

Planning for EV fleet rollout: Experiences from the Netherlands

Bibi Fabius

Birmingham, 11 December 2018

Agenda

1. EVConsult & our work
2. Electric buses in the Netherlands
3. E-buses: what's new?
4. Case: Province of Utrecht
5. Recommendations





EVConsult & our work

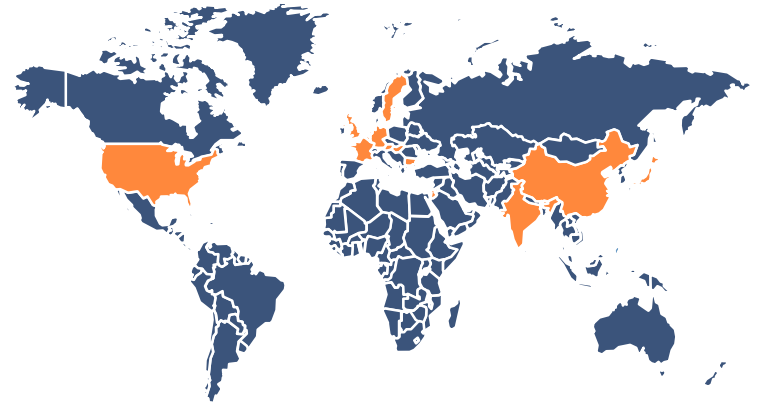


About EVConsult

Our mission: accelerate the transition towards 100% zero-emission mobility

- **Strategy, project management and research & innovation**
- 10 years of experience in over **200 e-mobility projects**
- **Growing team** of 25+ experts (technical, economic, legal)
- Based in **Amsterdam, Antwerp and London**
- **Worldwide network** of partners

Unique expertise in global field of e-mobility



About EVConsult

Experience



UKPN

International case studies

Smart charging models



Mitsubishi

Market research of major
CPOs and OEMs

Insights in business
models, objectives and
customer



Chargepoint planning

Insight in expected
demand for chargers



Premium OEM (NDA)

