ACEA Position Paper

Heavy-duty vehicles: Charging and refuelling infrastructure requirements

May 2021
KEY MESSAGES

a. **European truck and bus manufacturers are fully committed to reaching carbon neutrality in road freight transport by 2050 at the latest.** New low- and zero-emission vehicles – with battery electric and hydrogen-powered vehicles being the key technologies – are beginning to hit the market and will fast become the backbone of road freight transport.

b. **By 2025 approximately 40,000 battery electric medium-duty and heavy-duty vehicles will be in operation in Europe (EU27 + UK).** By 2030 this figure will increase to approximately 270,000.

c. **The first hydrogen fuel-cell electric vehicles are already being rolled out in Europe.** From mid-decade the vehicle offerings will increase significantly, reaching at least 60,000 trucks in operation by 2030.

d. **Today, the charging and refuelling infrastructure necessary for zero-emission heavy-duty vehicles is almost completely lacking.**

e. The review of the Alternative Fuels Infrastructure Directive (AFID) should set dedicated and binding infrastructure targets on European and member state levels.

f. **For battery electric heavy-duty vehicles**, a target of 10,000-15,000 (higher-power) public and destination charging points should be set for no later than 2025, and a target of 40,000-50,000 charging points for no later than 2030. In addition, a target of at least 40,000 lower power (100 kW) public overnight chargers at truck parking areas along the highways should be set for 2030.

g. **For hydrogen-powered heavy-duty vehicles**, there should be a target of around 300 truck-suitable hydrogen refuelling stations by 2025, and at least 1,000 no later than 2030.

h. **For alternatively-fuelled vehicles** running on fuels with a high renewable share, such as the gas-powered vehicles with renewable fuels that are already part of the vehicle fleet today, continued support should be given to develop the right infrastructure.

i. **For swift implementation**, the revised AFID should be changed into a directly applicable regulation, rather than a directive.

j. In addition to AFID, an **effective financial framework** should be established to
INTRODUCTION
Climate change is at the top of the agenda of the commercial vehicle industry as the most fundamental challenge for humanity and the global economy. To achieve carbon neutrality, greenhouse gas emissions from all sectors, including road freight transport, must be cut decisively and fast.

European truck manufacturers have expressed their full commitment to reaching carbon neutrality in road freight transport by 2050 at the latest\(^1\). Low- and especially zero-emission vehicles will play a crucial role in reaching this target. At the same time, the decarbonisation of all energy carriers used in road transport must be addressed by the EU and all member states in order to make the sector truly carbon neutral. This is valid not only for the new energy carriers (electricity and hydrogen), but also for those currently in use (liquid and gaseous fuels) which will continue to play a role in heavy-duty road transport.

Nonetheless, new powertrain technologies, with battery electric and hydrogen-powered vehicles being the key zero-emission technologies, will fast become the backbone of road transport. Reliable and efficient low- and zero-emission vehicles are already beginning to hit the market. As all heavy-duty vehicle manufacturers have either started or are ramping up the series production of new powertrain trucks and buses, their numbers and range will increase rapidly over the next few years.

Already by 2025, approximately 40,000 battery electric medium- and heavy-duty vehicles will be in operation in Europe (EU27 + UK). By 2030 this figure will increase to approximately 270,000.

The first hydrogen fuel-cell electric vehicles are already being rolled out in Europe\(^1\); From mid-decade the vehicle offerings will increase significantly, with at least 60,000 trucks expected to be in operation by 2030. These will be mainly used for long-haul and high payload transport. However, the infrastructure that is indispensable to operate, charge and refuel these trucks is almost completely missing.

Publicly accessible charging and refuelling stations will be needed, and indeed are the focus of AFID.

---

At the same time, private infrastructure is just as important for the market uptake of zero-emission vehicles. Widespread market deployment of new powertrain vehicles will not be possible if a sufficiently dense network of charging and refuelling stations that are specifically suitable for heavy-duty vehicles is not available.

The technical specifications of charging and refuelling infrastructure for heavy-duty vehicles differ significantly from those for passenger cars. Because of their significantly higher power and energy demand, heavy-duty vehicles cannot use infrastructure for passenger cars. The issue must therefore be addressed urgently, and all stakeholders and policymakers must take action to ensure a rapid infrastructure roll-out.

The review of the Alternative Fuels Infrastructure Directive (AFID) presents a crucial opportunity to set dedicated and binding infrastructure targets on the European and member state level for low- and zero-emission heavy-duty vehicles. It must be revised to take account of the requirements of heavy-duty vehicles and to facilitate the swift roll-out of a dense charging and refuelling network across all European member states.

