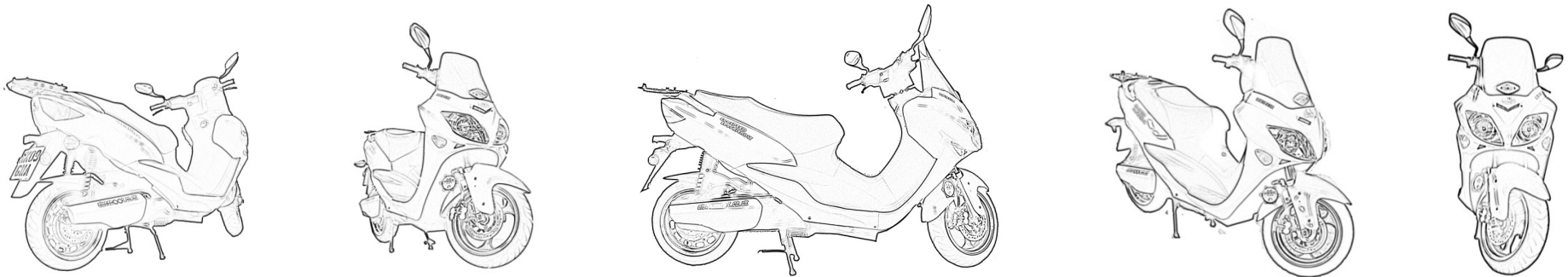


## Electric Scooters

Ignoring one key solution to sustainable urban/  
metropolitan transport?



## HVLC Aims

*HVLC research acting as a Value Innovator and System Integrator in the LCV sector.*

*High Value Low Carbon (HVLC) has been established to:*

*envisage new user value made possible by the integration of low carbon vehicle platforms with new process and network technologies at a time of dynamic industrial change.*

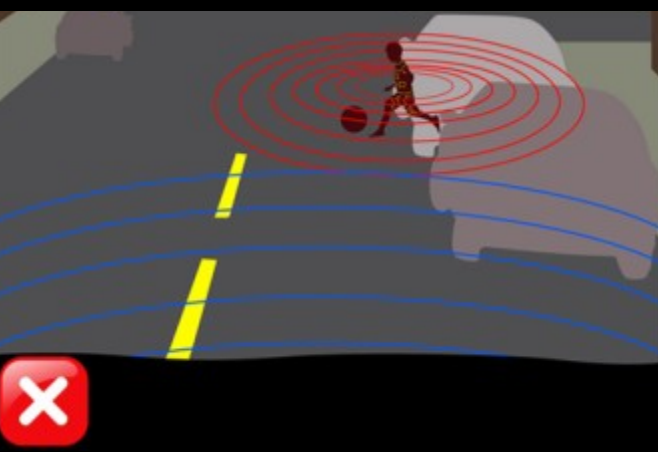
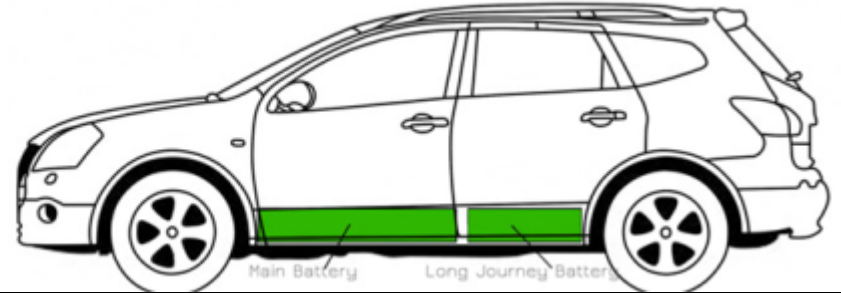
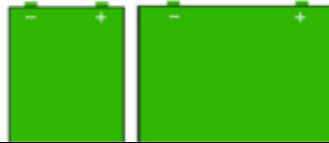


# HVLC Pilot Project

*To envisage functional and experiential value made possible by the commercial development of electric platforms and new technologies.*



Main Battery Long Journey Battery



### HVLC

High Value Low Cost EV Trip Management System

Account Summary Personal Information Planning a trip Billing & Payment Download History Account Settings

Planning	Cheapest	Time of Travel to York	Price of Travel to York
Cheapest	23.3	60.5	
Fastest	16.8	270.8	
Simple & Economic	18.6	68.3	
Simplest	17.9	69.5	

