ELECTRIC TRUCKS AND BUSES: ROLLING INTO THE FUTURE TOGETHER

EXPERT INSIGHTS ON THE ELECTRIC TRUCK MARKET, ITS IMPACT ON FLEETS, AND PREMIUM TYRE SOLUTIONS

MICHELIN

CONTENTS

ROLLING ON ELECTRICITY — 3

WHAT'S BEHIND THE SURGE IN THE ELECTRIC VEHICLE MARKET — 4

01. Driving the Change to Zero Emission Vehicles
02. Beyond the Tailpipe: Accounting for Lifecycle Emissions
03. Developing the Electric Vehicles of Today and Tomorrow
04. Less Diesel, More Zero Emission Vehicles

WHAT'S AT STAKE WITH ELECTRIC TRUCKS & BUSES — 8

01. TCO: From Good to Better for BEVs
02. Riding the EV Charge
03. Electric Trucks & Buses: High Impact on Tyres

PREMIUM TYRES ARE ESSENTIAL FOR ELECTRIC TRUCKS AND BUSES — 11

01. For Electric Trucks, the Tyre That's Suitable Is the Tyre That Has It All
02. Michelin and Electric Fleets: The Right Match

HIGH PERFORMANCE ELECTRIC TRUCK, HIGH PERFORMANCE TYRES — 14

01. Meet the Next Generation: MICHELIN X® Multi Energy™ Z2 & D2
02. MICHELIN X® Multi Energy™ Z2 & D2 Range: Durable and Robust for Electric Trucks
03. MICHELIN X® INCITY EV Z: Designed for Electric Vehicles, Outstanding for all Buses
04. Smart Predictive Tyres: Ensuring Peak Performance from Departure to Arrival

INNOVATION AND SUSTAINABILITY GO HAND IN HAND — 20

GLOSSARY

***EV** (ELECTRIC VEHICLE)*
Vehicles powered by an electric motor.

***BEV** (BATTERY ELECTRIC VEHICLE)*
Vehicles powered exclusively by rechargeable electric batteries with no internal combustion engine (ICE) or fuel tanks.

***ZEV** (ZERO-EMISSION VEHICLE)*
Vehicles using energy technology that emits no exhaust gas or other carbon emissions from the onboard source of power.

***ICE** (INTERNAL COMBUSTION ENGINE)*
An engine which generates power by burning fuel (such as petrol or diesel) inside a combustion chamber.

SOURCE: European Commission https://transport.ec.europa.eu/transport-themes/clean-transport/clean-and-energy-efficient-vehicles/clean-vehicles-directive_en

***FCEV** (FUEL CELL ELECTRIC VEHICLE)*
Hydrogen fuel cell electric vehicles (FCEVs) run on electric power generated by hydrogen fuel which is kept in compressed fuel tanks.

***WTT** (WELL-TO-TANK)*
Method used to calculate the energy consumed and GHG emitted from the moment of production of a transport fuel (petrol, diesel, electricity, natural gas) to the moment of fuel supply (at the recharging or refuelling station).

***TTW** (TANK-TO-WHEEL)*
Method used to calculate the energy consumed and GHG emitted from the point at which the transport fuel (petrol, diesel, electricity, natural gas) is transmitted to the vehicle to the moment of its use.

ROLLING ON ELECTRICITY

By contributing to the decarbonisation of the transport sector, electric vehicles help to address the planetary issue of climate change through carbon dioxide emission reductions. In the wake of tightening EU regulations, all actors in the transport industry are doing their part to reduce these emissions. This white paper examines the pivotal role of premium tyres in optimising electric truck performance, and highlights advancements in tyre technology and their impact on fleet operations.

ZOOMING IN FROM AN INDUSTRY TO A TYRE VIEW

“After an industry-wide overview of how carbon emissions are being tackled, there follows a look at the growth in electric truck acquisition and a comparison of Total Cost of Ownership (TCO) for an electric truck and a traditional diesel-powered one. As fleets increasingly adopt these new carbon emission-free vehicles, premium tyres become critically important. They must suitably and capably meet the specific demands that electric trucks and buses place on them, while ensuring safety and an optimised TCO.”

ESPERANZA GASPAR
Senior Vice President Worldwide
Long-Distance Transportation Business Line

WHAT'S BEHIND THE SURGE IN THE ELECTRIC VEHICLE MARKET

Rapidly expanding, the electric truck and bus market is driven by a greater number of environmental regulations that are also more rigorous, a growing demand for sustainable transport solutions, advancements in battery technology and new vehicle architectures. To reduce carbon footprints in logistics and freight industries, electric trucks and buses must offer competitive range, payload capacity and efficiency.

01.

DRIVING THE CHANGE TO ZERO-EMISSION VEHICLES

All members of the transport chain are doing their part to reduce CO_2 emissions. Pushed by EU regulations that target from new vehicle emissions and road tolls, and municipalities that are increasingly limiting emission-heavy traffic inside their boundaries, vehicle manufacturers, shipping companies and carriers are all investing in solutions that comply.

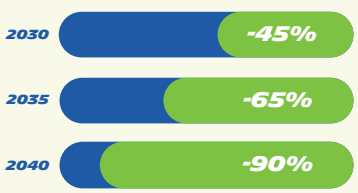
SOCIETY

There is a fundamental societal expectation that transportation will be able to reduce its CO_2 emissions, as the sector is one among many responsible.

GOVERNMENT REGULATIONS

Beyond EU regulations, local policies are already in place in hundreds of European cities to reduce or even ban polluting vehicles from urban areas.

EU TARGETS FOR CO2 EMISSION STANDARDS FOR HEAVY-DUTY VEHICLES



Source: European Commission. https://ec.europa.eu/commission/presscorner/detail/en/qanda_24_2527

VEHICLE MANUFACTURERS

Low- and zero-emission vehicles are being designed and built to meet new norms and regulations.

SHIPPING COMPANIES

To decarbonise their transport, shipping companies are developing multimodal transportation services and asking carriers to switch to zero-emission vehicles.

CARRIERS

Carriers are meeting these requests and developing their own ambitious plans. Higher EU motorway tolls for higher emission vehicles are further pushing them to meet reduction targets.

Overall, these ambitious objectives, including 2030 as a short-term intermediary deadline, will require some transitioning from diesel-powered to electric vehicles.

