Electrifying shared mobility

Pete Slowik

Roadmap 11
June 19th, 2018
Through 2017, cumulative global light-duty EV sales passed 3.2 million

- Mostly the sales are in China, U.S., and Europe
- These regions have a complex system of regulation, incentives, charging, local action

Leading global areas of electric vehicle adoption

- These 20 areas account for 40% of global electric vehicle sales
  - These areas represent just 3% of the world population and 8% of global vehicle sales
  - The areas have combination of national, state, city, and utility policies and actions
  - But are many of these in ride-hailing (e.g., Uber) and carsharing (e.g., car2go) fleets?

Based on total electric vehicles sales through 2016
Some shared fleets are starting to go electric

<table>
<thead>
<tr>
<th>Country</th>
<th>Taxis</th>
<th>Carsharing</th>
<th>Ride-hailing</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>Hangzhou, Shenzhen, Taiyuan, Tianjin</td>
<td>Beijing, Hanzhou, Shanghai</td>
<td>Beijing, Guangzhou, Hangzhou, Shanghai</td>
</tr>
<tr>
<td>France</td>
<td>Paris</td>
<td>Avignon, Bordeaux, Chamonix, Grenoble, Liège, Lille, Lyon, Lyon, Marseille, Paris</td>
<td>Paris</td>
</tr>
<tr>
<td>Germany</td>
<td>Berlin</td>
<td>Berlin, Stuttgart</td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>London</td>
<td>London</td>
<td>London</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Amsterdam, Utrecht</td>
<td>Amsterdam, the Hague, Rotterdam, Utrecht</td>
<td>Amsterdam</td>
</tr>
<tr>
<td>Canada</td>
<td>Montréal, Kelowna, Port Elgin</td>
<td>Montréal, Toronto</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Bogota, Brussels, Madrid, Rome, San Jose, Singapore</td>
<td>Brussels, Christchurch, Copenhagen, Dublin, Florence, Kuala Lumpur, Lisbon, Madrid, Milan, Oslo, Singapore</td>
<td>Bucharest, Lisbon, Singapore</td>
</tr>
</tbody>
</table>

Based on ZEV Alliance project data collection.
Overcoming barriers for shared electric fleets

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Electric vehicle barrier for private cars</th>
<th>Is electric vehicle adoption less or more difficult for shared fleets?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>• Higher cost</td>
<td>+ Bulk procurement, slightly lower cost</td>
</tr>
<tr>
<td></td>
<td>• Lower operating cost</td>
<td>+ Low operating cost (fueling, maintenance)</td>
</tr>
<tr>
<td></td>
<td>• Long payback period</td>
<td>+ Much higher annual driving, shorter payback</td>
</tr>
<tr>
<td>Charging convenience</td>
<td>• Mostly at home</td>
<td>– Charging time can mean downtime and lost revenue</td>
</tr>
<tr>
<td></td>
<td>• Some workplace</td>
<td>– Much more dependent on public charging</td>
</tr>
<tr>
<td></td>
<td>• Some public</td>
<td>– More rapid charging in denser urban settings</td>
</tr>
<tr>
<td>Consumer awareness</td>
<td>• Limited understanding of electric models, charging options, benefits</td>
<td>+ Companies can give car purchasing/leasing guidance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Allows vehicle electrification incrementally by the mile (i.e., without an electric car purchase)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ For passengers in shared vehicles, it’s an awareness campaign</td>
</tr>
</tbody>
</table>
What policy actions can encourage shared and electric?

- Parking, charging, permitting
  - Dedicated EV parking/charging
  - Streamlined permitting for charging
  - Electric vehicle-ready building codes
  - Mandated shares of EV parking

- Broader local activities
  - City-utility-transport company provider voluntary agreements
  - Curb space
  - Low emission zones/lanes
  - Utility preferential electricity rates
More info

U.S. metropolitan area electric vehicle analysis:
https://www.theicct.org/publications/expanding-electric-vehicle-market-us-cities

World electric vehicle capitals:

New mobility: Today’s technology and policy landscape

Acknowledgements

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Opportunity for electric *and* shared

- Ride-hailing cars driven *much* more → more fuel savings from electric
- Greater daily driving → need for more public rapid charging

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**Private car**

- Conventional (32 mpg) $20,000
- Hybrid (50 mpg) $24,000
- Electric (180 mi, $0.20/kWh) $3,000 $1,000
- Electric (240 mi, $0.10/kWh) $2,000 $1,000
- Conventional (32 mpg) $20,000
- Hybrid (50 mpg) $24,000
- Electric (180 mi, $0.20/kWh) $16,000
- Electric (240 mi, $0.10/kWh) $10,000

**Ride-hailing car**

- Conventional (32 mpg) $20,000
- Hybrid (50 mpg) $24,000
- Electric (180 mi, $0.20/kWh) $10,000
- Electric (240 mi, $0.10/kWh) $5,000

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Preliminary ICCT results.

Assumptions: Approximate 2018 vehicle prices, battery costs will continue dropping rapidly.
15k mi/yr private, 45k mi/yr ride-hailing; Maintenance (per mile): $0.06 gas, $0.04 hybrid, $0.025 electric
Shorter EV electric range is more dependent upon higher-cost rapid charging; Gasoline: $2.75 per gallon