sennder

ELECTRIFYING LOGISTICS

HOW ELECTRIC HEAVY-DUTY TRUCKS WILL OUTPERFORM DIESEL BY 2030

EXECUTIVE SUMMARY

Electric trucks are poised to become the primary mode of transportation for heavy-duty logistics—not because of policy mandates, but because of superior economics. **In the near term, electric heavy-duty trucks will be less expensive to operate than diesel alternatives, with minimal operational disruption**. This white paper demonstrates that shift, grounded in one of the most comprehensive cost modeling studies to date.

Three key factors will drive the economic superiority of electric trucks:

- Global electric vehicle (EV) scaling will unlock massive cost efficiencies for heavy-duty vehicles.
- Electricity can be produced and stored far more cost-effectively than fossil fuels.
- Supportive policy measures may accelerate the shift—but are not necessary for its success.

The takeaway is clear: the economics of electric trucks are improving dramatically—but not uniformly for everyone.

Shippers and carriers that prepare and adapt their supply chains and fleet strategies to support EVs will gain a lasting advantage, while those clinging to diesel may fall behind. In this high-stakes transition, winners and losers will be determined by readiness and execution.

OUR APPROACH

This study is fundamentally different. It models over 1.3 million cost scenarios based on real-world diesel and electric truck operations across Europe. Our goal: understand under which circumstances EVs become economically superior.

Electricity Cost vs. Truck Cost

Scenario Number. Color shows average of Electricity Cost Only. Size shows distinct count of Electricity Cost Only. The marks are labeled by Scenario Number. Details are shown for Scenario Number. The data is filtered on Driver Type DIESEL (LIVE ON Picker TABLE), which keeps 7 members.

Factors Modeled:

- Diesel Prices (2023–2024 actual ranges by country)
- Electricity Prices (0.05 EUR – 0.50 EUR/kWh)
- Road Tolls by Country (0%–100% subsidies modeled)[1]
- Carbon Price (0–200 EUR/tonne CO_2e)
- Daily Distance Driven (200–600 km)
- Electric Truck Purchase Price (2025–2030 with and without subsidies)
- Driver Costs by Country

The simulation covers seven core markets: Germany, Belgium, the Netherlands, Italy, Spain, Poland, and France.

What the Simulation Reveals:

This model shows **when and where EVs outcompete diesel on cost**—under realistic, complex conditions faced by **shippers and carriers** alike.

Our model does not account for:

- **Emission-free zones**, which are likely to further benefit electric vehicles
- **Subsidies beyond 2025**, which could improve EV competitiveness but remain uncertain
- **Grid connection costs**, which vary widely and are project-specific
  Major global oil price swings, which could significantly alter diesel cost dynamics
- **Increases in diesel truck pricing**, which are assumed to remain constant in our model, though market trends suggest upward pressure
- **Radical policy changes**, including both:
  - **Supportive measures** like internal combustion engine (ICE) bans
  - **Adverse shifts**, such as political moves favoring fossil fuels (e.g. subsidizing diesel), which could delay electrification

Why 2025–2030 Is Critical:

The period from 2025 to 2030 will define the tipping point for EV cost competitiveness generating a split between companies that have unlocked EV competitiveness and those who are diesel-reliant. Battery production, vehicle availability, and electricity access are scaling fast. This timeframe marks the shift from early adoption to widespread economic viability.

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1. https://www.ecgassociation.eu/wp-content/uploads/2024/08/Eurovignette.pdf

GLOBAL TRENDS SUPPORTING EV ADOPTION

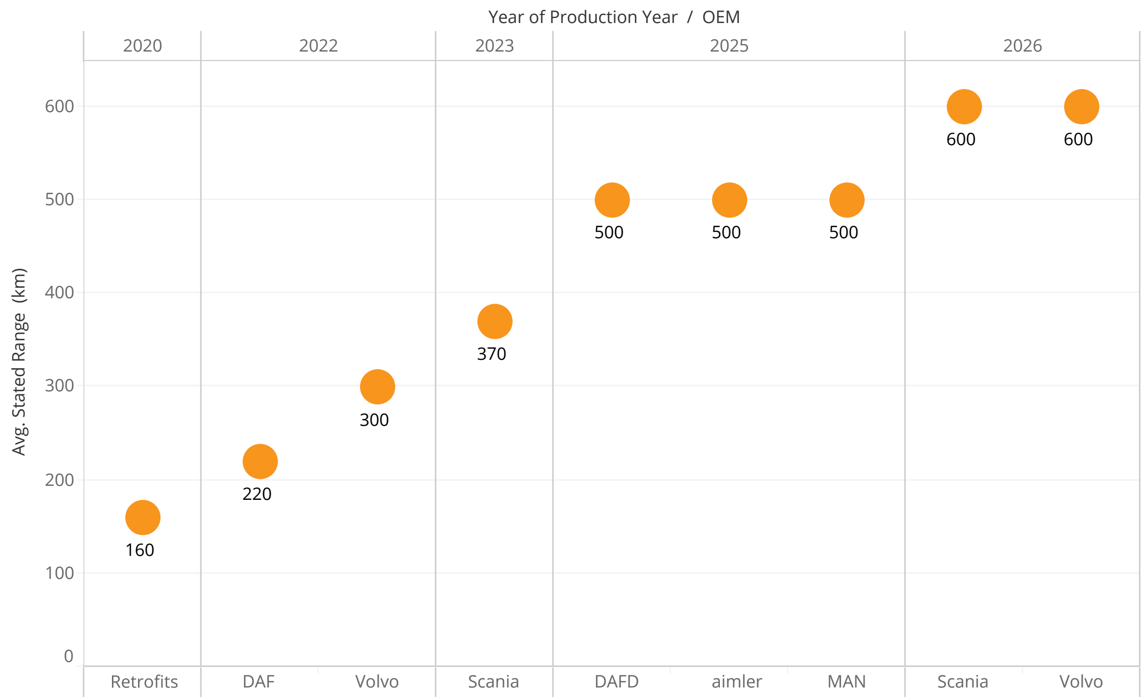
- **EV Expertise Scaling:** In 2024, 17 million electric passenger EVs were sold—20% of global new vehicle registrations.[2]
- **Heavy-Duty Catch-Up:** EV truck production is just beginning, but scaling is inevitable.
- **Battery Cost Reduction:** Forecasts show battery prices dropping from $149/kWh (2023) to $82/kWh by 2026—cutting EV truck prices significantly.[3]
- **Energy Storage Synergies:** Battery scaling also improves the economics of on-site electricity storage for logistics providers.
- **Policy Tailwinds:** While some European regions show policy hesitation, the overall trajectory remains in favor of clean technologies that improve both climate and air quality outcomes.

The improvement in quality of EVs as well as the effects of economies of scale throughout the EV industry will lead to a cascading improvement in the underlying cost base of electric trucks. Production systems will improve, component prices will decrease, battery quality will continue to increase while costs fall.

Electric Truck Ranges have improved nearly 300% between 2020 and 2026

With the improvement in battery technology the range of heavy duty electric trucks has improved from approximately 150km in 2020 when retrofitted diesels were the primarily available electric truck on the market to the newest Volvo FH Aero e-Axel launching in 2026 with a stated range of 600km. All major electric trucks currently available in the market have a stated range of 350+ km with many of the newest models claiming 500 km range.

Stated Vehicle Range by OEM (km) (2)t

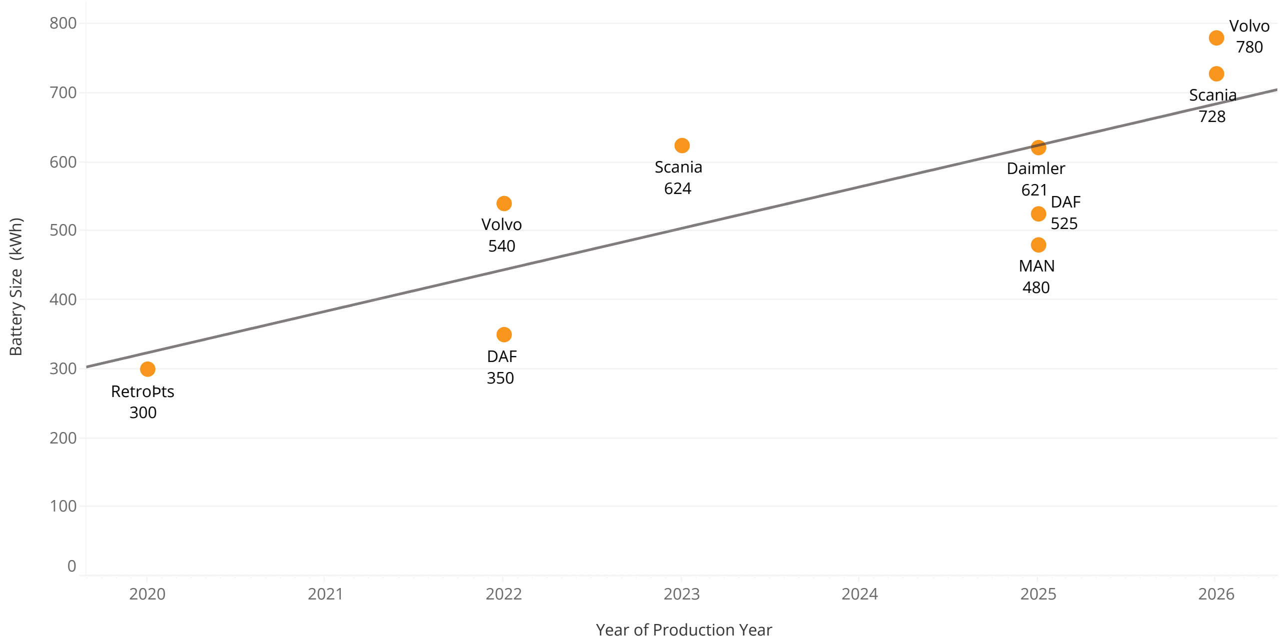


Electric trucks available on the market have approximately doubled the stated range in 3 years from 2022 to 2025 with further improvements around the corner[4]

2. https://iea.blob.core.windows.net/assets/0aa4762f-c1cb-4495-987a-25945d6de5e8/GlobalEVOutlook2025.pdf
3. https://www.goldmansachs.com/insights/articles/electric-vehicle-battery-prices-are-expected-to-fall-almost-50-percent-by-2025
4. OEM Technical Data: DAF, Daimler, MAN, Scania, Volvo

The increase in range is due to many factors related to the improvement in the quality of the technology underlying the electric trucks: batteries.

