BLOCKCHAIN:

ENERGY'S NEW DIGITAL PLAYBOOK

finboot tech

INDEX

An extraxt of the book of Geoffrey Cann

OVERVIEW

"A lot of effort in the back office in oil and gas is to reconcile why there are differences between the information in different systems. Consensualized data solves this. Blockchain is the perfect tool for consensualizing data."

Cory Bergh, VP, NAL Resources

Distributed ledger technology (DLT), also called **blockchain**, is a database design first described in 2008 as a way to maintain records between parties who don't trust each other, but without a central agent to provide trust.
A blockchain database has transactions (records) that are recorded sequentially by time stamp. The blockchain database is copied to many different computers, who use complex encryption and mathematics to update the database (by consensus) and ensure that the transactions cannot be tampered.

Bitcoin is the high visibility blockchain use case that has captured the imagination of many investors, but blockchain has so many other uses that can create value in oil and gas by lowering costs, eliminating disputes, and detecting fraud. Key areas include supply chain management, track and trace, trade simplification, automating contracts, and managing carbon credits.

BLOCKCHAIN SIMPLIFIED

Imagine the classic buy/sell relationship that we are all familiar with. I sell a book (which I do), and you wish to buy the book (which you do). We agree on the unit price, the number of copies you want, the delivery terms (shipping address, shipping method), and the delivery date. Being a simple fellow, I keep track of these details on a spreadsheet (or a ledger), which includes your name and address, the number of copies you want, and all these other details.

Since your memory may be faulty, or perhaps because you don't quite trust me, you write down the same details on your own spreadsheet or ledger. Now we're both maintaining the same data, but in separate ledgers. Either of us could have written our side of the transaction incorrectly, which could give rise to some confusion later — was it 10 copies or 12?

We rely on many central authorities to keep track of some key ledgers. Banks manage money ledgers. Governments look after tax ledgers. Stock exchanges keep track of trades.

Now let's string a few steps together. After you place your book order, I place an order with Amazon to print the copies, and Amazon places orders with a trucking firm, air transport, and ground courier to finally deliver the books to you. Each of these parties has their own ledger to keep track of their bit of the deal. And each ledger has the potential to contain errors or differences with the other ledgers.

If all of these ledgers could be precisely aligned all the time, eliminating the possibility of confusion and error, without need of a big central authority like a bank, we could eliminate much of the cost we incur to deal with the inevitable errors and confusion.

THAT'S WHAT BLOCKCHAIN DOES — CREATES HIGHLY TRUSTWORTHY DATA WITHOUT THE NEED OF A BIG COSTLY VULNERABLE CENTRAL AUTHORITY.

Transactions of interest are grouped together into blocks, encrypted, and digitally attached to each other in a large chain. The chain sits on many computers simultaneously, and the chains all have to match. Such a structure is highly secure because corrupting it means corrupting the majority of the chains at the same time.

PRODUCT TRACING

Aside from money, another asset that could benefit with traceability is **energy** itself. The oil and gas industry does a pretty good job tracking hydrocarbons, but tracing energy is another matter.

It's striking that we have not historically been as concerned about the traceability of our energy as we have been with whisky. In part, this is due to whisky being more fun, but also due to electricity being a local good, produced by a local utility, perhaps owned by the community, and consumed close to supply. On the other hand, petroleum producers have claimed, with some justification, that tracing the source and use of liquids and gases is not practical, because these commodities are fungible and are frequently blended.

Times are changing, and companies cannot properly respond to regulatory pressures without understanding where and how their operations and products contribute to climate degradation.

