

DECARBONISING HEAVY-DUTY ROAD TRANSPORT

STATE OF THE ENABLING
CONDITIONS

October 2025



acea
DRIVING MOBILITY FOR EUROPE

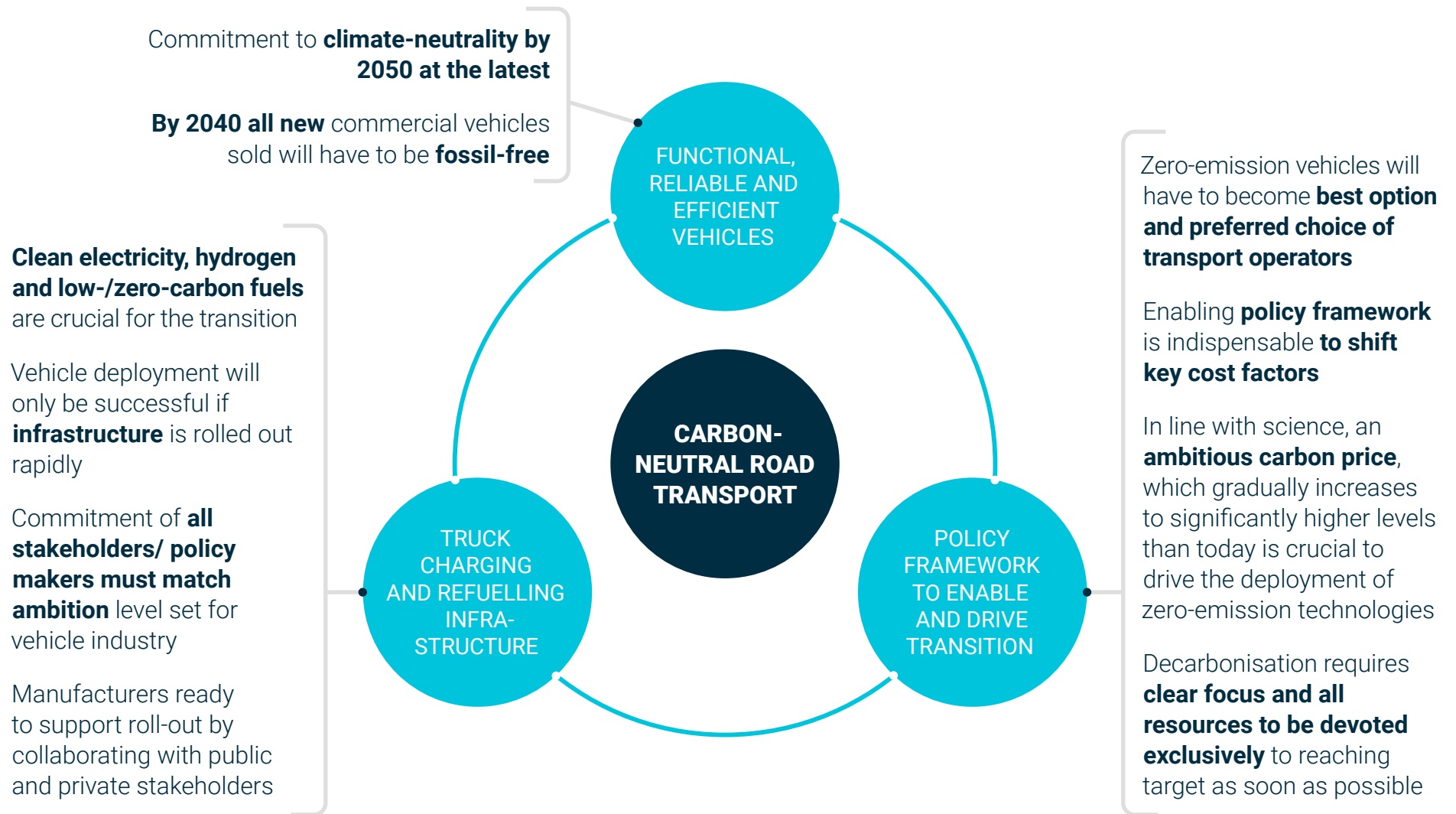
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ENABLING CONDITIONS

THREE KEYS TO ZERO-EMISSION ROAD TRANSPORT





ZERO-EMISSION VEHICLES

DRIVING EUROPE'S GREEN TRANSITION WITH ZERO-EMISSION TRUCKS AND BUSES



- **Europe's truck and bus manufacturers are leading road transport's transition** to climate neutrality by introducing state-of-the-art zero-emission vehicles.
- **45+ zero-emission truck models now available** – from city deliveries to long-haul transport.
- **20+ zero-emission bus models on the market** – powering clean, quiet mobility in cities & beyond.

Source: <https://www.acea.auto/news/driving-europes-green-transition-with-zero-emission-trucks-and-buses/>

Zero and low-emission heavy-duty vehicles (trucks)

	Power train	GVW (t)	GTW (t)	Application (e.g. Long-haul, Construction etc.)	Range (km)	Availability (series production, announced)
IVECO						
S-eWay	BEV	44t		urban and regional application	up to 550km	in series production
S-eWay Fuel Cell						

