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# Sustainable Logistics: How to drive the decarbonization of trucking?

July 2023

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# The Logistics industry is sitting on a sustainability time bomb



- Customers decarbonize their own value chains and define targets for scope 3 emissions
- Demand for sustainable solutions increases



- Working conditions of subcontractors and own staff particularly critical
- Social and environmental responsibility of a company important when choosing a place of work
- Driver scarcity



- Financial institutions step up pressure towards sustainability and climate protection
- Investments by the largest funds are made in companies in accordance with ESG criteria



- Increasing demands for sustainability reporting (e.g., CSR guideline, EU taxonomy, supply chain act)
- Reporting requirements and common taxonomy drive transparency



- Sustainability may increase costs, but also drives cost efficiency
- Sustainability provides opportunity for differentiation and increases competitive pressure

# An integrated sustainability strategy for logistics encompasses five building blocks



E

## Decarbonization

- Reduce **emissions** from all operations and strive for usage of **alternative energies and technologies**

*Focus*

E

## Circularity

- Circularity approaches for packaging and for assets (e.g. trailers, forklifts)
- Logistics services facilitation a circular economy

S

## Employee wellbeing

- Aim for a fair and uplifting environment **supporting all employees** in their daily job

S

## Sustainable supply chain

- Strive for a **value chain which supports environmental and social sustainability** across all own and sub-contracted operations

G

## Governance

- Anticipate and embrace **regulation and emerging ESG standards** in the company's governance, steering mechanisms and KPIs

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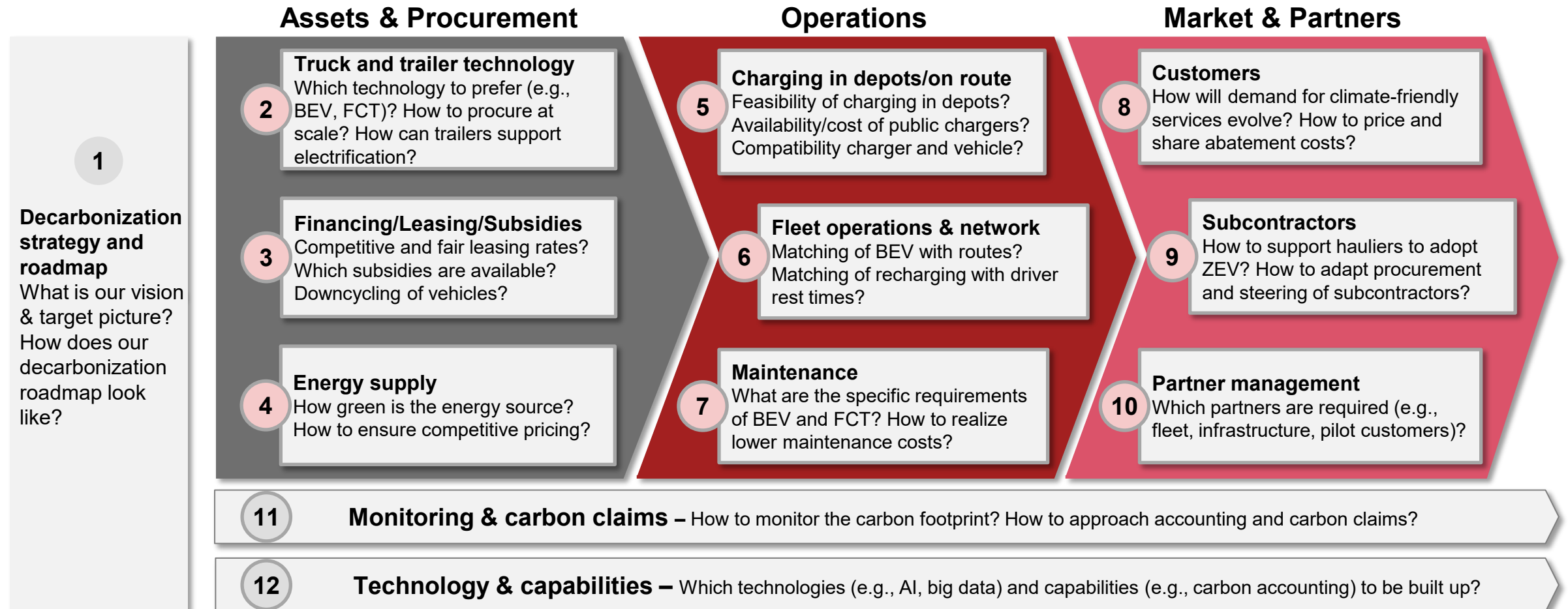
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# For the successful decarbonization of trucking 12 topics need to be addressed

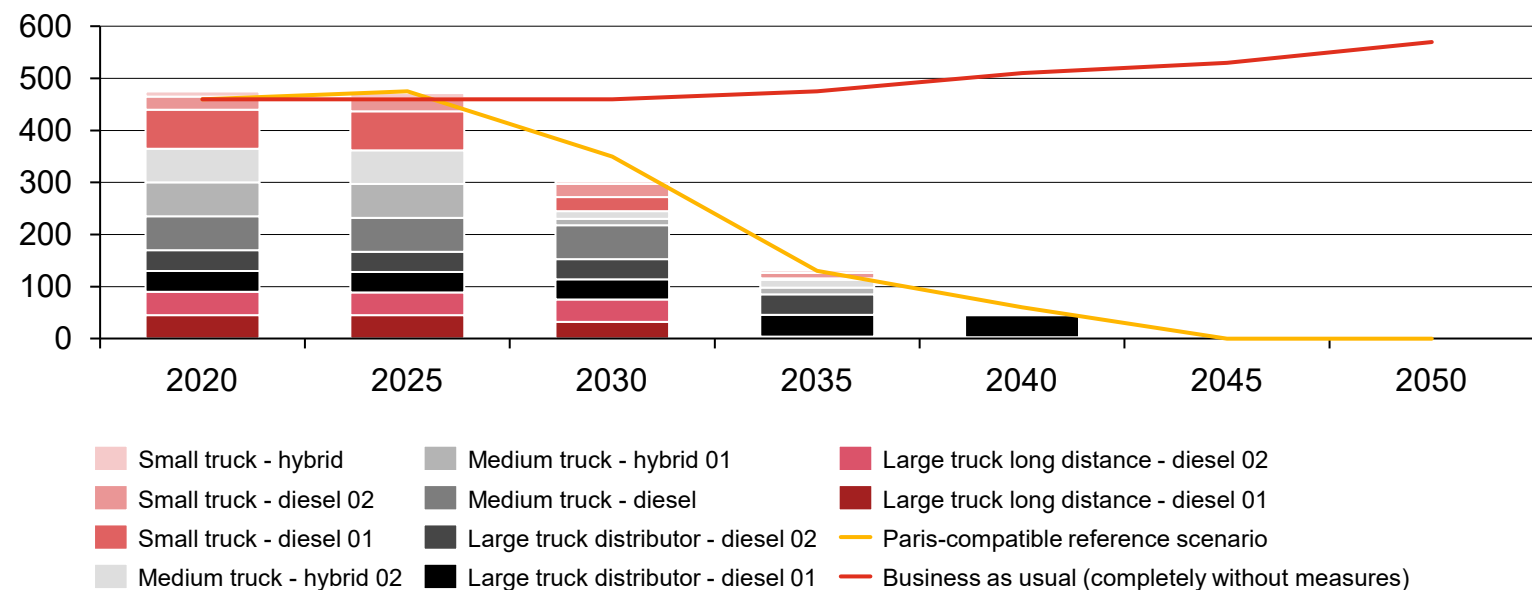
## Strategy & Decarbonization framework for Trucking



