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Electrification of Heavy-Duty Vehicles (HDVs) in the Czech Republic

How much it will cost and what is happening in neighbouring countries

November 2023

Summary

- This study builds upon the previous research titled "Electrification of Heavy-Duty Vehicles (HDV) in the Czech Republic - Basic Forecasts" published in May 2023 (available here). According to the projected scenarios, between 2 and 11 thousand eTrucks could be registered in the Czech Republic by 2030.(1)
- This current work seeks to provide information that could help develop the eTrucks market and fulfil the mentioned projections: (i) estimates the market gap – i.e. how much money is necessary to achieve the 2030 numbers, (ii) shows how eTruck market is subsidised in neighbouring countries and the size of the required support for the Czech Republic to match neighbouring countries.
- Several scenarios were developed to estimate the necessary size of subsidies, of which two were identified as the most likely: (i) reaching 2,000 eTrucks by 2030 is associated with the investment subsidies of at least CZK 4 billion, (ii) reaching 6,000 eTrucks by 2030 would require at least CZK 14 billion.
- The key instruments for supporting HDV electrification in the early stages of the market are: (i) investment subsidies for eTruck purchases and (ii) road toll discounts.
- Based on a review of subsidy programmes in neighbouring countries, the study shows that to achieve a comparable level of public support in the Czech Republic, approximately CZK 6 billion would need to be allocated to subsidy programmes supporting investments in eTrucks and related charging infrastructure by 2026 (to reach Germany's level would require almost twice as much). The sooner subsidies are launched, the better the Czech HDV operators can prepare for the future of electrification and maintain their competitiveness.

The study was funded by European Climate Foundation

European Climate Foundation

(1) For the purposes of this study, the term HDV (Heavy Duty Vehicles) is used to refer to the N2 (3.5 – 12 tones) and N3 (> 12 tones) vehicle categories. The term eTruck is used to refer to Battery Energy Vehicles (BEVs) in the N2 and N3 vehicle categories. Abbreviation “BEV” is also used in tables and graphs.

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Agenda

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1 Market gap estimation

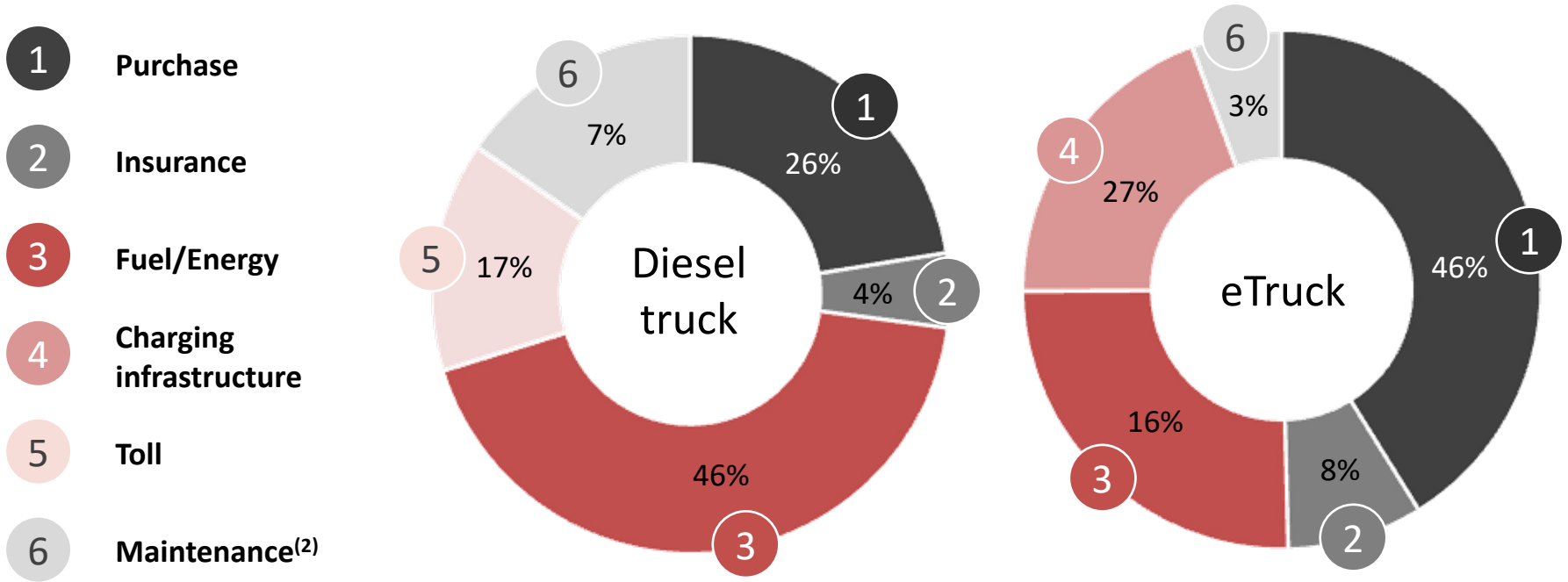
1.1 TCO breakdown

1.2 Illustrative TCO calculation

1.3 Estimate of subsidy needed

The key components for eTrucks TCO are the purchase price, the cost of electricity and the cost of charging infrastructure

The components of TCO for a diesel truck and eTruck(1)



- The key TCO (Total Cost of Ownership) components of eTrucks are the **purchase price** and the **cost of charging**.
- The cost of charging can be split into the **cost of electricity** and the **cost of the charging infrastructure**.(3)

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(1) The values are based on an example TCO calculation for N2 over 7 years of operation (see below).
(2) Includes maintenance and service costs.
(3) The separation of the cost of charging infrastructure from the cost of electricity shows the significance of the charging infrastructure costs.

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EU Member States are addressing the agenda of investment support (for eTrucks/chargers) and setting the parameters of the toll system

TCO components		Notes *(support mechanisms are described in more detail below)*	Incentives[1] (EU legislation)
1	**Purchase**	▪ The purchase price of eTrucks is 2-3x higher than diesel trucks. The common method of government support is a direct investment subsidy for the acquisition of vehicles.	**Investment subsidy** (GBER)[2]
2	**Insurance**	▪ The price of insurance is partly based on the purchase price of the vehicle. The price of BEV insurance is therefore higher than the price of ICE insurance.	-
3	**Fuel/Energy**	▪ The cost of consumed electricity is lower for BEVs than the cost of consumed diesel for ICEs. After accounting for the costs of the charging infrastructure, the price for BEV charging is higher than the cost of filling ICE vehicles with diesel.	(EU ETS II)[3]
4	**Charging infrastructure (non-public)**	▪ The cost of building and operating non-public charging infrastructure (required for the early stage of HDV electrification) is a significant TCO component for BEVs. Some countries have already adopted investment support (strategies).	**Investment subsidy** (GBER, RED III)[2],[4]
5	**Toll**	▪ eTrucks are currently exempt from tolls payment. Implementation of Eurovignette Directive (exp. 2024) will allow member countries to set parameters to favour BEVs. The level of benefits in the Czech Republic has not yet been specified.	**Toll charges** (Eurovignette Directive)[5]
6	**Maintenance**	▪ Lower maintenance costs are one of the advantages of BEVs, the savings are likely to be between 25 and 75%.	-

(1) Member State incentives applied in some neighbouring countries.
(2) The GBER (General Block Exemption Regulation) represents the basic legislative framework for the provision of permitted public support in the EU.
(3) Implementation of the EU ETS II (expected in 2027) will include fuel manufacturers. RED III will benefit renewable energy charging infrastructure operators.
(4) Operators of infrastructure with the possibility of charging from renewable energy sources will benefit from RED III.
(5) The introduction of the Eurovignette Directive will help to standardise tolls across the EU, but it largely leaves it up to Member States to set the parameters for zero-emission transport.

