

The Road Ahead

What are the enabling conditions and actions required to electrify heavy transport?



KEMPOWER

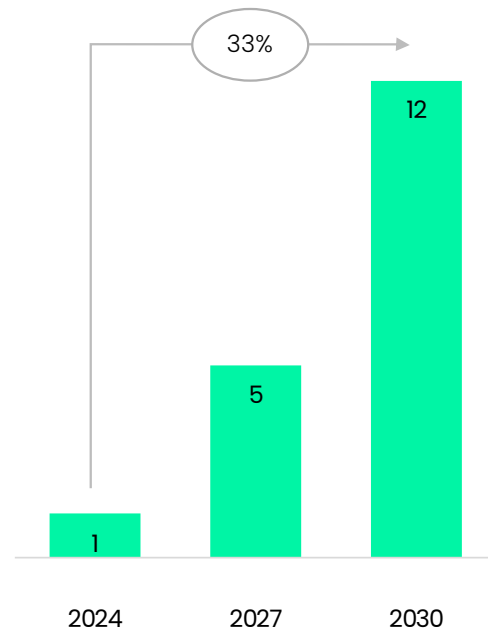


Commercial fleet electrification is just starting

Global CV fleet growth is taking off...

eLCVs, eTrucks eBuses in million unit (EU+NA)

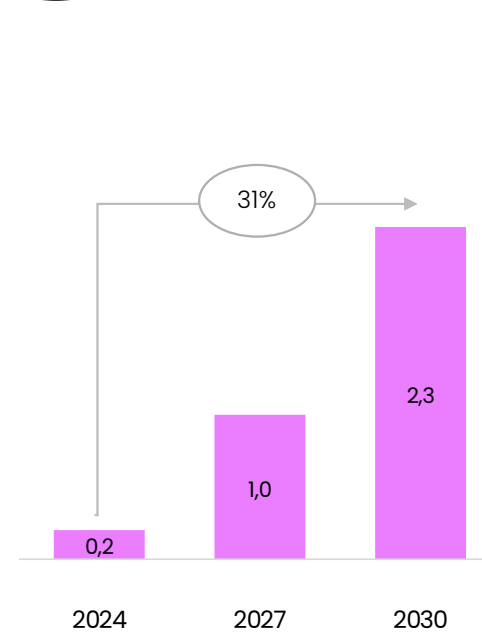
X% CAGR



...Requiring depot charging buildout...

DC + AC charging points in million unit (EU + NA)

X% CAGR



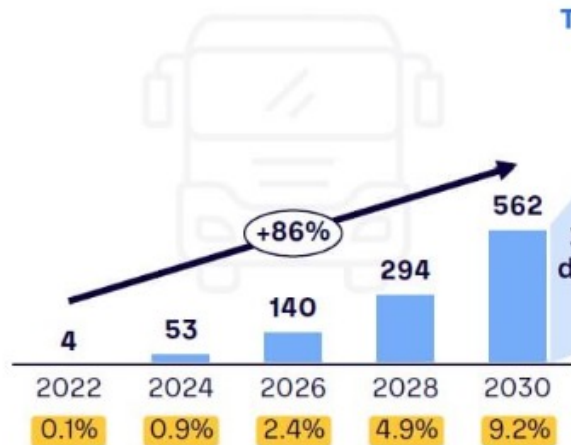


Energy is significant in Commercial Vehicle electrification

Electric truck fleet forecast

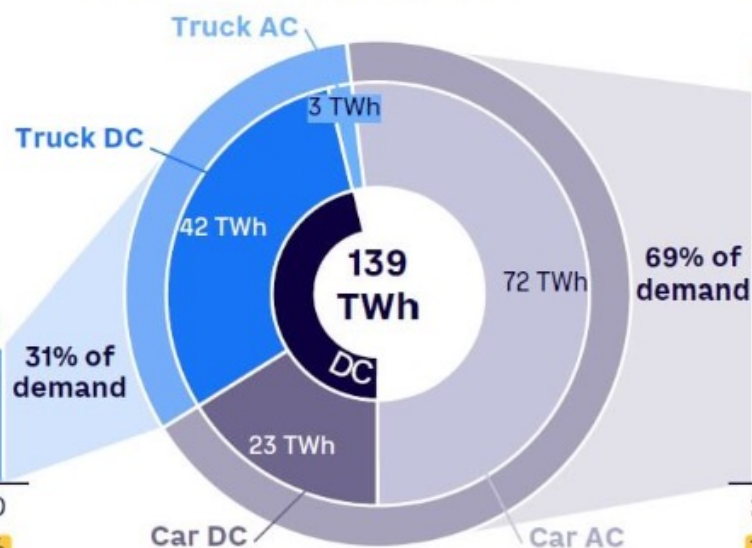
EU27, NO, CH & UK (in thousand units)

