Will Automotive be the Future of Mobility?

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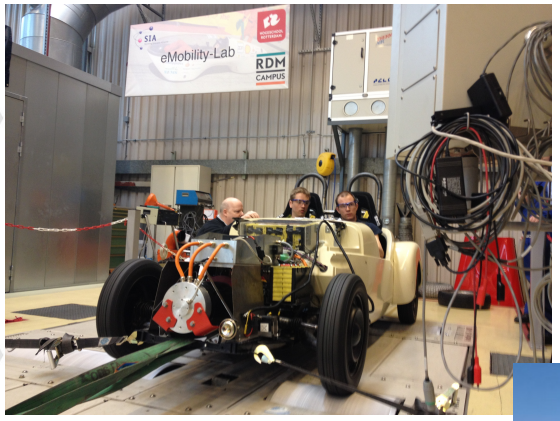
OUR DRIVE TO THE FUTURE
ELECTRIC VEHICLE SUMMIT 2017

Electric Vehicle Summit 2017, October 4th 2017, Dublin

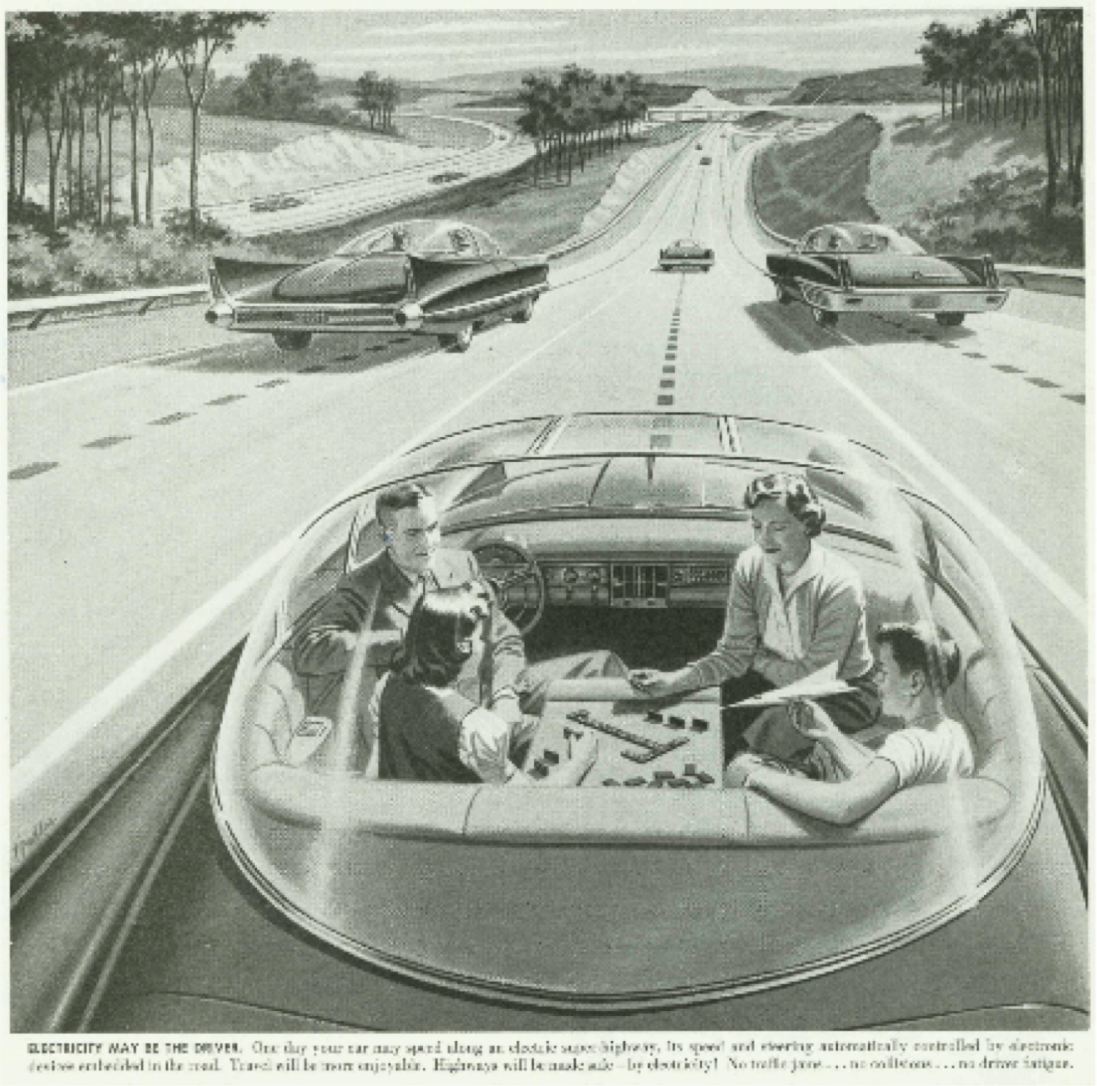
The European Association for Electromobility

