360 Degree Perspective of the Global Electric Vehicle Market Opportunities and New Business Models

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Partner,
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# Agenda

### Global EV Market Size and Forecasts – PVs, LCVs and 2 Wheelers

### Future Urban Mobility and Society Trends and Its Implications to Personal Mobility, and Electric Vehicles

### Electric Vehicles Market Overview, Technology Roadmap and Infrastructure Trends

### Global EV Market Size and Forecasts – PVs, LCVs and 2 Wheelers

### Business Model Analysis of Key Industry Stakeholders (Utilities, charging station and other market participants)

### London Case Study

### Discussions
Definitions
**Definitions – Electric Vehicles**

**Battery Electric Vehicles**: Electric vehicles (EVs) use electric motors instead of an internal combustion engine (ICE) to propel a vehicle. The electric power is derived from a battery of one of several chemistries including lead acid, nickel metal hydride (NiMH) and lithium-ion (Li-ion).

<table>
<thead>
<tr>
<th>Neighbourhood Electric Vehicles (NEVs)</th>
<th>City Electric Vehicles (CEVs)</th>
<th>Extended-range EVs (E-REVs)</th>
<th>Plug-in Hybrid Electric Vehicle (PHEVs)</th>
<th>High-Performance Electric Vehicles (HPEVs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEV is a US DOT classification for vehicles weighing less than 3,000 lbs (GVW) and having a top speed of 25 mph. NEVs are generally restricted to operate on streets with a speed limit of 35 mph or less.</td>
<td>A city car is a European classification for small and light vehicles intended for use in urban areas although capable of operating in mixed city-highway environment. In Japan, city cars are called kei cars.</td>
<td>These vehicles have an internal combustion engine (ICE) or other secondary source connected in a series configuration to a generator to supply the batteries. The drive range and speeds are comparable to IC engine vehicles.</td>
<td>A plug-in hybrid electric vehicle (PHEV) has an internal combustion engine (ICE) with a motor along with a battery connected in parallel to the ICE. They are generally regarded as full hybrids with bigger motor/battery and a plug to recharge.</td>
<td>These are sporty PHEVs or battery electric vehicles with top speeds exceeding 100 mph and driving range exceeding 100 miles. The price of these vehicles is expected to approach or exceed $100,000.</td>
</tr>
</tbody>
</table>

GEM e2, e4, e6; REVA G-Wiz i; ZENN; ZAP and others

Smart EV, Th!nk City, BMW Mini and others

Chevy Volt, Opel Ampera and others

Toyota Prius PHEV, Ford Fusion PHEV, etc

Tesla, Venturi Fetish, Lightning GT, etc
### Definitions – Charging Stations

<table>
<thead>
<tr>
<th><strong>Home charging</strong></th>
<th><strong>Semi-Public Charging</strong></th>
<th><strong>Public charging</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle charging at users residences, in their garages, drive ways and at apartment complexes as well as street residential spaces. Generally it is expected to be slow charging (Level 1) and can be used to charge EVs overnight. Home charging takes 8 to 12 hours for complete battery charging.</td>
<td>Vehicle charging at office workplaces which are including in/outdoor office garages, commercial complex parking garages, etc. These too are also similar to home charging, which is expected to be mostly slow charging (level 1) apart from this they maybe fast charging (level 2) portable ones also. Its takes 2 to 3 hours for complete charge.</td>
<td>The non-residential and non-workplace charging including on streets, private garages, supermarket garages etc. Expected to be a combination of fast charging (Level 2) and rapid charging (Level 3) for quick top-ups of battery power. Charging at this level is with in few minutes.</td>
</tr>
</tbody>
</table>

#### Residential, Work place charging

- Workplaces, Residential apartments (including car club bays), Leisure centers and sports facilities, Retail outlets, Community facilities, Underground and Over ground rail stations, Parks and other green spaces, Education facilities

- Town centers, high streets, tourist attractions, Residential areas (including car club bays)
## Definitions – Various Charging Station Levels