- Electric trucks >6 tonnes GVW
- Electric share of total fleet



Total electric charging demand

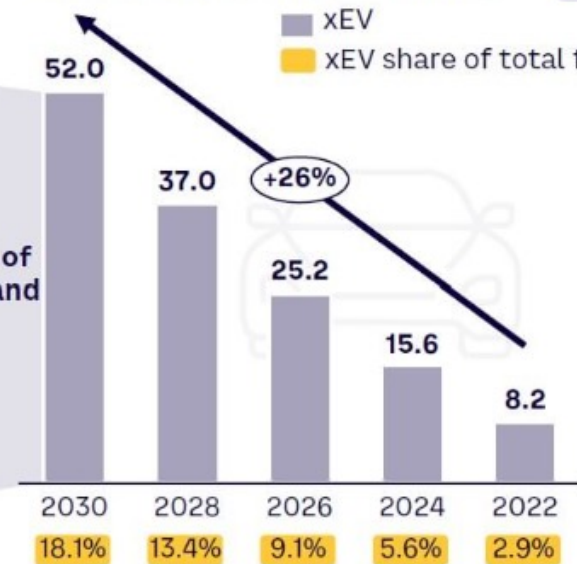
EU27, NO, CH & UK (in TWh, 2030)



Passenger xEV fleet forecast

EU27, NO, CH & UK (in million units)

