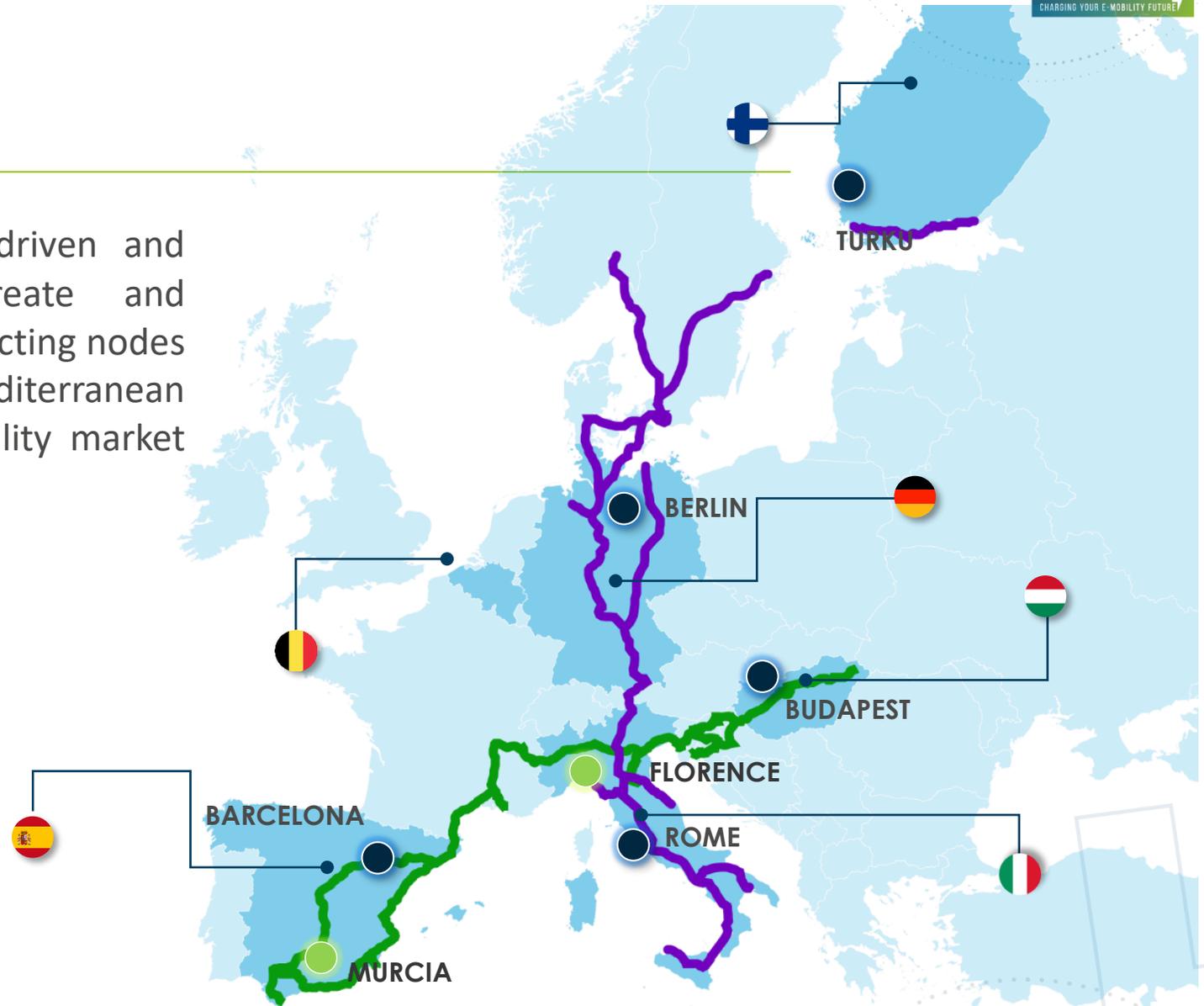


ELECTRIFYING URBAN BUSES - LESSONS FROM EUROPEAN CITIES

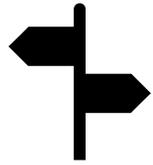
THE PROJECT

USER-CHI is an industry-powered, city-driven and user-centric project which will co-create and demonstrate smart solutions around 7 connecting nodes of the Mediterranean and Scandinavian-Mediterranean TEN-T corridors to boost a massive e-mobility market take-up in Europe.

- ✓ Duration: 2020-2024
- ✓ 24 partners
- ✓ Coordinator: **etra** | +D



AGENDA



Introduction – Marion Pignel, Eurocities



Setting the scene: EU policies on buses decarbonisation – Thomas Lymes, Eurocities



Electrification of Turku bus fleet - Topias Pihlava, Föli



Electrification of Berlin bus fleet - Yasmin Halil, SenMVKU



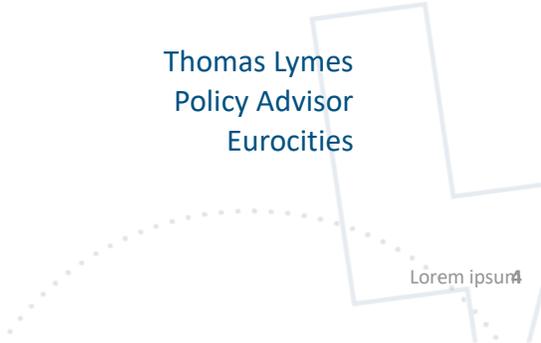
Electrification of Budapest bus fleet - Gergely Kofrán, BKK



Roundtable discussion and Q&A



SETTING THE SCENE: EU POLICIES ON BUSES DECARBONISATION



Thomas Lymes
Policy Advisor
Eurocities



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No [875187]

Setting the scene: EU policies on buses decarbonisation

- **Green Deal:** -55% CO₂ emissions by 2030 (2005 reference period) ; -90% expected for the transport sector alone by 2050 to reach climate neutrality objectives
- Public authorities expected to lead by example
- Three main **legislative instruments** to drive the buses' segment decarbonisation:
 - **Clean Vehicles Directive:** public procurement targets for the purchase of low and zero-emission buses:
 - **Regulation on CO₂ emissions standards for heavy-duty vehicles** (incl. urban and inter-urban buses): bus manufacturers CO₂ emissions targets for new buses
 - **Regulation on the deployment of alternative fuels infrastructure:** deployment targets for charging points
- Various **EU funding instruments** available for public authorities to help them procure zero-emission buses and invest in recharging infrastructure

Setting the scene: EU policies on buses decarbonisation

➤ Clean Vehicles Directive:

- Demand-side legislation targeting **public authorities** procurement's practices
- National targets applicable to **procurement contracts** : applicable for the purchase, lease, rent and relevant services contracts related to buses
- National targets for the procurement of zero-emissions buses ranging from 24% to 45% for the first reference period **2021-2025** ; 33% to 65% for the second reference period **2025-2027**
- **Review in 2027** : revise the targets in line with new supply-side legislation; relevance of the legislation depending on market developments

