Demand Response opportunities
of electric vehicle charge points

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ECODESIGN SMART APPLIANCES STAKEHOLDER MEETING
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DEMAND RESPONSE OPPORTUNITIES OF ELECTRIC VEHICLE CHARGE POINTS

Agenda

- Market growth of electric vehicles (and charge points)
- Electric vehicle charging
- Load shift potential
- Summary
Electric Vehicles are selling well in the UK

...and many EU nations have significant and growing EV sales

Cumulative UK EV registrations 2012-2015

Annual UK EV sales 2010-2015

Source: Next Green Car
MARKET GROWTH OF ELECTRIC VEHICLES

Their popularity is expected to increase

Projected EV car sales as % of all car sales 2011-2020

Source: Department for Transport modelling
MARKET GROWTH OF ELECTRIC VEHICLES

Governments are helping

Financial incentives for EV purchase and charging infrastructure

<table>
<thead>
<tr>
<th>Country</th>
<th>Capital cost incentives</th>
<th>Running cost incentives</th>
<th>Charging infrastructure*</th>
<th>2012 EV sales, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway</td>
<td>£12,200 (BEVs only)</td>
<td>Annual tax exemption, Free parking, Exempt from road tolls.</td>
<td>c. 4,000 public CP, and 127 fast chargers</td>
<td>3.28%</td>
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<tr>
<td>Netherlands</td>
<td>£4,200 – £6,800 for private purchase</td>
<td>Annual tax exemption, Exempt from income tax for lease vehicles, Some free parking.</td>
<td>c. 4,500 public and semi-public CP, and 89 fast chargers</td>
<td>1.02%</td>
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<tr>
<td>Japan</td>
<td>Up to £6,700</td>
<td>State – specific incentives inc. insurance and parking charge exemptions</td>
<td>Emphasis on fast charging, with 1,400 fast CP and c.4,000 slow CP</td>
<td>0.47%</td>
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<tr>
<td>United States</td>
<td>£1,590 - £4,770 Federal tax credit</td>
<td>Annual tax exemption, Free parking in places, exempt from congestion charge in Stockholm</td>
<td>c. 14,000 slow CP and 200 fast CPs</td>
<td>0.36%</td>
</tr>
<tr>
<td>Sweden</td>
<td>£3,900</td>
<td>Annual tax exemption, Free parking in places</td>
<td>c. 280 slow CP (although most people have access at home or work)</td>
<td>0.34%</td>
</tr>
<tr>
<td>Denmark</td>
<td>Up to £35,000 depending on segment (BEVs only)</td>
<td>Annual tax exemption, Free parking</td>
<td>c. 1,080 slow CPs and c. 100 fast CPs</td>
<td>0.31%</td>
</tr>
<tr>
<td>France</td>
<td>£5,900</td>
<td>Annual tax exemption, Free parking in some places</td>
<td>c. 1,600 slow CPs and 100 fast CPs</td>
<td>0.30%</td>
</tr>
<tr>
<td>Ireland</td>
<td>£5,650</td>
<td>Annual tax exemption</td>
<td>640 slow CPs</td>
<td>0.17%</td>
</tr>
<tr>
<td>Germany</td>
<td>Up to £8,500 (corporate purchase only)</td>
<td>Reduced annual tax, Exemption from congestion charge in London</td>
<td>c. 2,000 slow CPs</td>
<td>0.12%</td>
</tr>
<tr>
<td>UK</td>
<td>Up to £5,000 for cars, £8,000 for vans</td>
<td></td>
<td>C 8,500 public CP, &lt;100 50kW chargers</td>
<td>0.11%</td>
</tr>
</tbody>
</table>
20-25 million EV cars are expected in UK by 2050

Projected UK EV quantity to 2030

Source: Element Energy, National Grid

- 2015: 50,000 Electricity Infrastructure Roadmap
10-15 million charge points by 2050 (UK)

Projected electricity demand for EV charging by 2030

Source: Element Energy, National Grid

- 2015: 60,000 *Electricity Infrastructure Roadmap*
**ELECTRIC VEHICLE CHARGING**

**Charge points**

80% of electricity for transport could be via residential charge points *Electricity Infrastructure Roadmap*

<table>
<thead>
<tr>
<th>Market Segments</th>
<th>Equipment</th>
<th>Charge Time / Service Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Office/Home</strong> (Work/Sleep &amp; Charge)</td>
<td>AC Wallbox</td>
<td>4 - 8 hours 1 - 2 vehicles/day</td>
</tr>
<tr>
<td><strong>Public</strong> (e.g., Parking Lot)</td>
<td>AC Charge Post</td>
<td>4 - 8 hours 1 - 2 vehicles/day</td>
</tr>
<tr>
<td><strong>Commercial/Office</strong> (Park &amp; Charge)</td>
<td>Convenient Fast Charger DC 20 kW AC 22 kW</td>
<td>30 - 120 minutes 10 - 15 vehicles/day</td>
</tr>
<tr>
<td><strong>Highway</strong> (Charge &amp; Go)</td>
<td>Fast Charger DC 50 kW AC 43 kW</td>
<td>15 - 30 minutes 12 - 24 vehicles/day</td>
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</table>
**ELECTRIC VEHICLE CHARGING**

**Typical charge profile**

*Source: LCL trials, report B1*
Typical charge profile

Source: LCL trials, report B1
LOAD SHIFT POTENTIAL

Load shifting potential – curtailment technology

Source My Electric Avenue
LOAD SHIFT POTENTIAL

Maximum demand with and without EV uptake

Source My Electric Avenue
Demand from EV charger with load shift control

Source My Electric Avenue
LOAD SHIFT POTENTIAL

Aggregated demand for 22 EVs

Source Low Carbon London trials
DEMAND RESPONSE OPPORTUNITIES OF ELECTRIC VEHICLE CHARGE POINTS

Summary

- The number of electric vehicles on European roads is growing fast
- Each EV charger requires considerable energy for a sustained period
- The load on the network at peak times will rapidly become very significant
- Increasing peak load would require considerable expenditure on upgrading electricity networks, which could be avoided with demand response
- The load shifting potential is potentially very large
- The average maximal shifting period is also relatively large (several hours)
- Inclusion of EV chargers as a ‘smart appliance’ would enable potential Ecodesign measures to realise the technical capability for load shifting
- The anticipated market growth implies it might be better to take the current opportunity to encourage load shifting capability, rather than wait for a review
Thank you for your attention

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