

AIMING FOR ZERO. MOVE TOGETHER.



Task 8.4 Electric Bus Fleet upscale Eindhoven



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9755

Battery SOC 18 %
 Location Havenmeesterweg 27, 1118 CB
 Schiphol, Netherlands
 Location Changed 29.05.2018 14:38:01
 Current Speed 0 km/h
 Error No error
 Warning

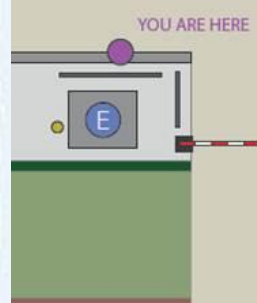


VDL Enabling Transport Solutions



- 1-2: C
- Pantol
- 3-4: C
- Pantol
- A-F: 4
- D: ES
- (2019)

The dashboard features a blue sidebar with navigation icons for Dashboard, Fleet, Vehicles, and Settings. The main area includes a 'BACK TO LIST' button, a dropdown menu for vehicle ID '9641', and a row of status icons. A large map displays a route in a city with a 'YOU ARE HERE' marker. At the top right, there are three circular gauges showing 0, 0.9, and 144, along with a battery level indicator at 9%.





Eindhoven (NL) Today

- Start operation: December 2016
- VDL Citea SLFA-181 Electric
- 43 articulated vehicles
- 180 kWh MPMC Battery
- Roof mounted Pantograph
- Daily average of 250 km/bus
- Maximum of 345 km/bus/day
- 6.500.000 km / 21 months
- 7500 ton CO₂ saved
- 35 ton NO_x saved

Comparison Today:

- Amsterdam Schiphol (NL)
- 100 articulated vehicles
- SoO: December 2017
- Daily average of 350 km
- Maximum of 500 km day
- Some vehicles only return in depot after 26 hours of operation
- 1.000.000 km every month

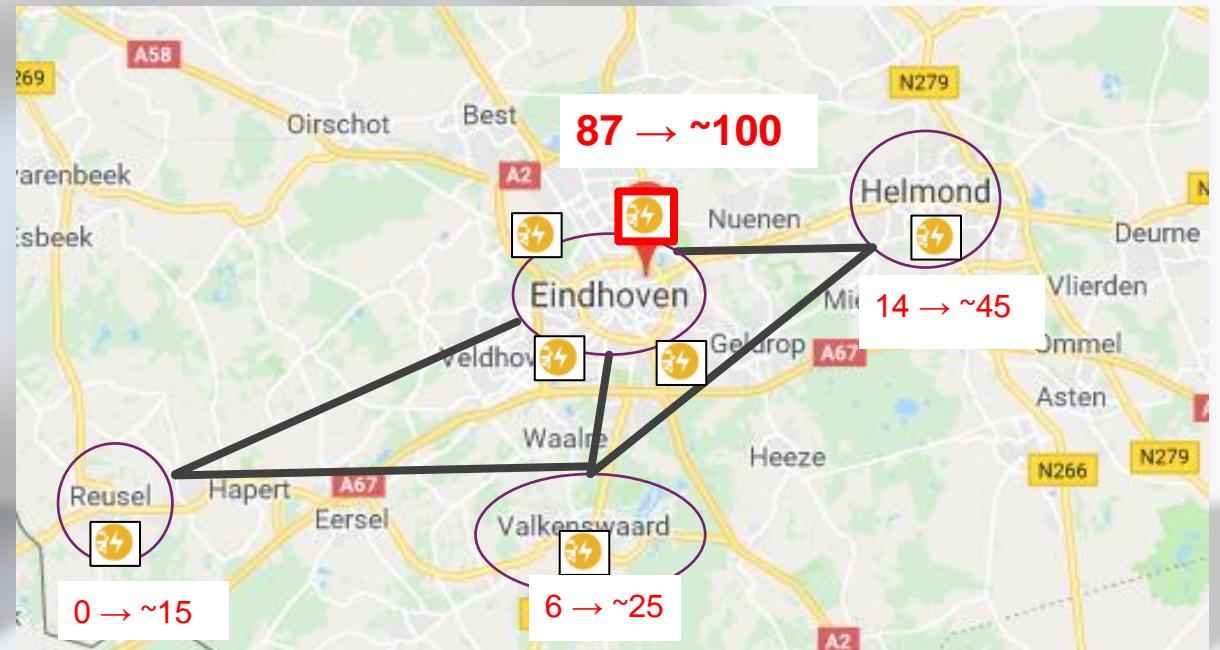
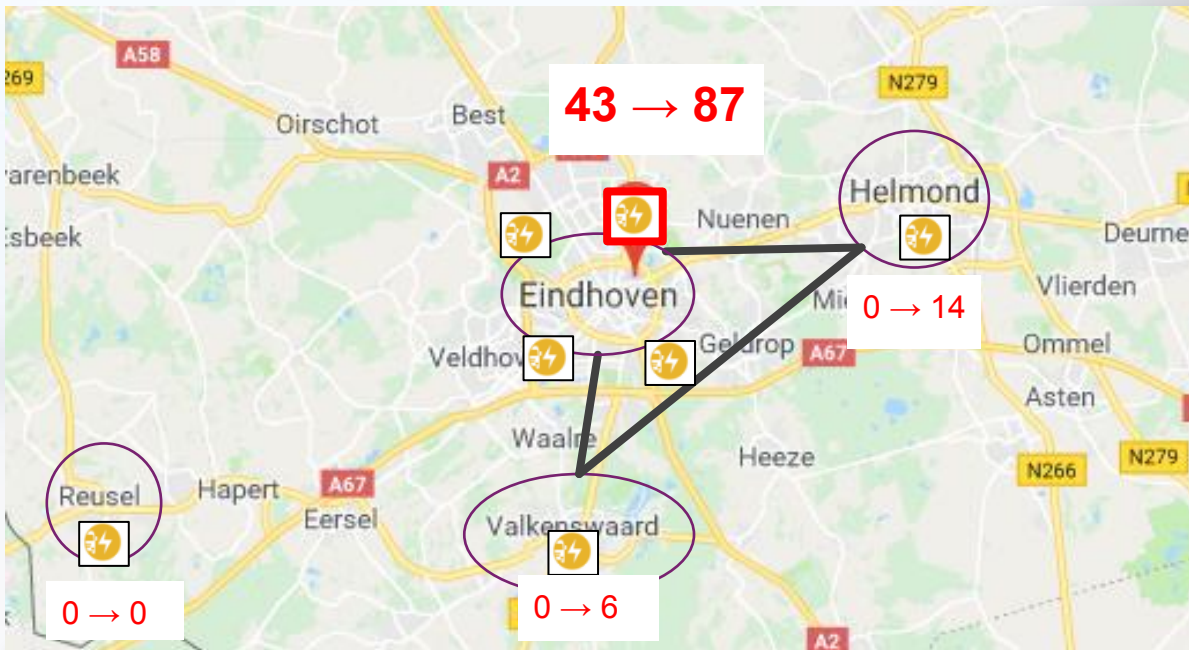
2020-2021 EV fleet 43 → 100+ vehicles