Setting the scene: EU policies on buses decarbonisation

➤ Regulation on CO2 emissions standards for heavy-duty vehicles

- Supply-side legislation
- **Fleet-wide CO2 emissions targets** applicable to the new sales of buses in the EU market
- Regulation still **under discussion** : probable conclusion of the negotiations in Q1 2024
- Main issue at stakes related to buses decarbonisation: **phase-out date for ICE buses sales** → date depending on the outcome of the negotiations
- Additional criteria introduced for the procurement of buses to **avoid dependency on third-country imports**

Setting the scene: EU policies on buses decarbonisation

➤ Regulation on the deployment of alternative fuels infrastructure ('AFIR'):

- Targets for **the deployment of charging points/H2 refuelling stations** : fleet-based targets and distance-based targets
- **No specific targets for electric buses** but targets for 'urban nodes' for heavy duty vehicles:
 - ✓ Min. **900 kW installed** power per urban node by **31 December 2025**
 - ✓ Min. **1,800 kW installed** power per urban node by **31 December 2030**
 - ✓ Targets to be met through recharging stations with individual power output of min. 150 kW
- Defines **technical specifications** for e-buses recharging infrastructure
- Encourages Member States to consider public transport in their **national deployment strategies**

Setting the scene: EU policies on buses decarbonisation

➤ Funding instruments for buses decarbonisation

- **Recovery and resilience facility:**
 - ✓ 72,2 billions allocated for sustainable and green mobility investments → funds granted following the submission of national plans by EU Member States;
 - ✓ 12% allocated for public transport rolling stock, 5% for recharging and refuelling networks and stations)
- **Alternative Fuels Infrastructure Facility :**
 - ✓ EUR 1.575 million in co-financing derived from the Connecting Europe Facility ('CEF')
 - ✓ roll-out of electricity fast-charging (min 350kW) and hydrogen refuelling infrastructure across the TEN-T network, including on the urban nodes
 - ✓ 5 calls between 2021 and 2023, last call closed in November 2023.
 - ➔ Instrument under evaluation until Q1 2024
- Other instruments: **EIB loans, InvestEU funds, European Structural and Investment Funds, etc**



LESSONS FROM TURKU, FINLAND

Topias Pihlava
Föli



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Föli region

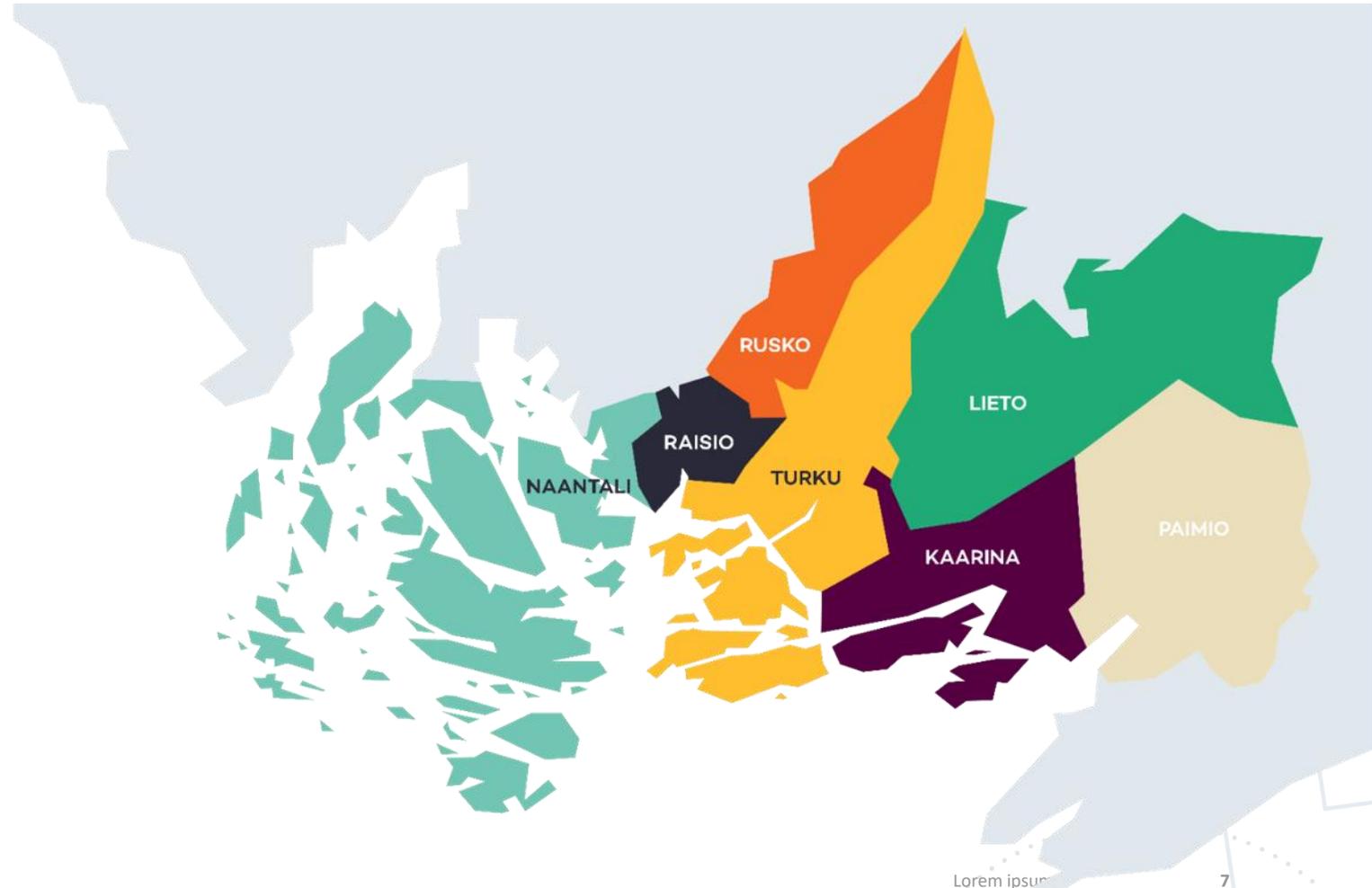
Southwest Finland

6 municipalities

- 300 000 inhabitants
- 26 milj. trips annually

Föli - Public Transport Authority

- Planning of routes and timetables
- Marketing and Sales, Fares
- Tendering processes of public transport
- Ticketing and info system
- Inspections
- Development of public transport
- Economy, clearing