# Decarbonization of trucking requires a massive transformation

## Decarbonization roadmap for trucking in Germany

GHG emissions in t CO<sub>2</sub>e/year



- **Limited room for efficiency improvement of combustion engine** (4-9% reduction in greenhouse gas emissions depending on truck size)
- **Bridge technologies may reduce climate impact**, e.g. **hybridisation** (33-55% reduction in well-to-wheel emissions), **bio-CNG** (43-55%) and **bio-LNG** (57-70%)
- **Only battery-electric trucks (BET) and fuel-cell trucks (FCT) enable full decarbonization at scale**

### Key questions for T&L players

- What are **regulatory and customer requirements** concerning decarbonization?
- What is the **decarbonization ambition** of the T&L player?
- Which **goal** should be achieved (e.g. SBTi)?
- How does the **long-term roadmap** towards 2045 look like?



# Mega players push the decarbonization agenda – mid-sized players are also active, yet public commitments still limited

## ESG ratings across logistics players

| ESG rating agency   | Market share | Rating scope and premise  | DB SCHENKER | DSV   | KUEHNE+NAGEL | XPO   | DHL   | Raben | RHENUS LOGISTICS | hellmann | DACHSER | FIEGE |
|---|--------------|---|-------------|-------|--------------|-------|-------|-------|------------------|----------|---------|-------|
| <b>MSCI</b><br>ESG Rating                                       | 43%          | • Scope: <b>All dimensions</b><br>• Target group: Investors   |             | A     | AAA          |       | A     |       |                  |          |         |       |
| <b>SUSTAINALYTICS</b><br>ESG Risk Rating                        | 31%          | • Scope: <b>All dimensions</b><br>• Target group: Investors   |             | 16.72 | 17.28        | 23.33 | 15.62 |       |                  |          |         |       |
| <b>ISS ESG</b><br>Quality Score                                 | 15%          | • Scope: <b>Governance</b> (not including environmental and social dimensions)<br>• Target group: Investors |             | 2     | 7            | 5     | 4     |       |                  |          |         |       |
| <b>CDP</b><br>Integrated Performance Score                      | 8%           | • Scope: <b>Decarbonization</b><br>• Target group: public (NGO)   |             | 4     | 0            | 0     | 6     |       |                  |          |         |       |
| <b>SCIENCE BASED TARGETS</b><br>Near-term temperature alignment | n/a          | • Scope: <b>Decarbonization</b><br>• Target group: Investors, public  | 2°C         | <2°C  | <2°C         |       | 1.5°C | <2°C  |                  |          |         |       |

Source(s): Manager Magazin, Bloomberg, Strategy& research Strategy&

  not available    
 MSCI ESG Rating    
 CCC laggard    
 AAA leader    
 SUSTAINALYTICS ESG Risk Rating    
 40+ severe    
 0-10 negligible    
 ISS ESG Quality Score    
 10 worst    
 1 best    
 CDP Performance Score    
 0 worst    
 8 best    
 SCIENCE BASED TARGETS    
 2°C worst    
 1.5°C best    
 9

# BET and FCT are promising drivetrain options for trucks, CAT and SYT questionable

## Deep dive: Alternative powertrain options for trucks

### BET

Purely battery electric truck



Direct use of electricity in electric motor for propulsion; battery used as energy storage



**Competitive technology**

- Decreasing vehicle costs as well as increasing load capacity and range
- High efficiency, low energy costs and high public acceptance

### FCT

Hydrogen-powered fuel cell truck



Conversion of electricity into hydrogen; fuel cell to transfer hydrogen into electricity to be used in electric motor for propulsion



**Competitive technology**

- Decreasing vehicle and energy costs
- High flexibility due to low refueling speed (compared with charging) and high public acceptance

### CAT

Overhead catenary hybrid truck



Direct use of electricity in electric motor for propulsion; small battery used as energy storage, as main energy is transferred via catenary



**Competitiveness questionable**

- Non-scalable upfront investments with under-utilization of infrastructure
- Low public acceptance

### SYT

Synthetic fuel-powered ICE truck



Conversion of electricity into carbonaceous fuel or “synthetic fuel” (Power-to-Liquid or Power-to-Gas); internal combustion engine used



