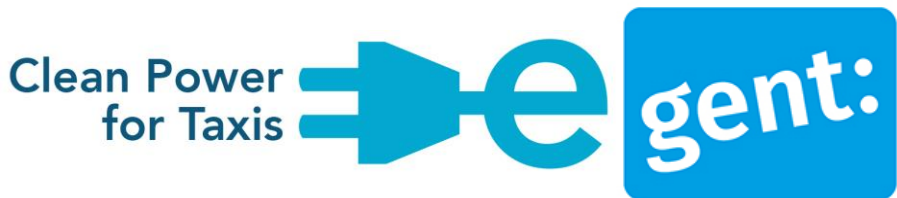


Transitie naar zero-emissie wegvervoer: sneller dan we denken?

Bert Witkamp
Gent, 26 juni 2018



Valuad Sprl – Bert Witkamp: expert consultancy

Energy & Transport Transition - Renewable Energy – Alternative Fuels – Electric Vehicles



IEA HEV Operating Agent Task 40 CRM4EV
Critical Raw Materials for Electric Vehicles



(Project management, Biofuels, Shipping)



Vehicle – 2 – X



Recycling of Rare Earth metals

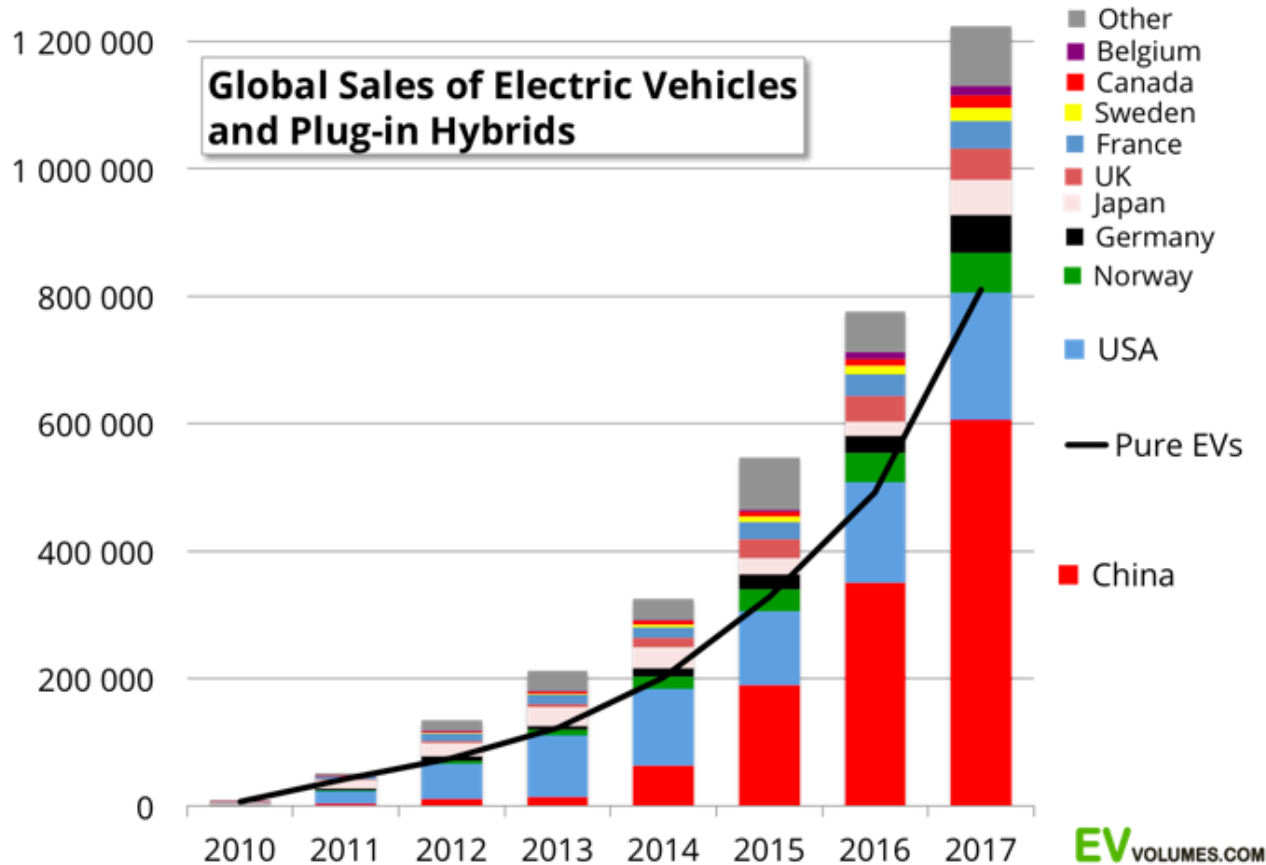
EV Transition: when not if

Where are we today with EV sales?

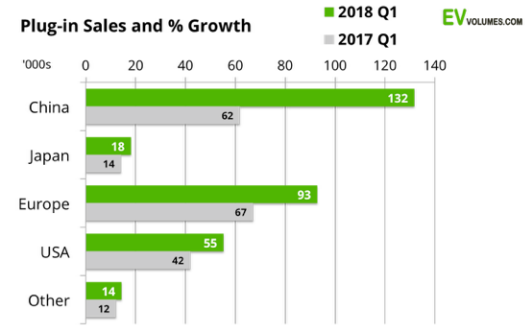
What is driving the transition?

How fast could it go?

Taxi's?



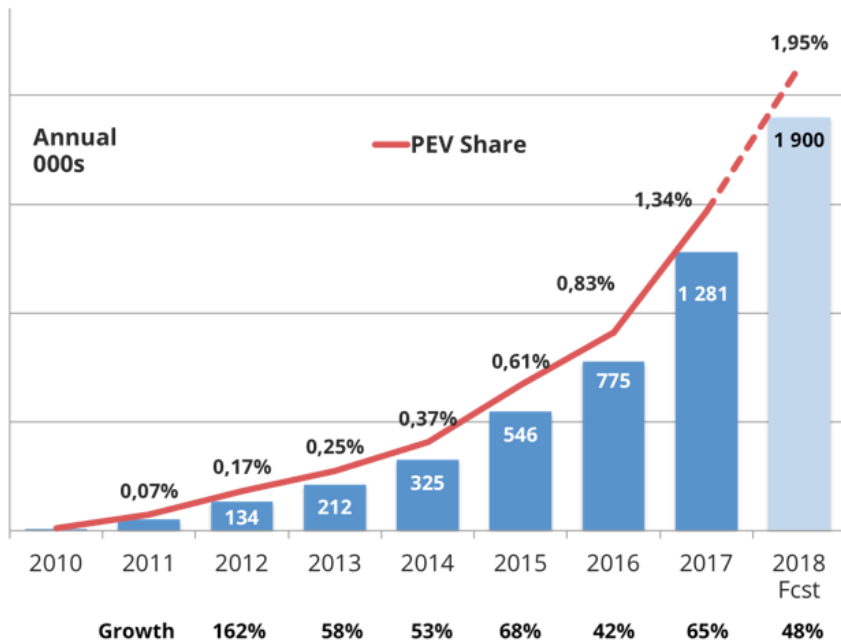
EV growth > 50% per year and China has taken over the lead



