Scaling the transition towards zero emission fleets

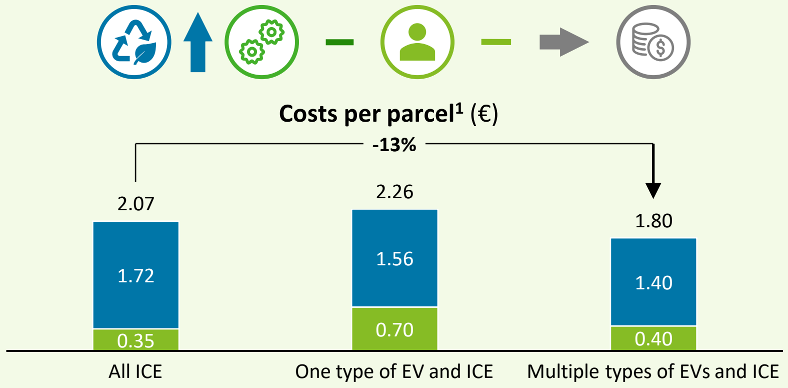
Deloitte ran simulations to better understand the different levers for fleet electrification

- Fleet managers must carefully **balance operational costs** and **service levels** while optimizing the **business value** to make the change successful:

- In collaboration with Chargetrip, Deloitte ran simulations to evaluate the **feasibility** of transitioning to a fully electric using actual data from 193 routes

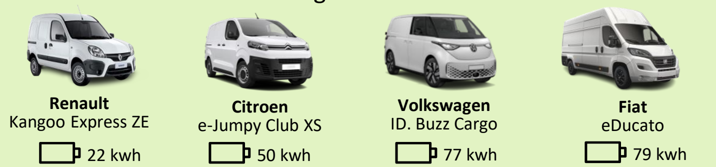
To alleviate operational fears, the simulation contains **conservative conditions**, including a large postal code region, winter temperatures (-3 °C), and 49.7% rural routes

Many routes can already be electrified by integrating EVs without modifying the operational set-up or service levels

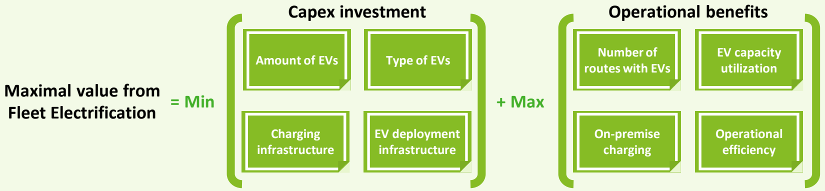


- An intelligent mix of ICE vehicles and EVs allows **72%** of routes to be electrified without on-route charging, saving **35g** CO_2e per parcel

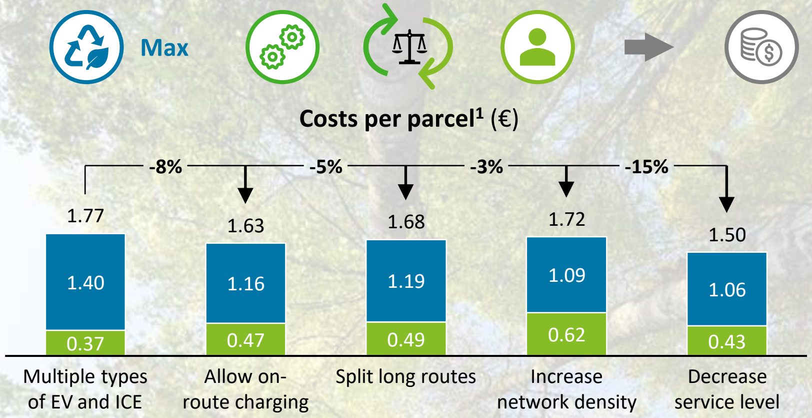
Vehicle optimization, considering battery packs and load capacity is crucial when moving towards an electric fleet