Battery Size by Vehicle Launch Date (kWh) (3)



eTruck Battery sizes in kWh by new truck launch date - battery sizes doubling between 2022 and 2026 [5]

The primary improvements related to the batteries are improved energy density, cost and chemistry.

Improvements in Battery Chemistry

The continuous improvement in battery technology is having a significant knock-on effect: the total usable capacity of batteries is increasing. In 2024, lithium-ion batteries offered a usable energy window of approximately 80%, whereas lithium iron phosphate (LFP) batteries are already achieving above 95%. This not only means that batteries are able to store more energy per kilogram, but also that fewer battery modules are required to achieve the same driving range — contributing to weight reduction, cost efficiency, and improved vehicle design in electric trucks.

Additionally, as drive trains and drive management systems continue to improve in quality, there will be less power output required to move the same amount of goods, measured in kWh / km.

Year	**Battery Needed for 600km Range** (kWh)	Usable Battery Percentage Best in Class
2023	975	80%
2024	904	83%
2025	755	97%
2026	736	97%
2027	716	97%
2028	695	98%
2029	675	98%
2030	655	98%

5. OEM Technical Data: DAF, Daimler, MAN, Scania, Volvo

These three factors (economies of scale, improvement in batteries, improvement in drive train management) are leading toward a world in which truck battery costs needed to achieve 600km range should fall from over 130,000 EUR to below 39,000 EUR in 2030 with major improvements happening already in 2025, 2026 and 2027.

This paper assumes that the cost of an electric truck in each modeled year is equal to the 2025 diesel truck baseline price plus the corresponding battery cost (as outlined below), plus 12,000 EUR to account for additional EV-specific systems and integration costs. This implies that most of the technological value gains anticipated over the next five years will be reflected directly in the sales price of electric trucks.

For comparison, we assume a fixed diesel truck cost of 100,000 EUR in both 2025 and 2030, with no projected cost increases over time. This is intentionally a conservative assumption that favors diesel, given the likelihood of future cost pressures related to regulatory compliance, emissions standards, and fuel system complexity.

Year	**Battery Needed for 600km Range** (kWh)	**Price of Car Batteries per kWh** (EUR / kWh)	**SOC Window** (Lithium)	**Total EV Truck Battery Cost for 600km Range, if priced at Car Battery Prices [Rounded]** (EUR)
2023	975	149	80%	131,600
2024	904	101	83%	91,300
2025	755	82	97%	61,900
2026	736	75	97%	55,200
2027	716	69	97%	49,400
2028	695	65	98%	45,200
2029	675	62	98%	41,900
2030	655	58	98%	38,000

The advancement of financing systems for EVs, such as pay per use models pioneered by sennder and Scania in the joint venture JUNA will help further accelerate the cost improvements for both shippers and carriers by providing advantageous financing for carriers.

ABOUT JUNA

JUNA is a joint venture between Scania CV and sennder that focuses on the development of innovative electric road logistics solutions in Europe. Founded in 2023 in Berlin, the company introduces electric truck solutions through a unique pay-per-use model, that enables access to electric trucks and guaranteed transport volumes by granting access to loads on sennder's digital platform. In doing so, JUNA effectively removes the main barriers to the introduction of electric trucks for carriers to accelerate the decarbonization of European road logistics. For more information, please visit juna.com.

CORE COST DRIVERS IN LOGISTICS OPERATIONS

The factors influencing road freight economics go far beyond the upfront cost of a truck. What will truly reshape the industry is the ability for companies to generate their own energy—a shift that simply wasn't possible in the fossil-fuel era. No transportation company, regardless of size, can produce diesel more cost-effectively than the world's oil majors.

In contrast, electric trucks enable operators to "own the electron"—producing and managing their own energy supply. This transformative advantage, combined with evolving road toll structures and carbon pricing mechanisms, is expected to play a significant role in reshaping the cost landscape for road freight across Europe.

Electricity Prices

Control over electricity—"owning the electron"—is emerging as a key strategic advantage. Unlike diesel, electricity offers multiple levers for cost control:

- **Produced onsite** through solar or wind installations
- **Purchased smartly** via flexible grid contracts
- **Stored efficiently** using battery systems for off-peak consumption

In fact, the levelized cost of energy (LCOE) from renewables in Europe is already as low as 0.05 EUR/kWh—up to 90% cheaper than standard charging costs of 0.40 EUR - 0.50 EUR /kWh at many public stations.[6, 7, 8]

Conservative EV Outcomes in 2025 and 2030

The following graph illustrates the financing costs of electric trucks in 2025 and 2030, under conservative assumptions, across a range of electricity prices (0.10 EUR– 0.40 EUR per kWh). These scenarios reflect daily driving distances of 440–600 km, assume that electric trucks pay full road tolls (equal to Euro 6 diesel trucks), and apply no carbon pricing (i.e., 0 EUR/tonne CO_2e).

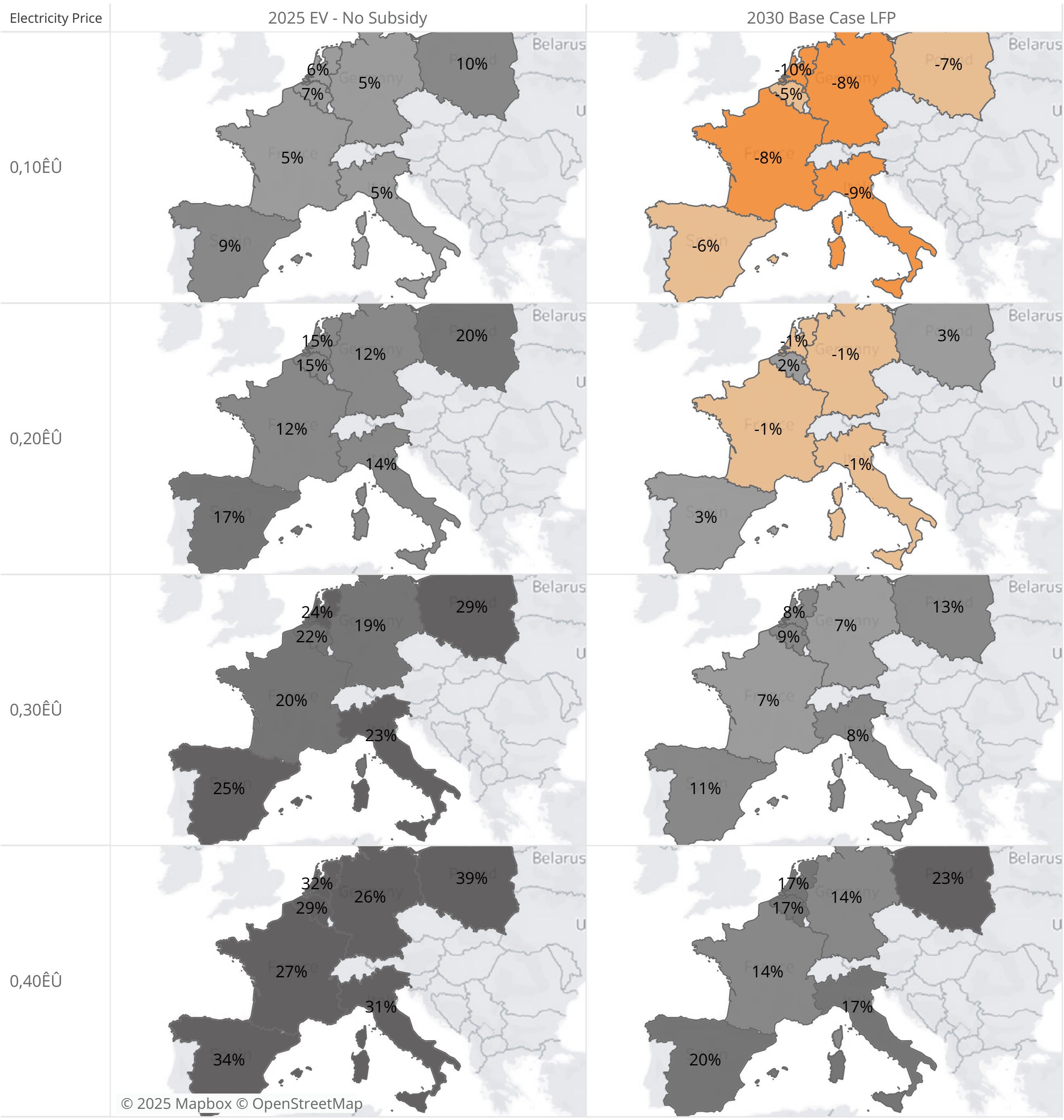
The analysis reveals the significant sensitivity of EV cost-competitiveness to electricity pricing: A shift in electricity cost from 0.10 EUR to 0.40 EUR per kWh results in a swing of approximately 20% in total transportation cost. This underscores electricity price as a critical cost driver in EV deployment economics.

In the 2030 base case, assuming no vehicle subsidies or road toll exemptions, and zero carbon pricing, most major European markets will still achieve cost parity with diesel or even be up to 10% cheaper, provided that electricity is procured at 0.10 EUR –0.20 EUR per kWh.

This model represents a highly conservative scenario, excluding any policy incentives or pricing mechanisms that are likely to further benefit electric trucks in the real world.