2011 – 2017: Global EV growth > 50% per year

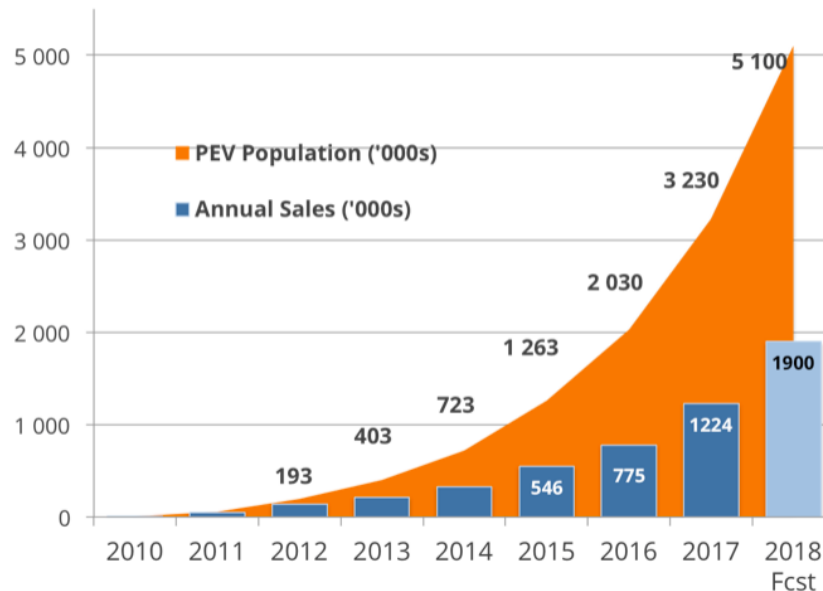
Global Plug-in Vehicle Sales & Share

EV VOLUMES.COM

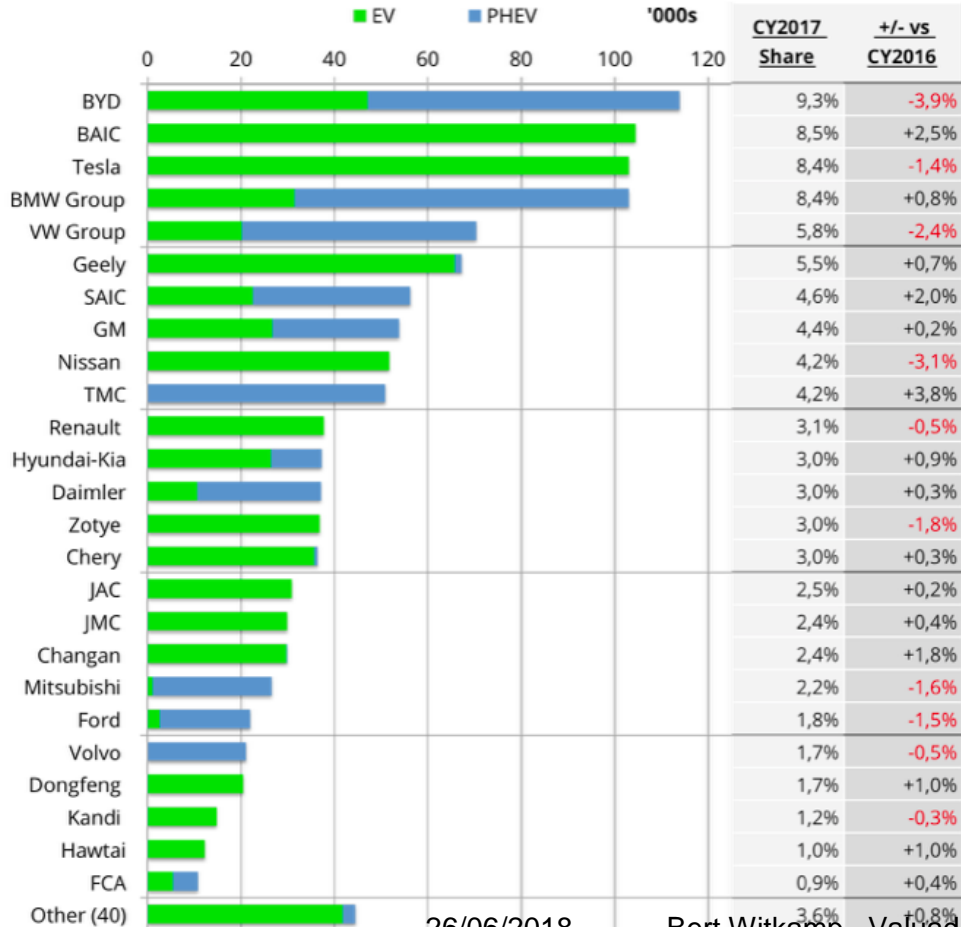


Global Plug-in Vehicle Population

EV VOLUMES.COM



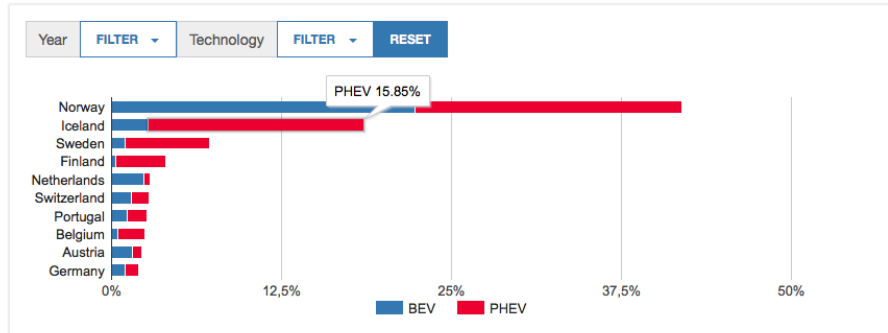
Global Plug-in Volume 2017 by Make



Who is making the EVs?

Market (share) development Europe 2008 -

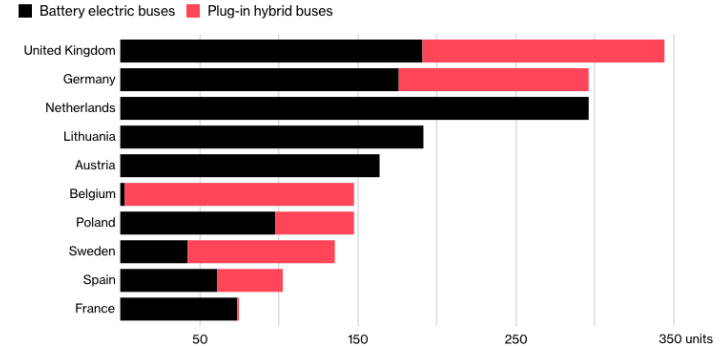
Top 10 PEV (M1) market share Countries in Europe



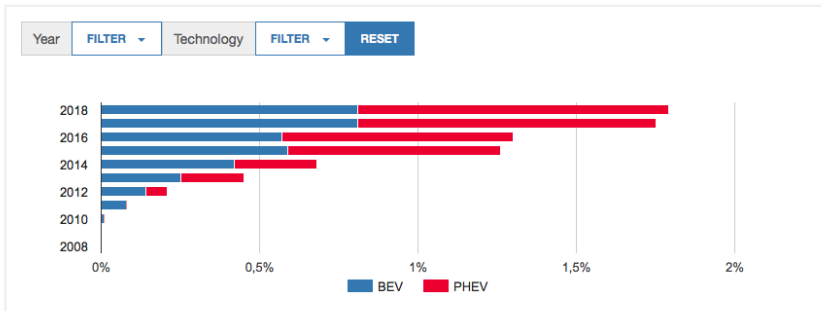
Ramping Up

Top-10 European electric bus fleets, 2017

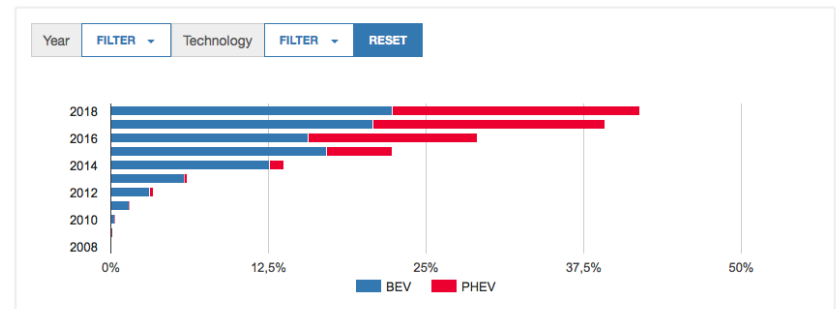
Source: BNEF



PEV (M1) market share in Europe

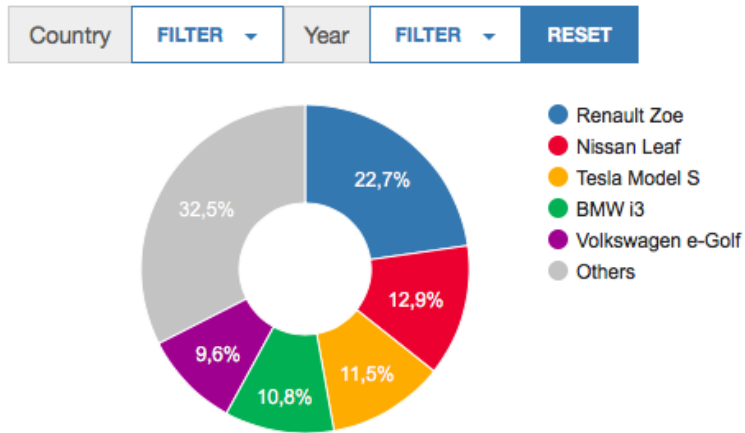


PEV (M1) market share in Norway

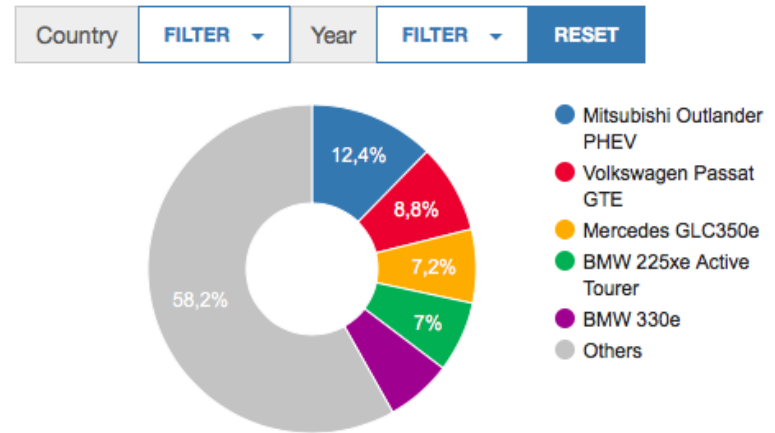


European EV sales come from just a few models....