Smart e-Mobility at RDM

ROTTERDAM UNIVERSITY
UNIVERSITY OF APPLIED SCIENCES



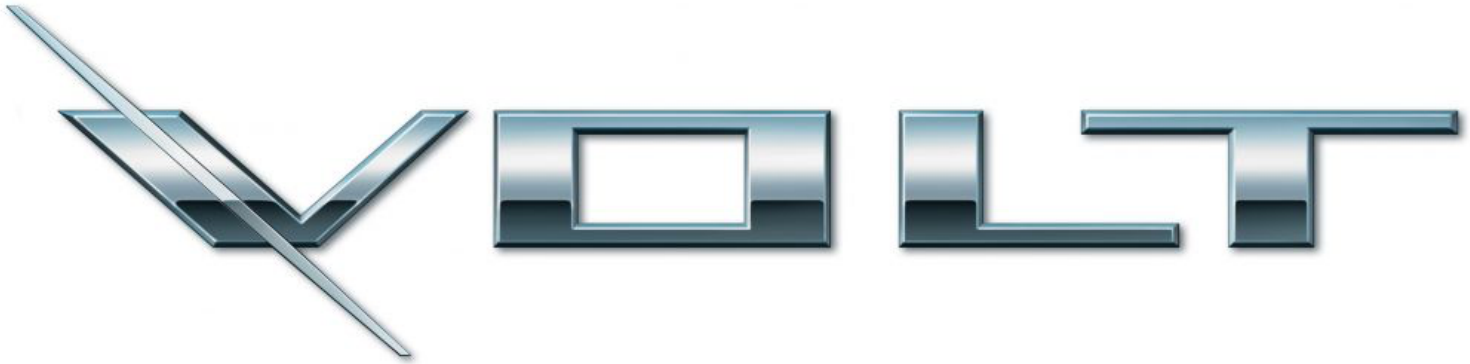
Future Mobility



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. Travel will be more enjoyable. Highways will be made safe—by electricity! No traffic jams . . . no collisions . . . no driver fatigue.

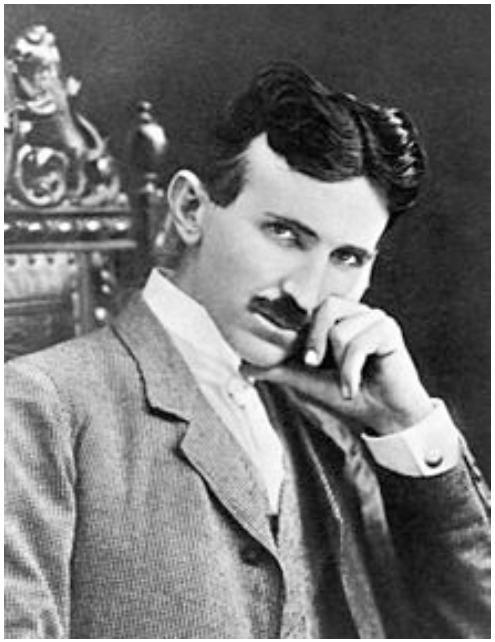
https://www.youtube.com/watch?v=Rx6keHpeYak

Who are they?



Alessandro Volta (1745)

Nicola Tesla (1856)

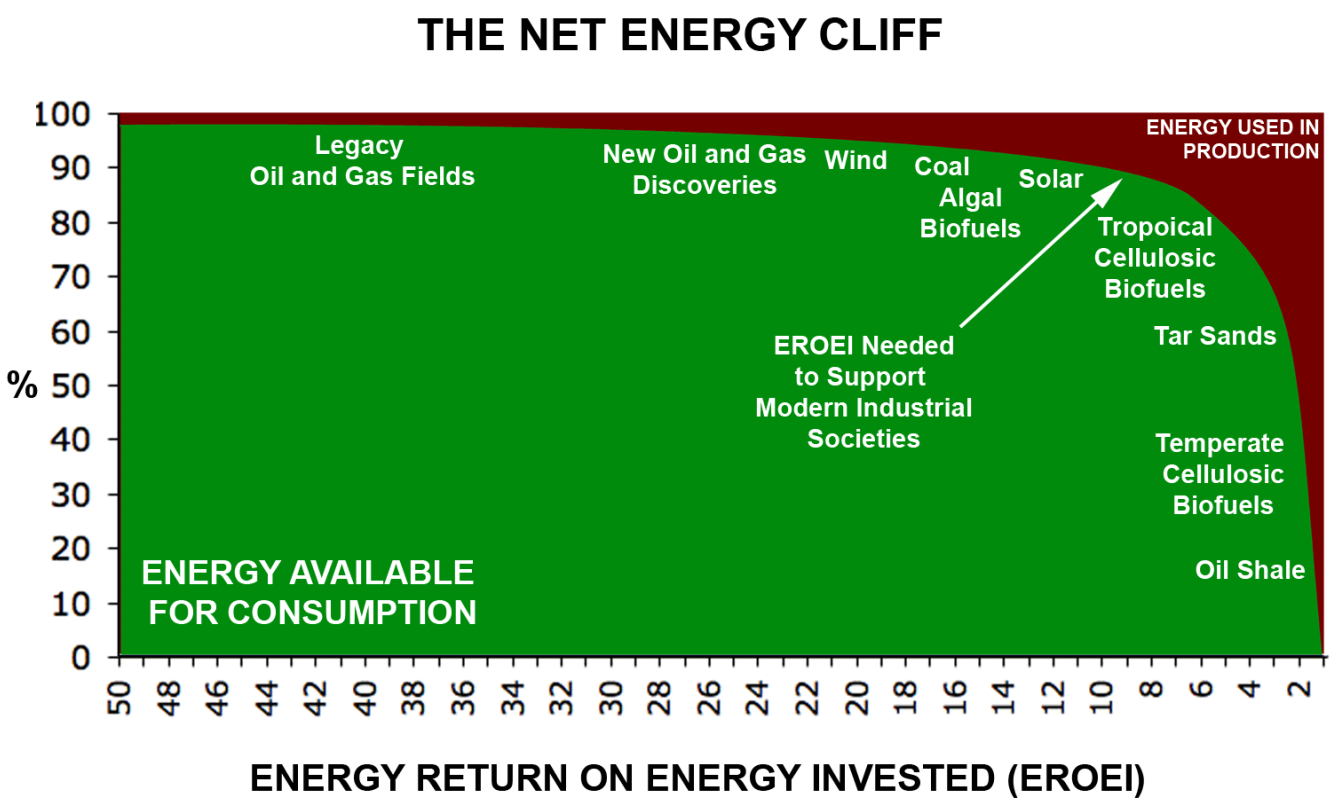


TESLA

Energy Transition

Fossil versus Renewable

Energy Cliff



There is no single solution

Systeem	Range	Charge	Cost	Emissions	Human
Battery-Electric system	Fair 300 km ⇑	Bad 3 uur ⇓	Good	Good	RA
Electric with range extender	Good 900 km	Good 10 min.	Fair cost ⇓	Fair	FA
Fuel Cell-Electric system	Good 900 km	Good 10 min.	Bad cost ⇓	Good	NA

‘Horses for Courses’

NICOLA (2016)

Will Automotive be the future of Mobility?