6. Milence 0.399 EUR / kWh ex. VAT https://milence.com/charging-payment/ May 20, 2025
7. Ionity 0.33 - 0.41 EUR / kWh ex. VAT with subscriptions https://www.ionity.eu/de/abonnements May 20, 2025
8. FastNED 0.41 EUR / kWh ex. VAT with subscriptions https://www.fastnedcharging.com/en/charging/tariffs May 20, 2025

Most Conservative Assumptions: 2025 (left) vs. 2030 (right) EV Premium to Diesel by Electricity Price with Zero carbon Price and EVs paying full road tolls



Data Variables: no truck subsidies; 0 EUR per tonne carbon pricing; EVs pay 100% tolls; 440-600km per day
With 0.20 EUR/kWh electricity in 2030, every market is at diesel parity or below.

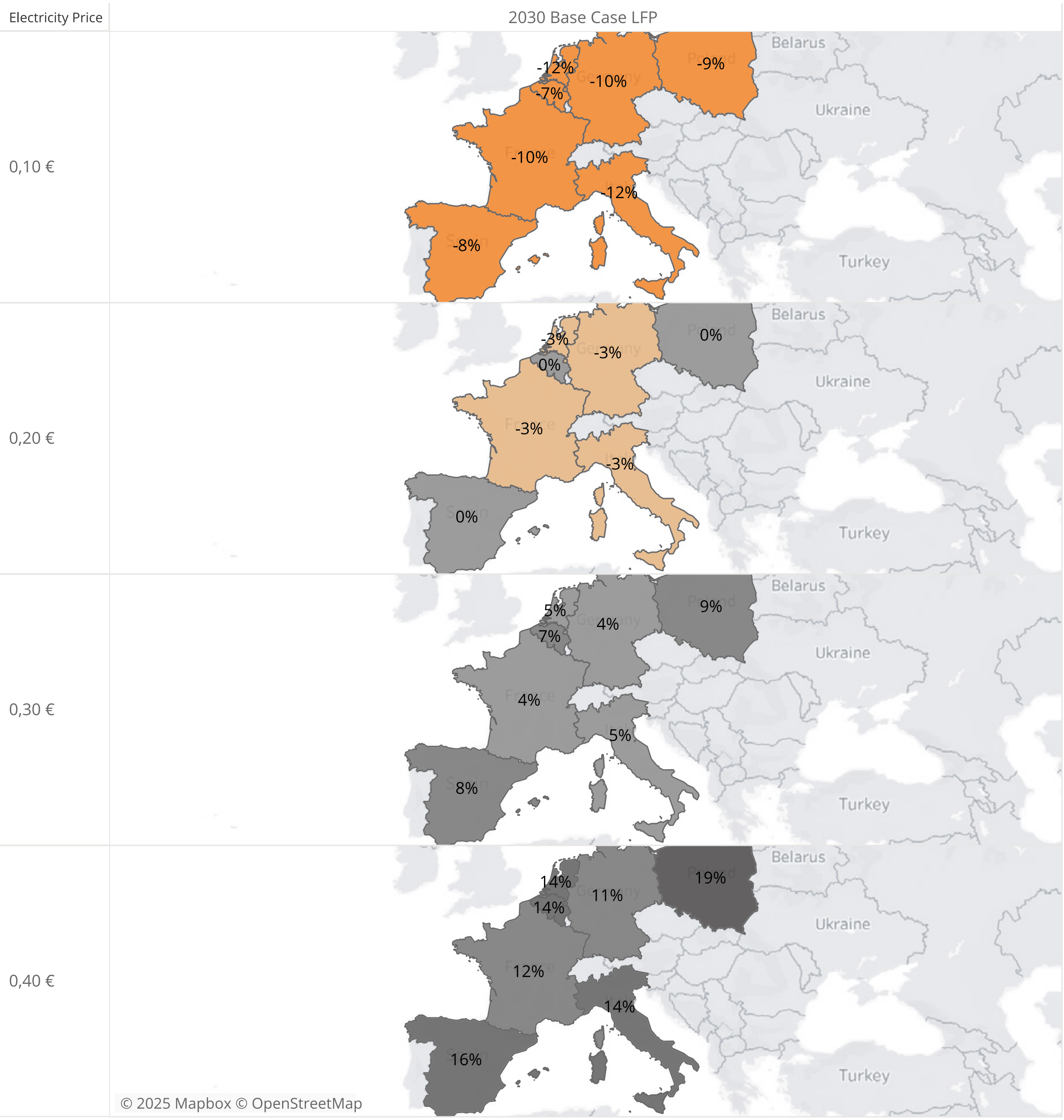
More Realistic Outcomes Include the Impact of Carbon Pricing from 50 EUR - 200 EUR per tonne CO_2e.

A more realistic scenario for 2030 incorporates the anticipated introduction of a 50 EUR per tonne CO_2e carbon price, aligned with the EU's Emissions Trading System II.

Under this assumption, even at an electricity price of 0.20 EUR per kWh, every major European market reaches cost parity or better compared to diesel. This marks a significant shift from today's economics and positions EVs as a cost-competitive option under mainstream conditions.

Moreover, companies that are able to procure, generate, or store electricity below 0.20 EUR per kWh—a threshold we consider highly achievable through smart energy strategies—will hold a structural economic advantage over diesel operations, especially when electric vehicles are operated at high utilization levels.This model represents a highly conservative scenario, excluding any policy incentives or pricing mechanisms that are likely to further benefit electric trucks in the real world.

5 (left) vs. 2030 (right) EV Premium to Diesel by Electricity Price



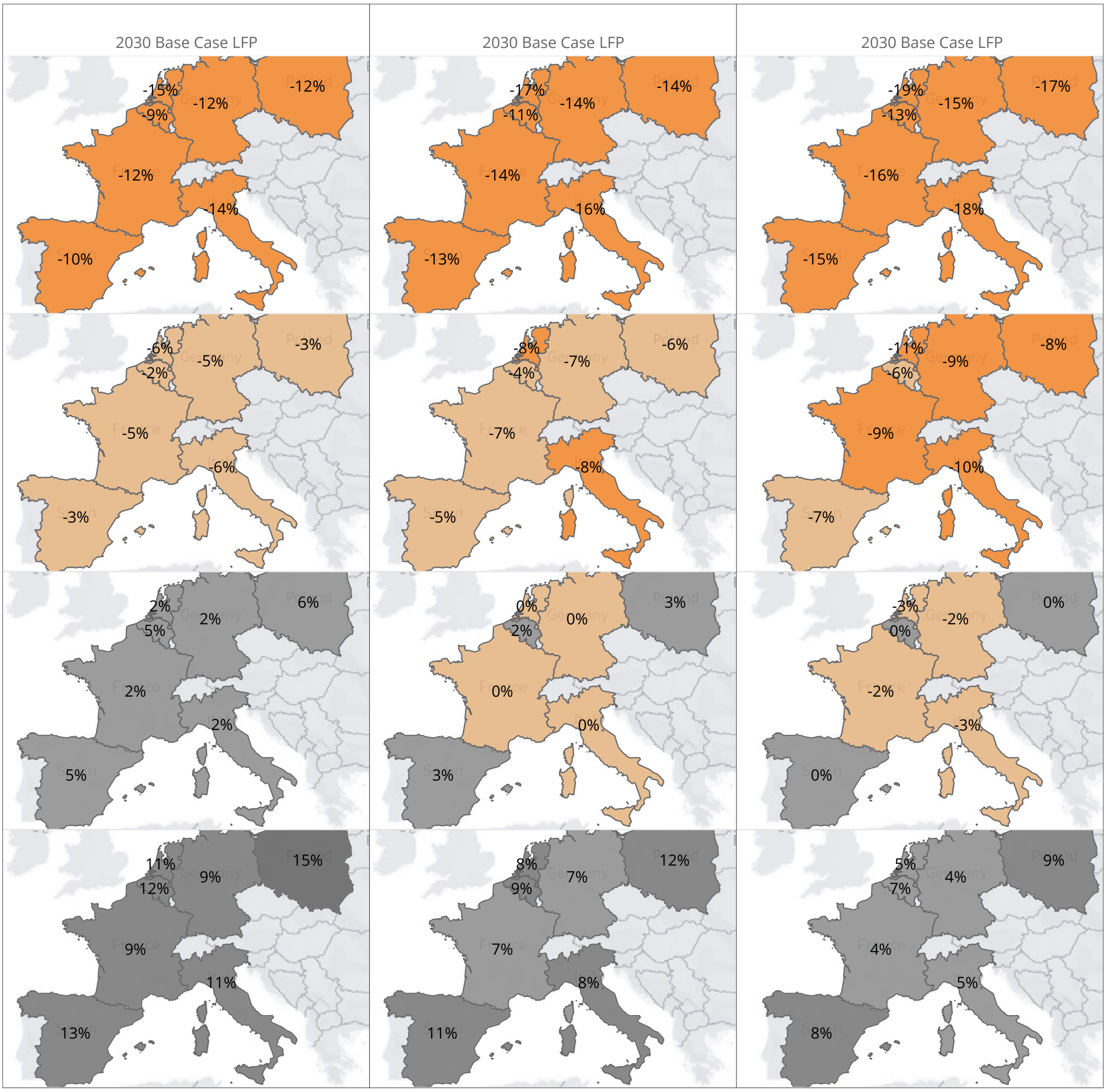
Data Variables: 2025 no truck subsidies; 2030 50 EUR per tonne carbon pricing; EVs pay 100% tolls; 440-600km per day
With 0.20 EUR/kWh electricity in 2030, every market is at diesel parity or below.