 Top 5 selling BEV

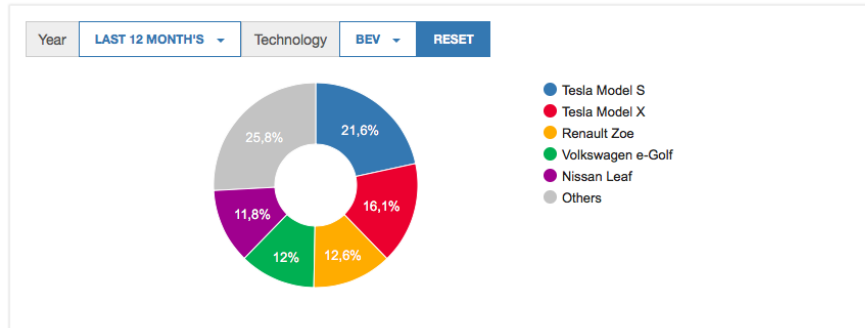


 Top 5 selling PHEV

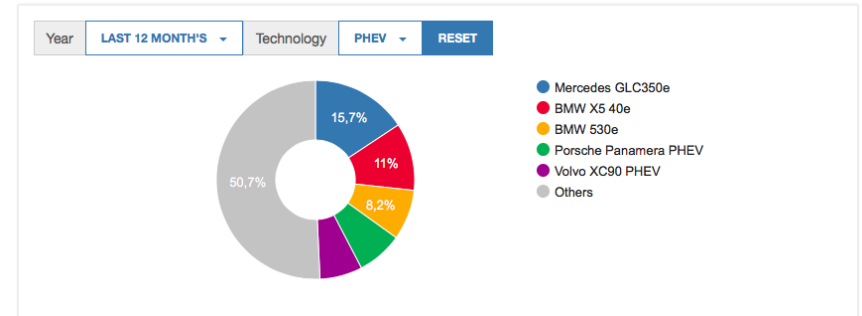


Belgium: EV sales growth and models

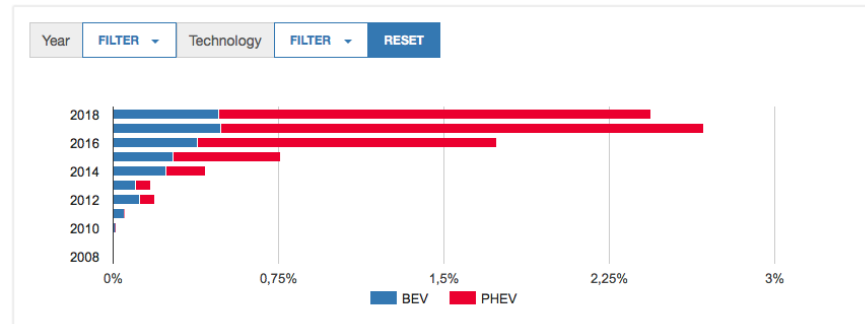
Top 5 bestselling PEV models (M1) in Belgium



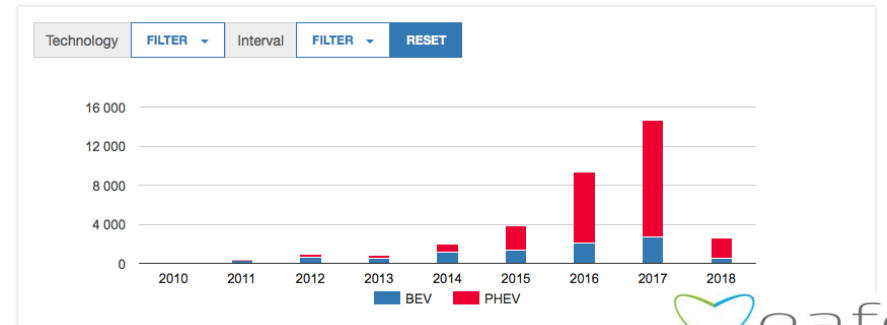
Top 5 bestselling PHEV models (M1) in Belgium



PEV (M1) market share in Belgium



PEV (M1) new registrations in Belgium



26/06/2018

Bert Witkamp - Valuad

Large Luxury Car Sales (Q1 2018, USA)

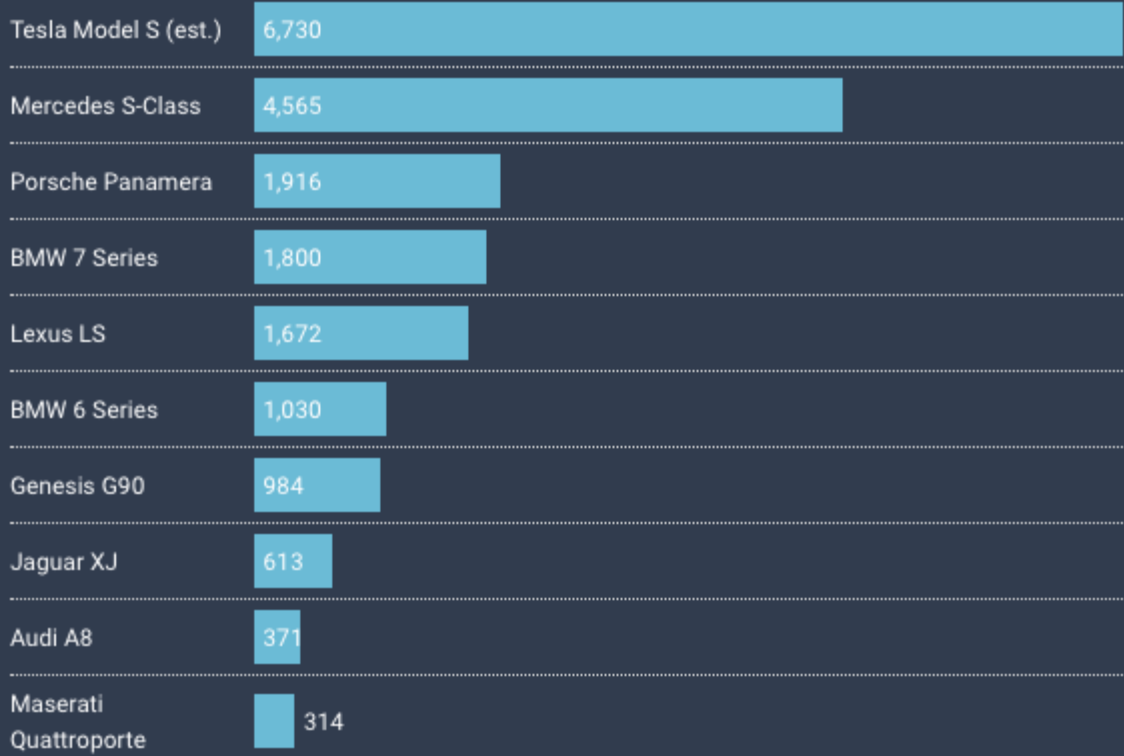


Chart: CleanTechnica · Source: CleanTechnica & Good Car Bad Car · Created with Datawrapper

Factors influencing current EV penetration

- Financial competitiveness with comparable ICE vehicles
 - Purchase price (consumers)
 - Total Cost of Ownership (fleets, company cars, consumers)
 - **(Lack of) Availability of EV models**
 - At vehicle category level
 - Physical availability at distributors level
 - Consumer knowledge, publicity
 - Non-financial incentives (parking, bus lane,..)
 - Charging infrastructure (availability)
- ✓ **Performance (range, driving)**
✓ **Driving experience**
✓ **Environmental impact**

Delivery times Germany

BMW i3: 2-3 months
Hyundai Ioniq: 1 year
KIA Soul: 6 months
Nissan LEAF: 1 year
Renault ZOE: 4 months
Smart: 1 year
VW e-UP!, e-Golf: 8 months
Tesla Model S/X: > 4 months
Tesla Model 3: N.A.
GM Bolt: N.A.