Develop and contract the
home charging proposition



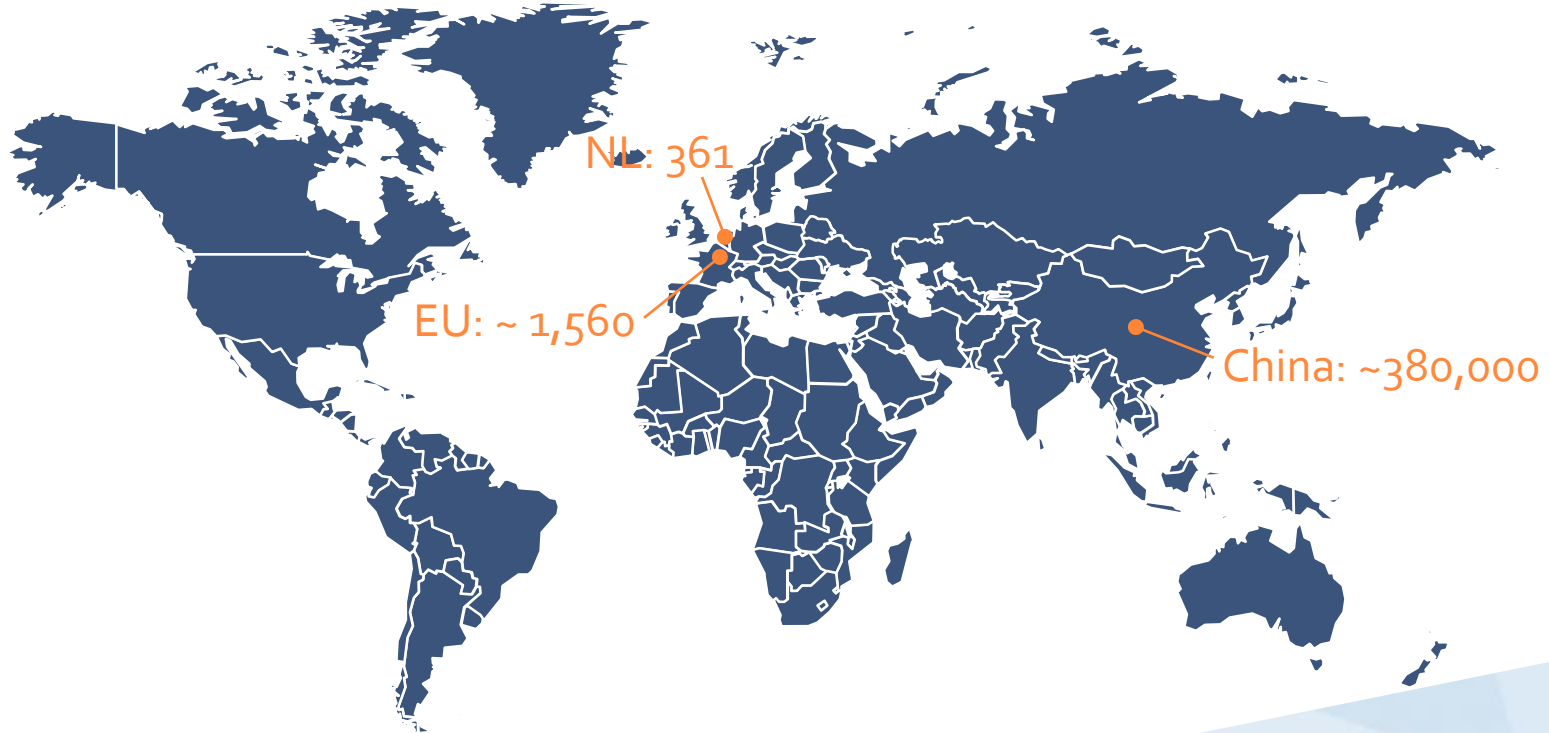


Electric buses in the Netherlands

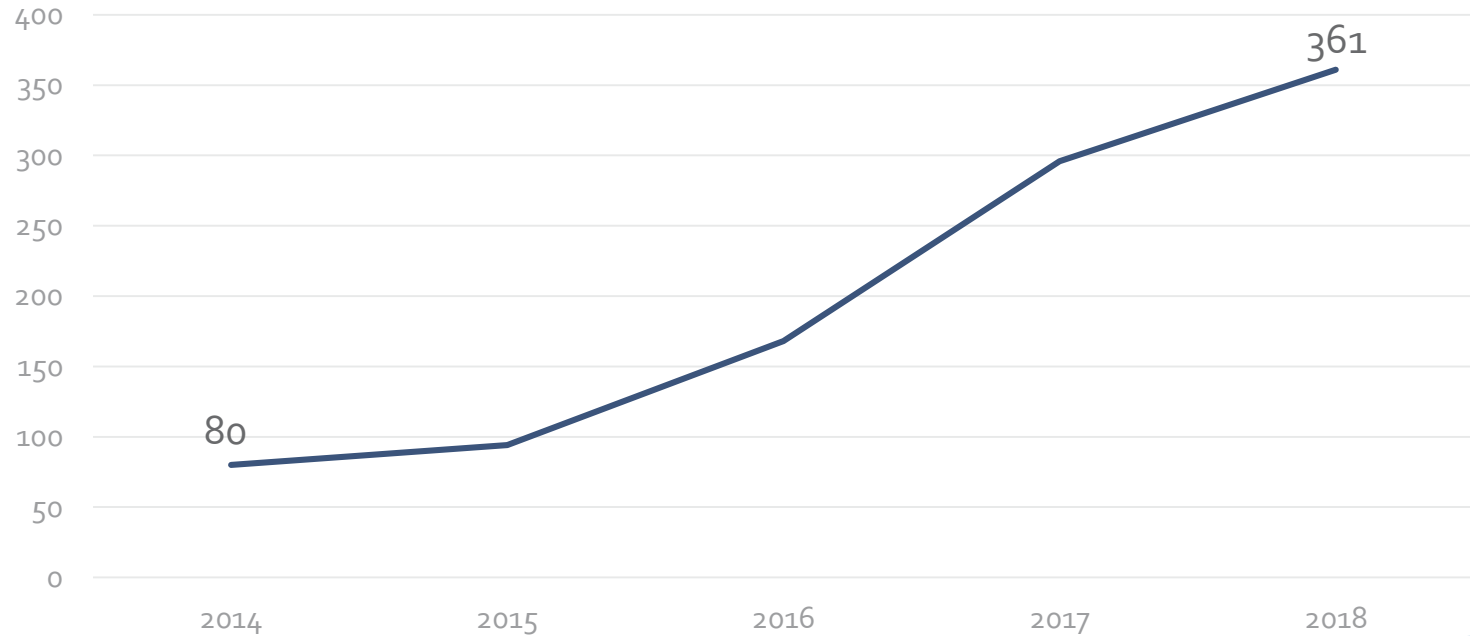


Electric buses worldwide

The global fleet of electric buses now totals around 385,000 vehicles



Electric buses in the Netherlands



Source: www.evmonitor.nl

Electric buses in the Netherlands

Zero-Emission Bus Agreement (2016)