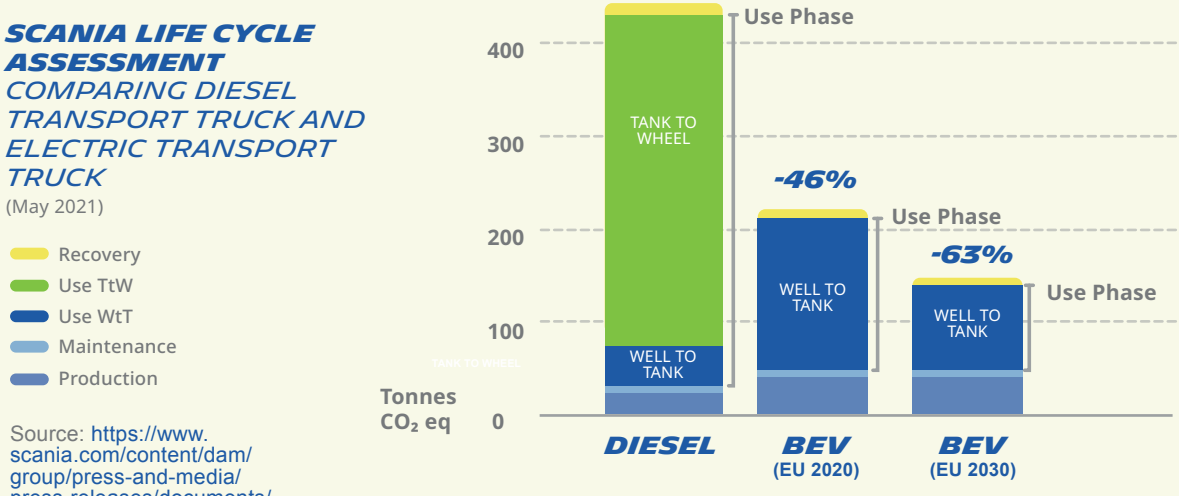
02.

BEYOND THE TAILPIPE: ACCOUNTING FOR LIFECYCLE EMISSIONS

Life Cycle Comparison: Electric vs. Diesel Trucks

Electric trucks produce zero CO_2 emissions while in the use phase (TTW), effectively eliminating tailpipe emissions and drastically reducing air pollution. While their manufacture (due to the production of battery), and their Well To Tank (due to the electricity production) result in higher CO_2 emissions compared to diesel trucks, these are more than compensated for over an electric truck's entire lifecycle. Take a look below:

SCANIA LIFE CYCLE ASSESSMENT
COMPARING DIESEL TRANSPORT TRUCK AND ELECTRIC TRANSPORT TRUCK
(May 2021)



Source: https://www.scania.com/content/dam/group/press-and-media/press-releases/documents/Scania-Life-cycle-assessment-of-distribution-vehicles.pdf

03.

DEVELOPING THE ELECTRIC VEHICLES OF TODAY AND TOMORROW

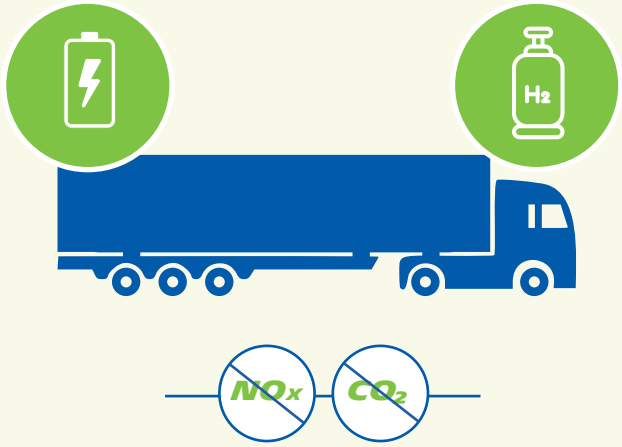
In Europe, two main technologies that provide zero tailgate emissions are being developed. They are battery-powered electric vehicles (BEV) and fuel cell-powered electric vehicles (FCEV).

BATTERY ELECTRIC *VEHICLE (BEV)*

MOTOR
100% electric

ENERGY
Electricity stored in a battery

RECHARGING
At a charging station, where charging time is variable, and can be long



FUEL CELL ELECTRIC *VEHICLE (FCEV)*

MOTOR
100% electric

ENERGY
Electricity is produced by the cell, by electrolysis, and stored in batteries

RECHARGING
With hydrogen, about the same time as filling up a diesel tank

Currently in the development stage, Electric Road Systems (ERS) for electric trucks involve infrastructure that supplies power directly to vehicles while they are in motion, typically through overhead wires. ERS allow trucks and buses to draw power directly from the grid.

KEEP AN EYE OUT FOR ***ELECTRIC ROAD SYSTEMS*** *(ERS)*

TRUE OR FALSE

THERE ARE NOT ENOUGH CHARGING STATIONS TO SUPPORT ELECTRIC TRUCK USE IN EUROPE.

FALSE

Currently, drivers have more stations available to them in some countries (Netherlands, Germany, France) than others. Planning rounds within range means that most trucks can be charged on-site at night – or topped up during a 45-minute break. The Alternative Fuels Infrastructure Regulation has deployment targets that have to be met between 2025 and 2030, with charging stations every 60 or 100 km along core and comprehensive networks.

Source: https://alternative-fuels-observatory.ec.europa.eu/transport-mode/road/european-union-eu27/country-comparison and https://www.consilium.europa.eu/en/press/press-releases/2023/07/25/alternative-fuels-infrastructure-council-adopts-new-law-for-more-recharging-and-refuelling-stations-across-europe/

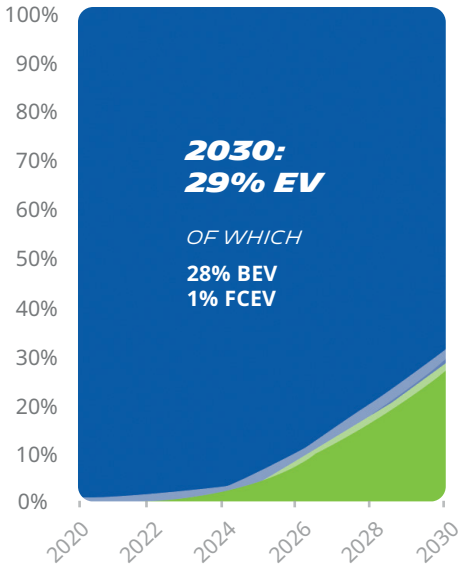
04.