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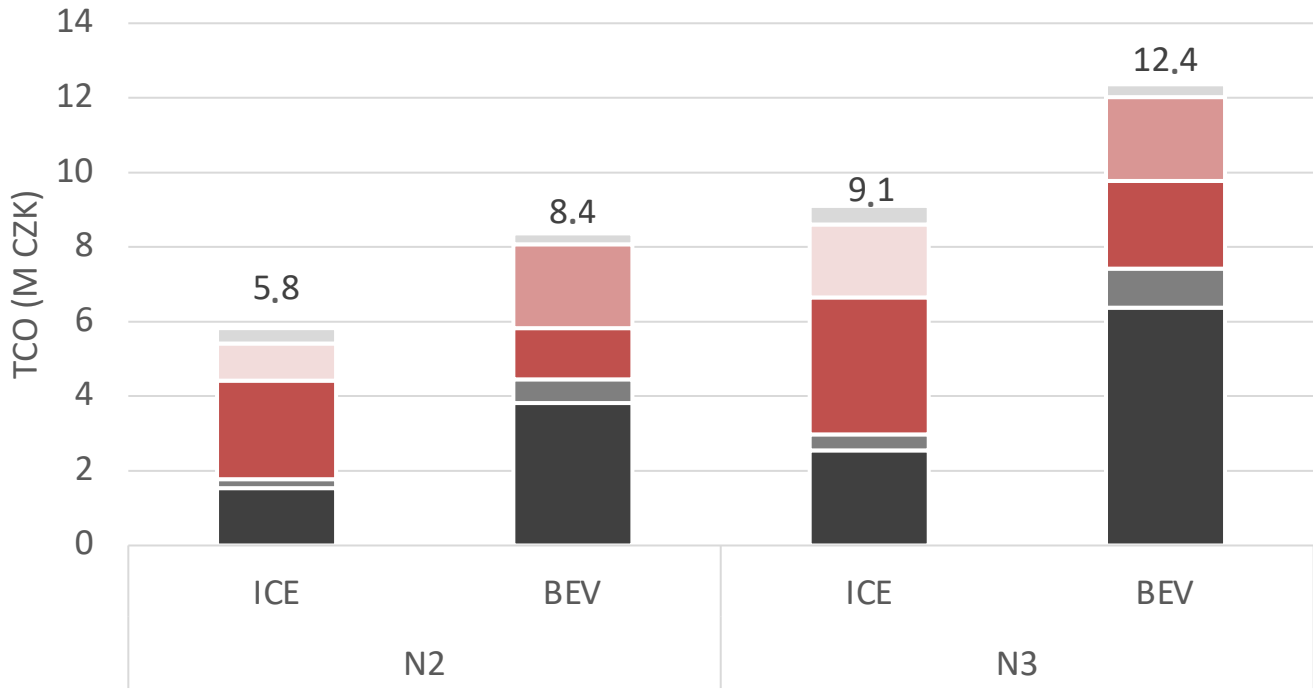
TCOs for N2 are about CZK 2.5M higher for BEVs than for ICE, for N3 eTrucks the difference is over CZK 3M in 7 years

TCO over 7 years of operation at 70,000 km/year(1)

(a model calculation based on the assumptions explained on the following slides)

1. **Purchase price**
2. **Insurance**
3. **Fuel/Energy**
4. **Charging infrastructure**
5. **Toll**
6. **Maintenance**



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(1) The calculation assumes (i) a daily range of up to 300 km and (ii) depot charging only, with power up to 75 kW. Further details are below.

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Purchase price of the Truck

1

		N2		N3	
		ICE	**BEV**	**ICE**	**BEV**
Purchase price		CZK 1.8M (EUR 70K)	CZK 4.5M (EUR 180K)	CZK 3.0M (EUR 120K)	CZK 7.5M (EUR 300K)
Milage	km/year	70K			
Operation	years	7			
Residual value	%	15			
TCO	CZK	1.5M	3.8M	2.6M	6.4M
TCO per km	CZK/km	3.1	7.8	5.2	13.0
		100%	~260%	100%	~220%

- In this model calculation the purchase prices of N2 corresponds to 12t vehicles. Tractor units are considered in the N3 category.
- The prices are list prices for 2024. Possible discounts available for large buyers are not taken into account.

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Insurance costs

2

		N2		N3	
		ICE	BEV	ICE	BEV
Annual cost		2% of the vehicle purchase price			
TCO[1]	CZK	0.3M	0.6M	0.4M	1.1M
TCO per km	CZK/km	0.5	1.3	0.9	2.1
		100%	~260%	100%	~220%

- Insurance costs include compulsory liability insurance and accident insurance.[1] Prices often include specific tariffs reflecting the size of the company.
- In the model calculation, the cost of insurance reflects the purchase price of the vehicle, resulting in higher insurance prices for BEVs.[2]

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(1) The price of compulsory liability insurance does not have to be linked to the price of the vehicle, the price of accident insurance does.
(2) The value of 2% of the price used for both ICE and BEV is based on the real values of insurance prices of currently operated BEVs in the Czech Republic. At this stage of market development, when there are only a small number of BEVs on the market, the price for insurance is relatively high. The price of insurance can be expected to decrease as the number of BEVs on the market increases.

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Fuel/energy costs

3

		N2		N3	
		ICE	BEV	ICE	BEV
Consumption		0.18 l/km	0.7 kWh/km	0.25 l/km	1.2 kWh/km
Fuel/electricity price		30 CZK/l	4 CZK/kWh	30 CZK/l	4 CZK/kWh
TCO	CZK	2.6M	1.4M	3.7M	2.4M
TCO per km	CZK/km	5.4	2.8	7.5	4.8
		100%	~50%	100%	~60%

- The price of electricity includes:
  a. The wholesale electricity price on the market (the current price of CAL 2024 BL is 120 EUR/MWh (~3 CZK/kWh))
  b. The trader's margin and the regulated fees linked to the consumption of kWh.
- Grid fees linked to the power output of the charging infrastructure (price per kW) are not included.

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Charging infrastructure costs

4

		75kW charging point
CAPEX depreciation(1)	CZK/year	100K
OPEX (fix)	CZK/year	220K
Total cost	CZK/year	320K
Milage charged	km	70K
TCO	CZK	2.2M
TCO per km	CZK/km	4.6

- Charging in the depot is considered using 150kW DC charging station with 2 charging points for 2 eTrucks N2 or N3 (i.e. each eTruck can use a charging power of up to 75kW) in existing parking lots.(1)
- Investment costs include the purchase of a charging station and other investment costs (engineering, grid connection, etc.). The depreciation used for the TCO calculation considers an expected lifetime of 10 years for the charging station, and an expected lifetime of 40 years for the network connection.(2),(3)
- Fixed operating costs include distribution fees and charges for supported electricity sources per 75kW reserved grid capacity.(4)

(1) 75 kW power output allows charging the battery by 450 kWh in 6 hours.
(2) Price of the 150kW charging station CZK 1,4M (CZK 75K annually for 75kW and 10 years). Other investment costs for 75 kW CZK 1M (CZK 25K annually for 40 years).
(3) Calculation does not include financing costs.
(4) These costs are independent of the volume of electricity consumption. The values correspond to the current level of regulated charges.

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Toll & Maintenance

5

		N2		N3	
		ICE	BEV	ICE	BEV
TCO	CZK	1M	-	2M	-
TCO per km	CZK/km	2	-	4	-

- The calculation of tolls can vary depending on the parameters of the vehicles and the types of roads they use. An average price of 2 CZK/km for N2 and 4 CZK/km for N3 is used. Zero toll rate is considered for eTrucks.(1)

6

		N2		N3	
		ICE	BEV	ICE	BEV
Annual costs	CZK	60K	40K	70K	50K
TCO	CZK	0.4M	0.3M	0.5M	0.3M
TCO per km	CZK/km	0.9	0.6	1.0	0.7

- eTrucks have maintenance and service costs reduced by 30%.(2)

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(1) In the coming years, toll rates are expected to be adjusted in the context of the implementation of the Eurovignette Directive. Scenarios for possible toll rate developments and their possible impact on TCO are discussed below.

(2) At present, only a limited amount of operational data exists. BEV savings in maintenance and service cost savings are expected between 25-75%.

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TCOs for N2 are about CZK 2.5M higher for BEVs than for ICE, for N3 eTrucks the difference is over CZK 3M in 7 years

	TCO (M CZK)				TCO (CZK/km)(1)			
	N2		N3		N2		N3	
	ICE	BEV	ICE	BEV	ICE	BEV	ICE	BEV
1 **Purchase price**	1.5	3.8	2.6	6.4	3.1	7.8	5.2	13.0
2 **Insurance**	0.3	0.6	0.4	1.1	0.5	1.3	0.9	2.1
3 **Fuel/Energy**	2.6	1.4	3.7	2.4	5.4	2.8	7.5	4.8
4 **Charging infrastructure**	0.0	2.2	-	2.2	0.0	4.6	0.0	4.6
5 **Toll**	1.0	0.0	2.0	0.0	2.0	0.0	4.0	0.0
6 **Maintenance**	0.4	0.3	0.5	0.3	0.9	0.6	1.0	0.7
Total	**5.8**	**8.4**	**9.1**	**12.4**	**11.9**	**17.1**	**18.6**	**25.2**
		+2.5		+3.3		+5.2		+6.7

(1) TCO in 7 years operation. TCO per km with 7 years and and 70,000 km/year.

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TCO gap sensitivity to changes in selected inputs

in CZK	N2	N3
TCO gap	**2.5M**	**3.3M**
Decrease in BEV purchase price by 10%	-0.4M	-0.7M
Decrease in BEV insurance price by 25%	-0.2M	-0.3M
Increase in BEV power consumption by 10%	+0.1M	+0.2M
Increase in ICE fuel consumption by 10%	-0.3M	-0.4M
Increase in price of electricity by 10%	+0.1M	+0.2M
Increase in price of diesel by 10%	-0.3M	-0.4M
Reduction of CAPEX for charging infrastructure by 10%	-0,1M	-0,1M
Decrease in charging infrastructure OPEX by 10%	-0.2M	-0.2M
Decrease in toll discount for BEVs by 10%	+0.1M	+0.2M
Increase of maintenance costs savings of BEVs by 10% (from 30% to 40% compared to ICE)	-0.04M	-0.05M

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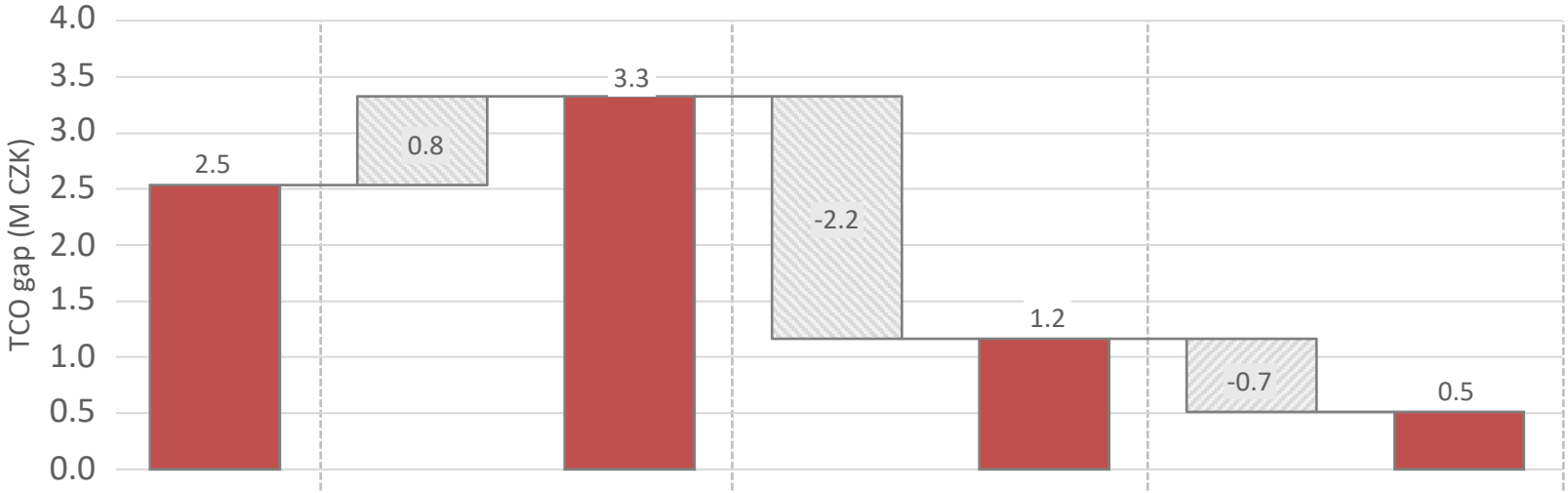
The combination of an 80% investment subsidy together with a 75% discount on tolls will reduce the TCO difference to 0.5 million. CZK (I)

TCO gap over 7 years of operation

(Example of one N2 eTruck based on the assumptions above)



I. TCO gap

Based on illustrative TCO calculation above (N2)

II. Eurovignette directive implementation (proposal[(1)])

Base case involves:

(i) cancellation of the current 100% discount for BEVs

(ii) 15% increase in tolls compared to current prices

(iii) introduction of a 17% discount for BEVs (instead of today's 100%)[(2)]

III. eTruck investment subsidy

Investment subsidy corresponding to 80% of the price difference between BEV and ICE

IV. 75% toll discount

Increase of the BEVs` toll discount from 17% (base case) to 75% (German reference)

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(1) The proposal is based on a working proposal for the implementation of the Eurivignette Directive prepared by the Ministry of Transport.

(2) 17% discount equals approx CZK 0,2M in N2 TCO. The discount rate may varies for different eTrucks.

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The combination of an 80% investment subsidy together with a 75% discount on tolls will reduce the TCO difference to 0.5 million. CZK (II)

- The difference in TCO after 7 years of operation of CZK 500 thousand does not seem to be too significant in the context of possible inaccuracies of the calculation (CZK 500 thousand corresponds to CZK 6 thousand/month or also CZK 1/km).
- It can be assumed that in some cases better values can be achieved (and in some cases worse). Also, it can be assumed that on the customer's side, emission-free transport may have an extra added value compared to emission transport, and that they may be willing to pay for this value (we cannot quantify the value for the customer at this point). Therefore, it is not necessary to achieve a strictly balanced TCO by means of investment subsidies.
- A number of other instruments can be used to favour emission-free transport. The above example shows that if investment subsidies for vehicle acquisition and toll discounts were set at the level applied in Germany, this would probably be a key (and probably sufficient) incentive for the development of HDV electrification.
- Other instruments that can help reduce the TCO gap include for example investment support for the purchase of charging infrastructure, discounts on regulated network charges or low-interest loans.(1)

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(1) The Ministry of Industry and Trade is expected to publish a subsidy programme called "Electromobility Guarantee" at the beginning of December 2024. Under this programme, businesses (regardless of size) will be able to apply for support in the form of a guarantee financial instrument combined with a subsidy component for the purchase of emission-free vehicles and charging stations. The programme will target vehicles of categories M1, N1 and N2 up to 4.25t.

Projection scenarios for estimating the size of the market gap and the subsidy needed

- Significant developments are expected in the three following TCO components in the outlook to 2030.[1]:
  - **A. Purchase price**: the price difference between ICEs and BEVs will decrease, the speed of price convergence will depend on the business strategy of vehicle suppliers[2]
  - **B. Fuel/energy costs**: the introduction of EU ETS II will result in higher fuel prices for ICE[3]
  - **C. Toll**: the implementation of the Eurovignette Directive will lead to changes in toll rates. The rate of the BEV advantage will no longer be 100%. The level of benefit will be determined by individual countries and has not yet been concretely set in the Czech Republic.[4]

		TCO projection scenarios		
		Slow Electric	**Medium Electric**	**Aggressive Electric**
1	**Purchase price**	No change in purchase prices in next 10 years	The price gap **reduced by 25%** in 2030	The price gap **reduced by 50%** in 2030
3	**Fuel/Energy**	The price of diesel increase by 10% in 2027		
5	**Toll**[5]	**17% discount** for BEVs from 2025	**45% discount** for BEVs from 2025	**75% discount** for BEVs from 2025

(1) The effect of RED III is not considered in the projections.
(2) In order for vehicle manufacturers to achieve their targets and sell the required number of BEVs, the prices of BEVs and ICEs will need to be brought significantly closer in the future. It is difficult to estimate if manufacturers will more increase ICE price or decrease BEV price, or how aggressive this development will be.
(3) The draft proposals of the Ministry of Transport are currently working with a possible increase of toll charges by 15% on average and discount of around 15-20% for BEV. Germany has already set a 75% discount from 12/2023.
(4) Effect on EU ETS II implementation is expected of about 3 CZK/l of diesel price (i.e. 10% of the current price).
(5) All scenarios assume a toll charges increase of 15% in 2024, discounts for BEVs are calculated from this base.

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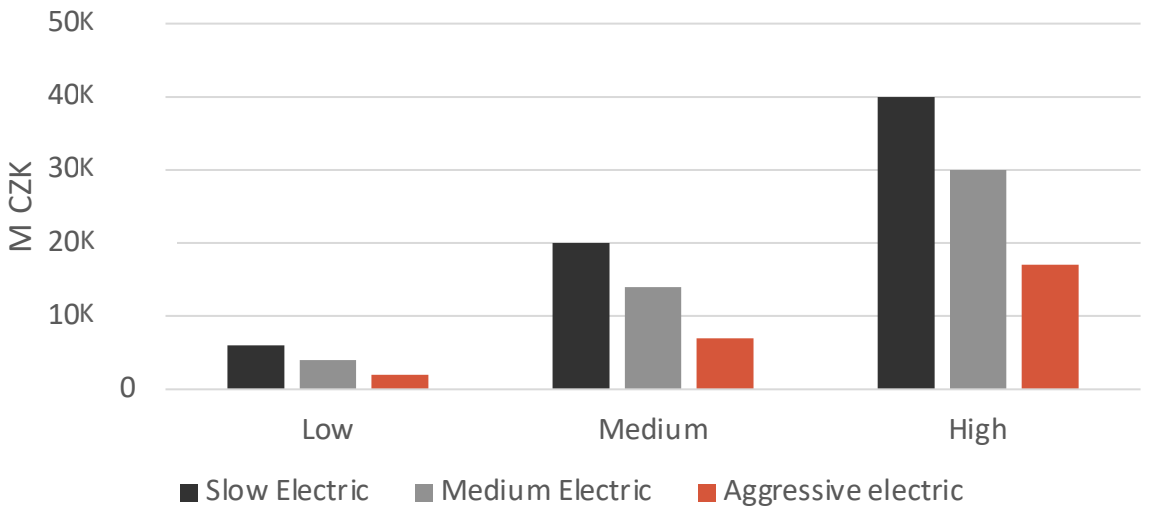
Achieving 2,000 to 6,000 eTrucks by 2030 will likely require subsidies of at least CZK 4 billion and CZK 14 billion, respectively

An estimate of the investment subsidy support needed in various scenarios
(by 2030, cumulated)



in billion CZK (cumulated)	Low (2K BEVs in 2030)(1)	Medium (6K BEVs in 2030)(1)	High (11K BEVs in 2030)(1)
Slow electric	6	20	40
Medium electric	4	14	30
Aggressive electric	2	7	17

Most likely minimum gap

Explanation

The challenge is to estimate the most likely minimum market gap which can be overcome by subsidies, i.e. how much funding will most likely be needed to achieve a reasonable number of eTrucks in operation by 2030:

1. The set of High scenarios (right column) and the set of Aggressive electric scenarios (bottom row) may be considered overly optimistic, i.e. unlikely.
2. Out of the remaining scenarios, the Slow electric Medium is also unlikely as the indicated subsidy volume of CZK 20B is too high to imagine.
3. The remaining scenarios represent the range which seems to be relevant, also when considering the size of subsidy programs in neighbouring countries, i.e.:
   a. At least CZK 4B if the 2030 target is 2K eTrucks
   b. At least CZK 14B if the 2030 target is 6K eTrucks

(1) The share of N3 in total projections is 0% in 2024, from 2025 to 2030 the share of N3 sold annually is expected to grow to 30%.

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2 Subsidy initiatives in neighbouring countries(1)

(1) Besides the neighbouring countries, the Netherlands (one of the EU leaders in transport electrification) is also taken into account. Also, relevant EU incentives are considered.

Introduction to subsidy mechanisms in EU countries

In addition to the TCO (bottom-up) calculation of the market gap, the reference example of subsidy programmes in neighbouring countries can be used to determine the appropriate size of the subsidy programmes.

Summary of investment subsidy incentives to support HDV electrification in EU countries:

1. **Vehicle acquisition incentives are the most commonly used policy tool** to incentivize the uptake of zero emission trucks (ZET).
2. Countries design their ZET subsidies as either **covering % point differences between the purchase price of a new ZET and a diesel truck** or as a **fixed per-vehicle sum.**
3. Regarding the supported drivetrain technologies, most countries offer aid for battery electric and hydrogen trucks.
4. For example, Spain and the Netherlands are differentiating their **subsidy amounts depending on the applicants' company size** or **annual turnover**. This allows to ensure larger aid sums flow to smaller companies with more limited financial capacities.
5. Most EU countries that offer financial support for the acquisition of an HVD also **provide financial support for the acquisition of a charging station (non-public).** Usually as a % of the eligible costs.
6. Support for **public charging infrastructure** is so far only a **marginal interest of national subsidy programmes**, the European CEF programme can be used for the development of public charging infrastructure.

Source: transportenvironment.org

Overview on incentives in neighbouring countries

	Programme	Availability	Allocation		non-public	public	Country's own targets
GER	KsNI[1]	2021 – 2026	**EUR 2.2B**	✓	✓		• 1 mil. charging points in Germany by 2030 (for all vehicle types) • 1/3 of the mileage in heavy road freight transport should be electric by 2030[7]
	BMDV[2] funding	2021 – 2025	**EUR 4B**[6] overall funding (EUR 1.15B public / EUR 2.8B non-public) **EUR 400M** [6] active programme		✓		
AUT	ENIN[3]	2022 – 2024	**EUR 365M**	✓	✓		• all new HDVs under 18 t should be zero-emission from 2030 and all new HDVs over 18 t from 2035
	Zero Emission Mobility	2023 – 2024	**EUR 9M** for 3 subprograms **Flexible budget** for the eTrucks relevant subprogr.	✓	✓	✓	
POL	Wsparcie infrastruktury[4]	2021 – 2025	**EUR 173M**[6]				• 17,760 different types of charging points and stations for electric vehicles and 20 hydrogen refuelling stations are planned to be created or reconstructed
NLD	AanZET[5]	2023 –2027	**EUR 125M**[8]	✓			• 100% of **new HDVs** should be zero-emission by 2040[9] • 100% of **all HDVs** should be zero-emission by 2050 (~160,000 eTrucks)[9] • establishing zero-emission urban zones in 30 – 40 cities[9]
SVK	–	–	–				–

opened call

programme support it, there is no call opened

programme does not support it

Strategic documents: GER: An Overall Approach to Climate-Friendly Commercial Vehicles (2020), Charging Infrastructure Masterplan II (2022), AUT: Mobility Masterplan 2030. POL: National Policy Framework for the Development of Alternative Fuel Infrastructure (2019), NLD: Dutch National Charging Infrastructure Agenda (2022), SVK: Plan for the Development of Electromobility in the Slovakia (2022) (1) KSNI = Klimaschonende Nutzfahrzeuge und Infrastruktur (2) BMDV = Bundesministerium für Digitales und Verkehr (3) ENIN = Emissionsfreie Nutzfahrzeuge und Infrastruktur (4) Wsparcie infrastruktury(= Wsparcie infrastruktury do ładowania pojazdów elektrycznych i infrastruktury do tankowania wodoru (5) AanZET = Aanschafsubsidieregeling zero-emissie trucks (6) The budget is related to charging stations based on power output, not on vehicle type. (7) Climate Protection Programme 2030. (8) Adjustments expected. (9) State Secretary Heijnen (letter).

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Germany

Programme	**KsNI** – Klimaschonende Nutzfahrzeuge und Infrastruktur (Climate-friendly commercial vehicles and infrastructure)						
Provider	Federal Ministry for Digital and Transport (BMDV – Bundesministerium für Digitales und Verkehr)						
Availability	2021 – 2026						
Budget	**EUR 2.2B**						
What is supported	Acquisition of (N1, N2, N3): i. commercial vehicles (battery, fuel cell, hybrid and plug-in hybrid) ii. special vehicles (battery, fuel cell, hybrid and plug-in hybrid) iii. converted diesel vehicles with battery and fuel cell					80% of the additional investment costs(1)	
	Procurement of operationally necessary refuelling and charging infrastructure					80% of the total eligible project-related expenditure	
	Preparation of feasibility study					50%	
Who is eligible for funding	• Commercial companies • Public institutions and associations • Leasing or rental companies						
Others	**Price limits in EUR**	for **new vehicles**				for **converted vehicles**	
	Powertrain tech.(2)	*Battery*	*Fuel cell*	*Hybrid*	*Plug-in hybrid*	*Battery*	*Fuel cell*
	N2 (> 3.5 t) < 7.5 t	100K	200K	-	-	90K	190K
	N2 < 12 t	200K	300K	-	-	190K	290K
	N3 < 20 t	350K	450K	120K	100K	330K	430K
	N3 < 30 t	400K	500K	170K	150K	380K	480K
	N3 > 30 t	450K	550K	220K	200K	420K	520K

Source: klimafreundliche-nutzfahrzeuge.de

(1) Applicants must enclose an offer for the acquisition of a comparable commercial vehicle with the conventional diesel drive meeting the latest Euro 6 emission standards with comparable vehicle characteristics together with their application. The plausibility of the selection of the comparison vehicle is subject to spot-checks by the granting authority.

(2) N1 ≤ 3,5: t Battery = EUR 25K, Fuel cell = EUR 90K

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Germany

public + non-public

not exclusively for HVDs!

Programme	Charging infrastructure in Everyday Life (BMDV funding)
Provider	Federal Ministry for Digital and Transport (BMDV – Bundesministerium für Digitales und Verkehr)
Availability	2021 – 2025
Budget	EUR 4B (EUR 1.15B public / EUR 2.8B non-public)
Current Subprogramme	**Fast-charging infrastructure for SMEs and large companies** (from 2023 to unknown, **EUR 400M**)
What is supported	• Purchase and installation of non-public fast charging points with nominal charging capacity ≥ 50 kW (DC). • Stationary electricity storage and grid connection.

		SMEs: 40%	**Large Enterprise: 20%**
Nominal charging power	Maximum amount / charging point (in EUR):	Maximum subsidy amount /charging point (in EUR):	
50 – 149 kW	35K	14K	7K
≥ 150 kW	75K	30K	15K

Who is eligible for funding	• Commercial companies • Companies with public participation
Others	• The grant is limited to EUR 5M per company, regardless of the number of fast charging points. • The **electricity required for the charging process must come from renewable sources**. • Procurement and installation must take place within 18 months of receipt of the grant notification (the project period begins on the date of the notification). • Fast-charging infrastructure must remain the property of the applicant company for a period of at least 2 years from the date of the installation protocol and is operated in Germany.

Source: nationale-leitstelle.de

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Austria

Programme	**ENIN** - Emissionsfreie Nutzfahrzeuge und Infrastruktur (Zero-emission commercial vehicles and infrastructure)
Provider	Federal Ministry for Climate Protection, Environment, Energy, Mobility, Innovation and Technology (BMK)
Availability	2022 – 2024
Budget	**EUR 365M** (N1, N2, N3, infrastructure) *EUR 35M come from European Union's Recovery and Resilience Facility (RRF), another EUR 330M come from national funds*
Current call	The budget for 2023 (EUR 113M) is divided into individual calls for proposals: • 1st EUR 35M for N1 vehicles, • 2nd EUR 50M for N2 and N3 vehicles, • 3rd EUR 14M for N1 vehicles, • **4th EUR 10M for N2 and N3 vehicles (CURRENT)**, • 5th EUR 4M for special vehicles of the N2 and N3 class.
What is supported	• **80% of the additional costs for zero-emission vehicles** or **80% of the conversion costs** • **40% of the acquisition costs for charging** or **refueling infrastructure** (60 % in the pre- and on-carriage of the combined transport)
Who is eligible for funding	• Individuals • Commercial companies • Consortia of individuals or Commercial companies
Others	Reference prices of diesel HDVs: • N2 (3,5 – 12 t): EUR 46,540 • N3 (< 18 t): EUR 92,650 • N3 (> 18 t): EUR 108,680

Source: ffg.at/ENIN

Austria

Programme	Zero Emission Mobility					
Provider	Climate and Energy Fund of the Austrian (Klimafonds)(1) under Federal Ministry for Climate Protection, Environment, Energy, Mobility, Innovation and Technology (BMK)					
Availability	2023 – 2024 (March)					
Budget	EUR 9M (3 subprogrammes in total)					
Relevant Subprogramme	**E-Mobilität für Betriebe, Gebietskörperschaften und Vereine** (E-mobility for companies, local authorities and associations) – flexible budget					
What is supported	• 30% of the eligible costs (= additional investment costs and costs for planning) for the acquisition of electric vehicles (BEV + FCEV) • Installation of charging stations with public and non-public access according to the tables below • The conversion of existing charging points to the current state of the art					
Who is eligible for funding	• Commercial companies • Other entrepreneurial organisations and associations • Public organisations, religious institutions					
Others	**Cap limits of state support (in EUR)**					
	e-Trucks	**N2**	22K			
		N3	65K			
	Public charging infrastructure	**AC** above 11 kW ≤ 22 kW	2,5K	**Non-public charging infrastructure**	**AC**	900
		DC < 100 kW	15K		**DC**	4K
		DC ≥ 100 kW	30K		**DC**	10K
					DC	20K

Source: klimafonds.gv.at

(1) The programmes of the Climate and Energy Fund connect politics, business and science and build bridges directly to the people on the ground: in cities, regions and municipalities.

Netherland

Programme	AanZET (Aanschaf Emissieloze Vrachtwagens)						
Provider	Ministry of Infrastructure and Water Management						
Availability	2023 – 2027						
Budget	**EUR 125M**(1)						
Current call	**Currently 1st round with the budget EUR 57M** (5 official application rounds in total – annual basis)						
What is supported	**Truck category**	**Large enterprise: 40%**		**Medium enterprise: 50%**		**Small enterprise: 60%**	
	N2	12.5%	EUR 17,8K	19.0%	EUR 26,8K	25.0%	EUR 35,7K
	N3 rigid	15.0%	EUR 43,6K	21.5%	EUR 63,7K	28.5%	EUR 84K
	N3 tractor-trailer	20.0%	EUR 72,7K	28.5%	EUR 102,3K	37.0%	EUR 131,9K
Who is eligible for funding	• Commercial Companies • Non-profit institutions						
Others	• The truck must be purchased new. The truck may be bought outright or based on a financial lease. In the case of the latter, the grant must be requested by the lessee (the company that will be operating eTruck). For operational leasing, only the leasing company/lessor can apply for the AanZET grant. • The grant recipient must retain ownership of the truck for at least four years. The grant will be calculated based on the purchase price (excluding VAT).						

public + non-public

A subsidy scheme for charging infrastructure is expected to be introduced in 2024.

Source: rvo.nl

(1) Initial plan – can be changed due to 1) 1st year overspending of 27.4 million EUR (30mil. EUR was the plan); and 2) European rules on state aid: percentages and maximum amounts should be adjusted downwards. Less subsidy should be given per truck. The way the subsidy is distributed should change. Each company can now only apply for a subsidy for one emission-free truck per day. This can be done as long as there are funds available. This increases the chance of each company receiving a subsidy compared to previous years.

Poland

*There is currently **no programme in Poland to support the acquisition of N2 and N3 eTrucks**. Based on **National Policy Framework for the Development of Alternative Fuel Infrastructure (2019)** Polish Energy ministry intends to compensate **30% of the price difference** between an electric truck and its diesel counterpart, with a maximum funding per **N2 vehicle of EUR 32,000** and **N3 vehicle of EUR 43,000**. It is not yet clear how logistics companies will be able to access the support.*

public + non-public

Primarily for passenger EV chargers, however, it does not exclude chargers for HDVs.

Programme	Wsparcie infrastruktury do ładowania pojazdów elektrycznych i infrastruktury do tankowania wodoru (Support for electric vehicle charging infrastructure and hydrogen refueling infrastructure)		
Provider	The National Fund for Environmental Protection and Water Management		
Availability	from 2021 to 2025 (contracting deadline) / 2028 (financing deadline)		
Budget	~ EUR 173M[(1)] (PLN 870M)		
Current call	**not available**		
What is supported	≤ 22 kW	25% of eligible costs	private
	≤ 50 kW to less than 150 kW	30% of eligible costs (45% in the case of smaller municipalities)	public, where at least one point allows a DC charging
	150 kW	50% of eligible costs	public
Who is eligible for funding	• Individuals • Entrepreneurs • Cooperatives, Housing communities • Local government units		

Source: gov.pl, pspa – Poland drives e-mobility (2022)

CEF for Transport (AFIF)

public

Programme	CEF for Transport – **AFIF (Alternative Fuels Infrastructure Facility)**	
Provider	European Climate, Infrastructure and Environment Executive Agency	
Availability	2021 – 2023	
Budget	EUR 1.57B (EUR 375M for Cohesion Envelope(1)/ EUR 1.2B for General Envelope(1))	
Current call	• the 5th cut-off (7 Nov – 31 Dec 2023) with budget 249 mil. EUR in Cohesion Envelope • 3 following topics of the call: Ⓐ Alternative Fuel Infrastructure Facility - Unit Contributions, Ⓑ Alternative Fuel Infrastructure Facility - Works - Zero Emissions, Ⓒ Alternative Fuel Infrastructure Facility - Works – LNG)	
What is supported	Ⓐ Public charging infrastructure located: i. along the TEN-T road network based on eligibility map (A,B,C relevant – see below) ii. on safe and secure parkings (A,C relevant – see below) iii. in urban nodes (B,C relevant – see below)	
	A. Charging stations with a power output ≥ **150 kW**	30K EUR
	B. Charging stations with a power output ≥ **350 kW**	60K EUR
	C. Grid connection (with a minimum power capacity of 600kVA)	30K EUR
Who is eligible for funding	Legal entities (public or private bodies) established in one of the EU Member States eligible for funding from the Cohesion Envelope(1).	

Source: cinea.ec.europa.eu
CEF = Connecting Europe Facility
(1) Cohesion Envelope: countries where the gross national income (GNI) per inhabitant is less than 90% of the EU average (includes CZ). General Envelope = countries with GNI per inhabitant more than 90% of the EU average.

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In the coming years, countries are concentrating on supporting the acquisition of eTrucks and related non-public charging infrastructure

	registr. N2 and N3 (in thousands)	Adjusted total subsidies per 2023-2026[2] (in milion EUR)	eTrucks (N2 + N3)			Non-public chargers subsidies			Public chargers subsidies			Private normal.	Total normal.
			a	b	c	d	e	f	g	h	i		
			Total[3] (in milion EUR)	Normalized[4] (EUR/ vehicle)	% of price difference (vs. ICE)	Total[3] (in milion EUR)	Normalized[4] (EUR/ vehicle)	% of eligible costs	Total[3] (in milion EUR)	Normalized[4] (EUR/ vehicle)	% of eligible costs	b+e (in EUR)	h+e+h (in EUR)
GER	567	1,580	735	1,296	80%	545	961	80%	300	529	up to 60%	2,257	2,787
AUT	69	165	109	1,585	80%	55	792	40%	1	14	amount per charger type	2,377	2,391
POL	708	43	-	-	-	8.7	12	25%	17.3	24	up to 50%	12	37
NLD	139	75	75	540	40-60%	*to be introduced in 2024*	-	-	*to be introduced in 2024*	-	-	540	540
Avg				1,140	70%		589	45%		189	50-60%	**1,297**	**1,439**

Assumptions: 1) In case the programme is supporting chargers for all vehicle types, to eTrucks is allocated ¼ of total budget, 2) In case the programme is supporting eTrucks + Non-public chargers, ¾ of the budget is allocated to eTrucks and ¼ to chargers. 3) In case the programme is supporting N1,N2 and N3 eTrucks, only 2/3 of the budget is taken into account (excluding N1 support).

(1) Reference: see slides on individual countries

(2) Current or announced direct subsidy programmes for the period 2023-26. In case of longer period, a subsidy is adjusted to 2023 –26. If the subsidy is related to chargers and refuelling stations for all vehicle types, ¼ of total amount is taken into account. Other support such as tax or other financial mechanisms not considered here.

(3) In some countries it is not (yet) clear exactly how support is divided among vehicles, private chargers and public chargers. In such cases, the numbers are either omitted (-) or deduced from what is known (in grey). (4) Subsidies in 2023-26 normalized by the total number of trucks in order to compare the countries.

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Achieving a comparable level of support in the Czech Republic would mean an allocation for subsidy support of approximately CZK 5.8 billion by 2026

- The table in the previous slide shows that the programmes supporting electrification of HDVs in the countries investigated have a budget equivalent to **approximately 35,000 CZK per HDV (~1,439 Euro)** in the period 2023-2026. However, the range is significant. Germany and Austria allocate around 2,787 EUR and 2,391 EUR respectively, while Poland only 37 EUR.
- Of this, approximately 90% is allocated to vehicle purchases and related non-public charging infrastructure.
- Public charging infrastructure is currently supported only to a small extent by national subsidies (or EU programme CEF, not shown in the table above). New programs in the context of the required AFIR objectives are being developed.
- In order to achieve a comparable level of support in the Czech Republic with neighbouring countries (i.e. CZK 35,000 per 165,000 registered N2 and N3 vehicles), it would be **necessary to allocate approximately CZK 5.8 billion** to support the electrification of HDVs by 2026 (which corresponds roughly to the estimates in the previous chapter of this study). To reach the level of support in Germany, it would be almost twice as much.
- Regarding the **level of support per vehicle**, it is the highest in Austria and Germany (80% of the additional investment costs). In the Netherlands, it depends on the type of vehicle and the size of the company applying for the subsidy (40-60% of the additional investment costs).
- In terms of the **level of support per charging station**, it varies across countries. For non-public chargers it is 25-80% of eligible costs and for public chargers up to 60% of eligible costs. For both categories, the highest level of support is observed in Germany.

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3 Conclusions

3.1 Market gap

3.2 Subsidy initiatives in neighbouring countries

Conclusions on market gap (I.)

1. The study developed an illustrative TCO calculation for ICE and BEV type vehicles in the N2 and N3 categories. The TCO comparison shows that at today's prices, a 7-year operation of an ICE is more expensive than a BEV by approximately CZK 2.5 million in the N2 category and CZK 3.3 million in the N3 category.

2. If the entire TCO were converted to cost per kilometer for an annual mileage of 70,000 km, the difference in the cost of the vehicle would be higher by 5.2 CZK/km in category N2, and 6.7 CZK/km in category N3.

3. The TCO calculation result is sensitive to many assumptions. The key components of TCO are the price of the vehicle and the cost of charging, which can be further decomposed into the cost of electricity and the cost of the charging infrastructure. A 10% reduction in the purchase price of BEVs would decrease the TCO difference by CZK 0.4 million for N2, and by CZK 0.7 million for N3. For example, a reduction in the price of electricity by 1 CZK/kWh would increase the TCO difference by CZK 0.3 million for N2, and CZK 0.6 million for N3. Reducing the CAPEX of the charging infrastructure by 10% will reduce the TCO difference by 0.1 million. CZK.

4. In order to estimate the size of the market gap by 2030, a total of 9 projection calculations were carried out. These projections were generated by combining 3 scenarios of vehicle purchase prices and 3 scenarios of the total number of eTrucks in 2030. Of these 9 combinations, 3 were selected as the most likely scenarios, namely 2 for 2 thousand eTrucks in 2030 and 1 for 6 thousand eTrucks in 2030.

Conclusions on market gap (II.)

5 Electrification of 2,000 HDVs by 2030 would require subsidy support of at least CZK 4 billion, while electrification of 6,000 HDVs by 2030 would require at least CZK 14 billion. The prediction assumes that by 2030 the N2 category will be the dominant (80% of eHDVs sold in 2030 will be in the N2 category, 20% in the N3 category).

6 The study includes an estimate of the potential effect of different support options to reduce the TCO gap. In 2024, the toll system tariffs are expected to be updated in line with the requirements of the European legislation, which will lead to a relative disadvantage for BEVs compared to the current situation where BEVs are fully exempted from toll charges. The ministry is working with a version of approximately 17% discount on toll for eTrucks, which in comparison to today's situation means in an illustrative TCO calculation for N2 an increase in the TCO gap from CZK 2.5 million to CZK 3.3 million over 7 years of operation.

7 The calculation also shows that providing an 80% subsidy on the purchase price difference between BEV and ICE (analogue of subsidy intensities in Germany and Austria) would reduce the TCO difference from CZK 3.3 million to CZK 1.2 million. A potential increase in the toll discount rate from 17% to 75% would allow reducing the TCO difference to CZK 0.5 million, which for a 7-year operation and a mileage of 70,000 km/year corresponds to costs of about 6 thousand CZK/month, or approximately 1 CZK/km.

Conclusions on subsidy initiatives in neighbouring countries

1. Looking at neighbouring countries, Austria and Germany provide the most significant support for HDV electrification. Both countries have programmes for both investment support for the acquisition of eTrucks and for non-public charging infrastructure.

2. In Poland, the purchase of eTrucks is not yet supported, charging stations are supported marginally. In the Netherlands, on the other hand, only the acquisition of eTrucks is supported (a charging station support system is to be introduced in 2024).

3. In terms of the level of support per vehicle, it is the highest in Austria and Germany (80% of the additional investment costs). Level of support per charging station varies across countries. For non-public charging stations it is 25-80% of eligible costs and for public charging stations up to 60% of eligible costs.

4. Around 90% of the current investment support in neighbouring countries for the period 2023-2026 is allocated to eTruck purchases and associated non-public charging infrastructure. EU's transnational transport programme CEF - AFIF can be used to support public charging infrastructure.

5. Looking at the current total budgets of subsidy programmes of neighbouring countries and taking into account the size of their fleets, the comparable amount of investment funding on average for the Czech Republic until 2026 corresponds to approximately CZK 5.8 billion. However, the range of values for individual countries is large. Germany's level is roughly double, while in Poland, on the other hand, support is currently minimal and focused exclusively on charging infrastructure.

Appendix

Methods of acquiring heavy NV in the Czech Republic (market survey)

Effect of CZK 4 billion in subsidies for the eTruck acquisition

TCO projections according to foreign studies

Public charging infrastructure utilization

Methodology

- CESMAD BOHEMIA(1), the largest association of freight carriers in the Czech Republic, conducted a survey for this study to gather information about the financing of the fleets of their members.
- Another source of data was the Register of Motor Vehicles CZ (public) provided by the Ministry of Transport, which, however, does not provide details.
- The survey was conducted among 50 CESMAD BOHEMIA members (of various sizes) by phone calls between the 6th and 10th November 2023.
- The focus of the survey was on N3 vehicles, however the N2 category is approached similarly.
- The main objectives were to find out:
  1. What funding freight carriers use and what is crucial for the decision making.
  2. Whether type of financing varies in relation to fleet size and operational mode.
  3. What is the freight carriers' approach to electric vehicles.

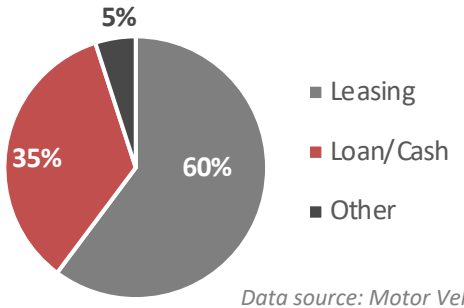
The outcomes are on the next slides.

ČESMAD members based on N° of HDVs in fleets		
N° of vehicles per company	**N° of companies**	**Vehicles total**
1-2	555	797
3-5	415	1,638
6-10	268	2,049
11-25	262	4,426
26-50	134	4,682
51-100	62	4,295
100+	31	5,831
TOTAL	**1,727**	**23,718**

(1) ČESMAD BOHEMIA je největší sdružení dopravců podnikajících ve vnitrostátní a mezinárodní dopravě v České republice. Má více než 2 000 členů v nákladní i autobusové dopravě s téměř 30 000 těžkými vozidly.

Data

Method of acquisition of new N3 vehicles in 2022



Data source: Motor Vehicle Register (2022)

*Based on publicly available data, **60% of N3 vehicles** in the Czech Republic were acquired **on lease in 2022**.*

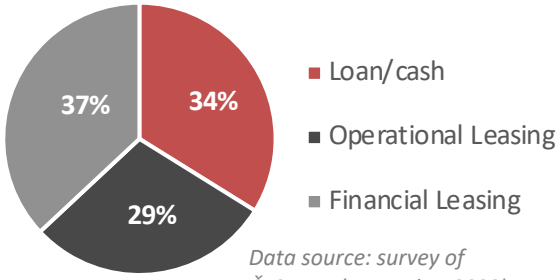
5 leasing companies in the CZ with the highest N° of registrations of N3 vehicles in 2022

1	ČSOB Leasing, a.s.
2	Mercedes-Benz Financial Services Czech Republic s.r.o.
3	VFS Financial Services Czech Republic s.r.o.
4	SG Equipment Finance Czech Republic s.r.o.
5	Raiffeisen - Leasing, s.r.o.

Data source: Motor Vehicle Register (2022)

*The leasing companies with the highest numbers of N3 vehicle registrations in 2022 are **subsidiaries of OEMs(1) and large Czech banks**.*

Method of acquisition of new N3 vehicles among CESMAD members



Data source: survey of ČESMAD (November 2023)

*Based on the survey, **29% of new N3 vehicles** is acquired on **Operational lease** and **37% on Financial lease** over the years.*

50 CESMAD members by fleet size and type of financing

Size of fleet / Type of financing	Own	FL	OL	Mix
small (<10 vehicles)	7	15	0	2
medium (<70 vehicles)	5	9	1	2
large (≥70 vehicles)	2	2	4	1

FL = financial leasing
OL = operational leasing

Data source: survey of ČESMAD (November 2023)

*Based on the survey, **SMEs** freight carriers prefer acquisition **via financial leasing** and **large** freight carriers **via operating leasing**.*

(1) OEM = Original Equipment Manufacturer

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Interpretations

- Compared to previous years, **an increasing share of financing using bank products** is noticeable, even for larger freight carriers. A key factor in the decision-making process is the interest rate of the loan, which has increased significantly in recent years.
- **Operational leasing is mainly used by large freight carriers** (economies of scale), it is not profitable for small and medium-sized freight carriers. On the other hand, **financial leasing is more common among smaller freight carriers**, who operate their vehicles for several years after repayment.
- Freight carriers often do not have a long-term preferred method of vehicle acquisition and continuously compare current offers of different types of acquisition.
- In terms of **electric HDVs** - freight carriers are not yet discussing offers of eTrucks because the difference in purchase price is too high. However, they are aware of the potential pressure from customers interested in low emission transport. Some of the larger freight carriers are considering testing electric HDVs in pilot projects in next few years. Nevertheless, without state support, the acquisition of more vehicles cannot be expected in the upcoming years.
- In terms of possible state support, **freight carriers would greatly prefer a direct investment subsidy** rather than favourable loan instruments (at least in the first years). Especially because of the administrative simplicity and immediate cash availability. Loan instruments could be a suitable complementary instrument when (in a few years' time) eTrucks become a common part of fleets (it will be more certain that they can be utilised during the repayment period).

Allocation of CZK 4 billion in subsidies as investment support for the acquisition of eTrucks can initiate the purchase of approx. 2-3 thousand eTrucks (category N2)

Illustration of the potential effect of direct eTruck acquisition subsidy (average current price gap CZK 2.7M and 80% subsidy)		
Subsidy per 1 eTruck (current prices)		**CZK 2.2M**
Subsidy per 1,000 eTrucks (current prices)		**CZK 2.2B**
Effect of CZK 4B(1)	Current prices	**1,900 eTrucks**
	Price gap reduced by 25%	**2,300 eTrucks**
	Price gap reduced by 50%	**2,800 eTrucks**

(1) The amount of CZK 4B roughly corresponds to the currently considered allocation in the Czech Republic.

Foreign studies expect rapid price (and TCO) development and indicate a break-even point (TCO parity) in EU countries within 10 years

Studies		TCO parity
a	**International Council on Clean Transportation** **(ICCT, 2021)**	TCO parity(1) of tractor-trailers (N3): A. **Without** subsidies, EU ETS II, Road tolls reductions, Additional CO_2 external costs: • Germany: 2029 • Poland: 2027 • Netherlands: 2024 B. **With** all incentives (listed in A), the study indicates the year 2021 in all countries.
b	**Transport & Environment** **T&E, 2021**	With the current acquisition subsidy in Germany (80% of additional investment costs) and toll scheme, long-haul (mostly N3) BEVs could reach TCO parity with fossil diesel trucks before 2025.
c	**Transport & Environment** **T&E, 2020**	TCO parity in EU: • Urban haul (<100 km/day): N2 in 2023 • Regional haul (101 - 200 km/day): N2 in 2023 / N3 in 2029 • Long haul (201 - 500 km/day): N2 in 2027 / N3 in 2031

(1) As a function of year of purchase, from the first ownership perspective (5 years) considering fixed diesel fuel and electricity prices for the 2020–2030 timeframe.

Public charging infrastructure in the CZ should provide over 100 MW of installed power output by 2030 according to AFIR requirements(1)

			TEN-T Core	TEN-T Comprehensive	Total
	Inputs				
A	Length of the TEN-T network in the CZ in 2030(2)	km	842	531	**1,275**
B	Maximum distance between the hubs	km	60	100	
C	Minimum power output of bidirectional hub(3)	MW	7.2	3	
	Calculation of the required extent of the public charging network				
	Total number of the charging hubs (=A/B)(4)	#	14	5	**19**
	Total installed power output (=A/B*C)	MW	101	16	**117**
	Electricity consumption corresponding to 1% of the installed power output(5)	GWh/year	8.9	1.4	**10.2**

(1) The Alternative Fuel Infrastructure Regulation (AFIR) sets the minimum power output of charging hubs for HDVs and their maximum distance along the core and comprehensive TEN-T network (parameters B and C in the table).
(2) The length of the TEN-T network in 2030 may differ from the listed values. The values include existing TEN-T network and network currently under construction. The values do not include the lengths of TEN-T in the planning phase. Including network in planning phase, the values would increase by about 50%.
(3) The AFIR requirements do not specify that the charging hubs must be bidirectional. They specify a minimum power available in each direction of 50% of the listed values.
(4) The total number of charging hubs shows the minimum number of hubs if all were bidirectional. If all charging hubs were one-directional, a twice as many would need to be built. This would not change the total installed power output of all hubs.
(5) The amount of annual electricity consumption for HDV charging corresponding to 1% of the installed power output (=A/B*C*8,760/100).

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Illustration of the calculation of the utilisation of public charging infrastructure in 2030

Example of calculation of power and time utilisation of public charging infrastructure in 2030 for various scenarios

		Low scenario	Medium scenario	High scenario
Number of vehicles	#	2,000	6,000	11,000
Total electricity consumption of all eTrucks *(with an average consumption per eTruck of 50 MWh/year)*	GWh/year	100	300	550
Use of public charging infrastructure *(20% of total consumption)*	GWh/year	20	60	110
Power utilisation of public charging infrastructure(1)	%	2	6	11
Time utilisation of public charging infrastructure(2) *(with a charging efficiency of 50%)*	%	4	12	22

Note on the calculation above:

- *The rate of utilisation of the public charging infrastructure cannot be estimated very accurately at present. The table below should therefore not be interpreted as a factual estimate, but rather as a calculation example for arbitrarily determined values.*
- *The calculation is based on projection scenarios of the number of eTrucks in 2030 and operates with the following values:*
  - *i. Average annual eTruck consumption: 50 MWh*
  - *ii. Utilisation rate of public charging infrastructure: 20%*
  - *iii. Efficiency of maximum charging power output utilisation during charging process: 50%*

(1) Power utilisation indicates the amount of electricity consumption for charging relative to the theoretical maximum consumption (continuous consumption at nominal power in one year).

(2) Time utilisation indicates what % of the time the charging infrastructure is occupied. The ratio between time utilisation and power utilisation indicates the efficiency of utilisation of the maximum power during charging.

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