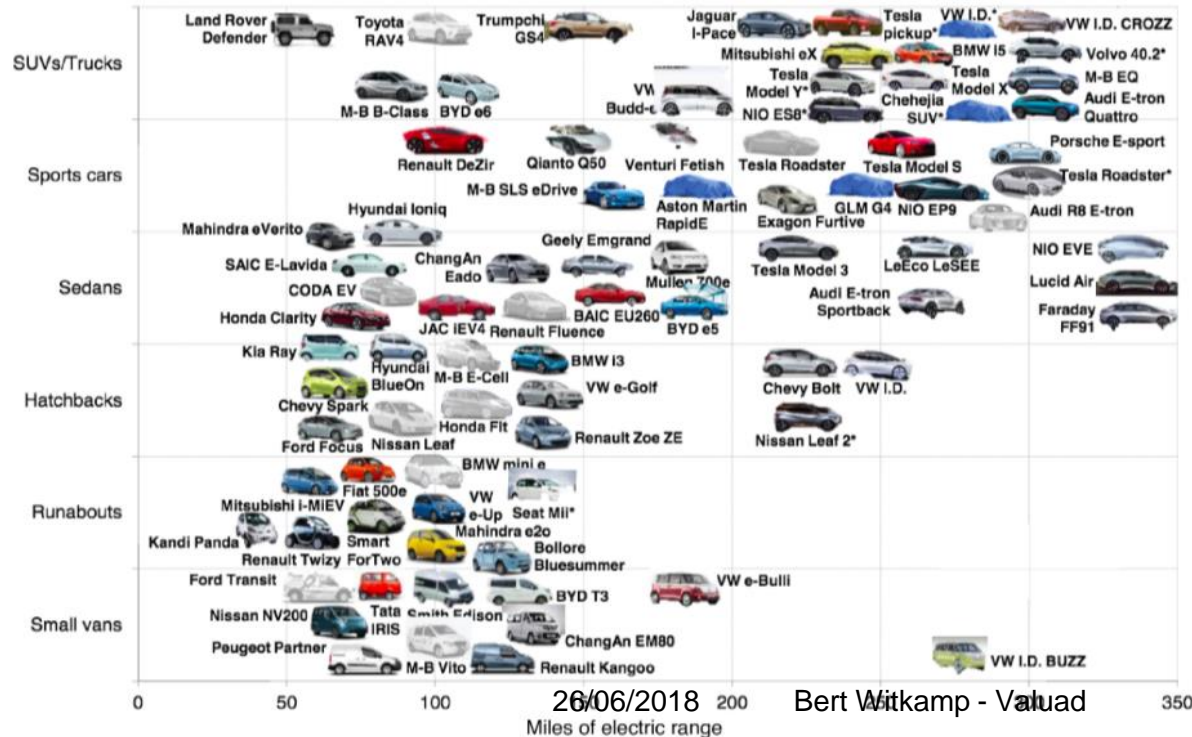
**Norway: 20,000 orders Hyundai Kona:
5,000 in 2018, rest in 2019, 2020....**

2018: The outlook for EV's has never been so good

Norway EV close to 50% new car sales = mass market

Electric-Car Boom

Models by style and range available through 2020and many more in China..



Key issues next 5 years:

- Cost
- e-range
- EV models
- Infrastructure

E-mobility as a main solution for decarbonization of transport: A fantasy only one or two years ago is becoming mainstream thinking

- ✓ **EVs lower cost than ICVs by 2022 -2026**
- ✓ **Fast Charging @ 350+ kW in 2017, 400 locations in Europe in 2020**
- ✓ **Range 300 - 500 km+ for midsize cars**

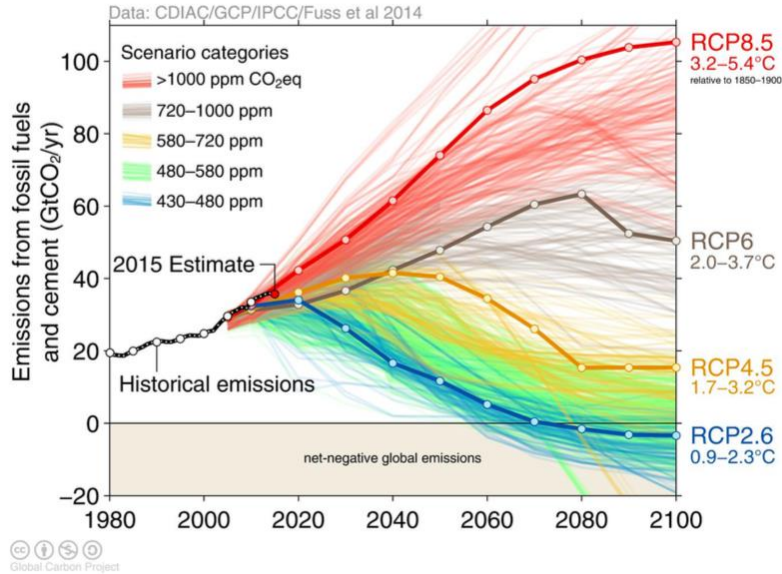
Consensus: « not if but when is the transition happening »

DRIVERS FOR THE TRANSITION

CLIMATE CHANGE – AIR QUALITY – INDUSTRIAL POLICY

1 GOVERNMENT POLICY

The COP21 commitment: what we need to do



Over 1000 scenarios from the IPCC Fifth Assessment Report are shown
Source: [Fuss et al 2014](#); [CDIAC](#); [Global Carbon Budget 2015](#)

1.5 C implies:

- *Emissions peak in 2020*
- *Zero carbon in 2070*
- *Developed countries zero carbon in 2060*

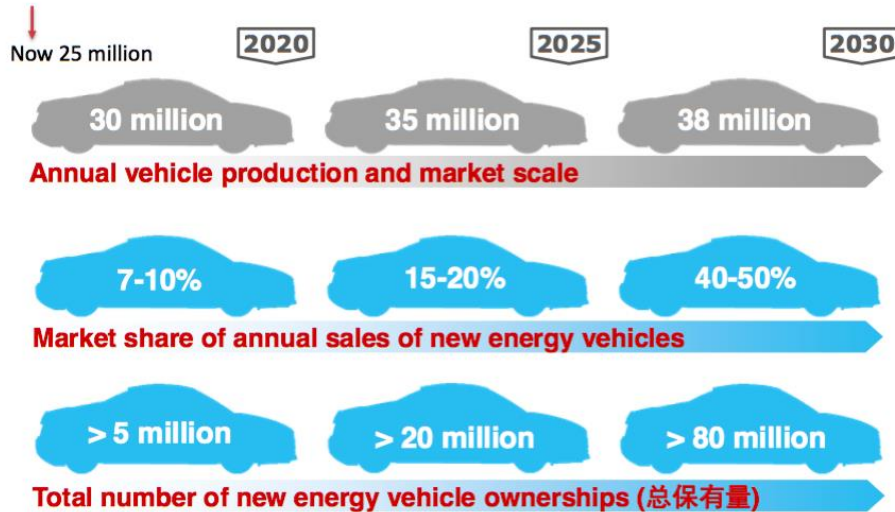
• ZERO CARBON ROAD TRANSPORT IN DEVELOPED COUNTRIES BY 2050

➤ **We can expect that EU target will get more ambitious in timing and decarbonization level**

Countries start to plan the time of the transition

Market size and new energy vehicles

《节能与新能源汽车技术路线图》
内容主旨发布



Transition to ZEV (cars) *Europe becomes follower*

Norway:	2025
UK:	2040
France:	2040
Ireland:	2035?
Netherlands:	2030?

Transition to EVs is becoming a national INDUSTRIAL policy !.....