EV GROWTH FORECAST: LESS DIESEL, MORE ZERO-EMISSION VEHICLES

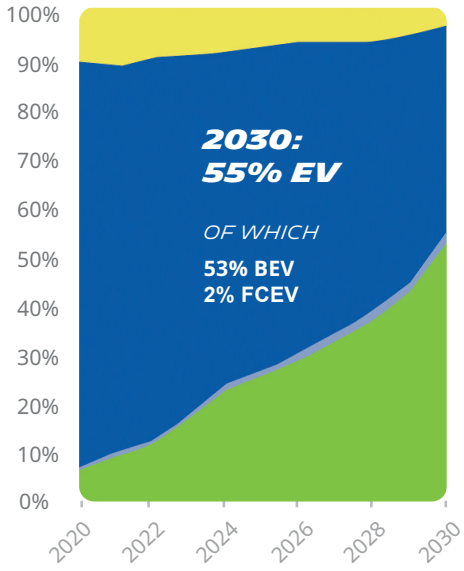
Electric vehicle adoption will rise over the next decade. Forecasts vary depending on the source.

For this paper's purposes, the forecast below estimates that by **2030, ELECTRIC TRUCKS** will already **REPRESENT 30% OF THE EUROPEAN FLEET, AND ELECTRIC BUSES** will reach **55%, EVEN WHEN ACCOUNTING FOR CHALLENGES POSED BY COST,** infrastructure and vehicle range in managing the transition.

MEDIUM AND HEAVY TRUCKS SALES
BY POWERTRAIN IN EUROPE



BUSES
PRODUCTION BY POWERTRAIN IN EUROPE



Source: S&P Global; 2023 data set; Green rules scenario for trucks.
*H2-ICE : Hydrogen Internal Combustion Engine vehicles.
**CNG / LNG : Compressed Natural Gas, Liquefied Natural Gas vehicles.

WHAT'S AT STAKE WITH ELECTRIC TRUCKS & BUSES

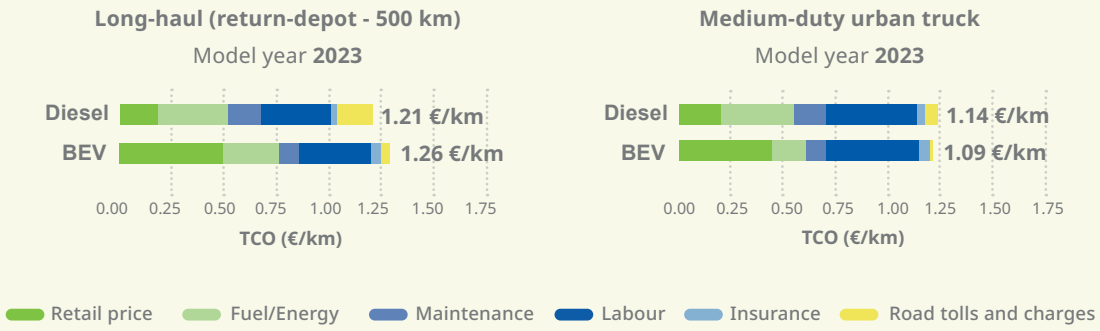
01.

TOTAL COST OF OWNERSHIP (TCO): FROM GOOD TO BETTER FOR BEVS

Overall, the Total Cost of Ownership at the moment for an electric truck is similar to that for an ICE vehicle. Variations are mainly due to the local cost of energy. As the technology develops and becomes increasingly adopted, TCO will improve as well.

DID YOU KNOW?

ELECTRIC TRUCKS CAN OFFER AN OVERALL COMPARABLE ***OR EVEN LOWER TCO TO DIESEL***



Source: International Council on Clean Transportation
https://theicct.org/publication/total-cost-ownership-trucks-europe-nov23/

A TRUCK'S TCO INCLUDES *THE VEHICLE PURCHASE PRICE, DRIVER SALARY, FUEL/ENERGY AND TYRE PRICES, TOLLS, MAINTENANCE AND REPAIRS, BREAKDOWN AND OTHER STRUCTURAL COSTS. IN OTHER WORDS, ALL DIRECT AND INDIRECT COSTS RELATED TO A TRUCK OVER ITS ENTIRE LIFECYCLE.*

02.

RIDING THE EV CHARGE

There's a lot of good energy that accompanies electric trucks as they're integrated into a fleet. For key roles in a transport company, the challenges of the transition are outweighed by the overall positive impact – on teams, customers and the planet. Below is a look at key questions to ask.

— Upper Management —

HOW TO FINANCE VEHICLES THAT USE FAST-EVOLVING TECHNOLOGY?

HOW TO USE THEM TO ADD TO THE COMPANY'S POSITIVE IMAGE?

— Operations —

HOW TO ADAPT ROUTES, AND LEARN ABOUT THE VARIABLE RANGE?

HOW TO TAKE CHARGING INTO ACCOUNT?

— Maintenance —

HOW TO ADAPT THE MAINTENANCE SCHEDULE?

HOW TO DEVELOP TEAM SKILLS?

— Corporate Social Responsibility Manager —

HOW TO DRIVE CHANGE IN THE ORGANISATION?

HOW TO MONITOR PROGRESS?

— Drivers —

HOW TO ADAPT TO DRIVING AN E-TRUCK?

HOW TO ENJOY THE EXTRA TORQUE AND THE QUIET RIDE?

"It's a decarbonisation strategy. We have a sizeable fleet, and as a carrier, we have a role to play in the ecological transition. So, it's not only good for the environment, but also for our image. By choosing these vehicles, we set ourselves apart from the competition."

High Value Goods transportation purchase manager, 300 vehicles, France

03.

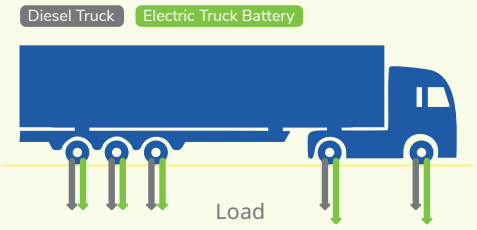
ELECTRIC TRUCKS & BUSES: HIGH IMPACT ON TYRES

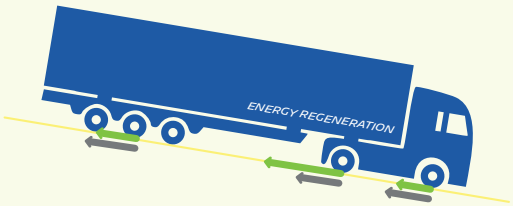
When transitioning to electric trucks and buses, tyres have more work to do. The short explanations that follow summarise the main impact on steer, drive and trailer tyres.