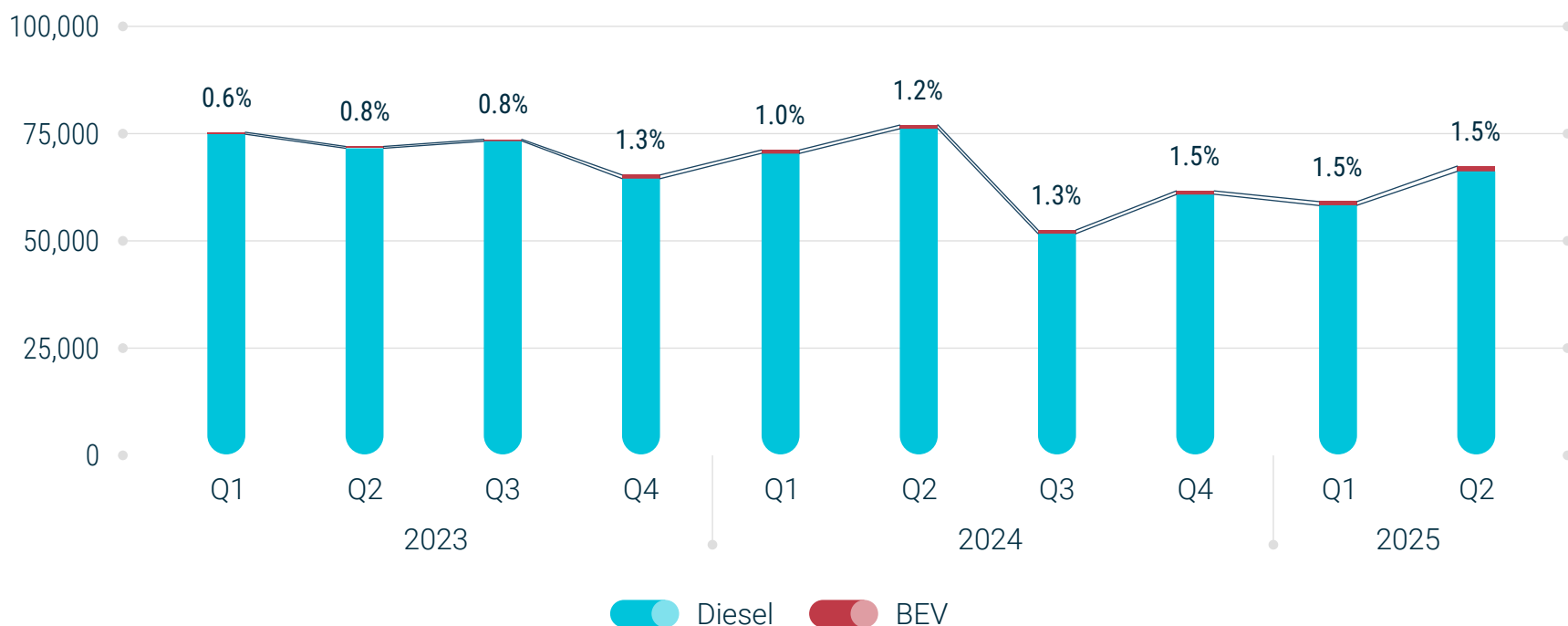
Zero and low-emission heavy-duty vehicles (trucks)

	Power train	GVW (t)	GTW (t)	Application (e.g. Long-haul, Construction etc.)	Range (km)	Availability (series production, announced)
DAF Trucks NV						
XB Electric						
XB Electric						
XD Electric						
XD Electric						
XD Electric						
XD Electric						
XF Electric						
XF Electric						
Daimler Truck						
eCanter						
eActros 300						
eActros 400						
eEconic 300						
eActros 300 successor						
eActros 400 successor						
eActros 600						
GenH2						
Hyundai Truck						
XCIENT, 4x2						
XCIENT, 6x2						
MAN						
eTGX Tractor						
eTGS Tractor						
eTGX 4x2 Chassis						
eTGS 4x2 Chassis						
eTGX 6x2 Chassis						
eTGS 6x2 Chassis						
Bayenflotte						
hTGX						
Scania						
L, P	BEV	18 - 33t	36t	city	up to 350 km	in series production
P, G, R	BEV	18 - 33t	up to 74t	construction	up to 350 km	in series production
G, R	BEV	18 - 29t	up to 74t	regional	up to 450 km	in series production
R, S	BEV	18 - 29t	up to 74t	long haul	up to 550 km	in series production
Volvo Trucks						
FH Aero Electric	BEV	44t		regional	300 km	in series production
FH Aero Electric	BEV	48t		long haul	600 km	first orders from Q2 2026
FH Electric	BEV	44t		regional	300 km	in series production
FH Electric	BEV	48t		long haul	600 km	first orders from Q2 2026
FM Electric	BEV	44t		regional	300 km	in series production
FMX Electric	BEV	44t		construction	300 km	in series production
FM Low Entry	BEV	32t		city	200 km	in series production
FE Electric	BEV	27t		distribution	275 km	in series production
FL Electric	BEV	18.6t		distribution	450 km	in series production
Renault Trucks						
E-Tech Traffic	BEV	3.1t		distribution	up to 300 km	in series production
E-TECH Master	BEV	3.5 and 4.0t		distribution	up to 460 km	in series production
E-TECH D	BEV	12 - 14t		distribution	up to 220 km	orders from Q2 2026
E-TECH D	BEV	16 - 18t		distribution	up to 560 km	in series production
E-TECH D Wide	BEV	20 - 28t		distribution & city construction	up to 350 km	in series production
E-TECH T	BEV	20 - 28t	up to 50t	distribution & regional	up to 300 km	in series production
E-TECH T	BEV	20 - 28t	up to 50t	distribution & regional	up to 400 km	orders from Q2 2026
E-TECH T	BEV	20 - 28t	up to 50t	long-haul	up to 600 km	orders from Q2 2026
E-TECH C	BEV	20 - 28t	up to 50t	construction	up to 300 km	in series production
E-TECH C	BEV	20 - 28t	up to 50t	construction	up to 400 km	orders from Q2 2026
Ford Trucks						
F-Line E 4X2	BEV	19t		regional	up to 250 km	series production in September 2025
F-Line E 6X2	BEV	27t		regional	up to 300 km	series production in September 2025