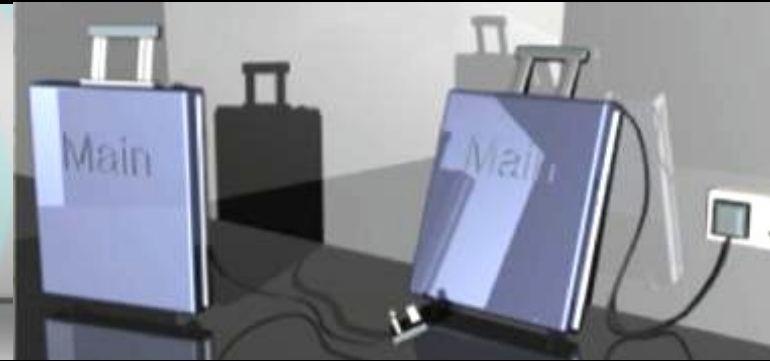
### HVLC

High Value Low Cost EV Trip Management System

Account Summary Personal Information Planning a trip Billing & Payment Download History Account Settings

Map showing route from 1. Newcastle to 2. York.

- 1. Newcastle
- 2. York



## Case Study Two: AVID CUE-V Exterior Design

The aim was to find an appropriate aesthetic for a car to be converted to an electric power train. The vehicle exterior was redesigned to produce new bodywork. The EV is in production.



# AVID CUE-V Project

*A full working CUE-V was exhibited and test driven at the CENEX LCV event in September 2010. This EV shows how even local OEM can make some positive impact on the EV market.*



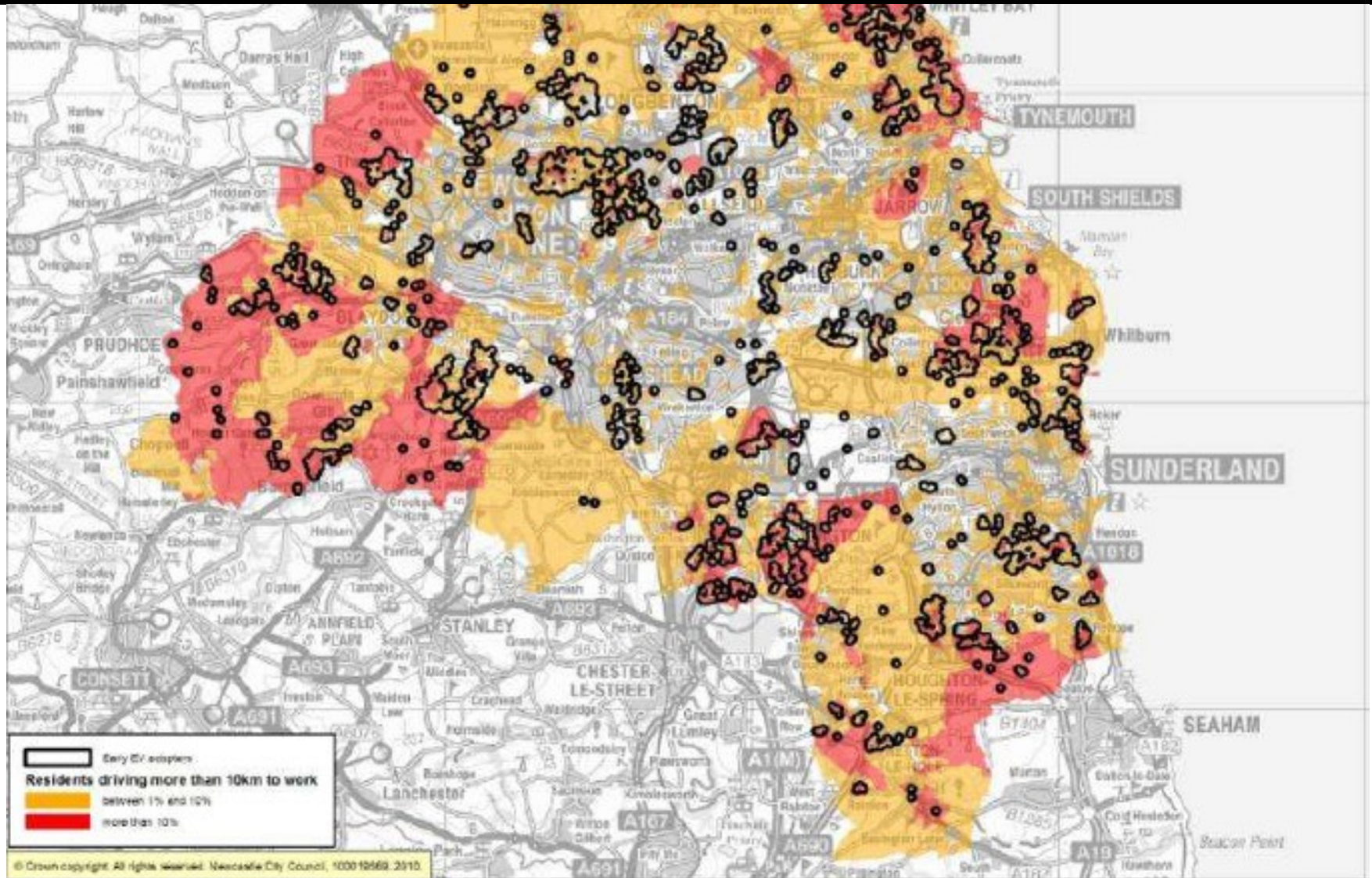
# HVLC Qashqai EV Power Train Demonstrator

