Scaling the transition towards zero emission fleets

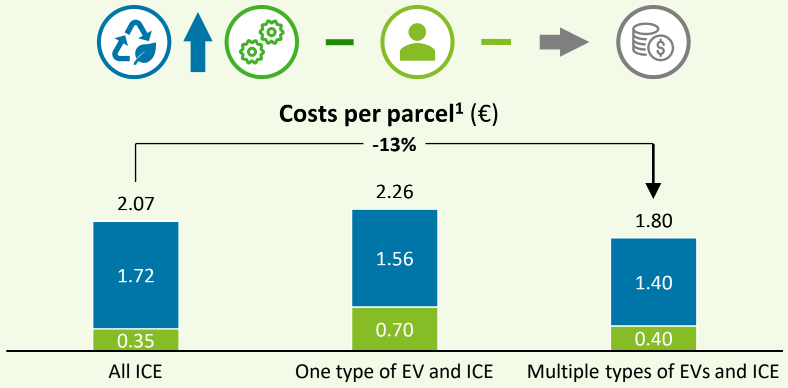
Deloitte ran simulations to better understand the different levers for fleet electrification

- 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 fleet 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

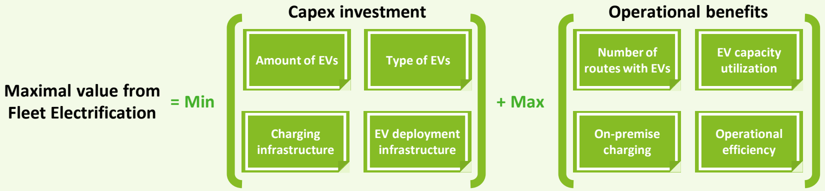
Renault
Kangoo Express ZE
22 kwh

Citroen
e-Jumpy Club XS
50 kwh

Volkswagen
ID. Buzz Cargo
77 kwh

Fiat
eDucato
79 kwh

Trade off within the operational boundaries



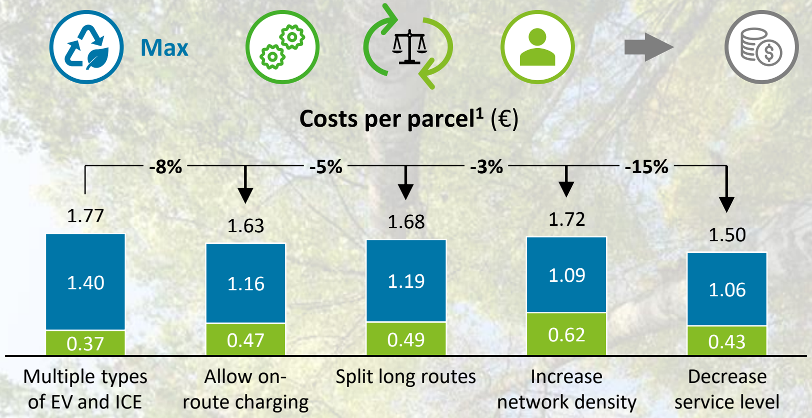
Maximal value from Fleet Electrification = Min

Capex investment
- Amount of EVs
- Type of EVs
- Charging infrastructure
- EV deployment infrastructure

\+ Max

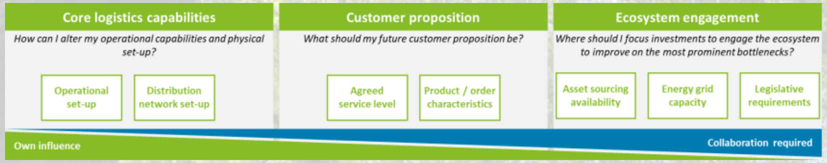
Operational benefits
- Number of routes with EVs
- EV capacity utilization
- On-premise charging
- Operational efficiency

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



Core logistics capabilities
How can I alter my operational capabilities and physical set-up?
- Operational set-up
- Distribution network set-up

Customer proposition
What should my future customer proposition be?
- Agreed service level
- Product / order characteristics

Ecosystem engagement
Where should I focus investments to engage the ecosystem to improve on the most prominent bottlenecks?
- Asset sourcing availability
- Energy grid capacity
- Legislative requirements

Own influence — Collaboration required

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[1] 🟦 Operational costs per parcel (OPEX) 🟩 Purchasing price per parcel (CAPEX)