Trade off within the operational boundaries

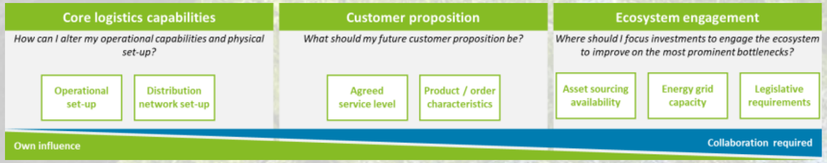


Full fleet electrification can be achieved without price premium, factoring the need for operational and/or service level adjustments



- The transition to a fully electric fleet does not necessarily result in higher costs
- Strategically balancing operational changes and potential service level adjustments is required for this transition
- Factors such as cut-off times, charging infrastructure and network density require careful planning and strategic choices

Key beliefs for improving the operational boundaries



1 Operational costs per parcel (OPEX) Purchasing price per parcel (CAPEX)

Deloitte.

chargetrip

How to scale the transition towards zero emission fleets

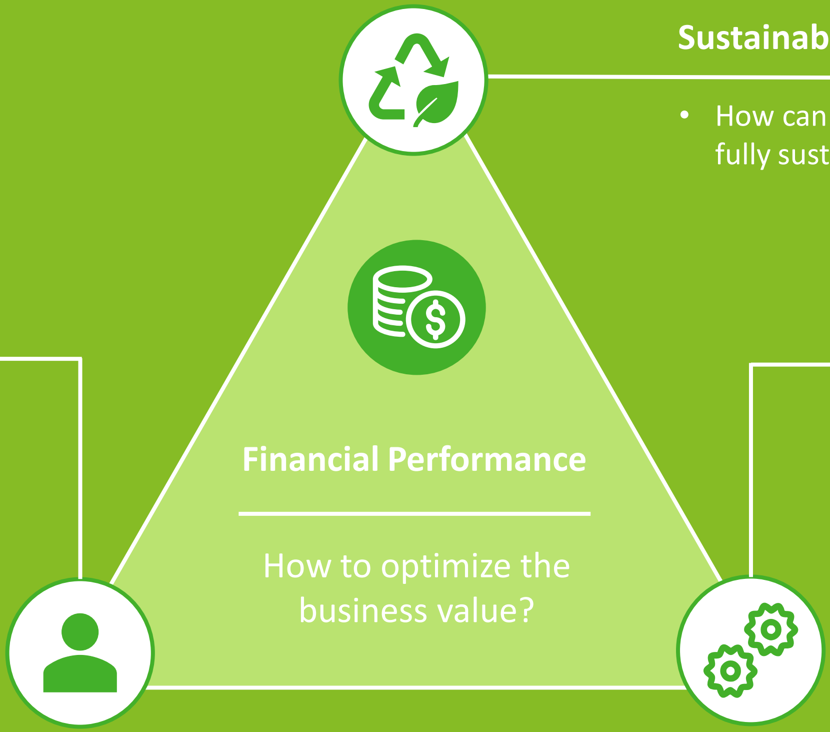
Point of view 2024

Supply Chain & Network Operations (NL)

Key considerations for fleet managers in last-mile fulfillment companies aiming for full electrification

Optimizing business value depends on balancing operational costs and service level adjustments

In this point of view, we examine the impact of complete fleet electrification, and the related operational and/or service level adjustments, on **financial performance**



Sustainability

- How can fleet electrification contribute to a fully sustainable business proposition?

Service Level

- How can we **maintain consistent service** levels and **delivery reliability** amidst the transition to fleet electrification?
- How can an electrified fleet model be adapted to **anticipate and accommodate** future shifts in **customer preferences** and expectations for delivery services?

