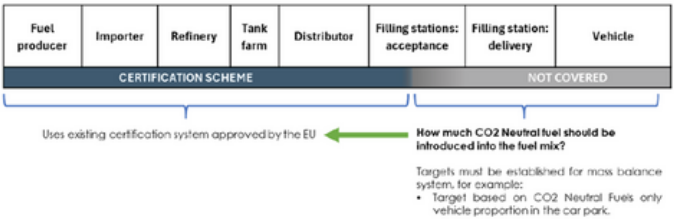
Option 9 - Mass-Balanced CNF Supply to Each CNF Vehicle (in accordance with the WGMM 2024 Report)



Description of Technology

Mass balancing is a simple and practical method for tracking CO_2-neutral fuels (CNF) across the supply chain. Its key advantage lies in leveraging the existing fuel infrastructure, eliminating the need for a dedicated CNF-specific system that could otherwise increase challenges to the adoption of CNF vehicles. This approach ensures that the amount of CNF introduced into the market matches the amount consumed, based on certified schemes under the Renewable Energy Directive (RED). Rather than requiring a direct physical link between CNF production and vehicle consumption, mass balancing allows CNF to be added to the general fuel supply system—such as pipelines, terminals, or retail stations—while still meeting the actual demand from CNF vehicles. By decoupling carbon compliance from the physical fuel path, mass balancing enables the immediate use of the entire existing fueling network. This accelerates CNF deployment and ensures that drivers can refuel anywhere without disruption. Vehicle consumption can be estimated using statistical data, such as average mileage/proportion of CNF vehicles registered. The responsibility of such a system can be at customer level e.g. with yearly compensation of the carbon footprint or at vehicle manufacturer level e.g. upfront with the purchase of a new vehicle (e.g., existing Swiss model with upfront compensation leading to immediate environmental benefits). Mass balancing can be implemented either as a transitional solution or as a long-term strategy until CNF is widely available across the EU. A robust and secure accounting system guarantees that vehicle use generates demand exclusively for CNF, delivering the same climate benefits as systems requiring direct physical supply. This system could be enhanced with digital technologies such as fuel tracking platforms, digital handshakes, and two-way communication between vehicles and fueling stations (e.g., Option 10 & 11).

Customer & Retail Perspectives

Advantages:

- European renewable energy mandate is based on this method and it's fully operational and recognized by the EU.
- It leverages existing regulations and infrastructure.
- High flexibility and scalability
- Low-cost barrier to entry
- Positive impact on legacy fleet
- Ease of Implementation and wide network coverage
- Supports gradual market transformation by integrating CNF without disrupting existing fuel supply chains
- Reduced environmental and logistical costs
- Avoids complexity in vehicles
- Industry responsibility over consumer burden
- Successful Implementation in other areas such as green electricity

Disadvantages:

- Absence of fuel usage-based penalties and offsetting if not combined with a digital tracking such as DFTS
- No physical traceability
- Certification and auditing needs
- Risk of fraud and greenwashing if not correctly audited

Regulatory Assessment

From a regulatory perspective, mass balancing is a well-established and highly efficient concept, recognized under several policies. For example, the RED and European Emission Trading System (ETS) are based on mass balancing concepts. A certification scheme along the value chain from the producer to the filling station verifies that all production and sustainability criteria are met. The EU has built the 'Union database for renewable fuels to ensure the traceability of these fuels (more information here). With careful but feasible development, the existing RED mass balancing system could be extended to enable the monitoring of CNF-only vehicles e.g. with using the Shares database. Other countries have already established mass-balancing systems to offset the carbon footprint of new vehicles like Switzerland with a crediting system for eFuels. The existing Commission proposal on a new vehicle class for CNF excludes any mass balancing approach. Therefore, the acceptance of a mass balancing system requires a policy shift, which would need to recognize the degree of security that can be achieved by the available technologies and operational methodologies. Given the efficiencies that are available, a mass balancing concept should not be neglected per se.