An even more advantageous situation for EVs would be under the circumstances that carbon prices are 100 EUR/ tonne or more, which in many projections can range from 100 - 200 EUR per tonne. Bloomberg New Energy Finance projects a carbon price for the ETS II at 149 EUR per tonne.[9] At a carbon price of 100 EUR per tonne, we see a distance to diesel parity at 0.30 EUR/kWh of 2-3% compared to

9. https://about.bnef.com/blog/europes-new-emissions-trading-system-expected-to-have-worlds-highest-carbon-price-in-2030-at-e149-bloombergnef-forecast-reveals/

diesel. On the right hand side, the table shows that with a carbon price in 2030, EVs will be breakeven even at the relatively high electricity price of 0.30 per kWh

2030 EV Premium to Diesel by Electricity Price with Carbon Prices of 100 EUR (left), 150 EUR (middle) 200 EUR (right)



Data Variables: 2030 100-200 EUR per tonne carbon pricing; EVs pay 100% tolls; 440-600km per day With the supportive mechanism of ETS II Carbon Pricing, the break even point for EVs can increase from 0.20 EUR/kWh to above 0.30 EUR/kWh. With the highest carbon prices of 150-200 EUR per tonne, it would be conceivable for EVs to operate 10-15% cheaper than diesel.

The most remarkable findings of this are not when EVs will experience a breakeven point. The most impactful conclusion here is that depending on the market pricing mechanisms of the ETS II from 2027 - 2030, **it is absolutely possible to see a pathway in which EVs can operate between 10-15% less expensively than diesel in 2030**.

Electricity Costs Determine EV Competitiveness:

- Shippers and carriers sourcing or generating electricity at 0.10 EUR – 0.20 EUR /kWh can achieve transport cost reductions of up to 10% versus diesel.
- Market rates at fast-charging stations (~0.40 EUR/kWh) render EVs uncompetitive vs diesel both now and in 2030 under all carbon pricing scenarios.
- We do not believe that shippers will be willing to scale to hundreds of thousands of EVs with a price premium of 10%+ vs. diesel, especially when there are pathways with less expensive electricity that bring EVs into cost competition with diesel.

The implementation of electrification and an advantage in electricity costs will not happen by accident, nor will it be an easy transition for much of the industry. Developing the expertise to produce, procure smartly and store electricity is largely an entirely new venture for most transportation companies.

This new ability to manage and optimize energy sourcing enables early adopters to secure long-term operational savings and build a significant competitive edge.

That is to say: the price of the electrons determines the baseline cost of a transport in the market in 2030, not the cost of diesel. This is a massive competitive shift away from today's diesel-based pricing.

Road Tolls (Maut)

Germany serves as a key example:

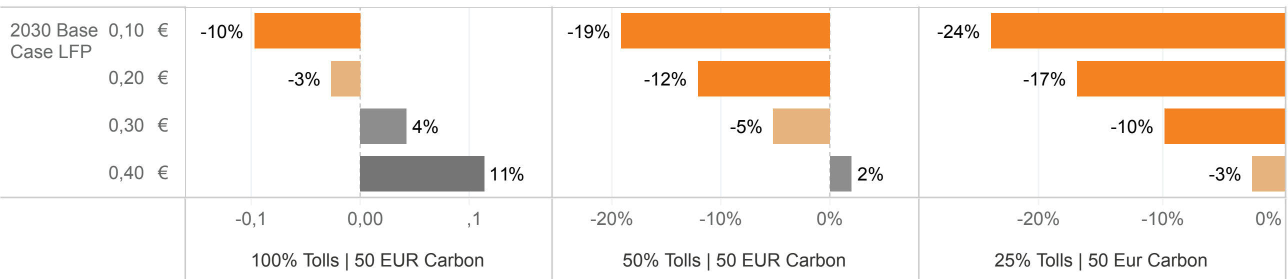
- Current toll: ~0.35 EUR/km for Euro 6 diesel trucks
- EVs in 2025: 100% exemption; in 2026: 75% reduction

Modeling shows that toll exemptions—when paired with smart electricity purchasing—can make EVs meaningfully cheaper to operate even today.

Germany has the highest road tolls in Europe at nearly 0.35 EUR per km for Euro 6 trucks making the EV toll exemption even more impactful than it would be in other countries. Looking at the potential policy scenarios for 2030, one might expect the currently enacted policy - 25% of tolls paid e.g. a 75% reduction in the road tolls for electric trucks - to continue.

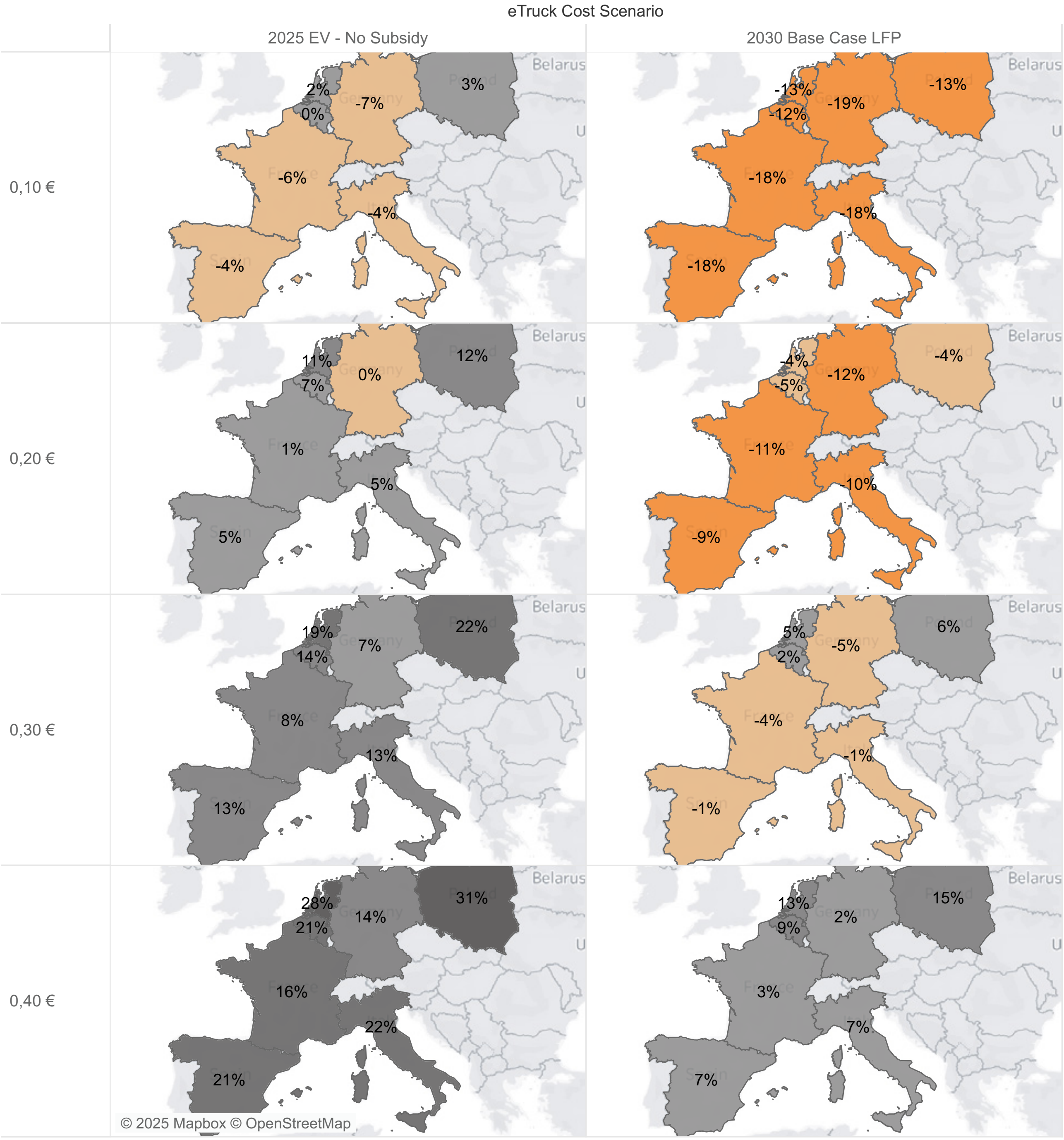
- This current EV Maut exemption policy, combined with high utilization of 440 km - 600 km per day would enable EVs to run more cheaply than diesel at any electricity cost, assuming the conservative 50 EUR/ tonne of carbon pricing.
- If the toll policy is scaled back in Germany to either 50% of tolls paid or even paying full tolls (marked below as 100% tolls), we can see that EVs remain tremendously competitive with the right electricity prices.

2030 EV Premium to Diesel with EVs paying various advantaged road tolls



Data Variables: 2030; 50 EUR per tonne carbon pricing; EVs pay 25%-100% tolls; 440-600km per day Demonstrating the immense impact of Maut on the break even point of EVs vs. Diesel in Germany, with a road toll advantage of 75% (currently in law) EVs could operate well below 10% cheaper than diesel.

EV Premium to Diesel in 2025 (left) and 2030 (right) With a theoretical 50% reduction in road tolls in all countries at a 50 EUR/tonne carbon price



Data Variables: 2030; 50 EUR per tonne carbon pricing; EVs pay 25%-100% tolls; 440-600km per day Demonstrating the immense impact of Maut on the break even point of EVs vs. Diesel in Germany, with a road toll advantage of 75% (currently in law) EVs could operate well below 10% cheaper than diesel.

Other countries are expected to enact carbon-based toll mechanisms in line with the European Union, albeit in different frameworks and different timelines. If we take a "middle of the road" approach and look at 2030, we can see that a 50% reduction in road tolls for most countries leads to a breakeven or better result with 0.30 EUR/kWh electricity in 2030.

Looking at the numbers for 2025, if all countries were to theoretically adopt an immediate 50% roll reduction and a carbon price of 50 EUR, breakeven takes place in this theoretical scenario between 0.10 - 0.20 EUR/kWh.