01

DIFFERENT LOAD DISTRIBUTION

- Battery weight makes electric vehicles heavier.
- Tyres have to carry more.
- **Tyre robustness** becomes even more important, in particular on the steer axle.





Braking and energy regeneration leads to higher wear on the drive position.

02

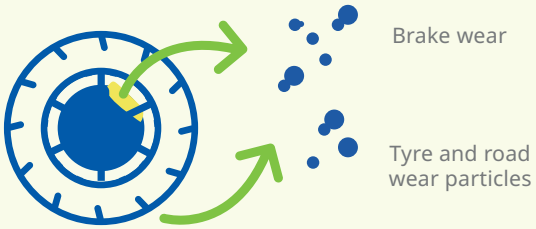
ENERGY REGENERATION

On an electric truck, the drive axle is subject to **higher torque** and consequently **higher wear** because of the energy regeneration system. Keep in mind that the front axle will also be exposed to higher wear levels due to the **heavier load**.

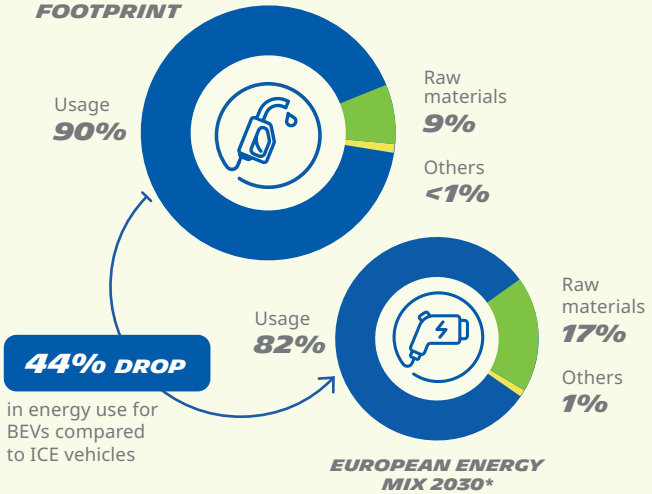
03

PARTICLE EMISSIONS

While EVs produce no CO_2 emissions while running, they still create brake and tyre particles. **Tyre abrasion** performance will prove to be even more essential, to help reduce tyre particles in general.



ICE VS BEV TYRE ENVIRONMENTAL FOOTPRINT



04

ENERGY CONSUMPTION

Even if an electric truck's environmental impact is significantly lower, **more than 80% of its impact still occurs during use**. That's why truck energy management is key.

The cost of energy used to recharge batteries in particular is now a factor to consider. Managing stored energy is key to **increasing range** and **lowering total cost of ownership** (**TCO**). Low tyre rolling resistance optimises both.

Source: Results from LCA methodology, EC of European commission for a 4*2 tractor + semi-trailer 3 axles fitted with MICHELIN X® Multi 315/70R22.5 and MICHELIN X® Multi 385/55R22.5 tyres, March 2024 * How the electricity will be produced in Europe in 2030 – Forecast by European Commission.

PREMIUM TYRES ARE ESSENTIAL FOR ELECTRIC TRUCKS AND BUSES

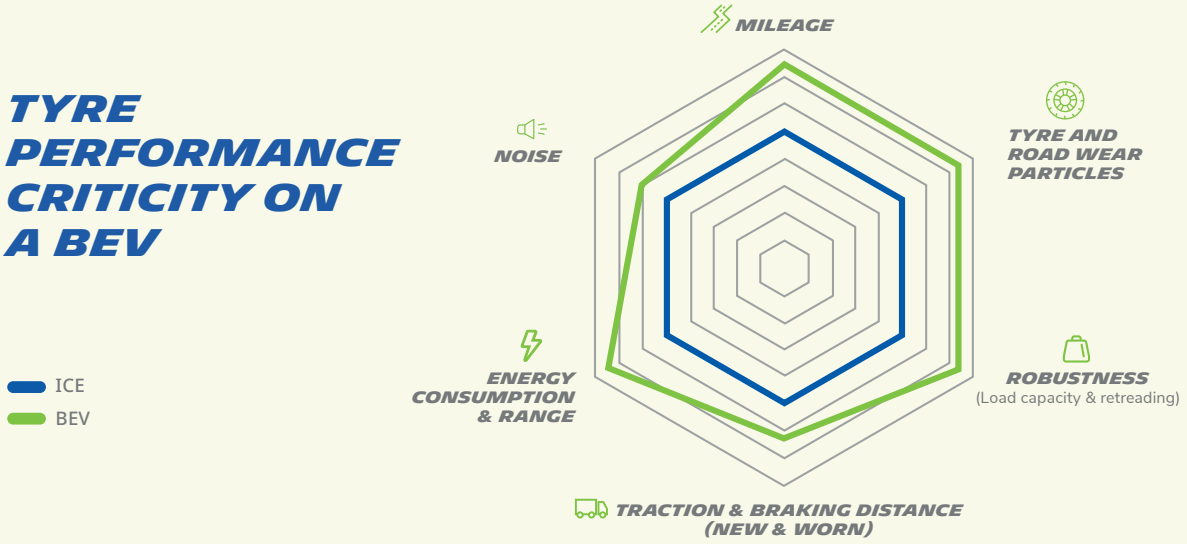
Following is a summary of the different factors that come into play for an electric truck tyre, and the degree to which they're important. On the whole, premium overall performance is required.

01.

FOR ELECTRIC TRUCKS, THE TYRE THAT'S SUITABLE IS THE TYRE THAT HAS IT ALL

Rolling resistance, robustness, durability, abrasion, noise...
As demonstrated, electric trucks place specific and high demands on tyres. Following is a more detailed look at the capabilities needed for steer and drive tyres in particular to best serve an electric truck relative to an ICE truck.

TYRE PERFORMANCE CRITICITY ON A BEV



Source: Internal assessment based on simulations & expertise built over the last four years.

MILEAGE

For electric trucks, tyres need superior mileage performance to counter the **higher wear from a heavier load** on the drive and steer axles, and greater torque on the drive axle. With better mileage, tyres are replaced less frequently, reducing the use of raw materials, and improving TCO and uptime.