<table>
<thead>
<tr>
<th>Level 1 (Slow Charging)</th>
<th>Level 2 (Fast Charging)</th>
<th>DC - DC Charging (Rapid Charging)</th>
<th>Inductive Charging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1/Slow Charging method uses a standard 240V AC branch circuit that is the lowest common voltage level found in both residential and commercial buildings. Typical amp ratings for these receptacles are 13 or 16 amps.</td>
<td>Level 2/Fast charging is typically described as the “preferred” method for the EVs charging both for private and public facilities and specifies a 240V AC, single phase branch circuit.</td>
<td>This type of charging employees direct current from the source to get the vehicles battery to be charged to a certain degree without converting into an alternate current.</td>
<td>Method of recharging a battery without connecting it to a charging station is by inductive charging. With this technology, electrical energy is transferred by a process called Inductive charging. This process uses magnetic forces to transfer electrical power from a transmitter to a receiver, without the use of cables or connections.</td>
</tr>
</tbody>
</table>
Urbanisation Trend and Its Impact on New Mobility Business Models
Urbanisation to Be-Redefined in Future And Will Lead to Development of Mega Regions and Mega Corridors

**MEGA CITY**
Urban area with more than 10 million inhabitants and GDP (PPP) more than 100 billion USD.
Urban area encompasses the areas of the suburbs and the outer business activity hubs.

**EXAMPLE:** Greater Tokyo, Greater New York, Greater Mumbai

**MEGA REGIONS**
Region within the perimeter formed by the combination of two or more closely located major cities or megacities, over 15 million population.

**EXAMPLE:** Johannesburg and Pretoria region called “Jo-Toria”

**MEGA CORRIDORS**
The area alongside the transport corridor connecting two or more major cities or business districts or megacities.

**EXAMPLE:** Hong Kong-Shenzen-Guangzhou in China (Population 120 Million)
Most offices moved to the first belt suburbs except non cost-sensitive activities: city centres becoming shopping areas (small scale deliveries) for expensive goods and living areas for “double income, no kids” households.

Cars needed to go to the working areas/malls outside first and second belt.

Industry offices moved out to the first belt area as also medium income families while manufacturing facilities and low-medium income families relocated in the second and third belt areas with logistics centres created on 2nd belt periphery.

‘Green wave’ families living outside cities in outer suburban area. Hypermarkets and malls mostly created inside the third belt low cost area (large scales deliveries).

Cars needed to go from outer suburban areas to join the intermodal public transport and working areas in third and second belt.
Over 40 Global Cities to be SMART Cities in 2020 - More than 50% of smart cities of 2025 will be from Europe and North America. China and India to see over 50 New “Sustainable” Cities

Legend
★ Cities built from scratch
★ Existing eco cities
★ Existing eco megacities

Source: Frost & Sullivan
CASE STUDY: Amsterdam: A Creative Economy Working Towards Deploying Smarter Technologies To Achieve A 40% Reduction Of CO₂ Emissions From 1990 Levels

SMART MOBILITY

- 39% commute by bicycle
- 400+ Km of dedicated cycle route
- To familiarise electric bicycle taxis
- 200 charging stations by 2012;
- 10,000 EVs By 2015
- Encourage car sharing
- Cheaper parking slots at public transit stations to park cars and board trains

SMART LIVING

- 1200 homes to feature smart meters and energy management systems.
- 14% reduction in energy use is expected of this smart meter project
- ITO tower is testing the use of smart meters and energy efficient appliances to cut energy consumption.
- Design aesthetics of building absorb natural light and air from the environment thereby keep artificial lighting and HVAC use to minimum.

SMART PUBLIC SPACE

- Yearly reduction of parking spaces and increase of tariffs inside the city.
- 30 kmph speed limits on 80% of roads inside the city - makes bicycles faster by atleast 50% on a A-B trip.
- 154 shore power connections to charge inland cargo vessels and river cruisers to be installed by 2012
- Utrechtsestraat – the popular narrow shopping street downtown is to feature energy efficient street lighting,
- Sustainable tram stops with solar powered displays and billboards
- Solar powered garbage bins with built in compacters will be installed on this street

SMART WORKING PLACE

- 25 MNCs have jointly signed to reduce home to work car miles by 10% by 2012.
- Incentive/free bicycles to employees
- Free & protected bike parks at offices to encourage cycle use.
- Work from home if necessary
New Mobility Model - Car Sharing in Europe

Germany, UK and Switzerland are the 3 biggest markets for Car-Sharing membership in Europe at present; 1 in 3 cars bought new by a CSO will be an EV after 2012.

Evolution of Megacities: Car Sharing in Europe, 2009 - 2025

**Carsharing Members in 2009**

- > 80,000
- 15,000 – 80,000
- <15,000

**2016 Potential**

- About €3.5 billion in revenues
- More than 5.5 million members
- More than 77,000 vehicles in carsharing fleet

Note: Others include Spain, Denmark, Finland, Greece, Ireland, Luxembourg, Portugal

Source: Frost & Sullivan
Mobility Integrators (MI) to Offer Innovative mobility solutions to complement commuters’ inter-modality and multi-modality travel split

The Concept of a Dynamic Transport Solution Integrating Different Modes Under a Single Entity to make Personal Transportation Easy and Simple

MIs will start exploiting the Web 2.0 and Mobile 2.0 Internet service to offer mobility-based applications (apps) on smart phones.

Source: Frost & Sullivan

*The company logos mentioned are only for descriptive purpose
Electric Vehicles Market Overview, Technology Roadmap and Infrastructure Trends
Electric Vehicle Technology Roadmap (Global), 2008-2015 - Charging Times to Drop to <30 Minutes by 2015

<table>
<thead>
<tr>
<th>Performance</th>
<th>Driving Distance/charge-up to 55 Miles</th>
<th>Up to 125 Miles</th>
<th>190 + Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Charge Time – 6 to 8 hrs</td>
<td>&lt; 1 hour</td>
<td>&lt; 15 minutes</td>
</tr>
<tr>
<td></td>
<td>Battery Capacity – up to 16kWh</td>
<td>Up to 50 kWh</td>
<td>75 kWh +</td>
</tr>
<tr>
<td></td>
<td>Motor Power- Up to 70 kW</td>
<td>70 kW – 250 kW</td>
<td></td>
</tr>
</tbody>
</table>

| Infrastructure       | Slow charging - onboard                | Fast charging – mostly off board | Battery Swapping |

Market for Extended-Range Electric Vehicles: Technology Roadmap for Plug in Hybrid Electric Vehicles

<table>
<thead>
<tr>
<th>ELECTRIC RANGE</th>
<th>Up to 40 miles</th>
<th>Up to 100 miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>BATTERY CAPACITY</td>
<td>7kWh – 15kWh</td>
<td>16kWh – 25kWh</td>
</tr>
<tr>
<td>MOTOR POWER</td>
<td>50kW – 70kW</td>
<td>70kW – 140kW</td>
</tr>
<tr>
<td>CHARGING TIME</td>
<td>2 – 6 hrs</td>
<td>15 mins – 2 hrs</td>
</tr>
</tbody>
</table>

Source: Frost & Sullivan
Current EV Range (50-80 Miles) Limits Developments Of Infrastructure to Metropolitan Areas.

**PRESENT DEVELOPMENTS WITH RESPECT TO ELECTRIC CHARGING STATIONS (2008 - 2015), World**

- **Pub. & Pvt. Parking Place**
  - Special EV parking space
  - Free charging from charging outlet

- **Commercial Facilities**
  - E.g., Dept. Stores, hotels, malls
  - Special parking lot for EV next to handicap provision
  - Free charge (1-2 hrs) using AC outlet

- **Home**
  - Normal charging by night time discounted electricity
  - Special charging plug at home

- **Car Dealers, Public Building**
  - Current strategic locations for fast charging
  - 15 min. charge to yield 60 miles range

**Source: Frost & Sullivan**

- **Improved range extension will see charging points extend beyond city limits to urban and sub-urban areas with emphasis on both normal and fast charging stations**
Future Developments in Electric Charging Stations (2013 on) : Target Focus on Parking Lots With Over 30 Minute Journey Stops

**Long Duration Stay**
- Multiplexes, railway stations are strategic spots where consumer “Park & Pickup” intervals are ideal for 80% charge
- Conventional charging stations preferred over fast charging

**Short-Medium Duration Stay**
- Dining & Restaurants, Golf courses, movie theatres
- Fast charging stations attractive

**Highway - Motels / Dining**
- High potential of fast charging stations seen to extend range of EVs
- Battery Swapping stations likely to gain ground as well

**EV Range extension** will see the rise of urban/sub-urban consumers using EV
- Fast charging stations seen across strategic locations on highways like motels, dining centres etc

Source: Frost & Sullivan
**European EV Charging Station Facts** - With exception of Norway, most countries today have less than 1000 charging stations installed.

