

Option 10 – Fuel Usage Balancing (FUB)

Description of Technology

FUB tracks every fueling event directly at the individual vehicle level and matches these amounts with certified CNF volumes in the cloud. The reported fueling amounts and corresponding certificates are recorded and voided in a Union-wide Data Base (UDB), ensuring transparency and accountability. If a vehicle falls short of meeting regulatory CNF requirements, the onboard FUB device can trigger a wide range of inducement actions to ensure compliance. This creates a robust, transparent system that guarantees carbon accountability without the need to physically trace individual fuel molecules.

While physical tracking offers conceptual clarity, a mass balancing approach still ensures verifiable carbon neutrality, with a key advantage: it eliminates the need for CNF-specific infrastructure. By decoupling carbon compliance from the physical fuel path, it allows immediate use of the existing fueling network and accelerates CNF adoption. Under this model, responsibility for carbon compliance shifts from vehicle manufacturers to the end-users – the motorists – who purchase CNF certificates corresponding to their fuel consumption. This is a positive paradigm shift: it aligns accountability with control, empowering those who actually consume the fuel to drive demand for carbon-neutral alternatives. The software platform (UDB) enables this by tracking fuel usage, verifying certificate matching, and interacting with the CNF registry to void certificates upon use.

It also lays the foundation for a functioning CNF marketplace, where fuel producers or trading platforms can offer competitively priced CNF and certificates to the motorists. Unlike models that credit manufacturers for upstream CNF production – which lacks a direct link between compliance and actual fuel use – this approach ensures verified emissions reductions by embedding compliance into each fueling event. Manufacturers retain full control over their fleet CO₂ targets by programming vehicles with CNF minimum usage requirements according to their needs.

This creates a new vehicle class – compliant by design – that ties regulatory goals, user responsibility, and fuel sourcing into one system, enabling a functioning, self-reinforcing market for CNF.

Customer & Retail Perspectives

Advantages:

- End-User Focus
- Penalty Indications
- Fuelling History Storage
- Compatibility with Inducement Systems
- Virtual CNF Credits for Sustainability Reporting
- Regulatory Geofencing
- Transparency for Drivers
- Potential for Retrofitting Older Vehicles
- Integration with Connected Services
- Incentives for Early Adoption
- No Need for Fuel Infrastructure Modifications

Disadvantages:

- Special attention regarding vulnerability to data latency and transmission failures necessary.
- Increasing effort to reduce susceptibility to system failures by multi trust centre approach
- Data privacy and GDPR compliance as for all digital systems demands special care
- Limitations in EU's external border fuelling flexibility if implemented without regulatory geofencing

Regulatory Assessment

This method ensures carbon neutrality by monitoring CNF usage through transaction-based tracking rather than physical fuel composition verification. Using life-cycle analysis principles, similar to RED methodology, it focuses on the CO₂ intensity of the fuel used. Software and cloud services require cybersecurity measures and fraud resistance. New digital protocols and standards might be developed to ensure accuracy and transparency, and an online connection is required for real-time tracking and validation.

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