- xEV
- xEV share of total fleet

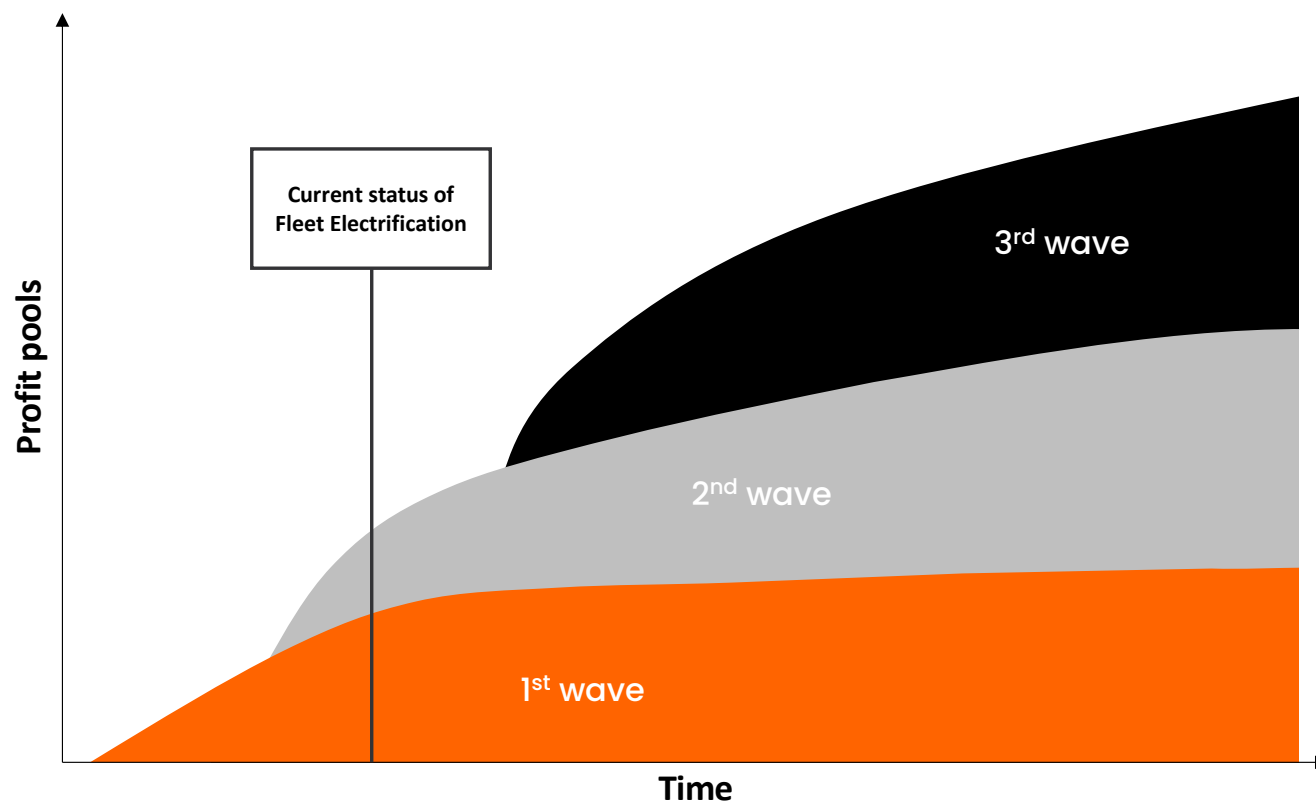


Note: Charts are not to scale relative to each other
Source: Arthur D. Little

Truck energy demand represents 31% of Europe's total energy demand by 2030



The winners in EV Charging will provide a seamless customer experience across hardware, software and energy management



The end-game is Energy

- Fleet electrification represents an enormous energy demand, driving revenue stacking opportunities
- Integration with local generation, storage, EV Charging enables revenue opportunities for Fleet operators
- Grid limitations are a critical bottleneck for EV Charging infrastructure, driving the need for Energy optimisation

Software as the Brains

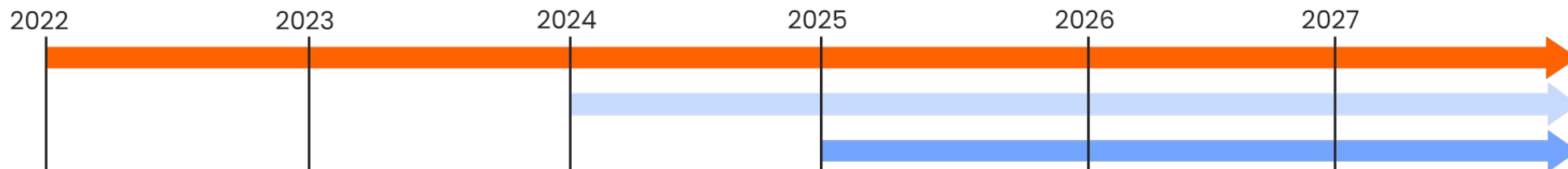
- Software optimises EV Charging at the intersection of complex energy, payment, OEM and infrastructure markets,
- Critical long term growth segments in EV Charging that drive uptime, reliability, operational efficiencies
- High impact on TCO as software drives down complexity and serves as the Brains of EV Charging

The Hardware foundation

- Hardware forms the foundation of EV Charging infrastructure across Public, Destination, Depot and Public Overnight Charging
- Commercial vehicle charging dominated by DC and MCS charging offering
- Kempower is an EV Charging Pioneer with state-of-the-art DC Charging solution portfolio



Phases of Truck Electrification

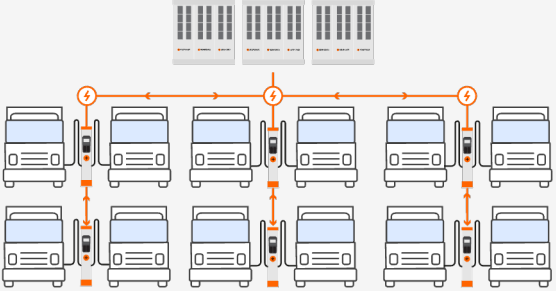




How do you charge?