How to transition to a decarbonized last-mile delivery model

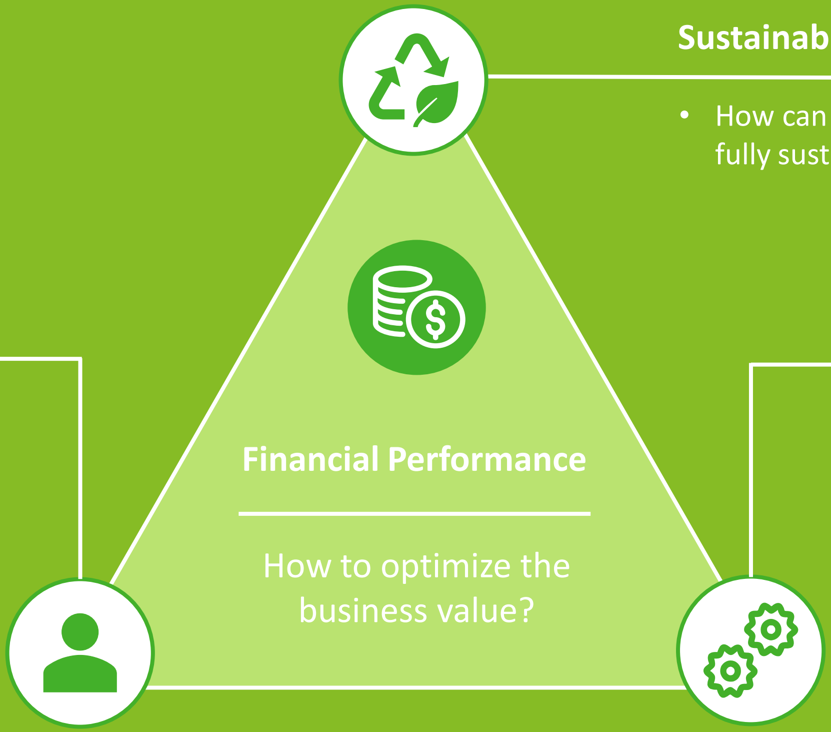
Point of view 2024

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**



Financial Performance

How to optimize the business value?

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?**

Consider operational changes to deliver a fully sustainable model for electrification

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

Hybrid fleet of ICE and EV

To get to a fully electrified fleet it is most probable **to transition to this end-state operating a hybrid fleet of ICE and EV**. Read our perspective on how to balance Capital Expenditures and Business benefits without **operational changes or adjustments in service levels**

- Simulations reveal **72% of routes can be immediately electrified** without on-route charging by optimizing the mix of EVs
- A balance needs to be found between minimizing capex investment while maximizing business benefits and electrification
- This balance considers aspects such as the type and amount of EVs sourced, the KMs and amount of routes driven and others

Full electrification

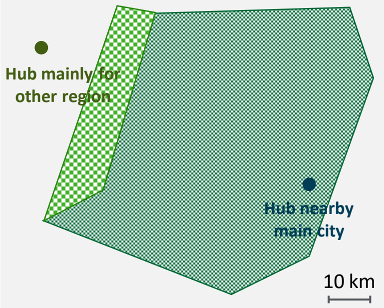
Our current focus is strategic, examining the **broader implications of a full transition** to an electric fleet. We are now considering potential **operational changes** and **service level adjustments** to achieve an all-electric fleet, while measuring the **financial impact**