*An EV version of the Nissan Qashqai was exhibited at the CENEX LCV event in September 2011. This prototype will be driven to test its electric power train in terms of efficiency and performance.*



# People Commuting patterns

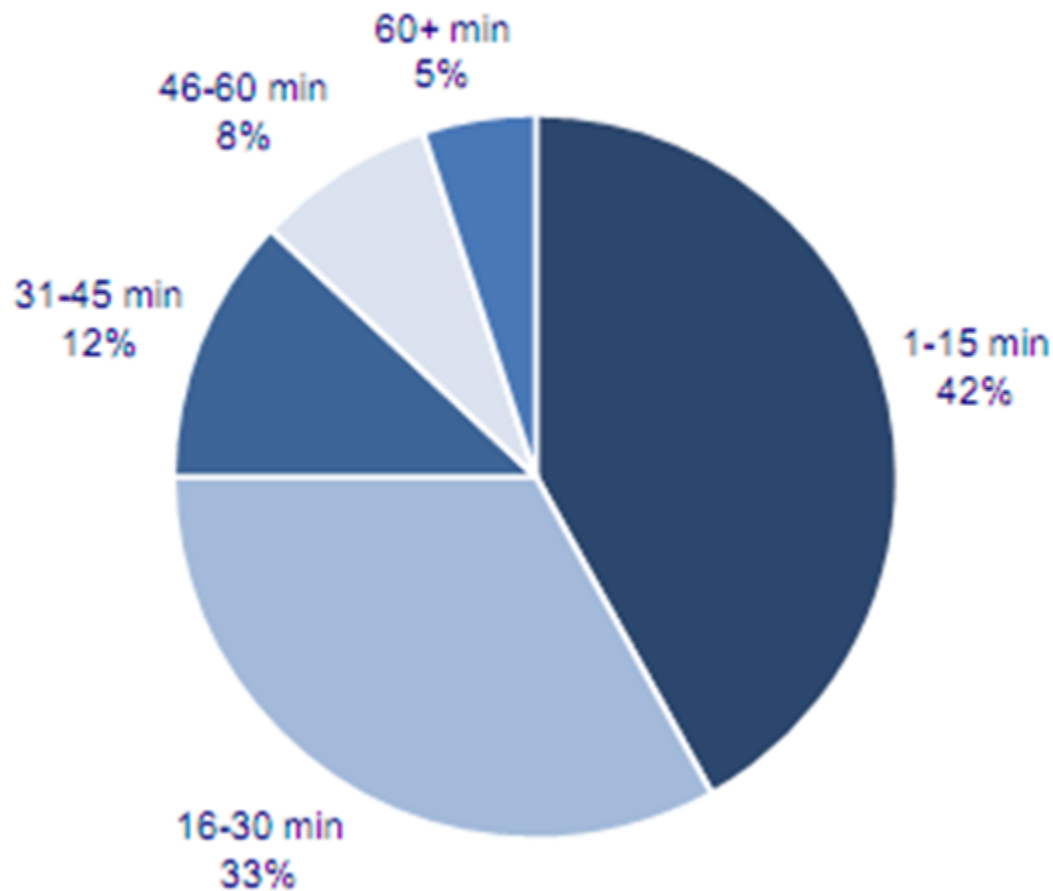
*Today's scenario: Around 80% of all trips and 44% of the total UK mileage is by vehicles that complete a daily distance of less than 40 miles (Element Energy, 2009).*



## People Commuting patterns

*Today's scenario:* Looking at the UK as a whole, around 3 in 4, or 75 per cent of workers take less than half an hour to travel from home to work.

