POLIS 2017 ANNUAL POLIS CONFERENCE
6-7 December 2017, Brussels
Innovation in Transport for Sustainable Cities and Regions

eLIPTIC
electrification of public transport in cities

From project to policies – ELIPTIC and electric public transport business cases

December 6, 2017 - Brussels

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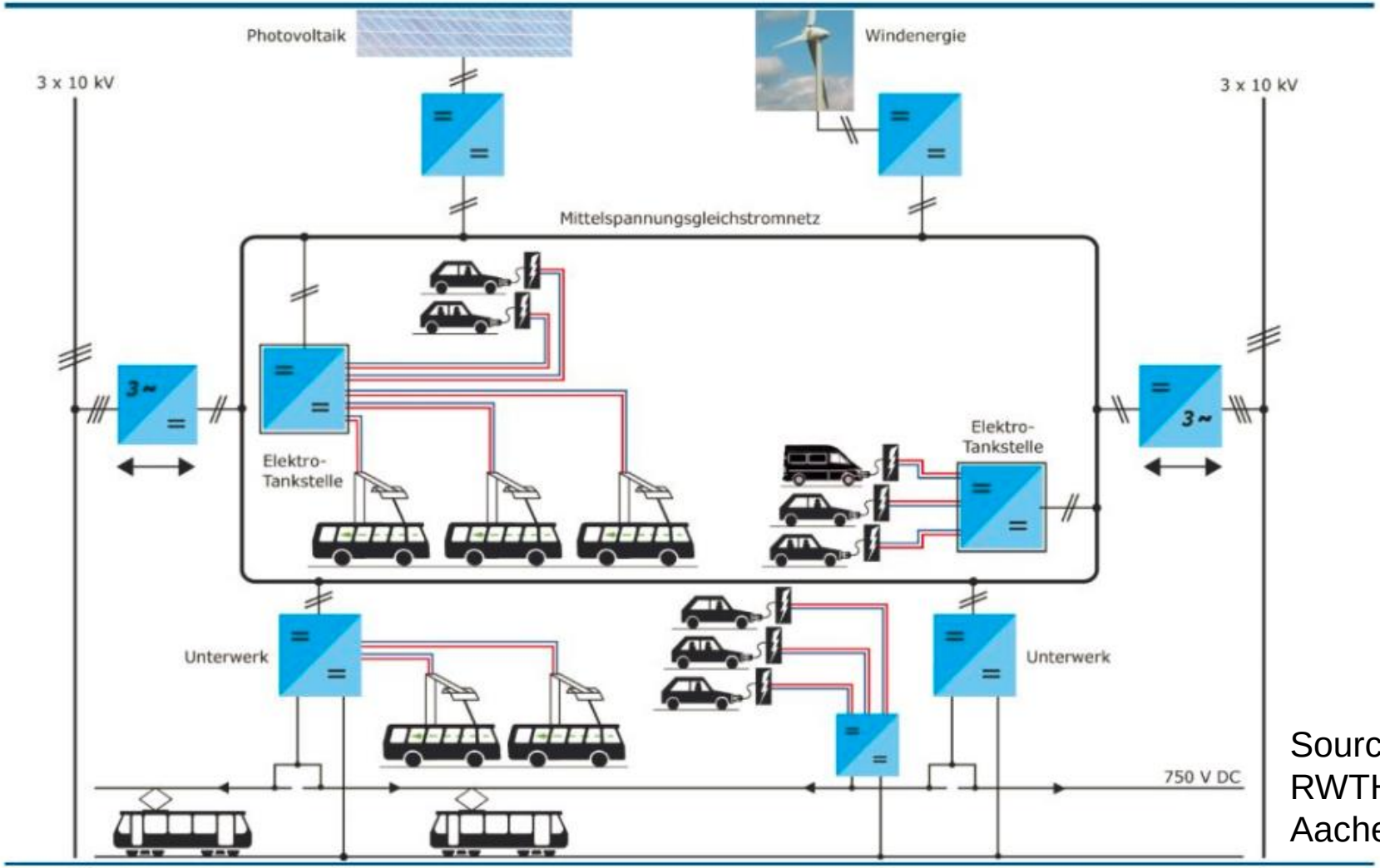
RUPPRECHT CONSULT
Forschung & Beratung GmbH