ZEV MARKET DEVELOPMENT

Heavy-duty trucks

New registrations EU-27

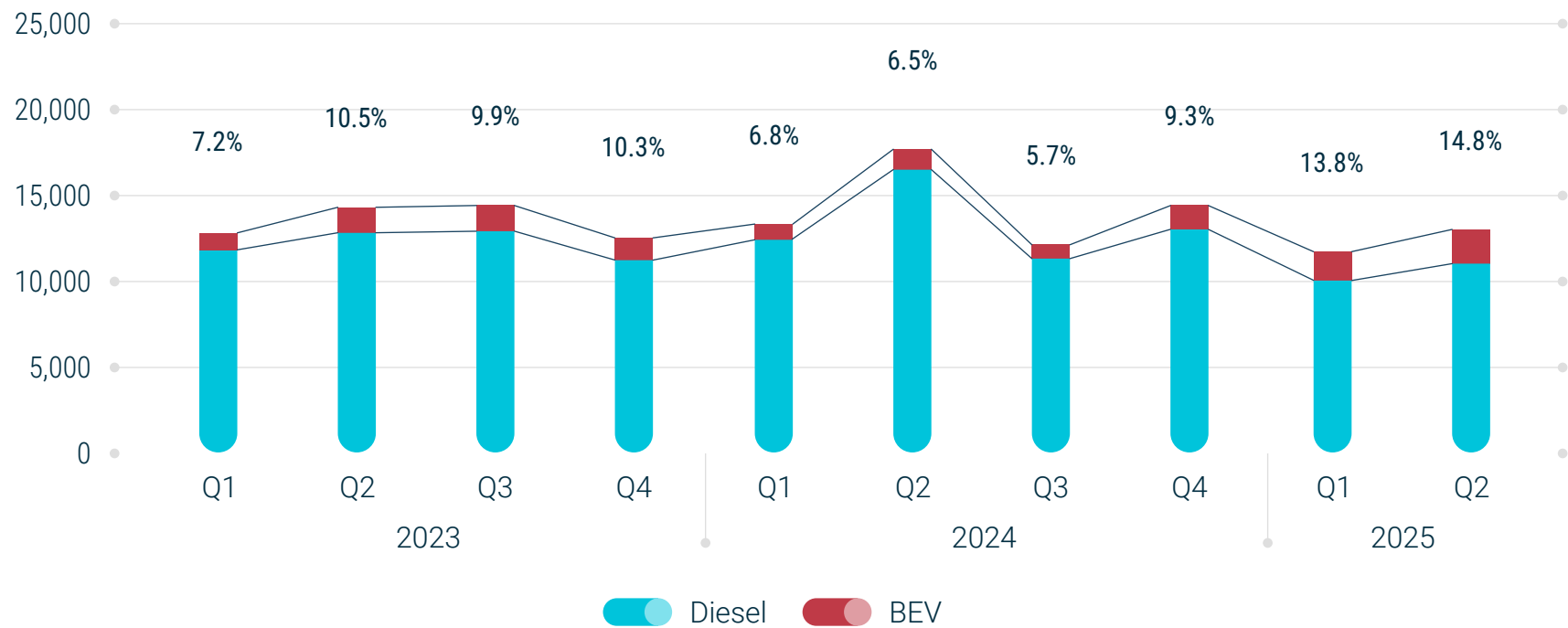


Note: Other powertrains excluded (<2.3% of HDV, <3.6% of MHDV).

ZEV MARKET DEVELOPMENT

Medium-duty trucks

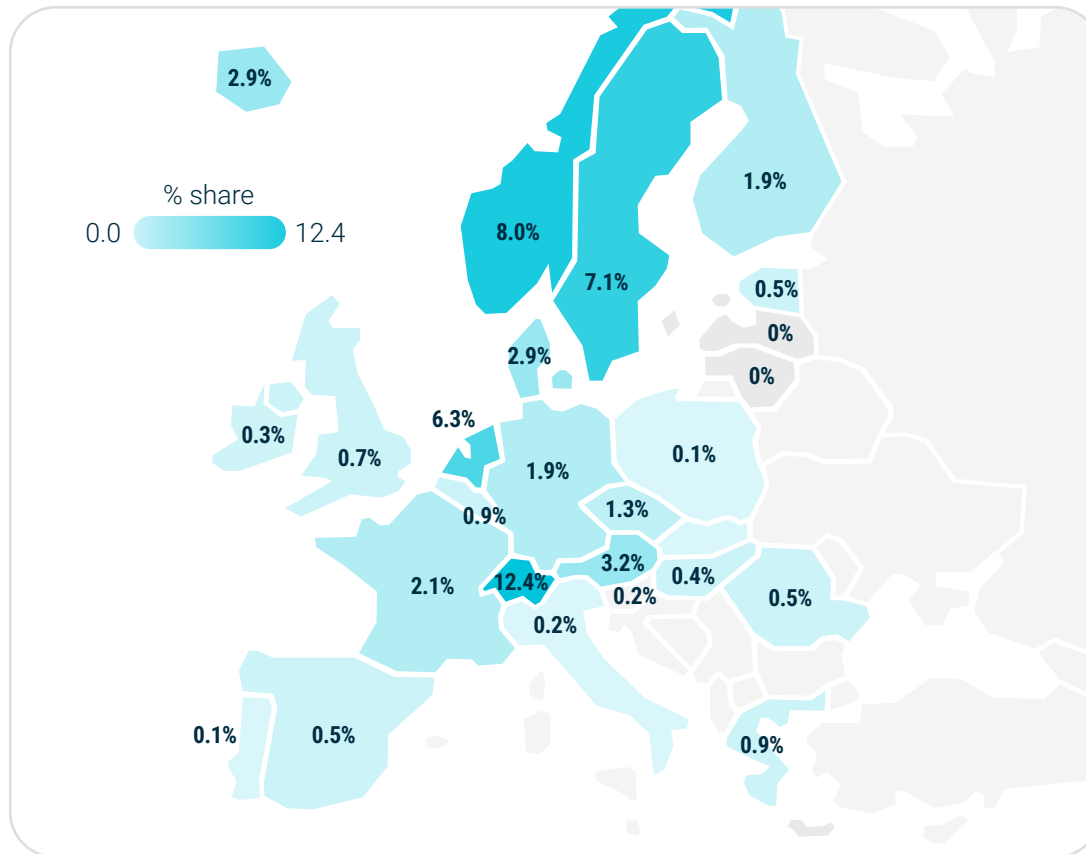
New registrations EU-27



Note: Other powertrains excluded (<2.3% of HDV, <3.6% of MHDV).