Percentage of workers by home-to-work travel time, October–December 2009, United Kingdom





# Electrification of transport

*AEA (June 2009): four new business models to encourage significant uptake of EVs and PHEVs.*

1. *Battery leasing.* By retaining liability for the battery the car manufacturer is committed to replacing it if its performance is sub-optimal.
2. *Mobile phone-style transportation contracts.*
3. *Vehicle leasing.* The natural extension to battery leasing is to use a vehicle leasing business
4. *Car-clubs.* The 'car club' business model could be soon a viable means of introducing the public to electric vehicle technology. It could provide added value in terms of promoting EVs and PHEVs



# EV and PHEV market

*Electric vehicles (EVs) and plug-in hybrid vehicles (PHEVs) are cheaper to run and pollutes less than traditional petrol or diesel engined car. However, they are still an expensive proposition.*



## New EVs and PHEVs on the market and related challenges

*About 10 EVs are coming to market in 2012 and 3 PHEVs. Can those LCVs save sufficient fuel to justify their comparatively high price?*

Will refinements to current lithium ion battery reduce EV battery costs?

The current cost of lithium ion batteries for EVs is around \$1,000 (£630) per kWh. Nissan UK vice-president says the cost of a replacement Leaf 24 kWh battery pack could hit £19392.

There's no sign EV battery costs have substantially come down yet. An article in the Pro section of the *Wall Street Journal* reports on skepticism about the rapid battery cost decline.

EV

Ford Focus: £29000

PHEV

Vauxhall Ampera: £33995

EV

Nissan Leaf : £28,350



## Today's LCVs mobility problem

*Consumer acceptance for EVs and PHEVs will be critical for the industry.*

With every major OEM now in the race to produce affordable electric vehicles (EVs), the focus is on ways of bringing down the cost of manufacturing and ownership and that of the battery in particular.

**“Meeting those cost goals will require innovation across the entire battery value chain,”**

(Larry Thomas, president and CEO of Primet Precision Materials, Ithaca, New York)



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Surprises promised  
for **2012 Qatar**  
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**Thailand Auto Parts**  
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Meeting the **connectivity**  
**challenge** – differentiation  
on a standard platform

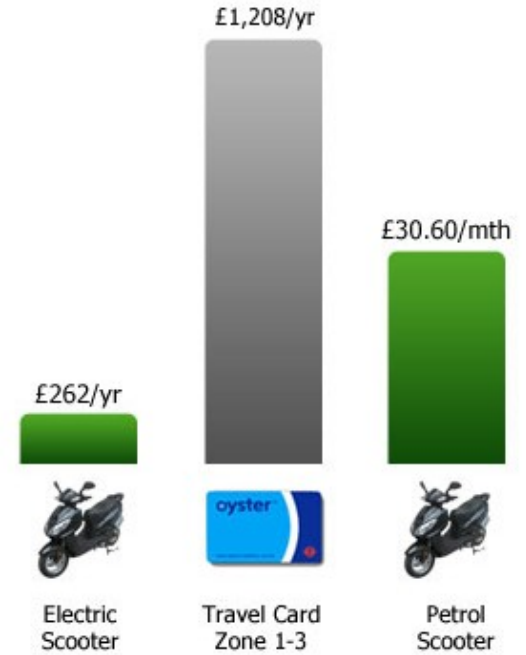
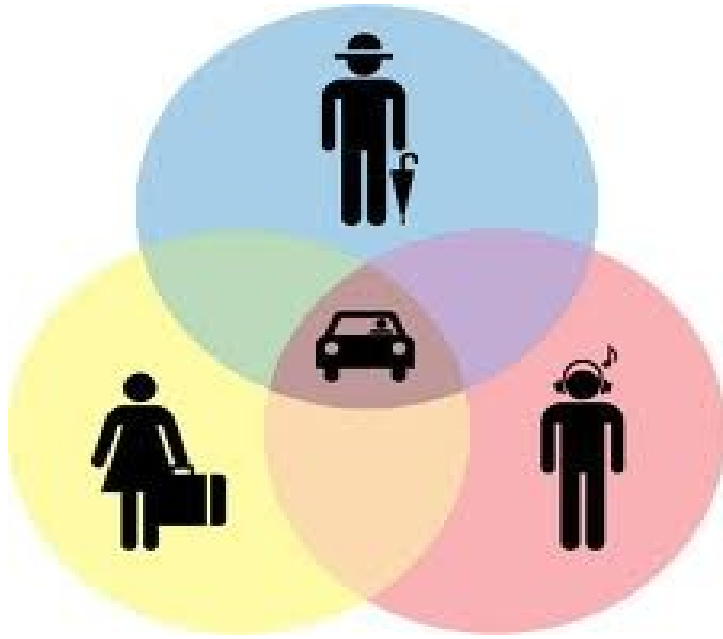
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**“** The chemical industry must deploy breakthrough process technology to make EVs competitive in the market.  
- Primet Precision CEO Larry Thomas, Page 46

Primet's CEO Larry Thomas talks with Automotive Industries Magazine.