Operational cost

- How can the **last-mile network** be designed to seamlessly adapt to changing demands and optimize delivery efficiency?
- How can we **manage a diversified fleet** in a way that balances cost-effectiveness, sustainability and service level commitments?
- How can the transition to an all-electric fleet be effectively managed to **mitigate upfront costs** and **maximize** long-term **operational savings?**

A sizable share of the fleet can shift to electric without route changes, considering typical patterns. Yet, some routes still need alternative solutions for full decarbonization

Current fleet, mostly ICE > **Hybrid fleet of ICE and EV** > **Full electrification**

Hybrid fleet of ICE and EV

Our current focus is tactical, exploring how far **electrification could be maximized** by integrating electric vehicles **without** modifying the **operational set-up** or **service levels**, aiming to evaluate the **impact on business value**

Focus of this Document

Full electrification

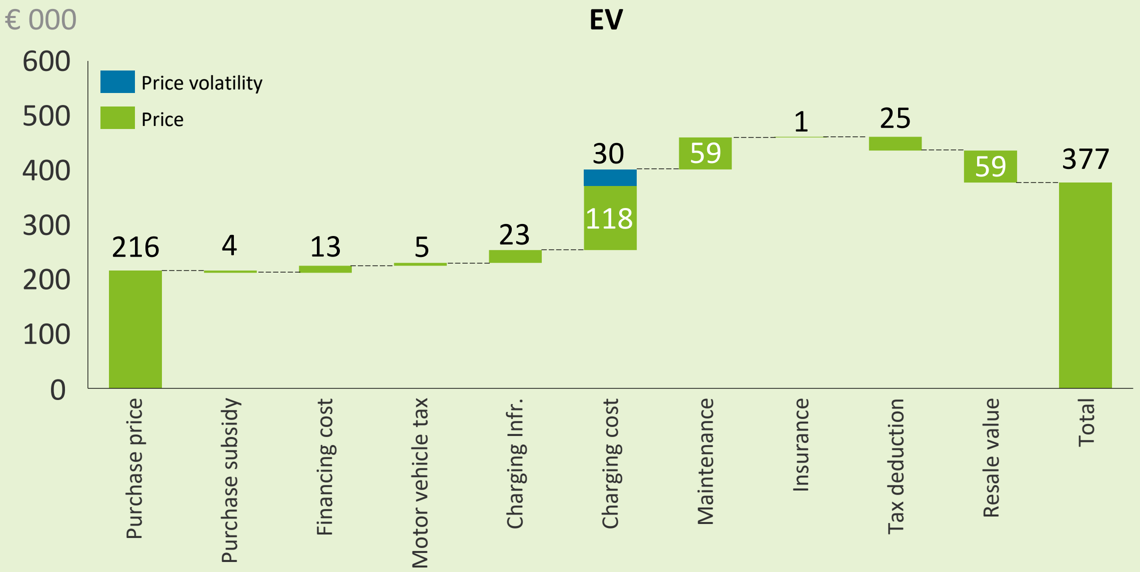
After understanding the difficult balance of the transition explained in this document, the next, strategic step is to move to an all-electric fleet through considering potential **operational changes** and **service level adjustments**, while measuring the **financial impact.**