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of charging stations 2010-</th>
<th>Number of charging stations 2017-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>~694</td>
<td>~250K</td>
</tr>
<tr>
<td>Netherlands</td>
<td>~45</td>
<td>~45000</td>
</tr>
<tr>
<td>Switzerland</td>
<td>~667</td>
<td>~39000</td>
</tr>
<tr>
<td>Norway</td>
<td>~2000</td>
<td>~185K</td>
</tr>
<tr>
<td>Portugal</td>
<td>~55</td>
<td>~57000</td>
</tr>
<tr>
<td>Belgium</td>
<td>~30 to 50</td>
<td>~30000</td>
</tr>
<tr>
<td>Finland</td>
<td>~40</td>
<td>~1000</td>
</tr>
<tr>
<td>Spain</td>
<td>~56</td>
<td>~220K</td>
</tr>
<tr>
<td>Italy</td>
<td>~120</td>
<td>~148K</td>
</tr>
<tr>
<td>Austria</td>
<td>~50</td>
<td>~20000</td>
</tr>
<tr>
<td>Sweden</td>
<td>~240</td>
<td>~60000</td>
</tr>
<tr>
<td>Demark</td>
<td>~50</td>
<td>~84000</td>
</tr>
</tbody>
</table>

Source: Frost & Sullivan
European Growth forecast: Cumulative number of various charging levels is in the range of 1.8 to 2 million by 2017

Electric Vehicles Charging infrastructure: Points growth analysis (Europe), 2011 - 2017

Note: Base numbers are rounded for all years
Source: Frost and Sullivan
Global Market Size and Forecasts
Sales Forecasts Scenario Analysis: Global Electric Vehicle Demand Analysis – Potential Sales of 2.2 million in Frost & Sullivan Scenario by 2017

Electric Vehicle Market: Sales Forecasts Scenario Analysis (World), 2009-2017

Includes all types of PEVs (LSVs, MSVs and free-way speed vehicles)

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<thead>
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</thead>
<tbody>
<tr>
<td>Optimistic Scenario</td>
<td>23,100</td>
<td>123,800</td>
<td>289,500</td>
<td>665,000</td>
<td>1,060,400</td>
<td>1,714,500</td>
<td>2,220,300</td>
<td>3,202,000</td>
<td>10-12</td>
</tr>
<tr>
<td>Frost &amp; Sullivan Scenario</td>
<td>16,500</td>
<td>72,000</td>
<td>193,000</td>
<td>453,000</td>
<td>792,000</td>
<td>1,287,500</td>
<td>1,736,000</td>
<td>2,203,000</td>
<td>5-7</td>
</tr>
<tr>
<td>Conservative Scenario</td>
<td>13,500</td>
<td>35,600</td>
<td>82,500</td>
<td>150,300</td>
<td>195,100</td>
<td>300,500</td>
<td>450,000</td>
<td>670,000</td>
<td>3-4</td>
</tr>
</tbody>
</table>

Note: All figures are rounded; the base year is 2010. Source: Frost &
EV Breakdown By Region - CEVs to Account for 69% Share In Europe; NA to Witness More PHEVs with a 35% Share

EV Breakdown By Region – Sales Estimates (World), 2017

Note: All figures are rounded; the base year is 2009 Source: Frost & Sullivan
Electric Vehicle Market Breakdown by OEMs: Renault Nissan likely to account for 22% of the market share by 2017 with Renault Fluence expected to be one of the top selling models.

Electric Vehicle Market: Top 10 Electric Vehicles (Europe), 2017

- Renault Fluence ZE: 76,300
- Nissan Leaf: 62,800
- Opel Ampera: 45,100
- Toyota Prius PHEV: 37,000
- VW Golf/Similar: 36,400
- Peugeot iON: 35,900
- Renault Zoe ZE: 35,800
- Renault Kangoo ZE: 33,500
- BMWi I3: 29,000
- Mitsubishi iMIEV: 28,000

Note: All figures are rounded; Source: Frost & Sullivan
Chinese OEMs to launch over 30 EV Models in Next 3 Years