**Competitiveness questionable**

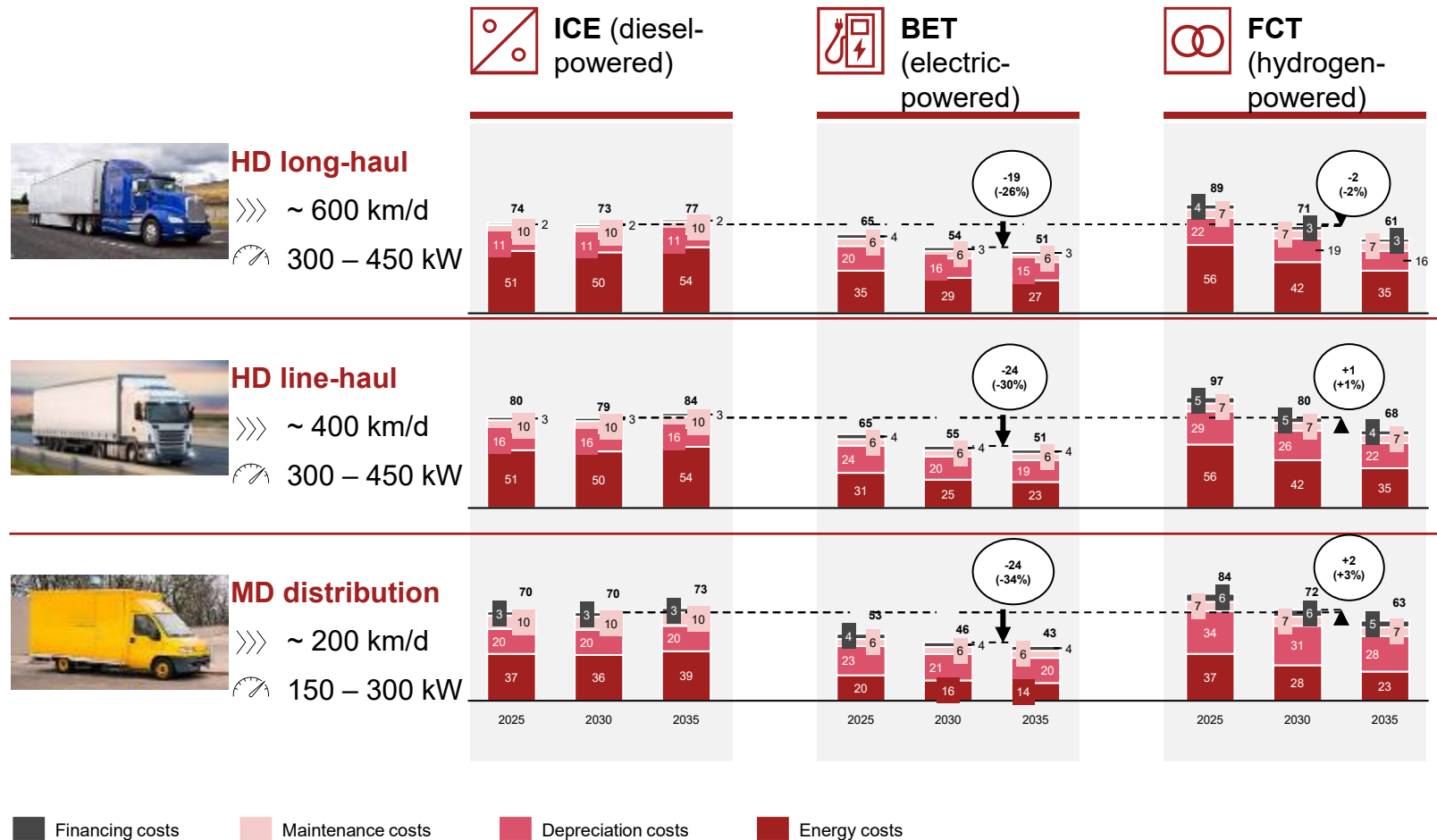
- High renewable primary energy investments due to low end-to-end efficiency
- High latency of additional renewable energy production to facilitate large-scale “synthetic fuel”

## Key questions for T&L players

- Which **drivetrain technologies** will be **competitive** now and in the future?
- Which **technologies** are **suitable** given the specific use cases of the T&L company, which technologies should be **discarded**?
- Which technologies are relevant for **niche applications**?

# BET outperforms ICE reg. TCO from 2025, FCT from 2030 – energy costs as main driver

## Deep dive: Alternative powertrain options for trucks



### Key questions for T&L players


- What is the **winning drivetrain technology**? What are the associated costs (TCO)?
- How does the **technology roadmap** for the individual T&L company and its specific use cases look like?
- How can **low TOCs** for ZEV be **realized** in practice?
- How can the **ZEV fleet be upscaled** and bottlenecks of auto OEMs be overcome?


Source(s): Strategy& Truck Study (09/2022) and E-Truck Readiness Study “How to foster eMobility truck fleets”? Strategy&


# Electrified trailers facilitate truck range and decarbonisation

## Electrified trailers – example

### Cooperation example

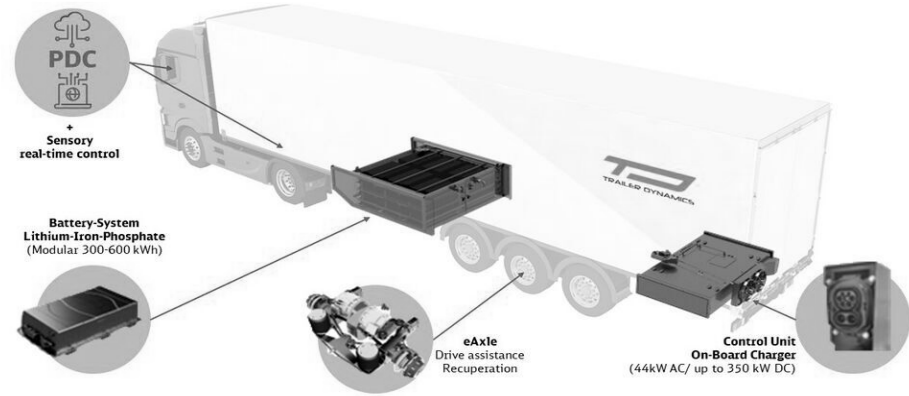
 Agreement between DB Schenker, Krone and Trailer Dynamics

 DB Schenker to purchase 2,000 Krone e-trailers

 Battery options: 300kWh, 450 kWh, 600 kWh





### E-trailer components



### Key questions for T&L players

- How can trailers support the **range of trucks**?
- What is the **TCO** and **benefits** of electrified trailers?
- What are **potential partners**?

