don't care about the technical capabilities of a platform. They care more about application capabilities and the value proposition,' Robinson says.

Vijay Michalik, Energy Analyst at Frost & Sullivan, maintains: 'Blockchains are not just about cryptocurrencies but all the other capabilities of a having a decentralised digital ledger for data sharing. It's a start-up landscape with many new blockchain applications on the infrastructure and backbone side.'

Key areas of development

So what are the key areas of blockchain development in energy?

Michalik notes that the energy sector has undergone significant changes in the last few decades across all generation, distribution, storage and consumption. Moving

away from central generation in different areas of renewables and distributed generation, with an ownership shift as well as a technology shift. There are also disruptive technologies arriving like the Internet of Things (IoT) and smartgrids that provide new challenges. 'We think blockchains can provide solutions, especially around data coordination; trading platforms; and new ways to enable open access for innovative products and services,' he says.

Frost & Sullivan highlights a few key players and start-ups.

Energy trading – Blockchains have been fitted to the model of peer-to-peer exchange in energy trading by a number of different start-ups, including Grid Singularity in Europe, Transactive Grid in the US, BTL in Canada, powerpeers in Australia, and voltmarkets in Scandinavia.

Energy IoT – This provides an infrastructure for data in smart meters and other energy generation IoT, and includes Electron, Filament, ElectricChain and Share & Charge.

Renewable incentives – Tokenisation is being developed as renewable incentives and for carbon credits by Energy Blockchain Labs in China, as well as SolarChange, SunExchange and SolarCoin.

Data infrastructure – This is being provided for several of these applications by infrastructure players like IBM, Consensus, Slock.it and Parity.

Blockchains in action

Share & Charge – One of the major challenges of deploying electric vehicles (EVs) has been building the infrastructure of charging stations. Share & Charge enables the incentivisation of providing new channels for participants to monetise their charging stations, using a blockchain app which gives users a digital wallet to connect to the EV charging stations. Developed by Innogy and Slock.it, this approach has been expanded to hundreds of charging stations across Germany, for roll-out across Europe.

Energy trading – Following a successful pilot for an energy trading platform, BTL Group in concert with BP, Eni Trading & Shipping and Wien Energie, additional energy companies are invited to participate in launch of a live, BTL Interbit-based commercial version of the platform by the end

of 2017. 'We have demonstrated reductions in risk and cost savings with a blockchain based application,' says Guy Halford-Thompson, CEO of BTL. 'Now we have an opportunity to deliver the first successful blockchain based application to the energy market.' BTL's blockchain capability has immutability, transparency, scalability and back-up redundancy capabilities, in a seamless end-to-end solution. The Interbit blockchain offers a consortium model where some nodes are not necessarily 'fully open' but meet privacy requirements.

Carbon asset management – IBM, Hyperledger Fabric and a consortium of other companies have developed what is claimed to be the world's first blockchain carbon asset management platform ready for the opening of China's unified national carbon market this year. According to Cao Yin, CEO of Energy Blockchain Labs: 'The blockchain platform will significantly shorten the carbon assets development cycle and reduce the cost by 20–30%.'

Frost & Sullivan emphasises the importance of tracking and following new developments, 'as so much innovation has happened over the last year alone,' says Michalik. 'Given the scale of investment... it is no longer something that can be ignored, as we see in the IBM study there are a lot of government and big business players taking this very seriously.'

The energy sector lags behind the financial sector in blockchain initiatives, but cross-industry platforms like the BTL Interbit platform show the need to foster a consortium approach between different energy participants. 'It is also important to bring start-ups on board as they have already solved some of the biggest problems,' notes Robinson. 'There are also big opportunities in peer-to-peer energy trading, which is what blockchain was originally designed to do.'

The timeline

In the financial services sector, blockchain applications have developed from proof of concept to now bordering the production stage within two to three years. Given the promised commercialisation of BTL's Interbit platform with Energy Blockchain Labs for energy trading within 2017, Frost & Sullivan anticipates more commercial energy-related blockchain platforms within the next three to five years.

According to a brief online poll,

energy trading apps will prove the most impactful (50% vote), followed by renewable incentives (33%) and energy IoT (17%). 'But as challenges are overcome in terms of infrastructure and especially security for IoT, we expect to see more investment move into the energy IoT segment,' says Robinson. 'Trading is definitely a key area, but renewables is also huge and a lot of blockchain project work will address decentralised solutions for this area.'

Given that the oil and gas industry had a bitter experience with new trading platforms in the dot.com crash, *Petroleum Review* enquired whether the oil and gas sector would prove reluctant to move into this area, compared to other sectors. Robinson replied: 'Yes, the oil and gas industry is quite conservative by nature, as is much of the power industry. I don't think they will commit huge funds early on, as we still haven't seen things relative to the potential, like digital oil fields taking off to the extent expected. But they will certainly be interested in the proposition, as the likes of IBM, GE and Siemens develop products in this area to support their businesses.'

Furthermore, how are blockchains likely to impact IoT in upstream and downstream operations? Robinson sees blockchains in a 'support' function. He explains: 'IoT means you would have numerous devices measuring performance and generating information. Blockchain would be a way of securely transferring that information. So it could definitely be a player in the background. Upstream, there are a lot of diverse assets in different locations. You may want to know the relative performance of each one, for example, to compare data quickly with aspects of contract performance, fulfillment, etc. Downstream, the blockchain could have a similar role related to the performance of refineries. Blockchain could be a way of essentially ensuring that those things have happened without the need for manual intervention, checking and evaluation.'

Indeed, blockchain has significant potential in the energy sector which will be difficult to ignore. However, the oil and gas industry is a firm believer in 'second mover advantage' rather than jumping into the game too soon, so it may be some time before this potential is realised. ●

For more on blockchain, see <http://bit.ly/2vsaXmB>

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Vijay Michalik, Energy Analyst, Frost & Sullivan