Turku policies

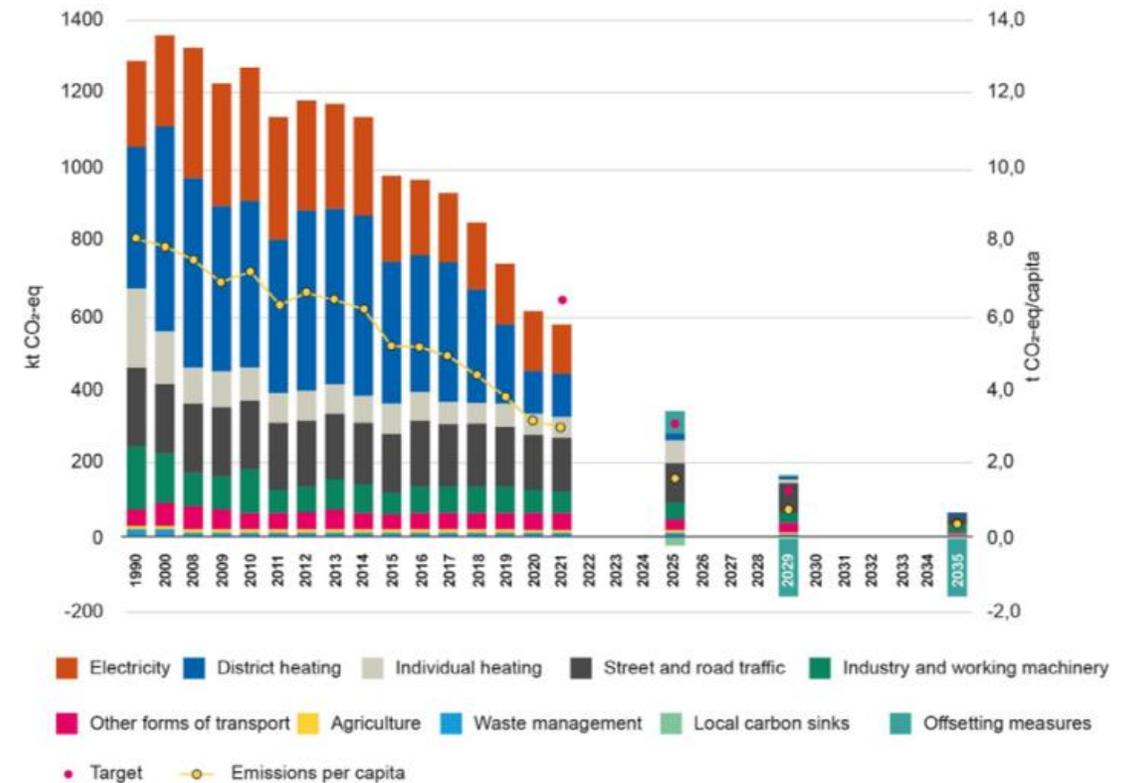
City of Turku has decided to go electric

- Noise, efficiency, local market, cost

Carbon neutral plan 2029

Walking + cycling + public transport shall cover over 66 % of all trips in Turku by year 2030

- Current: Cycling (13%), Public transport (9%) Walking (30%)

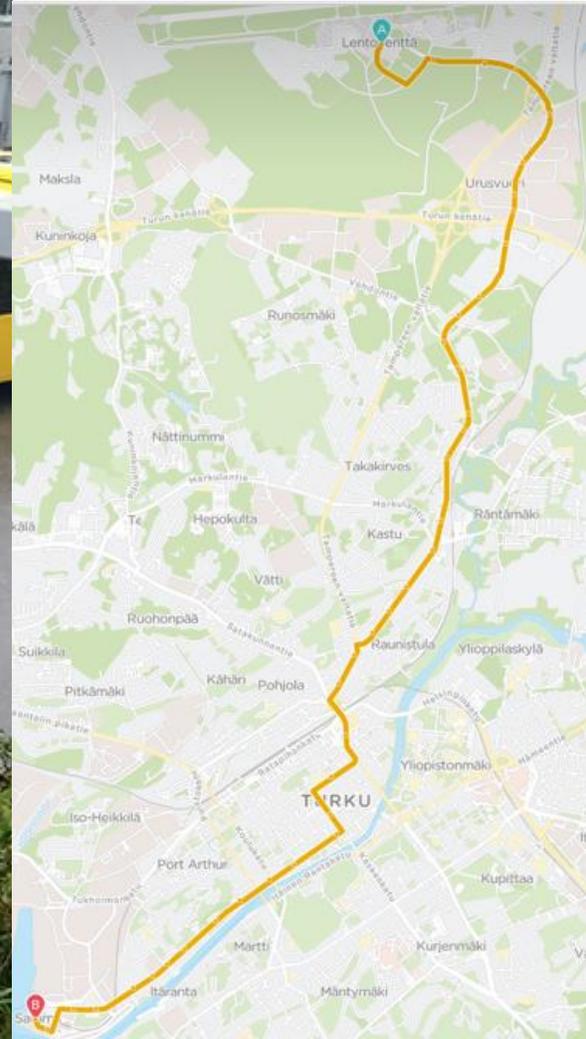


Normalised emissions in Turku in 1990, 2015 and 2020, calculated using the CO2 report method

The first Föli electric buses
were introduced in 2016.

In 2022, electric buses
accounted for a third of all
buses (70/260) and half of the
kilometres.





The first full electric bus started operation in Turku in October 2016. All the buses are electric on line 1 (Airport – City Centre – Harbour) – excluding the rush hour extra buses

Currently 3 operators with ebusses
BYD and Yutong (15m), Linkker
Part of normal contract, new busses

Clean vehicle and emission free
vehicle extra points in the
procurement

Operators are responsible for the
service



Feedback and future

Positive feedback, noice, smoothes

Turku will continue giving extra points in the procurement

All contracts has to use renewable fuel by 2029



LESSONS FROM BERLIN, GERMANY

Yasmin Halil
SenMVKU



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No [875187]



Electrifying urban buses in Berlin

Yasmin Halil

Senatsverwaltung für Mobilität, Verkehr, Klimaschutz und Umwelt (SenMVKU)
Eurocities USER-CHI peer-learning webinar

Short introduction...