- 2025: all new public buses Zero-Emission



- 2030: all public buses Zero-Emission



Electric buses in the Netherlands

E-buses are past pilot phase



City of Eindhoven

- First full electric bus fleet in Netherlands
- 43 full electric 18m buses
- City centre and suburban area
- Total km driven/vehicle/day: 200-300 km
- Depot charging with pantograph
- Start of operation: March 2017



Electric buses in the Netherlands

E-buses are already commercially-viable



Amstelland-Meerlanden incl. Schiphol

- 100 full electric 18m buses → Europe's largest electric bus fleet in operation
- Gate & city transport
- Total km driven/vehicle/day: >300 km
- 4 strategic charging points (450 kW pantograph)



Electric buses in the Netherlands

E-buses are already commercially-viable



Provinces of Groningen & Drenthe

- 159 full electric, 22 hydrogen-powered buses
- City & regional transport
- Opportunity charging with pantograph
- Start of operation: December 2019





E-buses: what's new?



E-buses: what's new?

New stakeholder in public transport



Public Transport Authority
(PTA)



Municipality



Public Transport Operator
(PTO)

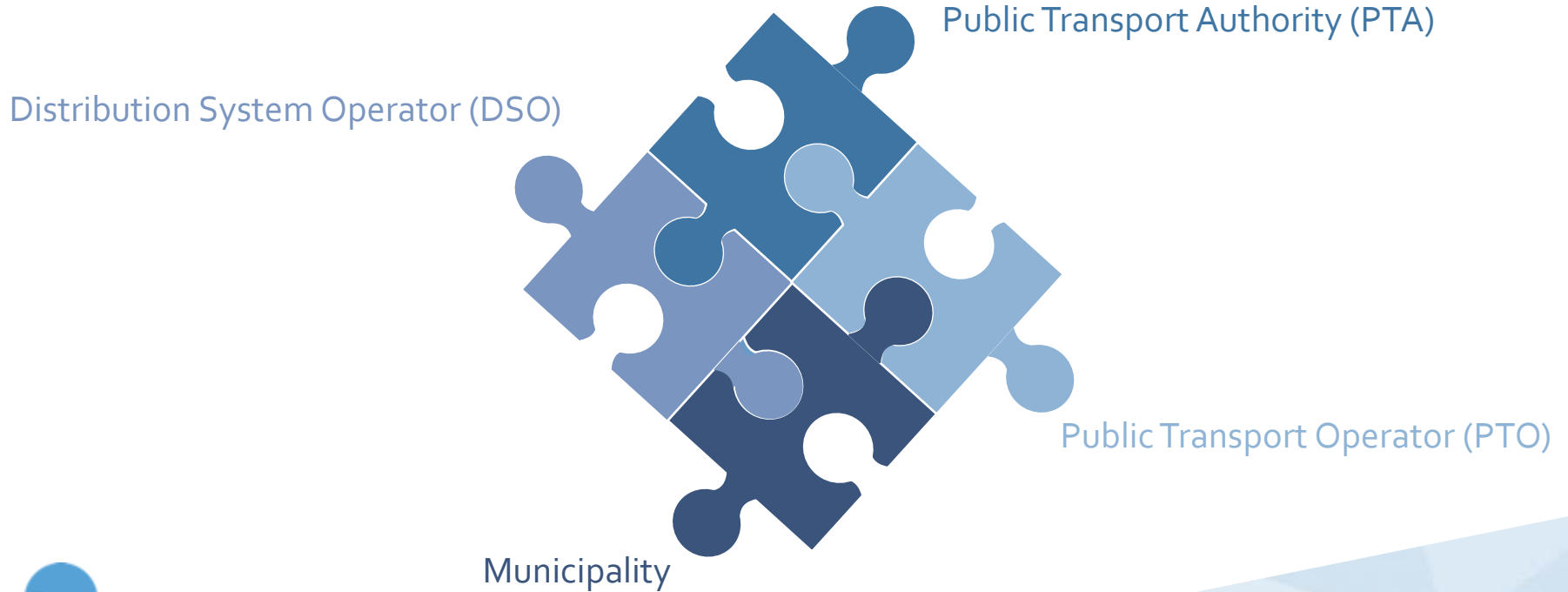


Distribution System Operator
(DSO)



E-buses: what's new?

