How do WE get to the zero-carbon highway?

Science Capital - Low Carbon 2014

Millennium Point, Birmingham

Wednesday 15 October 2014

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Founder, Former CEO
The Liberty Electric Cars group

@Barry_LIQUITY

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AGENDA

- History of road transport
- Innovation
- Drivers
- The zero-carbon highway?

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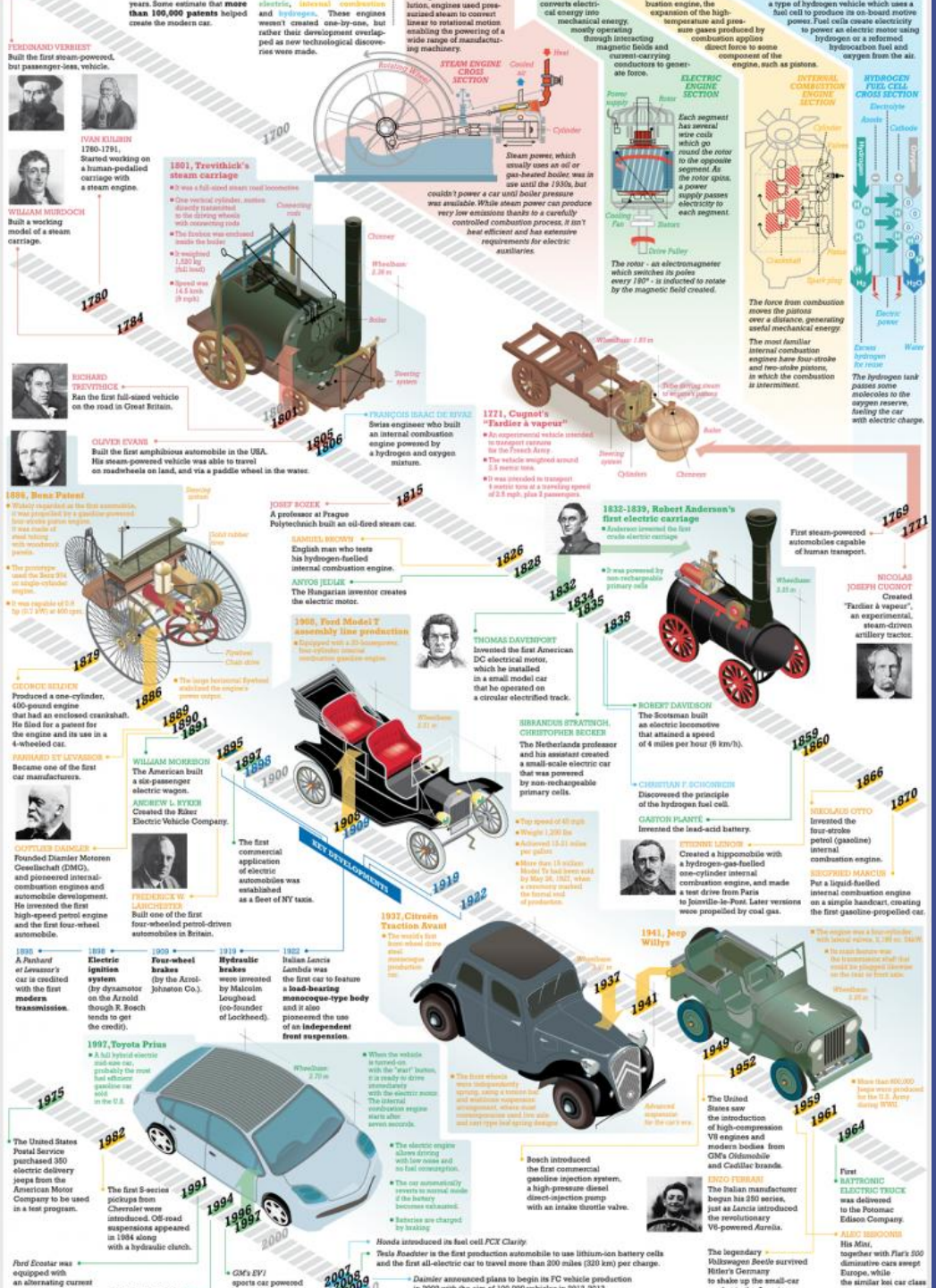

