Accelerated Decarbonization Through On-Demand Grid Flexibility

Via Science, Inc. (VIA)

Summary

The inability of the grid to keep up with electrification is causing increased outages and slowing decarbonization efforts. Collective good (decarbonization) can come from collective action (grid customers coordinating their demand). VIA's Skylight solution is a combination of Web3 technologies that coordinates smart electrification equipment. This coordination overcomes barriers that contribute to outages from electrification.

Background

Buildings are rapidly moving from natural gas and other fuel sources to grid electricity for both traditional uses such as heating and appliances, as well as new uses like electric vehicle (EV) charging.

The massive increase in electricity usage requires upgrades to power lines, transformers, and other grid infrastructure. Grid operators are already struggling to maintain reliability and will be unable to meet the increasing demand in the near term due to multiple compounding factors:

- **Decreasing Equipment Lifespans** - Much of the U.S. grid infrastructure is already at the end of its expected lifespan. Increasing stress such as bidirectional power flow (e.g., rooftop solar power to grid) and changes in load curves (e.g., EV charging at night) are decreasing the remaining useful life of equipment such as substation transformers.

- **Supply Chain Constraints** - Skyrocketing demand for electrification subcomponents from grid operators and new entrants such as EV manufacturers is creating multi-year delays for replacement grid equipment.

- **Retiring Workforce** - Maintaining and upgrading grid infrastructure is a specialized skill set. With as many as 25% and, in some markets, 75% of qualified personnel due to retire in the next five years, planning and implementing grid upgrades will be delayed.

The goal of grid upgrades is to ensure that equipment is capable of meeting the increasing demand. Energy demand, however, does not exceed equipment capacity 24/7. In fact, the peaks are often short and seasonal, driven by predictable events such as weather and lifestyle patterns. One mechanism to increase the lifespan of grid equipment is to coordinate electricity demand at, or ahead, of peak times (i.e., peak shaving). Grid operators can coordinate customer demand by requesting them to:

- Reduce their energy consumption (i.e., demand response)

- Increase generation from distributed energy resources (i.e., distributed energy resource management)

Grid operators face a number of barriers to engage individual customers to coordinate demand, including:

1. **Lack of Convenience** - Customers struggle to remember when to take action, and fear any energy limitation.

2. **Lack of Incentives** - Customers generally receive little compensation for their effort in comparison to their perceived effort. The compensation customers do receive is often 30 to 90 days after their action, or imperceptible (a small reduction in bills that they do not review regularly).

3. **Lack of Ownership** - Many customers are renters in buildings and not owners of large electrical equipment.

4. **Lack of Trust** - Customers worry that their energy and personal data will be used nefariously.

VIA's Skylight solution overcomes these four barriers with Web3 technologies. With more than 1.5 million downloads per week of Web3 libraries, Web3 technologies are readily available, increasingly affordable, and demonstrate significant performance improvements over other software frameworks. VIA has more than five years software development experience, and 10 issued patents in Web3 and related data privacy technologies.

Solution

VIA has combined non-fungible tokens (NFTs), smart contracts, and zero-knowledge proofs (ZKPs) to deliver a cost-effective solution to grid operators to enable real-time and / or preventative customer energy reduction and customer energy generation.

Skylight delivers a unique combination of benefits to grid operator customers:

1. **Convenience** - VIA has created a blockchain-based smart contract (ERC 721 and a custom ERC 1155) to automate the energy action (e.g., temporarily turn down a customer's water heater). The timing (e.g., 12PM) and duration (e.g., one hour) are mutually confirmed through digital signatures.

2. **Incentives** - Customers' energy actions are converted into an NFT. Customers (building owners and tenants) are compensated in near real time for their energy actions, even without access to a traditional bank or providing their bank account information. The smart contract compensates grid customers within 15 minutes of verification of the energy action.

3. **Ownership** - While customers may not own all of their equipment, they do own their data. VIA has developed specialized ZKPs to verify that an energy action was actually taken. VIA mints an NFT of the ZKP. The NFT provides definitive ownership of energy data (and related decarbonization action data) to the customer.

4. **Trust** - The use of NFTs and ZKPs provide anonymity to customers and also put the control and permission for use of their data in their hands 100% of the time.

VIA is partnering with energy equipment control and building retrofit companies on the installation of the necessary hardware and distributed energy resource management systems (DERMS).

Impact

The primary impact of VIA's approach is to accelerate decarbonization. That is, increasing flexibility for grid operators increases the ability of buildings to move from natural gas and other carbon-based fuels to grid electricity as well as install electric vehicle charging stations.

In addition, VIA's Web3 approach benefits lower and moderate income communities in three ways:

- **Improve Health** - Reducing energy consumption and clean energy adoption improves air quality and reduces health problems like asthma, particularly acute in urban disadvantaged communities.

- **Save Money** - For individuals with inefficient equipment, especially the 20 million Americans nearly $1,000 behind on their utility bills, Web3 can cost-effectively reduce the consumption of inefficient equipment[1] at peak billing times and reduce bills.

- **Earn Money** - VIA's Web3 approach is strongly aligned with the White House Comprehensive Framework for Responsible Development of Digital Assets[2]. Web3 can be used as an anonymous mechanism to compensate for energy-efficiency actions by the 7 million underserved Americans without bank accounts and 24 million that rely on non-bank services.

About VIA

VIA's mission is to make communities cleaner, safer, and more equitable. Verification, integration, and analysis across multiple private data sources is a requirement to improve communities, but also costly and massively time consuming. The U.S. Department of Defense (DoD), and energy companies around the globe, trust VIA to help them solve their data challenges. Using its Web3 platform, VIA enables real-time data verification, integration, and privacy-preserving analysis of energy, environmental, and other confidential data.

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[1] [20 million American households are behind an average $788 on their utility bills](#)
[2] [FACT SHEET: White House Releases First-Ever Comprehensive Framework for Responsible Development of Digital Assets](#)