Charging constraints for the use of electric vans by urban freight companies

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Why focus on the charging constraint?

- Range only defined jointly with charging behavior
- Very operational question for the companies
- To challenge the relevance of investments in public charging
Introduction and methodology
Electric van markets in Europe

Source: EAFO + ACEA, 2016

Norway: 2%
France: 1.1%
Germany: 0.34%
Sweden: 0.8%

> 15%
Charging infrastructure

Public accessible charging infrastructure...
... and private infrastructure

EU + EFTA + Turkey
Source: EAFO
Some examples

Paris Region:
• Autolib’: public accessible slow charging
• Belib’: 90 stations 22kW stations in Paris
  1 hour ~ +100 km (60mi)

Oslo, Stockholm: ~10 fast charging stations
  30 minutes ~ +100 km (60mi)

Amsterdam:
Demand-driven public charging infrastructure
(on request of the user !)

+ often support for private infrastructure installation
Based on 39 exploratory interviews

<table>
<thead>
<tr>
<th>Activity</th>
<th># of interviews</th>
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<tbody>
<tr>
<td>Couriers</td>
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<tr>
<td>Post, parcels &amp; pallets</td>
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<td>Food and Beverages</td>
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<td>Haulers associations</td>
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<td>Electromobility associations</td>
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<tr>
<td>Municipalities and public administrations</td>
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<td>Researchers and experts</td>
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<td>Fleet management software developer</td>
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<tr>
<td>Charging infrastructure operator</td>
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</tbody>
</table>

Only third party transportation

Interview form inspired by Diffusion of Innovation Theory
Attributes of an innovation influencing its rate of adoption

- Relative advantage
- Complexity
- Perceived risk

+ Trialability
+ Observability
+ Compatibility
Discussing three possible charging behaviors
Nighttime charging only

Fast charging during long trips

Integrated charging in-between trips
Nighttime charging only

- Overnight charging is perceived as **mandatory**, but offers alone only limited flexibility
- A risk of **loss of opportunities** is unacceptable
- **Installation of infrastructure** may present difficulties
- Own infrastructure = chance compared to other technologies (natural gas, hydrogen)
Ideal use case: postal and parcel delivery companies

Nighttime charging only

The vehicle is parked on companies premises (and not on the street or at the driver’s home)

New processes for the installation of infrastructure:
- New cooperation
- Grid access
- Supervision
Nighttime charging only

Ideal use case: postal and parcel delivery companies

- Very regular delivery rounds
- Small vans already on the market, less supply for bigger vans
- When drivers are hired: no other use of the vehicle
Nighttime charging only

Ideal use case: most of today’s users!

La Poste buys 5000 EVs between end of 2011 and 2014

End 2014: DHL launches Streetscooter Work for its own use

Market share of electric vans

France

Germany
Nighttime charging only

Fast charging during long trips
- Fast charging during the trip is an enabler, but companies are preoccupied by **waiting time**
- Fast charging resembles the current refueling processes
- Companies do not like the **dependence** on the service operators it creates
Fast charging during long trips

Fast charging: how fast?

Expectations:
“One hour for a full [400km] charge”
“7 minutes fast charging”
“fast charging as quick as for conventional vehicles”
Etc.

Waiting time is heavily penalized
Fast charging during long trips

Ideal use case: small subcontracting transport company

End-to-end express transportation
Usually between 200km and 400km (120 to 240 mi) a day

Pick-up / Delivery tours
~ 100km (60mi) a day

Very often a mix of both
Fast charging during long trips

Ideal use case: small subcontracting transport company

A few times in the month, long trips, potentially for other clients

Not ready to give up
Most rewarding

Risk of loss of opportunities:
- Is there a station available?
- How is the quality of service?
Reliability? Queuing?

Garage at home or on the street?
Nighttime charging only

Fast charging during long trips

Integrated charging in-between trips
Integrated charging in-between trips

- Integrated charging is rationalized **opportunity charging** (FREVUE: less heterogeneous charging for commercial vehicles)
- Integrated processes can lead to **substantial benefits**, for companies with regular activity
- Integrated charging requires **tailor-made processes**
Daily charging in-between trips

Daily charging: for what purpose?

Daily charging

Smaller batteries

1 hour at 7 kW every day <-> **300€** of savings per year per veh

1 hour at 22 kW every day <-> **925 €** of savings per year per veh

Based on current Renault battery rental rates for a user driving 25,000 kilometers a year
Daily charging in-between trips

Ideal use case: companies with several shifts

- Several shifts = several drivers for each vehicle = Premises
- If first shift starts at night: less time to charge during the night
- Between the shifts: time for integrated charging at the dock
- One to two other shifts during the day
- No new processes, no additional risk
Daily charging in-between trips

Ideal use case: other examples

During lunch breaks

During deliveries and pick-ups
**Nighttime charging** is mandatory in every scenario, but self-sufficient only for very regular uses.

**Fast charging** is an enabler, to avoid losses of opportunities, but can have a high cost and a high perceived risk.

**Integrated charging** might be complex but rewarding. Gives not much flexibility.
Conclusions

• **Cost** and **flexibility** matter the most

• No solution that ‘fits all’
  - Process changes are very user dependent.
  - In many companies, activities get mixed up, or can suddenly change.

• Many process changes must be supported by ITs, high quality of service and reliability are essential

• Relevance of public intervention, necessary cooperation with private companies.
Hypothesis for future behavior

- Many companies are going to wait for an easy (but not optimal) change to EVs (affordable batteries, fast charging solutions)

- And then first optimize their processes with more and more integrated charging
Thank you for your attention!

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## Annex: numerical assumptions

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<thead>
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<th>Driver information</th>
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<td>Annual driven distance</td>
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<td>Average daily driven distance</td>
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<td>(250 days/year)</td>
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<td>Cost of time</td>
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<table>
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<th>Vehicle information</th>
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<tr>
<td>Battery rental costs</td>
<td>1396€/year</td>
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<td>Battery rental costs per kilowatt-hour</td>
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<td>Max consumption</td>
<td>27,5 kWh / 100km</td>
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<table>
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<th>Fast charging service information</th>
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<tbody>
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<td>Fast charging costs</td>
<td>0,2 € / kWh</td>
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