ROBUSTNESS *(LOAD CAPACITY AND RETREADING)*

Selecting premium robust tyres with an adapted **load index** ensures they carry the battery's additional weight throughout the tyres' lifespan. Regrooving and retreading tyres also keeps costs down and uses less raw material.

TRACTION AND BRAKING DISTANCE *(NEW & WORN)* / SAFETY

The new distribution of mass between the steer and drive axles on an e-truck, as well as the extra torque, necessitate a tyre that delivers superior traction, adherence and braking distance, throughout the entire lifespan (new and worn).

TYRE AND ROAD WEAR PARTICLES

With lower abrasion, tyre can minimise the particle emissions that result from the **higher wear and torque** as well as ensuring compliance with evolving Euro 7[(1)] regulations.

ENERGY CONSUMPTION AND RANGE

Managing an electric truck's stored energy is critical to optimising range and **TCO**, helping to make e-trucks an economically viable solution. Low rolling resistance contributes strongly to both.

NOISE

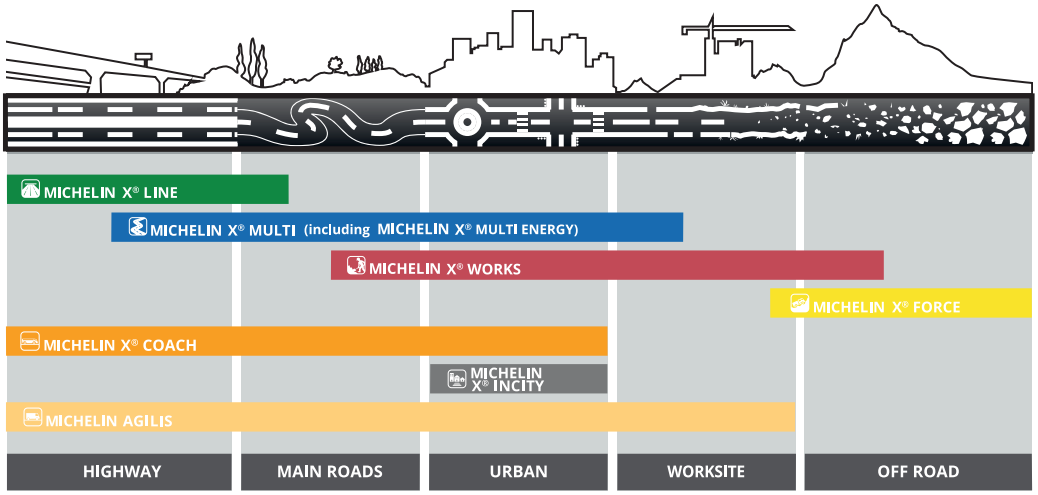
Since BEVs make less noise than ICE vehicles, tyre noise becomes more prominent. Beyond complying with EU standards, a tyre's low noise certificate adds to its suitability for e-trucks.[(2)]

Sources:
(1) European Council
https://www.consilium.europa.eu/en/press/press-releases/2024/04/12/euro-7-council-adopts-new-rules-on-emission-limits-for-cars-vans-and-trucks/
(2) European Commission
https://single-market-economy.ec.europa.eu/sectors/automotive-industry/environmental-protection/noise-reduction_en

02.

MICHELIN AND ELECTRIC FLEETS: THE RIGHT MATCH

Michelin's tyre portfolio offers a remarkable level of performance to meet the exacting demands required by electric trucks and buses – mileage, robustness, safety and energy use (low rolling resistance tyres) – as well as the criteria that count the most to fleet managers: safety, durability and TCO.

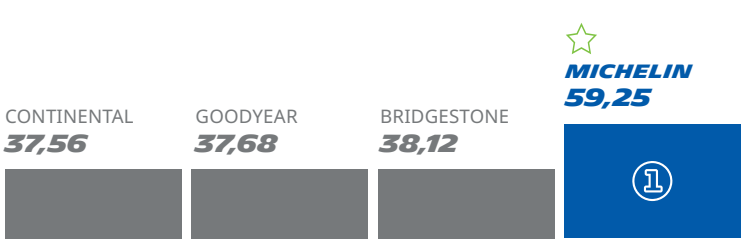


SELECTING FROM MICHELIN'S RANGE *ENSURES HIGH PERFORMANCE TYRES SUITABLE FOR ELECTRIC FLEETS, AND ACROSS APPLICATIONS.*

MICHELIN : *MAKING AN ALL-AROUND DIFFERENCE FOR EV CRITICAL REQUIREMENTS, WHILE KEEPING IT SIMPLE FOR FLEETS.*

Michelin's unique product offer, across diesel and electric applications, keeps tyre management simple as fleets transition to a various mix of vehicles in their operations.

Fleets recognise Michelin as the #1 brand based on total performance evaluation, which is key, as Electric Vehicles will require superior performance across multiple criteria.



MICHELIN, RANKED FIRST FOR :

- *VALUE & PARTNERSHIP*
- *INNOVATION & QUALITY*
- *SAFETY & RELIABILITY*
- *SUSTAINABILITY*

*Brand study from 2023 conducted by Kantar at Michelin's request that surveyed 250 fleets in each of five countries (Brazil, France, Germany, Spain, United States) to evaluate the brand image of tyre manufacturers and their Brand Power Score (BPS). 'Among the following brands, which do you think offers tyres that...?' 'Which of the following brands are...?' Transporters could select several brands in response to each question.

HIGH PERFORMANCE ELECTRIC TRUCK, HIGH PERFORMANCE TYRES

Acquiring an electric truck is an important investment not only financially but also regarding the impact on a fleet and a carrier's commitment to their environmental transition. Take a look at how Michelin is not only ensuring premium performance but also paves the way for the future with the next generation of tyres and services.

01.

MEET THE NEXT GENERATION: MICHELIN X® MULTI ENERGY™ Z2 & D2 TYRES

In the following interview, **François Le Hen, Director of Product Marketing, Frederic Domprobst, Predevelopment Truck Tyre Designer and Damien Bardin, Development Truck Tyre Designer** present the next generation MICHELIN X® Multi Energy™ 2 tyres and review the requirements needed to manufacture tyres for electric trucks.

CAN YOU EXPLAIN THE DEVELOPMENT PROCESS FOR THE NEW MICHELIN X® MULTI ENERGY™ 2 TYRES?

> We received feedback from customers and analysed the original MICHELIN X® Multi Energy™ tyre's performance to understand how it could be optimised. We also anticipated changes in the truck market with vehicles that would be heavier due to the batteries. Overall, it took three and a half years of development to arrive at MICHELIN X® Multi Energy™ 2 tyres, meeting both electric truck requirements and Michelin brand sustainability commitments for lighter, retreadable products.