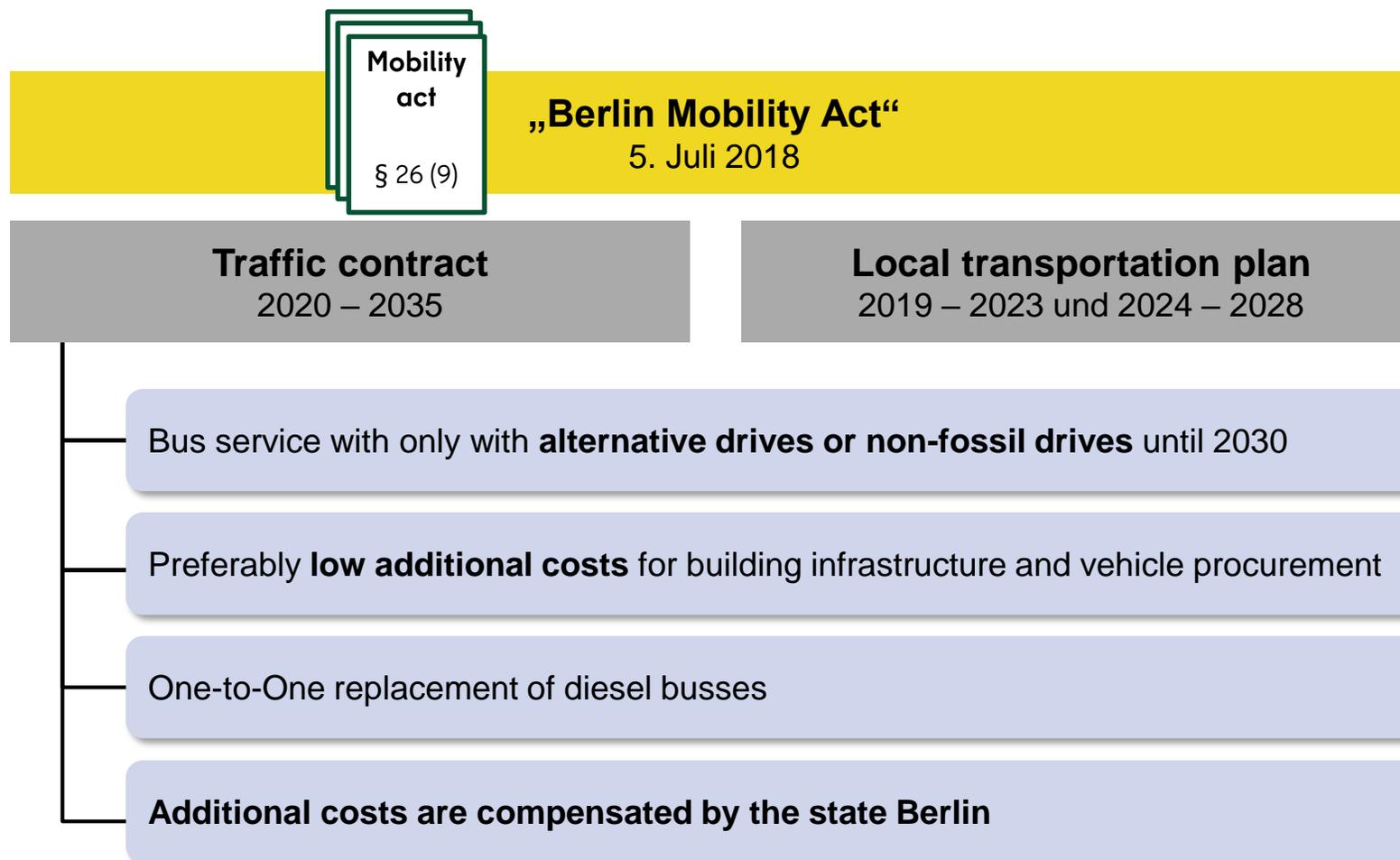
Senate department for mobility, traffic, climate protection and environment

“ÖPNV-Aufgabenträger”

Organizing and financing the public transportation in Berlin



Decarbonisation by 2030 is legally determined in Berlin



By 2030 the BVG will replace the entire bus fleet

...using different electric bus technologies

environment protection

air pollution reduction

100% locally emission free until 2030

different technologies are possible



E-Bus (Depot charging)



E-Bus (opport. charging)

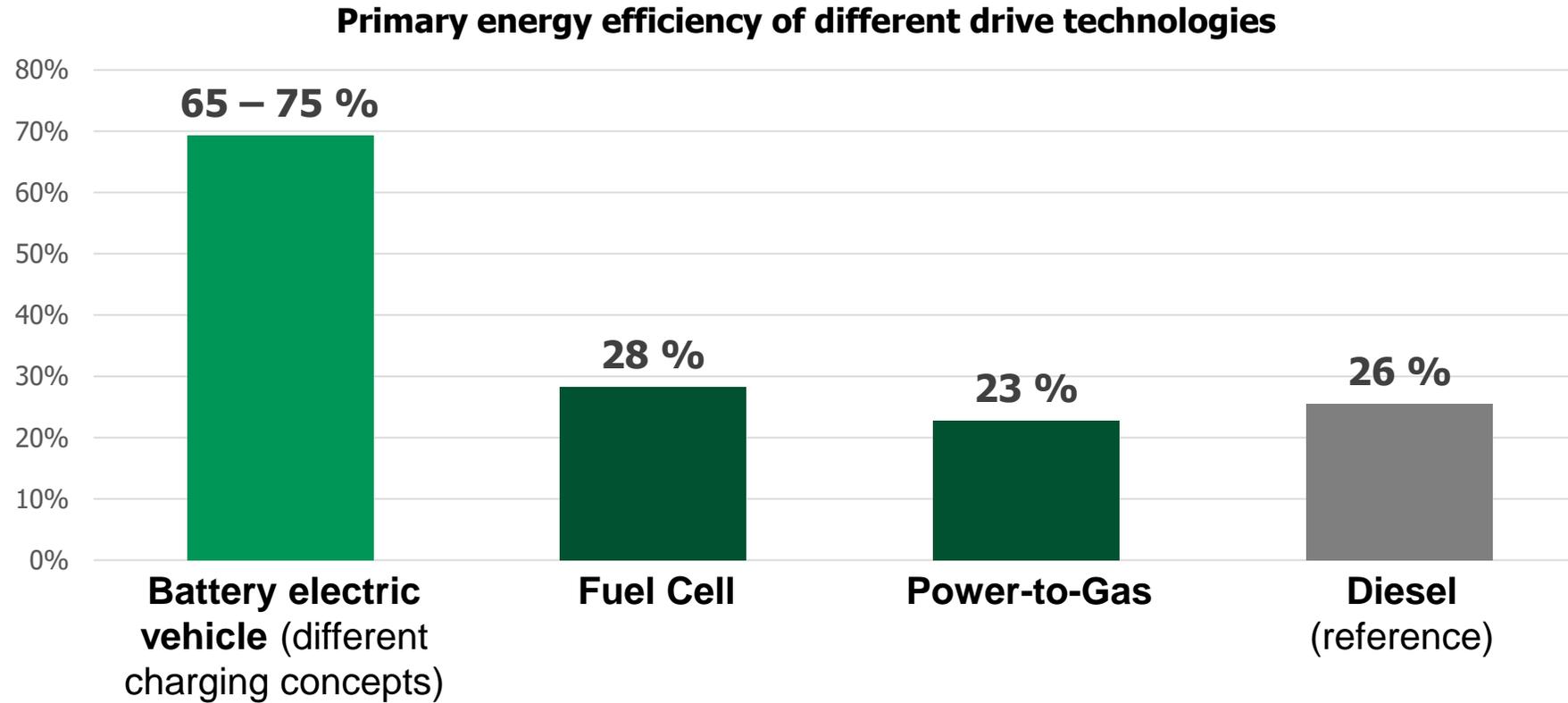


Trolley bus



Fuel cell

Comparing different (fossil free) technologies

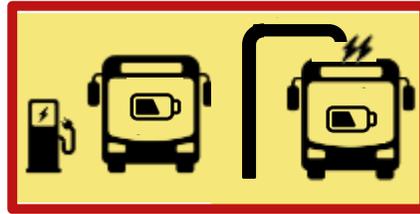


→ **Focus on battery electric vehicles (locally emission free, higher efficiency)**

Different studies...