- Based on the ‘traditional’ values of *individual freedom* and *maximum flexibility*
- Major positive disruptive technologies will consolidate the automobile to be the preferred choice for mobility of persons and goods

1. Electrification
2. Automation
3. Connectivity

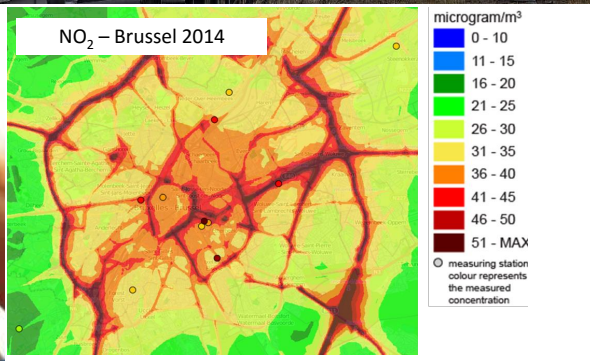
Global Automotive Executive Survey, KPMG 2017

Regulatory pressure pushes awareness for electrification: Battery electric vehicles are this year's #1 key trend.

Emissions?

Drivers for Urban Mobility

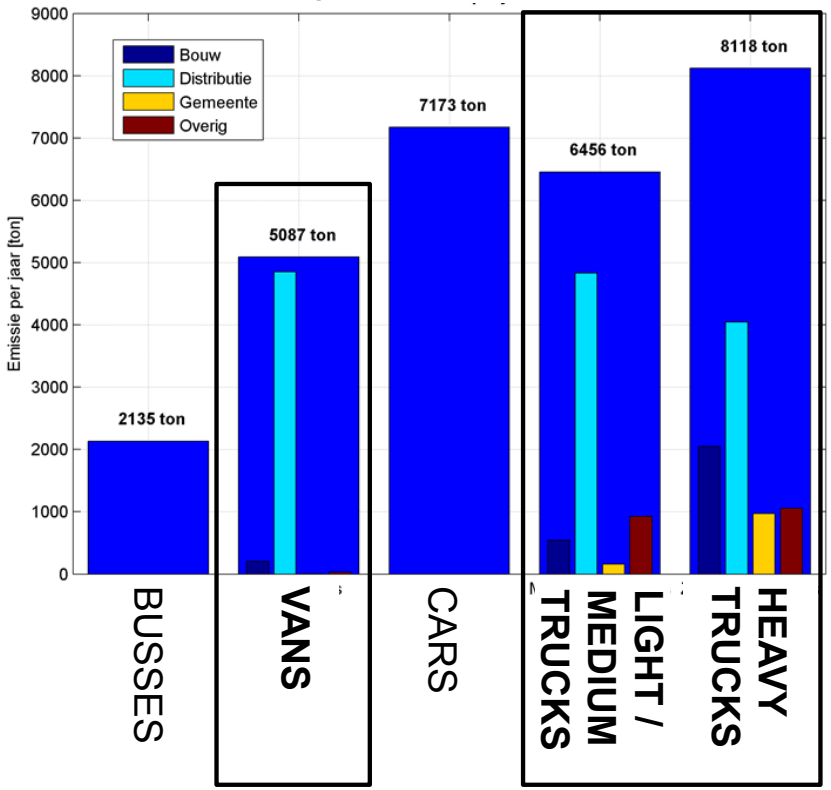
- Today: Air quality / Fine dust
- Today: Smart Logistics
- Today: Noise / Quality of live
- Tomorrow: Energy / CO_2
- **Always: €€€€€€€**