ZERO-EMISSION VEHICLES

HEAVY-DUTY TRUCKS, NEW REGISTRATIONS H1 2025

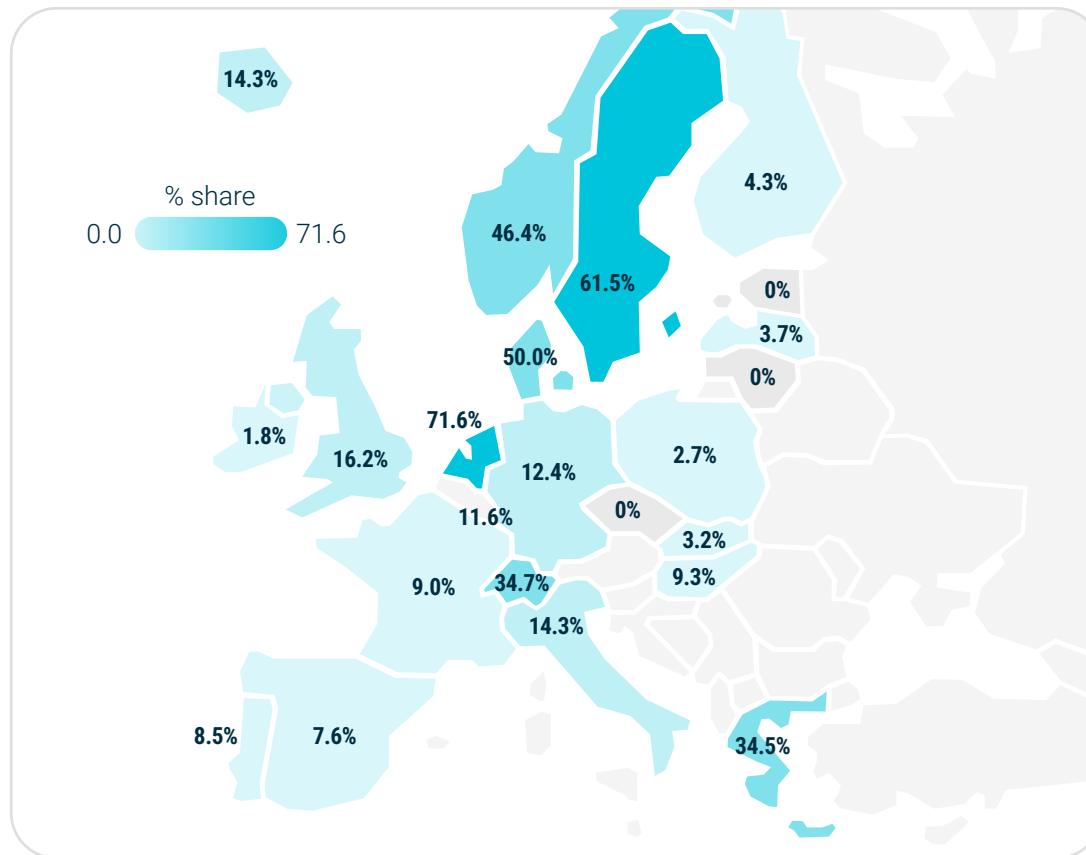


Source: <http://www.acea.auto/zero-emission-tracker>

- The market share of **zero-emission medium- and heavy-duty trucks** was just **3.6%** in H1 2025 (up from 2.1% in 2024)
- **Nearly 80% of all new BEV heavy-duty trucks** were registered in **five member states**
 - Sweden (7.1%)
 - Netherlands (6.3%)
 - Austria (3.2%)
 - Denmark (2.9%)
 - France (2.1%)
- **Switzerland (12.4%) and Norway (8.0%)** outperform EU member states

ZERO-EMISSION VEHICLES

MEDIUM-DUTY TRUCKS, NEW REGISTRATIONS H1 2025



Source: <http://www.acea.auto/zero-emission-tracker>

- The market share of **zero- emission medium- and heavy- duty trucks was just 3.6%** in H1 2025 (up from 2.1% in 2024)
- **BEV shares reached 14.4%**
 - Netherlands (71.6% = 669 BEVs)
 - Sweden (61.5% = 292 BEVs)
 - Denmark (50.0% = 204 BEVs)
 - Greece (34.5% = 41 BEVs)
- Medium-duty trucks account for ~1/5 of the heavy-duty market volume

HDV CO2 TARGETS

NECESSARY ZEV TRAJECTORY

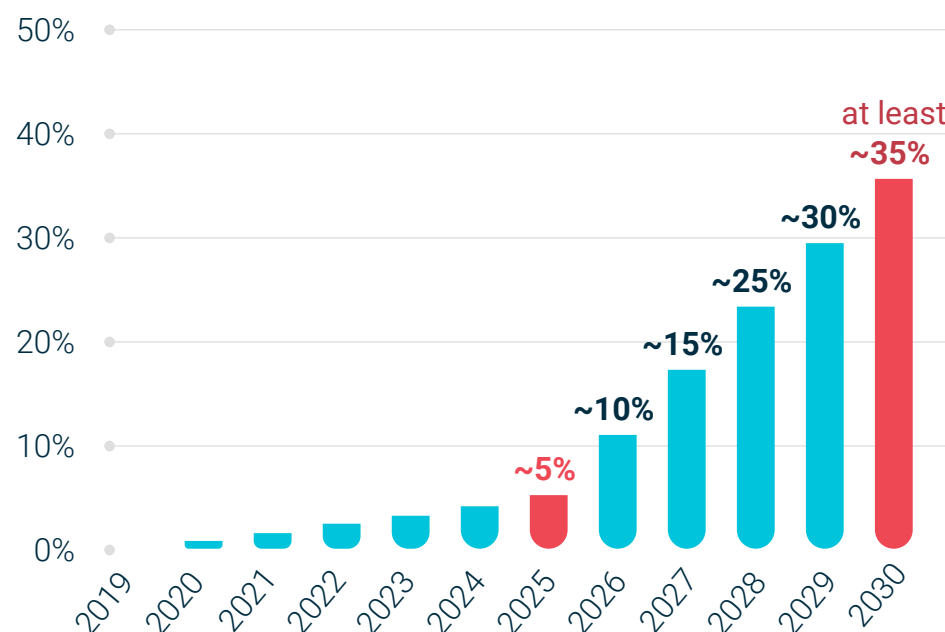
2030 targets require rapid ZEV uptake

- **~400,000 ZEV** in operation by 2030
 - Total fleet ~6.2 million (HDV >3.5t)
- **~100,000 ZEV** registered annually
 - **>1/3 of annual registrations**

High non-compliance fines

- €4,250 per g CO₂/ tkm x number of registered vehicles

Minimum ZEV share needed
(to avoid non-compliance penalties)



