



Life Cycle Analysis With Blockchain Carbon Accounting

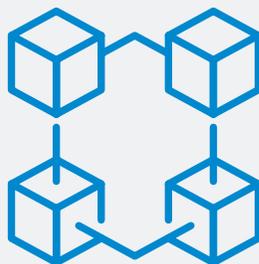
Aviation is pivoting from petroleum-based jet fuel to more sustainable energy carriers, such as low-carbon sustainable aviation fuels, hydrogen, and electricity stored in batteries. With the potential for deep reductions in life cycle greenhouse gas (GHG) emissions, these advanced energy carriers are critical to decarbonizing flight by midcentury. But with a mix of fuels, technologies, and supply chains at play, airlines, fuel refiners, regulators, and consumers need dependable and consistent methods to confidently measure progress.

Understand the Complexity in Today's Carbon Accounting

Different fuel formulas, unique sources of electricity, aging aerial vehicles, changing flight paths—calculating the carbon intensity of flight can be a moving target. Data are often only applicable to certain technologies, companies, or contexts, making carbon accounting difficult to compare and track.

What You Need To Know

- 1. Data and Model Assumptions Are Not Publicly Shared**—Methods for emissions analyses are often not public, limiting transparency and preventing robust verification.
- 2. Tools Are Inconsistent**—Carbon analysts may use different methods, note different uncertainties, or set different boundaries when conducting life cycle GHG assessments.
- 3. Results Are Not Easily Shared**—Tracking and allocating carbon savings to a broad group of stakeholders is not possible with current practices.

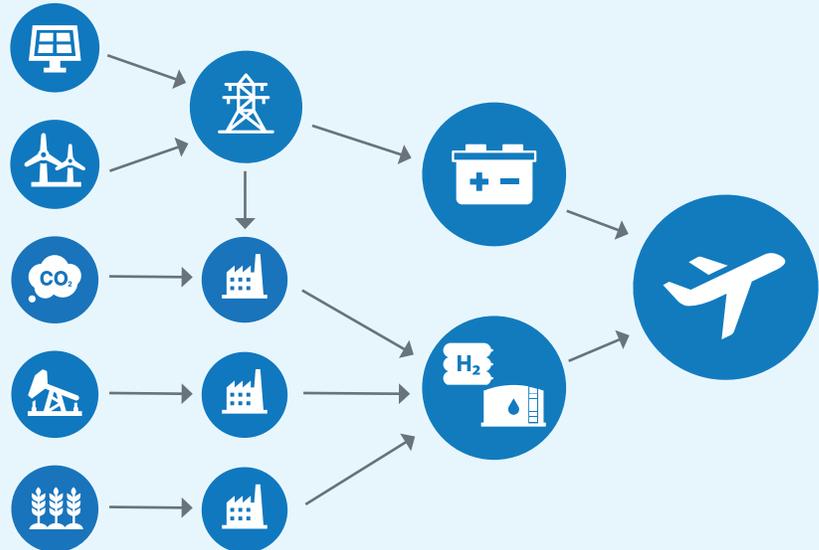


What Is Blockchain Technology?

Blockchain is a digital accounting technology used to independently verify and track transactions. Although commonly associated with cryptocurrencies, blockchain technology can be used to account for other exchanges of value, such as carbon credits.

Emissions Analysis in Action

National Renewable Energy Laboratory (NREL) researchers have conducted dozens of aviation-related life cycle GHG assessments. For example, NREL recently analyzed electric vertical takeoff and landing aircraft—helping one company quantify the carbon intensity of its technology per passenger-kilometer. The methods behind these studies are models for reporting the carbon footprint of flight as a function of aircraft manufacturing, fuel or energy production, vehicle operation, and beyond.



NREL Can Employ Blockchain for Secure, Consistent, and Transparent Carbon Accounting

When linked with the NREL's rigorous life cycle assessment methodologies, blockchain technology can enable aviation stakeholders to quantify and transact on the impacts and benefits of sustainable aviation fuels and technologies. NREL can develop high-fidelity carbon modeling tools that enable apples-to-apples comparisons across technologies, fuels, companies, and jurisdictions.

- **Linking Aviation Energy Demand With Blockchain**—NREL can connect blockchain accounting with life cycle GHG assessments as an interactive web tool, facilitating the growth of carbon trading markets.
- **Leveraging Existing Knowledge on Energy Production and Distribution**—As a leader in fuel and energy analysis, NREL can conceptualize resource inputs for detailed and robust emissions estimates.
- **Stakeholder Relationship Mapping**—As a meeting ground for aviation stakeholders, NREL can help formalize connections between unique participants in carbon chain trading.

Unlock the Benefits of NREL Analysis Expertise

- **Transparent and auditable carbon accounting** across multiple aviation energy, manufacturing, and technology pathways.
- **Accessible online tools** to measure and verify carbon intensities across the spectrum of aircraft, energy sources, and associated supply chains.
- **Consistent accounting structures** to support carbon trading and transactions, whether made by individual consumers or to support national and international standards or taxes.
- **Ability to create and assign value** to aviation stakeholders who participate in the energy production and usage chain.

Contact Us

Brett Oakleaf
Strategic Partnerships Manager
brett.oakleaf@nrel.gov
nrel.gov/sustainable-aviation