2020 CIVITAS

Horizon 2020 Programme

The project:
Multi-purpose use of public transport infrastructure



Source: RWTH Aachen

The project:
Electric public transport grids as backbone for e-mobility concepts

Micro-Mobility	Public Transport	Vehicle-Sharing

Bike, pedelec

(E-)car sharing

Segway

Trains, trams, (trolley-) buses …

Bike sharing

Electro scooter

- Trolleybuses as „backbone“ of transport chains
- Micro-Mobility & Vehicle-Sharing to complete start & end mile

mobility sharing

Spath, IAO, 2011

The project in a nutshell:

- Research and Demonstration project in EU Program „Horizon 2020“ (Mobility for Growth 5.1)
- Funding primarily for research and promotion (only small share for hardware)
- 33 partner in 8 Countries
- Duration: 01.06.2015 – 30.05.2018
- Coordinator: Freie Hansestadt Bremen
- Budget: 5,9 Million Euro

Horizon 2020 Programme

This project has received funding from the European Union's Horizon 2020 research an innovation programme under grant agreement No 636012

The project:
Three thematic pillars

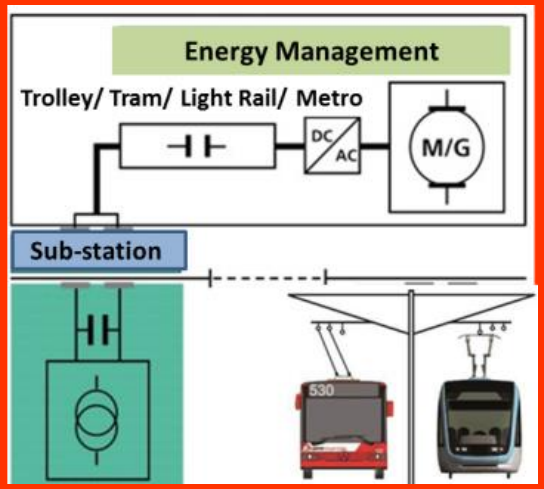
A

E-buses

Safe integration into existing electric PT infrastructure

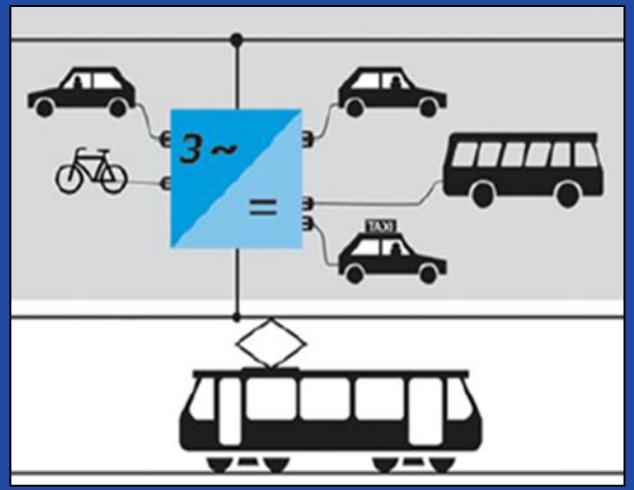
B

Energy efficient electric PT system



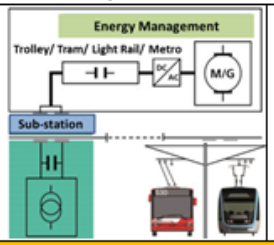
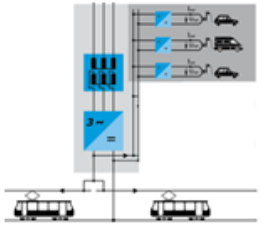
C

