



Volvo Buses

trolley:motion Conference
Leipzig 23rd October 2012

Environmetally Secured Buses

- design and performance of Volvo hybrid
- Why concentration on hybrid?
- Why parallel hybrid?
- Experience from China with fully electric buses
- Milestones of future development
- New opportunities for city traffic
- Vision for European public transport



Volvo buses' hybrid experience



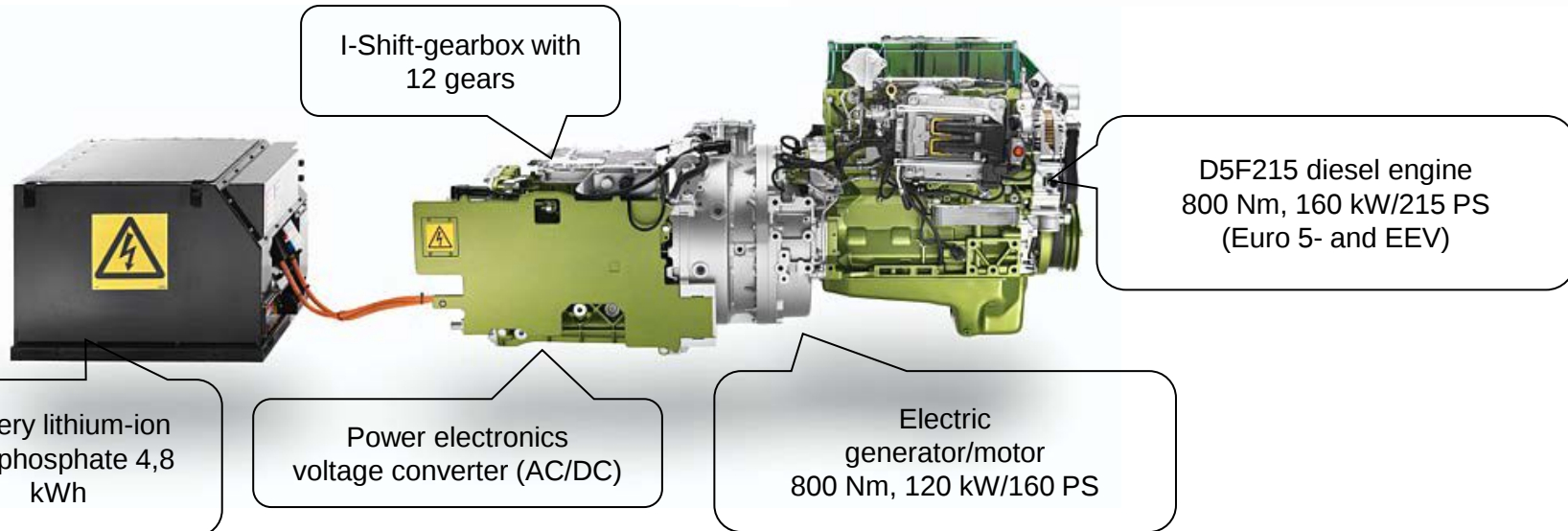
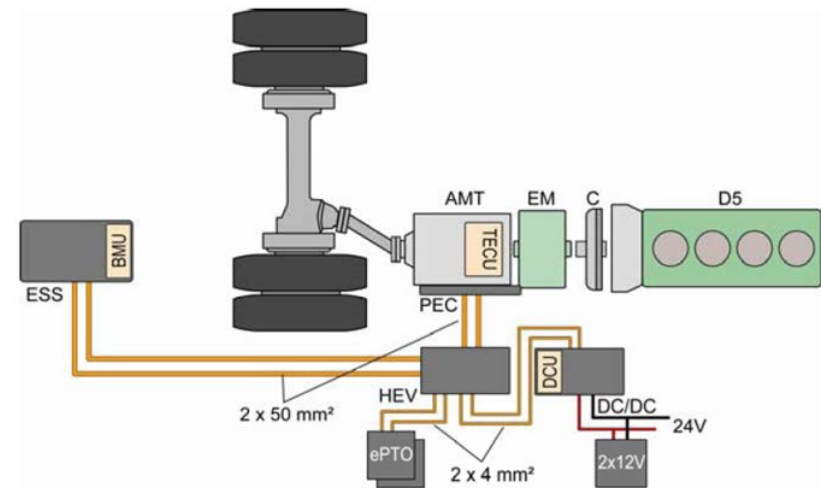
- Suitable for urban and suburban transport
- 407 buses in operation*
- More than 800 buses sold year to date*
- >20.000.000 km experience in commercial operation *
- Fuel savings reported by customers between 29% and 40%
- ~160.000.000 litres of total fuel saving expected during complete lifetime of the ~800 sold buses
- ~420.000 tonnes CO2 will be avoided during complete life of the ~800 sold buses