WITHIN 5 YEARS: YOUR ARE IN OR OUT

2 INDUSTRY DRIVEN CHANGE

OEM statements on price parity: ICE - EV

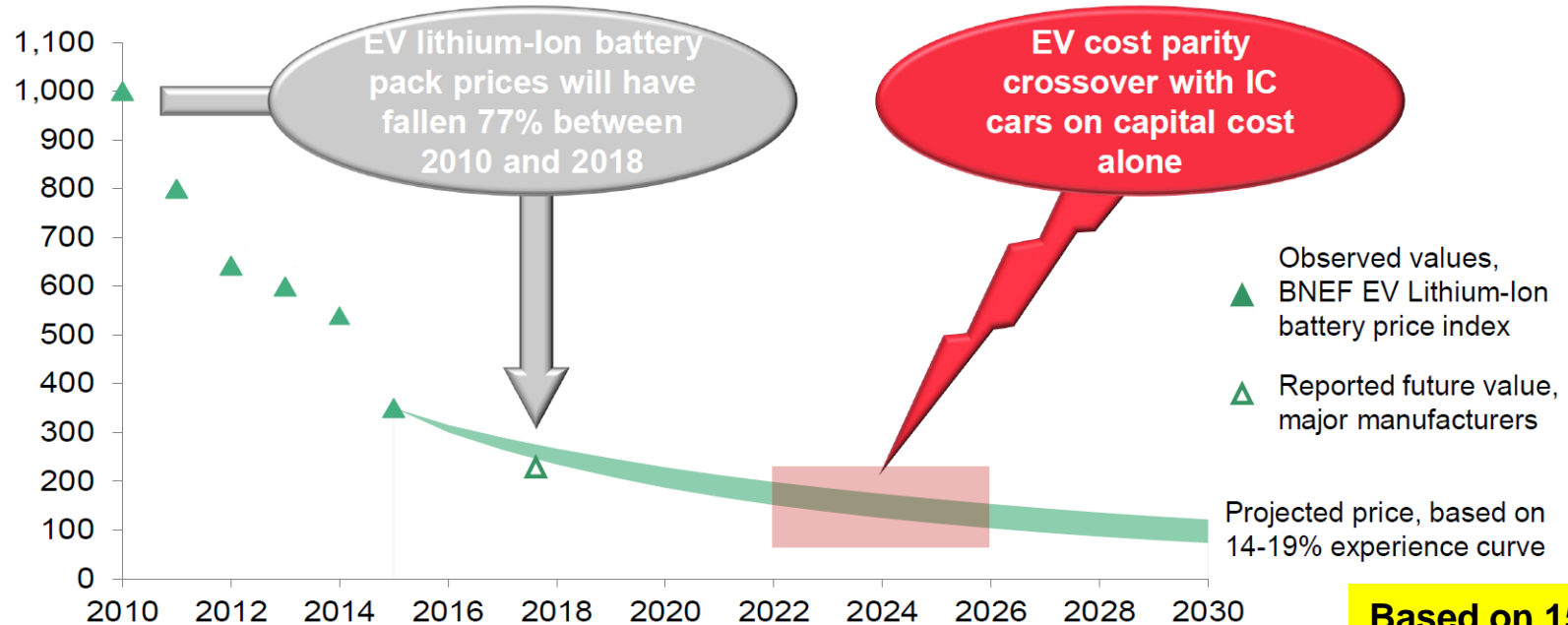
Renault's head of electric vehicles believes EVs like the ZOE will cost about same as similarly sized, conventionally-powered cars by the year 2020. Gilles Normand, senior vice-president for electric vehicles at Renault, he believes that as more manufacturers and suppliers invest in battery development and manufacturing, the prices of EVs will take only a couple of years to reach the same level as petrol-engined cars. Speaking at the Financial Times Car of the Future Summit in London, Normand said, "We are moving faster than we expected. When we introduced the first ZOE back in 2012, we didn't think the new battery capacity would come in 2016; we expected it by 2018. "So we mustn't forget that the prices of combustion-engine cars will go up, and EV prices will come down. If you go for B-segment [cars like the Ford Fiesta], **by early next decade we consider the prices of EVs will be on par with combustion-engined cars** (quote from AutoExpress, May 10th, 2017).

At a press conference in Wolfsburg, **VW** confirmed its intention to bet heavily on electricity. **Volkswagen** announced **the real revolution is to come in 2020.** That's when the new platform MEB will be launched. Especially developed for electric vehicles with an estimated **range between 400 and 600 km.** It will underpin four models: the **I.D. which will cost about the same as a Golf diesel** (quote from Gopressmobility, May 8th, 2017).

In the German language "bimmertoday.de", May 8th, 2017 it was reported that **BMW** engineers at the Vienna Motorsymposium have stated that **by 2020 BEVs will be offered at the same price as gasoline cars from the same segment.**

"We see this tipping point happening around 2025. By then for the customer to buy petrol or EV it will be practically same cost," Nissan Executive Vice President Daniele Schillaci said. **"And then ... if you have the same price for EVs and petrol why would you buy traditional technology?"** (Tokio Motor Show, October 2017, Reuters 25-10-2017).

Towards cost parity at vehicle level: 2022 - 2026



Based on 15,000 km per year

Note: Forecast range based on a learning rate of 14-20%. EV cost parity is calculated on an unsubsidised total cost of ownership (TCO) basis. Date range reflects cross over with different vehicle classes in the US.

Source: Bloomberg New Energy Finance. EV lithium-ion battery price index

Tesla battery data shows path to over 500,000 miles on a single pack



Musk: "we want drive units that just never wear out" – Tesla targets powertrains lasting 1 million miles

Electric Vehicles:
Outperform ICVs
Outlast ICVs
Lower maintenance
*Lower energy cost**

Who is going to manufacture the vehicles of the future?

Multi-trillion \$ industries start investing: IT/Internet/Electronics, Chemical, Power, Automotive

OEM's ? They should, but can they adapt fast enough?

- ✓ Tesla (like start ups)
- ✓ BYD, Geely, Foxconn,...
- ✓ Google
- ✓ Apple
- ✓ Tata, Mahindra

Other “digital”, consumer goods or industrial goods manufacturers....?

Combinations of any of these?

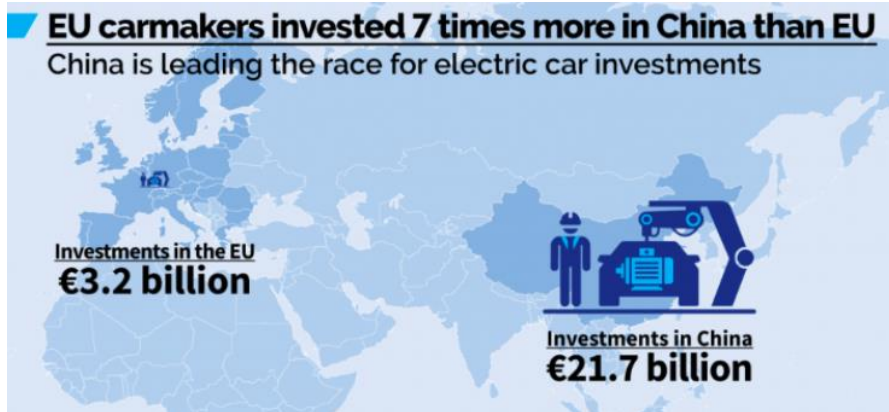
Many, many small companies (Light Electric Vehicles!)

Demographics: volume goes to Asia

Geely has bought Volvo cars, has taken 10% stake in Daimler

Manufacturing of EV's : easy, low cost, small scale and low entry barriers!

Where are the cars of the future going to be build? ...and by whom??



Source: Transport & Environment

- **Very limited investments in Europe by OEMs in EV production....**
- **Limited model availability in Europe**
- **EV difficult to see, try and buy in Europe**

Volkswagen, announced an investment of €15 billion in electric and autonomous vehicles in China by 2022, part of which will be met via a new joint venture with Chinese firm Anhui Jianghuai Automobile (JAC).

Nissan has pledged €8 billion as part of a joint venture with Renault and Dongfeng

Daimler AG teamed up with China's BAIC in a venture worth €1.6 billion to expand the production of Mercedes-Benz EVs to a new facility in Beijing.

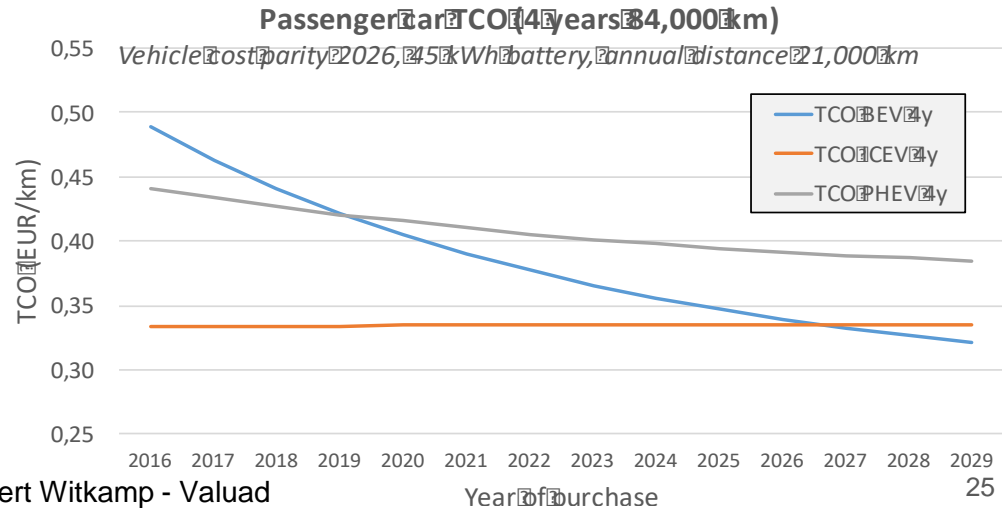
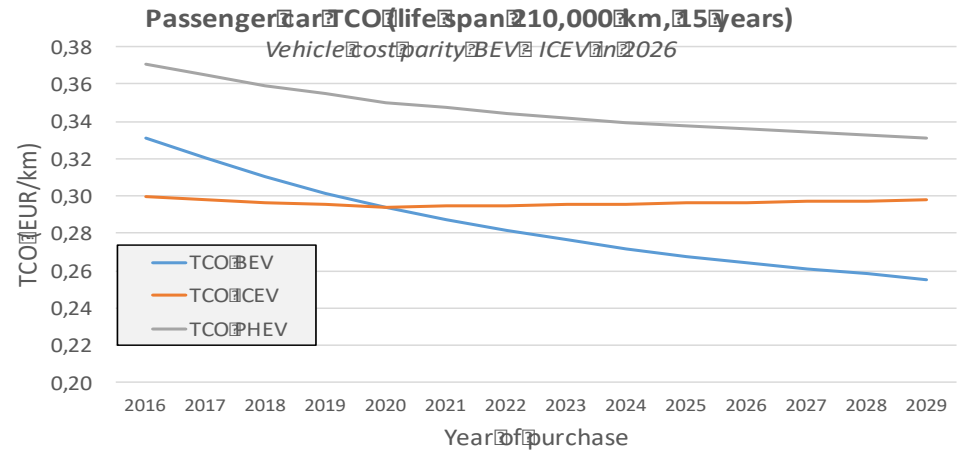
DRIVING EXPERIENCE - LOWER COST OF OWNERSHIP -
ENVIRONMENTAL