Overnight

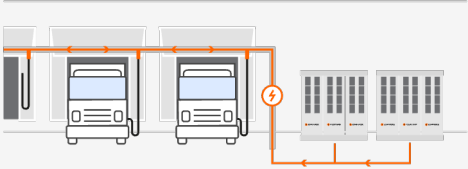
Depots, Truck Stops



6-8h 50-100 kW CCS*

Destination


Warehouses, Distribution Centers



30min-2h up to 400 kW CCS*

On-The-Move

Urban Nodes, Highways

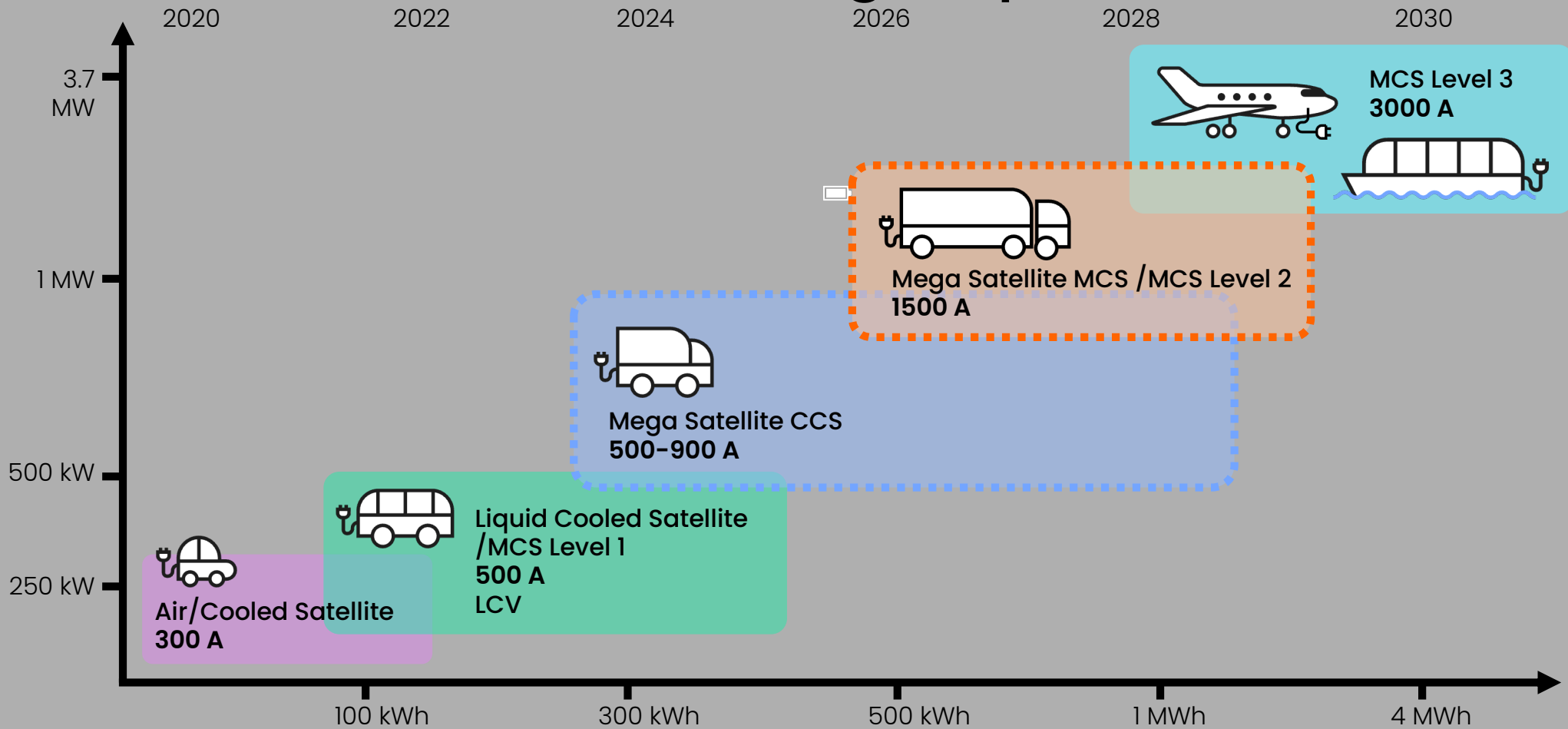


45min 400-1200 kW CCS & MCS

*Assuming MCS not being adopted as the general truck charging standard in the short run