Markets are responding to this general trend to understand energy provenance by applying sourcing concepts to energy products. Airlines offer consumers a fuel surcharge to purchase carbon offsets.[1] Power companies sell green

[1]Tiffany, "Airline Fuel Surcharges: Everything You Need To Know," One Mile at a Time, April 12, 2019, https://onemileatatime.com/airline-fuel-surcharges/.

energy options such as green credits.[2] Petroleum companies offer a green fuel option at the pump.[3] Chemical companies now track the use of their products throughout their supply chains in response to global brand pressures.[4]

Carbon targets compel companies to be much more interested in the source of all of their carbon emissions, the provenance of their hydrogen (was it produced using fossil fuels or solar power?) the origins of their biodiesel, and the carbon content in their products from all of their suppliers.

Energy systems have historically been a series of separate and independent value chains. These designs date back to the dawn of the modern energy age, and are generally built to solve for monopoly effects of large distributed infrastructure, and for the capital needs of the asset owner and investor. They are focused on managing the engineering problem of balancing physical supply networks, and not participating in a world of traceable energy.

Fortunately, the same digital innovations that have transformed many other markets (financial services, telecoms, entertainment) are about to have the same positive impacts on energy. These building blocks—the internet of things, cloud computing, blockchain—allow for the tracing of energy products completely throughout their independent and increasingly interconnected value chains.

THE ESSENTIAL INGREDIENT TO TRANSFORMING ENERGY IS DATA.

Historically, the energy industry has relied on its instrumentation and controlling systems (SCADA) to produce the data needed to manage energy supply and demand. The internet of things will provide for vast new data sources about energy, to be stored and processed in the cloud, and for consumers, immutably and confidentially recorded on blockchain structures. Emerging artificial intelligence engines will be able to process that data to make meaningful consumer decisions.

Many organizations are starting to exploit these new capabilities to reinvent various supply chains in and related to energy.

---

[2]"Encor Chirp - Green Home Energy Solutions," Epcor, 2021, https://www.epcor.com/products-services/encor/green-energy/Pages/default.aspx.

[3]"Biofuel Facts for the Road: The Energy Department and Your Gasoline Pump," Energy.gov, November 24, 2015, https://www.energy.gov/eere/articles/biofuel-facts-road-energy-department-and-your-gasoline-pump.

[4]Anne Ter Braak, "Stahl Selects Finboot's Blockchain Solution MARCO to Share Verified Sustainability Credentials with Brands That Use Its Products," Stahl, 2020, https://www.stahl.com/news/finboot-sustainability-credentials-solution?page=2.

BULK COMMODITY TRANSFERS

Water hauling is a big issue for the North American upstream industry. Water is used for fracking, steam generation, and water flooding. Water is produced naturally from wells, and flows back up after fracking and steaming are completed.

Contaminated salt water needs to be disposed of at special sites, and every ounce must be accounted for. Local governments monitor water resources carefully, but are resource constrained. Invoicing and reconciliation are largely manual, and compliance is self-reporting.

THERE ARE WELL OVER 100M TRUCK MOVEMENTS PER YEAR HAULING WATER IN NORTH AMERICA ALONE.

Regulators want precise, frequent and accurate records of water handling, and levy penalties or production curtailment for repeat offenders of the rules.

GumboNet is a blockchain-based solution to simplify and streamline this costly and inefficient process. Eventually, other bulk commodities could benefit, including chemicals, sand, and fuel. Haulage of equipment may also be improved using blockchain.

TRADING SIMPLIFICATION

One of the earliest trials of blockchain was in the area of **petroleum trading**, which incorporates considerable haulage.

TRADING IN PETROLEUM (GASOLINE, DIESEL, JET FUEL), IS TRICKY BECAUSE THE PRODUCT IS HIGHLY REGULATED, VERY VALUABLE, COMPLETELY STANDARDIZED, QUALITY SENSITIVE, AND BULKY.

It passes through many hands (tank farms, barges, tankers, and pipelines) and title changes frequently mid-journey. It crosses borders easily, attracts lots of taxation and tariffs, and generates its own wave of paperwork.