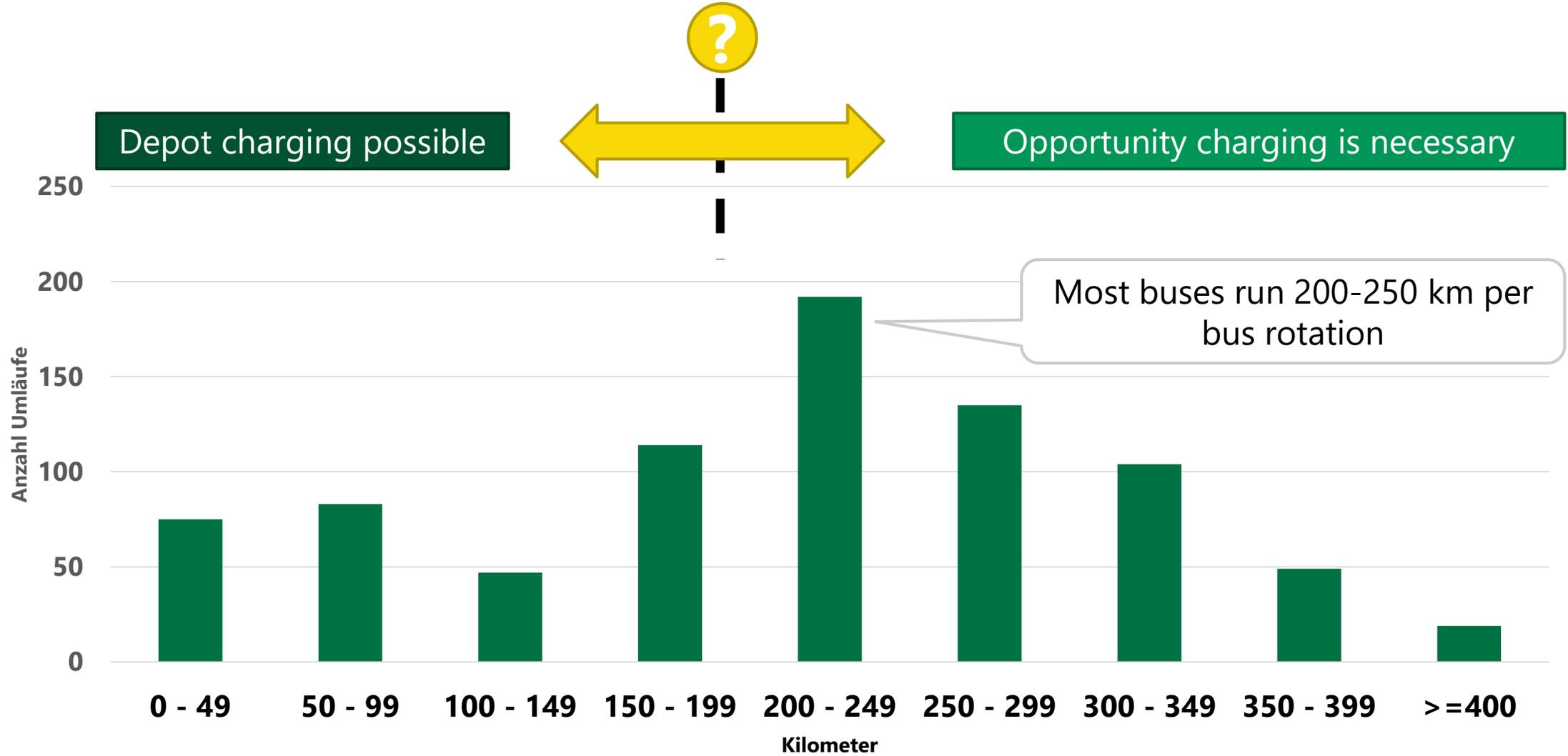
... lead to the final decarbonisation strategy

- ✓ Feasibility study trolley bus (2019)
- ✓ Feasibility study decarbonising double-decker buses (2021)
- ✓ Research project "E-Metrobus" (2019-2022)
- ✓ Market survey double-decker buses + economic viability study
- ✓ economic viability study bus network (2022-2024)
- ✓ Research project "E-Bus 2030+" (2023-2025)



„Flex charging“

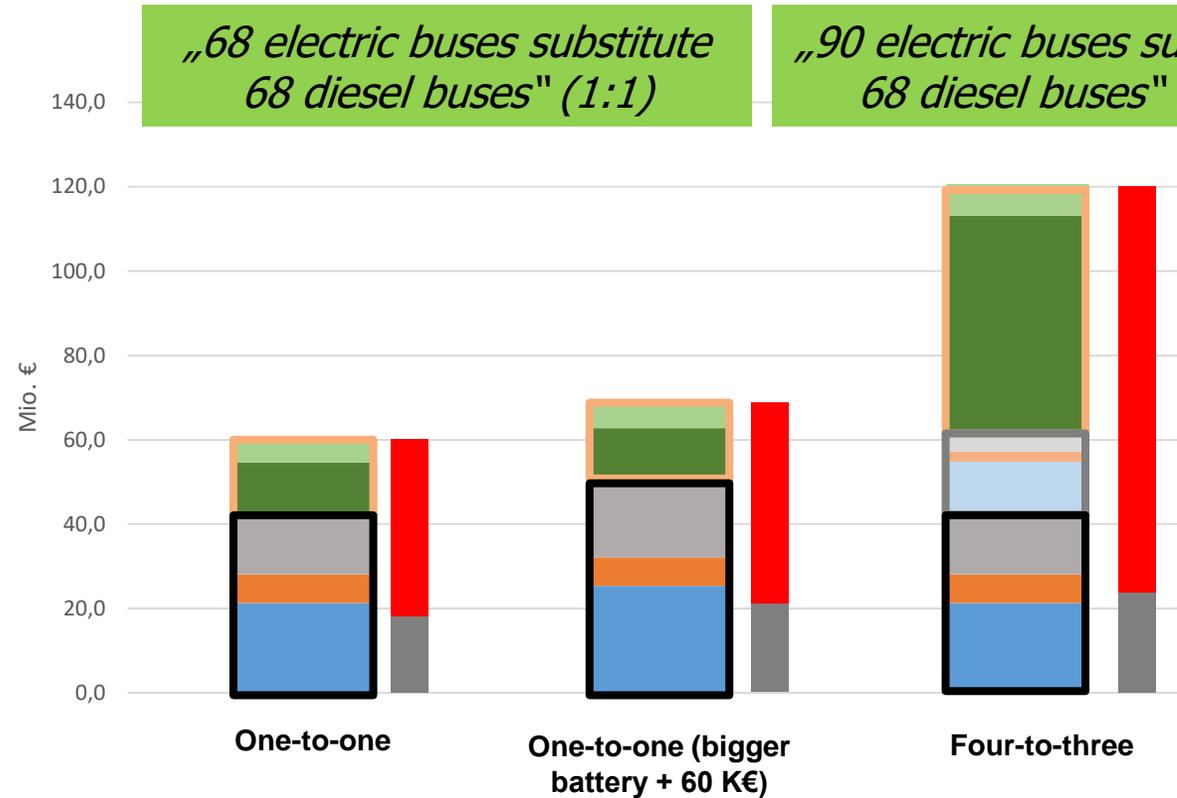
Which charging concept is the best?