Multi-purpose use of electric PT infrastructure

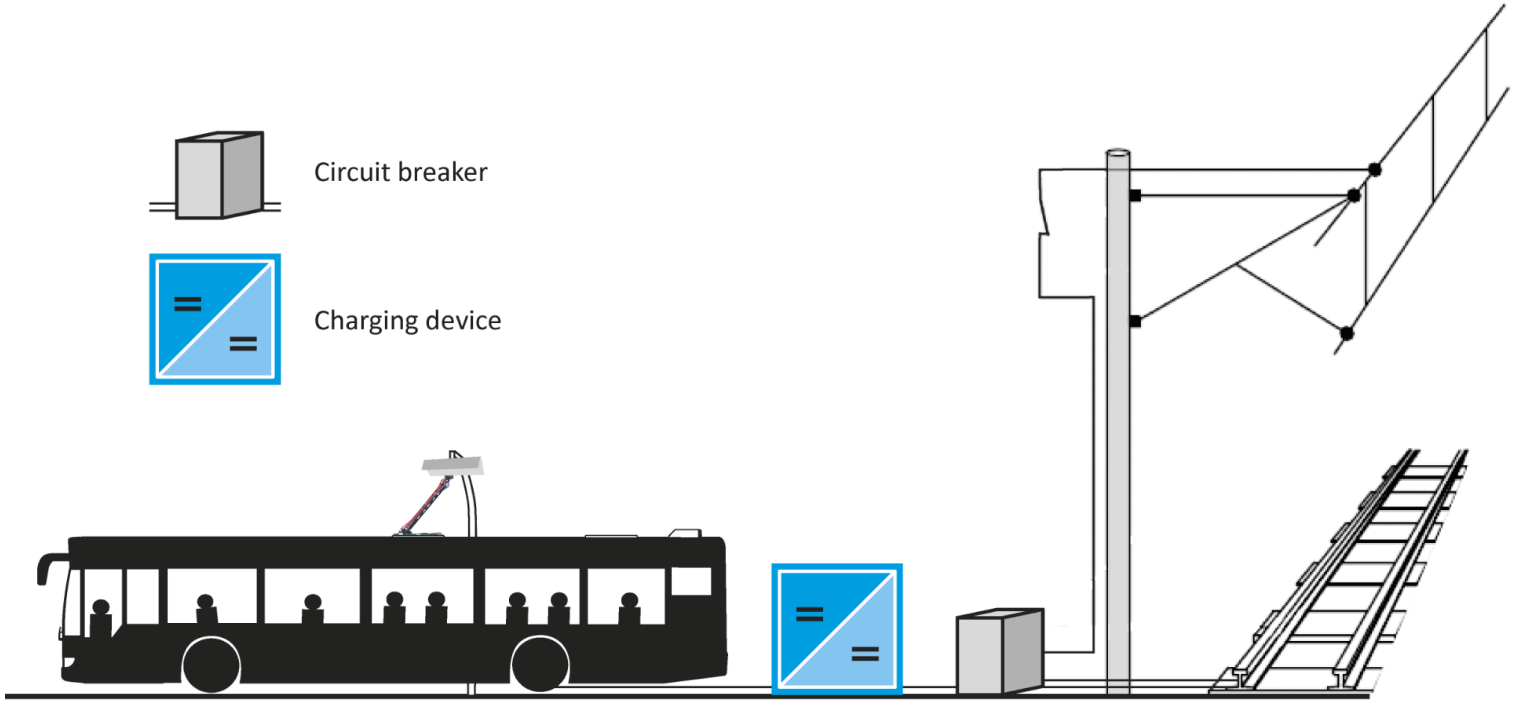


The project:
More than 20 use cases …

Table 2: ELIPTIC use cases: = feasibility study / technological concept / = demonstration in operational environment