# Electrification of transport

*Recognising challenges to mobility including growing traffic volume, rising energy costs, and the need to reduce CO2 emissions.*



Haven't we missed a trick here, as we keep on promoting and developing our low carbon vehicle agenda focusing mainly on EVs?



## Electric scooters. Any preconceptions?

*Nowadays there is wide selection of 2-wheel, 3-wheel and 4-wheel electric scooters on the market. Should electric scooters have to look like this all the time?*



## EV vs. e-scooter

Electric scooters are starting to make a mark, with prices ranging from about £1,500 for a basic model up to around £5,000 for a top end electric bike.

**Power:** Electric via lithium ion battery powering rear-wheel electric motor

**Running costs:** 1p a mile

**Range:** around 60 miles (100Km)

**Top speed:** 31mph (50Km/h)

**Charging:** 5 metre retractable cable and domestic plug

**Full charge:** 4 to 5 hours from domestic mains

**Price:** £4,000 to £5,000 estimated

**Power:** Electric via 48V 90KW lithium ion battery powering a 80KW DC electric motor

**Running costs:** 22p a mile

**Range:** 100 miles (160Km)

**Top speed:** 28mph (45Km/h)

**Charging:** cable and domestic plug charges scooter from the household mains.

**Full charge:** 8 hours from domestic mains

**Price:** £28,350



## EV vs. e-scooter

Electric scooters can be 6-7 times cheaper than EVs and PHEVs. Their running costs are minimal around the nominal figure of 1p or even less.

**Power:** Electric via 48V lithium ion battery - 4KW DC electric motor

**Running costs:** n/a

**Range:** up to 62 miles (100Km)

**Top speed:** 28mph (45Km/h)

**Charging:** cable and domestic plug charges scooter from the household mains.

**Full charge:** 3 to 5 hours from domestic mains

**Price:** n/a

**Power:** ICE and electric via 4.4KWh lithium ion battery - 60KW DC electric motor

**Running costs:** 54p a mile

**Range:** up to 13 miles (21Km) in EV mode  
540 miles (870Km) in PHEV mode

**Top speed:** 62 mph (100Km/h) in EV mode  
112 mph (180Km/h) in PHEV mode

**Charging:** cable and domestic plug charges scooter from the household mains.

**Full charge:** 1.5 hours from domestic mains

**Price:** under £31000





# HVLC Elecscoot 4 Project

To develop concept ideas for future hybrid/electric motor homes in terms of creating improved interior layouts, flexible cabin designs and distinctive next generation exterior forms.



# HVLC Elecscoot 4 Project

To redesign and upgrade an electric scooter by conferring a more resolved exterior design language and semantic. This concept is set to enter mass production soon.



# HVLC Elecscoot 4 Project

This electric scooter concept should be compared with a traditional big scooter normally featuring a 500cc engine.



**Max Speed:** 60 mph (97Km/h)

**Max Range:** 100 miles (161Km)

**Battery Type:** Lithium 60V 70 AH

**Motor Type:** 4KW Brushless

**Charge Time:** 2-4 hours

**BMS:** Yes

**Regenerative Braking:** YES

**Carrying Capacity:** 200kg

**Climbing Capacity:** 30 degrees

**Recharge Life:** Up to 3000 cycles

# HVLC Elecscoot 4 Project

*This project was exhibited at the CENEX LCV event in September 2011. The E4 scooter is designed to provide 100 mile range for an affordable estimated cost of £5000+.*



## The best scooters are yet to come.. Market growth

BMW Motorrad is aiming to carry a driver and passenger safely on urban highways. The battery capacity, intelligent battery management and brake energy recovery system give this scooter a realistic range of 60 miles in everyday use.



**“The best-selling EVs won’t have four wheels.”** Pike Research predicts that compound annual growth rates for sales of e-motorcycles and e-scooters will surpass 71% (from 17 million today to 138 million) between now and 2017.

Their price points make them much more easier to justify than EVs, especially in urban centres where limited parking and traffic also presents a challenge.

# HVLC Consortium of Partners



## HVLC contact details

Northumbria University School of Design offers design expertise in the field of Low Carbon Vehicles (LCVs).

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Investment Director

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## Electric Scooters

Ignoring one key solution to sustainable urban/  
metropolitan transport?

Thank you. Any questions or comments?