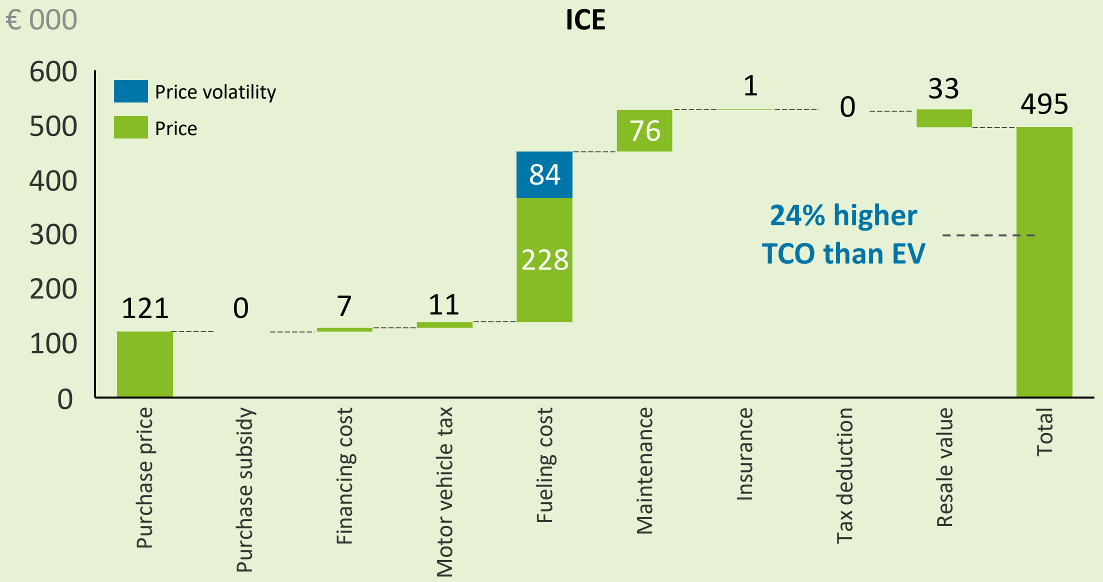
- A series of key beliefs must be defined, identifying the most effective combination of actions to maximize value from fleet electrification
- These key beliefs are centered around the core logistics capabilities, (future) customer promise and ecosystem position and engagement
- Strategic choices must be taken on future operational and distribution set-up, service levels and supplier and legislator engagements

Electrification could lower the total cost of ownership by 24% in The Netherlands

Costs breakdown assuming seven years of operation

Comparison in The Netherlands, H1 2022





There are three key uncertainties

Purchase subsidies and tax deductions differ per country and year

Fluctuating prices for electricity and fueling cover a large part of total cost of ownership

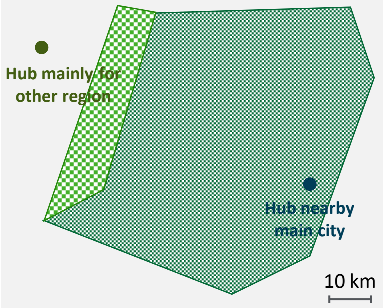
Alternative technologies are not considered in this comparison

Notes: 1) Resale value is based on annual depreciation beginning from net purchase price; 2) Models above assume 80,000 KM annual route distance; 3) Electricity and diesel prices based on H1 2022 Eurostat data; 4) Comparison with Germany available in appendix; 5) Price volatility of fuel based 2022 prices of Diesel Fuel prices in Netherlands • fuel-prices.eu

Deloitte ran simulations using actual data from 193 routes, with conservative assumptions

Total of 193 routes driven in the European region, split between urban and rural routes

VISUALIZATION OF THE EUROPEAN REGION

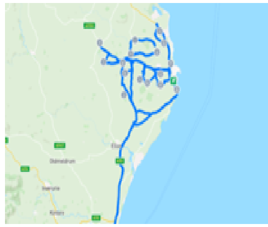


Surface area
Urban: 60 km^2
Rural: 6.200 km^2

Avg. elevation
Urban: 100m
Rural: 1150m

# of People
Urban: 220.000
Rural: 260.000

Avg. # of stops
Urban: 70
Rural: 40



Rural routes within European postal area

Urban routes within European city district

RESTRICTIONS FOR ROUTES

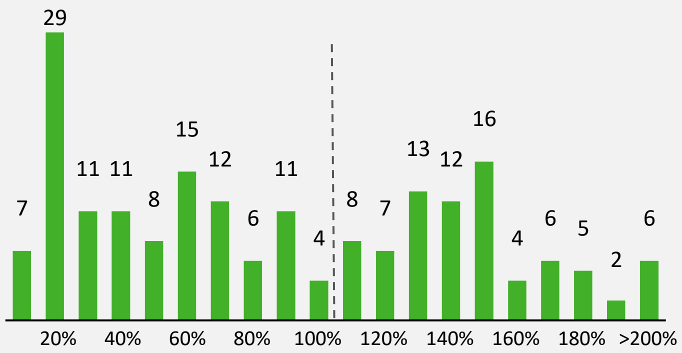
Weight
1,500 kg

Volume
15,000 L

Time
No constraints

Route Coverage
One route is one van

NUMBER OF ROUTES THAT REQUIRE % OF BATTERY CAPACITY



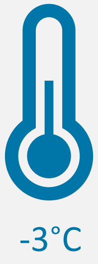
79 of the 193 routes have a distance greater than can be covered with one full battery