VAKT is a blockchain-enabled reimagining of the trade relationship between parties in the industry.[5]

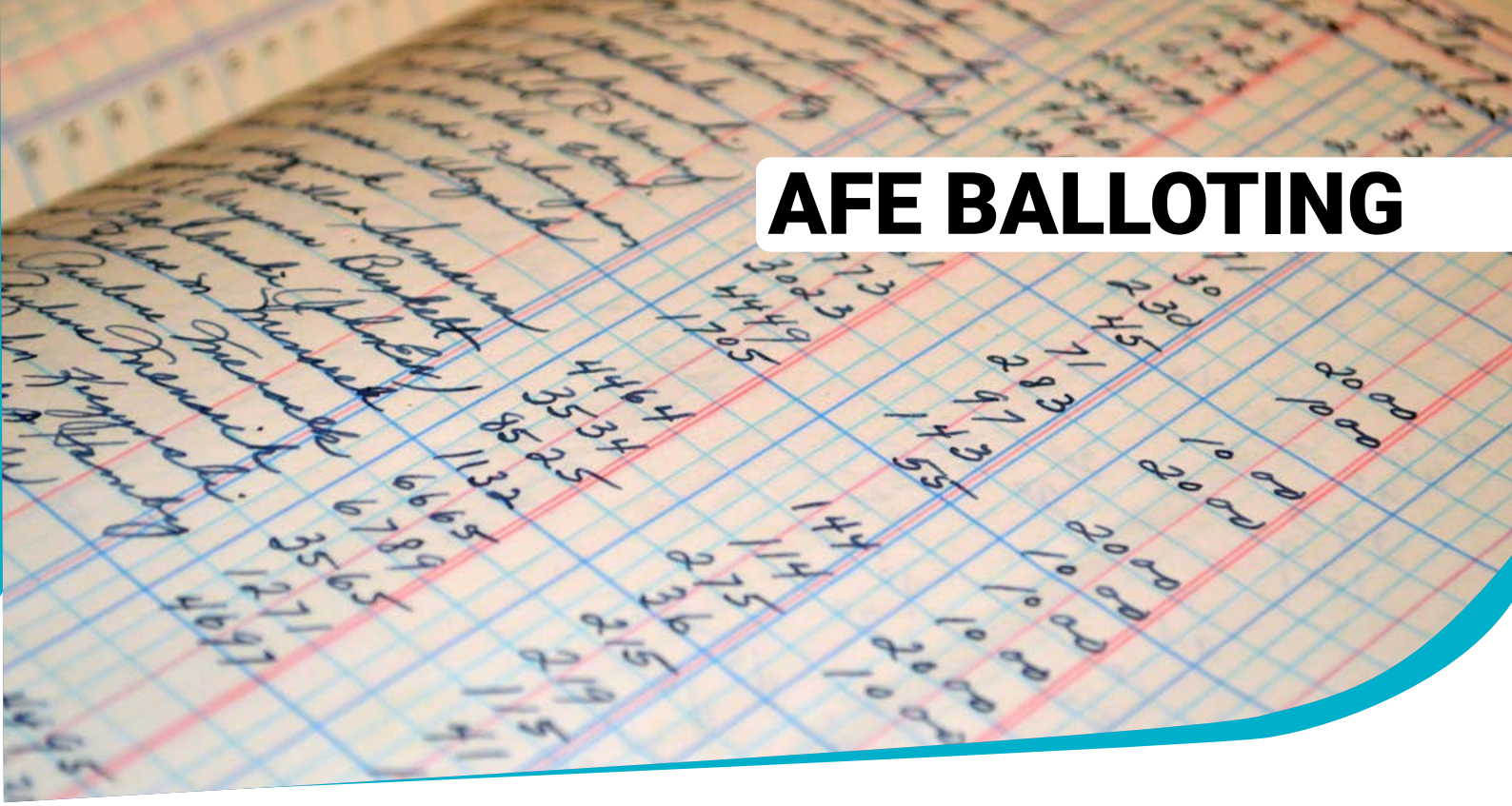
[5] "Home - Vakt Global," 2020, https://www.vakt.com/.