The big three poluters

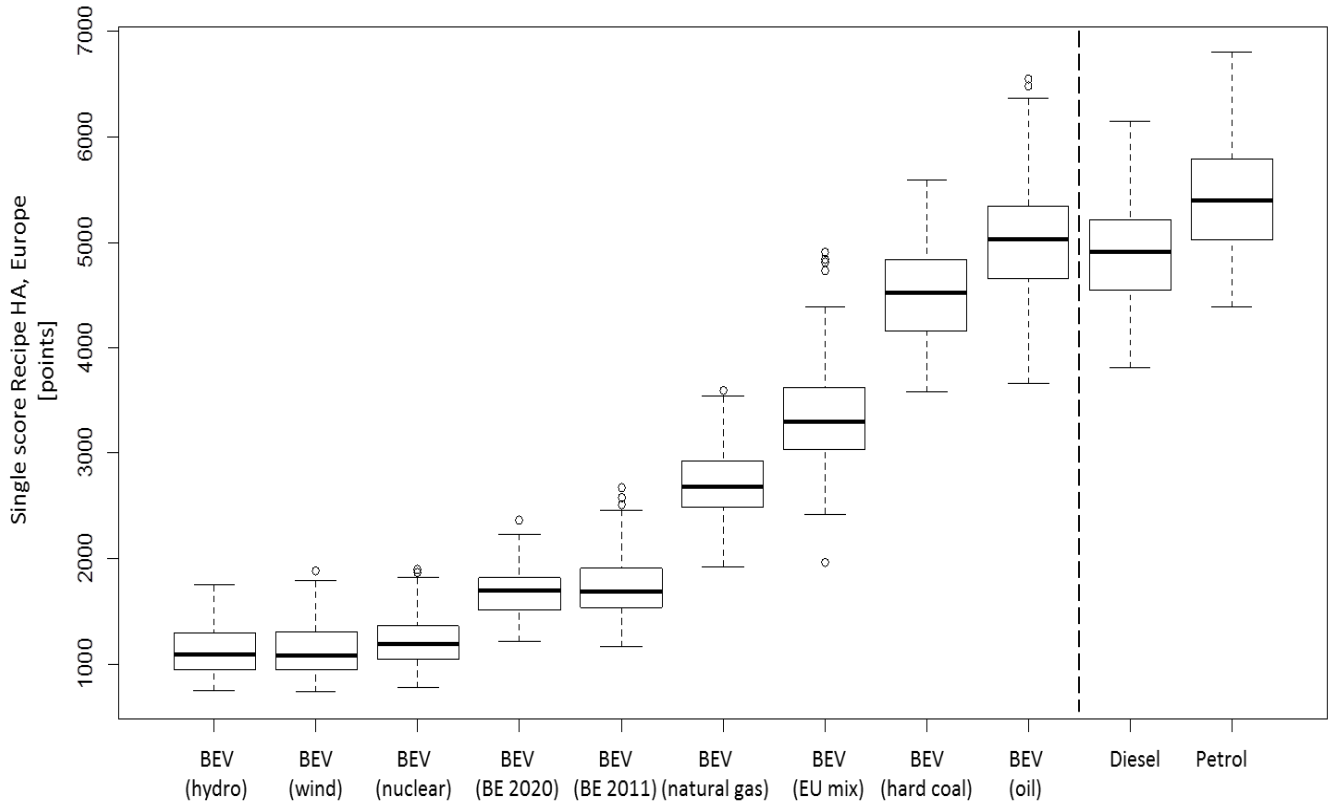
Urban freight transport

Total NOx emissions city traffic in the Netherlands



Estimated total emissions per year per vehicle type for all urban traffic in the Netherlands (TNO, 2015)

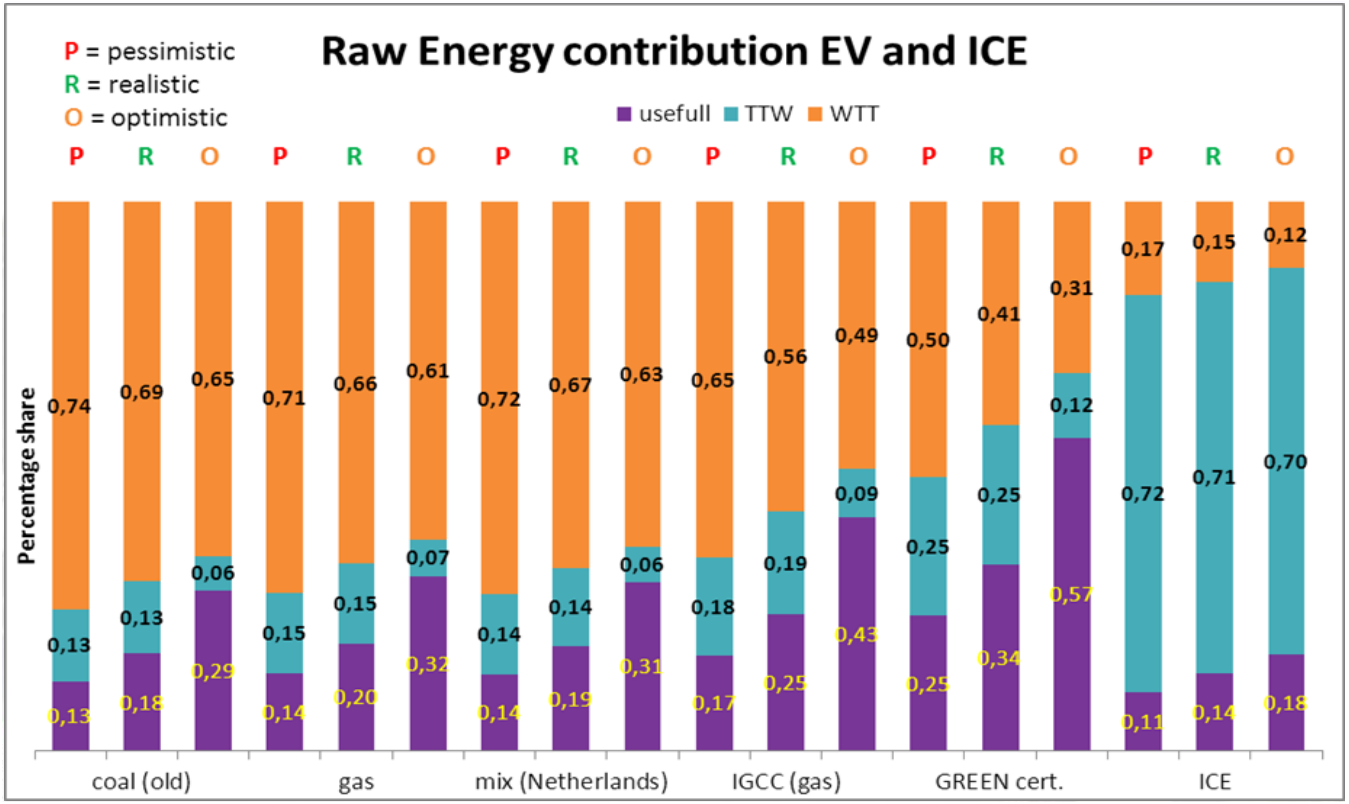
Influence of the electricity mix on single (eco) score Recipe