Thematic pillar / Partner city		Safe integration of ebuses using existing electric public transport infrastructure (A)		Innovative energy storage systems to increase operational efficiency (B)		(C) Multi – purpose use of electric public transport infrastructure (C)
Bremen (DE)	A.1: Operation-optimized system of opportunity charging at bus depots		B.1: Recuperation of braking energy from trams: Refurbishment of a flywheel energy storage system		C.1: From uniqueness to system: Extension of existing multimodal mobility hub station	
London (UK)	A.2: Opportunity (re)charging of ebuses and/or plug-in hybrid buses (using metro infrastructure)				C.2: Use of metro sub-station for (re)charging TfL fleet vehicles (e-cars & e-vans) and zero-emission capable taxis	
Brussels (BE)	A.3: Progressive electrification of hybrid bus network, using existing tram and metro infrastructure		B.2: Optimised braking energy recovery in light rail network			
Barcelona (ES)	A.4: Opportunity fast (re)charging and slow overnight charging of electric buses based on metro infrastructure				C.3: Use of metro/tram infrastructure for recharging e-cars (municipal fleet and private e-cars)	
Warsaw (PL)	A.5: Use of /tram infrastructure for recharging e-buses					
Leipzig (DE)	A.6: Opportunity (re)charging of ebuses (using tram infrastructure)				C.4: Use of tram network sub-station for (re)charging e-vehicles	
Oberhausen (DE)	A.7: Opportunity (re)charging of ebuses (tram catenaries and sub-stations)				C.5: Fast-charging stations for e-cars powered from the tram network	
Gdynia (PL)	A.9: Opportunity (re)charging of ebuses connecting Tri-city agglomeration based on trolleybus infrastructure A.10: Replacing of diesel bus lines by extending trolleybus network with trolley-hybrids					
Eberswalde (DE)	A.11: Replacing diesel bus lines by extending trolleybus network with trolley-hybrids (incl. demo of automatic (de)wiring)					
Szeged (HU)	A.12: Replacing diesel bus lines by extending trolleybus network with trolley-hybrids				C.7: Multipurpose use of infrastructure for (re)charging trolley-hybrids & e-vehicles	
Lanciano (IT)			B.4: Light rail (tram) operation for rural rail track			

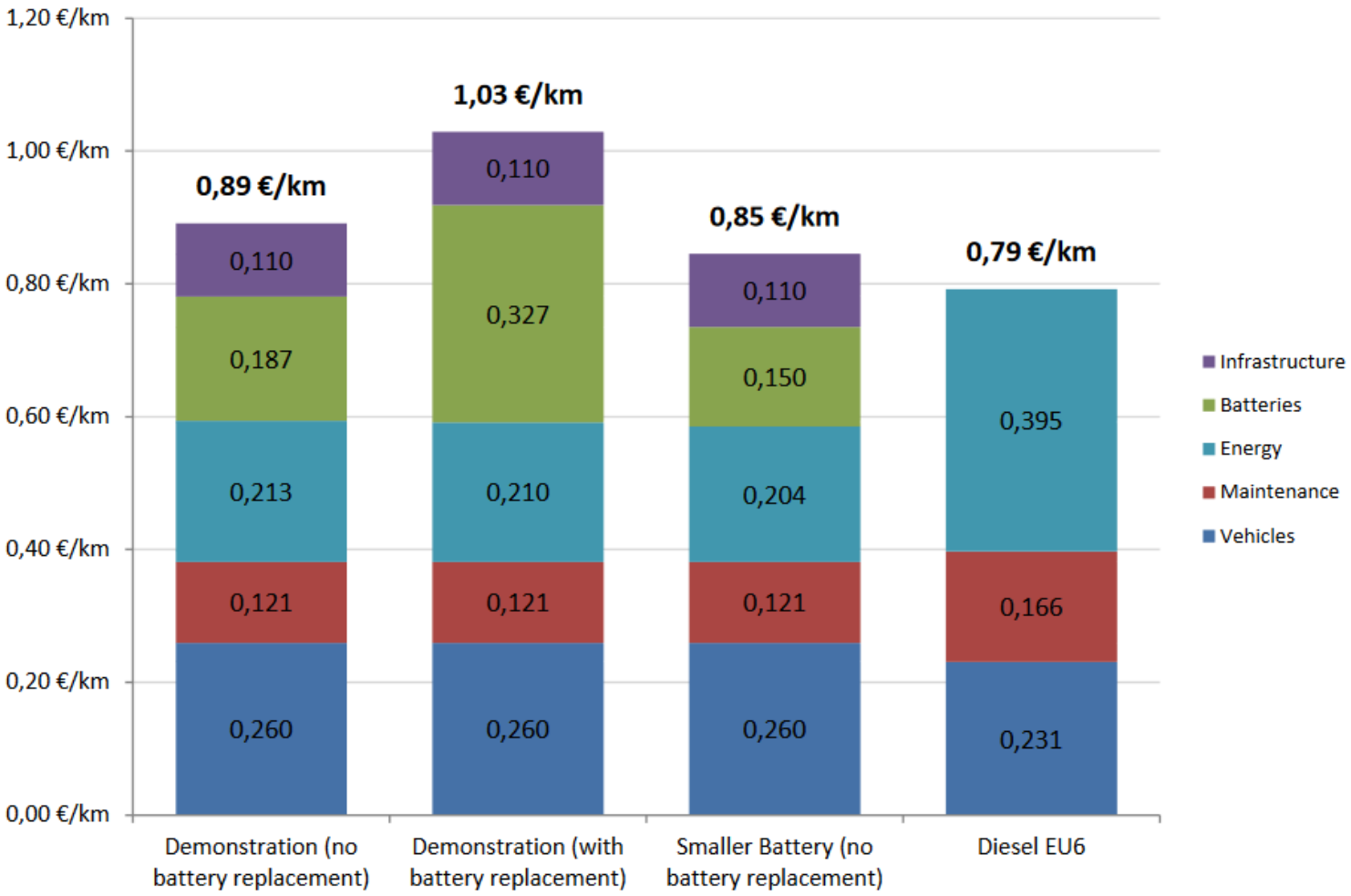
From use case to business case:
Tram-powered e-bus charging station (at Sterkrade station)