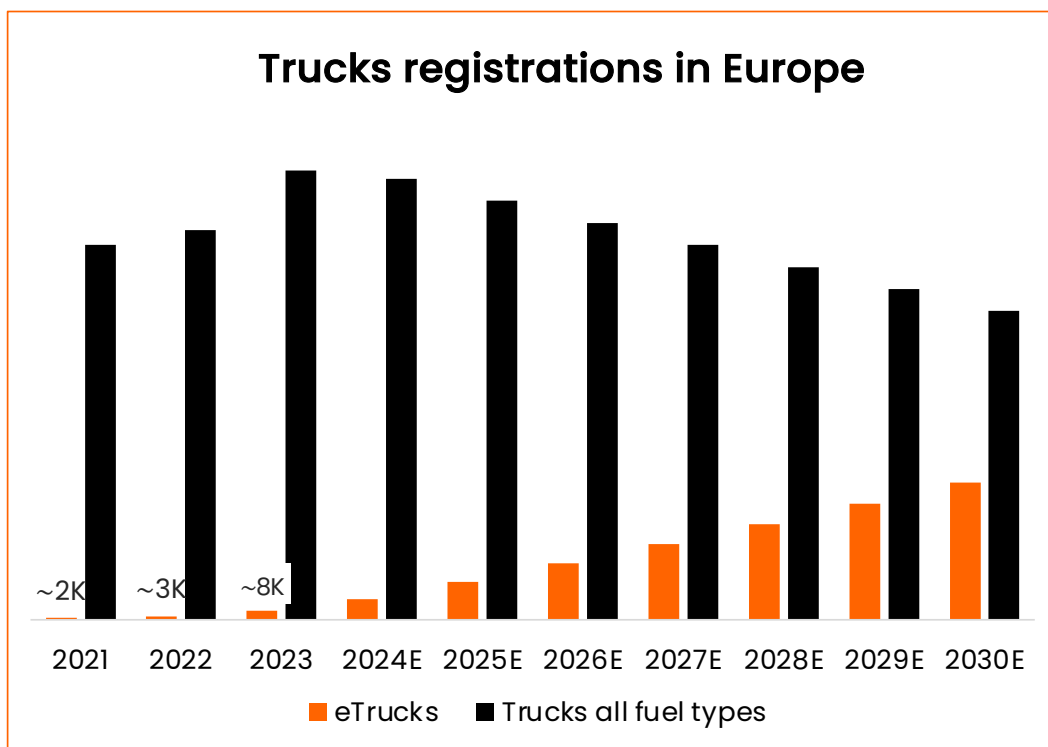


The road to higher powers

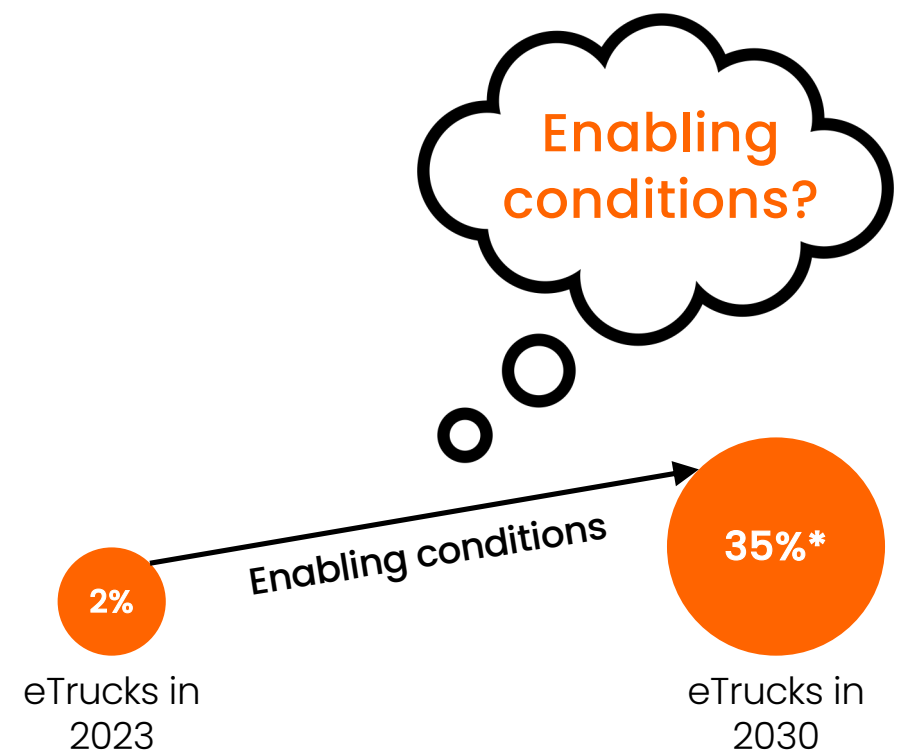




Half a million Electric Trucks to be on the European roads by 2030



*Kempower Market Research Estimates
Source: Kempower Market Research (KMR)





What are **Enabling Conditions**?

1

eTrucks Charging Infrastructure

New AFIR regulation on DC charging points on Europe's TEN-T Core and comprehensive road networks

2

More Favourable Policies

Purchase incentives, tax schemes, carbon pricing measures, etc.,

3

TCO* on par with fossil fuel Trucks

To make a viable business case for transport operators

4

Enough Green Energy to charge



Otherwise, we are not decarbonising

*TCO – Total Cost of Ownership

Source: Kempower Market Research (KMR)

The Infrastructure Challenge: ~35000 MCS Charging Points, by 2030



CO2 target 2030		-45%
Infrastructure		
 Publicly accessible charging points	Total	at least 50,000
	of which are MCS	~35,000
 Hydrogen refilling stations	6 tons/ day	at least 700
	2 tons/ day	~2,000

“Trucks require fast DC chargers, which can rapidly deliver significant power, minimising downtime to maintain operational efficiency. The near absence of infrastructure undermines seamless operation along highways, at depots, and during overnight charging sessions”
 -European Automobile Manufacturers Association (ACEA)

