What is the Role for Electric Freight Vehicles in Urban Logistics

The Chartered Institute of Logistics and Transport
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The Case for Electric Freight Vehicles

- Traditionally focus on electrification of passenger cars and buses
- Freight vehicles contribute disproportionately to urban air pollution
- Freight movements remain crucial to well-functioning cities
- Fully electric freight vehicles offer no tailpipe emissions and significant reductions in CO$_2$ emissions
FREVUE
Freight Electric Vehicles in Urban Europe

- 4.5-year EU-funded project
- 8 cities, 32 partners
- To demonstrate the suitability of electric freight vehicles for inner city logistics
Question to fleet managers: Are EFVs a viable alternative to ICEs?

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>39%</td>
</tr>
<tr>
<td>No</td>
<td>6%</td>
</tr>
<tr>
<td>I am not sure</td>
<td>56%</td>
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</table>
FREVUE Vehicles

- Deployed 86 fully electric vans and trucks
- <3.5 tonnes to 19 tonnes
Supplier: Ginaf (NL)

Payload: 4t; Load volume: 25 m³

Battery capacity: 120 kWh; Range: 125 km
Supplier: EMOSS

Payload: 7.5t; Load volume: 38 m³

Battery capacity: 160 kWh; Range: 160 km
FREVUE Vehicles

Supplier: EMOSS

Payload: 7-8t; Load volume: 47 m3

Battery capacity: 200 kWh; Range: 200 km
FREVUE Findings
Data

- Dynamic vehicle data with state-of-charge from
- 10 operators and 83 vehicles
- Covering 757,000 km – 19 times around the Earth at the equator
FREVUE Findings
Km per kWh, temperature and weight group
FREVUE Findings
Energy usage taking GVW into account
Question to fleet managers: What are your range requirements?

Before survey:
- <100km: 6%
- 100-199km: 28%
- 200-299km: 17%
- 300-499km: 39%
- >500km: 11%

I am happy with what we…

After survey:
- <100km: 50%
- 100-199km: 17%
- 200-299km: 17%
- 300-499km: 0%
- >500km: 11%

I am happy with what we… 6%
FREVUE Findings
Environmental benefits

- Clear environmental benefits
- Resulting cost savings significant

"IF, IN LONDON ALONE, WE COULD ELECTRIFY 10% OF THE FREIGHT FLEET BY 2021, WE COULD SAVE OVER €1 BILLION PER ANNUM IN PUBLIC SPENDING ON REDUCED HEALTH IMPACTS AND ABATEMENT COSTS."
FREVUE Findings
Noise

- Many factors contribute to **road traffic noise**, including vehicle, road, geo-spatial and weather related parameters

- However, EFVs only reduce engine noise

- In the FREVUE project, the impacts are impossible to measure

- Previous studies show that noise reductions from an EFV significant at lower speed
● A positive business case is achievable for small and medium EFV

● For large EFVs this remains difficult
FREVUE Findings
Economics – Key factors

- Financial incentives
- Depreciation period
- Battery specification
- Km driven per day
**FREVUE Findings**

**Impact of fast charging**

<table>
<thead>
<tr>
<th>Vehicle class</th>
<th>Expected purchase price difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Converted EFV</td>
</tr>
<tr>
<td></td>
<td>Slow charging</td>
</tr>
<tr>
<td>&lt;3.5 tonne</td>
<td>46,000</td>
</tr>
<tr>
<td>13 tonne</td>
<td>111,000</td>
</tr>
<tr>
<td>19 tonne</td>
<td>159,000</td>
</tr>
</tbody>
</table>
Question to fleet managers: Are EFVs a viable alternative to ICEs?

**Before survey**

- Yes: 39%
- No: 6%
- I am not sure: 56%

**After survey**

- Yes: 72%
- No: 11%
- I am not sure: 17%
EFV Uptake

September 2017 McKinsey Report*:

*eTruck market share could reach 15% by 2030*

Our latest research reveals that eTrucks could account for 15% of global truck sales by 2030, with favorable segments like urban light duty trucks reaching sales as high as 25-35% in China and Europe.

*Source: McKinsey (2017): New reality: electric trucks and their implications on energy demand*
EFV power requirements

- EFV power requirements and charging patterns different to passenger cars and buses

  An 18t single-shifted truck with a 200kW battery in daily operation requires an average of **163 kWh per day** to charge. In comparison, a medium-sized van requires approximately 30kWh per day.

- Little diversity in charging patterns of large EFVs

  Large (over 12 tonnes) and medium (3.5 tonnes to 7.5 tonnes) EFVs within FREVUE tended to be **charged only once a day** in the late afternoon at the operator’s depot.

- Providing challenges but also opportunities
Local grid infrastructure capacity

- Overall impact still low but local constraints pose problems
- FREVUE partner UPS encountered grid infrastructure constraints when charging all EFVs at the same time
- Infrastructure upgraded to charge up to 63 vehicles
- Such infrastructure upgrade has proven:
  - Costly, lengthy and disruptive
  - Non-incremental
  - Requiring investment in 3rd party assets

Barrier to the large-scale deployment of EFVs
Smart Electric Urban Logistics

- An additional 20 EFVs at UPS central London depot
  - Bringing the number above the maximum that can theoretically be charged
- Design and implement an innovative smart charging system at this depot together with an energy storage system
- Design and implement a sophisticated network capacity assessment tool developed to take into account time of day variation in demand
- April 2017 to March 2019, funded by UK Office for Low Emission Vehicles
Smart Electric Urban Logistics
Active Network Management
Smart Electric Urban Logistics (cont’d)

- Expected results
  - 5-year vision: Develop roadmap of how all 170 vehicles at UPS central London depot could be electric
  - Clarify how these results are transferable to other fleet operators
Thank you

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