 Extended range by up to 500 km

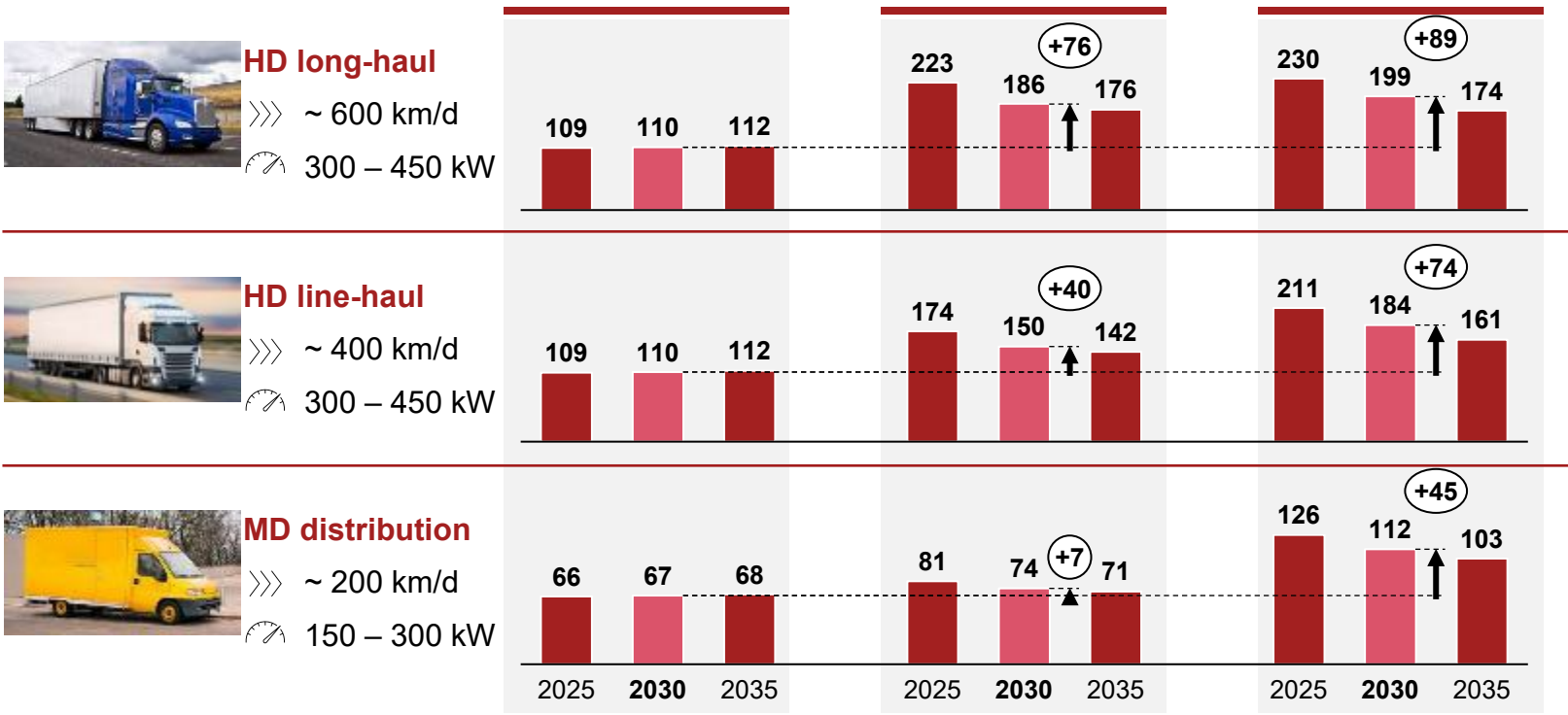
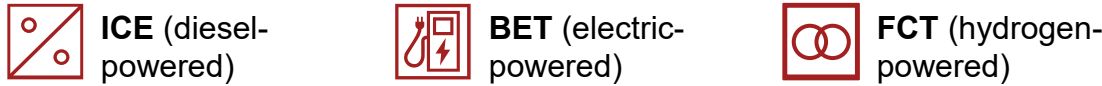
 Reduction of fuel consumption leading to 20-40% CO2 savings potential

Source(s): [Sustainable Truck Van](#); [Electrification Coalition](#); DB Schenker Strategy&



# BET and FCT vehicle prices will remain higher than prices for ICE trucks

## EU truck prices in 2025-2035 for ICE, BET and FCT (€k)



### Key questions for T&L players

- How will **vehicle prices** for the different drivetrains evolve?
- How can **demand** be aggregated to speed up large-scale e-truck deployment (e.g., Fleet Electrification Coalition by Smart Freight Center)?
- Which **funding opportunities** do exist?
- How do the **leasing models** look like?
- How are **sub-contractors supported** in their shift towards a green fleet?


Mileage (km) per day (based on 250 working days per year)
 Performance (power)
   
 Source(s): Strategy& Truck Study (09/2022) and E-Truck Readiness Study "How to foster eMobility truck fleets"?
   
 Strategy&

# Funding and leasing schemes should be checked to facilitate electrification of fleets

## Funding and Leasing


### Green funding

- **EU funding:** New road toll system from May 2023 grants ZEVs a 50% discount - up to €25k in savings per truck p.a.
- **DE funding:** €5bn for the charging network expansion for commercial vehicles (CVs) & passenger cars (PCs); €1.6bn for purchasing zero-emission CVs
  - Funding of 80% of additional investment for purchasing BET over ICE
  - Funding of 80% of operating costs for zero-emission charging/fueling infrastructure

 **Funding and subsidies** to electrify the fleet to be assessed

### Leasing

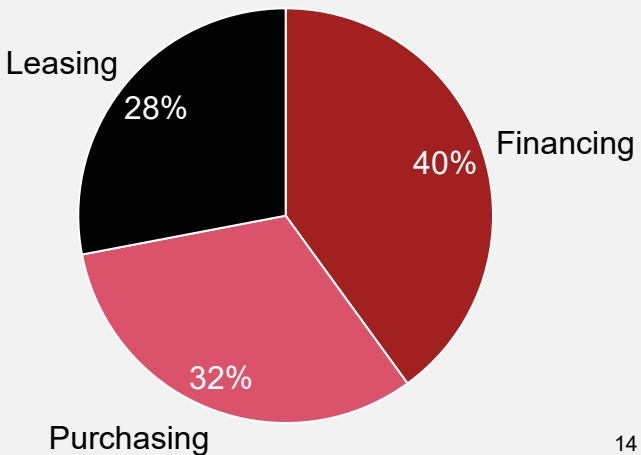
- **Leasing rates are driven by depreciation/residual value** plus interest, services/insurance and profits
- **Residual value** is impacted by depreciation of vehicle and battery, downcycling opportunities, and technological risks
- Initial analysis indicates that **leasing rates for battery electric passenger cars are overcharging** drivers – leasing rates for trucks to be checked
- **Compatibility of leasing with eligibility for subsidies** to be ensured