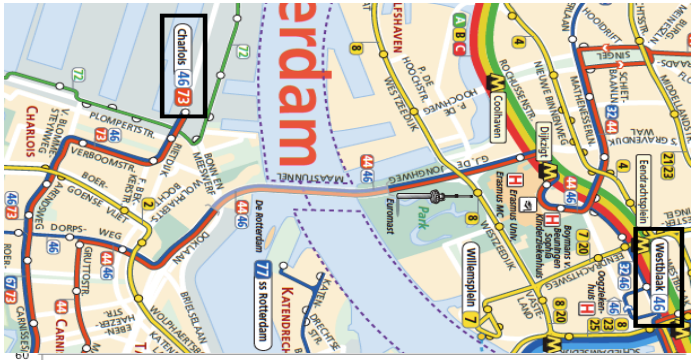
M. Messagie, J. v. Mierlo cs, A Range-Based Vehicle Life Cycle Assessment Incorporating Variability in the Environmental Assessment of Different Vehicle Technologies and Fuels. Energies, Vrije Universiteit Brussel, 2014

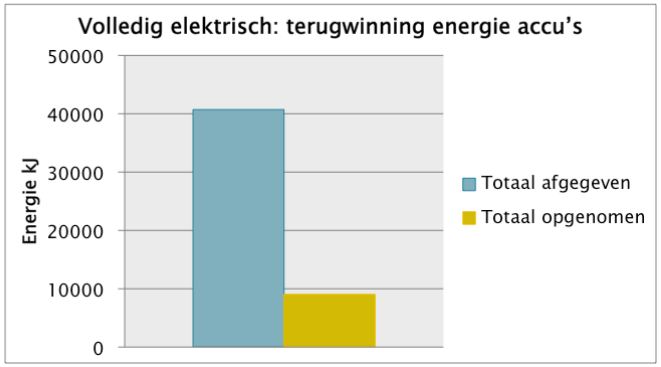
Energy?