200 years

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INDUSTRY BACKGROUND

Car industry

- 70 million cars worldwide
- Enormous, mature industry
- internal combustion engine

Electrics Sector

- Innovations - 12 phase motors
- Energy storage –battery, KERS
- Electric vehicles invented 1835
- reliable technology - electric trains

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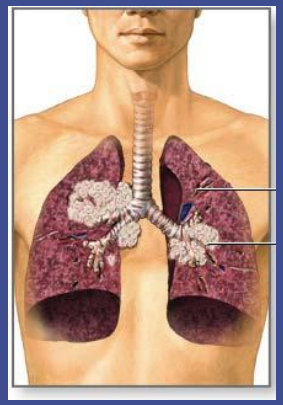
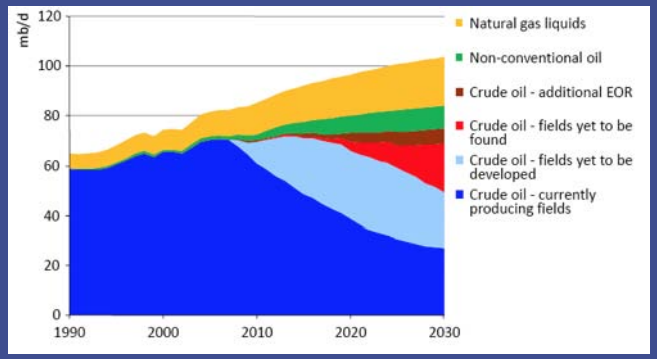
INDUSTRY BACKGROUND





themes (converging?)

- HEALTH: reduce deaths, cancers.
- ENVIRONMENT. Global Warming / Climate Change
- ENERGY – running out of oil?

Government action

- Higher taxes for higher polluting cars
  - Road Tax, Congestion charges, fines for OEMs from 2015