 **Competitive leasing rates** and terms to be ensured

## Key questions for T&L players

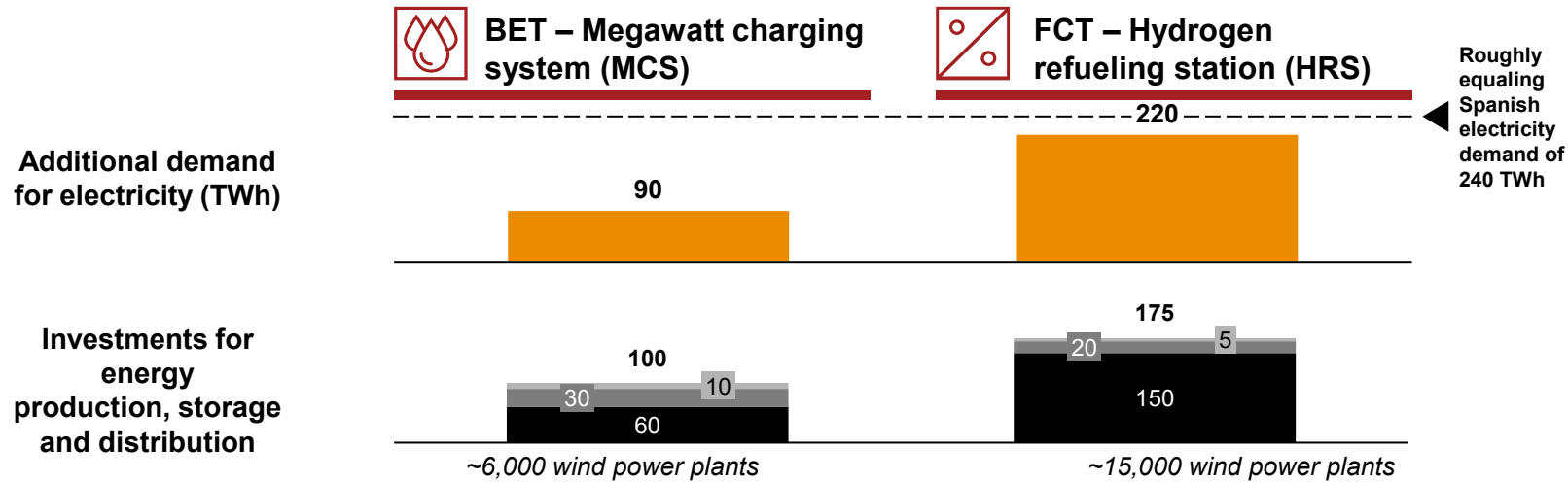
- What **funding and subsidies** can be accessed?
- How can **favorable financing conditions** for own vehicles be ensured?
- How competitive and „fair“ are **leasing rates** for BEV?

## Priorities of fleet operators for procurement of heavy duty trucks



# Electrification of trucking requires massive additional electricity

## Renewable energy requirements (in €bn; Germany)



## Key questions for T&L players

- How to ensure a **cost-competitive energy supply**?
- What is the **energy mix** for recharging and the ensuing carbon footprint?
- How to secure access to **green energy** at affordable prices?
- Which **strategic partnerships and long-term contracts** are required for a competitive energy supply?

### Key considerations electric energy supply

- **Enormous additional energy demand** for full electrification of truck fleet (>15% of current electricity generation in Germany)
- LSP need to ensure **access to green energy** for full decarbonization and **competitive energy prices** and contracts. Strategic partnerships with energy producers to be considered
- **Significant price premium for public charging** compared to depot charging. Premium for public charging likely to remain for some time due to low utilization of recharging infrastructure during ramp-up of fleets and lack of competition

■ Distribution   ■ Storage   ■ Renewable power

Source(s): Strategy& Truck Study (09/2022) and E-Truck Readiness Study "How to foster eMobility truck fleets"?

# Depot chargers can be installed at moderate costs, public infrastructure needs to be built

## Depot charging vs. charging parks

**BET – Depot charging system (DCS)**



Visualization

**BET – Charging park (MCS + Overnight)**



Charge speed

Up to ~50km/h

**MCS:** Up to ~850 km/h  
**Overnight:** Up to ~50 km/h

Refill duration

Charge for ca. **400 km range in 8h (overnight)**

**MCS:** Charge for **400 km range in ~30 min**  
**Overnight:** Charge of **400 km range in 8h**

Power

Total power of ca. **750 kW** required per depot (for fleet of ~10 trucks)<sup>1)</sup>

**MCS:** Power up to **1.5 MW** per charger  
**Overnight:** Required power of ca. **75 kW per truck** (150 kW charger with ~ 2 cables)

Cost

Medium-sized logistics company with fleet of ca. 10 trucks requires **3x 250 kW chargers** with investment of ~**€450,000**<sup>1)</sup>

Charging parks for 200 HDTs per day with **6 MCS chargers** and **28 overnight charging bays** require invest of ~**€8.5 million** per park

1) Each 250 kW charger serving several trucks simultaneously via multiple cables  
Source(s): Strategy& analysis, Rose (2020), Fraunhofer ISI  
Strategy&

**EU regulation (AFIR) defines requirement for deployment and coverage of public chargers**


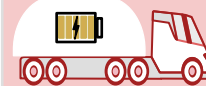
## Key questions for T&L players

- What **type of charging** is required for the use profiles (depot vs. on route; overnight vs. fast mega-charging)?
- How to set up **charging infrastructure in the depot**?
- How to accommodate **space requirements** for overnight charging in depots?
- Are **battery-storage systems** in the depot required?
- How to embed charging into **depot operations**?
- Which **coverage of public charging infrastructure** to expect (e.g. AFIR)?
- How to ensure **availability and compatibility of chargers**?
- What are the **fallback options** (e.g. battery switch-packs)?