<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
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<td><strong>A00</strong></td>
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<tr>
<td></td>
<td>Beni EV</td>
<td>QQ3 EV</td>
<td>M1 EV</td>
<td>i-car</td>
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<td>Chana</td>
<td>Chery</td>
<td>Chery</td>
<td>Dongfeng</td>
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<td><strong>A0</strong></td>
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<td></td>
<td>F3DM</td>
<td>620EV</td>
<td>Haima EV</td>
<td>F0 EV</td>
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<td>BYD</td>
<td>Lifan</td>
<td>FAW</td>
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<td></td>
<td>E6</td>
<td>premacy EV</td>
<td>F6DM</td>
<td>BE 701</td>
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<td>FAW</td>
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<td>BAW</td>
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<td><strong>MPV</strong></td>
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<td></td>
<td>E6</td>
<td>premacy EV</td>
<td>Shuaike EV</td>
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<td>BYD</td>
<td>FAW</td>
<td>EV</td>
<td>Dongfeng</td>
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<td><strong>SUV</strong></td>
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<td></td>
<td>Odin EV</td>
<td>Ruiqi EV</td>
<td>2008 EV</td>
<td>Tiggo EV</td>
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<td></td>
<td>Dongfeng</td>
<td>Dongfeng</td>
<td>Zhongtai</td>
<td>Chery</td>
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</tbody>
</table>

Sum: 13, 2, 7, 2, 3, 5

Source: Frost & Sullivan
Electric 2 Wheelers – eBicycle, eScooter and eMotor Bike Market Worth Over 25M Units Worldwide

- Over 20 million electric 2 wheelers sold globally in 2008
- Modest growth expected globally with 22 million sales forecast by 2010

### Sanyo Enable
- Motor driven by torque sensor on pedal
- 125 Volt NiMH battery
- Charging time – 2 hours
- Acceleration (0 – 80 kph) – 6.8s
- Max speed – 100 kph
- Range – 110 km @ 40 kph

### XM 3000 Electric Moped
- Hub motor driven purely by throttle
- 60 Volt lead acid battery
- Charging time – 7 hours
- Max speed – 70 kph
- Range – 80 km

### Vectrix Electric Scooter
- Regenerative braking functionality in high end models
- 125 Volt NiMH battery
- Charging time – 2 hours
- Acceleration (0 – 80 kph) – 6.8s
- Max speed – 100 kph
- Range – 110 km @ 40 kph
Electric Commercial Vehicles will be concentrated more towards depot based delivery vehicles with fixed payload and work schedule cycle.

<table>
<thead>
<tr>
<th>Type of Commercial Vehicle</th>
<th>Urban</th>
<th>Intra-Urban</th>
<th>Highway</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Usage</strong></td>
<td>Super Market City Councils Utilities</td>
<td>Parcel Vans Logistics Distribution</td>
<td>Medium to Long Haul</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>Urban (&lt;60 miles)</td>
<td>Intra-Urban (&lt;150 miles)</td>
<td>Highway (&gt;150 miles)</td>
</tr>
</tbody>
</table>

**Electrification Attractiveness**

- **High (4% ~ 10% of total CV market @ 2015)**
  - This implies immediate opportunity and target for electric vehicles.
  - Highways (>150 miles)

- **Medium (1% ~ 4% of total CV market @ 2015)**
  - This signifies an expanding opportunity gained by early adopters experience and challenges can be overcome but require substantial investment.
  - Intra-Urban (<150 miles)

- **Low (<1% of total CV market @ 2015)**
  - This represents the size of opportunity and electrification will need to overcome considerable technical and market challenges.
  - Urban (<60 miles)

**Source:** Frost & Sullivan
NA Drivers who use their vehicle for more leisurely activities generally park short times between trips, while those that use the vehicle to commute park for longer overall.

- Commuting to and from work, 15.5 mi
- Supermarket/Retail shopping, 15.0 mi
- Taking & picking kids up from school, 13.6 mi
- Others, 15.6 mi
- Recreational activities, 14.9 mi
- Leisure driving, 15.9 mi
- To use while at work such as visiting clients, 16.9 mi

**Q6 Average distance per day / Q5 trips per day & Q8 time spent parking / Q5 trips per day**

**Size of bubble Q3 - percent of people that use vehicle for that activity**

*Bubble size represents % of respondents who use their vehicle for each activity*
Business Model Analysis of Key Industry Stakeholders and Key Opportunities
Electric Vehicle Industry Value Chain Provides Opportunity to Enter New Fields
Example of Products/Services Portfolio That Can be Offered by an Integrator in the E-Mobility Market