Source: [2024_ACEA_TrucksAndBuses_Manifesto](#)

TEN-T Network: Truck operators are unlikely to change their driving behaviour/routes with switch to Electric



TEN-T core and comprehensive network (bold red: core, yellow: urban nodes)

2025	2027	2030	
<p>eHDVs: TEN-T Core Network</p> <ul style="list-style-type: none"> At least 15% of network length Charging hub ≥1400kW One charging point ≥350kW in each direction of travel 	<p>eHDVs: TEN-T Core Network</p> <ul style="list-style-type: none"> At least 50% of network length Charging hub ≥2800kW Two charging point ≥350kW 	<p>eHDVs: TEN-T Core Network</p> <ul style="list-style-type: none"> Charging hubs of ≥3600kW every 60km Two charging point ≥350kW 	
<p>108 000 km</p> <p>Trans-European Transport Network (TEN-T)</p>	<p>31 121</p> <p>Total truck stop locations</p>	<p>143 083</p> <p>Total truck stops/day</p>	<p>3 126</p> <p>Locations requiring chargers by 2027</p>

Source: [acea report](#); [Transport&Environment – Fully charged for 2030](#)

80 percent of EU member states lack incentives

22 EU member states



Do not offer incentives for purchasing electric commercial vehicles



Tax benefits

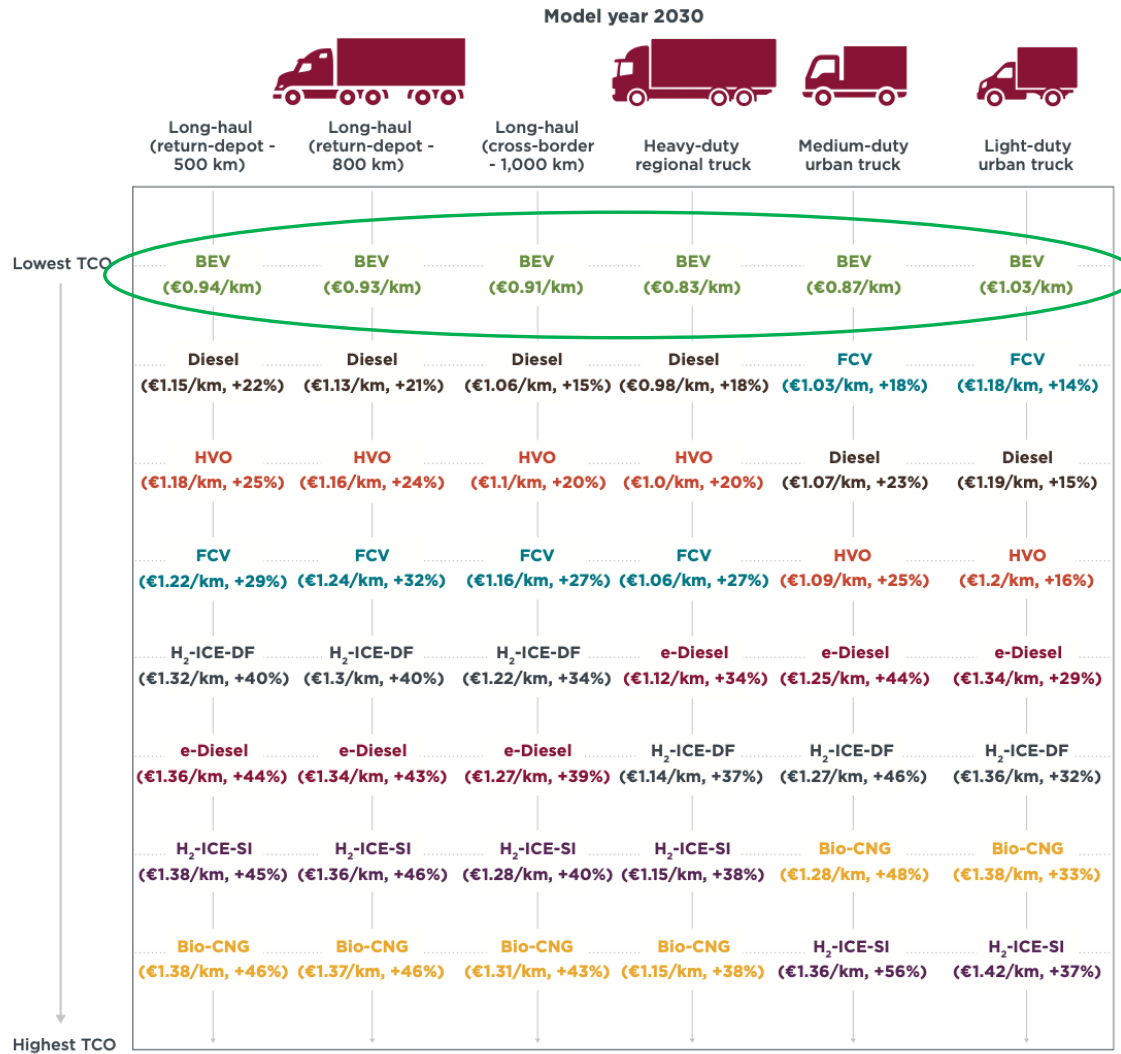