One-to-one substitution is essential for the costs

... 4-to-3 substitution doubles the costs

-  Additional employees charging infrastructure
-  Additional employees drivers
-  Costs additional battery change (once per vehicle)
-  Costs additional charging infrastructure
-  Costs additional vehicles
-  Costs battery change (without additional vehicles)
-  Costs charging infrastructure (without additional vehicles)
-  Additional costs electric vs. diesel bus (without add. veh.)
-  Additional Costs investment (without additional vehicles)
-  Additional costs investment (because of add. vehicles)
-  Additional personnel costs
-  Funding federal government
-  Cost coverage Berlin



Electrifying six bus depots, building two new depots



Building charging infrastructure at terminal stations



Bus depot Müllerstr.

Bus depot Spandau

Bus depot Cicerostr.

Bus depot Britz

New bus depot Sântisstraße

Bus depot Indira-Gandhi-Str.

Bus depot Lichtenberg

Bus depot Alt-Friedrichsfelde
▪ For Diesel buses

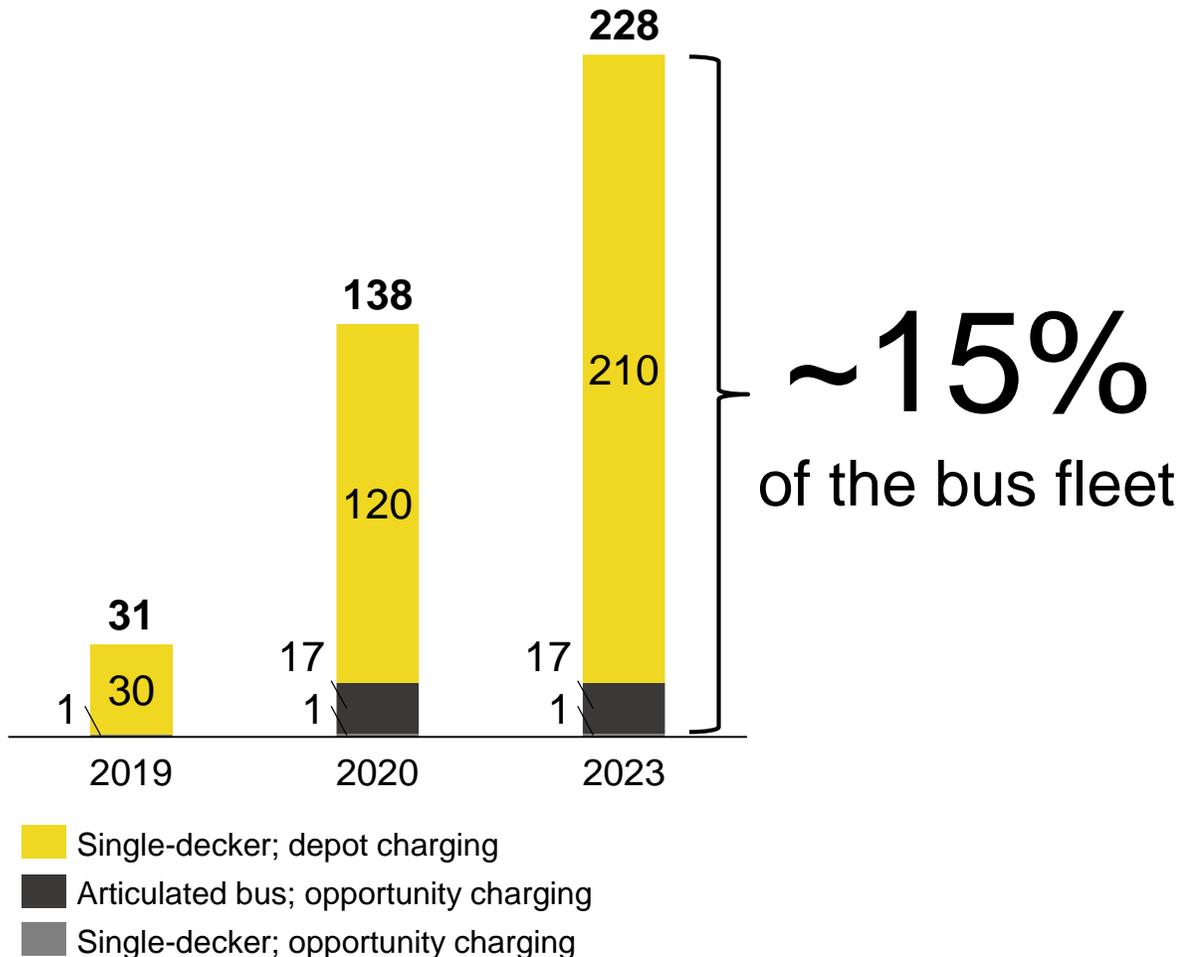
New bus depot Süd-Ost

Charging infrastructure at terminal stations

exemplary

The bus electrification is in progress...

since July 2023 approx. 15% of the buses are electric



Electric single-deckers (12 m); opportunity charging

Solaris research bus

Amount: 1
in operation since: 2018
heating: electric

Electric single-deckers (12 m); depot charging

Solaris I. Charge

Amount: 15
in operation since: 2019
heating: additional heater (diesel)
range: 150 km

Solaris II.-IV. Charge

Amount: 90
in operation since: 2020
heating: electric
range: 130 km

EvoBus

Amount: 15
in operation since: 2019
heating: additional heater (diesel)
range: 150 km

Ebusco

Amount: 90
in operation since: 2023
heating: additional heater (diesel)
range: 294 km