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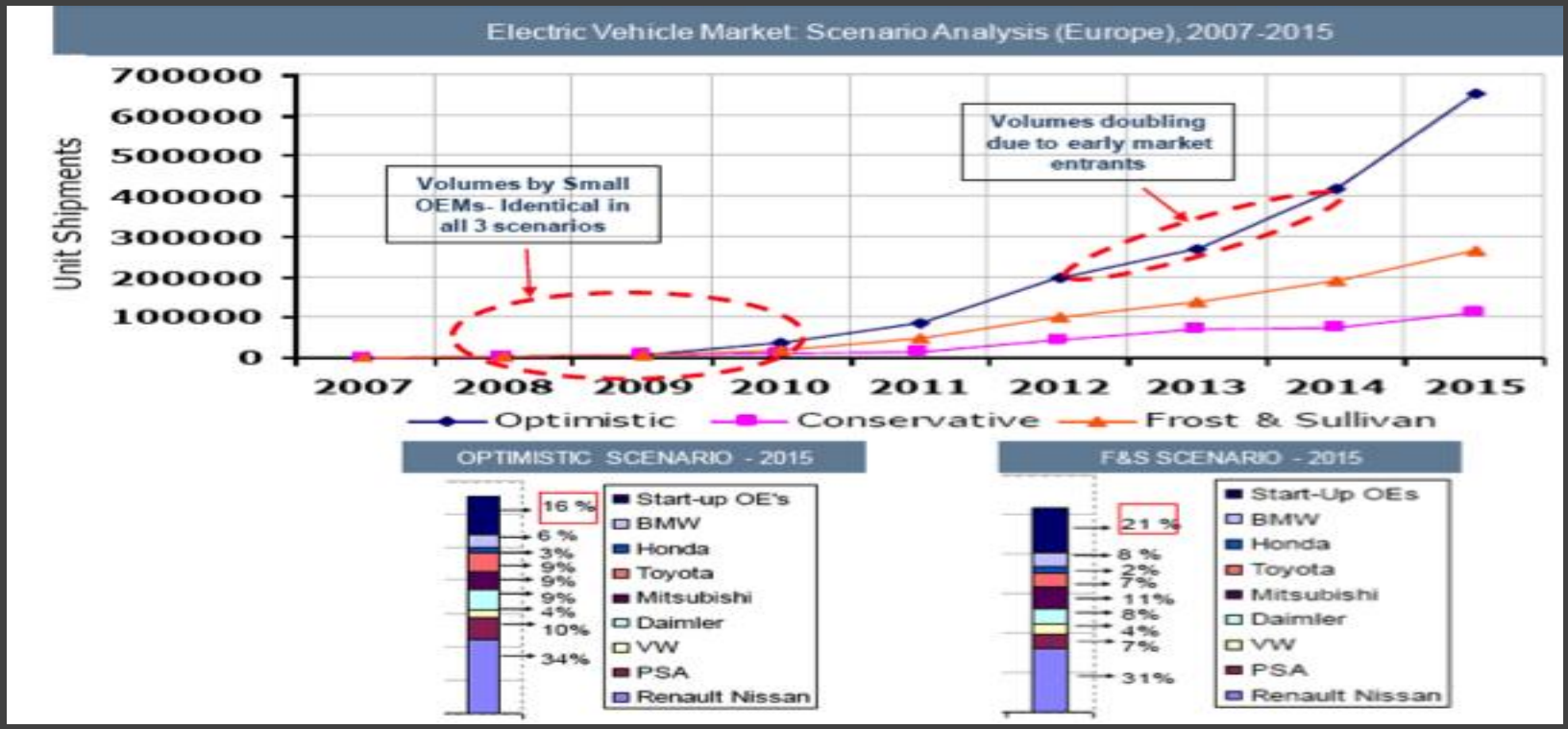
RAPID GROWTH FORECASTED (?)



- Volkswagen: EV's will be 15% of global cars sales by 2020
- Business Insights: 1m EV's in America by 2015, 1.2m in UK