In April 2020, ACEA published a first detailed assessment of the charging and refuelling infrastructure requirements of heavy-duty vehicles\(^2\). This assessment was based on the understanding of the regulatory framework and technology development at the time. In the meantime, some key factors have evolved. With this revised position paper, ACEA is updating its position to take account of recent developments. While key elements of the ACEA position remain unchanged and valid, adjustments have been made especially to reflect a faster deployment of battery electric trucks in the timeframe until 2025. In addition, as the rapid roll-out of high-power charging points is absolutely crucial, the (lower-power) overnight chargers are now displayed separately. When it comes to heavy-duty vehicles, AFID should focus on the roll-out of high-power charging points.

**PUTTING THE INFRASTRUCTURE IN PLACE**

Today, the vast majority of heavy-duty vehicles in operation across Europe run on diesel (97.8% of trucks; 94.5% of buses), as it is the most convenient and affordable energy carrier for professional transport operators. So far, only a negligible number of low- and zero-emission trucks are in operation, as the pie charts on the next page show.

---

EU truck fleet by fuel type

% SHARE / 2019

EU bus fleet by fuel type

% SHARE / 2019
However, this picture will change dramatically over the next few years, when a swift market uptake of low- and especially zero-emission vehicles is expected. On average, at least 5% of heavy-duty vehicle registrations will be zero-emission by 2025. This will increase to at least 20% by 2030.

Three powertrain technologies will drive the transition:

- Battery electric vehicles;
- Hydrogen-powered vehicles, such as hydrogen fuel cell electric vehicles;
- Alternatively-fuelled vehicles, such as gas-powered vehicles running on low- and zero-carbon renewable fuels.

1. Battery electric heavy-duty vehicles (BEV)

Key recommendations

- The revised AFID should set a target of 10,000-15,000 (higher-power) public and destination charging points no later than 2025, and 40,000-50,000 charging points no later than 2030.
- In addition, a target of at least 40,000 lower power (100 kW) public overnight chargers at truck parking areas along the highways should be set for 2030.
- To ensure that the necessary number of charging points are available by 2025 and 2030 in all EU member states, binding targets should be set per member state according to the proposed methodology.
- To take account of the substantially higher power demands of heavy-duty vehicles, three power categories should be defined: below 350 kW, 350-500 kW and above 500 kW.

Rationale and justification

Battery electric vehicles (BEV) are the first zero-emission technology hitting the truck market. The current regulatory framework, especially the CO2 emission standards regulation (EU) 2019/1242, is effectively triggering manufacturers to focus on the deployment of these vehicles, especially in the long-haul segment. Accordingly, ACEA estimates that already by 2025, approximately 10,000 medium-duty trucks (3.5t-16t GWV) and 30,000 heavy-duty trucks (>16t GWV) will be in operation in Europe (EU27+UK). By 2030, the fleet will grow to approximately 70,000 medium-duty and 200,000 heavy-duty trucks. These can be considered minimum estimates, as the technology strategies of the different manufacturers differ and the impact of further changes to the regulatory framework (eg the European Green Deal) has not been considered.

Because heavy-duty trucks and buses are business tools run by professional transport operators, the shift to zero-emission vehicles must be driven by demand and affordability. Transport operators will only invest in battery electric trucks if their total costs of ownership are competitive compared to conventionally-powered vehicles, and if operators have full confidence that they can operate and charge the vehicles to fulfil their transport missions. Charging the expected vehicle fleet will...
require 10,000-15,000 (higher-power) public and destination charging points\(^3\) no later than 2025, and 40,000-50,000 charging points no later than 2030 in EU27 + UK.\(^4\) The large majority of these must be high-power (>500 kW) chargers.

Three power categories for heavy-duty vehicle charging (eg below 350 kW, 350-500 kW and above 500 kW) should be established.

The table below shows a possible share of the required charging points in the different power categories to enable the operation of the expected vehicle fleet.

<table>
<thead>
<tr>
<th>Public and destination charging points (EU27 + UK)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>DC &lt;350 kW (CCS)</td>
</tr>
<tr>
<td>DC 350 kW (CCS)***</td>
</tr>
<tr>
<td>DC &gt;500 kW (MCS)</td>
</tr>
</tbody>
</table>

\(^*\) As of May 2021

\(^**\) Required overnight chargers if charging points with 350/>500KW are not equipped to deliver lower-power at night or overnight parking is not possible

\(^***\) These should allow upgrades to megawatt charging (MCS, >500 kW) as soon as standard definition is available

In order to enable long-haul operations, high-power charging stations with at least 350 kW – but focussing on megawatt charging (MCS) above 500 kW – must be rolled-out. The technical specifications of MCS are currently being defined but it needs to be highlighted that the operation of long-haul battery electric trucks will require this level of high-power charging. The revised AFID should require at least one high-power charging station with a minimum of four charging points every 100 km by 2025, and at least one site every 50 km by 2030 on the TEN-T core network. At least one charging point per station has to be accessible for coaches.