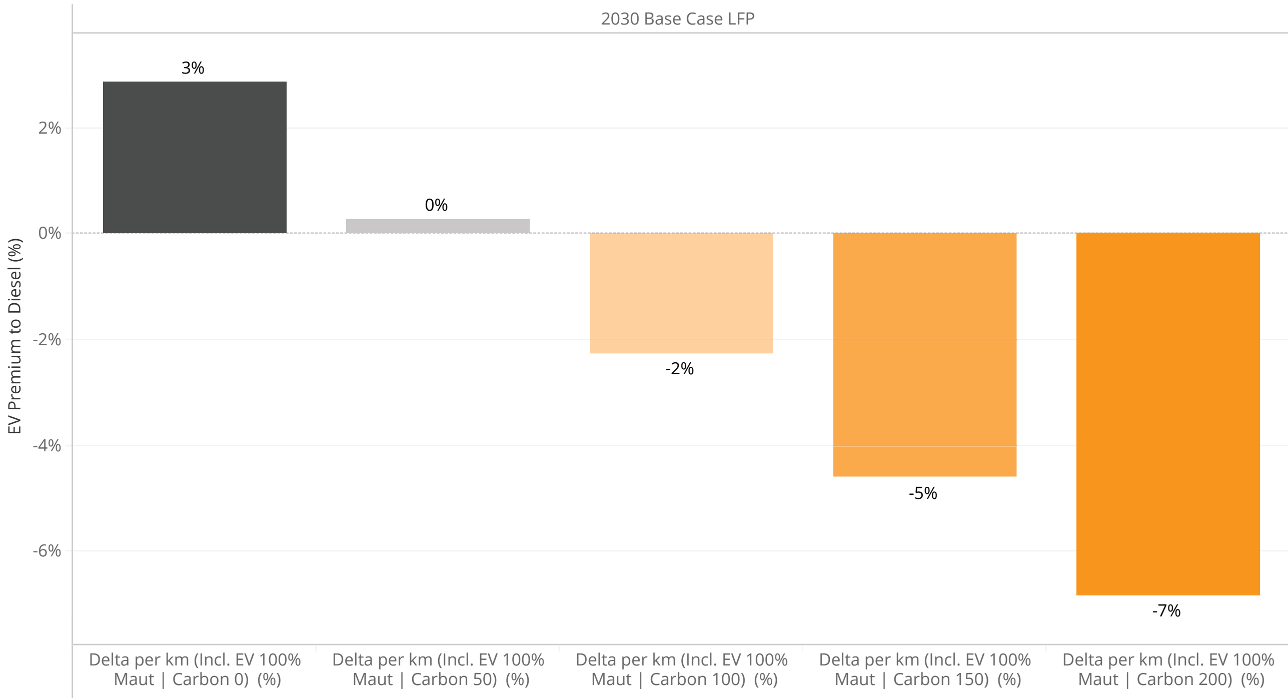
Carbon Pricing

Under the Emissions Trading System II (starting 2027/2028), carbon prices are expected to range between 50 EUR – 200 EUR per tonne:

- Every 50 EUR/tonne adds ~2.5% cost advantage for EVs
- At 100 EUR/tonne, EVs become 2% cheaper than diesel—even if paying full road tolls and 0.20 EUR/kWh for electricity
- Bloomberg New Energy Finance projects a carbon price for the ETS II at 149 EUR per tonne in 2030.[10]

Carbon pricing is an accelerator—but not the sole driver—of the EV shift.

2030 Impact of Carbon Price 0 EUR - 200 EUR per tonne CO_2e, average of all countries



Across the average of all countries, for every increase in the carbon price of 50 EUR per tonne there is a corresponding improvement of the EV economics of 2-3% vs. diesel.

COUNTRY-LEVEL INSIGHTS

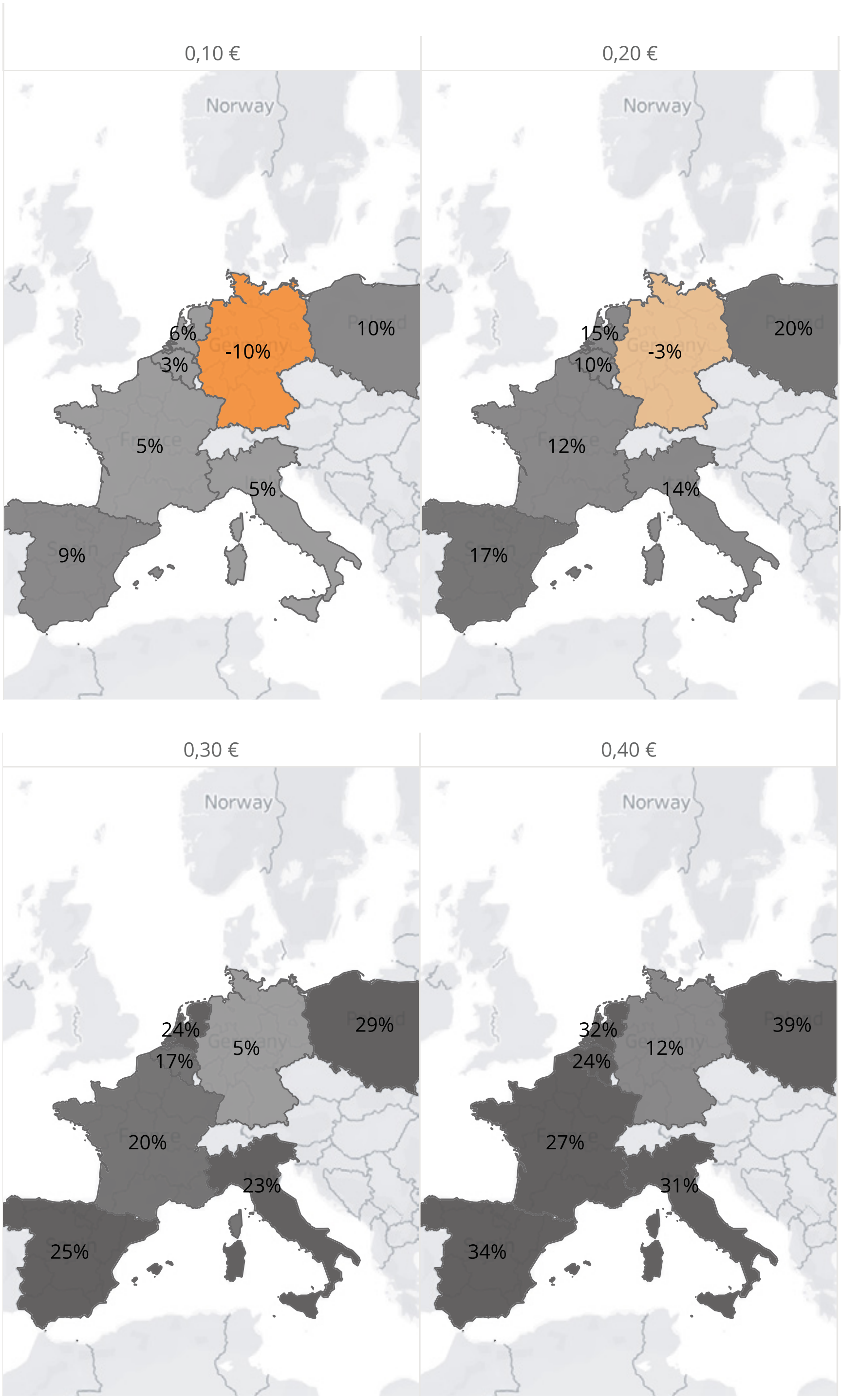
Country	Driver Cost	EURO 6 Road Tolls Category	Diesel Range Simulations (ex. VAT)
Germany	High	High	1.30-1.55
Italy	Low	Moderate	1.30-1.55
France	High	High	1.30-1.55
Netherlands	High	Low	1.30-1.55
Belgium	Very High	Moderate	**1.15 - 1.35**
Poland	Low	Low	**1.15 - 1.35**
Spain	Low	Moderate	**1.15 - 1.35**

10. https://about.bnef.com/blog/europes-new-emissions-trading-system-expected-to-have-worlds-highest-carbon-price-in-2030-at-e149-bloombergnef-forecast-reveals/

An analysis of the most representative scenarios for 2025—particularly reflecting the current toll structure in Germany—shows that Germany stands out as the only major European market where electric trucks are already cost-competitive with diesel.

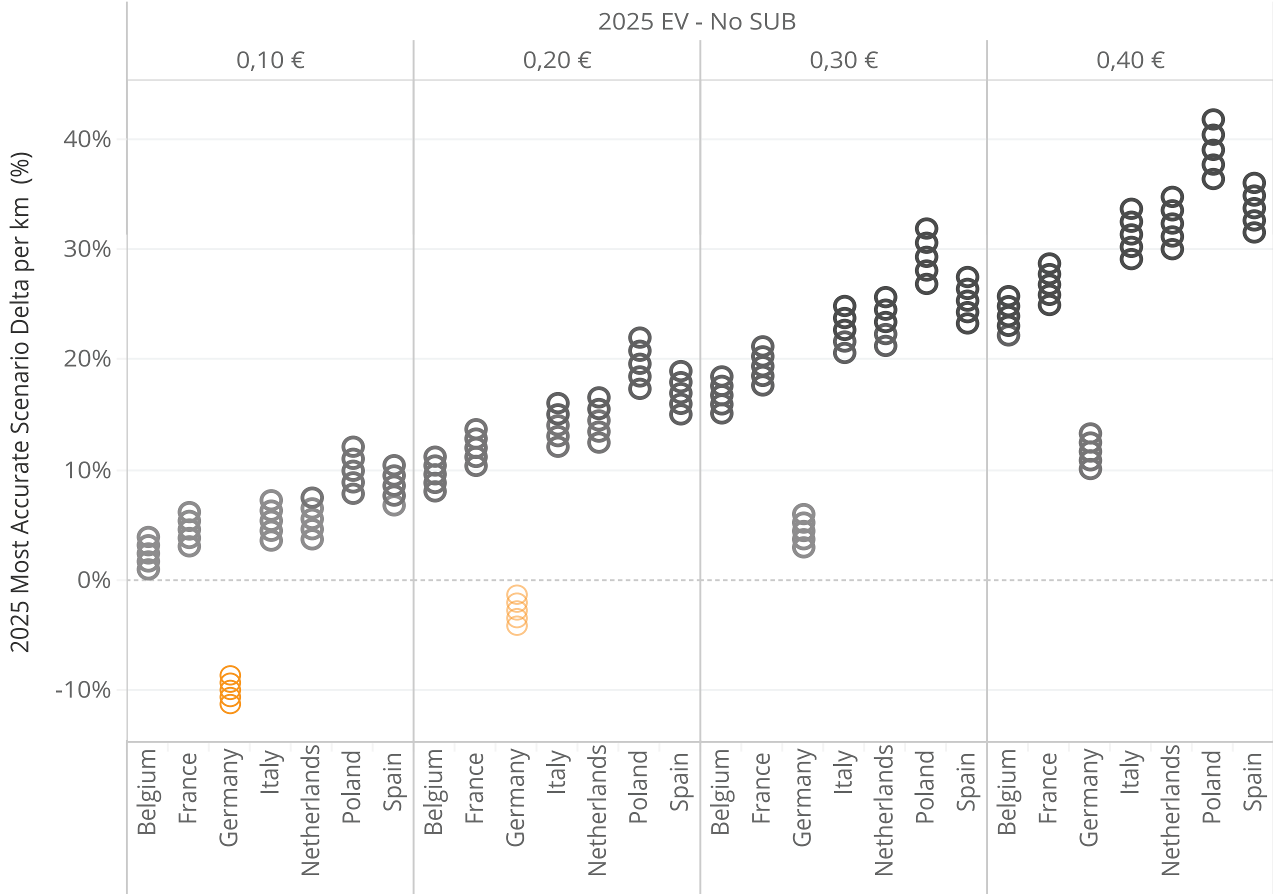
This competitiveness is primarily driven by the substantial toll exemptions for zero-emission vehicles, which, when combined with the right operational setup (such as high asset utilization and efficient routing) and access to affordable electricity, make electric trucks a viable and economically attractive option today.

2025 most representative scenarios broken down by electricity price



Electricity price remains the key lever in all countries in getting close to or below diesel operating costs in 2025. The only country that is calculated to be at or below diesel operating cost today is Germany, due to the Maut exemption (calculated at 75% in this model for 2026 onwards).

2025 most representative scenarios broken down by electricity price and country; each circle represents a simulation with a daily-driven kilometer distance from 440 - 600km



Data Variables: 2025: no truck subsidies; 0 EUR per tonne carbon pricing; EVs pay 100% tolls outside Germany andBelgium; 50% in Belgium, 25% in Germany; 440-600km per day.

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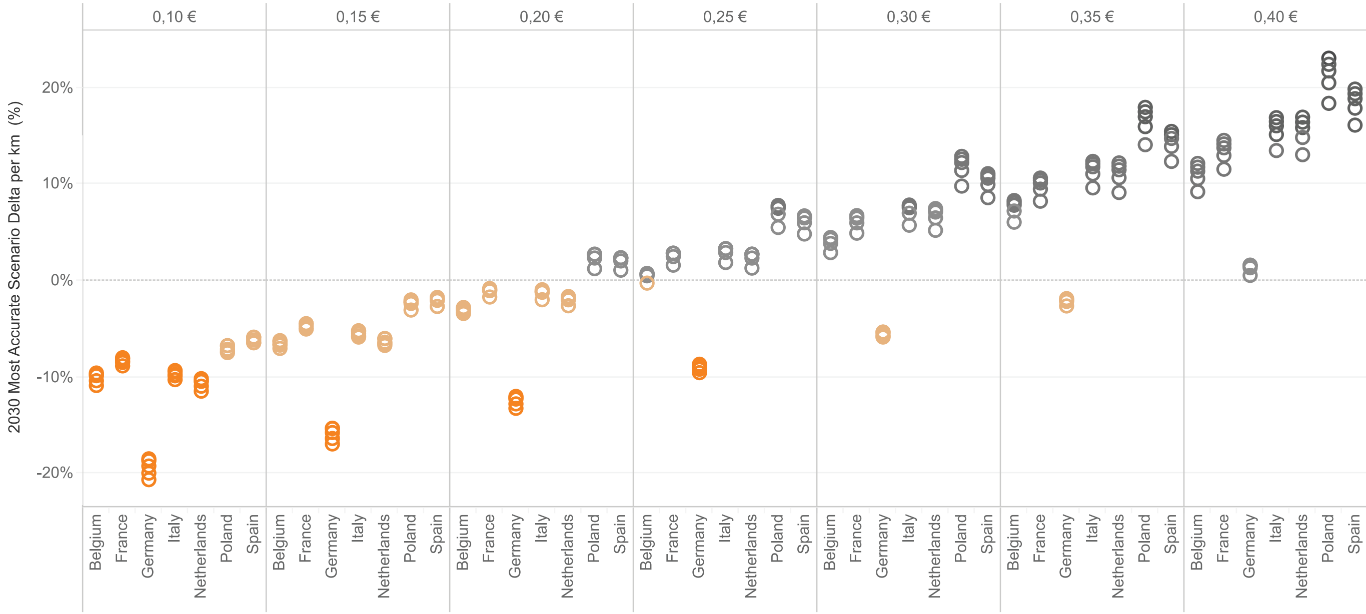
2030 Scenario Outlook

Based on a forward-looking assessment and applying a relatively conservative approach to policy support assumptions, we modelled the most probable scenarios for the year 2030. These projections are grounded in anticipated carbon pricing levels of 50 EUR or 100 EUR per tonne CO_2e, combined with expected road toll exemptions for zero-emission vehicles.

Country	Most Representative Scenario 2025	Most Likely Scenario 2030
Germany	25% Toll | C = 0	50% Toll C = 100
Italy	100% Toll | C = 0	100% Toll C = 50
France	100% Toll | C = 0	100% Toll C = 50
Netherlands	100% Toll | C = 0	50% Toll C = 100
Belgium	50% Toll | C = 0	50% Toll C = 50
Poland	100% Toll | C = 0	100% Toll C = 50
Spain	100% Toll | C = 0	100% Toll C = 50

The analysis indicates that by 2030, the declining total cost of ownership of electric trucks will render them economically superior to diesel counterparts in nearly all assessed countries. The critical tipping point for cost competitiveness is reached at an electricity price of approximately 0.20 EUR per kWh, beyond which electric vehicles consistently outperform diesel in terms of operating cost.

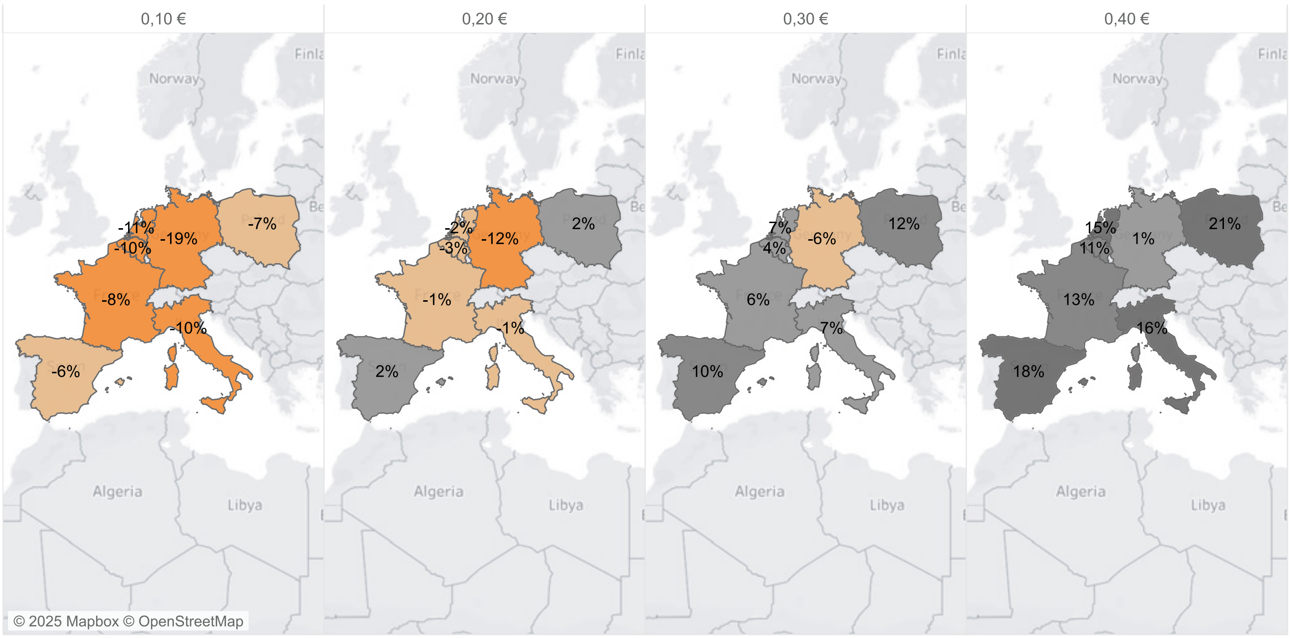
2030 Outlook: scenarios broken down by electricity price and country; each circle represents a simulation with a daily-driven kilometer distance from 440 - 600km



Data Variables: 2030: no truck subsidies; 50-100 EUR per tonne carbon pricing (see table); EVs pay 50-100% tolls (see table); 440-600km per day.

In 2030 the majority of countries are better than break even with 0.20 electricity and Poland and Spain are just within 2% of parity with diesel.

2030 Outlook: scenarios broken down by electricity price 0.10-0.40 EUR/kWh and country



Data Variables: 2030: no truck subsidies; 50-100 EUR per tonne carbon pricing (see table); EVs pay 50-100% tolls (see table); 440-600km per day

- **Germany:** Already cost-competitive with current toll exemptions
- **Belgium, France, Italy, Netherlands:** Approaching parity between 2025 and 2030, will generate the next wave of EV advantage geographies
- **Poland, Spain:** Slower transition due to low input costs for diesel, low driver costs and low road tolls makes diesel difficult to overcome the embedded momentum

STRATEGIC ENABLERS FOR EV SUCCESS

Energy Strategy

Shippers and carriers that invest in:

- Onsite generation
- Battery storage
- Smart energy procurement

gain long-term control over one of the largest operational cost drivers.

The Levelized Cost of Energy (LCOE) of various electricity sources depends on the type of electricity source and the scale at which it is produced. In Europe, 0.05 - 0.10 per kWh LCOE is a relatively reasonable number for large scale solar and wind developments in 2024, with costs expected to further decrease.[11, 12] Of course, this drastic difference between production LCOE and charging station prices of 0.40+ EUR/kWh is partially accounted for by grid costs, infrastructure investment and capital costs.

- **Onsite generation** is a powerful tool for all participants in the heavy duty transport industry: shippers, carriers, LSPs and charging station operators. Each of these parties can benefit economically by maximizing the amount of onsite generation to increase the efficiencies from generation to use, without paying grid fees which can be very significant, often in the range of 0.10 EUR/kWh.
- **Battery storage** enables the usage of inexpensive electricity at a time other than the time of production. For renewables such as wind and solar this is a very important part of electricity generation and procurement. Solar electrons are likely to be produced at a time when trucks are on the road rather than parked for the evening, making battery storage a critical bridge between time of production and time of use. However, battery storage is not limited to solar production during the day; it also enables an entire generation of smart energy procurement. Furthermore, as the cost of battery production continues to decrease, the cost to install stationary batteries to enable better electricity procurement will also decline.
- **Smart energy procurement** can begin to play a role in the powering of electric trucks. In Germany in 2024, over 5% of total hours had negative electricity prices[13], meaning that power takers were being paid (excluding grid fees) to take electricity off the grid. These periods of zero cost or low cost electricity combined with battery storage and timely charging management can help push the cost of electrons down for all players: shippers, carriers, LSPs and charging operators.

Because of these market opportunities and the fact that the technical side of the equation (battery storage) is already solved, we believe that market forces will crowd in to take advantage of them and thus leverage these to reduce the costs of electrons to power electric cars and trucks.

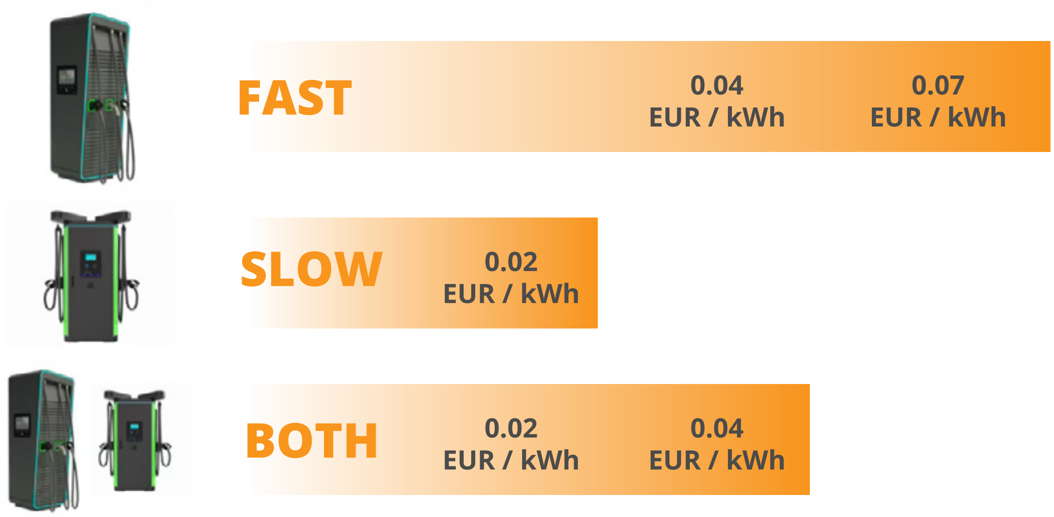
11. https://ember-energy.org/app/uploads/2025/01/EER_2025_22012025.pdf
12. https://www.ise.fraunhofer.de/content/dam/ise/en/documents/publications/studies/EN2024_ISE_Study_Levelized_Cost_of_Electricity_Renewable_Energy_Technologies.pdf
13. https://www.pv-magazine.com/2025/01/06/germany-records-457-hours-of-negative-electricity-prices-in-2024/

Cost of infrastructure installation

The exact economics of charging infrastructure depend on many factors such as the need to upgrade a grid connection, the speed of the charger and the amount of groundworks and permitting required. That being said, a reasonably accurate ballpark range for fast chargers (350+ kW), based on 2025 pricing, is between 0.04-0.07 EUR per kWh when amortized over 4-12 years. For slow chargers, that number is likely 0.02 EUR/kWh installed.

Charging infrastructure tends to come down in price while improving in quality and speed over time. So these numbers based on direct observations in 2025 are likely to come down further over the coming years, leading to a further support mechanism in achieving lower implementable electricity prices.

Charging Infrastructure per kWh Capital Costs



Estimates of per kWh charging infrastructure installation costs based on 4-12 year amoritization and expected utilization show that charging infrastructure costs when utilized over multiple years will not be prohibitive to achieving good electron economics for trucks.

Operational Optimizations

EVs perform best under:

- High vehicle utilization (e.g., 2-shift models)
- Drop trailer and reliable flows with efficient routing
- Effective Charging: Fast public charging or slow overnight charging combined with charging periods matching the operational requirements of the lanes

Levers to increase effectiveness of EVs in order to improve economics on specific operations

14. sennder calculations and industry observations. Assumes 50 kW charger cost of 20k EUR and 350 kW charger cost of 80k EUR plus necessary grid upgrade costs of 200k EUR. Assumes average charging session of 500 kWh per truck per day and the related utilization by charger.

Because of the high capital cost of the truck itself, high operational effectiveness is critical for competitive economics on EVs vs. diesel. Combining effective charging timing with solutions like drop trailers helps improve the economics of the operations.

3x Daily Intra-Company

4x Daily Intra-Company

A simple example of moving charging from after hours to during operating hours with drop trailers, enabling a fourth load to be completed in a single day while maintaining appropriate driver working hours.

While often considered secondary in diesel operations, driver behavior and routing decisions become critical levers for the success of EV deployments.

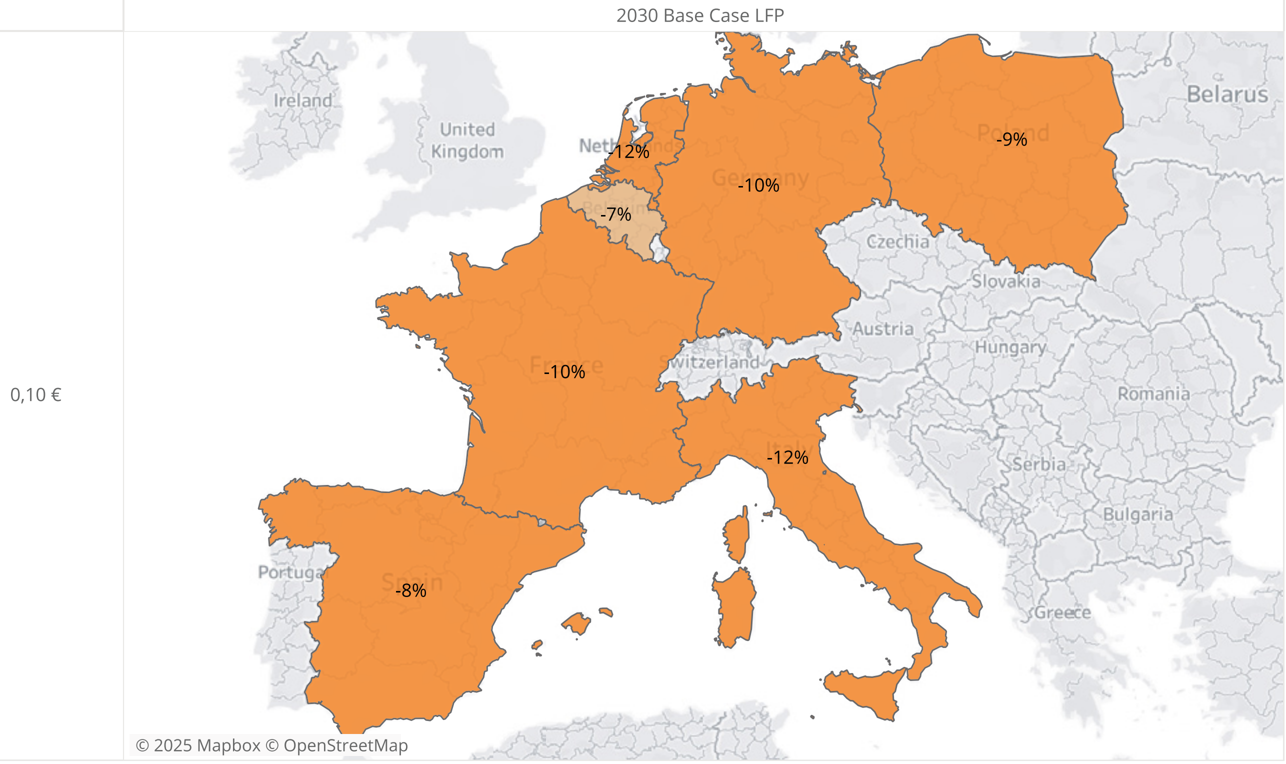
For instance, eco-driving practices—such as maintaining optimal speeds and minimizing aggressive acceleration—have traditionally been a “nice-to-have” in diesel fleets. In EV operations, however, these practices can be the deciding factor between completing a route or running short on battery. The margin for inefficiency is significantly smaller.

Similarly, optimal routing cannot simply be equated with the shortest path. In electric trucking, a route that is slightly longer but avoids energy-intensive conditions—such as steep inclines—may result in substantially lower battery consumption. At sennder, we’ve already observed real-world cases where intelligent routing optimization enabled EV operations that would not have been feasible under traditional assumptions about range and terrain.