SUMMARY



Market uptake of HD zero-emission vehicles [H1 2025] currently is

- **Too slow** (3.6% ZEV)
- **Concentrated on just a few use cases**
- **Highly fragmented in just a few member states** (Sweden, Netherlands)
- **Two non-EU countries, Switzerland and Norway outperform EU member states** (because of favourable enabling conditions and coherent policies)



Annual growth rates >50% needed to make 2030 CO₂ targets achievable



CHARGING/REFUELLING INFRASTRUCTURE

CHARGING INFRASTRUCTURE

[PRIVATE] DEPOT CHARGING

No data available/ Not regulated

[SHARED-PRIVATE] DEPOT CHARGING

No data available/ Not regulated

PUBLIC CHARGING

Dedicated HDV charging

AFIR targets (Art. 4)

- Member states reporting (2027)
- Commission/ European Observatory (EAFO) data will become available by ~Q3/Q4 2025

HDV-accessible charging

AFIR targets LDV (Art. 3)/ HDV (Art. 4)

- ACEA data based on EY survey
 - ACEA zero-emission tracker

ENABLING CONDITIONS

HDV CHARGING INFRASTRUCTURE

- Very **limited visibility** about charging infrastructure suitable for heavy-duty vehicles; no official figures available
- Several independent surveys (public infrastructure) conclude:
 - **ACEA** (based on EY survey, May 2025): **~1,000 HDV-suitable chargers** (350 kW+) in 12 countries (incl. CH, UK)
 - **IRU** (2025): **~120 dedicated HDV chargers** in EU-27
 - **Milence** (July 2025) **up to 1,100 dedicated high-power truck charging connectors** in 14 countries (incl. CH, UK)
- **~500 dedicated HDV public chargers** needed EVERY MONTH until 2030 to power the required ZEV fleet



ENABLING CONDITIONS

HDV CHARGING & H2 REFUELLING INFRASTRUCTURE




	Chargers ≥350 kW (verified)	Chargers ≥350 kW (tbc)	Total	HRS (verified)	HRS (tbc)	Total
BE	53	73	126	1	2	3
CH	10	10	20	2	3	5
DE	120	-	120	34	-	34
DK	3	15	18	1	-	1
ES	4	20	24	-	-	-
FR	53	79	132	2	4	6
UK	26	33	59	-	-	-
IT	5	14	19	-	-	-
LU	1	-	1	-	-	-
NL	38	114	152	10	3	13
PL		4	4	1	2	3
SE	140	176	316	2	-	2
Total	453	538	991	53	14	67



Source: ACEA (based on EY survey)

CO2 TARGETS AND INFRASTRUCTURE

NECESSARY CHARGING/REFILLING INFRASTRUCTURE

CO2 target 2030		-45%	
Zero-emission vehicles needed on EU roads (minimum)		~400,000	
	Battery-electric vehicles	~330,000	
	Hydrogen-powered vehicles	~70,000	
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

- Meeting the 2030 CO2-targets requires ~400,000 ZEVs in operation
- To enable their operation, these vehicles will require
 - ~50,000 publicly accessible charging points suitable for HDVs
 - Including ~35,000 MCS-capable chargers
 - ~700 H2 refilling stations (with 6t/day capacity)
- In addition, semi-public and private depot chargers are needed

DEPOT CHARGERS INCENTIVES



Source: IRU 2025

- Depot charging is an essential prerequisite for ZEV deployment
- Depending on use case, ~80% of HDV charging happens at depots
- Several member states provide incentives for the rollout of depot charging
 - E.g. Austria, France, Ireland, Netherlands, Poland, Sweden, Slovenia, UK
- The current eHDV fleet shows a "return to depot" behaviour
 - If charging in depots should also dominate in other segments, transport and logistics patterns will have to change so that vehicles operate shorter legs in between depots only. With current operating way, charging away from home is needed when passing ~20% of the fleet

SUMMARY



Despite ongoing efforts by many stakeholders, there is a **clear infrastructure gap towards 2030**



Most critical elements include:

- publicly accessible chargers dedicated for HDVs
- MCS chargers
- grid access for public and depot chargers
- charging price, especially fast charging is often more expensive than diesel
- H2 refuelling stations suitable for HDV
- H2 price and availability