**Possible Revenue Streams**

- **Charging Stations**
  - Manufacturing & Sales
  - Installation & Maintenance
  - Charge Payment Program / Subscription based services
  - Revenues from value added services
  - Premium revenues via Renewable Energy Vs Non Renewable Energy
  - Premium revenues via Peak Power Vs Off Peak Charging
  - Level 1 Vs Level 2 Vs Level 3 Charging

- **Batteries**
  - Battery Leasing Model
  - Refurbishing
  - Recycling
  - Battery 2nd life
  - Battery Swapping
  - Extend to other E-mobility solutions
  - Battery Integration

- **E-Mobility Vehicles**
  - Energy Subscription Packages
  - Extended E-mobility solution e.g. vehicle sharing
  - Offering After-Sales services –
  - Market green solutions such as Solar panels to E-Mobility client base
  - Battery Integration

- **Electricity**
  - Subscription based Energy service Scheme
  - Load Management
  - Investment in renewable energy such as wind farms and gain carbon credits
  - Premium revenues via Peak Power Vs Off Peak Charging
  - Premium revenues via Renewable Energy Vs Non Renewable Energy

- **Telematics & other value added services**
  - Data Aggregator (working with other partners)
  - Battery management services
  - E-Mobility IT Platform
  - V2V and V2G Communication
  - Added value service (POIs, Diagnostics, etc)

**Source:** Frost & Sullivan
EV Business Models Will Have to Compete With The Internal Combustion Engine Cost Ownership Structure

<table>
<thead>
<tr>
<th>Example</th>
<th>Small Segment</th>
<th>Low/Medium Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Toyota Yaris • Vauxhall Corsa • Citroen C2</td>
<td>Capital Investment = €13,573</td>
<td>Capital Investment = €22,142</td>
</tr>
<tr>
<td>~ €4,000</td>
<td>~ €900</td>
<td>~ €6,308</td>
</tr>
<tr>
<td>226</td>
<td>1,197</td>
<td>80</td>
</tr>
<tr>
<td>317</td>
<td>1,445</td>
<td>468</td>
</tr>
<tr>
<td>722</td>
<td>349</td>
<td>1,313</td>
</tr>
<tr>
<td>1,222</td>
<td>329</td>
<td>349</td>
</tr>
<tr>
<td>154</td>
<td>152</td>
<td>154</td>
</tr>
</tbody>
</table>

Average Annual Standing and Running Costs per Vehicle

- Cycle Period: 3 years
- Average Target Cost
  - ~ €29,000
  - ~ €44,000

Cost Ownership Structure

- Cost of finance (Interest)
- Depreciation
- Fuel
- Insurance
- Maintenance
- Tax
- Assistance membership
- Parking charge
- Congestion charge
- Replacement parts
- Tyres

Source: RAC
## Business Models Analysis: Future Leasing Models To Sell 75% Of EVs; The Rest 25% Sold Traditionally

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Business Model 1</th>
<th>Business Model 2</th>
<th>Business Model 3</th>
<th>Business Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>COVER</td>
<td>Energy Package</td>
<td>Maintenance Package</td>
<td>Part Subsidy</td>
<td>Full Subsidy</td>
</tr>
<tr>
<td>ENERGY</td>
<td>Monthly Bill</td>
<td>Flat: Max 1250 miles/month</td>
<td>Flat: 15,500 miles/year</td>
<td>Flat: ~18,500 miles/year</td>
</tr>
<tr>
<td>CONTRACT</td>
<td>NA</td>
<td>NA</td>
<td>4 years</td>
<td>7 years</td>
</tr>
<tr>
<td>SUBSIDY</td>
<td>NA</td>
<td>NA</td>
<td>50% car price</td>
<td>Free car</td>
</tr>
<tr>
<td>MONTHLY LEASE</td>
<td>Up to $225</td>
<td>Up to $500</td>
<td>$750- $1100</td>
<td>~ $1350- $2250</td>
</tr>
</tbody>
</table>

### Other Possible Leasing models

<table>
<thead>
<tr>
<th>Flexible Mileage</th>
<th>Unlimited Miles</th>
<th>Max number of miles</th>
<th>Pay as you go</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible Contract</td>
<td>The customer opts for the number of years and flexible mileage- customized lease</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Better Place, Frost & Sullivan

**Note:** Values that have been dealt here are an European perspective converted into US$ at today's exchange rate.
The Overview of Current Business Models of Vehicles in the Market: Outright Sales and leasing concept preferred by key players