# For the successful and cost-efficient operations of BEV a few challenges need to be overcome

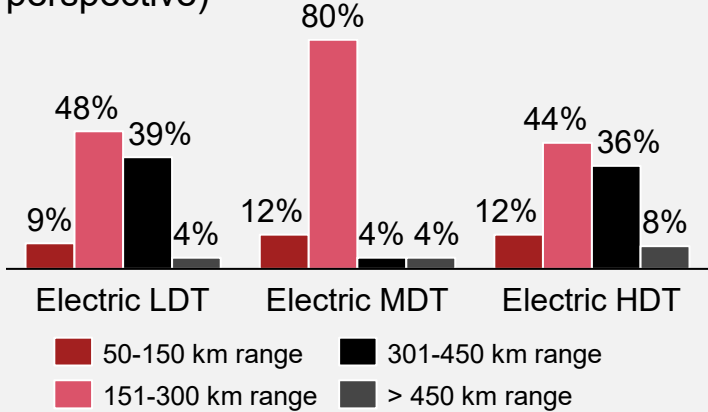
## Charging infrastructure

|                                  |  <b>Distribution</b>   |  <b>Long-haul</b>  |
|----------------------------------|---|--|
| <b>Fleet range</b>               | <ul style="list-style-type: none"> <li>Sufficient range for <b>urban</b> distribution with current models, limitations for <b>regional</b> distribution; to be overcome with future models</li> <li>Rewe pilot showed: All <b>urban delivery</b> tours feasible with BET (without intermediate charging), regional tours ~50% (current models)</li> </ul> | <ul style="list-style-type: none"> <li>530 km per day driven on average by tractor trailers, 97% of trucks drive less than 800 km</li> <li><b>Current</b> models: Range of <b>~500 km</b></li> <li><b>Future</b> models: Range of <b>~800 km</b> expected</li> <li>Futuricum truck reached <b>1.000 km</b> under test conditions (2022)</li> </ul> |
| <b>Charging</b>                  | <ul style="list-style-type: none"> <li><b>Depot-based charging.</b> Majority of truck charging expected to take place in/near depots</li> <li><b>Overnight charging</b> to become dominant model</li> </ul>   | <ul style="list-style-type: none"> <li>Mix of <b>depot charging</b> and charging at <b>public chargers</b> on route</li> <li>Mandatory rest breaks after <b>4,5 hours</b> (~350 km) to be used for <b>power charging</b></li> <li>Mandatory rest break after <b>11 hours</b> (~800 km) to be used for <b>overnight charging</b></li> </ul>         |
| <b>Payload</b>                   | <ul style="list-style-type: none"> <li>Urban and regional delivery trucks with <b>higher payload</b> than diesel</li> </ul>   | <ul style="list-style-type: none"> <li><b>Short-term payload losses</b> (~1.6 tons in 2025), mid-term no payload losses (2030; due to lighter battery packs)</li> </ul>  |
| <b>Key operations challenges</b> | <ul style="list-style-type: none"> <li><b>Route planning</b> for mixed fleets</li> <li><b>Matching of rest times</b> with recharging during day</li> </ul>  | <ul style="list-style-type: none"> <li><b>Route/network planning</b> for mixed fleets</li> <li><b>Matching of rest times with recharging</b></li> <li><b>High electricity prices</b> at public chargers</li> <li>Lacking <b>compatibility of charger &amp; truck</b></li> <li><b>Realizing low TCOs</b></li> </ul>                                 |

## Key questions for T&L players

- What are the **range requirements** of different use cases and how can they be supported by BETs?
- How to adjust **route planning** to account for the different vehicle/driver restrictions?
- How to **match charging times with rest times of drivers** and standstill times of vehicles?

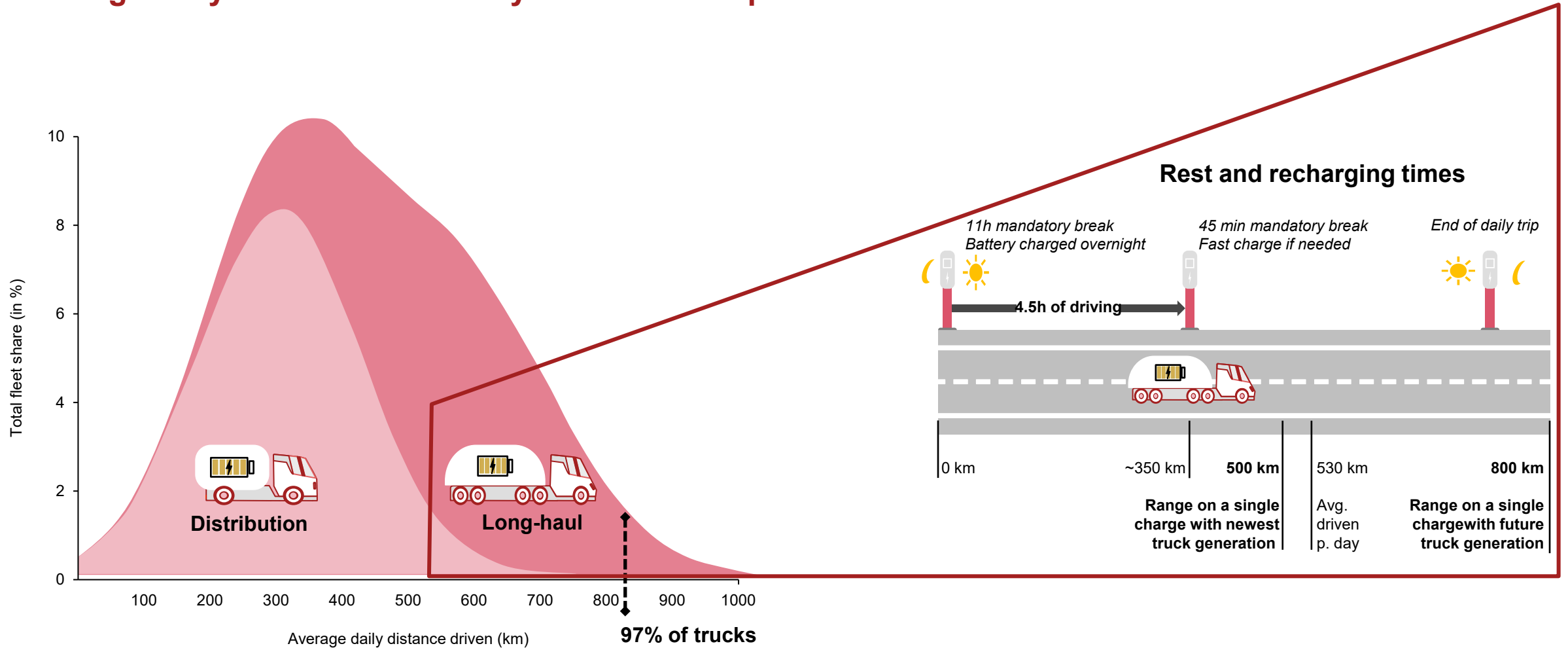
Required ranges for BETs (fleet operator perspective)



Source(s): ACEA; Agora Verkehrswende (10/2022); T&E; Fraunhofer Study "Lieferverkehr Fallbeispiel REWE Group" (2021); Strategy& eReadiness Commercial Vehicles (01/2022)