ZEV COST PARITY

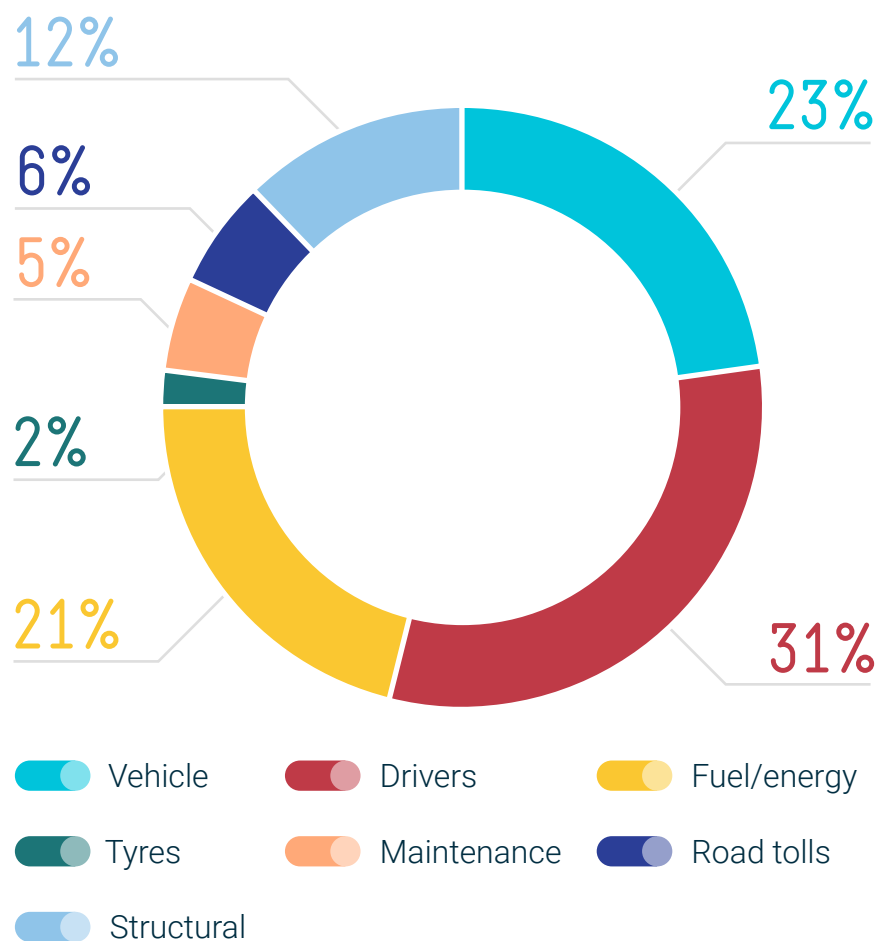
COST PARITY

- **HDV road transport is a B2B market!** Achieving cost parity for zero-emission vehicles is essential to enable the transition
- Without **robust business cases** across a wide range of use cases and member states the ZEV market uptake will remain insufficient
- A wide range of policy measures are needed to support **competitive Total Cost of Ownership (TCO) for ZE HDVs**
 - CO2-differentiated road user charges, favourable taxation for renewable fuels, hydrogen and electricity, ETS-2, competitive charging prices, vehicle-related regulations (e.g. Weights & Dimensions Directive), demand-side measures (incentives, public procurement), etc



TOTAL COST OF OWNERSHIP (TCO)

Diesel; example France



Source: IRU

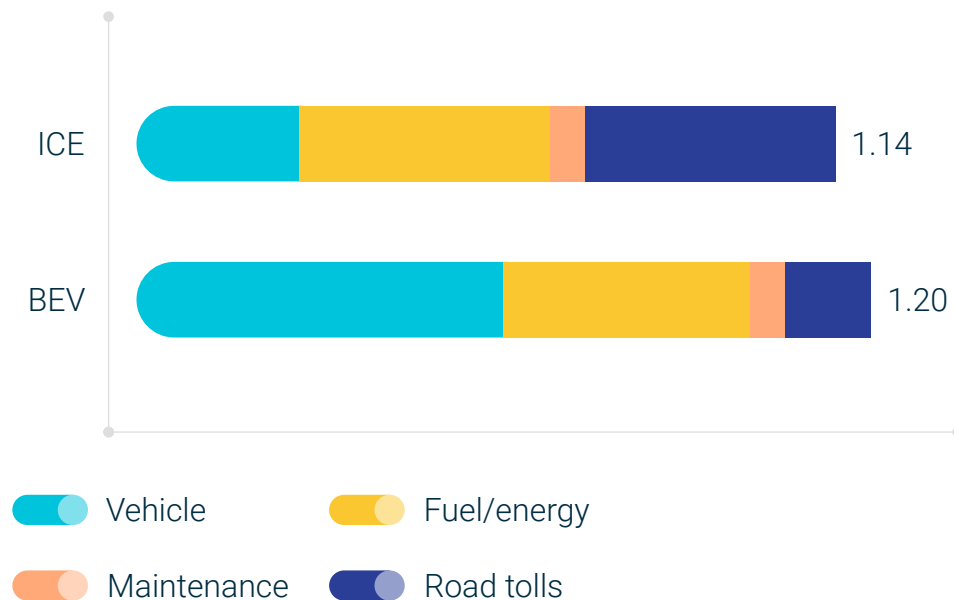
TCO vary significantly for different use cases and countries

- Main categories include:
 - Drivers
 - Vehicles
 - Fuels
 - Tolls
 - Others
- Although important, **vehicle costs** are only one element of the TCO
- **Fuel** and **driver costs** have a similar or higher share
- TCO are also not considering revenues, but **payload parity is essential** for revenues

ZEV COST PARITY

Total cost of ownership

Heavy-duty truck (€/km)
Example Germany

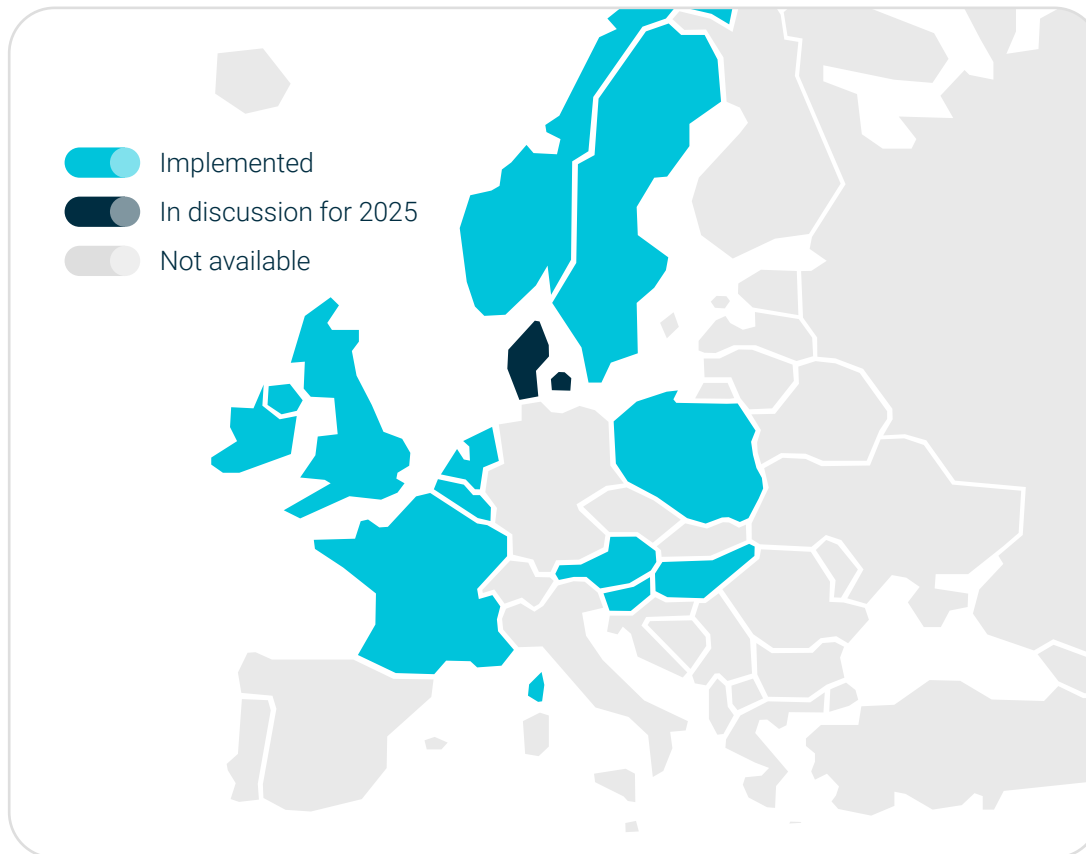


- **TCO gap differs significantly** for different use cases and member states
- Currently, **zero-emission trucks are not yet competitive in many use cases and member states**