<table>
<thead>
<tr>
<th>Business Model</th>
<th>Nissan Leaf</th>
<th>PSA C-Zero</th>
<th>Th!nk</th>
<th>iMEV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outright Purchase Price</strong></td>
<td>• GB£28,990 <em>(Before rebate, incl. VAT)</em></td>
<td>• Upfront payment left to Consumers</td>
<td>• €29,500 *(Before rebate, excl. VAT) – GB£23k in UK</td>
<td>• £28,990 <em>(Before rebate, incl. VAT)</em></td>
</tr>
<tr>
<td><strong>Basic Business Packages</strong></td>
<td>1. <strong>Outright Purchase</strong> -£399/m; 4yr contract -Access to Charge Station -IT Telematics -Maintenance and Service -Monthly utility Bill</td>
<td>1. <strong>Leasing</strong> -€499/month; 4yr contract -Vehicle + Battery -Telematics (Specific Assistance) -Navigation -Add. Fee for info. On status of battery (&gt;1/day) -No charge stations -Vehicle returned to dealer post contract period</td>
<td>1. <strong>Outright Purchase</strong> -5 yr Battery Warranty</td>
<td>2. <strong>Leasing</strong> -€554/m; 5yr contract (10% residual value) -€510/m; 5yr contract (15% residual value) -IT Telematics -Maintenance and Service</td>
</tr>
<tr>
<td><strong>Warranty Conditions</strong></td>
<td>• 7 yr Battery Warranty</td>
<td>• 5 yr Battery Warranty</td>
<td>• 5 yr Battery Warranty</td>
<td>• 5 yr / 62,500Kms Battery Warranty</td>
</tr>
<tr>
<td><strong>Residual Value</strong></td>
<td>• Vehicle: 60% after 3 yrs - <strong>Battery</strong>: 15% after 8 yrs</td>
<td>• Vehicle: 55% after 3 yrs - <strong>Battery</strong>: 15% after 8 yrs</td>
<td>• Vehicle + Battery : 15% after 5 yrs</td>
<td>• Vehicle: 60% after 3 yrs - <strong>Battery</strong>: 15% after 8 yrs</td>
</tr>
</tbody>
</table>

*Source: Frost & Sullivan*
## Utilities Business Model – Revenue Generating Opportunities Are Mainly Outside Selling Energy

<table>
<thead>
<tr>
<th>Source Of Revenue Generation</th>
<th>Calculated over 5 years (based on certain assumptions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Revenues from Selling Electricity</td>
<td>€300Mn - €400Mn</td>
</tr>
<tr>
<td>2. Revenues from selling Charging Stations</td>
<td>€500Mn - €700Mn</td>
</tr>
<tr>
<td>3. Revenues from Installation &amp; Maintenance of Charging Stations</td>
<td>€300Mn - €500Mn</td>
</tr>
<tr>
<td>4. Revenues from Other Sources (Solar panels and other retailing, Advertising, Load Balancing, Garage Referrals, Data Downloads etc)</td>
<td>€450Mn - €650Mn</td>
</tr>
</tbody>
</table>

### Capital Investment (1st yr)
- Includes:
  - New Energy Capacity
  - Command and control centre
  - Network Recurring Cost
  - Charging Station Purchase Cost
  - Installation and Maintenance cost
  - Logistics, Admin, Selling, general, rental, Marketing and Labour Cost

**TOTAL: €1.5 bn - €2 bn**

**Capital Investment (1st yr):**
- €48Mn - €50Mn

**Fixed & Operating Cost**
- €640Mn - €650Mn
Total Cost Of Ownership Analysis for Fleets: Fuel costs are the predominant elements of vehicles Cost Of Ownership in Utility companies, Public Sector and Business Delivery Services

Question: Please estimate how much you spend on the following per month (Euros)

- Building & Maintenance: €645
- Bus Delivery: €627 (56%)
- Car Rental: €265 (28%)
- Public Sector: €546 (63%)
- Postal: €435 (53%)
- Utility: €396 (63%)

- Interestingly, fuel amounts for up to 2/3 of fleet running costs across businesses interviewed with Business Delivery and Public sector seeing it take up the largest share of their Cost of Ownership
- EV’s should aim to address the Fuel and Road Taxing costs for businesses