AS ELECTRIC TRUCKS BECOME MORE PREVALENT, WE ARE LEARNING MORE ABOUT THE DEMANDS THEY PLACE ON TYRES. WAS THIS A MAJOR FACTOR FOR THE RELEASE OF THE MICHELIN X® MULTI ENERGY™ 2 TYRES?

“A big focus for this next generation of tyres was to ensure they were suitable with the specific performance requirements of electric trucks, including load and torque. Not to mention the importance of reducing operating costs for fleet managers and contributing to their environmental transition, while ensuring the same safety requirements.”

HOW DOES MICHELIN X® MULTI ENERGY™ 2 TYRES MEET ELECTRIC TRUCK LOAD REQUIREMENT?

“Michelin drew on its experience and Powercoil, Infinicoil and Duracoil technologies to make the MICHELIN X® Multi Energy™ 2 casing highly robust. It’s able to carry a higher load capacity (LI 158) on the steer axle. Furthermore, retreading is equivalent to or better than the previous generation.”

WHAT WAS THE MOST FULFILLING PART OF WORKING ON THESE NEW TYRES?

“A number of things. We had several surprises we had to deal with along the way, and the development time was a lot longer than usual. That said, it was gratifying to converge all our ideas and turn them into something tangible. There is a marked improvement in the MICHELIN X® Multi Energy™ 2’s rolling resistance. Beyond that, these tyres really hit a sweet spot in terms of delivering high levels of performance on all criteria.”

02.

MICHELIN X® MULTI ENERGY™ Z2 & D2 RANGE: DURABLE AND ROBUST

MICHELIN X® Multi Energy™ 2 range was developed specifically to meet the main criteria of mileage, robustness, reliability and optimised energy consumption, all of which are essential when choosing tyres for electric trucks.

MICHELIN TECHNOLOGIES


REGENION


INFINICOIL


POWERCOIL


DURACOIL

315/80 R22.5

315/70 R22.5

SEE MORE

X® MULTI ENERGY™ Z2
Load Index: 158/150L[9]

X® MULTI ENERGY™ D2
Load Index: 156/150L[10]

ENERGY CONSUMPTION

Higher Range and Lower Energy Consumption

+5% vs MICHELIN X® Multi[1]

LONGEVITY

Low Tyre Cost

→ High mileage[2]

→ High retreadability[3]

LOAD CAPACITY AND ROBUSTNESS

Adapted to EVs

→ Load Index (LI) 158 (+2LI) = **8.5t** on steer axle[4]

→ Strong casing endurance

GRIP AND TRACTION

Excellent Mobility

→ 3PMSF marking[5]

→ Long-lasting grip and traction[6]

→ Improved lateral wet grip

NOISE

Optimised Noise Level

→ Improved noise labelling: up to **3 dB quieter**[7]

IN ADDITION

Minimised Raw Material Use

→ Reduced mass: -0.8kg on average[8]

Sources Data:
(1) EV range increase: MICHELIN X® Multi Energy™ 2 range +5% vs MICHELIN X® Multi range (internal calculations based on rolling resistance tyre test results & simulations)
(2) Mileage : 315/70R22.5 MICHELIN X® Multi Energy™ Z2 : 96 vs MICHELIN X® Multi Energy™ Z (100), 315/70R22.5 MICHELIN X® Multi Energy™ D2 : 91 vs MICHELIN X® Multi Energy™ D (100), 315/80R22.5 MICHELIN X® Multi Energy™ Z2 : 90 vs MICHELIN X® Multi Energy™ Z (100), 315/80R22.5 MICHELIN X® Multi Energy™ D2 : 96 vs MICHELIN X® Multi Energy™ D (100). Internal study based on simulation tool, Ladoux Research Centre, 2024. Results may vary according to the road conditions, the weather conditions and the driving style.
(3) Retreadability: High retreadability (highest acceptation rate in the market) & retread offer continuity for circularity (Remix X Multi Energy D2). Around 9 out of 10 MICHELIN casings are accepted for MICHELIN REMIX® retreading. More than 473,000 casings were examined between 2015 and 2018. Data collected in the UK by TRS, an independent UK casing recycler, with calculation of the retread acceptance rate based on casing brand for a first retread. Calculated by Michelin on the basis of this data as well as the number of end of first life casings considered acceptable for retreading by brand, divided by the number of end of first life casings.
(4) Load Index : 315/70R22,5 MICHELIN X® Multi Energy™ Z2 vs 315/70R22,5 MICHELIN X® Multi Energy™ Z : +2 LI, 158/150 L (154/150 M) vs 156/150 L, 8,5 t vs 8 t / +500 kg by axle ; 315/70R22,5 MICHELIN X® Multi Energy™ D2 vs 315/70R22,5 MICHELIN X® Multi Energy™ D : +2 LI, 156/150 L (154/150 M) vs 154/150 L ; 315/80R22,5 MICHELIN X® Multi Energy™ Z2 vs 315/80R22,5 MICHELIN X® Multi Energy™ Z : +2 LI, 158/150L (154/150M) vs 156/150L (154/150M), 8,5 t vs 8 t / +500 kg by axle ; 315/80R22,5 MICHELIN X® Multi Energy™ D2 vs 315/80R22,5 MICHELIN X® Multi Energy™ D : iso, 156/150L (154/150M) vs 156/150L (154/150M).
(5) 3PMSF marking : 315/70 & 80 R22,5 MICHELIN X® Multi Energy™ Z2 & D2 : 3PMSF (3 Peak Mountain Snow Flake) marking (validated with the regulatory test R117 for grip on hard snow).
(6) Grip and traction: 315/70 & 80 R22,5 MICHELIN X® Multi Energy™ Z2 & D2: Long lasting grip and traction whatever the weather. MICHELIN X® Multi Energy™ 2 : Labelling Wet Grip C, iso vs MICHELIN X® Multi Energy™ (except for 315/70R22.5 MICHELIN X® Multi Energy™ Z : WG B). Grip until the last mm, being understood as until the minimum legal tread depth (1.6 mm). Please refer to the minimum legal tread depth in your country.
(7) Noise : 315/70R22,5 MICHELIN X® Multi Energy™ Z2 vs 315/70R22,5 MICHELIN X® Multi Energy™ Z : iso ; 315/70R22,5 MICHELIN X® Multi Energy™ D2 vs 315/70R22,5 MICHELIN X® Multi Energy™ D : +2 dB; 315/80R22,5 MICHELIN X® Multi Energy™ Z2 vs 315/80R22,5 MICHELIN X® Multi Energy™ Z : -3 dB; 315/80R22,5 MICHELIN X® Multi Energy™ D2 vs 315/80R22,5 MICHELIN X® Multi Energy™ D : -1 dB
(8) Mass : 315/70R22,5 MICHELIN X® Multi Energy™ Z2 vs 315/70R22,5 MICHELIN X® Multi Energy™ Z : -0,5 kg ; 315/70R22,5 MICHELIN X® Multi Energy™ D2 vs 315/70R22,5 MICHELIN X® Multi Energy™ D : +0,2 kg ; 315/80R22,5 MICHELIN X® Multi Energy™ Z2 vs 315/80R22,5 MICHELIN X® Multi Energy™ Z : -1,9 kg ; 315/80R22,5 MICHELIN X® Multi Energy™ D2 vs 315/80R22,5 MICHELIN X® Multi Energy™ D : -1,1 kg ; -0,8 kg on average.
(9) Single fitment: 158, Dual fitment: 150, Speed index: L
(10) Single fitment: 156, Dual fitment: 150, Speed index: L

