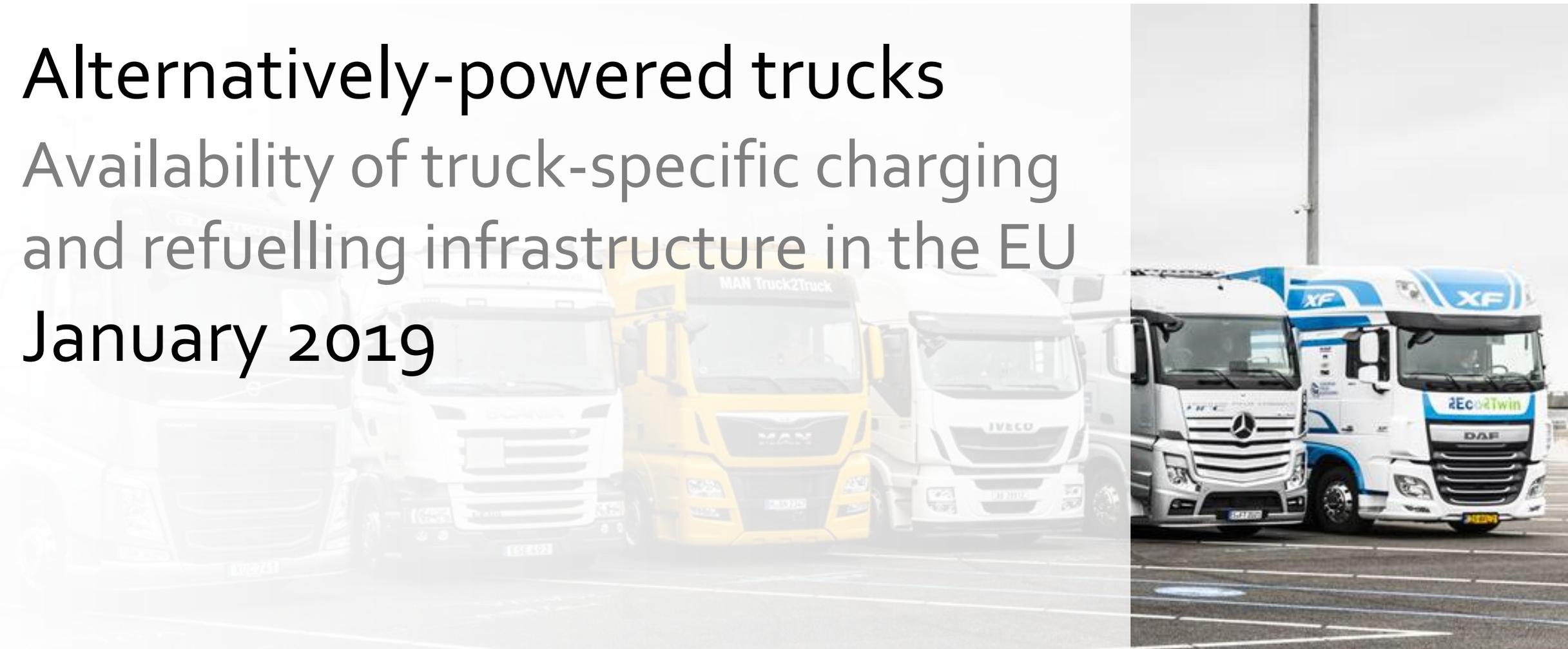


Alternatively-powered trucks

Availability of truck-specific charging
and refuelling infrastructure in the EU

January 2019



CURRENT AVAILABILITY AND CHALLENGES

- **The EU CO₂ targets proposed for trucks will require a rapid and large-scale market uptake of alternatively-powered vehicles**
- **However, the required truck-specific charging and refueling infrastructure is simply not available today**
 - So far, the European Commission has set infrastructure deployment targets (Directive 2014/94/EU), but these only apply to filling stations / charging points for cars and vans – not those for heavy-duty vehicles (except for LNG)
- **Heavy-duty trucks cannot use infrastructure for cars**
 - Because of their significantly higher power and energy demand, as well as the many parking spots required along all major routes in Europe
 - If an electric truck was to use car infrastructure, it could take days to recharge!

CURRENT AVAILABILITY AND CHALLENGES

- **Moreover, standards for 'high-power charging' by trucks (DC >500 kW) do not even exist yet and have to be developed first**
- **A clear political action plan to roll out truck-specific infrastructure across the EU is completely lacking today**
 - Yet, the widespread availability of dedicated charging and refueling infrastructure for trucks is the most basic prerequisite for achieving the market uptake of the alternatively-powered trucks required to meet the CO₂ targets

In other words, the proposed truck CO₂ standards cannot be achieved as long as the necessary infrastructure for zero- and low-emission vehicles is missing!

