



## Electric Vehicle (EV) Fuel Mix Verification

Via Science, Inc. (VIA)

### Summary

VIA's Web3 platform verifies the fuel mix of the charge and discharge of EV batteries. Specifically, VIA's zero-knowledge proof (ZKP) provides a publicly, mathematically verifiable proof of the fuel mix. The same ZKP also maintains the privacy of the EV owner, charge and discharge details, and EV location, time, and date of charging. Uniquely, VIA's ZKPs are the first and only software verification currently being evaluated by the U.S. Department of Energy (DOE), and the U.S. Department of Defense (DoD).

### Energy Background

EV fleet owners are increasingly committed to tracking the carbon sources used by their fleet vehicles. Fleet owners, however, lack a mechanism that is both authoritative and privacy-preserving to track the fuel sources used to charge their vehicles' batteries.

In addition, EVs increasingly have the capability to discharge their batteries to buildings (vehicle-to-building or V2B) and to the grid (vehicle-to-grid or V2G). This has multiple benefits to building owners and energy companies:

- Coordinated / well-timed V2B and V2G discharging is a **source of grid flexibility**. This is extremely valuable at peak consumption times and during emergencies.
- Coordinated / well-timed V2B discharging can **reduce the electricity costs** to a building owner and / or tenants.
- V2B can be a **source of grid resiliency** against increasing extreme weather events and other grid stress-related outages, particularly in remote and underserved communities.

EV fleet owners, building owners, and transmission and energy companies are highly motivated to understand the fuel mix of energy from V2B and V2G discharge because:

- Carbon tracking has become a requirement or an organizational standard.
- Building owners and energy companies may choose to compensate EV owners differentially for V2B and V2G discharge, based on the fuel mix (carbon footprint) of the energy provided.

Verifying the fuel mix of the energy from an EV battery has significant challenges:

- EV owners and drivers may be different, therefore tracking cannot be tied to a driver-specific app.
- An EV may be charged in one location and discharged in another.
- An EV may be charged in multiple locations before a discharge.
- An EV battery state will change due to use between charging and discharging.



- EV owners preferentially, and in some regions legally, require strict data privacy and anonymity regarding the time, date, location, driving distance, etc. of their vehicles.

## Technical Background

VIA verifies EV battery fuel mix at charging and at V2B and V2G discharge times while overcoming data privacy challenges. To accomplish this, VIA leverages Web3 technologies, along with public data, and data from vehicle telemetry that is widely available in commercial fleet vehicles.

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. In addition, VIA's Web3 platform is the only blockchain with a TOP SECRET level cybersecurity accreditation from the U.S. Department of Defense.

Specifically, VIA uses ZKPs and its software derivative, zero-knowledge Succinct Non-Intrusive Argument of Knowledge (zk-SNARKs). The advantage of ZKPs is the ability to verify, in real time, valuable information without revealing any underlying data. ZKPs are already in wide use in cryptocurrency markets to verify monetary transactions between two anonymous parties without the need of an intermediary (e.g., a bank). ZKPs and zk-SNARKs are rapidly improving, largely driven by cryptocurrency use cases. To our knowledge, VIA's ZKPs are the first demonstration of ZKPs to track fuel sources in charging and in V2B and V2G.

## Solution

VIA's zk-SNARK implementation, as well as additional Web3 technologies, verify the fuel mix of energy during charging and V2B and V2G discharging. VIA's software also maintains data privacy for the EV owner regarding vehicle charging and locations and timing.

Specifically, VIA integrates vehicle telemetry and hourly U.S. fuel source data to create a zk-SNARK that enables:

- **Accurate information** required for fuel mix verification and carbon tracking
- **Independent, public, and open verification** of the accuracy of the proof
- **Secure privacy protection** of each proof to safeguard the anonymity of details (e.g., owner, location, and battery signal) of each EV

VIA's Web3 approach has an additional benefit:

- **Incentives** - By converting V2B and V2G actions into a Web3 digital asset, EV owners can be compensated in near real time for their V2B and V2G contributions, even without access to a traditional bank or providing their bank account information.

Uniquely, VIA is in process of empirically testing the accuracy, privacy, and scalability of its Web3 approach to EV fuel mix verification with DOE National Labs, as well as leading academic institutions.



## Impact

VIA's Web3 implementation is reproducible across millions of EV fleet vehicles, building owners, and energy companies in the United States.

VIA's Web3 approach is strongly aligned with the White House Comprehensive Framework for Responsible Development of Digital Assets<sup>1</sup>. Verification of EV fuel sources can also accelerate V2B and V2G adoption, and thereby increase grid resilience, particularly in underserved communities.

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## 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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<sup>1</sup> [FACT SHEET: White House Releases First-Ever Comprehensive Framework for Responsible Development of Digital Assets](#)