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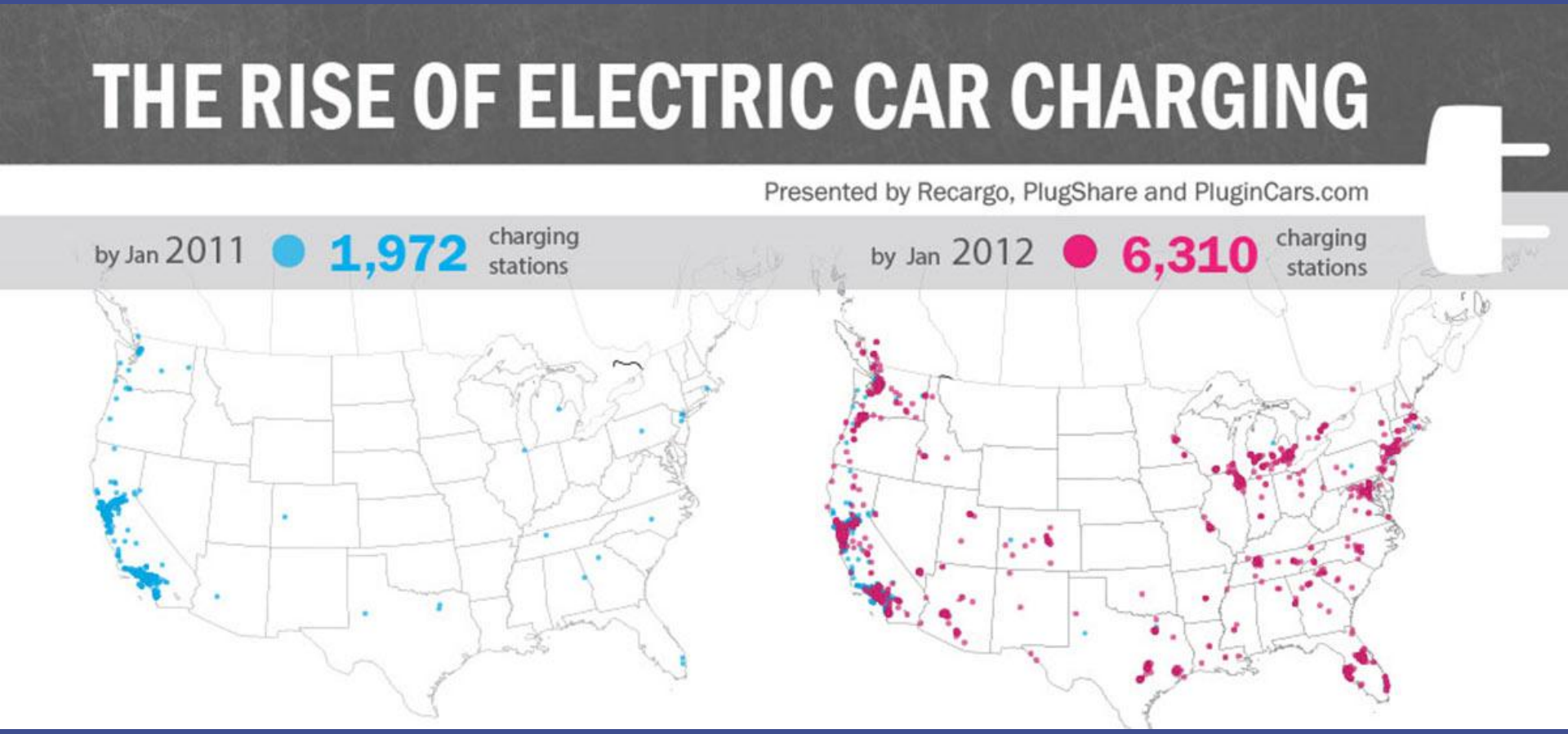
INFRASTRUCTURE?



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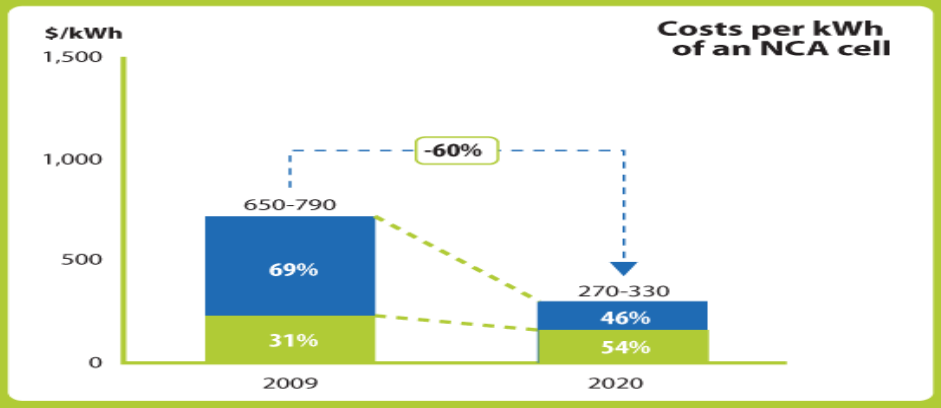
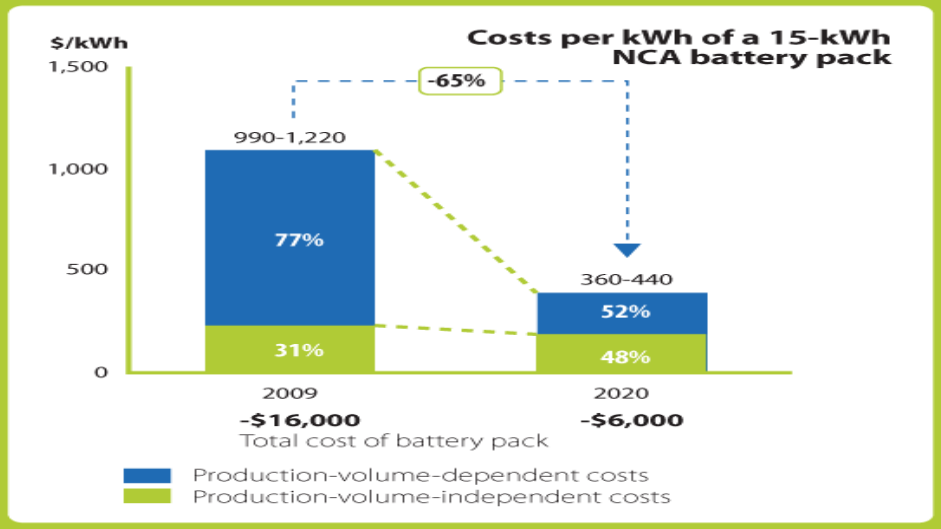
REDUCTION IN FUEL CELL COSTS