Electric articulated bus (18 m); opportunity charging

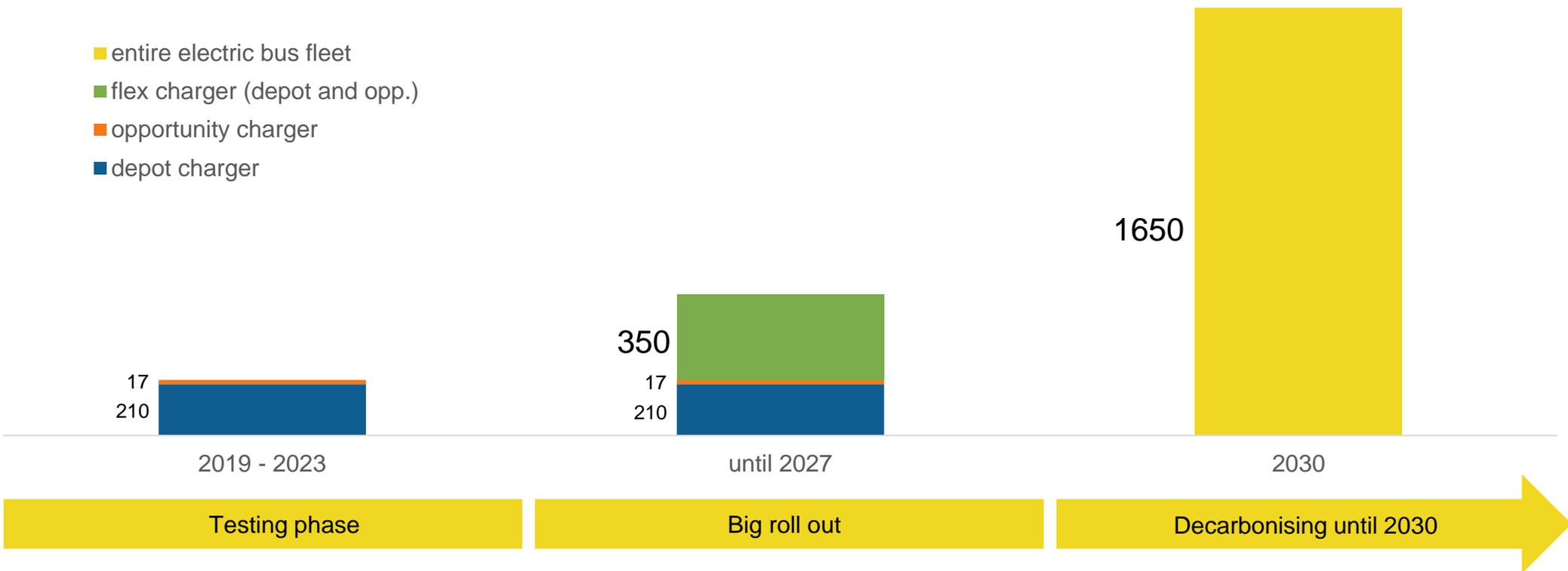
Solaris

Amount: 17
in operation since: 2020
Heating: electric

2024/2025 procurements of articulated buses will start

... up to 350 additional buses are planned

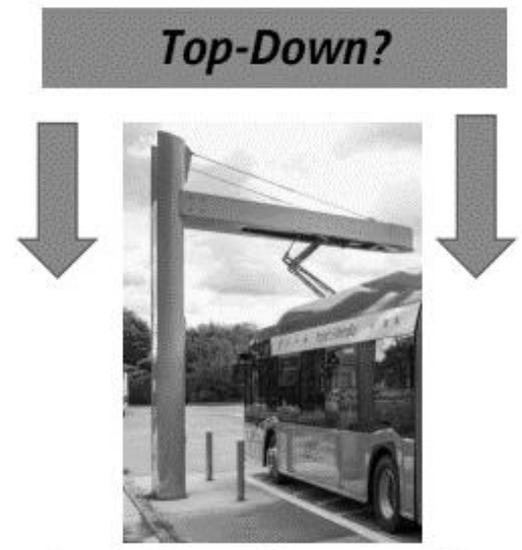
- entire electric bus fleet
- flex charger (depot and opp.)
- opportunity charger
- depot charger



Mandatory requirements:

-  Electrification of depots
-  Charging infrastructure at terminal stations

Which pantograph to be used?



- Less maintenance at derrick
- Less problems during operation (one bus vs all buses at this terminal)
- Higher costs (invest)

Which challenges do we face?

Lack of skilled labour

Limited experience with electric buses and infrastructure

Supply bottlenecks

Increased complexity
(path dependencies)

Products do **not meet quality demands**

Time consuming approval processes and tenders



Multi crisis

Challenges with electrification of bus terminals



- Need of special use permit  12 districts (process time up to 2 years)
- Electricity supply (grid operator) (process time up to 2 years)
- High amount of bus terminals to be electrified
- Competition for land use (charging infrastructure, bike lane, parking spots, green area, ...)
- Many construction sites

Exemplary transformer stations

1



2



3



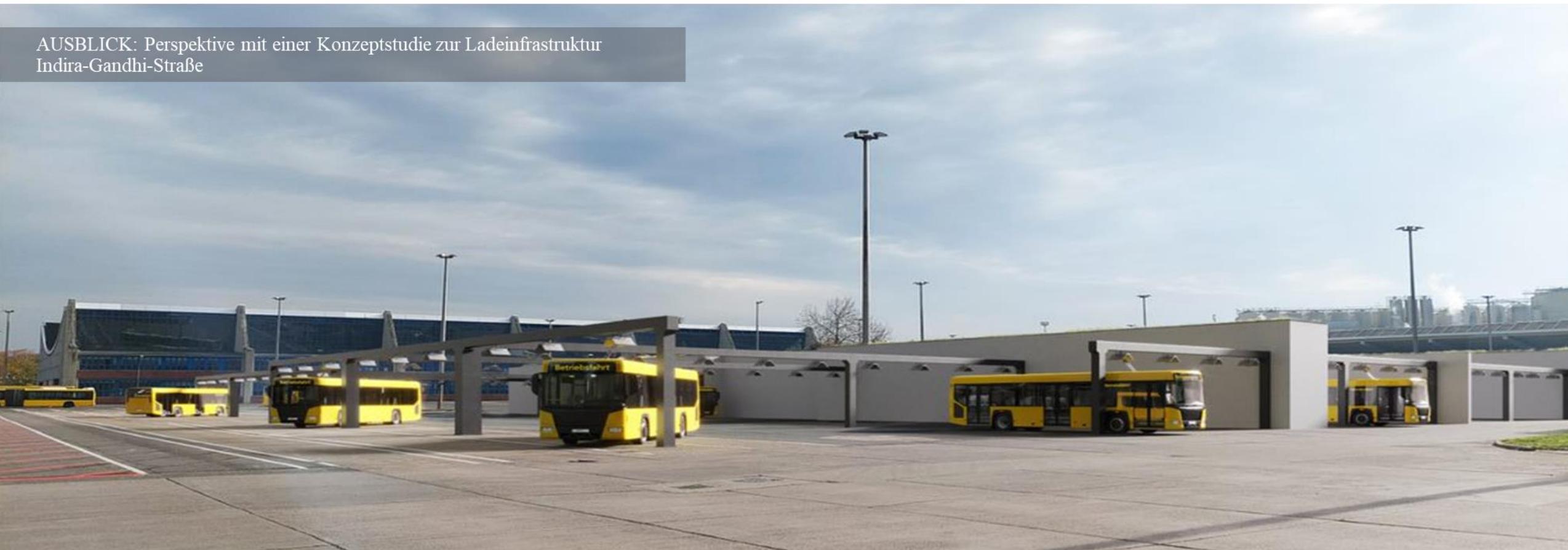
4



(Quelle: Kieler Verkehrsgesellschaft KVG)