Tram-powered e-bus charging stations (at Sterkrade station)

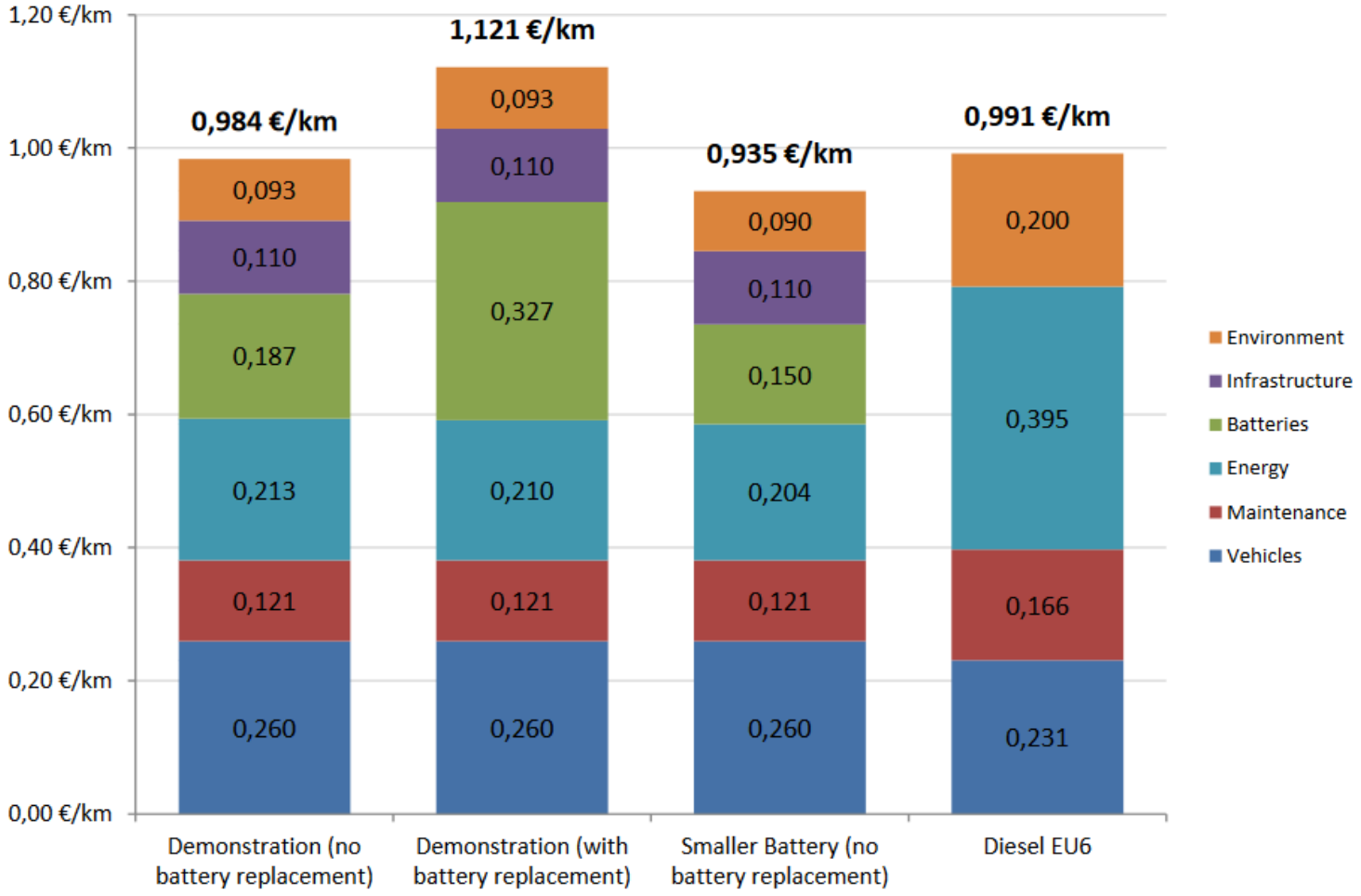
Business Case?