Forecast of battery cell price reduction.

Sources: Interviews with component manufacturers, cell producers, tier one suppliers, OEMs, and academic experts; Argonne National Laboratory; BCG analysis.

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THE WORLD'S FIRST PURE ELECTRIC 4x4

- Range – 200 miles (330 km)
- O-60mph circa 7 seconds (0- 100kph)
- top speed 100mph (160kph)
- Largest battery pack ever installed in an EV

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THE UPS AND DOWNS OF INNOVATION

BYD

- Leading Chinese battery-maker.
- Berkshire Hathaway founder Warren Buffett invests US$230M for 10%

Tesla

- Founding Investors:
  - Elon Musk
  - Draper Fisher Jurvetson
  - JP Morgan
- Daimler $50M for 9% stake
- $82.5M series F led by Fjord.
- $465m from DOE
- Toyota buyS $50m during IPO

Project Better Place

- Founded by forme[r] SAP H[ea]d Shai Agassi
- Raised US$700M
  - Israel Corp.
  - Maniv Energy Capi[t]
  - Morgan Stanley
  - Vantage Point

Fisker

- Raises over $178m [b]acked [b]y Kleiner Perkins, Paolo Alto and Qatar inves[t]ors
- Secures $529m loan fr[o]m the DOT

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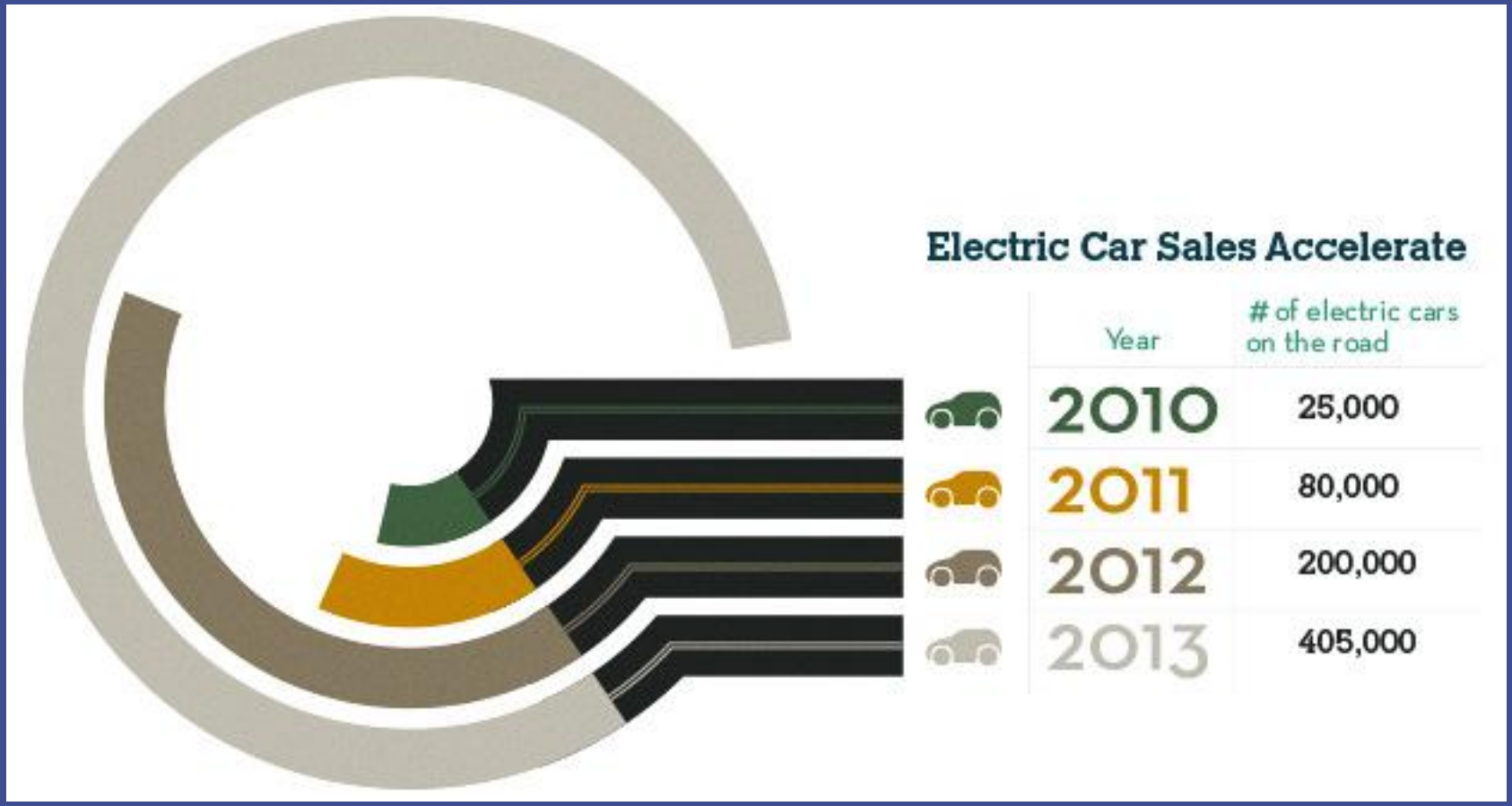
EV SALES



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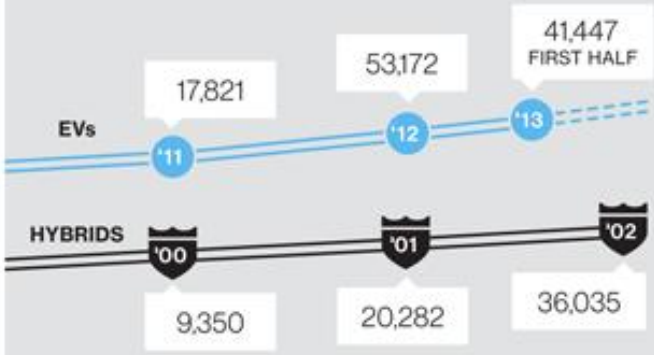