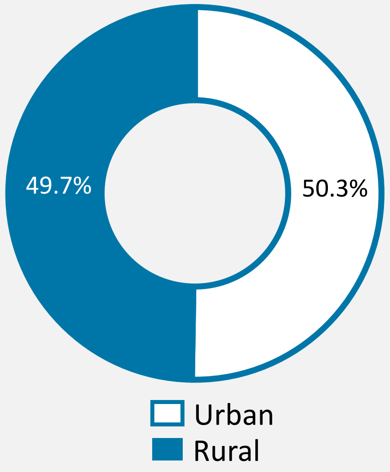
Deloitte ran simulations using actual data from 193 routes, with conservative assumptions

SIMULATION CHARACTERISTICS

Conservative circumstances:

- Significant share of rural routes
- Winter circumstances
- One of Europe's largest postal code areas
- Limited public charging infrastructure





CHARGING INFRASTRUCTURE REGION

Limitations to charging capacity in the region:

- Region's city located on far east side of the postal code area
- Limited chargers accessible in rural areas
- Most available chargers have a 50 kW charge capacity *(compared to widespread 300 kW)*

Charging stations in region:

	Urban	Rural
22 kWh	49	43
50 kWh	17	23
>50 kWh	4	0

All results have been cross-referenced considerably smaller regions, which have better public charging infrastructure

The simulated case examines four distinct scenarios for completing these 193 routes, varying in the types of vehicles used and the permissibility of on-route charging

Scenario 0 - ALL ICE

ICE vehicles fulfill all routes

Scenario 1 – One type of EV and ICE

- **ICE vehicles** fulfill deliveries that require on-route charging
- **One type of EV** fulfills deliveries feasible without on-route charging

Scenario 2 – Only one type of EV

- **One type of EV** services all routes
- The EV utilizes public charging stations for on-route recharging

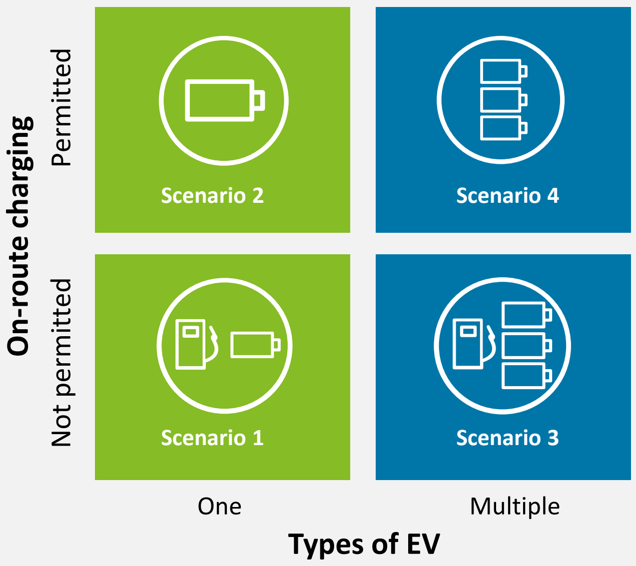
Scenario 3 – Multiple types of EVs and ICE

- **ICE vehicles** fulfill deliveries that require on-route charging
- **Multiple types of EVs** service routes feasible without on-route charging

Scenario 4 – Only multiple types of EVs

- **Multiple types of EVs** service all routes
- The EV utilizes public charging stations for on-route recharging

Scenarios[1]