ELECTRIC TRUCK INFRASTRUCTURE

 Electricity	Status of infrastructure				Public charging points	
	Not available	Initial	Developing	Mature enough	Available in 2018	Required by 2025/2030 ¹
DC 150-500 kW charging points					0	20,000
DC >500 kW charging points along motorways					0	6,000

- High-power charging points of up to DC 350 kilowatt (kW) are being rolled out across the EU for passenger cars, but cannot be used by trucks
- Long-haul trucks require at least 6,000 points of >500 kW along EU motorways
 - Because there is not even a standard for these plugs today, not a single charging point exists nor is there any EU political action plan in place

¹ Assuming that every battery-electric truck will also have the possibility to charge at depot, otherwise more needed

HYDROGEN TRUCK INFRASTRUCTURE

 Hydrogen	Status of infrastructure				Public stations	
	Not available	Initial	Developing	Mature enough	Available in 2018	Required by 2025/2030
cH₂ stations (compressed 350/700 bar)					<10¹	500
LH₂ stations (liquefied hydrogen)					0	500

- H₂ filling stations for cars cannot be used by trucks, given that the pressure storage is too small to meet the H₂ demand of trucks
- Long-haul trucks require high pressure H₂ (700 bar) or liquefied H₂ for long distances
 - These filling stations simply do not exist, nor is there a political action plan in place

¹ Only 350 bar, mainly for buses

NATURAL GAS TRUCK INFRASTRUCTURE

 Natural gas	Status of infrastructure				Public stations	
	Not available	Initial	Developing	Mature enough	Available in 2018 ²	Required by 2025/2030
CNG stations					200	500
LNG stations¹					155	At least 1,000³

- Truck-specific public filling stations for compressed natural gas (CNG) and liquefied natural gas (LNG) are currently available in some EU member states, but their distribution is still very patchy across Europe
- CNG refuelling mainly takes place at depot stations

¹ LNG stations also enable the distribution of liquid biogas, 10bcm is required to support the LNG truck fleet in 2030

² Sources: <https://www.ngva.eu/stations-map/> and <https://www.gie.eu/index.php/gie-publications/maps-data/gse-storage-map>

³ NGVA Europe roadmap 2030

ANNEX I: ASSUMPTIONS

- **These (conservative) infrastructure estimations are based on the following assumptions**
 - Industry estimates of electric charging points consider a ramp-up scenario ending up with **8% of all new truck sales being battery electric vehicles (BEVs) with a gross vehicle weight (GVW) greater than 16t (heavy-duty trucks) and 15% of new sales being BEVs with a GVW less than 16t (medium-duty trucks).**
 - This would lead to approximately **110,000 BEVs in operation in the EU28 in 2030.**
 - Industry does not believe that this is achievable by 2025 (and is quite ambitious even for 2030) given the current market conditions, **but** these numbers are even far below the target of 20% zero-emission vehicles (ZEVs) in 2030 as proposed by the European Parliament.
 - For that reason, we have set our assumptions for the 2025/2030 timeframe since the infrastructure has to be built up in advance. Our calculations consider a high utilisation rate per charging point (lower utilisation naturally would require even more charging points).
 - In other words, if the ambition levels proposed by the European Parliament would come into effect, these assumptions are too conservative.

ANNEX I: ASSUMPTIONS

- **Overall assumptions**

- Focus on medium-duty vehicles (>3.5t GVW to 16t GVW) and heavy-duty vehicles (>16t GVW) in the EU28.
- For high-power charging, >500 kW is needed to significantly reduce charging time below one hour. This is beyond today's state-of-the-art technology.
- Estimated charging point numbers do not include non-public charging points (eg at depot stations), but here it is **assumed that all trucks can use depot charging** (if not, the number of required public charging points would be much higher).
- Plug-in hybrids are not considered here.

- **Charging point assumptions**

- Charging points of 150-500 kW are used by medium-duty vehicles and heavy-duty vehicles (regional delivery). Heavy-duty vehicles (long haul) will only use them for overnight charging.

ANNEX I: ASSUMPTIONS

- Charging points along motorways (>500 kW) are only used by heavy-duty vehicles (long haul), both during day and night-time.
 - Maximum distance between points: 100 km (for >500 kW) and 50 km (for 150-500 kW).
 - Approximately **8 charging points at each high-power charging (HPC) station along motorways**, leading to at least a **6 MW peak-power** installation.
 - Approximately **15 charging points at each HPC station with 150–500 kW**, leading to at least a **3 MW peak-power** installation.
- **Charging interval assumptions**
 - **Every truck charges at a depot** once a day, while heavy-duty, long haul trucks charge at depot stations every second day.
 - **Every heavy-duty vehicle for long-haul use has to charge once a day along motorways** (during daytime). In addition, every second heavy-duty vehicle also needs to charge at night-time.
 - Heavy-duty and medium-duty vehicles for regional delivery charge at depot stations. In addition, every second vehicle also charges at public charging points.