Long-haul battery electric trucks, when travelling long distances, will not always return to base for overnight charging. The revised AFID should therefore set targets for deploying lower power (100 kW) public overnight chargers at truck parking areas along the highways, with at least 40,000 overnight public chargers in 2030.

\(^3\) Charging points at ‘destination’ are located at logistic hubs or at private companies where trucks are loaded and unloaded.

\(^4\) As the UK is one of the biggest (and largely integrated) markets in Europe, full interoperability must be ensured. According to ACEA estimations, at least 8,000 high-power charging points will be necessary in the UK.
In addition, every battery electric truck will require a (lower-power) depot charging point, ie 40,000 depot charging points should be installed no later than 2025, and 270,000 charging points no later than 2030. Transport operators, especially those who invest early in the new technologies, should be incentivised and rewarded for their infrastructure investments with meaningful and targeted support.

**Targets per member state**

Binding targets per member state will be required to ensure that the total of 10,000-15,000 charging points in 2025 and 40,000-50,000 charging points in 2030 become available across the EU.

ACEA proposes to set targets per member state based on a fair, simple and transparent methodology which takes account of the share of new vehicle registrations and weighted according to national GDP and average mileage (each compared to EU level). Accordingly, the following targets should be set for 2025 and 2030.

**Charging points in the EU27 + UK ► 15,000 in 2025**
Charging points in the EU27 + UK ➤ 50,000 in 2030

Methodology

The number of public charging points per member state (PCPᵢ) is defined as follows for both 2025 and 2030:

$$CPᵢ = αᵢ \times T$$

where:

T is number of charging points needed in the EU27 in 2025 and 2030.

$$αᵢ$$ is the allocation key of member state i, defined as:

$$αᵢ = \frac{Rᵢ}{R_{total}} \times GDPfactorᵢ \times \frac{VMᵢ}{VM_{average}}$$

with:

Rᵢ are the number of trucks newly registered in country i,
R_{total} is the total number of trucks newly registered in the EU,
GDPfactor is 1 when the GDP per capita in a country is between 0.75 and 1.25 of the average GDP per capita, 1.25 when it’s above 1.25 of the average GDP per capita and 0.75 when it is below 0.75 of
the average, 
VMᵢ is the average vehicle mileage in country i, 
VMaverage is the average vehicle mileage in the EU, 
αᵢ is average over the period 2015-2019 for more robustness.

2. Hydrogen-powered vehicles

Key recommendations
- The revised AFID should set a target of around 300 truck-suitable hydrogen refuelling stations by 2025, and at least 1,000 no later than 2030.
- In addition, a target should be set to ensure one hydrogen refuelling site is available every 200 km on the TEN-T core network by 2030.
- A hydrogen refuelling station for trucks should have a minimum daily capacity of at least six tonnes of H₂ with at least two dispensers per stations. The technical specifications and the target should be reviewed and, if necessary, adjusted in 2025.
- To ensure that the necessary number of refuelling stations are available by 2025 and 2030 throughout the EU, binding targets should be set per member state according to the proposed methodology.

Rationale and justification

The first hydrogen fuel cell electric vehicles are already in operation in Europe. Several truck manufacturers have announced the series production of hydrogen fuel cell electric trucks from the mid-2020s, hence the vehicle offerings are expected to increase significantly in just a few years, reaching at least 60,000 vehicles in operation by 2030.

Fuel cell electric trucks are particularly suitable for high payloads and long-haul operations. They will likely mainly replace tractors, which make up one third of the heavy-duty fleet in operation today but contribute to about two thirds of the overall road freight transport performance⁵.

Accordingly, the revised AFID must address the refuelling needs of hydrogen-powered heavy-duty vehicles by setting a target around 300 truck-suitable hydrogen refuelling stations by 2025, and at least 1,000 no later than 2030. In addition, a target should be set to ensure one hydrogen refuelling site is available every 200 km on the TEN-T core network by 2030. The minimum distance between two hydrogen refuelling stations should guaranteed in both directions.

A hydrogen refuelling station for trucks should have a minimum daily capacity of at least six tonnes of H₂ with at least two dispensers per station. Both compressed hydrogen at 350bar and 700bar, as

⁵ According to Eurostat about 4.3 million rigid trucks (>3.5t GVW) deliver 500 billion tkm compared to 2 million tractors which deliver 1,000 billion tkm. https://ec.europa.eu/eurostat/web/main/data/database
well as liquefied hydrogen refuelling technology should be considered.

| Publicly-accessible hydrogen refuelling stations for HDVs (EU27 + UK) |
|-----------------------------------------------|---------|---------|---------|
| Current availability | Needed by 2025 | Needed by 2030 |
| H2 stations (compressed, liquified) | 0* | 300 | 1,000 |

* Currently 6 truck-suitable hydrogen refuelling stations (350 bar) are in operation in Switzerland; 2 more are in planning phase

**Targets per member state**

In order to ensure the infrastructure roll-out across all member states, the EU target should be broken down to national targets following the same transparent approach as for BEVs, based on the share of new vehicle registrations and weighted according to national GDP and average mileage (each compared to EU level).