* as of September 2012

Technical solution - drive train

Volvo I-SAM Parallel-Hybridsystem

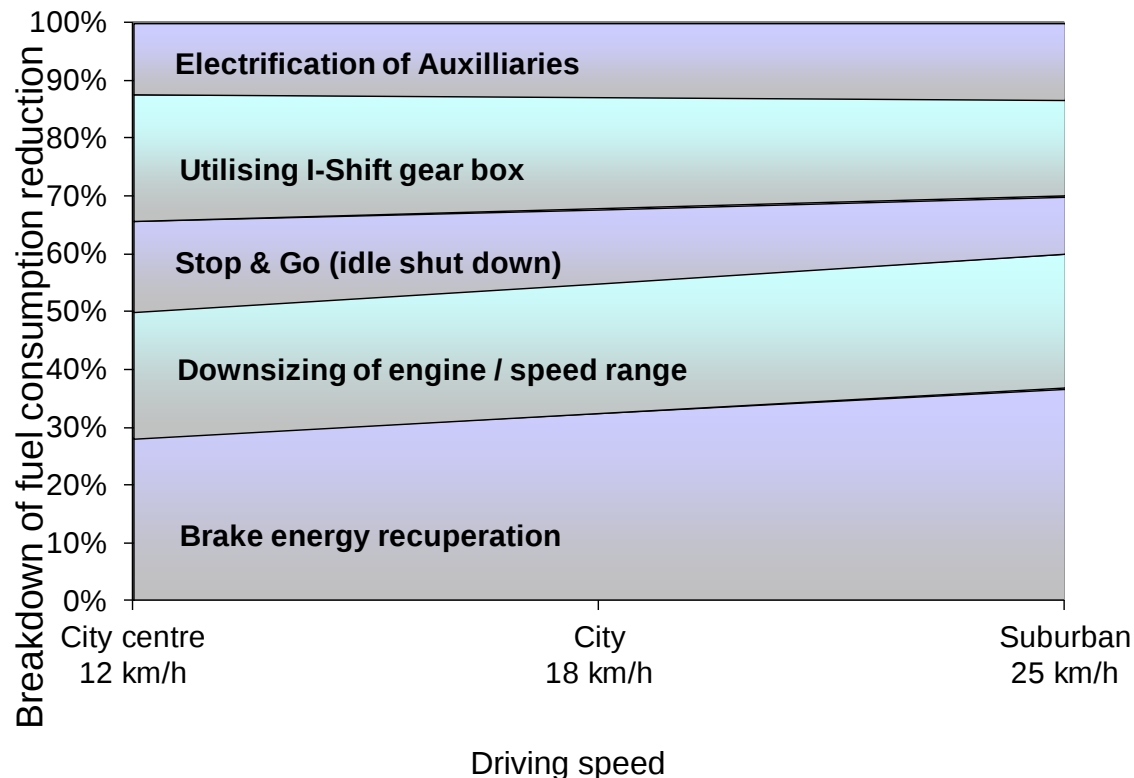
- Volvo D5F215 diesel engine EURO V/EEV with/ without DPF
- Electric motor
- Automated Volvo I-Shift gearbox AT2412D without torque converter optimized for bus applications