3 CONSUMER DRIVEN CHANGE

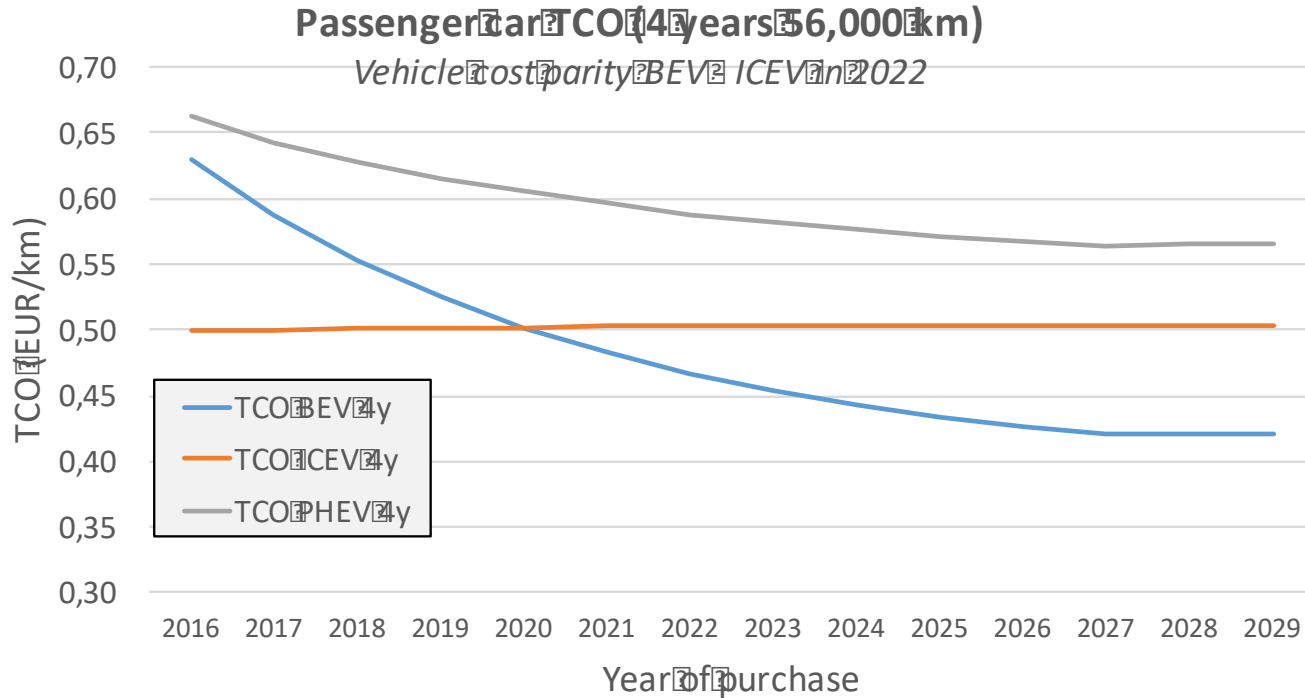
The transition to a Zero Emission Vehicles fleet for cars in the EU by 2050

Pathways and impacts:

An evaluation of forecasts and backcasting the COP21 commitments



TCO for EV « company cars » competitive within years



At a certain moment, people will not buy old technology anymore , especially young people !

People love EV's 😊

From “policy driven” to “market pull” within a decade ?!

CONCLUSIONS FROM THE EAFO LITERATURE REVIEW ON ZEV SALES FORECASTS

The literature forecast data by experts over the past years for the coming decades is much lower than the current ambitions of ZEV Leader countries as well as the stated targets for ZEV sales by OEMs.

- **Policy makers and other decision makers would be prudent to prepare for significantly faster ZEV market growth than what experts predict what will happen.**
 - **The risk of being too pessimistic may be bigger than the risk of being too optimistic**

TRANSITIONS TO RENEWABLE ENERGY AND ELECTRIC
VEHICLES ARE COMPATIBLE AND REINFORCE EACH OTHER

4 RENEWABLE ENERGY

Two disrupting industries reinforcing each other

Automotive Industry

Transition to Electric Vehicles:

- Energy Storage capacity through Electric Vehicles
- At near zero incremental cost
- Cars increasingly connected & smart


Power Industry

Transition to intermittent renewables sun & solar:

- Decentralised production
- Increasing need for energy storage
- Grid increasingly connected & smart

Value creation from the EV battery

Interreg 
North Sea Region
SEEV4-City
European Regional Development Fund

 Amsterdam University
of Applied Sciences

AVERE
The European Association
for E-mobility

KU LEUVEN



AMSTERDAM
Arena

× City of
× Amsterdam

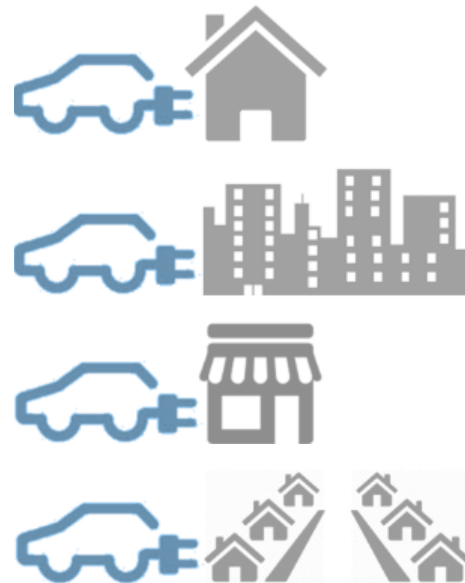
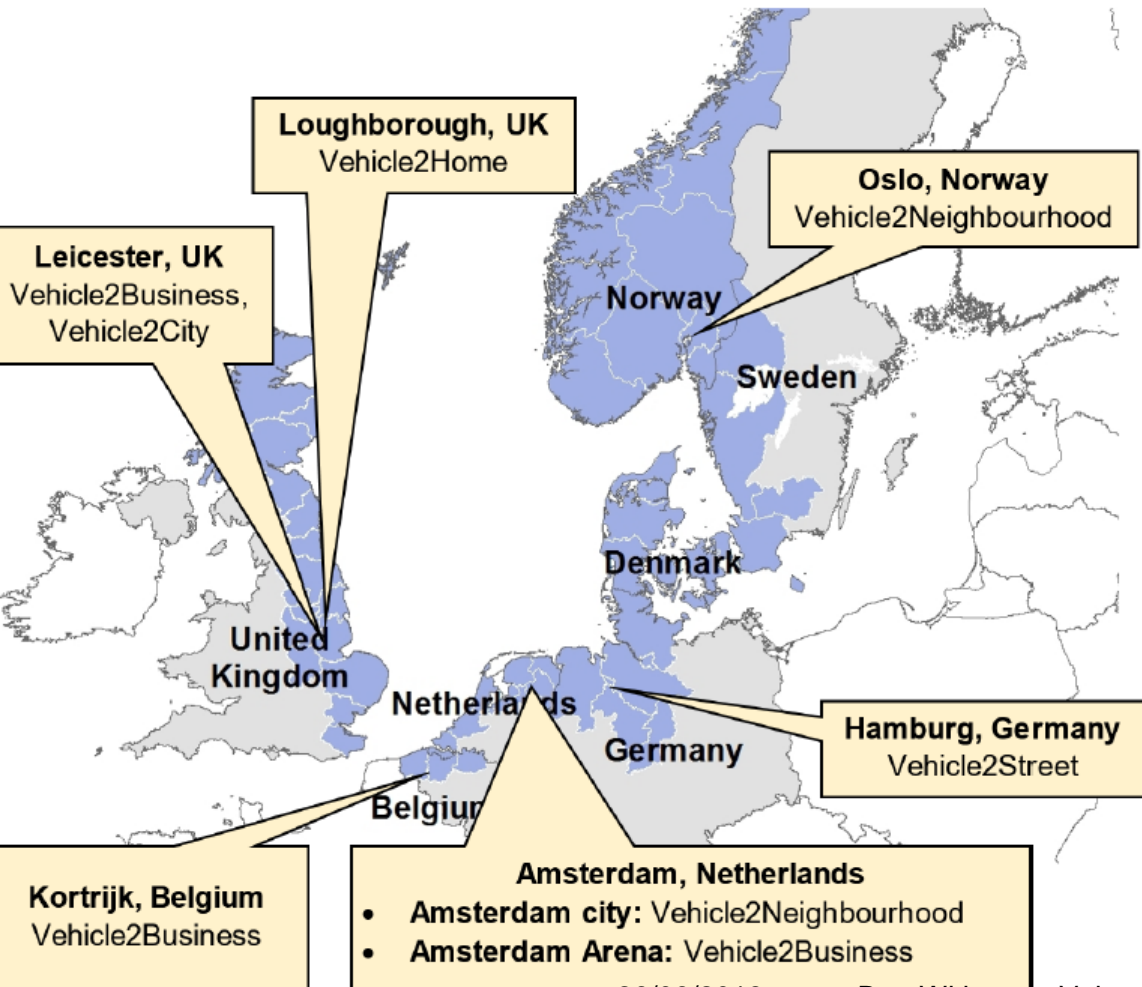