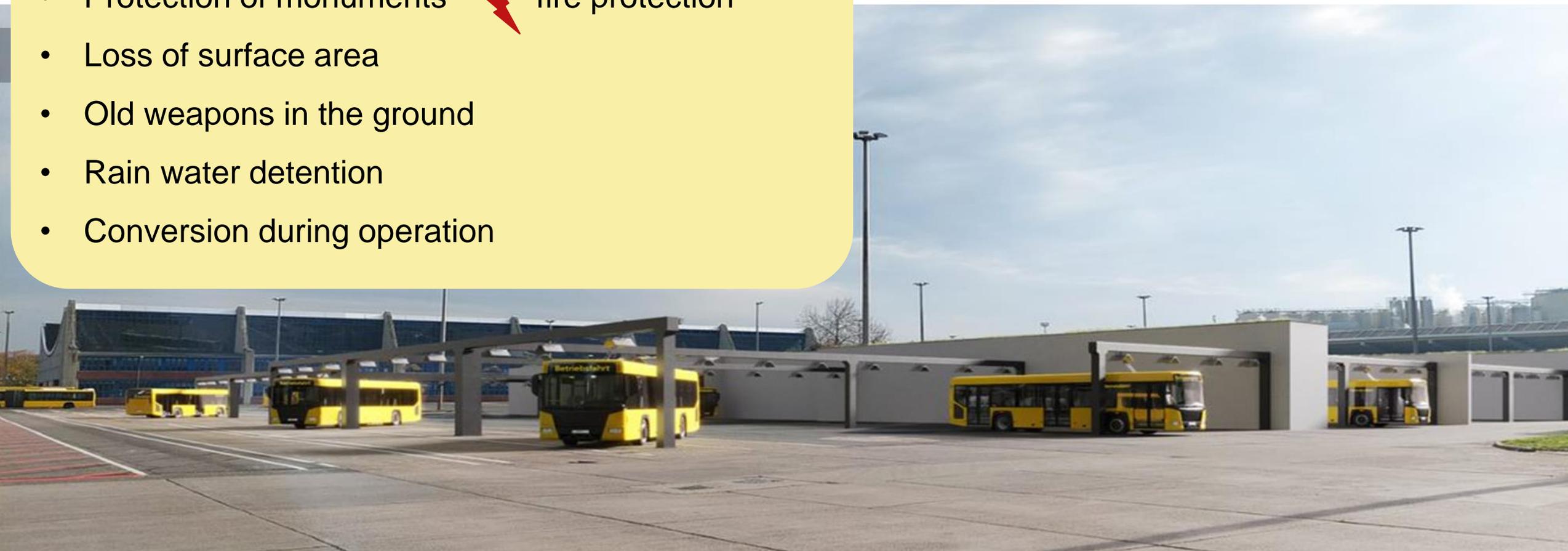
Simulation bus depot Indira-Gandhi-Straße

AUSBLICK: Perspektive mit einer Konzeptstudie zur Ladeinfrastruktur
Indira-Gandhi-Straße



Challenges with electrification of bus depots

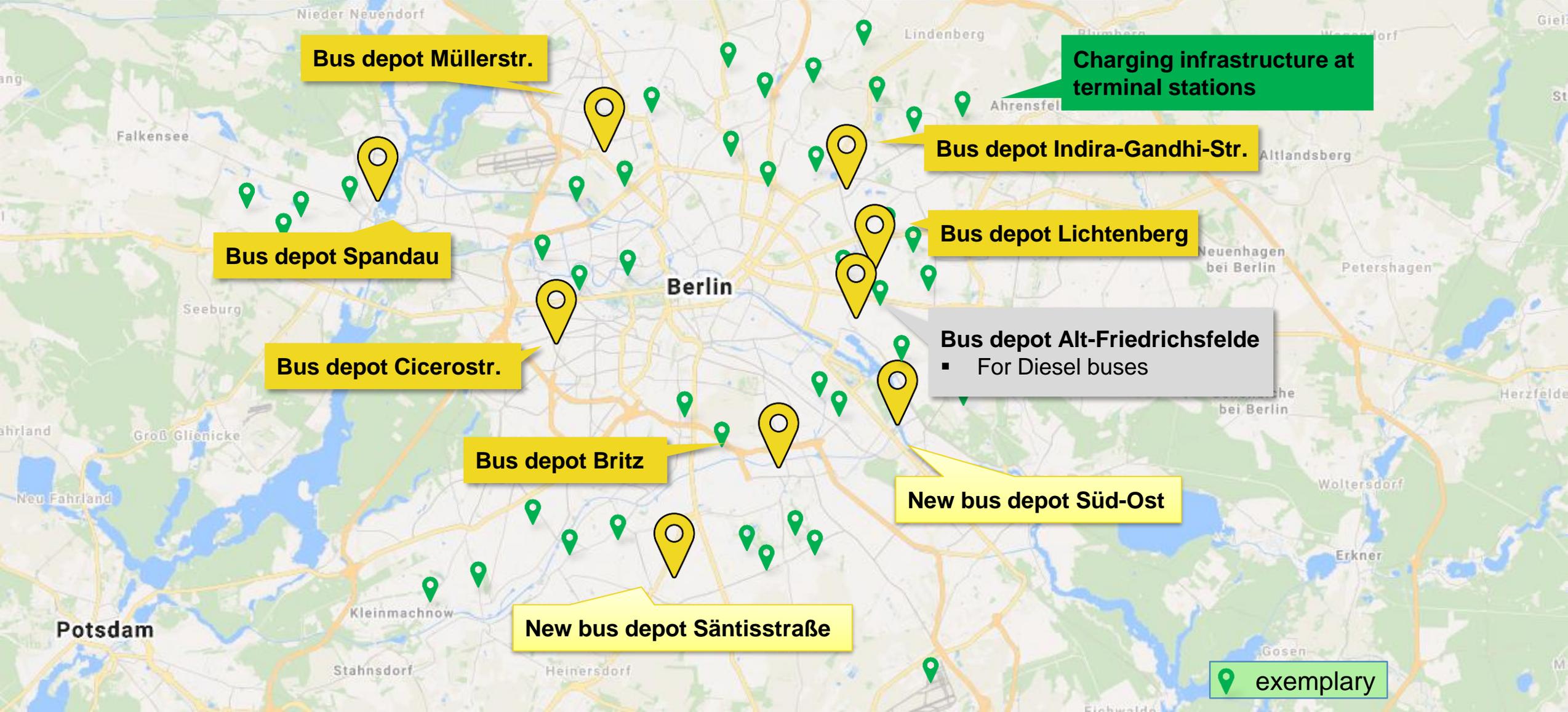
- Protection of monuments  fire protection
- Loss of surface area
- Old weapons in the ground
- Rain water detention
- Conversion during operation



Electrifying six bus depots, building two new depots



Building charging infrastructure at terminal stations



Bus depot Müllerstr.

Bus depot Spandau

Bus depot Cicerostr.

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New bus depot Sântisstraße

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Bus depot Lichtenberg

Bus depot Alt-Friedrichsfelde
▪ For Diesel buses

New bus depot Süd-Ost

Charging infrastructure at terminal stations

 exemplary

Time for questions...



LESSONS FROM BUDAPEST, HUNGARY



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THANK YOU!

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