(ebus vs. diesel bus; TCO = 12 years)



Business Case?

(ebus vs. diesel bus; incl. external factors)

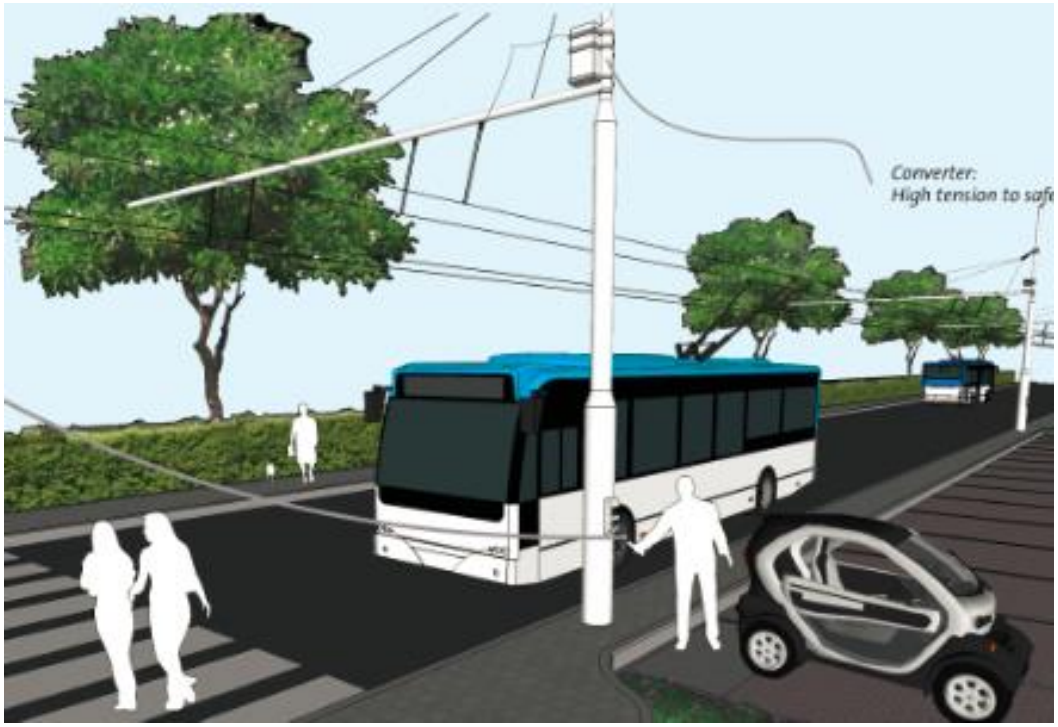


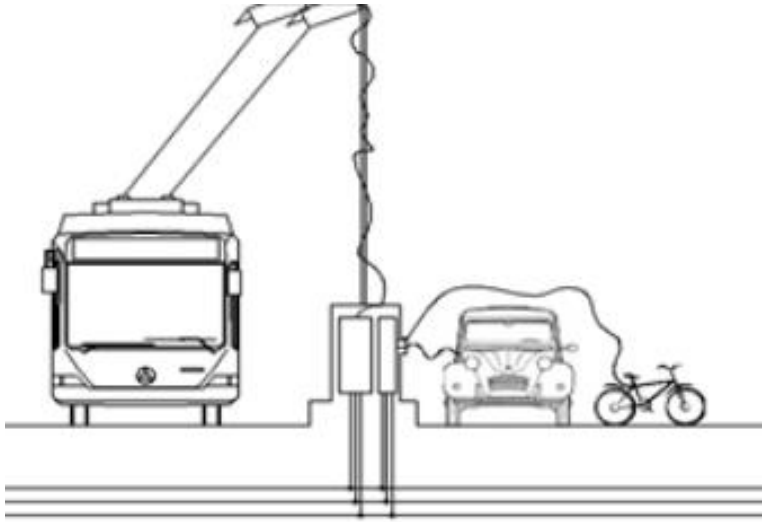
Business Case?:

Issues:

- **Costs**: Zero-emission technology is still developing – relatively early market with higher risks, unknowns (capital costs – vehicles and charging infrastructure, residuals, battery life ...)
- **Legal barriers**: Usage of tram/train „drive power“ for e-buses legally not foreseen