northumbria
UNIVERSITY NEWCASTLE

SEEV4City Smart, clean Energy and Electric Vehicles 4 the City

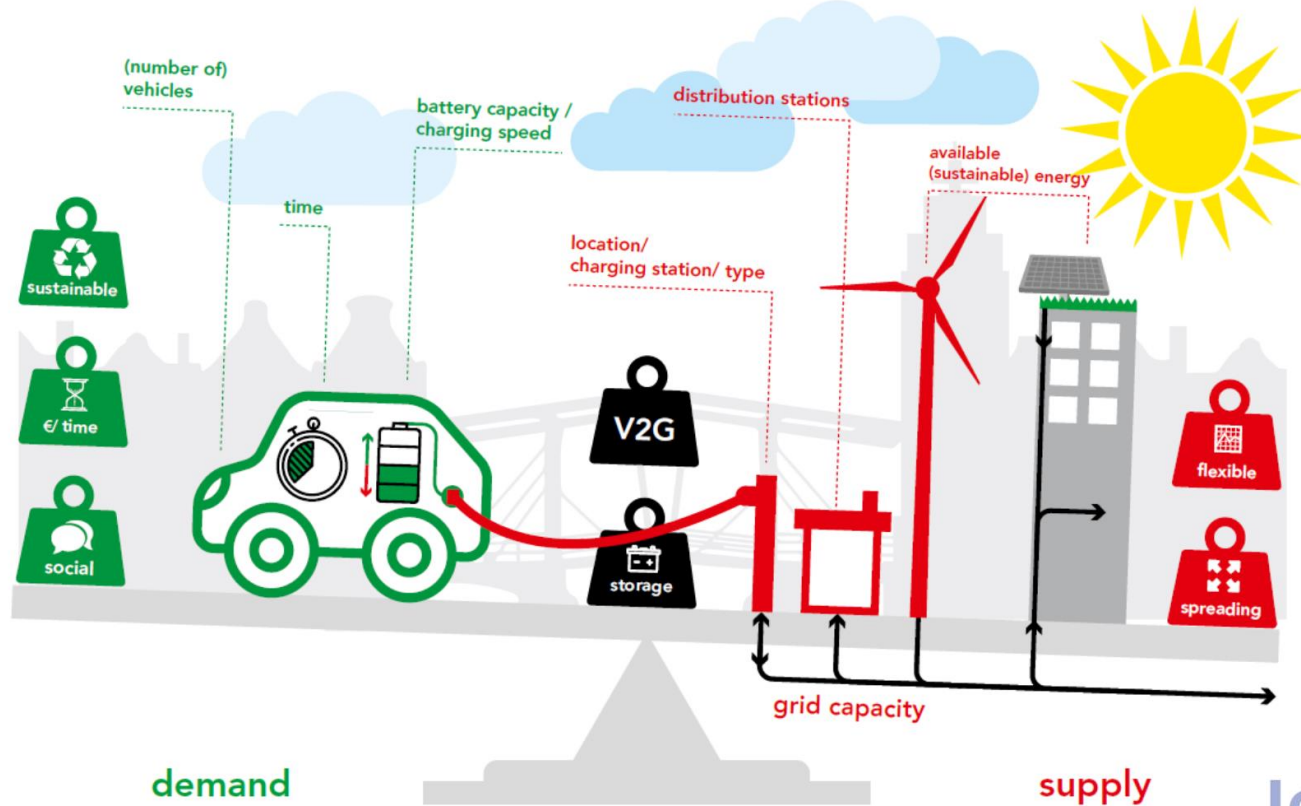
State of the Art report/
Point of Departure



Interreg 
North Sea Region
SEEV4-City
European Regional Development Fund



Amsterdam city pilot: future proof EV-Energy system



Amsterdam ArenA pilot project

Amsterdam ArenA

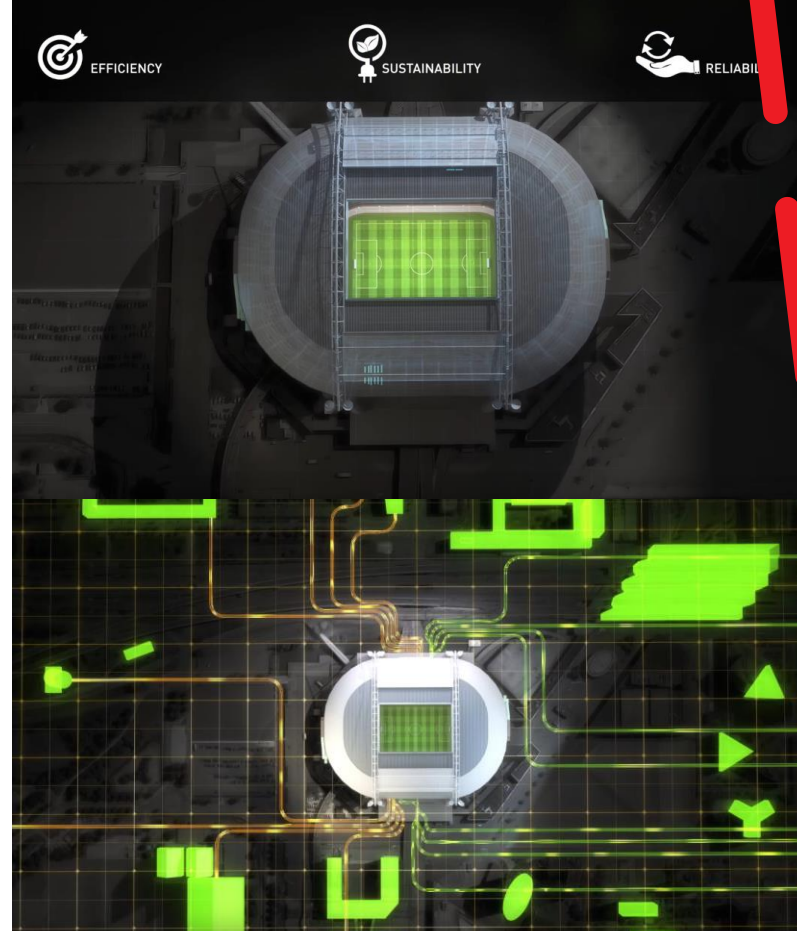
Project Drivers

- Efficiency
- Sustainability
- Reliability
- Future Proof
- Innovative

4 MWh battery storage
(1200 car batteries)

Revenue Drivers / Services

- Backup (replacing diesel generators)
- Peak Shaving
- Grid Stabilisation Services (4 MW)
- Vehicle to Grid Solutions
- PV Integration (ArenA rooftop)
- Charging Station Integration
- Load Management