Cooperation at an early stage is essential





Case: Province of Utrecht



Goals



2013
3 electric buses



2017
+ 10 electric buses



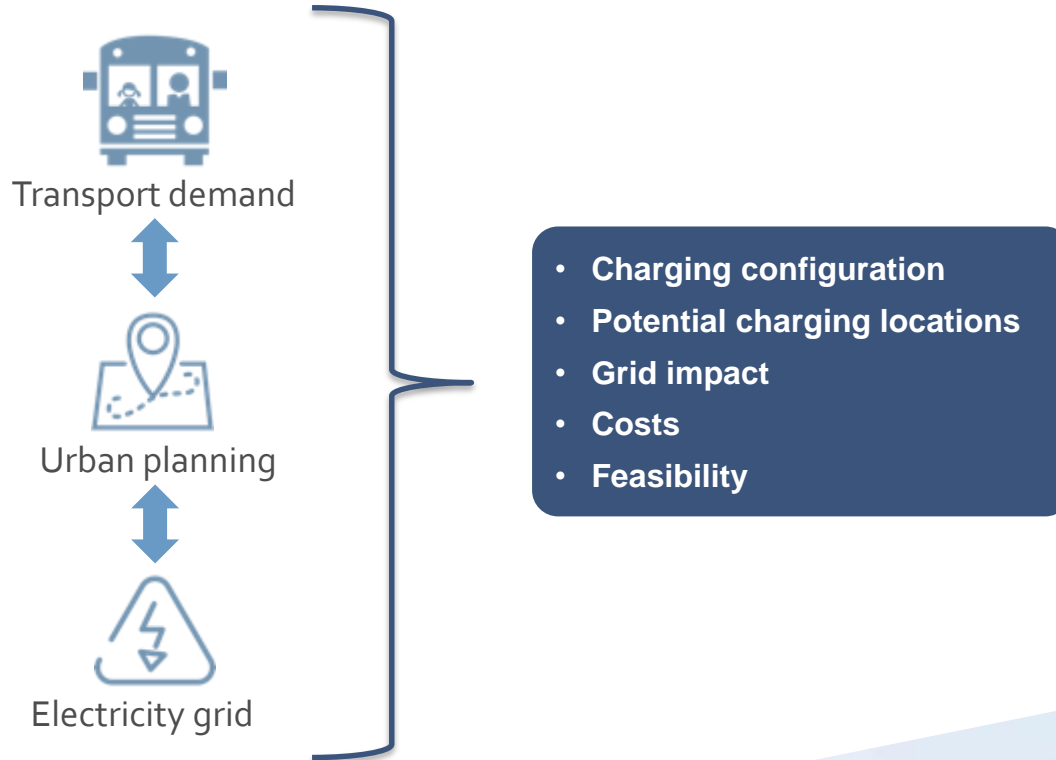
December 2019
+ 55 electric buses

Planning (long term):
100% electric buses in 2024



The triple layered model

Model to develop a sustainable charging network



The triple layered model

Layer 1: develop charging scenarios

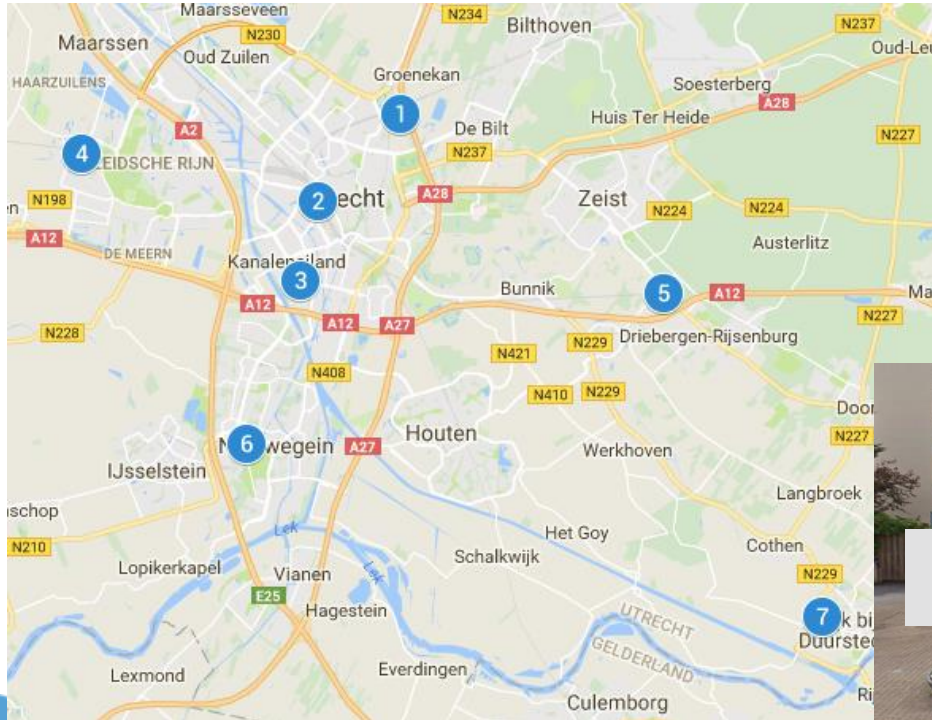
- Define current and future routing
- Analyse charging scenario's (overnight and OC charging)
- Define configurations of buses, batteries and chargers

Scenario	Battery size	# e-buses	Chargers at end stops	Chargers at depot
1. Opportunity charging	100 kWh	11	2x 300 kW	11x 30 kW
2. Opportunity charging	340 kWh	11	2x 150 kW	11x 80 kW
3. Overnight charging	570 kWh	11	0	11x 150 kW



The triple layered model

Layer 2: urban planning



- Room in public space
- Bus route
- Landscaping
- 1 or multiple PTOs
- Scalability

