Early adopters of EVs in Germany unveiled

Results of a study among private users of EVs in Germany

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Public perception of electric vehicles

• Only a small selection of car models at high purchase costs
  ➡ Limited buyership

• Limited (electric) range
  ➡ Restricting personal mobility

• Charging facility necessary at home/company
  ➡ Limited user group

• EVs require trip planning and periodic re-charging
  ➡ Loss of simplicity

May 2015: ~35,000 registered electric vehicles in Germany (BEV & PHEV)
Who are the early adopters of EVs and how do they use the vehicles?

• Why is it important to ask this question?
  • Validate measures
  • Assess the environmental benefits of electric vehicles e.g.:
    • replaced vehicles vs. additional vehicles
    • proportion of electric driven kilometer of PHEVs
    • charging period
  • Develop/adjust measures to increase EV sales and expand potential buyership

• Comprehensive studies of (private) EV users with a large sample sizes available from US and Norway: results not transferrable
• Results for Germany are based on small sample sizes, stated preferences and field trials in research projects
Getting a picture of the status of electric mobility in Germany

Survey among owners of BEVs and PHEVs in 2014:

• 3,100 participants from a total 9,000 invited EV owners in Germany (private and commercial)

• Comprehensive information about:
  • motives for purchasing an electric vehicle
  • daily usage
  • characteristics of household / company
  • charging practices and preferences

• The presentation and the paper focusses on private users of EVs (67% of the survey respondents)
Profiles of private EV users in Germany

89% male, ø age 51 years

2- and 4-person-households

51% University degree, 70% are full time employed, high income

53% households live in detached houses

> 50% strong environmental friendly attitude

Compared to owners of (new) conventional cars: EV users tend to be older, male and having a higher socioeconomic status.
## Mix of motives for purchasing EVs

<table>
<thead>
<tr>
<th>Motive</th>
<th>Very Important</th>
<th>Important</th>
<th>Neutral</th>
<th>Not Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest in innovative vehicle technologies</td>
<td>58</td>
<td>21</td>
<td>9</td>
<td>32</td>
</tr>
<tr>
<td>Reducing the environmental impact</td>
<td>64</td>
<td>15</td>
<td>8</td>
<td>42</td>
</tr>
<tr>
<td>Low energy costs per km</td>
<td>48</td>
<td>21</td>
<td>11</td>
<td>43</td>
</tr>
<tr>
<td>Pleasure of driving an electric vehicle</td>
<td>45</td>
<td>20</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Low maintenance costs</td>
<td>24</td>
<td>20</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>Eco-friendly image</td>
<td>27</td>
<td>15</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>Use of electricity from own photo-voltaic system</td>
<td>35</td>
<td>9</td>
<td>7</td>
<td>31</td>
</tr>
<tr>
<td>Free use of public recharging stations</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>33</td>
</tr>
<tr>
<td>Exemption from vehicle tax</td>
<td>10</td>
<td>6</td>
<td>10</td>
<td>29</td>
</tr>
<tr>
<td>Free use of charging stations at work</td>
<td>13</td>
<td>6</td>
<td>6</td>
<td>53</td>
</tr>
<tr>
<td>Free parking</td>
<td>6</td>
<td>4</td>
<td>9</td>
<td>46</td>
</tr>
</tbody>
</table>

All figures are percentages

n = 2,467

Neutral responses were not considered in the calculation
Large share of EVs in small cities

- Higher availability of charging infrastructure at home
- Longer trip distances by inhabitants of small cities and their surroundings.
EVs are used just like ICE vehicles – on a business day

<table>
<thead>
<tr>
<th>Battery electric vehicles (BEV)</th>
<th>11,500 km</th>
<th>48 km business day</th>
<th>13,600 km</th>
<th>39 km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug-in hybrid electric vehicles (PHEV)</td>
<td>11,500 km</td>
<td>48 km business day</td>
<td>13,600 km</td>
<td>39 km</td>
</tr>
</tbody>
</table>

| Small / low speed vehicles (e.g. Renault Twizy) | 7,500 km | 38 km business day |

- (new) ICE vehicles have an average annual mileage of ~15,000 km
- Range restrictions apply especially for weekend and holiday trips
The majority of users charges exclusively at home.

<table>
<thead>
<tr>
<th>Location</th>
<th>(almost) every day</th>
<th>1 to 3 days a week</th>
<th>1 to 3 days a month</th>
<th>less frequently than monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the vicinity of the home (n=1,873)</td>
<td>60</td>
<td>33</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>At work or educational facilities (n=664)</td>
<td>30</td>
<td>24</td>
<td>17</td>
<td>28</td>
</tr>
<tr>
<td>In public street space in cities (n=778)</td>
<td>4</td>
<td>14</td>
<td>32</td>
<td>49</td>
</tr>
<tr>
<td>At shops (n=455)</td>
<td>14</td>
<td>29</td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>In the vicinity of recreational facilities (n=359)</td>
<td>6</td>
<td>22</td>
<td></td>
<td>71</td>
</tr>
<tr>
<td>At service stations along motorways or highways (n=362)</td>
<td>13</td>
<td>20</td>
<td></td>
<td>76</td>
</tr>
</tbody>
</table>

- 60% of the respondents like charging their vehicle at work
- 50% would use on-street charging regularly
Fast charging is a highly appreciated option

• Recharging the EV within 30min to 80% would allow overcome present obstacles to driving longer distances without lengthy intermediate stops
• 67% of the BEV users and 47% of the PHEV users like to use fast charging
• 77% are willing to pay for this option – the majority is willing to spend 500-1000€ for the option

All figures are percentages
Interest in inductive charging limited to users of PHEVs

• High frequency of charging → convenient option
• 27% of the BEV users compared to 38% of PHEV users rate inductive charging as an important option
• Willingness to pay limited – vast majority not willing to spend more than 1000€ for the option – PHEV users somewhat more
Expectations on electric range vary – but the vast majority wants more

- Restrictions in range decrease usability of EVs – 70% like a higher range
- Expected choice: BEVs = 120/150/200/300 km & PHEVs = 50/80/100/120 km

- Required range is irrational – but car ownership ever was irrational – also oriented on real world range experiences!
Willingness to pay for additional electric miles is high

- Users of BEVs have overall a higher willingness to pay (2,884€ resp. 2,254€)
- But: considering the requested range, the willingness to pay per additional electric kilometer is higher for owners for PHEVs (23€ resp. 18€)

All figures are percentages
Requirements on the EV system from user’s perspective

Solutions are needed to minimize limitations of EVs or make them better:

• Sticker price has to come down – current EVs contain a lot of extra equipment increasing the price → perception as a luxury product
• Electric range should be offered in different configurations
• Promote workplace charging → allows full electric mobility on working days
• Public accessible charging infrastructure for car sharing vehicles and as “backup” for private users
• Fast charging on motorways and in cities for power user groups

What’s next?
• Efficient and sustainable measures needed to promote EVs:
  • Incentives, subsidies ? → short term, impact on 2nd hand market
  • “soft measures” (e.g. usage of bus lanes, free parking in the city) are interfering city goals to promote public transport, cycling and walking
Thank you

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