Purchase incentives



"In general, EU member states offer a lower number of tax benefits and purchase incentives for electric commercial vehicles compared to electric passenger cars."
-European Automobile Manufacturers Association (ACEA)

3 Total Cost of Ownership (TCO)



2030: Across all truck classes, **Battery Electric** powertrains recorded the **lowest TCO**

Conventional trucks powered by fossil diesel are expected to be more expensive to own and operate than battery electric trucks by **15% to 25%**

Hydrogen combustion powertrains and conventional trucks powered by Bio-Compressed Natural Gas (Bio-CNG) and e-diesel (synthetic diesel) record the highest TCO, at **30% to 45%** higher than that of battery electric trucks.

Source: ICCT - [Working Paper 2023-28](#)

2023: 44 percent share of Renewables in the EU electricity mix, over 40 percent for the first time

44%

Share of renewables in the EU electricity mix

↓ 26%

Reduction in Coal power generation

↓ 15%

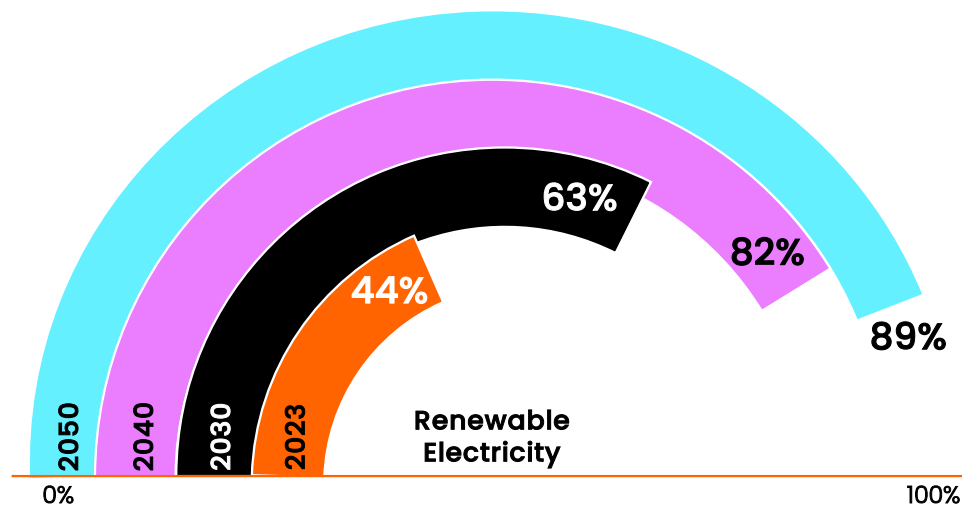
Reduction in Gas power generation

↓ 19%

Reduction in Power sector emissions

“A fifth of the EU’s coal plant fleet will close in the next two years”