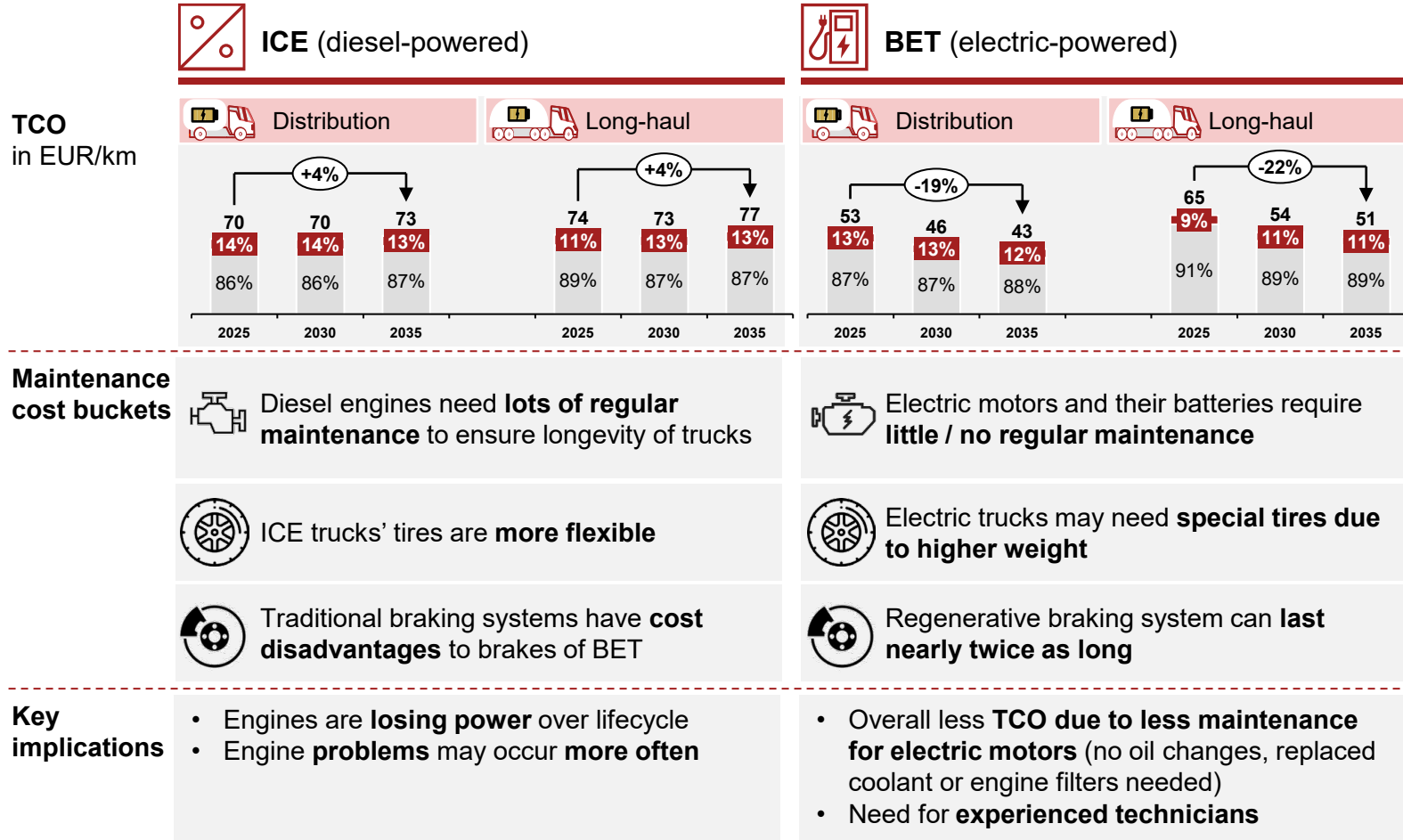
# 97% of trucks in Europe are long-haul delivery fleet, driving up to 800 km per day

## Average daily distances driven by trucks in Europe



# Maintenance costs for BEV are lower than ICE, but capabilities such as technicians to be built

## Operations criteria



■ Maintenance costs ■ Other costs

Source(s): ACEA; Agora Verkehrswende (10/2022); T&E; Strategy& eReadiness Commercial Vehicles (01/2022); Strategy& Truck Study (09/2022) [United World Transportation Strategy&](#)

## Key questions for T&L players

- How should the **ideal operations model** look like?
- How to deal with mixed fleets?
- What new **safety requirements** need to be addressed?
- Which **capabilities** are required for BET maintenance and spare parts handling?
- Who are the right **partners** for BET maintenance?

# T&L players have started to offer climate-friendly products

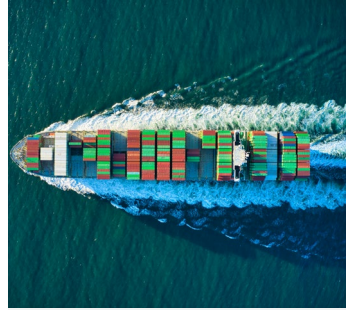
## Examples of climate friendly products



Parcel delivery



Land transport



Sea transport



Air transport

### GoGreen

- CO<sub>2</sub> neutral transportation by investing in global projects for climate protection
- Option to choose train transport instead of truck transport



### Econutral option

- Enabling carbon footprint offsetting through certified climate protection projects
- Cooperation with the European non-profit organisation atmosfair



### Emissions dashboard

- Overview of emission data of goods traffic
- Suggestion of measures to reduce emissions



### Sustainable Air Fuels

- Giving passengers the option to select the use of synthetic fuels in the booking process



## Key questions for T&L players

- How large is the **potential for climate-friendly products** (e.g. derived from clients' own climate goals)?
- How will the **willingness-to-pay** a premium evolve (currently very few customers in land transport willing to pay extra)?
- What products are **competitors** offering or developing?
- What is the room for **differentiation**? How should products be configured?
- What can be learnt from **other segments and industries**?
- How should **prices** for climate-friendly products be set?

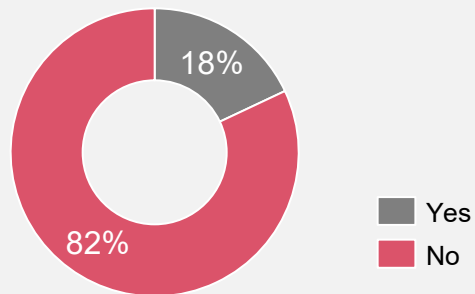
Source(s): [DHL GoGreen](#); [DB Schenker Econutral](#); [MAERSK Dashboard](#); [Lufthansa SAF Strategy](#)

# Fleet operators have limited experience with BET and there are several barriers for adoption

## Fleet operator perspective on BET

### Experience with BET

Q Have you had any experience with battery electric trucks yet?



- Most operators without BET in their fleets have not experienced battery electric trucks at all
- Almost all of them have adopted alternative drivetrain options instead

OEMs should provide offers to increase first hand experience for ...

### Barriers for adoption

Q What are the major obstacles for increasing the electric vehicle fleet in your business?