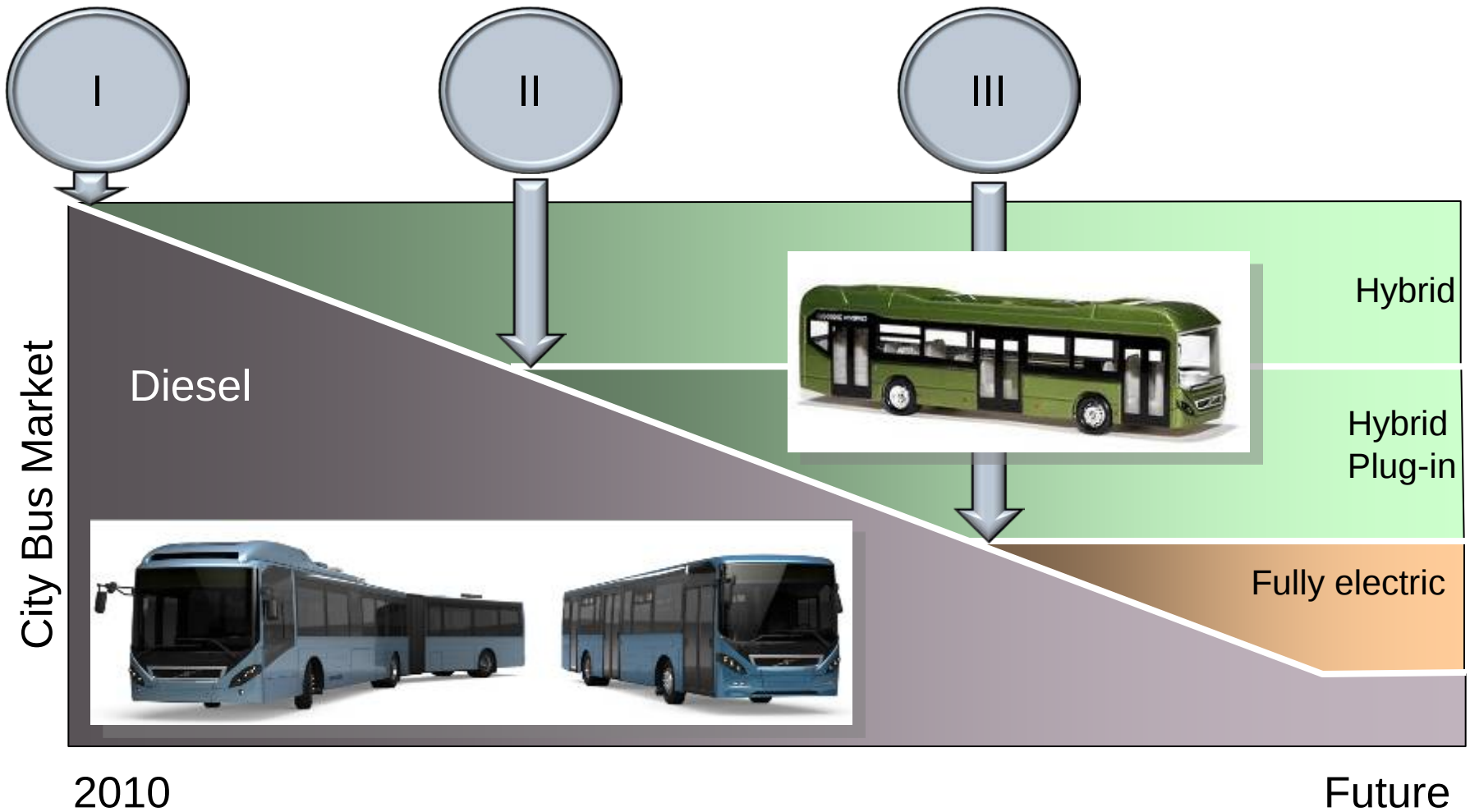
Technical solution - components affected

Success of the Volvo Hybrid System

- Among the reasons for the lower fuel consumption of the Volvo hybrid brake energy recuperation is only one of the features. Others are:
 - **Electrification of Auxilliaries:** No fuel is spent on auxilliary systems such as the AC, air compressor and servo, as they are powered by the hybrid system instead
 - **I-Shift:** Volvo's gear-changing system optimises the driveline
 - **Stop & Go:** The diesel engine shuts down during stops. Leaving from bus stop electrically
 - **"Rightsizing" of engine:** A 5-litre engine is used instead of a 7 or 9-litres engine



The path towards Green Efficiency



Independent institutes and Real traffic data

Customer field test and traffic data Reported by Customers and Public Authorities

	7700 Hybrid litre / 100 km	7700 Diesel litre / 100 km	Saving %
Göteborg – Daily operation	25	40	31%
London - Route 159**	35	54	35.5%
London - Route 141 fleet	38	68	35.5%
Switzerland (hilly)	54	76	29%
STIB Brussels 17 km/h	33	61	45%
Switzerland (flat)	23	35*	34%
Fraunhofer- Avg. 7 routes	32	47*	31%
La Rochelle - Commuter	26	43*	38%
La Rochelle - City	30	54*	43%
Luxemburg 31 km/h	22	37*	40%

* Competitor's bus from existing fleet used as reference

** Chassis dynamometer test at Millbrook, UK

Conclusion La Rochelle testing: *Announced energy and environmental gains are confirmed: the vehicle consumes 38 to 44% less fuel than standard buses, for equivalent pollutants emissions gains.*