Types of EVs used

Scenario 1 & 2 – One type of EV

Fiat eDucato L4H3 — BATTERY PACK 79kwh

Scenario 3 & 4 – Multiple types of EV

Volkswagen ID. Buzz Cargo — BATTERY PACK 77kwh

Citroen e-Jumpy Club XS — BATTERY PACK 50kwh

Renault Kangoo Express ZE — BATTERY PACK 22kwh

Scenario 1: A 100% increase in vehicle capex and a 9% decrease in opex
Scenario 2: A 163% increase in vehicle capex and a 17% decrease in opex

METRICS

MEASURES

Vehicle purchasing price (excluding resale value), assuming 7 years of operation

Operational costs (OPEX) includes fueling cost, charging cost and cost of labor hours

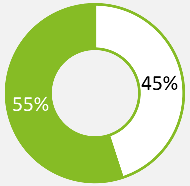
Both measures are calculated **per year**, and divided by yearly volume to result in purchasing price and operational cost **per parcel**

TOOL USED

The Deloitte database is used in combination with a **fleet route batch tool** from Chargetrip

SCENARIOS 1 AND 2: KEY CONCLUSIONS

ROUTES ELIGIBLE FOR ELECTRIFICATION



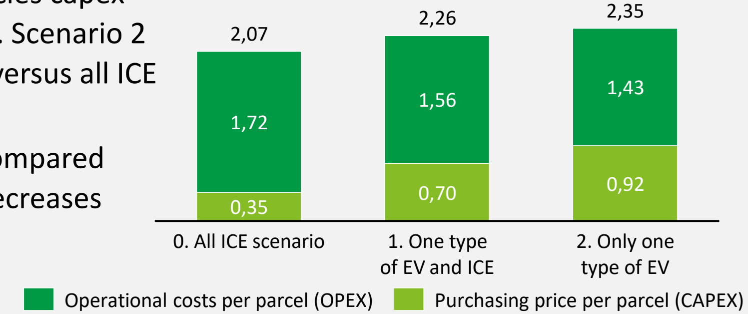
The simulation suggests it is already feasible to electrify **55%** of routes without on-route charging, or making a change in routing patterns or network set-up

Charging
Non-charging

Scenario 1 (one type of EV and ICE) results in a vehicles capex[1] increase of **100%** compared to the all ICE scenario. Scenario 2 (one type of EV) results in a **163%** capex increase versus all ICE

Scenario 1 demonstrates a **9%** reduction in opex compared to all ICE. In the all-EV scenario, operational costs decreases by **17%** compared to all ICE, primarily due to the difference in charging and fueling costs

COST PER PARCEL (€)



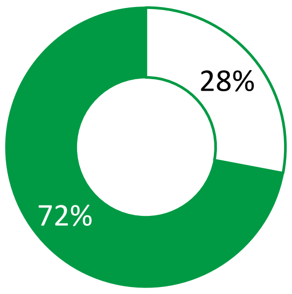
Per parcel **0.35 kg** of CO_2e is saved by electrifying the routes without on-route charging

The benefits can increase when choosing a carefully calibrated **mix of vehicles and battery capacities to better cater for varying transportation needs**

Scenario 3: a 14% increase in vehicle capex and a 18% decrease in opex
Scenario 4: a 31% increase in vehicle capex and a 33% decrease in opex