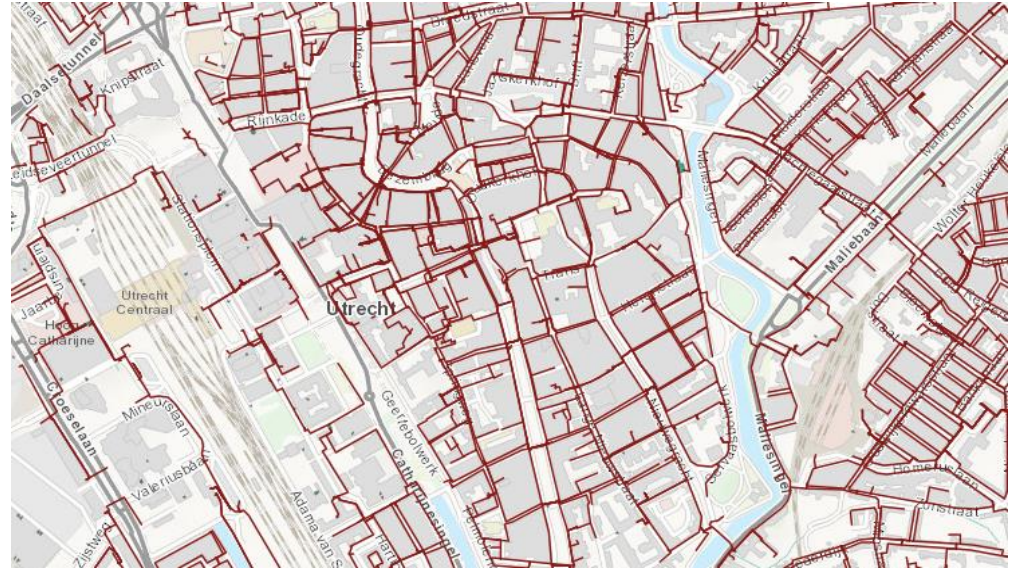


The triple layered model

Layer 3: grid connection

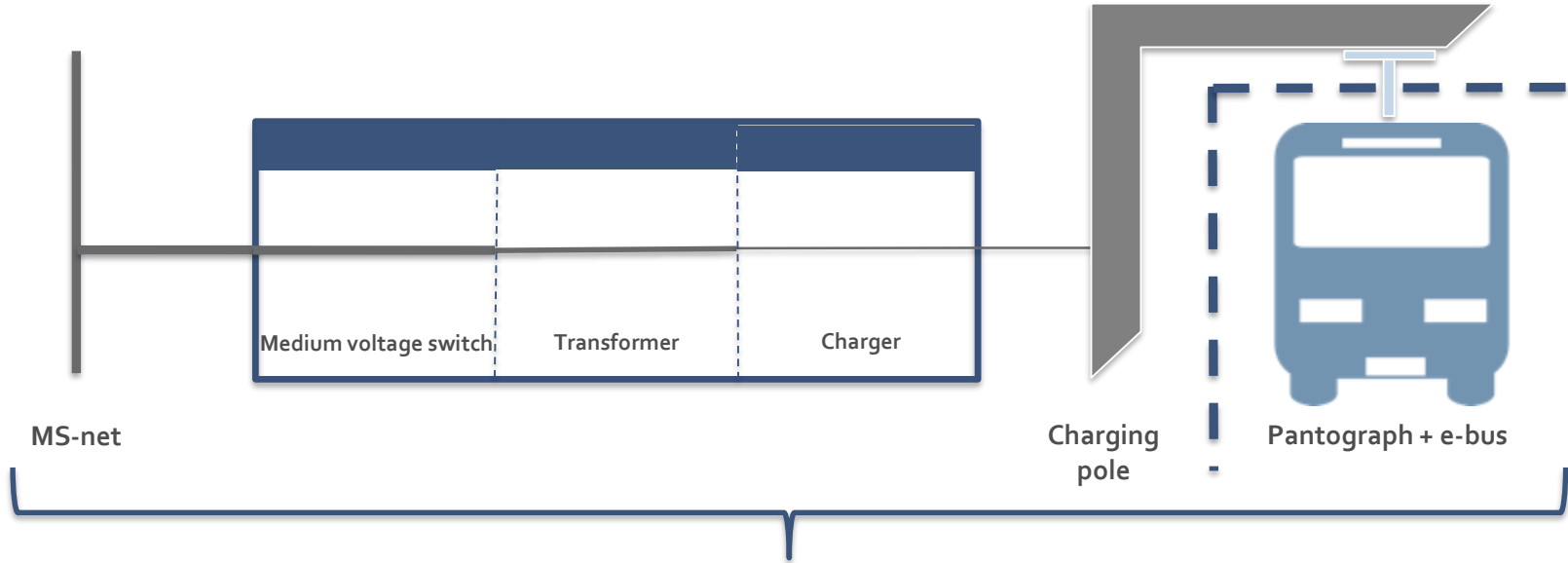
Check with DSO:

- Current grid capacity and needed capacity for charging
- Expected need for capacity in future
- Distance of charging location to the grid