Well to Wheel comparison EV & ICE

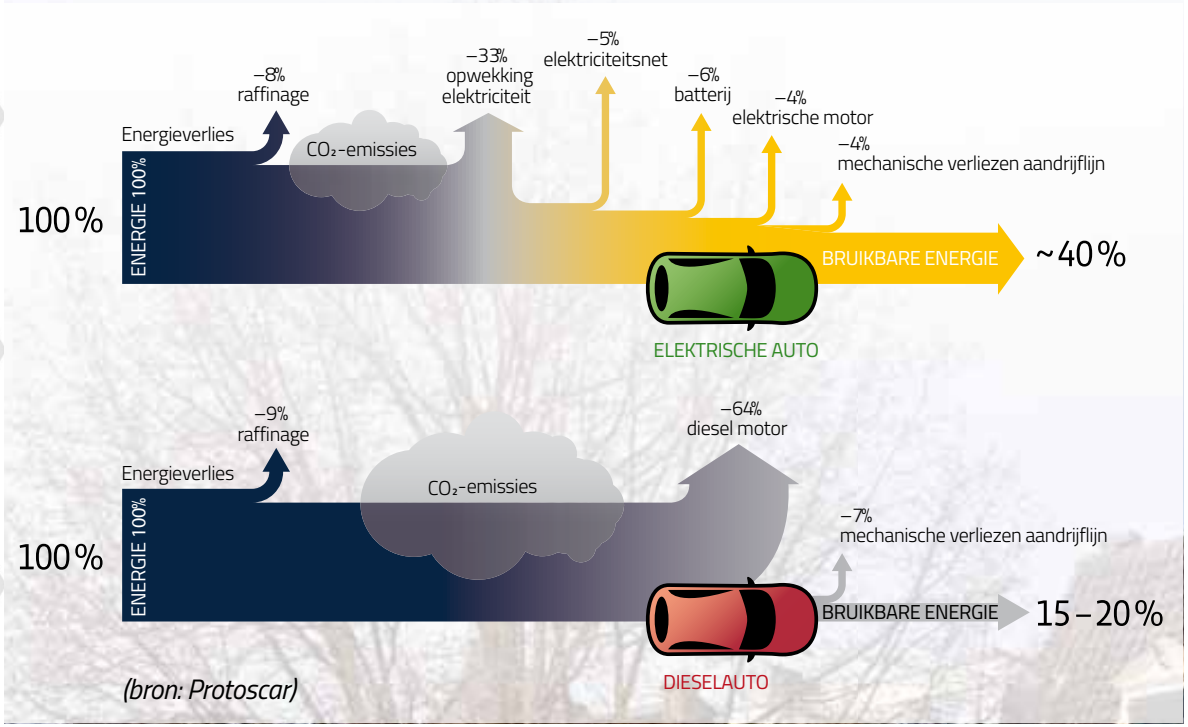


Recuperation of brake energy

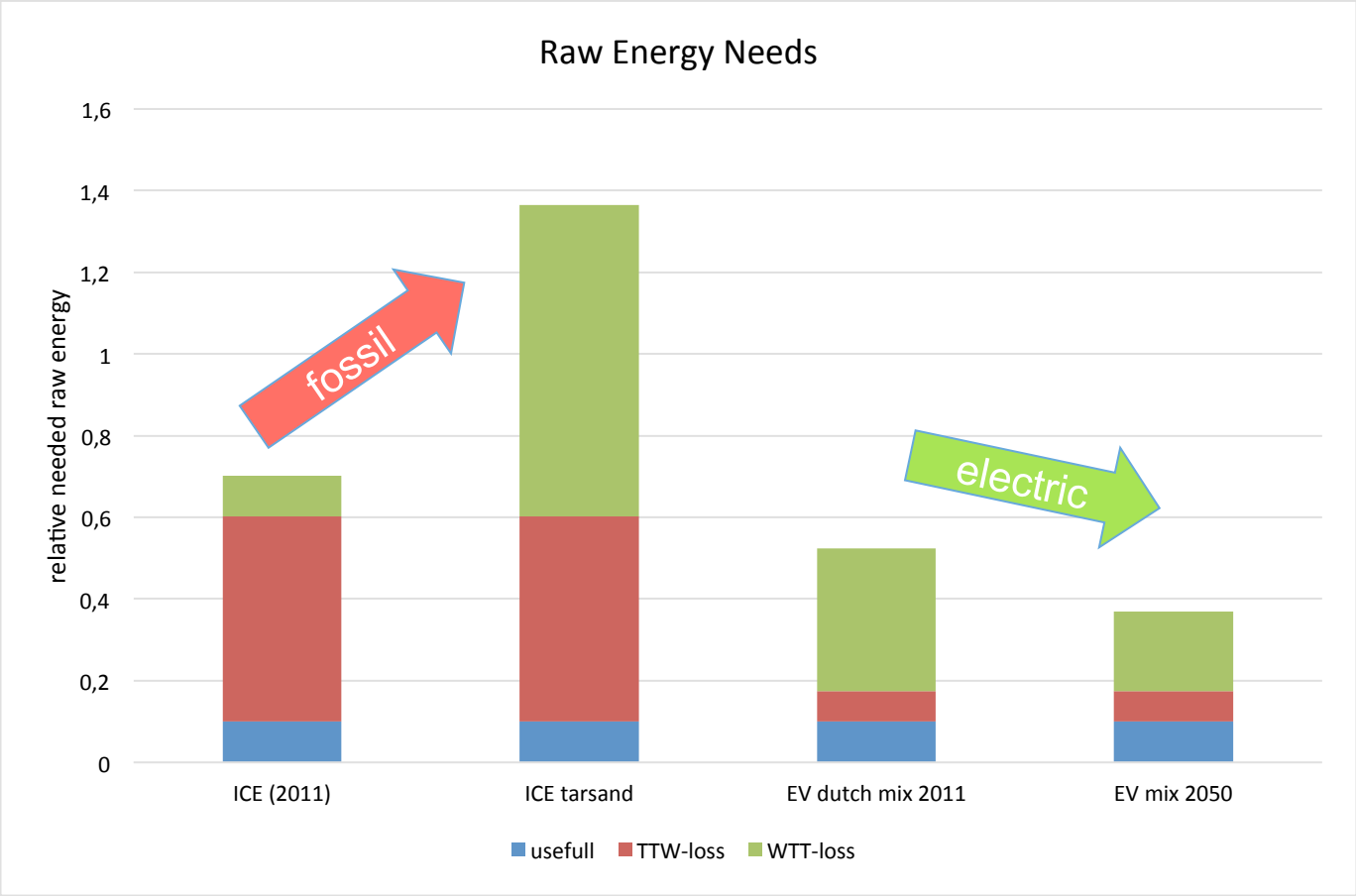




Well to Wheel Electrification

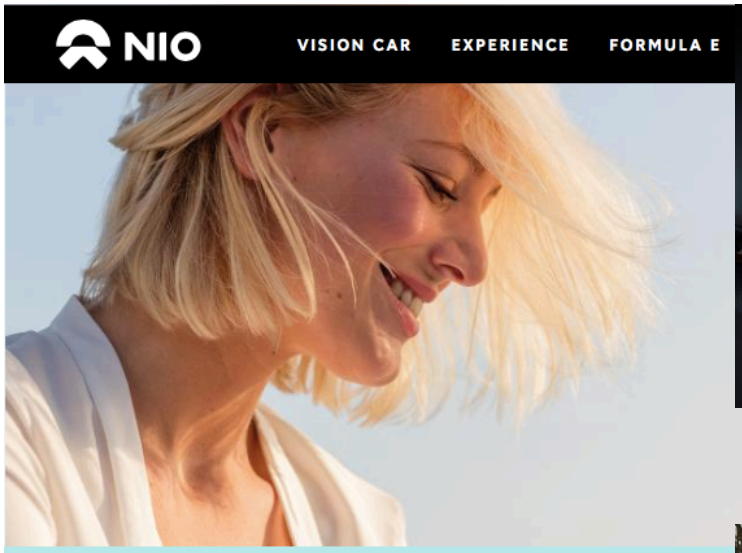


Future Proof



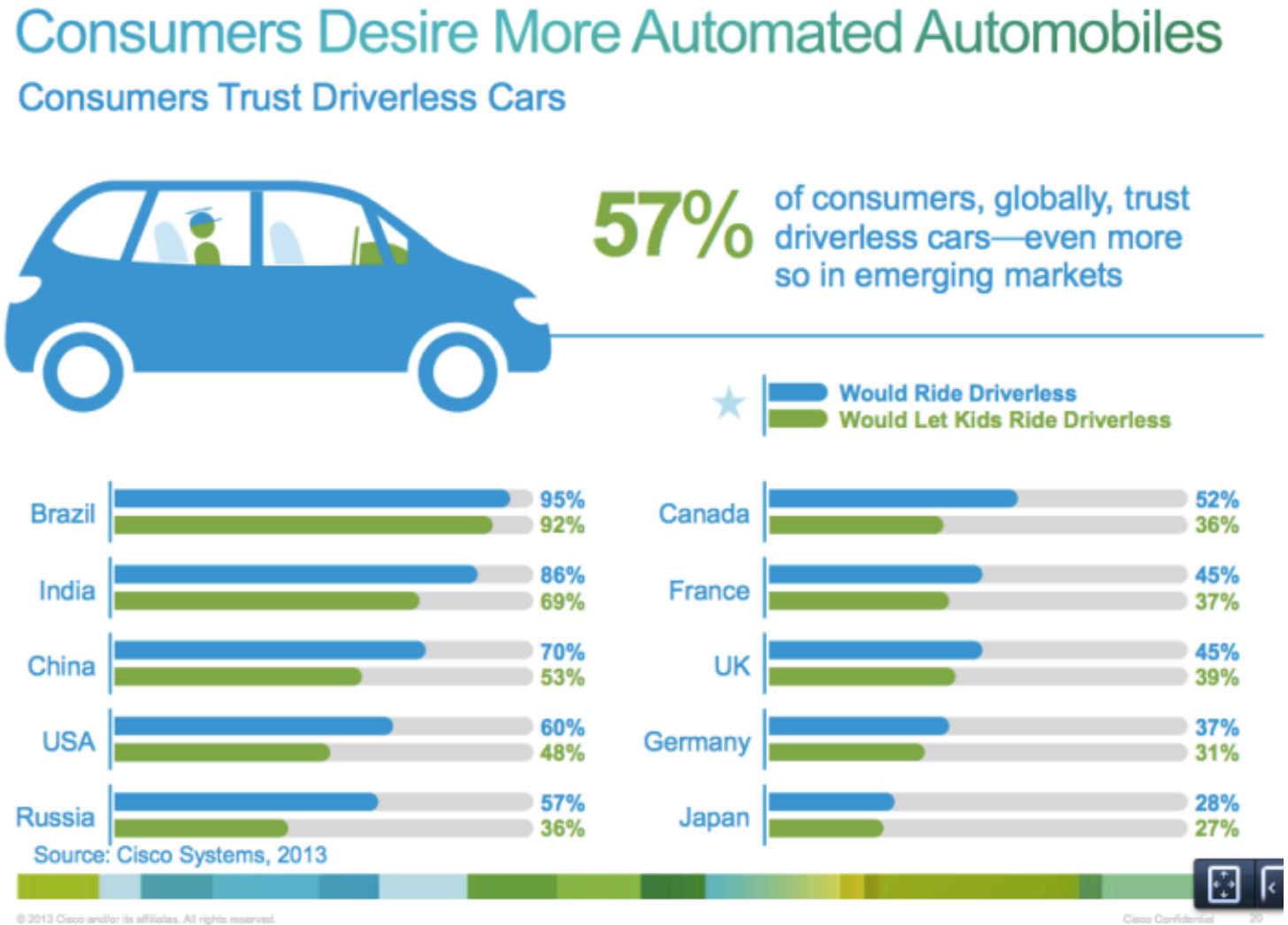
Congestion?

Give-back freedom of time



In the past, cars gave people the freedom of mobility. In the future, cars will go one step further and free people from driving, giving them the freedom of time. **It's a future we're excited to shape.**

Pilot assist or self driving cars



Accidents?

Safety Levels

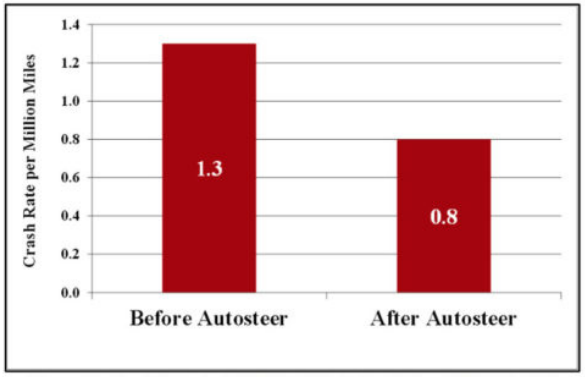


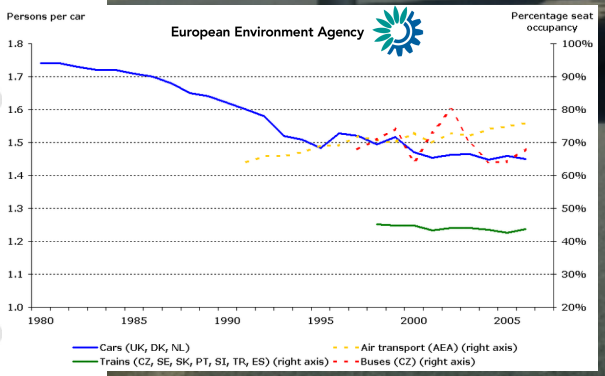
Figure 11. Crash Rates in MY 2014-16 Tesla Model S and 2016 Model X vehicles Before and After Autosteer Installation.

Level	Name	Narrative definition	Execution of steering and acceleration/ deceleration	Monitoring of driving environment	Fallback performance of *dynamic driving task*	System capability (*driving modes*)	BASt level	NHTSA level
***Human driver* monitors the driving environment**								
0	**No Automation**	the full-time performance by the *human driver* of all aspects of the *dynamic driving task*, even when enhanced by warning or intervention systems	Human driver	Human driver	Human driver	n/a	Driver only	0
1	**Driver Assistance**	the *driving mode*-specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the *human driver* perform all remaining aspects of the *dynamic driving task*	Human driver and system	Human driver	Human driver	Some driving modes	Assisted	1
2	**Partial Automation**	the *driving mode*-specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the *human driver* perform all remaining aspects of the *dynamic driving task*	**System**	Human driver	Human driver	Some driving modes	Partially automated	2
***Automated driving system* ("system") monitors the driving environment**								
3	**Conditional Automation**	the *driving mode*-specific performance by an *automated driving system* of all aspects of the *dynamic driving task* with the expectation that the *human driver* will respond appropriately to a *request to intervene*	System	**System**	Human driver	Some driving modes	Highly automated	3
4	**High Automation**	the *driving mode*-specific performance by an *automated driving system* of all aspects of the *dynamic driving task*, even if a *human driver* does not respond appropriately to a *request to intervene*	System	System	**System**	Some driving modes	Fully automated	3/4
5	**Full Automation**	the full-time performance by an *automated driving system* of all aspects of the *dynamic driving task* under all roadway and environmental conditions that can be managed by a *human driver*	System	System	System	**All driving modes**		

cyberlaw.stanford.edu/loda

Empty?