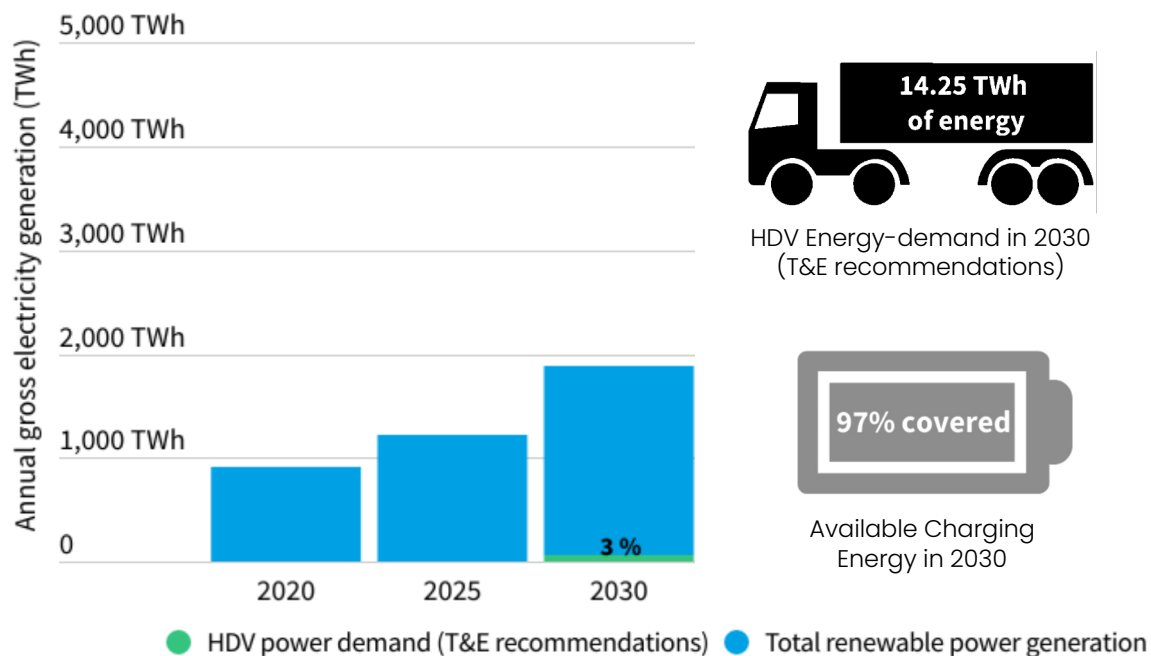
- European Coal Plant Database; Ember Calculations



- Europe's electricity grid is already 44% renewable.
- Based on the already adopted policies by EU member states, Ember projects that 63% of the EU's electricity generation will be renewable by 2030, 82% by 2040, and 89% by 2050.

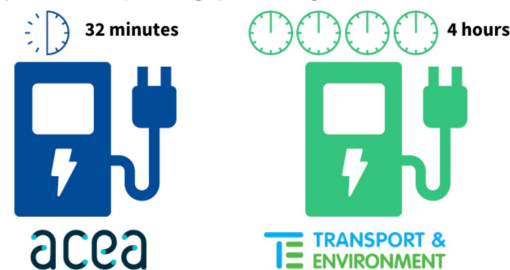
T&E* Report: HDVs will only marginally increase the total renewable energy demand in Europe

Energy demand from electric trucks and buses in the EU



Chargers only used for ½ h/day in ACEA scenario

Daily utilisation of public high power chargers



Sources: T&E calculations based on T&E (2022), EU (2023), ACEA (2023).

- T&E* Report: 97 percent of HDV Energy demand is covered in 2030
- From the mid 2030s onwards, around 8% of the projected renewable electricity generation will be due to electric trucks, buses and coaches.

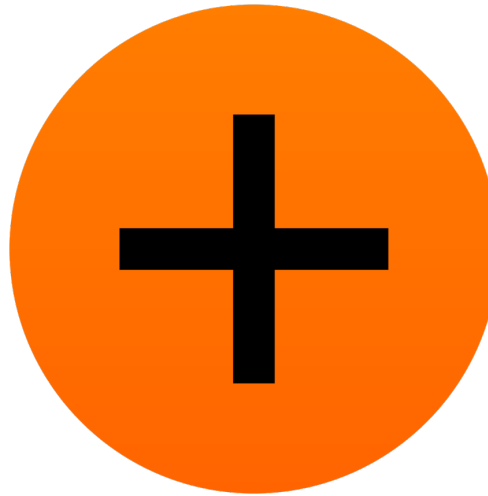
Source: T&E calculations based on European Union Transportation Roadmap Model (EUTRM) (2023), EU (2021), Ember (2023); T&E calculations based on T&E (2022), EU (2023)

*T&E – Transport & Environment

Source: [Transport&Environment – Fully charged for 2030](#)

Notes: Projected gross energy demand from HDVs in EU-27 (TTW) in 2030 that needs to be provided by public charging and available charging energy. Projected gross energy demand from HDVs in EU-27 based on T&E recommendations for HDV CO2 targets of ~65% in 2030 and ~100% in 2035. Includes grid transmission and distribution losses. Compared to the gross renewable electricity generation according to Ember's 'stated policy' scenario. Assuming 100% BEVs for small and medium trucks and urban buses, 90% buses/10% FCEVs for heavy trucks, 80% BEVs/FCEVs for vocational vehicles and 50% BEVs/50% FCEVs for coaches

Electrify heavy traffic with us!



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