



In its ongoing journey to power and move the world, the energy industry has faced many structural challenges that have been addressed through the effective deployment of innovative and groundbreaking technologies. The resulting industry landscape is technology rich and highly streamlined, but is yet faced with a complex and costly transactional ecosystem which may prove itself as fertile ground for the introduction of distributed ledger technology—better known as blockchain. With many digital innovations such as the Internet of Things (IoT), automation, artificial intelligence, cloud platforms, big data, and advanced analytics, executives must strategically decide how to adopt these digital capabilities—likely with blockchain serving as the underlying backbone of the transactional infrastructure.

Digital technologies and ubiquitous data are increasing visibility, transparency, coordination, and information sharing across company boundaries—enabling smarter, more informed decisions and greatly improved operating efficiency. In order to capitalize on those digital innovations, the industry needs to address the fundamental issues of security and trust, which are basic requirements for doing business. That is where blockchain comes in.

# A breakthrough in establishing trust

Blockchain is a powerful peer-to-peer network technology that uses advanced computer science techniques to efficiently enable completely trustworthy interactions between parties, even if they don't completely trust each other. In a nutshell, it is a shared electronic ledger that can be accessed and managed by multiple parties—even those that are unknown or anonymous—yet is extremely reliable, secure, and immutable (i.e., ledger entries cannot be modified after they are created).

Much like the impact of the emergence of other modern payment systems, blockchain is likely to change the fundamentals of transacting and create opportunity for a near-infinite number of applications.

With blockchain, companies can execute and record transactions and information with unprecedented reliability. They can also achieve “optimal transparency” when sharing information—controlling exactly what information gets shared and who it gets shared with—and can do so not only reliably but also, if desired, anonymously.

To understand the tremendous value of a trust mechanism like blockchain, it helps to think about the

various ways businesses have traditionally achieved a workable level of trust. The oldest and arguably most important trust mechanism is relationships; however, those take significant time and effort to create and are not 100 percent reliable. Another is legal contracts, but those also require significant time and effort to create and administer; in addition, they can also involve costly legal fees and are never air tight, which means, in practice, adherence often defaults to the strength of the underlying relationship anyway. Last, but not least, is the involvement of a third-party intermediary (such as a bank, broker, exchange, credit rating agency, or regulatory entity) to provide a neutral and reliable mechanism for transactions and other interactions that require trust. Intermediaries are very common in today's business processes; however, they tend to be very expensive, typically charging a commission that is equal to a small percentage of each transaction but in total reach to a large dollar amount. Also, the level of trust provided is still ultimately limited by the trust and reliability of each intermediary and its supporting operations.



# Blockchain in energy and resources

Although blockchain seems to be generating the most buzz in financial services, the networked infrastructure of the energy industry makes it particularly suited for blockchain technology applications. And with the rise of IoT, the entire energy industry may soon find its operations transformed into a vast global network of connected devices all feeding digital data into blockchain-enabled platforms that can capture and share information in real time.

Here's a closer look at four specific use cases that illustrate blockchain's potential in energy and resources.

## Energy transacting

One of the most obvious and powerful uses for a digital ledger technology like blockchain is to provide a reliable and efficient platform for executing and recording transactions (and for tracking ownership as assets change hands multiple times before settlement). With blockchain, transactions can be recorded and settled almost instantly, with no need for an intermediary and with little or no need for reconciliation since all parties are using the same platform. In fact, there is essentially nothing to reconcile since there is only one system and one entry for the transaction, which is shared by all parties. What's more, a blockchain entry can include executable computer code that reflects the terms of the contract—creating a “smart contract” that automatically validates transactions without the need for human intervention. Blockchain's suitability as an efficient and reliable shared trading platform could be applied to both physical and financial trading across the full spectrum of energy commodities. In the power sector specifically, as distributed energy resources continue to penetrate the grid, blockchain has the potential to enable peer-to-peer transacting between end users. These localized trading networks could alleviate systemic inefficiencies such as transmission line losses, congestion, and volatile price formation.

## Regulatory reporting and compliance

Regulators are increasingly requiring energy and resources companies to provide vast amounts of data that can be analyzed to detect non-compliance and other regulatory issues. With current technologies and methods, gathering and cleaning up the required data is a huge burden. There's also significant risk that the data could fall into the wrong hands and be misused, exposing sensitive corporate information and putting a company at a competitive disadvantage. Blockchain could potentially eliminate most of these issues, enabling transparency by allowing regulators to securely access clean, tamper-proof data at the source, while at the same time allowing companies to retain strict control over what information is

available and who is allowed to access it. An important benefit of using a blockchain-based platform to share information with regulators is that it would create a standard data format for key areas of industry, which is something that is simply unavailable at the moment.

## Global supply network

The end-to-end process of getting hydrocarbons out of the ground, converting it into a usable form, and then delivering it to customers involves numerous steps and many different players, from major energy companies to government inspectors to individual service providers, and everything in between. At the moment, the systems and information to support all of these steps are often highly disjointed and siloed, making it nearly impossible to get a comprehensive view of what's happening and preventing companies from enhancing the process.

Deloitte has prototyped a platform that could be used to support the entire end-to-end process. Such a platform creates much more value with a digital ledger technology such as blockchain, which provides the real-time speed and efficiency, tamper-proof reliability, traceability, and transparency to allow companies to share information on a common platform without fear of having their sensitive, business-critical information compromised.

Such a platform could become even more important as connected devices are increasingly used to capture real-time data and artificial intelligence predicts and reacts to demand—all without the need for human interaction.

## Asset optimization across sectors

In both the oil and gas, and power and utilities sectors, one of the principal challenges is making asset optimization decisions in a highly siloed environment where separate entities each have a competitive incentive to hold their cards close to the vest. In today's extended enterprise environment, the interaction with thousands of suppliers, vendors, and counterparties drives up complexity and cost. Blockchain can help companies monitor compliance from their suppliers and ultimately reduce costs. By enabling transparency that allows each entity to reveal only the information that is necessary for collaboration, while masking critical proprietary information that is a source of competitive advantage, a digital ledger technology such as blockchain makes it possible for the industry to reduce costs while improving reliability and distribution efficiency. Blockchain may also supplant the role of major transmission intermediaries by facilitating the coordination and delivery of power across broad geographies on a low-cost and automated basis.

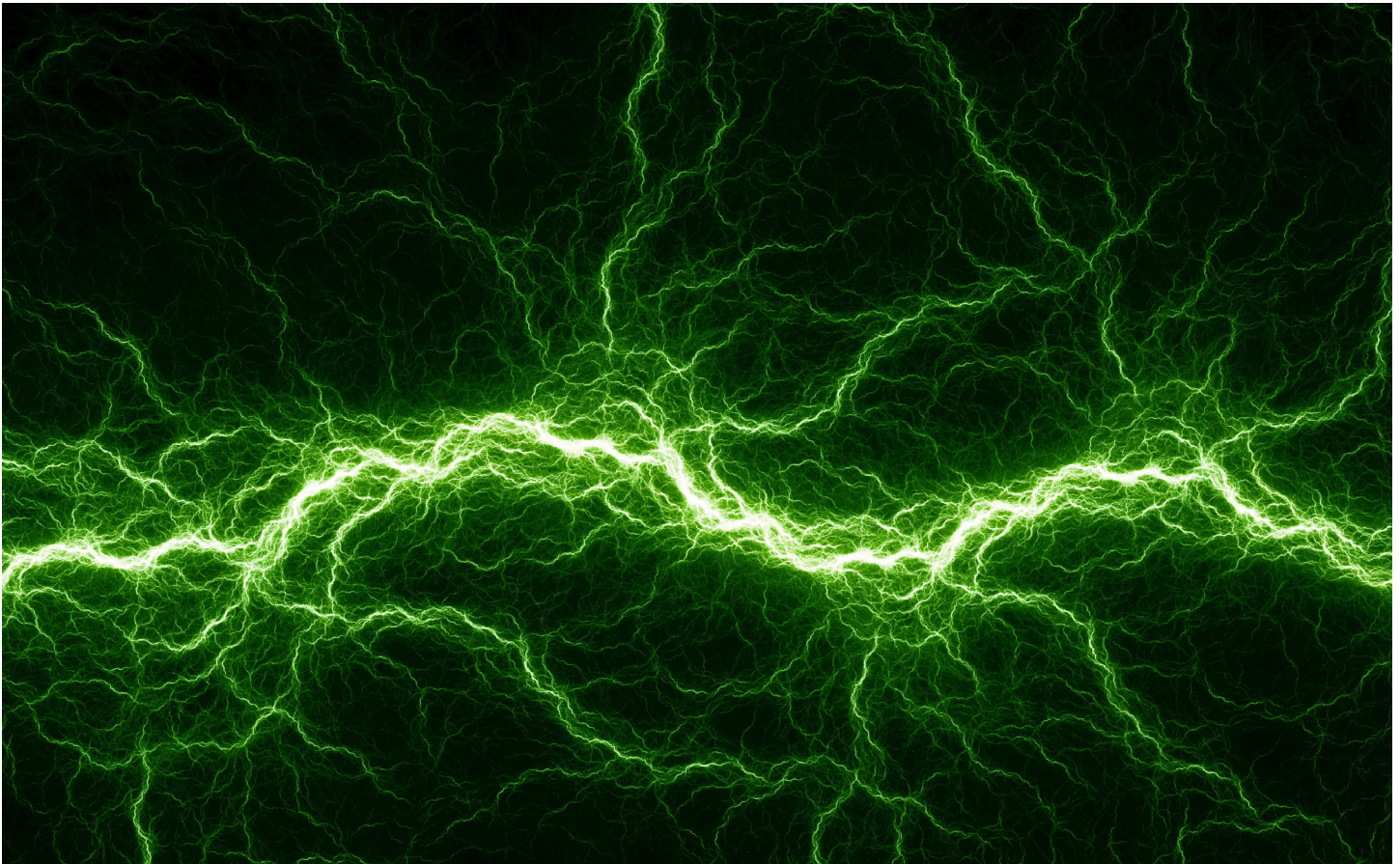
## Benefits and key strategic questions

Blockchain has the potential to unlock substantial value across the energy and resources industry, due in part to:

- Improved visibility, collaboration, and operating efficiency made possible by blockchain's transparency
- Removal of expensive market frictions and intermediaries
- More efficient back-office processes, including expedited settlement cycles
- Streamlined regulatory reporting and improved data standardization
- Creation of new business models and monetization of new blockchain platforms across the industry

### Key strategic questions:

- How can this technology enable transformation in adapting to new infrastructure models and a challenging commodities environment? How do we integrate these platforms into legacy systems?
- Could there be a first-mover advantage similar to what has been observed through the capture of low-cost licenses in automation?
- As new blockchain-based marketplaces open up, how can companies maintain relevance and achieve advantaged positioning?
- How should investments be made given the relative lack of standardization and regulatory approval? How should regulators be engaged while building these new blockchain-based platforms?
- How can the talent be sourced that is required to innovate in the blockchain space?



# Challenges and next steps

Blockchain is a disruptive technology that will require a significant investment of time, money, and effort. However, because the potential strategic impacts and opportunities for value creation are so compelling, the required investment can be relatively easy to justify. In reality, the biggest obstacles to blockchain adoption in energy and resources have nothing to do with technology or economics and everything to do with people—specifically, getting the right players to buy into the blockchain vision and then working together to make it happen.

- Coming together to create a solution:** One of the biggest obstacles to blockchain adoption in energy and resources will likely be getting companies to cooperate and collaborate—creating a common vision, developing common standards, and agreeing to build and use a common platform. Whether companies are direct competitors or supply chain partners, each has a strategic interest in maintaining some kind of edge over other companies. However, blockchain's ability to create significant value for the industry as a whole means that every company also has an incentive to cooperate. Deloitte is already engaging in building blockchain solutions with individual companies throughout the industry, and we are seeing compelling business cases and momentum towards shaping the future of energy's transaction ecosystem. Our belief is that different companies will need to come together in the spirit of competitive collaboration, with the goal of expanding the value pie for everyone. While the challenge of joining a consortium requires significant resources, the cost of being closed out of these newly emerging markets may become much more expensive as the landscape evolves.
- Getting regulators on board:** Deloitte has also been closely monitoring public comment from regulators, and engaging in prototyping for a blockchain-based regulatory platform. To that end, it's in the industry's best interest to take the lead in developing and championing a practical blockchain vision and workable, real-world solutions—so that lawmakers and regulators have a strong, practical base to build on.

## Making the vision a reality

Blockchain is a breakthrough trust mechanism that can remove the need for costly intermediaries and enable an unprecedented level of transparency, coordination, and information sharing across the energy industry—while at the same time allowing companies to retain control over sensitive information that gives them a competitive advantage in the marketplace. As such, it has tremendous potential to improve both efficiency and effectiveness, creating value for the entire industry. Many startups are investing and trying to disrupt industries by leveraging blockchain. And energy is no exception. However, capturing the full benefits of blockchain will require a concerted effort on many fronts, so incumbents should lead the definition of their own future. It's time to build the next generation of your business

## Let's talk

### Mike Prokop

Managing Director | Deloitte Risk and Financial Advisory  
Deloitte & Touche LLP  
[mprokop@deloitte.com](mailto:mprokop@deloitte.com)  
+1 713 982 2998

### Mark Koeppen

Principal  
Deloitte Consulting LLP  
[mkoeppe@deloitte.com](mailto:mkoeppe@deloitte.com)  
+1 713 982 2369

## Contributing authors

### Shirin Vakil

Senior Manager | Deloitte Risk and Financial Advisory  
Deloitte & Touche LLP

### Tony Petro

Senior Manager  
Deloitte Consulting LLP

### Steven Goyne

Consultant | Deloitte Risk and Financial Advisory  
Deloitte & Touche LLP



This publication contains general information only and Deloitte is not, by means of this publication, rendering accounting, business, financial, investment, legal, tax, or other professional advice or services. This publication is not a substitute for such professional advice or services, nor should it be used as a basis for any decision or action that may affect your business. Before making any decision or taking any action that may affect your business, you should consult a qualified professional advisor.

Deloitte shall not be responsible for any loss sustained by any person who relies on this publication. As used in this document, "Deloitte" means Deloitte & Touche LLP, a subsidiary of Deloitte LLP. Please see [www.deloitte.com/us/about](http://www.deloitte.com/us/about) for a detailed description of our legal structure. Certain services may not be available to attest clients under the rules and regulations of public accounting.

Copyright © 2018 Deloitte Development LLC. All rights reserved.