- **Limiting factors**: Capacity to support charging is power availability, time (schedules) and location (distance to grid) dependent
- **Interoperability**: lack of standards in charging infrastructure solutions (e.g. pantograph positioning)
- **Market barriers**: low emergence of DC charger suppliers - not many on the market

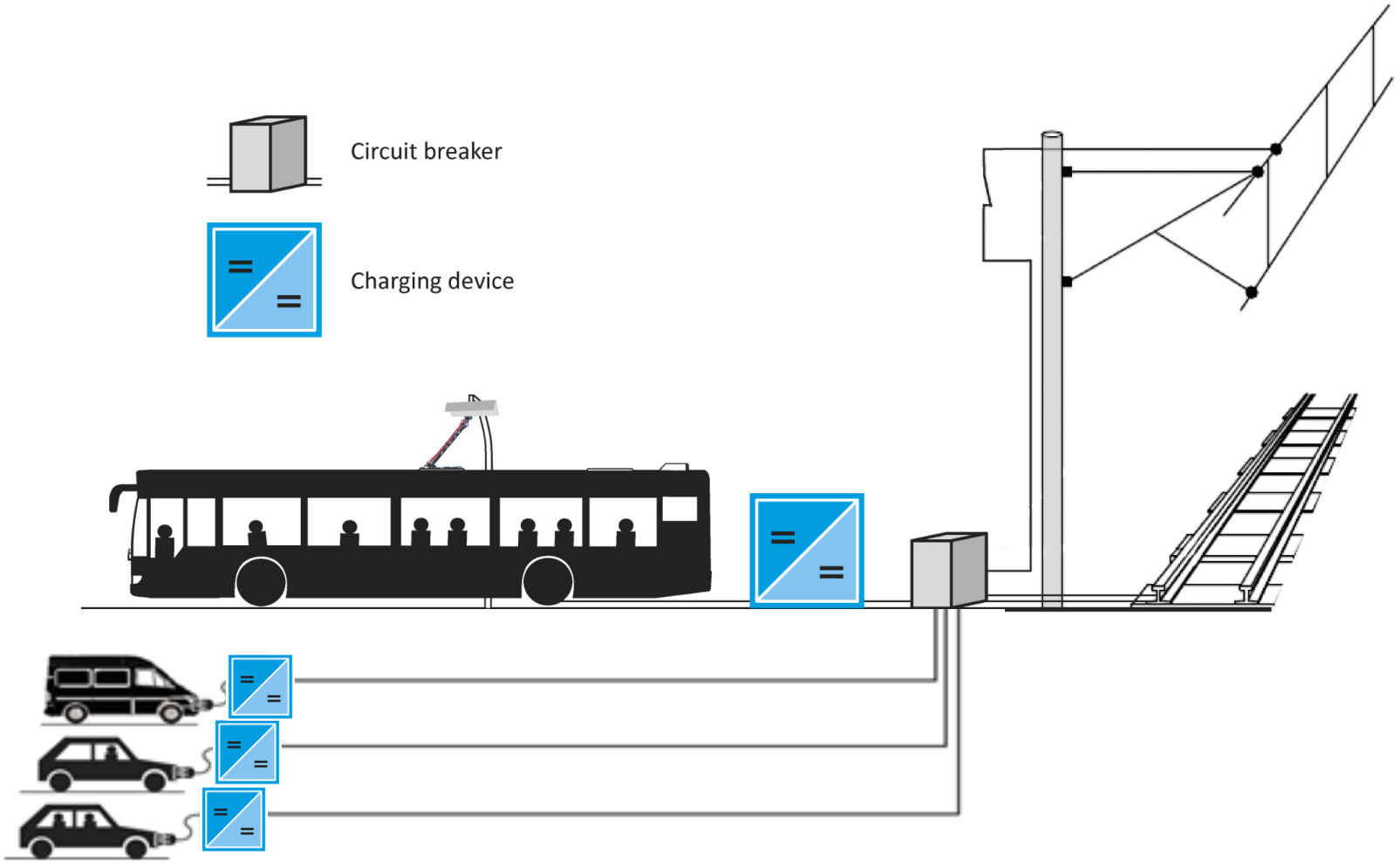
From use case to business case:
Multi-purpose trolley charging infrastructure in Arnhem, NL