the first three years after their introduction in the U.S. exceeded the number of hybrids sold in their first three years. Last year, 435,000 hybrids were sold in the U.S., or 3 percent of the market.



TOP 5 COUNTRIES FOR EVs

These account for nearly 80 percent of the world's overall stock.

U.S.	JAPAN	FRANCE	CHINA	U.K.
71,174	44,727	20,000	11,573	8,183

1897 *Electric vehicles enter the New York City taxi fleet.*

1888 *German engineer Andreas Flocken builds what is widely considered the world's first four-wheeled electric car.*

1912 *Worldwide electric-vehicle stock reaches 30,000.*

1930s *Electric vehicles are made virtually obsolete by cheap gasoline for cars with internal-combustion engines.*

1997 *Toyota begins selling the Prius, the world's first commercial hybrid, in Japan.*

1996 *To meet California emission standards, General Motors produces and begins leasing the EV1.*

2010 *Nissan releases the all-electric Leaf.*

2011 *Global EV stock hits new peak of 50,000.*

2012 *Global EV stock passes 18*

AVERAGE EMISSIONS PER MILE

Pounds of CO_2

- .87 INTERNAL COMBUSTION
- .62 PLUG-IN HYBRID
- .57 HYBRID
- .54 ALL-ELECTRIC

CHEAPER BATTERIES

Some $8.7 billion in R&D spending by governments worldwide has helped to lower the cost of batteries. That means electric cars can cost less or have longer ranges for the same price.

