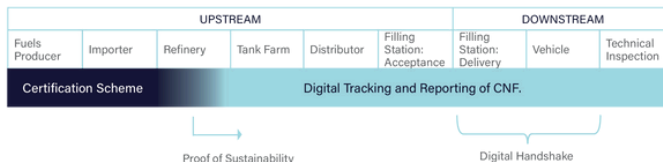# Option 3 – 100% Digital Fuel Tracking System from Upstream to Downstream (DFTS w/ Digital Handshake)

Description of Technology

Digital twins (DFTS) are already used in other industrial systems, and their application in fuels offers secure digital tracking and ledger accounting of CO_2-neutral fuel (CNF) across the fuel supply system and in-vehicle operation. DFTS allows fast onboarding by utilizing existing data from the RED II framework in fuel supply infrastructure and vehicles. It digitalizes the entire fuel supply chain, from production to the end consumer, enabling stakeholders to utilize CNF as a new fuel variant with digital certification. DFTS tracks CO_2 and certifies sustainability reports along the supply chain, pairing the vehicle with the fuel supply through a digital handshake. It also incorporates a fuelling monitor in the vehicle, confirms CNF use for CNF-only vehicles, and ensures robustness with plausibility checks. DFTS provides end-to-end fuel tracking, transparency in sustainability, and the ability for inducement reactions if CNF is not detected. It also allows authorities to access consumer data and enables flexible responses in emergency situations.

Customer & Retail Perspectives

Advantages:

- Technology availability and fast implementation
- Cost efficiency
- Ease of use and high customer acceptance
- Data security and compliance
- Enhanced monitoring (extended information transfer beyond simple yes/no information is possible) and flexibility mechanisms
- Regulatory geofencing capability
- Future-ready and scalable applications
- Enables real-time emissions auditing and compliance reporting for fleet operators and regulators

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

- Limited infrastructure availability initially
- Dependence on continuous internet connectivity may create accessibility issues in remote or underserved regions

Implementation requirements:

- Reliable datalink between stations and central host
- Qualified filling stations
- Legislative definition of penalty enforcement

Regulatory Assessment

The Cyber Resilience Act (CRA) and the NIS2 Directive apply to the cyber security of data along the value chain (data, storage, back-end). NIS2 Annex I "High Criticality Sectors, 1.) Energy"; may need to be amended to include a new category "Renewable Fuels" in addition to the existing categories of oil, gas and hydrogen. Regarding the cybersecurity of in-vehicle data, Regulation (EU) 2024/1257 requires vehicle manufacturers to ensure the secure transmission of emissions-related data by implementing cybersecurity measures in accordance with UN R155. UN R155 refers to ISO/SAE 21434 and takes a risk-based approach. It requires the OEM to implement and process a risk assessment as part of a Cyber Security Management System (CSMS). UN R156 regulates software updates and Software Update Management Systems (SUMS). From a vehicle type-approval perspective, Regulation (EU) 2024/1257 should be amended to extend rules on data access, data communication and data protection against misuse and manipulation to DFTS-relevant data. Fuel-related data should be made available to vehicle users in a similar way to environmental data. The planned new implementing regulation of Regulation (EU) 2024/1257 for the type-approval of CNF vehicles must remain technology-neutral in order to allow for the possibility of monitoring the use of CNF by means of a digital device capable of communicating with the refuelling station (DFTS). The implementing regulation should describe an appropriate trigger system that would be activated in case of non-CNF refuelling.