PRODUCT CERTIFICATION

To assure product quality, oil refiners operate labs that process thousands of assays and samples annually to confirm oil purchases and refined products meet regulatory and industry specifications, and to track those samples as they transit to customers.
Labelling errors, information losses, misplaced samples, or samples disconnected from their documentation frequently happen, triggering considerable work chasing down samples.

REPSOL HAS LAUNCHED A BLOCKCHAIN SOLUTION CALLED BLOCKLABS TO TRANSFORM THIS PROCESS AREA.[6] BLOCKLABS IS BUILT ON A BLOCKCHAIN MIDDLEWARE PLATFORM CALLED MARCO FROM FINBOOT, A TECHNOLOGY COMPANY BASED IN CARDIFF AND BARCELONA.

[1]"Blockchain Technology for the Energy Sector," REPSOL, 2020, https://www.repsol.com/content/repsol-corporate/en/home/sala-prensa/repsol-news/32.



AFE BALLOTING

Authorization for Expenditure (AFE) is the process to **approve capital spending for a project**, such as a well or an infrastructure investment. In the case where a project has multiple possible participants, the process to secure agreement between the parties is called balloting.

The lead operator in a Joint Operating Agreement (JOA) prepares a draft AFE ballot to send to the other participants. The draft AFE sets out the proposed spend for each of the participants, pro rata to each's interest level. Ballots are binding, and take the form of a certified, hand-signed, manually delivered letter.

The process is time consuming, paper based, costly, manual, and prone to disputes.

Guild1 is working on this problem area working with Blockchain for Energy, a consortium of energy companies based in the US.[7]

[7]GuildOne, "GuildOne's Royalty Ledger Settles First Royalty Contract on R3's Corda Blockchain Platform," GlobeNewswire News Room, February 14, 2018, http://globenewswire.com/news-release/2018/02/14/1348236/0/en/GuildOne-s-Royalty-Ledger-settles-first-royalty-contract-on-R3-s-Corda-blockchain-platform.html.

A BLOCKY FUTURE

Blockchain's future looks assured. The early use cases are demonstrating quite dramatic cost savings, and the solution areas are almost certainly the easiest ones to prosecute at this stage. The big opportunity areas have yet to be tapped.

The low-code, no-code technology philosophy will also come to the blockchain protocols, which will simplify and democratize its adoption cycle. Next generation solutions will be very easy to use and operable on all platforms, further insulating the analyst from having to become a deep blockchain expert.

Eventually, there will be a wide diversity of blockchain database designs, each solving for specific kinds of problems.

- Some will focus on the **high volume but low data intense applications**, such as bitcoin.
- Other companies will aim at **smart contract opportunities**.
- Governments will embrace **different blockchain databases** for registries, contracting, and compliance needs.

As a consequence, companies should anticipate that they will likely be party to multiple blockchain solutions, and that attempts to rigidly standardize blockchain protocols are unlikely to succeed.

The proliferation of blockchain-enabled solutions will create demands for interoperability between various blockchain structures. Solution providers will need to incorporate open standards and application programming interfaces (APIs) into their designs.

WHILE BLOCKCHAIN SOLUTIONS ARE GENERALLY ECONOMIC ON THEIR OWN, THEIR REAL IMPACT IS REALIZED IN COMBINATION WITH OTHER TECHNOLOGIES.

For example, using blockchain to immutably record machine-generated data from an edge device unlocks trusted autonomy for that edge device and its recorded data. The industrial world seeks precisely this kind of advancement in the drive to decarbonize distributed carbon sources and carbon sinks.

The proliferation of blockchain-enabled solutions will create demands for interoperability between various blockchain structures. Solution providers will need to incorporate open standards and application programming interfaces (APIs) into their designs.

Do you want to improve transparency,
traceability and data charing across your supply chain?

BOOK A CONVERSATION WITH OUR TEAM

finboot tech