Pilot Vulkan Oslo: multi-story EV parking

Opened March 6th, 2017

Objective grid optimization, getting best value for money

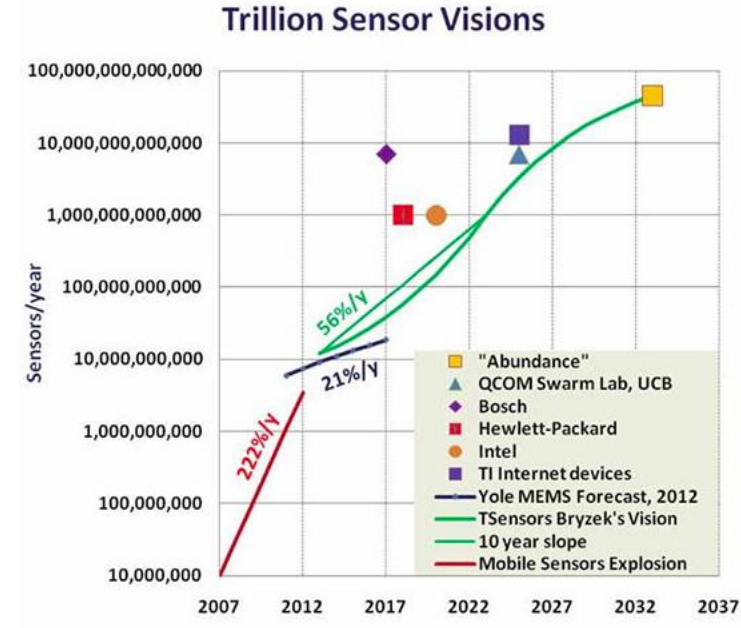
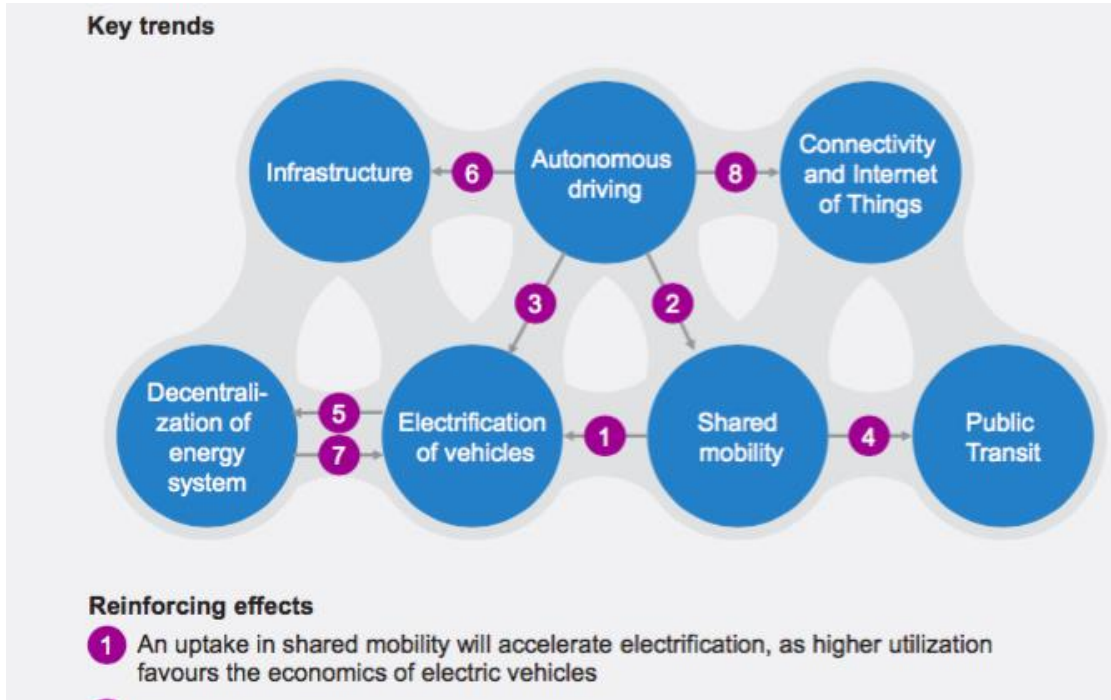
« How to integrate housing (apartments) and transportation »?

- 104 chargers parking garage (incl. 2x2 fast chargers, 150kW « ready »)
- Day time professional users such as taxis, this will replace ICE taxis, evening free EV parking for residents
- Battery storage for peak shaving, smart meters,



5 AUTONOMOUS DRIVING

Autonomous & electric = reinforcing transition



Autonomous Electric Vehicles (AEV): *what will this change in cities (OECD study)?*

Similar mobility with 10% of the cars and much lower cost

**Shared AEVs + high-capacity public transport replaces all cars,
taxis, buses**

Congestion at peak hours decreases

**Reduced parking needs will free up significant public and private
space (*up to 80% of off-road parking*)**

Hyperdrive

Electric Black Cabs Are Taking Over in London

The six seater has wifi, air conditioning, a glass skyroof and no smelly diesel fumes.

- **LEVC's taxi allows for a range of over 650 km, including over 120 km using battery power.**
- **50kW rapid charge, the battery powers up to 80 percent in 25 minutes.**
- **Option for a range extender to charge the battery while driving.**
- **LECV says driving a TX taxi equates to £100 in fuel cost savings per week.**



Robertson charges his TX City London taxi. Photographer: Luke MacGregor/Bloomberg



LONDON'S ELECTRIC TAXI

In 2018 new taxi's will be electric cars



0:03 / 2:16



City policies Electric Taxis

- TfL (Transport for London) has committed to installing 150 rapid charge points for taxis by the end of 2018.
- LEVC opened a £325 million plant in Coventry where the electric taxi is being manufactured.
- The taxis are on sale now in London, and will roll out to overseas markets in early 2018. The Netherlands has already ordered 225 vehicles.
- 9,000 Electric Taxis in London by end 2020
- Oslo: dedicated fast chargers for taxis, priority for electric taxis in waiting line



Amsterdam elektrisch



Subsidie en opladen

- > Subsidie voor elektrische voertuigen
- > Openbaar oplaadpunt aanvragen
- > Kaart oplaadpunten
- > Opladinstructie elektrische auto
- > Wat voor stroom komt er uit de openbare laadpalen?

Elektrisch parkeren

- Met een elektrische auto krijgt u voorrang op de wachtlijst voor een parkeervergunning.
- > Parkeervergunning elektrische auto aanvragen - voor bewoners
 - > Parkeervergunning elektrische auto aanvragen - voor bedrijven
 - > Regels elektrisch parkeren

Voor professionals

- > eRVV-ontheffing
- > Open dataset oplaadpunten
- > Filmpje: optimizing charging infrastructure
- > Project IDO-laad
- > Infographic: oplaadupdate Amsterdam (PDF, 776 kB)
- > Datakaart Amsterdam elektrisch (2014) (PDF, 1,6 MB)

Meer

- > Vakblad Plan Amsterdam themanummer over elektrisch vervoer
- > Logo Amsterdam elektrisch
- > Contact
- > Nieuwsbrief
- > Twitter
- > Facebook
- > Beleid: Verkeer en vervoer

What does a London taxi driver say?

It takes a lot to impress a London cabbie, but as Neville Robertson pulls up to a sea of taxis at a stop light next to Buckingham Palace, he's the center of attention. The driver next to him winds down his window and shouts, **“you like it?”** Robertson, 53, knows what he's asking about. **“It's good!”** he answers. He gets a skeptical grimace in response. The drivers are so interested in Robertson's car because they know it's their future. Robertson's is one of the first vehicles delivered to meet the city's decree that all new taxis have to be electric. **It's a TX City, built by the London Electric Vehicle Company, a subsidiary of China's Geely Automobile Holdings Ltd. There are 34 on the road at the moment, with 20 a week rolling off the line.**

“It's quite a nice effect at night,” says Robertson, who has been a chauffeur for 30 years. “It will be excellent for the Christmas lights.” **When Robertson pulls away, you notice the other difference. London black cabs are loud. Even when they're not moving, you can hear their diesel engines chug away. The new taxi isn't just quiet, it's silent.** There aren't many more ways to describe the total absence of noise, but try this: At one point as we drove past St James's Park, I swear I heard birdsong.

During my passenger experience, I met John Dowd, a taxi driver with nearly a decade of experience. Six weeks ago, Dowd began to test out LEVC's new zero-emission taxi on his route. **He says he's been blown away by the driving experience in comparison to his regular diesel cab. "The driving position, the power, the silence, the smoothness of the delivery and just the ease of use is just incomparable with anything I've ever driven before,"** Dowd says. "Navigating traffic on London's roads, it's a piece of cake. It's easier." He says the experience has changed his perspective. "When I got into [my diesel cab] and started it up, I couldn't understand what had happened. It was like getting back into a tractor," Dowd says. **"Talk about coming back down to earth with a bang! It was just a vast, vast difference."**

“And then ... if you have the same price for EVs and petrol why would you buy traditional technology?”

*Nissan Executive Vice President Daniele Schillaci
(Tokio Motor Show, October 2017, Reuters 25-10-2017)*

So: who knows how rapid the transition will go???

But: are we prepared for a possible FAST transition???

Thank you for your time!

For inquiries, please contact:

Bert Witkamp

b.witkamp@valuad-expert.com

+32.470.17.26.36