Assumptions: 40t tractor, 90,000 km/year, upfront costs €110,000 for ICE, €260,000 for BEV, Diesel ~€1.52/l, charging price €0.39/kWh

Source: McKinsey

ZLEV PURCHASE INCENTIVES



Source: IRU 2025

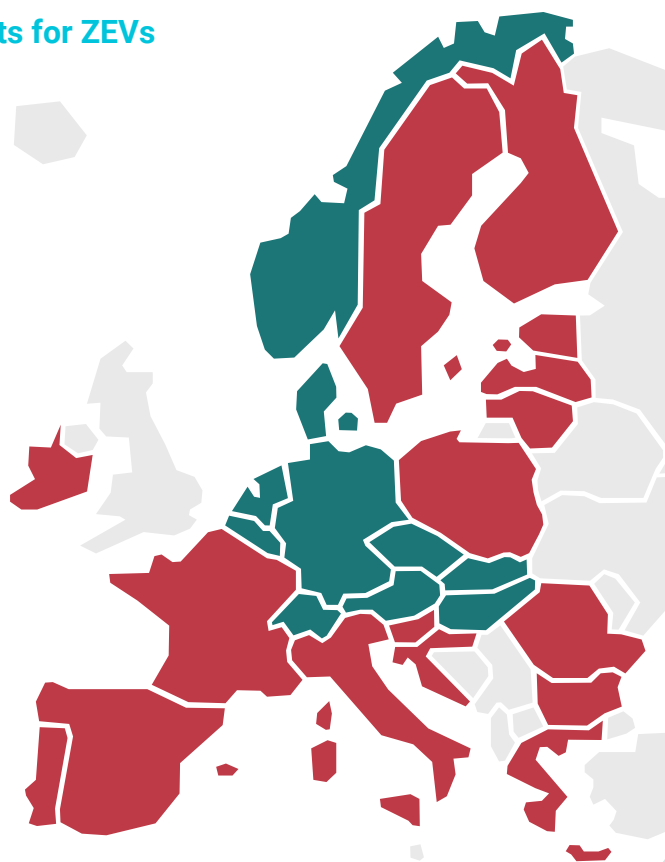
- ZLEV purchase incentives for heavy-duty vehicles are provided in several member states
 - E.g. Austria, Belgium, France, Hungary, Ireland, Netherlands, Poland, Sweden, Slovenia, UK
- While they can effectively support the ZEV market uptake they are often
 - Administrative burdensome
 - Not sustainably long-term
 - Disruptive to regular fleet renewal investments
 - Not coordinated on a European level

EUROVIGNETTE IMPLEMENTATION

Eurovignette

Toll rate benefits for ZEVs

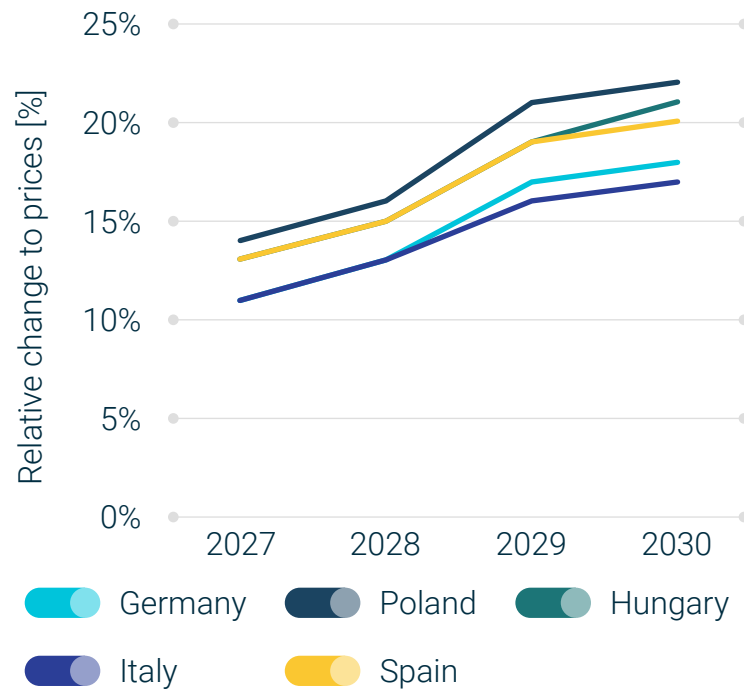
- ☒ Yes
- ☐ No



- **CO2-based road user charges with full exemption for zero-emission vehicles** are one of the most effective, targeted measures to enable ZEV cost parity
- However, on its own it is insufficient to fully reduce the TCO gap between ZEVs and conventional vehicles
 - Only in Germany, Austria, and Switzerland discount levels are currently high enough to drive ZEV demand
- Currently, **only two member states fully exempt ZEVs** from road tolls
 - Belgium and Germany
- **Ten member states apply reduced toll rates** for ZEVs
 - Austria, Bulgaria, Czechia, Denmark, Hungary, Latvia, Luxembourg, the Netherlands, Slovakia, Sweden

ETS2 – INDISPENSABLE FOR HDV ROAD TRANSPORT

ETS2-related fuel price changes



Source: VEYT (2025)

- The **ETS2 is indispensable** for the decarbonisation of heavy-road transport
- **Significant uncertainties persist** about its implementation and the expected impact on fuel prices
- **Current price projections for 2027 range from €55 to €92/t**
 - Expected to lead to a 10% – 15% increase of fuel prices
 - However, these are considered too low to close the TCO gap and actively drive the transition

SUMMARY



Today, **TCO of zero-emission trucks are not yet competitive in most member states and use cases**



Important cost parameters remain highly dependent on favourable policy measures



Key elements of the necessary policy framework are still missing

- Payload parity is missing because of the stalled Weights & Dimensions Review



Partially favourable conditions currently only for a few applications in a few countries

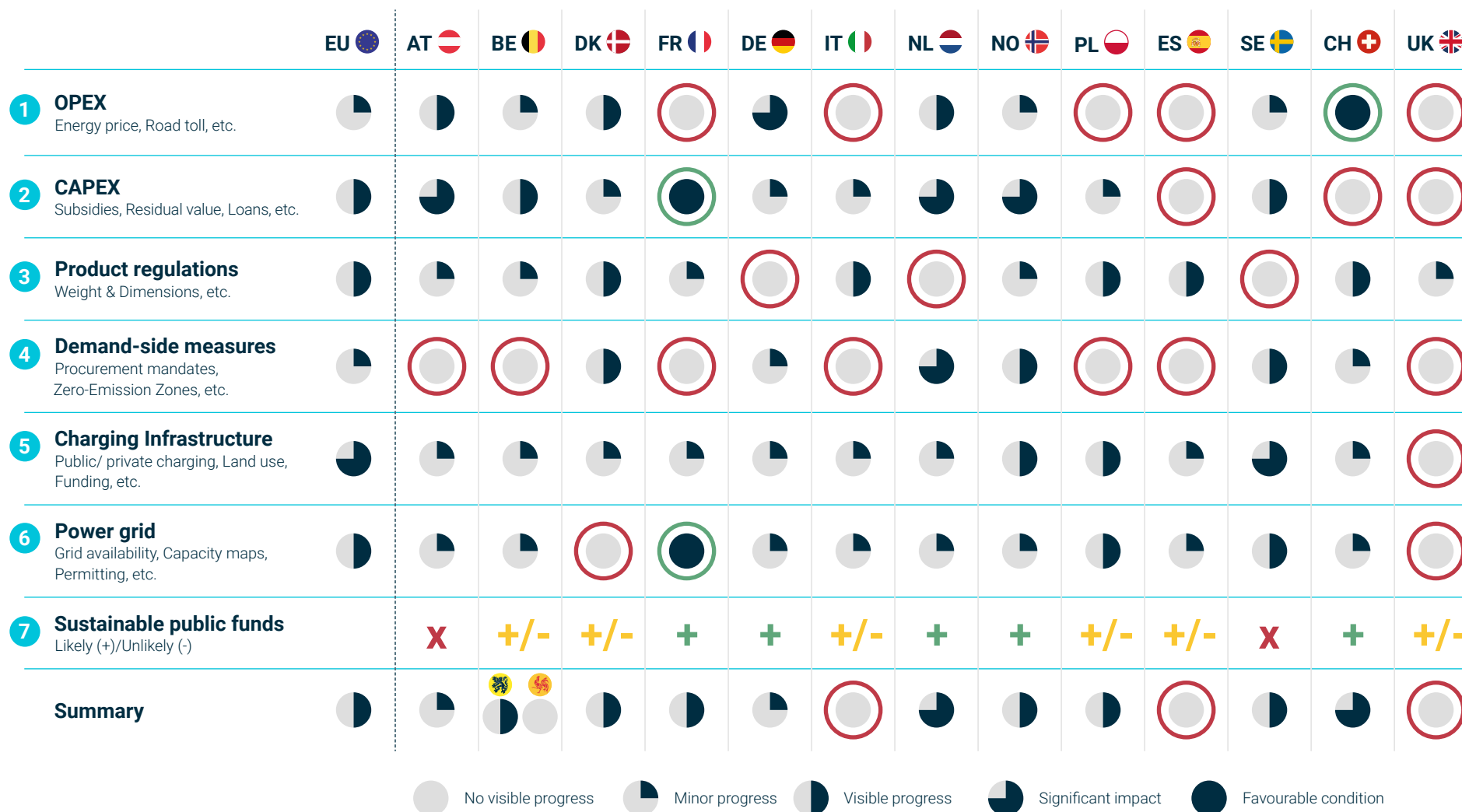
- E.g. Switzerland, Norway, Netherlands



CONCLUSIONS

HD BEV STATUS OF ENABLING CONDITIONS

SELECTED MARKETS [H1 2025]



ZEV TRANSITION: QUO VADIS?

VEHICLES

HDV CO2 targets

- 2025/ 2030/ 2035/ 2040
- Globally most ambitious and comprehensive targets, including significant non-compliance penalties
- Review

INFRASTRUCTURE

AFIR

- Minimum targets 2025/ 2027/ 2030
- Pending MS implementation
- No requirements for depot charging
- Public charging beyond AFIR (e.g. Milence)
- Insufficient H2 availability
- Review 2026

Power grids

- Insufficient transparency about capacities
- Queuing and connection issues (first-come- first-serve)
- Investment frames from NRAs and lack of anticipatory investments

COST PARITY

Eurovignette

- Fragmented implementation and insufficient level

ETS-2

- Pending implementation

Weights & Dimensions Directive

- Stalled in Council

Energy Taxation Directive

- Stalled in Council

MCS Standard

- Delayed

Fleet renewal incentives

- Insufficient and fragmented

ZE zones and similar measures

- Fragmented

Public procurement requirements to support ZEVs

CONCLUSIONS



Several key conditions are still missing to enable a swift and broad market uptake of zero-emission vehicles



These missing elements **severely limit the ZEV market**



Unless they are addressed urgently, the **2030 CO2 targets for HDVs will not be achievable**

GLOSSARY OF TERMS

ZEV	Zero-emission vehicle
HDV	Heavy-duty vehicle
OEM	Original Equipment Manufacturer
BEV	Battery-electric vehicle
CO2	Carbon dioxide
ETS2	Emissions Trading System 2
HRS	Hydrogen Refuelling Station

MCS	Megawatt Charging Systems
CCS	Combined Charging Systems
GWV	Gross Weight of Vehicle
MS	Member States
AFIR	Alternative Fuels Infrastructure Regulation
H2	Hydrogen
TCO	Total Cost of Ownership



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