2008	2012
$1,000 per kWh	$485 per kWh

"HYBRID" refers to vehicles that, like the Toyota Prius, combine an internal-combustion engine with one or more electric motors but do not draw electricity from the grid. "Electric vehicle" refers to both plug-in hybrids like the Chevrolet Volt and plug-in vehicles powered solely by a battery, like the Nissan Leaf.

PERSONAL RAPID TRANSIT (PRT)

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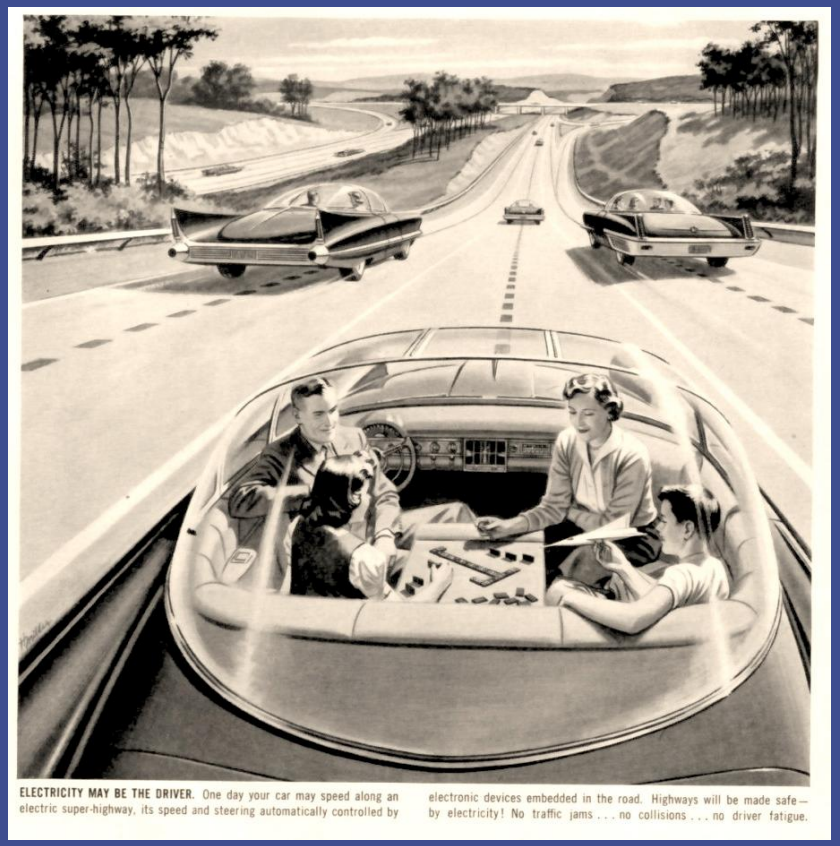
THE DRIVER-LESS CAR



ELECTRICITY MAY BE THE DRIVER. One day your car may speed along an electric super-highway, its speed and steering automatically controlled by electronic devices embedded in the road. Highways will be made safe—by electricity! No traffic jams . . . no collisions . . . no driver fatigue.

