

Electricity and the chain of custody

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Mass balance and book-and-claim are important examples of chain-of-custody approaches. The mass-balance approaches include the rolling average: an average over a period is used to represent the product characteristics (e.g., recycled or bio-based content) of a physical flow where the actual content varies with time. Another mass-balance approach is the credit method, where a single physical flow is divided into parts that are assigned different characteristics. In a book-and-claim system the product characteristics are traded separately from the physical flows through certificates.

The current debate on mass-balance and book-and-claim approaches in life cycle assessment (LCA) can benefit from previous debates on location-based and market-based modelling of electricity. Location-based electricity is the annual average for a specific region. It corresponds to the rolling-average mass-balance approach, because the actual electricity mix varies from hour to hour. Market-based electricity accounts for Guarantees of Origin and other contractual instruments. It corresponds to the credit mass-balance approach or the book-and-claim approach, depending on whether the contractual instrument requires a physical grid connection.

The Environmental Footprint framework and the international standard for product carbon footprints (ISO 14067) stipulate market-based modelling. The standard on greenhouse gas (GHG) emissions from organizations (ISO 14064-1) stipulates location-based modelling and allows for the market-based approach to develop additional information, but does not specify how the additional information can be used. The Scope 2 Guidance of the GHG Protocol requires that companies present both market-based and location-based results, when they have any operations in an electricity system with contractual instruments.

Market-based electricity modelling can stimulate the expansion of renewable-energy production, but risk leading to greenwashing and double counting of renewable electricity. The consequences depend on details in the rules for market-based electricity. We discuss these challenges and give recommendations on how the standards can be harmonized