Focus of this Document

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

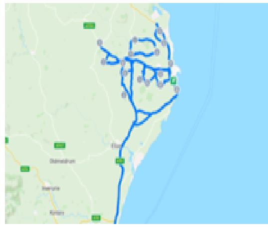
Urban: 100m
Rural: 1150m

# 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

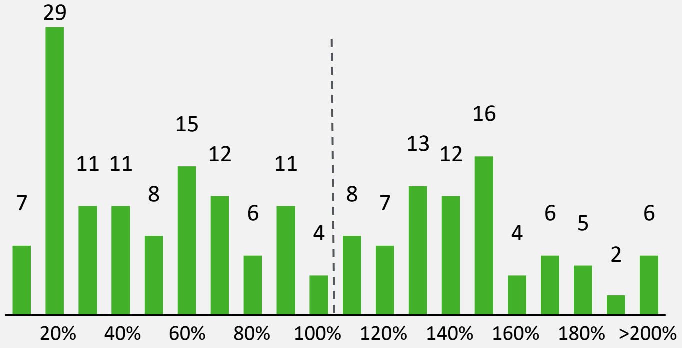
Time

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

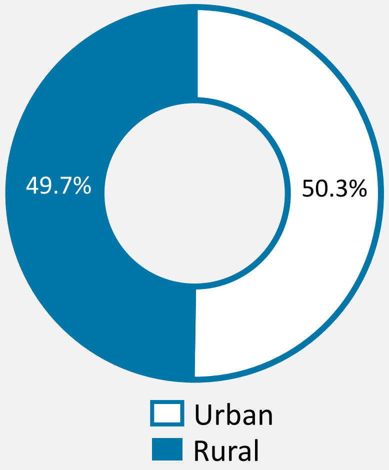
Deloitte ran simulations using actual data from 193 routes, with conservative assumptions

SIMULATION CHARACTERISTICS

Conservative circumstances:

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

-3°C



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

We considered four scenarios for the full electrification of a fleet

The scenarios offer different tradeoffs between operational feasibility and service levels

Full electrification requires **operational adjustments** affecting financial performance and/or changes in **the customer proposition**

Base Scenario (0)

No on-route charging + ICE vehicles

- The base scenario (0) employs a hybrid fleet with both EV and ICE vehicles (no-regret moves)
- ICE vehicles are used for all routes that would require on-route charging when using an EV

Scenarios A, B, C and D only consider the use of EVs and are compared to the base scenario 0

Operational Cost

We considered three operational adjustments to realize full electrification. Each presents challenges that impact the financial performance

Routing adjustments

Scenario A | Allow on-route charging

- Delivery routes that require on-route charging utilize public charging stations
- Extends route duration and may impact cut-off times

Scenario B | Split long delivery routes

- Routes that require more than a 100% battery charge will be divided into shorter routes
- Requires extra vehicles, infrastructure, and operators

Infrastructural changes

Scenario C | Increase network density[1]

- Greater network density increases consumer proximity
- Requires extra vehicles and high upfront investment

Service Level

A change in the customer proposition can lower costs, but will also lower the service level for the customer

Scenario D | Order pooling[1]

- Re-define the service proposition for rural areas to boost stop density and decrease trip frequency
- Lowers the customer service level and extends route duration

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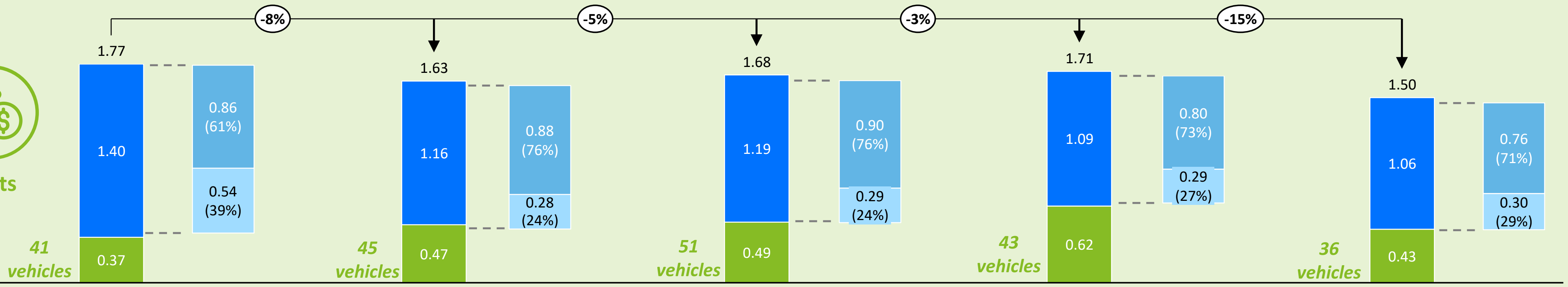
[1] More details on the set-up in Scenarios C and D can be found in Appendix A

Higher initial capital expenditure more than offset by lower operational costs

While fuel/charging costs fall in all four scenarios, there are significant variations in opex and capex

Scenario 0	**Scenario A**	**Scenario B**	**Scenario C**	**Scenario D**
No on-route charging + ICE	On-route charging	Split long routes	Increase network density	Order pooling

Costs



Scenario 0 | No on-route charging + ICE

Scenario A | On-route charging

- Higher operator costs due to **longer trip time**
- More vehicles needed due to **varying route requirements**

Scenario B | Split long routes

- More vehicles needed as **9%** more routes are driven, also resulting in higher operator costs

Scenario C | Increase network density

- CAPEX increase due to **lease costs of an extra hub** and need for more vehicles
- Results in **shorter trips** and lower operator costs

Scenario D | Order pooling

- Rural routes evenly distributed over weekdays **minimizing required vehicles**
- The **longer and optimized** routes minimize OPEX

Emissions[1] — CO_2e of **0.70 kg** per parcel

Emission-free parcel delivery

🟦 Operational costs per parcel (OPEX) 🟩 Purchasing price per parcel (CAPEX) 🟦 Operator costs per parcel 🟦 Fuel/Charging costs per parcel

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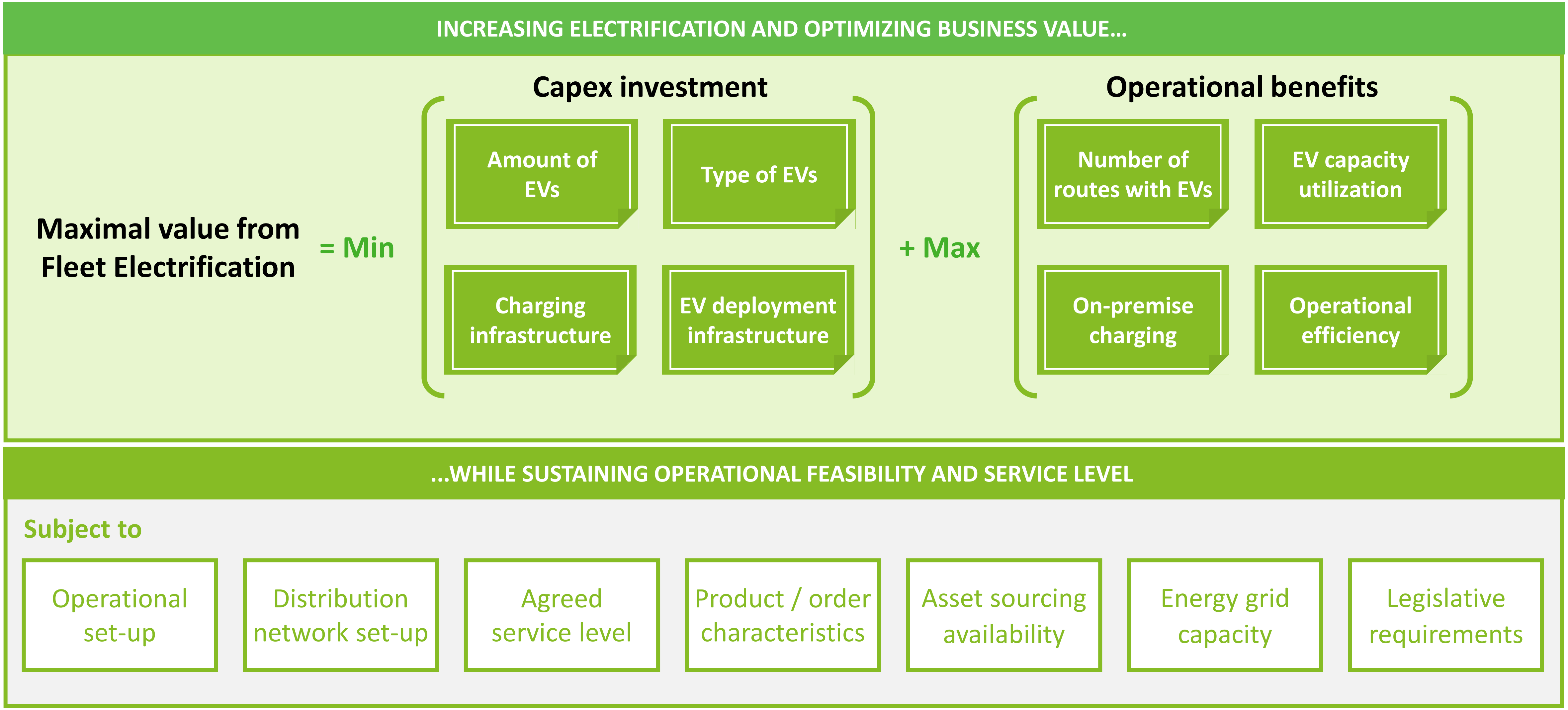
[1] To calculate CO_2 emissions, only emissions during the last-mile delivery itself are included

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



INCREASING ELECTRIFICATION AND OPTIMIZING BUSINESS VALUE…

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…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
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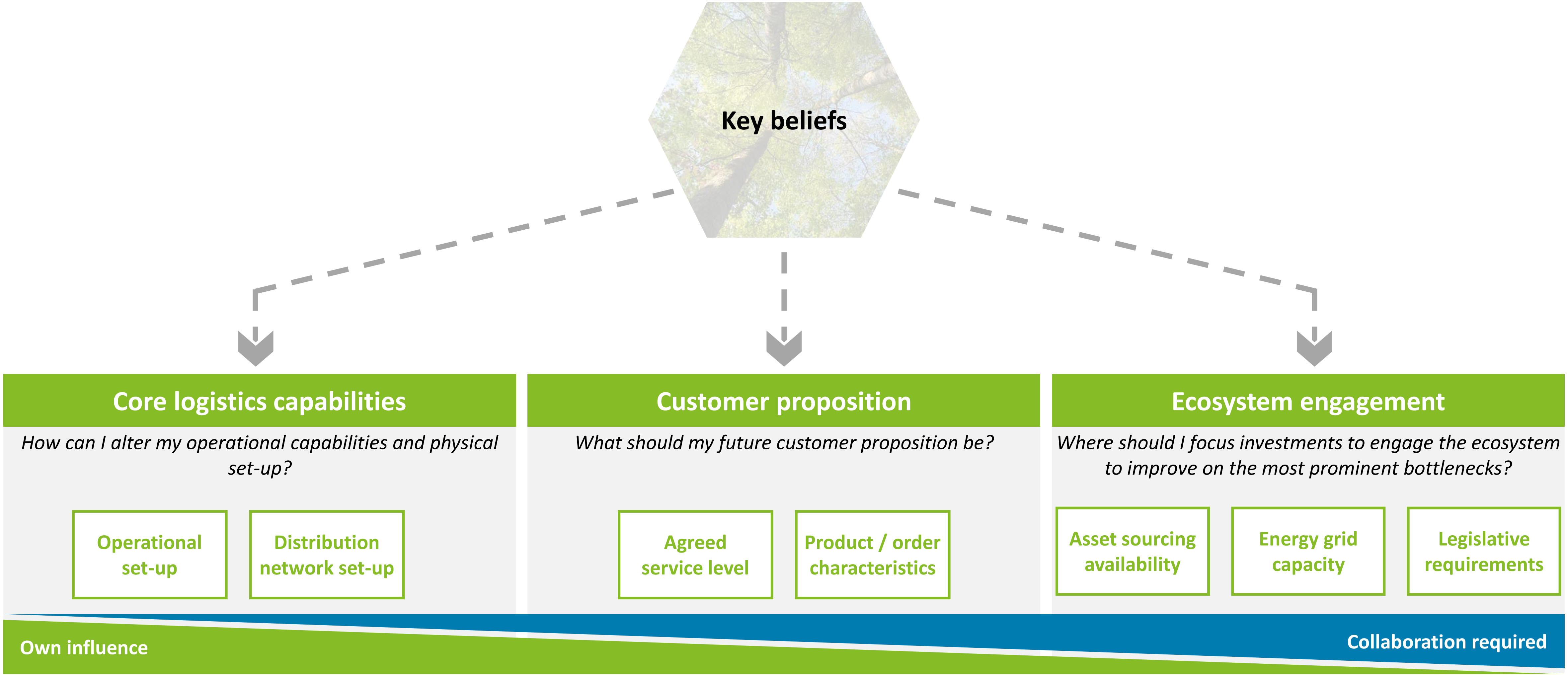
A series of key beliefs must be defined, identifying the most effective combination of actions to maximize the value from fleet electrification



Key beliefs

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Own influence **Collaboration required**

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

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