03.

MICHELIN X® INCITY EV Z: DESIGNED FOR ELECTRIC VEHICLES, OUTSTANDING FOR ALL BUSES

MICHELIN X® INCITY EV Z was developed specifically to meet the primary challenges of bus electrification and meet the demands of passenger transportation.

MICHELIN TECHNOLOGIES


INFINICOIL


POWERCOIL


FORCION


REGENION

SEE MORE

275/70 R22.5

MICHELIN X® INCITY EV Z

Load Index: 152/149J (5)

LOAD CAPACITY AND ROBUSTNESS

Adapted to EVs

→ 8 tonnes capacity on front axle (1)

→ Stronger casing endurance thanks to Infinicoil technology

SAFETY & QUALITY

High safety standards

→ 3PMSF marking

→ Wet grip throughout entire tyre life thanks to Regenion technology

→ Sidewall protection against sidewalk kerbing

LONGEVITY

Operational efficiency

→ Increased mileage by up to 25% (2)

→ Retreadable and regroovable

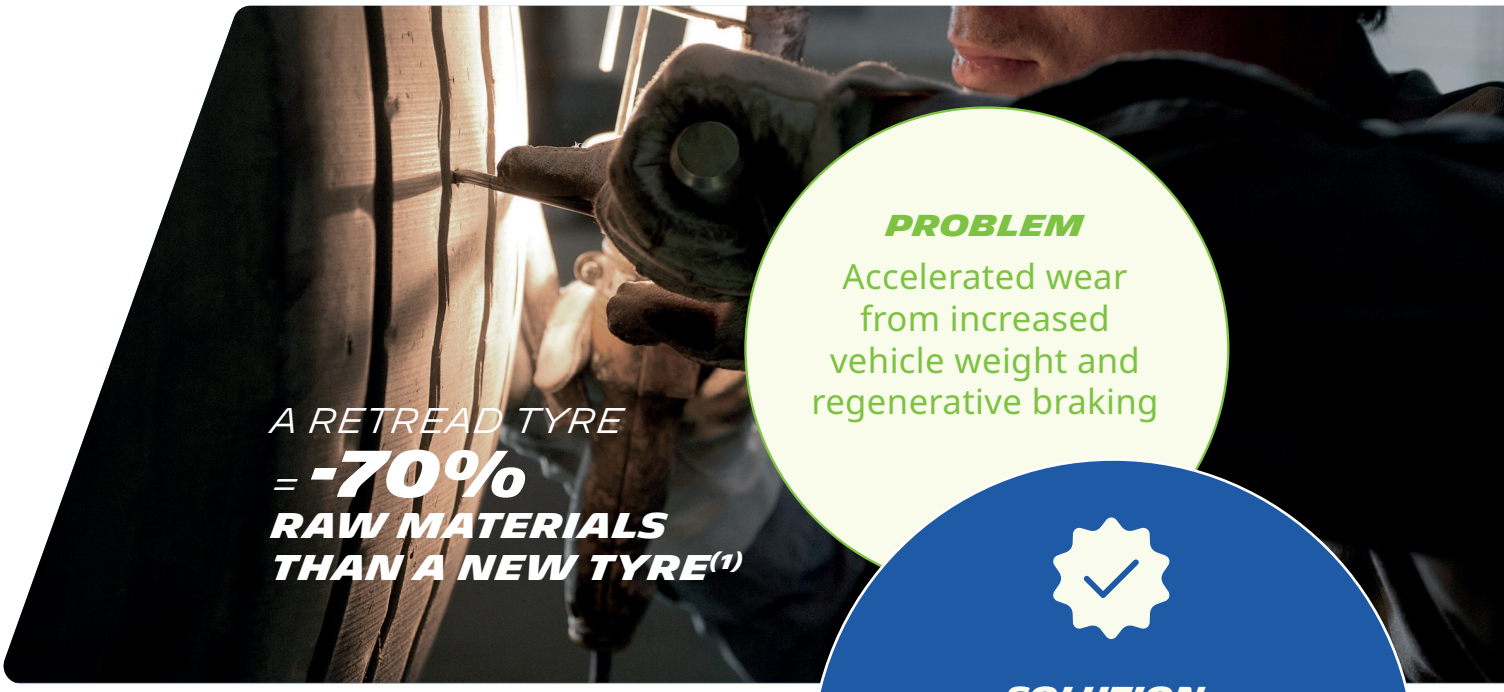
ENERGY CONSUMPTION

Reduced environmental footprint

→ Reduced rolling resistance by up to to 13% (3)

→ Lower CO_2 emissions & energy consumption (4)

