

Alternative fuel infrastructures for heavy-duty vehicles

Anouk van Grinsven and Matthijs Otten
CE Delft

Structure of the presentation

- 1. Aim, scope and approach of study**
- 2. Current state of technology**
- 3. The AFIR proposal**
- 4. Assessment of the proposal**
- 5. Barriers and enablers**
- 6. Policy recommendations**

1. Aim, scope and approach of study

Aim

- To provide insight in the **current status of technology** and the expected **need for infrastructure** in relation to the **proposal for an Alternative Fuel Infrastructure Regulation** (hereafter: AFIR).

Scope

- Heavy-duty vehicles, in particular trucks.
- Wide range of alternative fuels.

Approach

- Desktop study, case study analysis and stakeholder interviews (10).

2. Current state of technology

Vehicles and fuels

- **Battery Electric Trucks (BET):** All Original Equipment Manufacturers (OEMs) have models ready to enter the market.
- **Fuel Cell Electric trucks (FCET):** likely to become commercially available after 2025 by some of the Original Equipment Manufacturers (OEMs).
- **Liquefied Natural Gas (LNG) trucks:** mature technology and commercially available.
- **Biofuels:** Already commercially available.
- **E-fuel:** Not expected to play a significant role before 2030.

2. Current state of technology

Infrastructure

- Currently, **only minimal publicly accessible refuelling and recharging infrastructure.**
- **Electricity:** Charging systems up to 350 kW are already available for battery electric trucks (BETs), while Megawatt Charging Systems (MCS) are in development.
- **Hydrogen:** Compressed hydrogen refuelling stations are available in an early phase of commercialization, while liquid hydrogen fuel stations are not yet available.
- **Electric Road Systems:** ERS as a charging concept for BETs are only in the pilot phase.
- **LNG:** almost full minimum level of infrastructure realized.
- **Biofuels** can be used in existing infrastructure.

3. The AFIR Proposal

Binding distance-based targets

- Distance-based targets for electric recharging infrastructure and hydrogen refuelling infrastructure.
- Other indicators (like fleet-based targets) less suitable due to the long distances and transboundary nature of international goods transport.
- TEN-T network good starting point for roll-out: high traffic intensity of long-distance trucks.

3. The AFIR Proposal

Locations

- Along the TEN-T core and comprehensive networks.
- At urban nodes.
- Safe and secure parking areas.
- Freight terminals (for hydrogen).

Technical requirements

- Minimum power output for charging infrastructure.
- Minimum pressure level requirements and minimum daily capacities for hydrogen infrastructure.

4. Assessment of the proposal

Number of charging/ refuelling facilities

- The AFIR proposal sets targets for a **minimum** of infrastructure to allow BETs and FCETs to circulate through the EU. Authorities should monitor whether the minimum is sufficient.
- The market should further develop the required infrastructure based on demand.
- The targets for 2030 in the AFIR proposal correspond to a total of **17,314 charging points** and **728 hydrogen refuelling stations (HRS)** (Own calculation based on targets in AFIR proposal).

4. Assessment of the proposal

Number of charging/ refuelling facilities

- Two studies (T&E and ACEA) expect a considerably higher (**42,000-85,000**) number of charging points needed.
- To allow circulation through the EU, the **proposed minimum number of charging points at overnight parking areas seems low (factor 10 or lower)** as compared to the expected required charging points.
- Studies expect similar **numbers of HRSs**, but with a **higher daily capacity** per station as compared to the minimum requirements from the AFIR proposal.

4. Assessment of the proposal

Recharging and refuelling technology

- Along the TEN-T corridor, several studies recommend higher minimum levels of power output (**>500 kW instead of 350 kW**) to allow full recharging within 30-45 minutes resting time. The sector itself is also working on higher power output levels (1 MW and above).
- In urban nodes the studies recommend higher minimum levels of power output (**>350 kW instead of 150 kW**).
- Liquid hydrogen target is ambitious: **350 and 700 bar** dispensers and internal tank systems are already in use. **Liquid hydrogen** for road transport is still in the early phase of development (to be piloted).

5. Barriers and enablers

- Main barriers covered in the Commission's strategic roll-out plan:
 - Technical barriers relating to standardisation.
 - Grid-related issues.
 - Operational barriers (information provision, payment systems and development of a data governance framework).
- Funding mechanisms need to increase investment security and help cover additional costs.
- Efficiency and effectiveness of these actions depend not only on the European Commission, but also on the decisiveness of Member States, local authorities and stakeholders.

6. Policy recommendations

Design of the AFIR proposal

- Increase the minimum levels of power output along the TEN-T corridors and in urban nodes.
- Introduce indicative rather than binding targets for liquid hydrogen.
- Increase the minimum requirement of charging stations at safe and secure (overnight) parking areas dedicated to heavy-duty vehicles.

Grid impacts

- Further investigate the **grid impacts** of the additional power production implied by the 'Fit for 55' policy proposals.
- The AFIR proposal does not contain projections for **the cost of grid adjustments**, in addition to those for recharging and refuelling points. Insight in these costs will be helpful.

6. Policy recommendations

Implementation of the AFIR proposal

- There is only **limited time for testing and revising national policies and revision of the AFIR before 2030**. One option would be to adjust the timeline for the national policy frameworks (and reporting) to earlier dates.
- **New emerging technologies** and their links with **data governance** issues and **new communication technologies** need to be followed closely because of the possibility of **new barriers** arising. This will also require **flexibility** on the part of policy makers to swiftly reply to these developments.
- Provide **sufficient support to local authorities** not only financially, but also organisationally and in terms of knowledge, since progress will depend to a major extent on procurement procedures.

Contact details

- Anouk van Grinsven, grinsven@ce.nl
- Matthijs Otten, otten@ce.nl