

Case Study #1

# **Potential Use Cases of Blockchain in Oil & Gas**

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Despite the scale of the oil and gas industry, it has historically always been relatively reluctant to change and slower than other sectors at adapting to a transforming world. One can argue that its proven, profit-rich business models have not needed much alteration – the process of oil extraction from beneath the Earth’s surface remains similar to when we first began utilizing hydrocarbons. However, it is also true that fluctuations in oil prices, due to supply and demand variations, and the race between corporations to gain a competitive advantage has driven innovation - leading to a series of disruptive changes in the past. Companies that have failed to keep up with modern practices often lose out and their business usually goes to someone who does – as is the case with most commodity businesses. Better seismic exploration tools, more efficient drilling techniques and refining at more effective volumes are just some examples of how the O&G industry has benefited in the past from the advent of technology. At present, most oil companies are working rapidly to implement “IT Transformation” projects which seeks to augment business workflows through information collection, knowledge extraction, and insight generation from the mountains of data that is produced by their engineering teams. While their investment into such an extravagant renovation is commendable, the current state of panic could have been mitigated by a shrewd foresight of the information age and the realization of the benefits it can provide at least a decade earlier. Another such opportunity seems to be developing and corporations will do well to learn from their mistakes and attempt at remaining ahead of the curve this time. This case study will investigate the potentially revolutionary blockchain technology and the different ways it can power the future of the oil and gas industry.

Blockchain, the technology that powers bitcoin, can be applied to a multitude of problems outside of the cryptocurrency markets as well. [8] Melanie Swan says, “We should think about the blockchain as another class of thing like the internet – a comprehensive information technology with tiered technical levels and multiple class of applications.” More specifically, it’s a decentralized ledger that works through algorithmic self-policing and automated consensus among peered users. One of the advantages of the decentralized architecture include a reduced need for intermediaries. We place our trust in the computer systems and the code on it to ensure data integrity leading to a transparent, immutable, and easy to audit chain of anything we might want to record. [6] Hence, the blockchain can be used as a trustless proof mechanism, that can be deployed as an application layer over the internet, to change the way business is conducted between companies, vendors, governments, and other entities. [6] Everett Muzzy, from ConsenSys, states that “across all these stakeholders, countless opportunities for transparency, efficiency, and optimization exist in order to overcome the difficulties we they face from siloed databases and proprietary infrastructures. Brainstorming is underway for the many potential applications of the technology – the following are just a few of the proposed use cases in the oil and gas industry.

One of the obvious implementation of the blockchain is for commodity trading and tracking after the resource has been extracted from the reservoir. [6] A blockchain-

based trading platform can reduce costs that are currently incurred with legacy, proprietary systems that costs millions to maintain and secure. [6] A blockchain-based system can also reduce liabilities due to labor, data management, data visibility, settlement delays, dispute resolutions, and inter-system communication – all without the need for changing trading methodology or compromising data security at the information sources. Companies may choose to develop on an existing hacker-proof system such as Ethereum and make use of the established infrastructure already present further reducing the resistance for the conversion. Such a platform would mean that data is transparent to whoever the companies deems fit – such as auditors or regulators, and secure from competitors – since it cannot be decrypted without a private key. This would also provide synergies with regulators for when legalities with trades are questioned – rather than packaging and sending the information, the authorities could even themselves be on the blockchain monitoring trade patterns in (near) real-time. [6] A pilot program conducted recently by BTL Group with BP, which used blockchain technology to track gas trades, revealed a reduction of almost 30% in operational cost – thus further strengthening the case for the idea. [4] A similar program for other trades can easily be implemented by modifying the gas trade smart contract to suit other transactions.

The upstream segment of O&G, consisting of exploration and production, also has numerous stakeholders and its complex processes often involve multiple companies operating in unstable regions under strict regulatory rules. Reconciliation between these companies is often quite laborious and results in incongruent data. [6] One such example is in the case of identify and certification of workers who perform specialized tasks on the wells. It is often unclear if only the appropriate personnel are allowed access to the rigs and whether or not they are verified to have the correct certification to operate machinery. Currently, this data lives across many different systems and thus leads to the inability to produce audit trails at demand. [6] Many a times companies are unable to identify what has happened on their own site for up to 45 days after an incident. If this data were to live on the blockchain, all employee identity, certification, access logs, and output can be automatically recorded in a way such that the sequence of events is both immutable and transparent. The same holds true for data sanitation – the data generated from operations is also stored across various siloed systems which leads to a duplication of work and disparity between companies' logs. If the data is stored on the blockchain in such a way that all parties can trust the information, its possible to remove these inefficiencies and create a singular repository which only provisioned personnel can access both on and off shore. [6] Last but not the least, tracking land and mineral rights might be the most useful application of a blockchain-based system. Prior to drilling, rightful ownership must be established for permission and payments purposes– which can change from site to site – and requires complex legal paperwork to track (often in coordination with the government). A block-chain system can sustain and maintain a clear record of company land and mineral right transaction. Although the feasibility of this approach remains unclear, it is a use case that could eliminate lost, misplaced, and duplicated records.

The downstream segment of the O&G industry, where crude oil is finally processed into finished products and eventually makes its way to the consumer, is another complex network of refiners and distributors that can benefit from a blockchain-based platform. [5] As mentioned earlier, data usually resides in databases across various operators: convenient access and an appropriate normalization can be tough to achieve. On the other hand, storing all data in a single, centralized database, no doubt, raises concerns about permission control and security. [10] On a shared ledger, backed by blockchain, we might be able to achieve an alliance of companies who shared their data when appropriate for greater visibility into the entire supply chain of the network. This would lead to a more efficient refined product delivery and hence a better customer experience – no gas station might ever be out of gasoline again. An advanced version of this highly-optimized network might even be able to track specific product supply – leading to the ability to know exactly the environmental effects of a product.

Blockchain remains, for the most part, a mysterious technology that has not yet proven its benefits in the O&G industry. All of the use cases presented in this case study have been resourced from independent articles, journals, and presentations – signifying that some of these conversations are in fact taking place. While some of the ideas may not be feasible in the near future, the sector is certainly more aware of this revolutionary architecture than it has been of other, historical changes. It is only through these kinds of dialogue that the needle can tick forward and we can start reaping the positives from some of these ventures. [2] PetroBloq, a blockchain enterprise developed exclusively for the O&G sector, is an example of building a community around the topic and working with companies to try out new ideas to see how well they can really function in the real world. [2] PetroBloq, funded through petroleum associations, is actively conducting research into blockchain applications for both upstream and downstream segments. Although it is admittedly wise to be wary of some of the hype created around blockchain – most platforms like PetroBloq haven't even developed anything tangible yet - it is my recommendation to stay up to date with developments in the field. By recognizing opportunities such as those mentioned in this study, it is essential to continually try and weigh the benefits and risks associated with each project. History has shown that it is only companies that are willing to adapt in O&G that tend to stay around and I hope this case study starts a deeper conversation amongst them. As the blockchain technology matures, more opportunities will become possible and early adopters might have a lot to gain from it.

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