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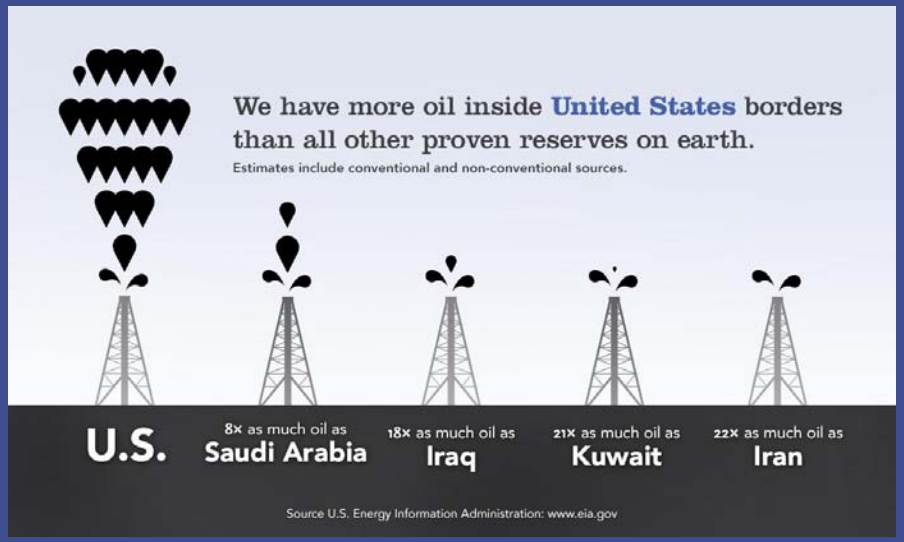
THE CONSUMER?

- 62% concerned about air pollution
- 74% concerned about country`s dependence on oil
- 99.9% - fashion
- 100% - value

CONCLUSIONS

- Fossil Fuels have, and will, dominate
- For who is ‘green’ a priority?
- Can politicians be long-term?



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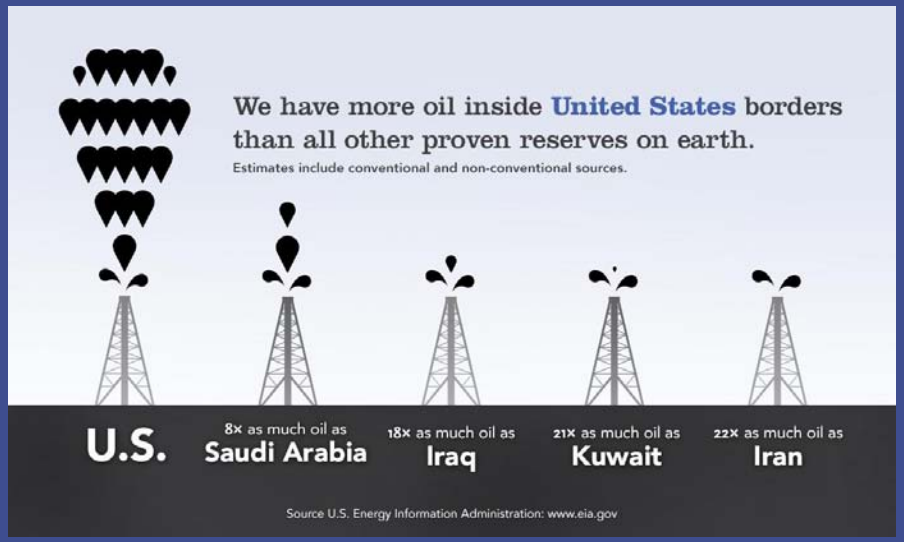

“if it is to be, it is up to me”

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END OF PRESENTATION

合作协议

该合作协议由下列各方于 2010 年 5 月 27 日签署，其目的与目标如下定

(1)甲方：中国电子科技团公司第二十七研究所（下称甲方），所地址：河南郑州市郑东新区博学路 1000 号

(2)乙方：库柏科技（北京）有限公司（下称乙方），公司地址：中国北京市城区新街口外大街 28 号 A 座 212 房。

£30M PLAN TURNS GAS-GUZZLERS INTO GREEN MACHINES

Liberty launches eco Range Rover

Barry Shrier

@Barry_LIQUITY

STRICTLY CONFIDENTIAL

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