CORU 223012 3
22G1
IJSSELMONDE
EMPTY CONTAINER TRUCKING
DH-98-PV


Persons per car
European Environment Agency
Percentage seat occupancy
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
100%
90%
80%
70%
60%
50%
40%
30%
20%
1980
1985
1990
1995
2000
2005
Cars (UK, DK, NL)
Air transport (AEA) (right axis)
Trains (CZ, SE, SK, PT, SI, TR, ES) (right axis)
Buses (CZ) (right axis)

Private, public or sharing

car2go provides “ON DEMAND” transportation that is unlike other conventional car-sharir

Feature	car2go	Traditional Car-Sharing
Eco-friendly	✓	✓
One-way trips	✓	
Billing to per-minute rates	✓	
Flexible, open-ended rentals	✓	
Dedicated parking spaces	✓	✓
Flexible Parking Solutions for customers	✓	
On-demand rentals	✓	
Round trips only		✓
Advanced reservations	✓	✓
Scheduled return times		✓

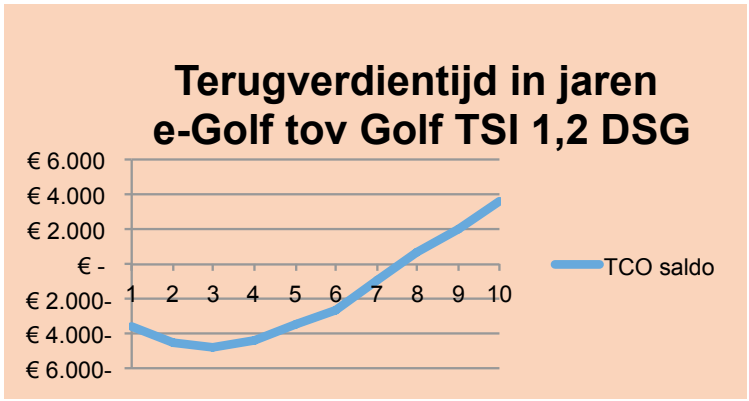
UBER

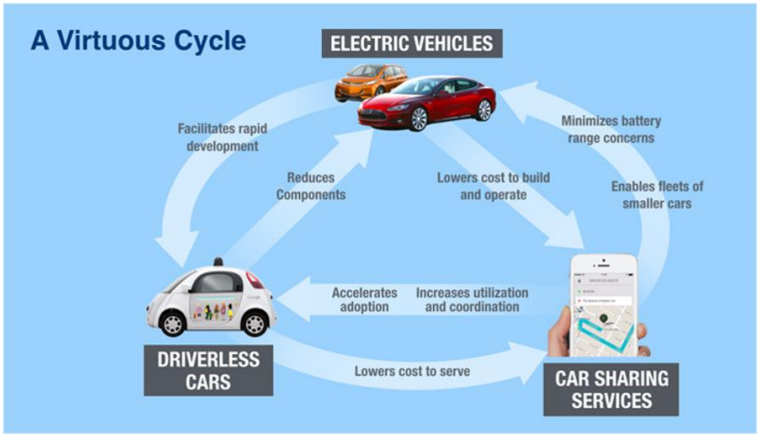
Bla Bla Car

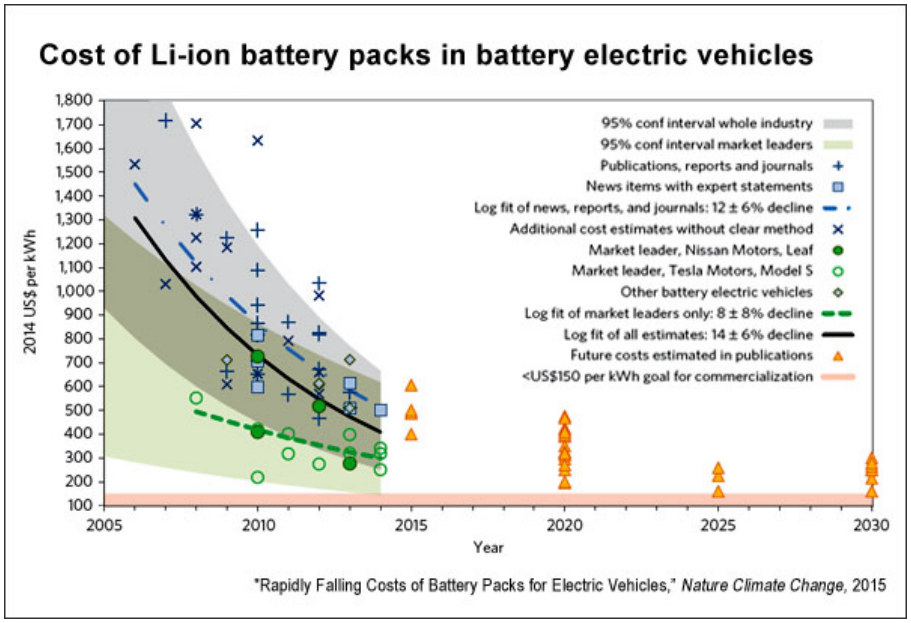
Cost?


CENTRUM
Average Annual Cost of Owning a Car: $8,884
Based on 18,000km of driving per year
1. Value Depreciation
$3,515 or 20¢/km
2. Auto Insurance
$1,913 or 11¢/km
3. Fuel Costs*
$1,818 or 10¢/km
4. Maintenance & Repair
$827 or 5¢/km
5. Financing Charges
$699 or 4¢/km
6. License & Registration
$112 or 1¢/km
Based on Canadian Automobile Association 2010 Driving Costs. *$1.30/L

EV's will break even soon
Sharing will make them earn







Maintenance and durability

Summary 3D-6Z

3 Disruptions

6 Zero's

Electrification

Automation

Connectivity

Zero Emission

Zero Energy

Zero Congestion

Zero Accident

Zero Empty

Zero Cost

Sibrandus Stratingh (1785)

Probably the first electric powered vehicle in the World (1834)