The triple layered model

Cost comparison over the entire value chain

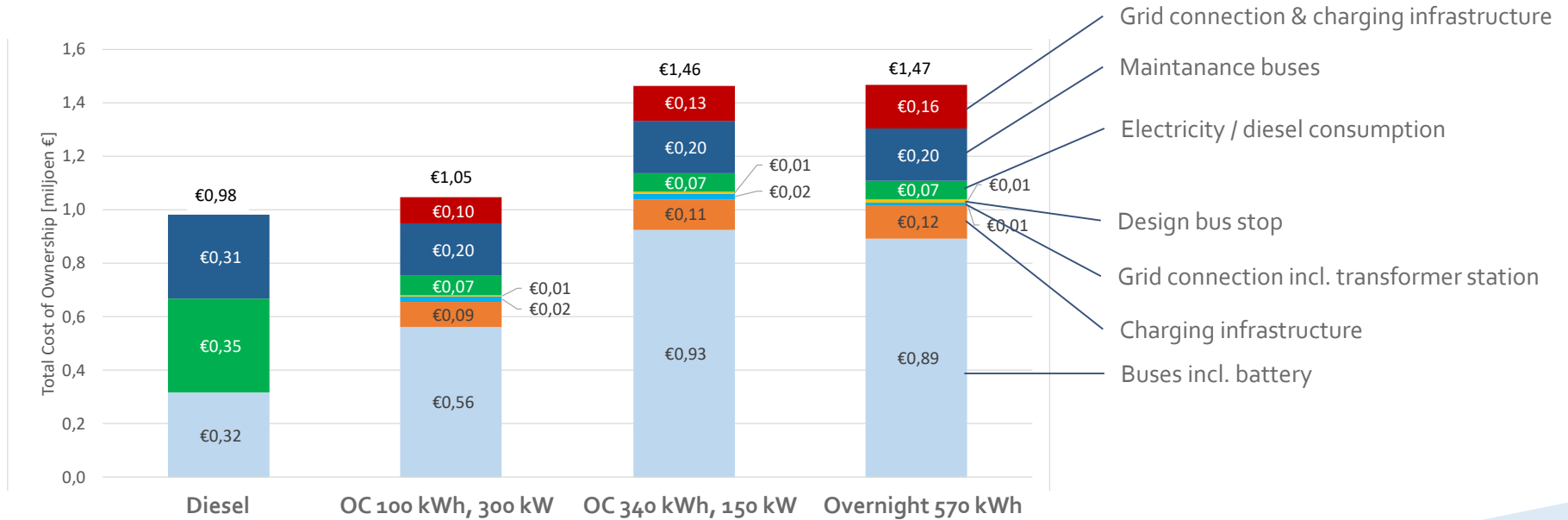


Cost comparison over the entire value chain



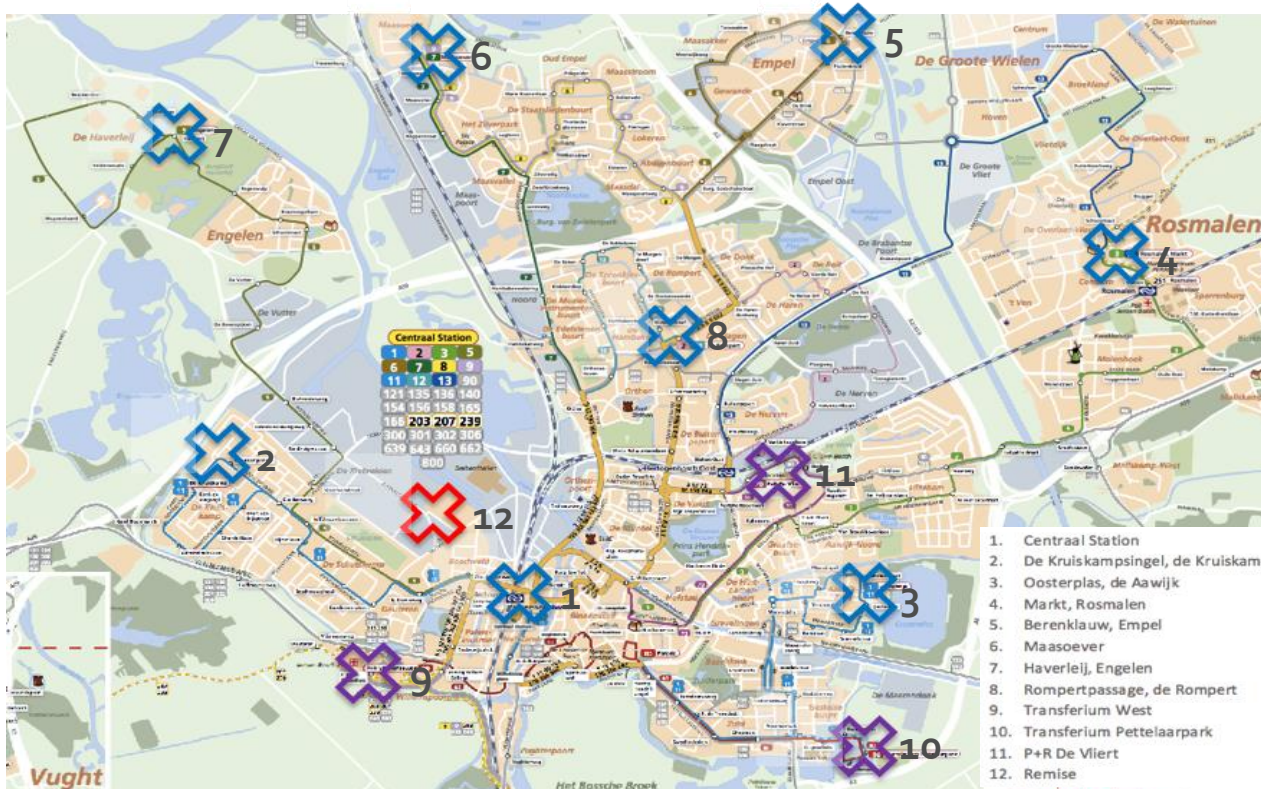
The triple layered model

Result cost comparison



The triple layered model

Results



Insight in:

- Charging configuration
- Potential locations
- Grid impact
- Costs
- Feasibility

Recommendations

- Gain knowledge upfront about e-buses and charging infrastructure
- Start discussions at an early phase: cooperation between stakeholders is essential
- Develop a strategy including all three layers and their interests





Questions?



Contact



Amsterdam

Overtoom 60-4

1054 HK Amsterdam

 +31 6 52 66 30 32

 r.steinmetz@evconsult.nl

Antwerpen

Mechelsesteenweg 271

Bus 1.1 2018

 + 32 4 99 51 66 33

 info@evconsult.be

London

13 Blackburn Road, Suite 5

London. NW6 1RZ

 + 44 7754 318 626

 k.house@evconsult.uk



E-buses: what's new?

New technology and opportunities for PTO



Technique

Educating drivers and mechanics



Costs

Different cost structure, infrastructure, investment



Scheduling

Driving routes, charging locations, charging time



Charging infrastructure

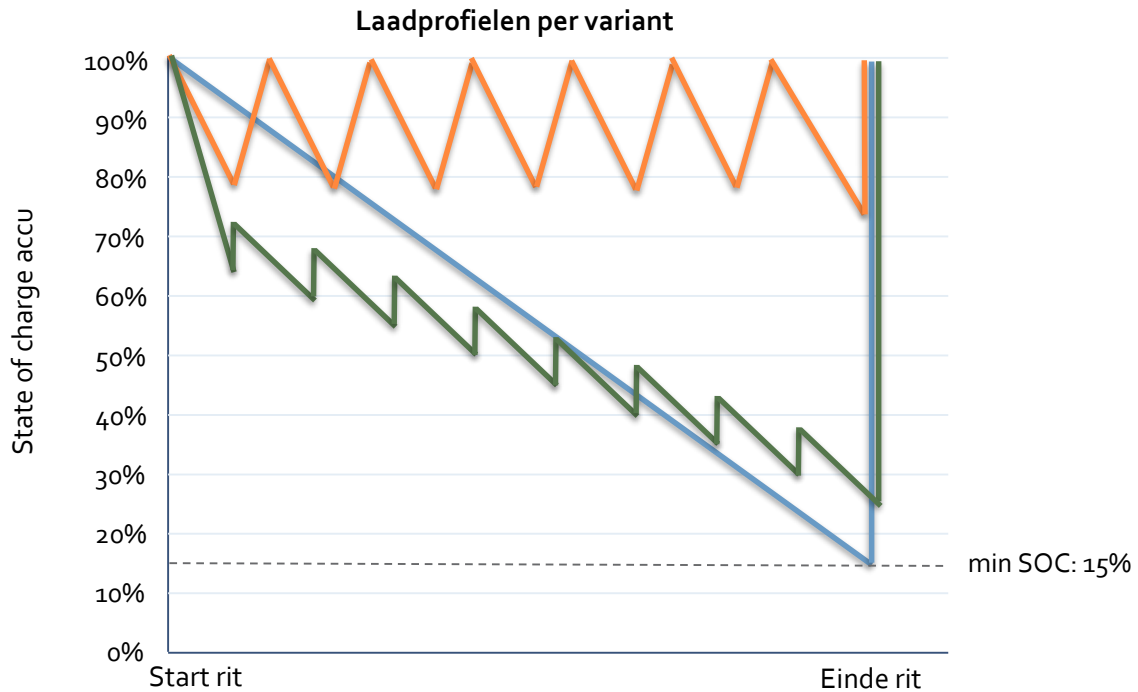
TCO (cost) and practical implications



New business models

Purchasing & selling energy





- OC variant met klein accupakket en laders met hoog laadvermogen (max. 600 kW)
- OC variant met groot accupakket en laders met laag laadvermogen (max. 300 kW)
- Overnight charging variant (met of zonder buswissel)



E-buses: what's new?

You ask for this:



But... also get this:

