



Patrick Hughes,  
Senior Director,  
Government  
Relations  
and Strategic  
Initiatives, NEMA

Mr. Hughes leads NEMA's Strategic Initiatives program to accelerate the future of the electroindustry.

## Demystifying Blockchain: How It Will Grow Demand for Distributed Energy Resources

You may have heard the buzz about using blockchain technology to facilitate energy transactions, especially for distributed energy resources. Unless you are a bitcoin user, however, you may not know what a blockchain is, or its relevance to the electrical system.

This article should help demystify the concept of blockchain and give you an idea of how it might facilitate increased deployment of distributed energy resources like solar photovoltaic systems, microgrids, energy storage, electric vehicles, demand response, and similar technologies.

Blockchain technology provides a way of securely recording transactional data. Let's say, for example, that Janie sold 100 kilowatt-hours of solar-generated electrons to Howard on January 3, 2017, at 1:46 p.m. for \$10. The feature that makes blockchain networks more secure than traditional centralized databases is that the information is stored on distributed computers and servers; there is no single database of transactions that could be tampered with.

This makes it nearly impossible for a hacker to alter the transaction, because doing so would require editing

thousands of “blocks” stored on thousands of different computers to successfully modify the information. Otherwise, disagreement amongst the distributed records would clearly identify transactions that had been altered.

In the energy sector, this offers a secure, low-cost, and high-speed platform for monitoring energy transactions. There are currently more than one million solar installations in the United States, and that number is expected to double within the next two years.<sup>1</sup> Many of those solar owners will be looking to sell excess generation. Today, most excess electricity is sold back to electric utilities; however, through local markets facilitated by blockchain technology homeowners will be able to sell excess electricity to whomever they want.

This scenario is not far-fetched, nor far off. Siemens and LO3 Energy recently announced a project based in Brooklyn, New York, where they are pairing a microgrid with a blockchain-based energy trading platform to facilitate the sale of distributed generation at the local level.<sup>2</sup> With this project in operation,

neighbors will be able to buy and sell electrons just as easily as they can buy and sell sports memorabilia on eBay.

“There is no question about where you got your kilowatt-hour, where it came from, and how it was produced,” said Lawrence Orsini, founder of LO3, in an interview conducted by *Renew Economy*.<sup>3</sup> “I was skeptical that people would have an interest in where [their] energy [is] coming from, but Brooklyn shook that up a bit. [...] In Brooklyn, they want their electrons to be Brooklyn electrons.”

<sup>3</sup> [reneweconomy.com.au/why-sharing-solar-is-the-next-big-thing-in-energy-industry-33652](http://reneweconomy.com.au/why-sharing-solar-is-the-next-big-thing-in-energy-industry-33652)



<sup>1</sup> [www.seia.org/research-resources/solar-industry-data](http://www.seia.org/research-resources/solar-industry-data)

<sup>2</sup> <https://www.siemens.com/press/PR2016110080EMEN>

## Blockchain Lexicon

**Block:** A record of a transaction that includes a link to a previous block, creating a chain. Blocks are stored on distributed networks of computers, making it nearly impossible to alter the transactional information.

**Chain:** A set of connected blocks that reference each other, allowing easy identification of altered blocks and making it nearly impossible to change a transaction (because a hacker would need to edit all subsequent blocks that reference the hacked block, and those blocks are stored on separate computers).

Energy trading is not the only potential use case of blockchain technology in the electricity sector. Blockchain technology could be integrated with devices to facilitate payment for energy services, such as charging an electric vehicle or doing laundry. But before we get to that point, more pilot projects will be needed and some concerns will need to be addressed—especially related to privacy.<sup>4</sup>

One of the fundamental principles of blockchain technology is that records are publicly available, which increases transparency and security. Blocks must be visible to everyone in the network, because the veracity of a specific block is verified by checking it against all the other blocks in the chain.

This could cause some privacy issues. For example, Jesse could know how much electricity Kate is buying if the blockchain network is broadly accessible. However, access to the blockchain could be limited to a limited number of approved participants (this is the approach favored by some financial institutions), ameliorating some of the privacy concerns.<sup>5</sup> It is also possible to

limit or encrypt the information included in the blocks, so that viewers would not have access to the names or addresses of market participants.

Assuming the privacy and other issues facing the widespread use of blockchain technology in the energy sector are resolved, blockchain networks have the potential to revolutionize how electricity and energy services are bought and paid for. Markets could be decentralized, and consumers could have full control over where their electricity comes from (at least financially). New markets for distributed electrons could spur investments in distributed energy resources, necessitating upgrades to distribution grid infrastructure. A shift from central-station to distributed generation could have implications for utility-owned assets, utility business models, and likely a plethora of unintended and unforeseen consequences.

Manufacturers should pay close attention to this trend over the coming years because, in one form or another, blockchain technology is going to impact your business. ☺

<sup>4</sup> [ieeexplore.ieee.org/document/7589035](http://ieeexplore.ieee.org/document/7589035)

<sup>5</sup> [www.ft.com/content/eb1f8256-7b4b-11e5-a1fe-567b37f80b64#axzz3qWZ8Giy1](http://www.ft.com/content/eb1f8256-7b4b-11e5-a1fe-567b37f80b64#axzz3qWZ8Giy1)

## Sample Blockchain Transaction