**Hydrogen refuelling stations (HRS) in the EU27 + UK ➤ 300 in 2025**
3. Alternatively-fuelled vehicles (low- and zero-carbon renewable fuels)

Key recommendations

- Alternatively-fuelled vehicles operated with low- and zero-carbon renewable fuels will play a crucial role in the transition towards the full decarbonisation of the road freight transport sector. The revised AFID should therefore continue to support the infrastructure development for fuels that offer the potential of a high renewable share.
- In order to support efficient long-haul and interregional transport and to serve a growing presence of low-emission vehicles in Europe, a more comprehensive network of CNG and LNG filling stations is needed.

Rationale and justification

Thousands of alternatively-fuelled trucks are already part of the vehicle fleet today, making a contribution to lowering CO2 emissions from road freight transport. These vehicles will continue to play an important role in the transition to carbon neutrality, especially considering the CO2 reduction potential of low- and zero-carbon renewable fuels.

While truck-specific public fuelling stations for compressed natural gas (CNG) and liquified natural gas (LNG) are currently available in some member states, their distribution is still patchy across the
Today’s LNG infrastructure mainly supports regional-haul operations in countries with filling stations. In order to support efficient long-haul and interregional transport, a more comprehensive network of LNG filling stations is needed.

<table>
<thead>
<tr>
<th>Publicly-accessible gas stations for HDVs (EU27 + UK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently available</td>
</tr>
<tr>
<td>CNG stations</td>
</tr>
<tr>
<td>LNG stations</td>
</tr>
</tbody>
</table>

### POLICY RECOMMENDATIONS

- The ambition level for charging and refuelling infrastructure set in AFID must be aligned with the ambition level of the Green Deal, and especially the CO2 emissions targets for heavy-duty vehicles. For swift implementation, the revised AFID should be changed into a directly applicable regulation rather than a directive.

- **Dedicated and binding infrastructure targets on European and member state levels** must be set to create a clear and harmonised pathway for infrastructure deployment, independent of national agendas. Dedicated targets should be set for:
  - Charging stations for battery electric heavy-duty vehicles;
  - Hydrogen-powered vehicles;
  - Alternatively-fuelled vehicles.

- **A mid-term review should be initiated in 2024** to provide a sound reality-check of the actual market situation and infrastructure roll-out, and to allow heavy-duty specific technical requirements and targets to be adjusted.

- An **effective financial framework is needed to accelerate the infrastructure roll-out** for low- and zero-emission vehicles. Especially in this early stage, meaningful incentives should be provided to support investments in public, publicly accessible (destination) and private charging and refuelling stations for trucks and coaches. Support should also be granted to help transport operators adjust their operations to new powertrain vehicles, wherever necessary.

- **Adequate medium-term planning of the deployment of the electricity grid** and upgrades will be essential to limit system costs and accelerate the deployment of charging infrastructure. The revision of the TEN-E network will need to be coordinated with TEN-T investments in charging infrastructure to ensure that when a truck parking site is built or renovated, notably along the...
highways, the grid connection is future-proof and sufficient for future heavy-duty vehicle charging demand.

- Although the infrastructure requirements for heavy-duty vehicles differ substantially from those for passenger cars, all activities and preparations aimed at **setting up charging and refuelling stations for passenger cars** should also be aligned with – and wherever possible include an extension to – heavy-duty vehicles.
ABOUT THE EU AUTOMOBILE INDUSTRY

- 14.6 million Europeans work in the auto industry (directly and indirectly), accounting for 6.7% of all EU jobs.
- 11.5% of EU manufacturing jobs – some 3.7 million – are in the automotive sector.
- Motor vehicles account for €440.4 billion in taxes in major European markets.
- The automobile industry generates a trade surplus of €74 billion for the EU.
- The turnover generated by the auto industry represents over 7% of EU GDP.
- Investing €60.9 billion in R&D annually, the automotive sector is Europe’s largest private contributor to innovation, accounting for 29% of total EU spending.

ACEA MEMBERS

ACEA represents the 15 major Europe-based car, van, truck and bus manufacturers

www.acea.be
+32 2 732 55 50
communications@acea.be

twitter.com/ACEA_eu
linkedin.com/company/ACEA
youtube.com/ACEAeu