* Based on 93 Interviews with Fleet Drivers who are involved in the choice and running costs of their vehicle
Telematics and E-Mobility IT Platform for Electric Vehicles
eMobility IT platform: Number of Mission Critical Elements needs to be Monitored through a Communication Platform at the Charging End

Key Elements to be Captured

- Billing Data
- Vehicle Identification Number
- Vehicle Charging Location
- Parking Incentives/Information
- Dynamic Electricity Rates
- Grid Demand Management
- Vehicle Charging Duration
- Utility Provider Mapping
- Charging Preferences Mapping
- Vehicle 2 Grid Communication
- Billing Information
- Battery Monitoring
- Battery State of Charge
- Offering Renewable Options

- Supporting utility is the key backbone of this infrastructure
- Grid management, load leveling/shedding support are key

- Billing is another key feature from this infrastructure
- Authenticate with security proper information for billing
Automotive Apps: From Car Sharing to Diagnostics to EV’s, Apps for Cars are becoming a Value Added Development
Case Study - London
Role of Non-Ministerial Organizations supporting E-Mobility in UK / London

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 1 | **TFL**  
Transport for London (TfL) is the local government body responsible for most aspects of the transport system in Greater London in England. Its role is to implement the transport strategy and to manage transport services across London |
| 2 | **OLEV**  
The Office for Low Emission Vehicles (OLEV), a cross Whitehall team is dedicated to taking forward this ambitious program. Through OLEV, working with UK industry and the regions, key aim is to position the UK as a world leader in the development, demonstration, manufacture and use of ultra-low carbon automotive technology. |
| 3 | **Cenex**  
Cenex is a delivery agency established with support from the Department for Business, Innovation and Skills to promote UK market development and competitiveness in low carbon and fuel cell technologies for transport applications. |
| 4 | **TSB**  
Their role is to stimulate technology-enabled innovation in the areas which offer the greatest scope for boosting UK growth and productivity. Promotes support and invest in technology research, development and commercialization. Spread knowledge, bringing people together to solve problems or make new advances. |

Sources: 1) tfl.gov.uk  2) dft.gov.uk  3) cenex.co.uk  4) inovateuk.org
Representative Eco-System for Electric Vehicle Infrastructure in the city of London (UK)

**Supply Side**
- Power
- Distribution Network
- Charging Equipment
  - Standard Points (e.g., EDF, Transport for London)
  - Rapid Points
  - Battery Swap
- Integration
  - Partner TBD

**Demand Side**
- Incentives
  - Congestion Charge Relief
  - Parking fee Relief
  - Business Fund
- Vehicles
  - Manufacturers
  - Car Clubs
  - Rental Vehicles
- Users
- Information
  - Website
  - Call Centre

**Charging Points**
- Work Places (e.g., Transport for London)
- Streets
- Public Car Parks (e.g., NCP)
- Retailers (e.g., Sainsbury’s, Tesco)
- Transport Hubs
- Leisure Facilities
- Car Dealers
- Car Club/ Rental Bays

**Partner** TBD
Of the announced 25,000 charging stations in London – significant proportion of this is to be integrated in workplaces across West and South regions

Planning EV infrastructure distribution

- 49 key town centres
- Potential EV households, poor off-street parking
- Potential EV workplaces, poor off-street parking

- Train and Tube station car park locations
- Public car park locations
- Retail car park locations
- EV “destination factor”

- Locations of workplace parking spaces
- Locations of largest employers
- EV “destination factor”

Sources: Mayors Office
Workshop - Urban Mobility 3.0: [http://www.gil-global.com/urbanmobility/](http://www.gil-global.com/urbanmobility/)

Growth Opportunities in Smart Mobility Business Models, Infrastructure and Electric Vehicles – 15TH and 16TH June in House of Parliament

Unique thought leadership platform where Parliamentarians and Corporate come together to debate transport of the future

Speakers include:

- Senior Parliamentarians and MPs
- Dr. Bernhard Blättel
  Director Project Mobility Services, BMW AG, Munich
- Robert Henrich
  CEO, car2go (Subsidiary of Daimler)
- Andrew Everett
  Head of Transport Technology Strategy Board
- Isabel Dedring, Mayor of London's Environment Adviser
- Michael Hurwitz, Director, Office for Low Emission Vehicles (OLEV)
- Christian Schlosser, Ph.D., UN-Habitat Chief, Urban Transport Section
- Others include Sixt, Zipcar, Eaton, IBM and many others
Discussions
Contacts

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