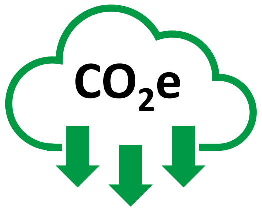
SCENARIOS 3 AND 4: KEY CONCLUSIONS

ROUTES ELIGIBLE FOR ELECTRIFICATION



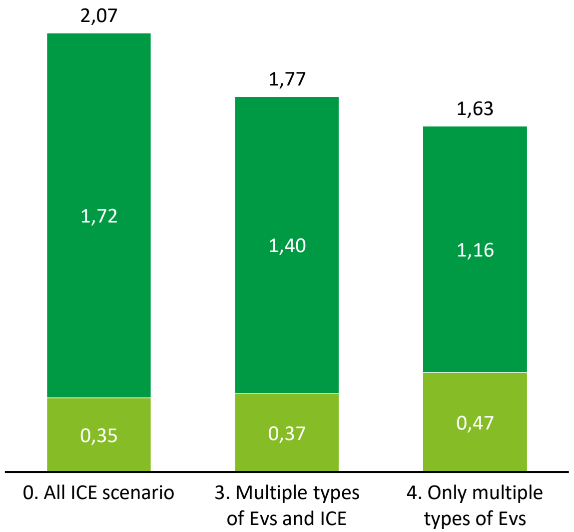
With **a carefully calibrated mix of Evs** **72%** of the routes can be driven without on-route charging

- ☐ Charging
- ■ Non-charging



By mixing EVs, a total CO_2e of **0.64 kg** per parcel is saved: **83%** more than **scenario 1**

COST PER PARCEL (€)



- Scenario 3 (multiple types of EVs and ICE) increases vehicle capex [1] by **6%** compared to all ICE, while scenario 4 (multiple types of EVs) requires a **34%** capex increase
- Scenario 3 lowers opex by **18%** compared to all ICE, while Scenario 4 produces a **33%** reduction in opex
- The lower capex compared to scenarios 1 and 2 is due to the careful alignment of vehicle mix with the route patterns – low cost Evs with smaller battery capacities are used for shorter routes
- The lower opex compared to scenario 1 and 2 is due to a larger number of routes being fulfilled with lower fueling costs

The simulation highlighted how using EVs with different battery capacities and charging profiles allows for a flexible range of operations and optimization of charging stations to reduce infrastructure cost

A strategic trade-off is required to determine the maximal value from fleet electrification given operational constraints

INCREASING ELECTRIFICATION AND OPTIMIZING BUSINESS VALUE…

Maximal value from Fleet Electrification = Min { **Capex investment**: Amount of EVs; Type of EVs; Charging infrastructure; EV deployment infrastructure } + Max { **Operational benefits**: Number of routes with EVs; EV capacity utilization; On-premise charging; Operational efficiency }

…WHILE SUSTAINING OPERATIONAL FEASIBILITY AND SERVICE LEVEL

Subject to

- Operational set-up
- Distribution network set-up
- Agreed service level
- Product / order characteristics
- Asset sourcing availability
- Energy grid capacity
- Legislative requirements

Get in Touch

With our experience and expertise, we are committed to helping you navigate the future with confidence

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Verification of case results | The alternate region represents a smaller and more urban region, resulting in the possibility to drive all routes with an EV in both base and hybrid case scenarios

VERIFICATION TEST

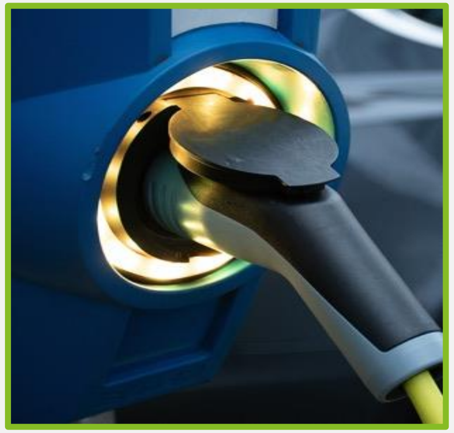
We translated our test case in the European region to another region (~8 times as small), which is a representative size of many EUR regions to show a holistic view of Europe. All other test circumstances are kept equally conservative, concerning:

- Winter circumstances
- Conservative fuel and electricity prices

GENERIC DIFFERENCES

The alternative test results show

- Routes with **mostly urban characteristics** with short stem times
- **Total routing time is short** in comparison with the EUR region



BASE CASE

In the base case, the Bournemouth area offers the possibility to drive **100%** of the last mile delivery routes with EVs without on-route charging required

HYBRID CASE

In the hybrid case, there is **no need for the largest battery pack,** as the small and medium battery packs are sufficient to cover all routes without on-route charging