- 1 Range (and battery life) anxiety
- 2 Lacking infrastructure and high charging duration/ frequency/ cost
- 3 Limited number of BETmodels available
- 4 Insufficient monetary incentives (e.g. government subsidies)

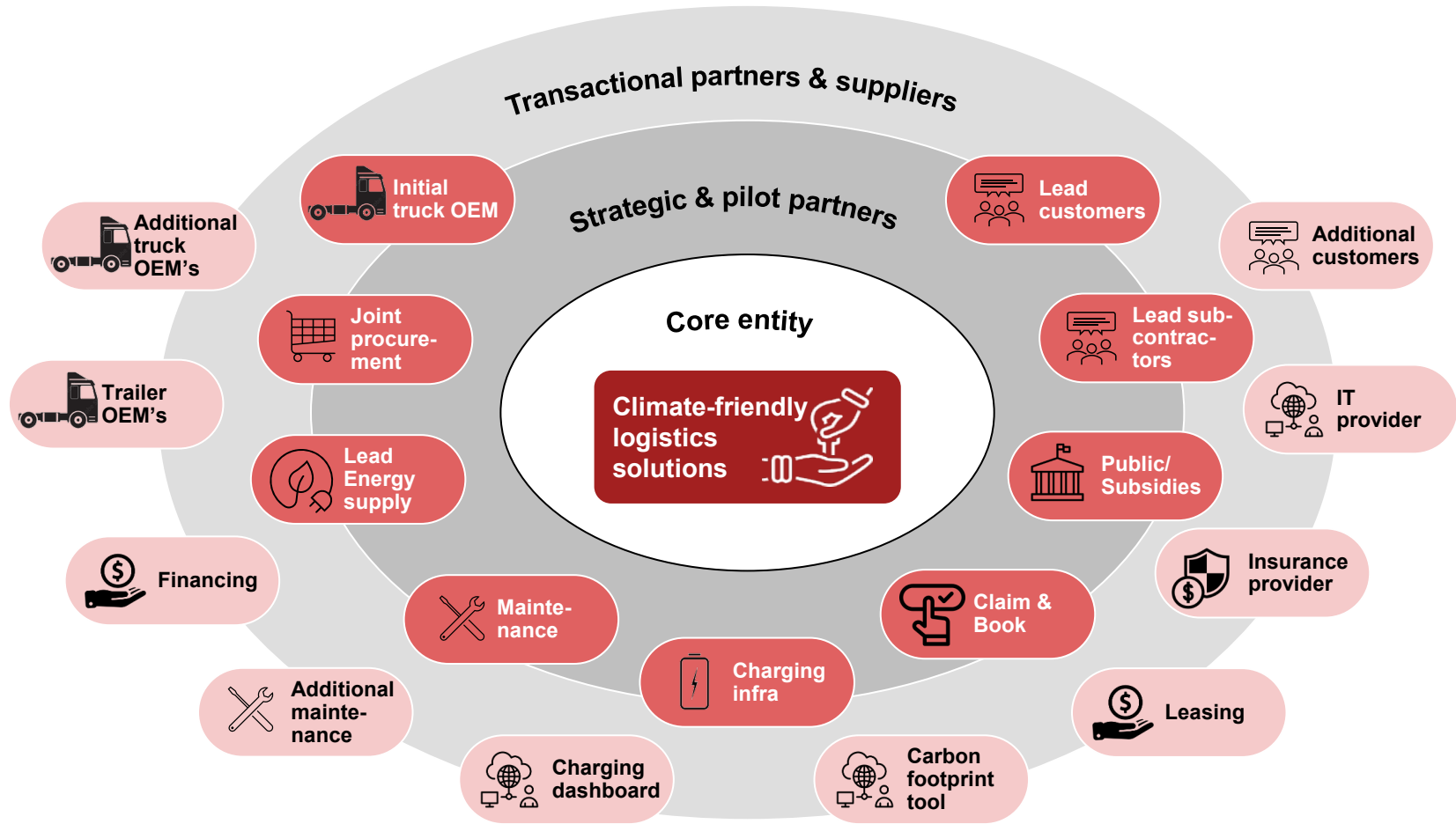
... but are still struggling with well-known barriers for adoption

## Key questions for T&L players

- What is the **subcontractors' stance** on zero-emission trucks? What are the specific barriers for adoption?
- How can **LSPs support their subcontractors** during the transition to electrified trucks (e.g., technology decision, TCO/business case, use cases, capability building)?
- How can the **risks & opportunities** of electrification be **shared**?
- How can the **utilization of Capex-heavy BETs** be facilitated?
- How are climate friendly drivetrain technologies reflected in **procurement decisions** for subcontracted services?

# Strategic partners for pilots and the climate transformation should be chosen wisely

## Potential partners for decarbonization of land transport



### Key questions for T&L players

- What can the LSP do **standalone**, where are **strategic partners** required?
- How are **pilots** for climate-friendly transport orchestrated? Which pilot customers and subcontractors are required?
- For which activities and during which stages of the transformation are **strategic partners vs. transactional suppliers** required?
- Which **type of partners** are required, e.g. Business, Public, NGOs (e.g., Smart Freight Center), what maturity/scale is required (e.g., start-up/scale-up vs. large tech players/OEMs) ?

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# We support you on the decarbonisation journey



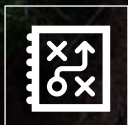
## Lighthouse

Develop a lighthouse for the electrification of trucking (e.g. specific depot, sub-network)



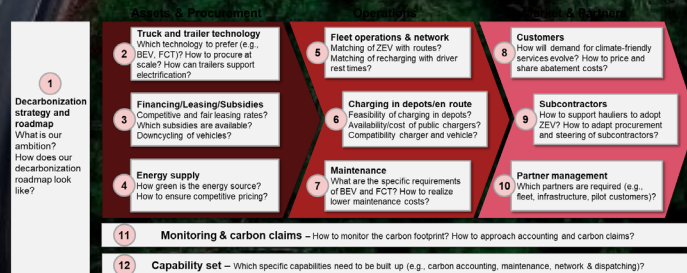
## Goals

Proof of concept and demonstration of feasibility for electrification

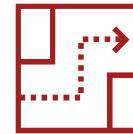


## Approach

Check and elaborate all the elements of the decarbonization framework



## Our contribution



### Strategy through execution

Capability driven strategy allowing an end-to-end transformation until final implementation



### Focus on T&L industry and Automotive

Strong expertise in Transport & Logistics and Automotive industries



### ESG expertise

Global network of experts, researchers and academics with regards to sustainability (e.g. carbon abatement, battery technology, climate reporting)



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# Thank you

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