http://www.omroepgelderland.nl/nieuws/2134955/Autorijden-op-energie-van-remmende-trolleybussen

From use case to business case:
Multi-purpose tram charging infrastructure in Oberhausen, DE



3 fast-chargers for private e-vehicles at Sterkrade station

Final design of the fast chargers
- in operation since 07/17; 18 months after installation due to legal barriers!

Business Case?:

Issues:

- **Legal/ regulatory barriers:** re-selling energy is still very difficult for PT operators; standards currently prohibit the use of the Tram/Trolley/Metro Power Networks for non-railway/trolley related purposes
- **Tax and accounting barriers**: how do you solve accounting when multiple parties are involved? New business models are needed
- **Technical barriers**: Available capacity, grid connection, voltage stability, availability of charging stations (manufacturers), standardised metering and calibration systems

From (failed!) business cases to policy recommendations

- **First recommendations:**
  - Increase funding for electrification of public transport: **Factor 100**: exploit impact of electric public transport!
  - Use PT transport grids as a „backbone“ for charging infrastructure planning (ELIPTIC examples from London, Oberhausen and Barcelona!)
  - Change regulations and eliminate barriers related to usage of PT grid power for other purposes than rail/tram/metro operation
  - Develop interoperability standards to make use of existing infrastructure by several e-modes
  - Develop standardised DC measurement devices for clear billing and payment models

Factor 100 Campaign

Passenger car		Bus (18m)
< 1 hour	Daily usage	12 - 16 hours
Small (- medium)	Engine size	big
50 - 60% Diesel	Fuel	95 – 98 % Diesel
Diesel: PM_{10} + NO_2 Gasoline: low	local pollutants	Diesel: PM_{10} + NO_2
500 l gasoline/ Diesel	Annual fuel consumption	40,000 l Diesel
~ 1,2 to	CO_2 emission p.a.	~ 100 to
	Total impact	Equals to app. 100 electric passenger cars

From campaign to funding programme!

Positionspapier / März 2016

Elektromobilität im weiter fördern

Politik

Freitag, 05. Mai 2017, 14:41 Uhr

Länder wollen "Faktor 100"-Programm

Die Bundesregierung soll sofort ein Förderprogramm für Elektrobusse im Nahverkehr auflegen. Das verlangen die Umweltminister der Länder, wie aus dem *klimaretter.info* vorliegenden Abschlussprotokoll ihrer halbjährlichen Umweltministerkonferenz (UMK) in Bad Saarow bei Berlin hervor.

Die Umweltminister der Länder wollen E-Busse mit einem "Faktor-100-Programm" massiv fördern. (Foto: Oliver Lang/BVG)

SAVE-THE-DATE

- ELIPTIC Final Conference 26/27 April 2018 in Bremen
  Registration via www.eliptic-poject.eu

Thank you for your attention!

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