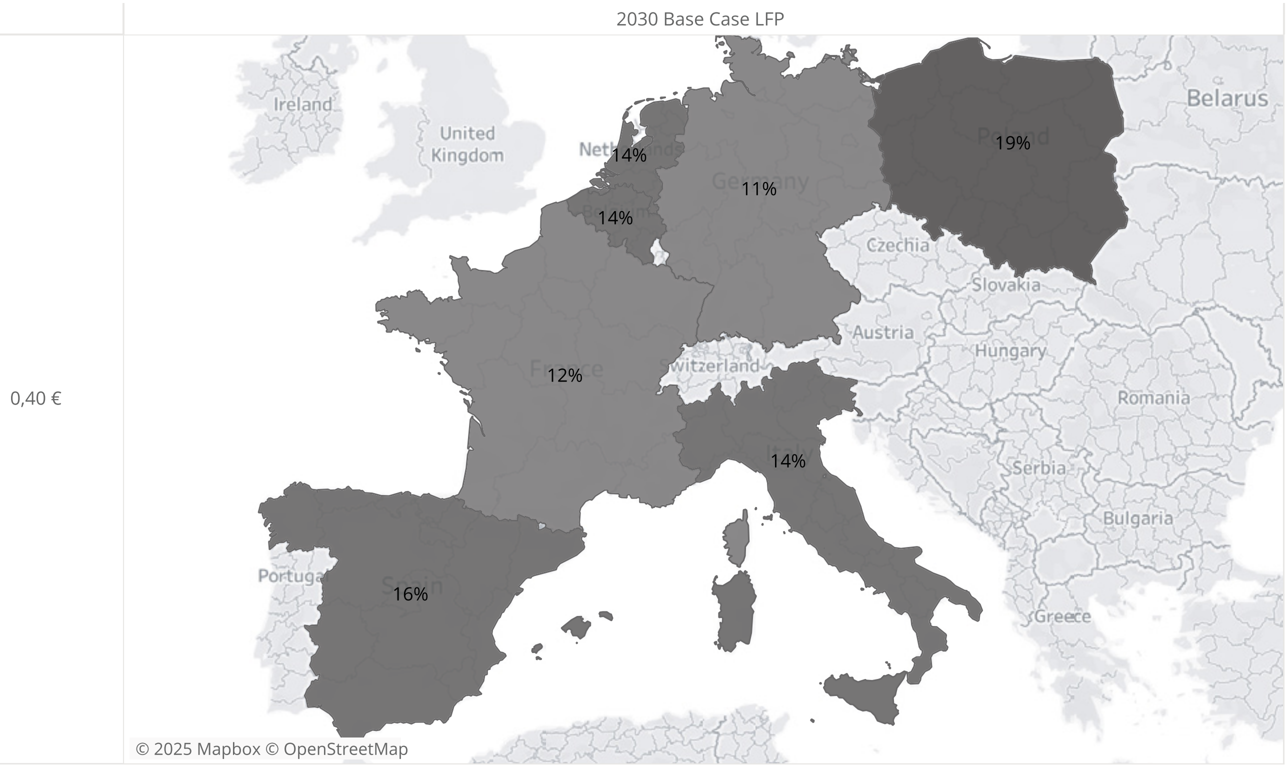
Looking ahead, these types of EV-specific operational optimizations—including charging planning, load-dependent energy forecasting, and charger reservation systems—will become foundational components of transport management systems (TMS). They represent the new baseline for ensuring economically and operationally viable electric freight networks.

The Story of Two Companies

A company becomes a master of electric truck operations (charging, integrated into the TMS, integrated EV routing etc.) and electricity procurement and are able to offer customers both high utilization and a very competitive EV price. We expect their economics to be in line with approximately 10% below diesel price, even when paying full road tolls, by 2030.



Another company leaves behind the EV excitement and waits to see the outcome, with no investment in trucks, charging or commercial agreements to improve electron costs. They are stuck running diesel with a high electricity price. Their EVs will operate more than 10% more expensive than diesel in 2030.



It is clear that between the two companies there is nearly a 20% swing in end-customer transportation costs. For a company paying 0.40 EUR/kWh, electric trucks will be 10%+ more expensive to operate than diesel trucks. For a company paying just 0.10 EUR/kWh, electric trucks **will be up to 10% cheaper to operate than diesel**.

This is the future of the transport industry - the combination of digital infrastructure maximizing the utilization and output of these new technologies - and the commercial savvy to procure, produce and store electricity effectively powering the new generation of vehicles at a cost that is meaningfully below that of diesel.

CASE IN PRACTICE: NESTLÉ & SENNDER

Nestlé sennder

Strategic enablers in action – decarbonizing FMCG transport with electric trucks

Nestlé and sennder have successfully implemented cost-effective electric vehicle (EV) operations to decarbonize Nestlé's road freight activities in Germany. This collaboration illustrates how strategic enablers can be effectively put into practice:

- Operational Optimization: EVs are integrated into dedicated transport flows with predictable routes and volumes, enabling reliable overnight charging and high vehicle utilization.
- Energy Strategy: Nestlé sources green electricity through external procurement and is actively exploring options for onsite generation to power its depot-based charging infrastructure.
- Collaborative Planning: Close coordination between Nestlé and sennder ensures optimized charging schedules, route planning, and vehicle turnaround times, maximizing both cost-efficiency and uptime.

In just four months, sennder has delivered over 100 orders and operated more than 10,000 kilometers with electric trucks in North Rhine-Westphalia, reducing CO_2e emissions by approximately 55 tonnes annually on a single transport lane.

This case clearly demonstrates how forward-looking energy strategies and intelligent operational planning are critical to unlocking the full economic and environmental potential of electric trucks in modern logistics networks.

CONCLUSION: THE RACE IS ON

The economics and capabilities of electric heavy-duty trucking are moving fast. EVs will outcompete diesel across most key markets by the end of the decade—but not for everyone.

Shippers and carriers that move now to prepare infrastructure, optimize operations, and secure energy access will win. Those who wait risk falling behind as the transition accelerates.

This is not just a technological shift. It's a strategic inflection point for the entire road freight industry.

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Next Steps for Shippers and Carriers

To fully capture the cost and sustainability advantages of electric trucks, shippers and carriers must take proactive and strategic action across three key areas:

1. Start Today

The transition to electric trucks is accelerating faster than many anticipate — especially when viewed through the lens of procurement cycles, which typically span 1–2 years. This means that between now and 2030, there are only 2 to 4 strategic decision points left for most organizations to pivot effectively. To stay ahead of the curve, companies must begin developing high-level logistics and charging infrastructure strategies now, rather than waiting for a perfect moment.

2. Outline the Future — Even If It's Uncertain

While no one can fully predict how the market will evolve, the value of scenario planning lies in the process itself.

Major shippers and carriers stand to benefit greatly from mapping out:

- **The approximate volume of transports** that could be handled by EVs
- **Priority lanes by country**, based on cost parity and performance modeling
- **Charging locations** that offer either a strategic advantage or present operational risks

By "ballparking" future electric operations today, companies can reduce friction and accelerate implementation later.

3. Partner with sennder

At sennder, we work daily with some of the world's largest shippers to analyze their freight networks and uncover opportunities where electric vehicles can outperform diesel. Our leading team of experts uses advanced analytics to co-create tailored electrification roadmaps, helping shippers and carriers optimize costs, ensure operational feasibility, and future-proof their strategies.

Final Thoughts

Electrification is no longer a future goal—it is an active transformation already reshaping the logistics industry. For quick responding shippers and carriers, the window of opportunity is now. Those who invest in electric operations, infrastructure, energy, and system redesign will not only decarbonize their fleets, but also position themselves as the cost leaders of tomorrow's road freight market.

Contact:

For more information, data access, or to schedule a workshop with our electrification experts, contact

green@sennder.com

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APPENDIX

This model simulates the total cost of operating electric versus diesel trucks using bottom-up cost inputs that reflect real-world operating conditions in 2025. Inputs are based on sennder's operational expertise, with a focus on standard tautliner operations, which we believe offers a representative view across most vehicle categories.

While specific logistics configurations (e.g. equipment type, operating hours) may vary by company, the relative relationship between diesel and electric operations is expected to remain consistent across use cases.

We do not include cabotage-related cost differentials in this model and assume standard cost factors per country.

Simulation Scope and Assumptions

- The model assumes equal daily mileage for electric and diesel trucks, up to 600 km per day in single-shift operations. With continued improvements in charging speed and infrastructure, we consider this assumption to be realistic by 2030—and increasingly feasible before then.
- All values compare the percentage difference in operating costs between electric and diesel vehicles, based on the defined variables.

Cost Components Modeled

Electricity Cost

- Formula: Cost per kWh × kWh/km consumption
- Electricity price scenarios modeled between 0.05 EUR and 0.50 EUR per kWh

Driver Cost

- Country-specific wage assumptions

Road Tolls

- Country-specific tolls modeled under different EV policy scenarios:
- 0%, 25%, 50%, and 100% of diesel-equivalent tolls

Carbon Price

- Simulated between 0 EUR and 200 EUR per tonne CO_2e

Vehicle Efficiency (with 16t payload and 17% empty kilometers)

- Diesel: 26.1 liters / 100 km
- Electric: 130 kWh / 100 km

Conservative efficiency values are used to avoid overestimating EV advantages.

Additional Operational Costs

- Overhead and carrier margin
- Telematics and dispatching systems

Truck Price Assumptions

All truck costs are modeled using a pay-per-use structure, consistent with JUNA's modeling framework, to reflect total cost of vehicle access.

Diesel Trucks

- **2025:** 100,000 EUR
- **2030:** 100,000 EUR

No inflation or policy-driven price increases assumed — a conservative position that favors diesel.

Electric Trucks

- **2025:** 290,000 EUR
- **2030:** 150,000 EUR

Reflects expected reductions in battery and system costs as the EV market scales.


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