Volvo Buses - Complete Electromobility Range

Low floor

2010 Volvo 7700
Hybrid



2012 Volvo 7900
Hybrid



2013 Volvo 7900
Plug-in Hybrid



Volvo 7900 Hybrid
Articulated



Volvo Fully electric
low floor



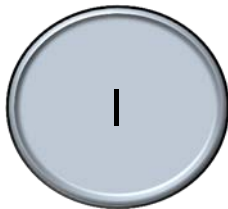
Low entry

Volvo 8900 Hybrid
Low entry and articulated



Coach

Volvo 9700 Hybrid



Volvo 7900 Plug-in Hybrid

II

March 2013 Field test

Beyond Euro VI Serial Production

Data

10-20 km Electric range

5-10 min Charging time

Plug-in from all infrastructure

Energy use 30-40% of diesel

Charging principles

Tram

Trolley



Induction

Slide-in

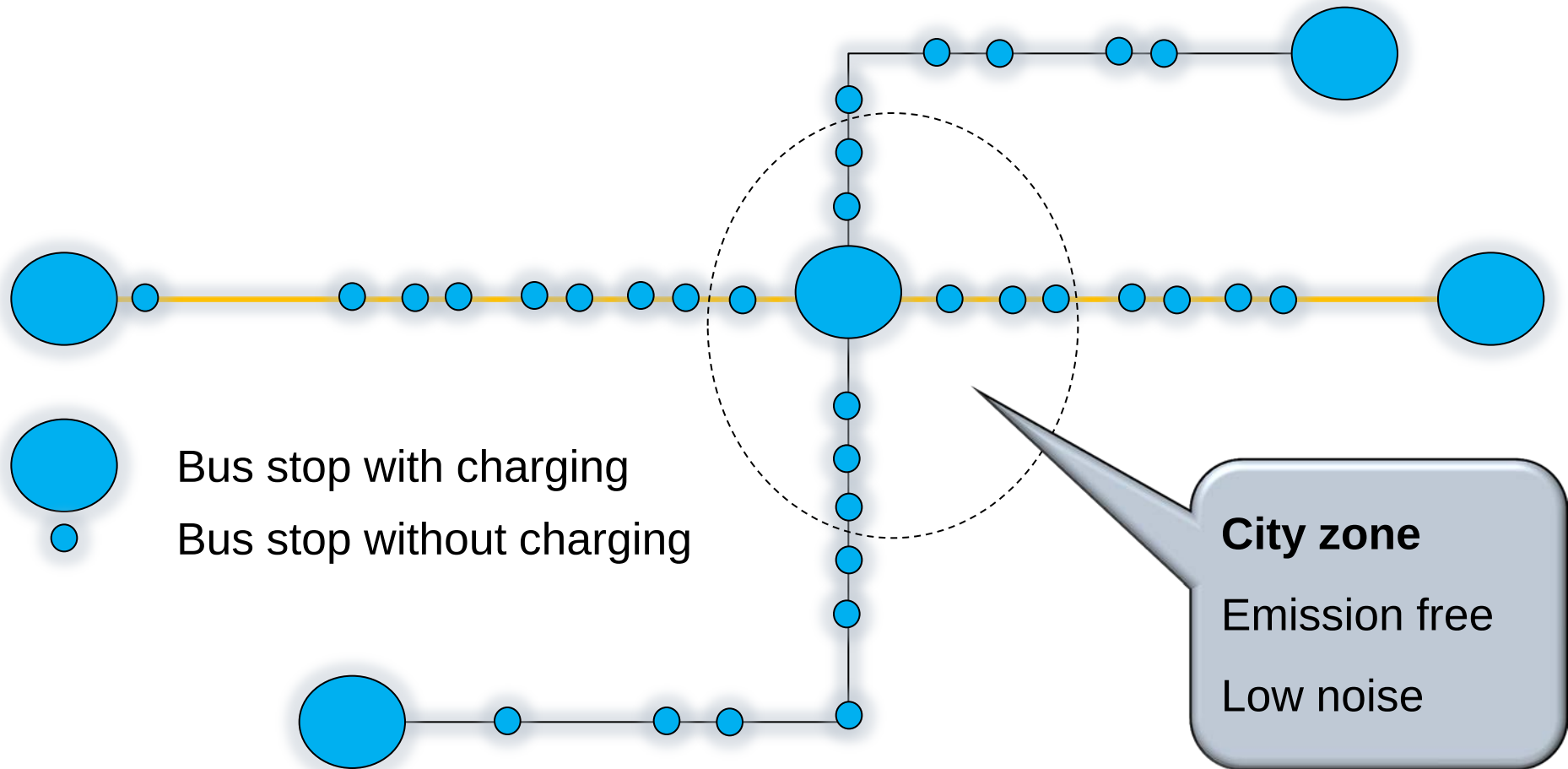
Electric buses



Volvo joint venture with Sunwin: 500 bus fleet of 3 different technologies

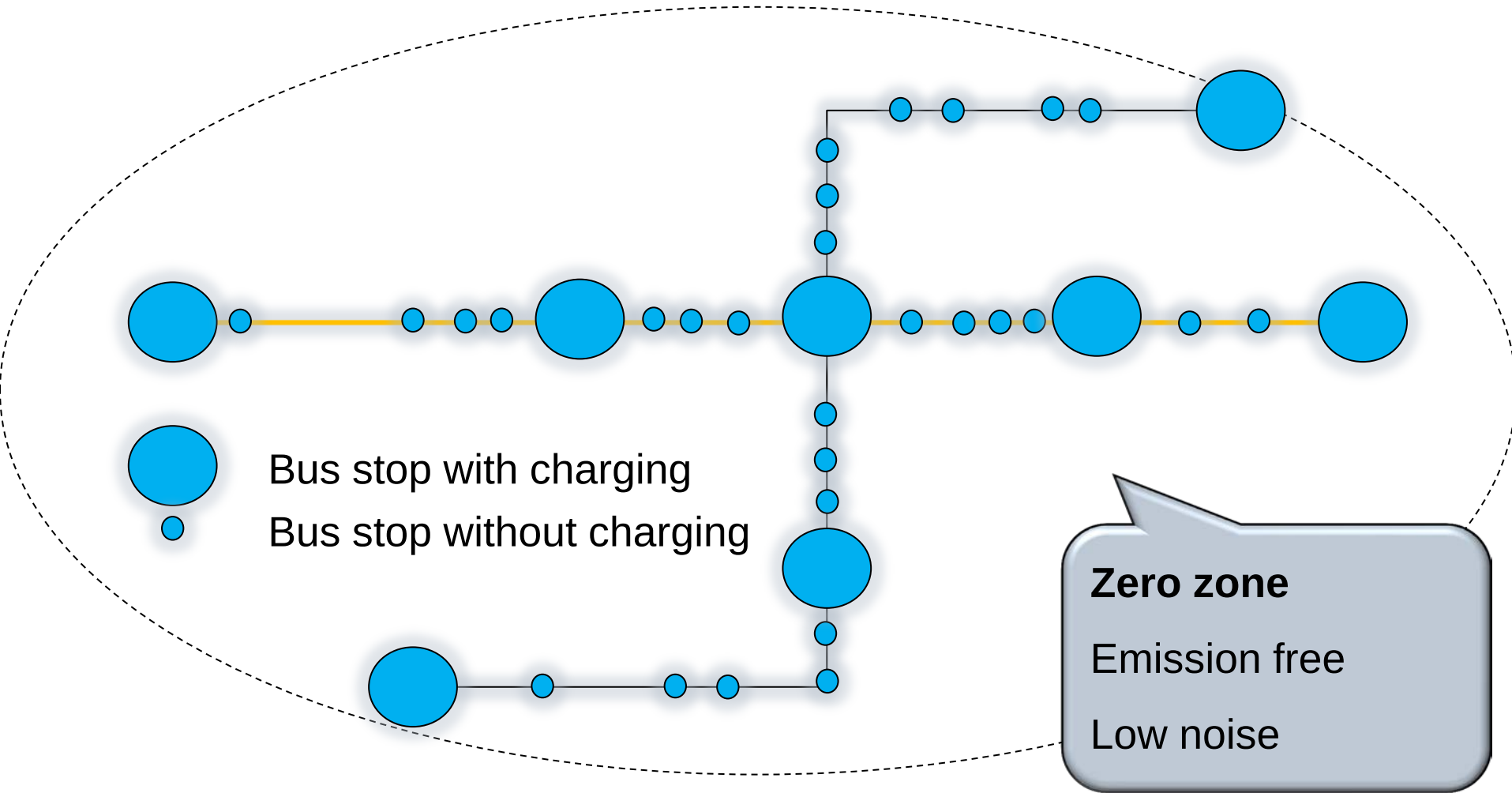
Charging infrastructure

- model 1: minimising cost



Charging infrastructure

- model 2: minimising emissions

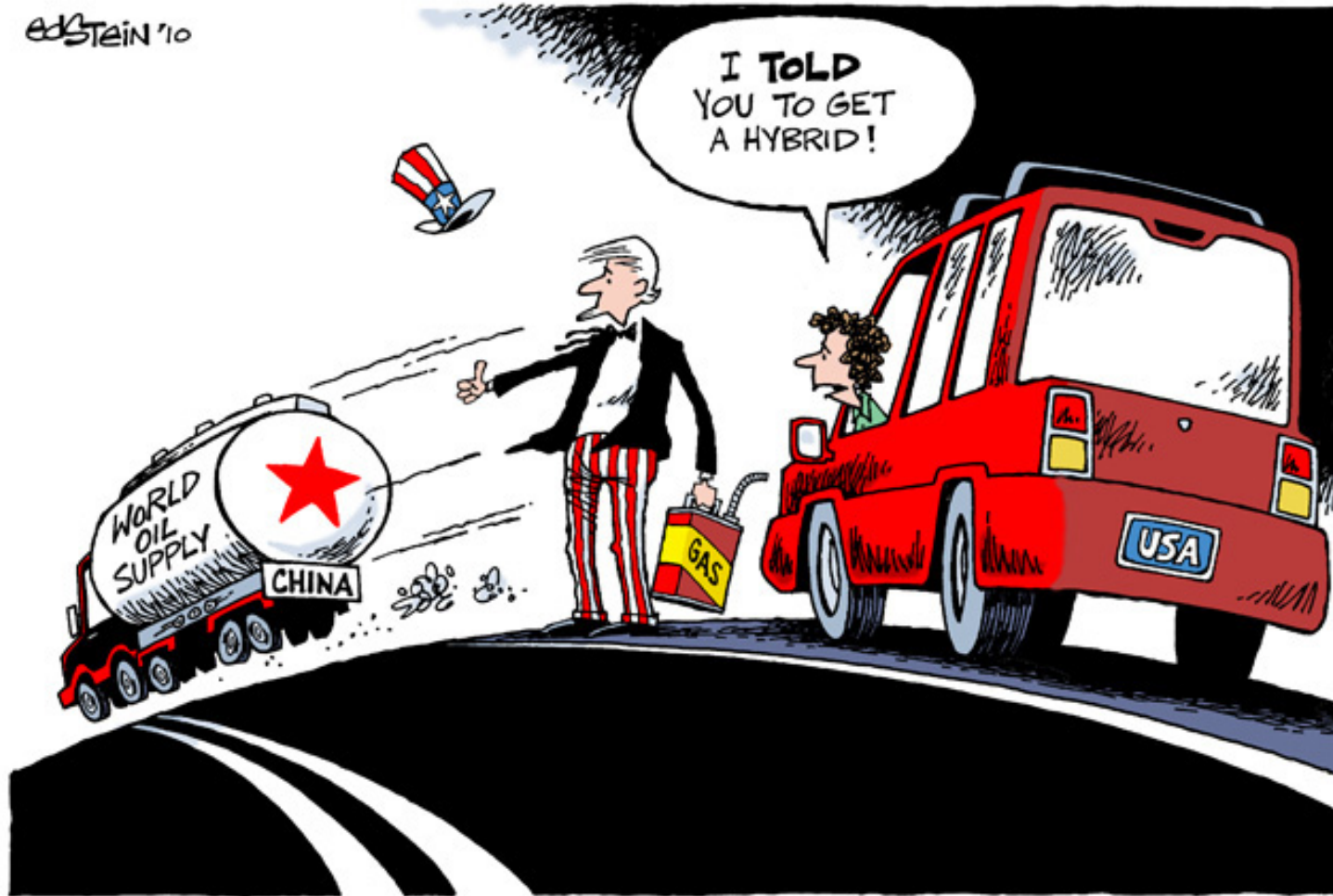


New opportunities for city planning



Summary

- **Future technology as parallel development:**
 - Hybrid bus + Plug-in hybrids (parallel) for low floor segment
 - Diesel
 - Fully electrical buses
- **Drivers:**
 - Noise
 - Energy efficiency
 - Synergies with cars and trucks
 - Environmental impact less than Euro VI already today
 - Less dependency on oil
 - Low infra structure requirement
 - Operational flexibility
 - Affordability



Source: charlieblunt@wordpress.com

Danke für Ihre Aufmerksamkeit!