Sources:
(1) Comparison of Load Index between 275/70R22.5 MICHELIN X® INCITY EV Z (152/149J) versus 275/70R22.5 MICHELIN X® INCITY Z (148/145J). Up to 8 tons due to the +15% load capacity as defined in ETRTO for urban usages (LI 152 for single fitment = 7100kg + 15% = 8165 kg on front axle)
(2) Internal measurement based on longevity test run in average real usage on fleets with 45 Electric Bus placements, from July 2020 up to now, with 50 000km at Amiens (France) and 80 000km at Eindhoven, (Netherlands) run and extrapolated with estimated longevity at 2mm, comparing 275/70 R 22.5 MICHELIN X® INCITY™ EV Z (152/149J) versus MICHELIN X® INCITY™ HLZ (150/145J) on Steer & Drive axles. Results may vary depending on the weather, type of road and driving behaviour.
(3) Internal measurements of rolling resistance of 275/70 R 22.5 MICHELIN X® INCITY™ EV Z, class C, in comparison with 275/70 R 22.5 MICHELIN X® INCITY™ XZU, class D (+13%), and in comparison with 275/70 R 22.5 MICHELIN X® INCITY™ HLZ, class D (+5%).
(4) Internal Calculation based on Rolling Resistance value with TCO2 Simulator Tool for the gains per bus/year on E-BUS & ICE-BUS 275/70 R 22.5 MICHELIN X® INCITY™ EV Z (152/149J) versus MICHELIN X® INCITY™ XZU (148/145J); On EV BUS : -2,8kWh/100km on average of 70 000km/year = -1960kWh/bus/year based on Urban e-Bus configuration 4x2 & energy cost 1kWh=0,1€. Full Energy Cost 275/70 R 22.5 MICHELIN X® INCITY™ EV Z (152/149J) 146,67 kWh/100km versus MICHELIN X® INCITY™ XZU (148/145J) Full Energy Cost 149,42 kWh/100km On ICE Bus -1kg of CO2/100km on average of 70 000km/year = -280l /bus/ year based on Urban ICE-Bus configuration 4x2 & diesel cost 1l=1€. Full Energy Cost 275/70 R 22.5 MICHELIN X® INCITY™ EV Z (152/149J) 34,94 l/100km versus MICHELIN X® INCITY™ XZU (148/145J) Full Energy Cost 35,33l/100km so -0,4l/100km so -280l/bus/year on average of 70 000km/ year. CO2 Emissions on 275/70 R 22.5 MICHELIN X® INCITY™ EV Z (152/149J) 128,60g CO2/km versus MICHELIN X® INCITY™ XZU (148/145J) 138,90gCO2/km so so -0,7ton of CO2/100km
(5) Single fitment: 152, Dual fitment: 149, Speed index: J



PROBLEM

Accelerated wear from increased vehicle weight and regenerative braking

SOLUTION

Excellent retreadability thanks to infinicoil technology that gives Michelin casings remarkable robustness

(1) MICHELIN Remix® retreading only requires adding, on average, 20kg of raw materials, equivalent to a saving of 70% compared with the purchase of a new tyre

Retreading extends the life of tyres.

Electric trucks will wear tyres down faster due to regenerative braking and increased vehicle weight. The MICHELIN X® Multi Energy™ 2 has excellent retreadability thanks to Michelin's Infinicoil technology, which gives casings their remarkable robustness. Retreading prolongs tyre life while using less raw material and improving TCO.

DID YOU KNOW?

ENHANCED ENDURANCE THANKS TO ***MICHELIN INFINICOIL TECHNOLOGY***

A continuous steel wire – which can be as long as 400 metres – is wrapped around the tyre to provide it with greater stability throughout its lifetime. The tyre's enhanced **endurance** with higher **load index** or **harder usage** conditions means that you can drive with **complete confidence**. On top of benchmark endurance, tyres designed with Infinicoil can either get you more **mileage** or enhanced **fuel savings**.

04.

MICHELIN OPTIMIZED TIRE PERFORMANCE

Ensuring next level tyre management from departure to arrival.

Michelin's cutting-edge digital solution uses advanced technology and data to help fleet operators optimize their resources.

⟶ Reduce vehicle fuel consumption and CO2 emissions by up to 12%.

⟶ Improve the productivity of fleets and safety of drivers by reducing up to 80% of tire-related breakdowns.

⟶ Have peace of mind, knowing that Michelin and its proven network of service providers are looking after the vehicle's tyres.

- **CONNECTED TYRE**
- **CONSULTING TEAM & ACTION PLANS**
- **CONNECTED VEHICLE & DATA CAPTURE**
- **SERVICE PROVIDER NETWORK**
- **FLEET MANAGEMENT PLATFORM**
- **PERFORMANCE ANALYSIS**

MICHELIN QuickScan

Finally, drivers can also scan on demand with MICHELIN QuickScan technology (automatic wear and tear diagnosis system). A Tyre Pressure Monitoring System (TPMS) automatically checks tyre pressure in real time. MICHELIN predictive algorithms convert data into personalised recommendations, adapted to each fleet. With MICHELIN QuickScan, drivers are aware of their tyres' status at any moment and can make decisions accordingly.

MICHELIN RECEIVED THE I-NNOVATION AWARD AT SOLUTRANS 2023 IN THE DIGITAL CATEGORY

Source: (1) Estimated maximum reduction in the number of breakdowns due to tires being under-inflated in relation to their recommended nominal pressure thanks to the daily monitoring of pressure measurements combined with appropriate maintenance operations. Internal Michelin study carried out on 7.000 vehicles in Europe equipped with the Michelin Effitrailer solution, on a panel of 340.000 pressure measurements analysed.

CONCLUSION

AT MICHELIN, INNOVATION & SUSTAINABILITY GO HAND IN HAND.

The shift to electric trucks and buses is a major undertaking for the transportation industry. The underlying performance requirements for tyres are such that only premium tyres are capable of meeting them all. Michelin is well positioned to meet these demands.

Michelin has always made it a priority to design tyres that ensure **safety**, offer **durability** and optimise owners' **Total Cost of Ownership**. These three criteria are part of our philosophy, where innovation goes hand in hand with **sustainability.**

Michelin is not only investing in but also investigating the innovation of tomorrow. Each generation of products and services is a step towards longer life cycles and a lower environmental impact. Through close collaboration and research and development, Michelin is creating tyres that meet the unique requirements of electric vehicles, driving the industry toward a more sustainable and virtuous future. Keep an eye out for what's next!

"At Michelin, our purpose is to offer everyone a better way forward. That is why we are committed to reducing the environmental footprint of the transportation industry. That is why we want to support fleets and show you that thinking sustainable can be beneficial for the environment AND for your business. That is why we develop products, services, training and tips to assist you in moving towards sustainable mobility, without compromising your business.

Let's STEP UP side by side!"

ESPERANZA GASPAR
Senior Vice President Worldwide
Long-Distance Transportation Business Line

SEE MORE ABOUT STEP UP

STEP UP
Side by side for sustainable mobility