- Charging strategy mix?
- 2 additional depots will be added
- Do we need chargers on depot?
- If so how much and what size?



2022-2024 EV fleet 100+ → 180+ vehicles

- Charging strategy update?
- 1 additional depot will be added
- Do we need additional chargers on depot?
- Or do we have smarter charging strategies



ZOB Concession (NL) BRAVO

- Tender issued by Province of Noord Brabant for Dec. 2016 up to Dec. 2026
 - City of Eindhoven is part of Concession Zuid-Oost Brabant (ZOB)
 - Concession granted to Hermes (Transdev) for 10 years
 - Vehicles at start of concession:
 - 43 x 18m LF Electric
 - 65 x 13m LE Euro 6
 - 32 x 12m LF EEV
 - 32 x 12m LE EEV
 - 3 phases replacement to Zero Emission
 - 1st Phase SoO December 2016
 - 43 x 18m SLFA Electric
 - 65 x 13m LE Euro 6
 - 2nd Phase 2020-2021
 - Replacement Diesel 32 x 12m LF EEV
 - 32 x 12m LE EEV
 - 3th Phase 2022 – 2024
 - Replacement Diesel 65 x 13m LE Euro 6
- ★ 100% Zero emission

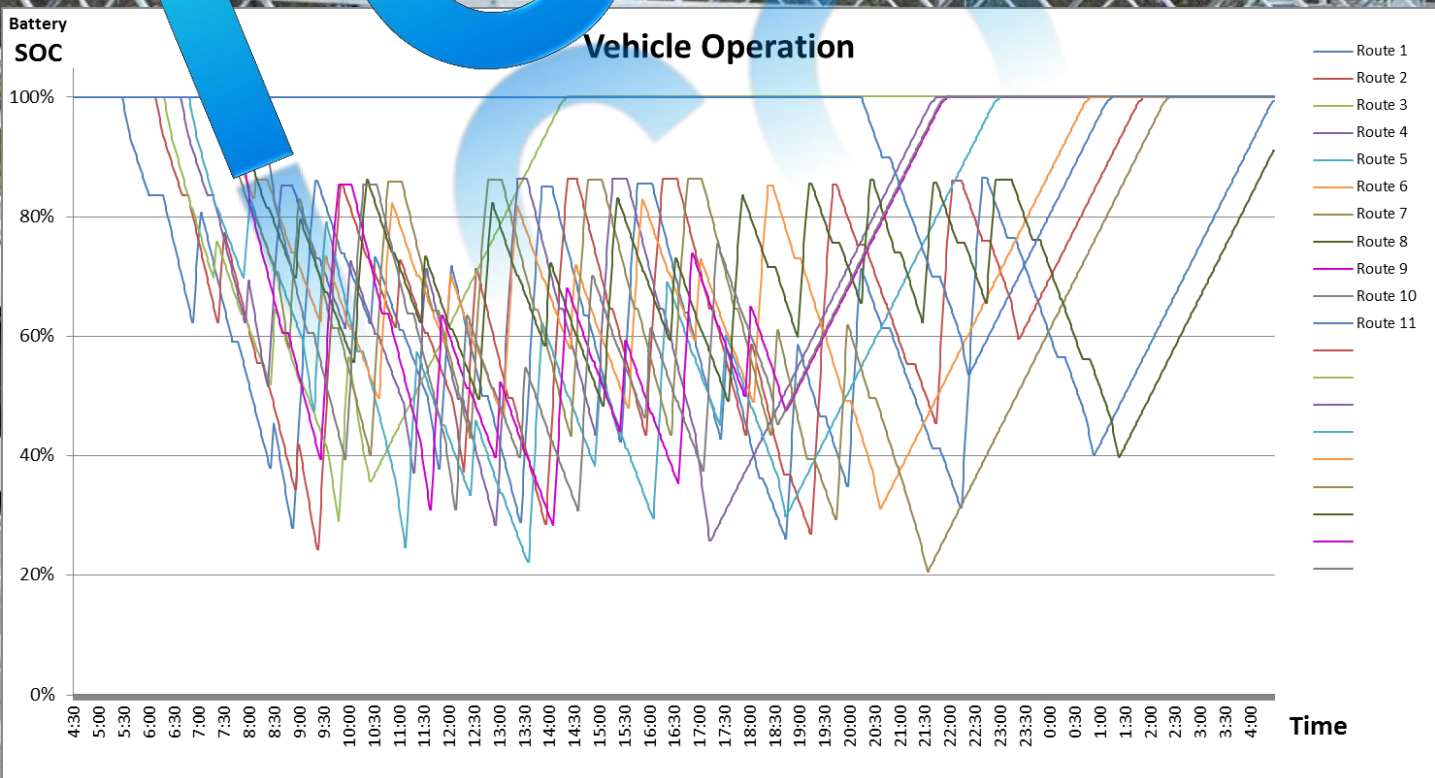
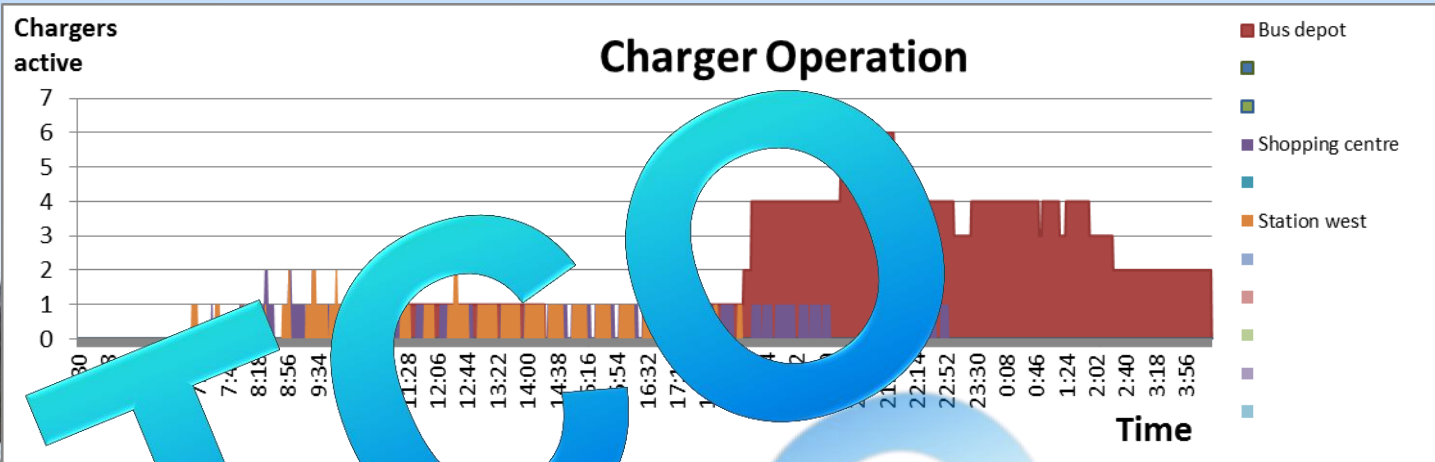
2016 - 1st phase choices

- Buffer locations on Eindhoven bus station are 12m (≠ 18m vehicle length)
- Bid of Transdev in 2016 had to be unconditional.
- Permits for charging infrastructure are issued by the City of Eindhoven
- No direct relation between both
- Implementation period less than 12 months
- Bus station ≠ end point
- Charging infrastructure had to be on 'own' property
- Installed grid connection is future proof
- 10 MVA grid power connection (cable and housing)
- 1st phase 3 x 1,6 MVA installed power
- Installed chargers:
 - 10 x 300 kW, DC switch to 20 fast charge outlets
 - 22 x 30 kW slow chargers
 - System Efficiency = 95-97 %
- System simultane factor 1:1 (each bus can be charged in parallel at any time) maximum charging redundancy.

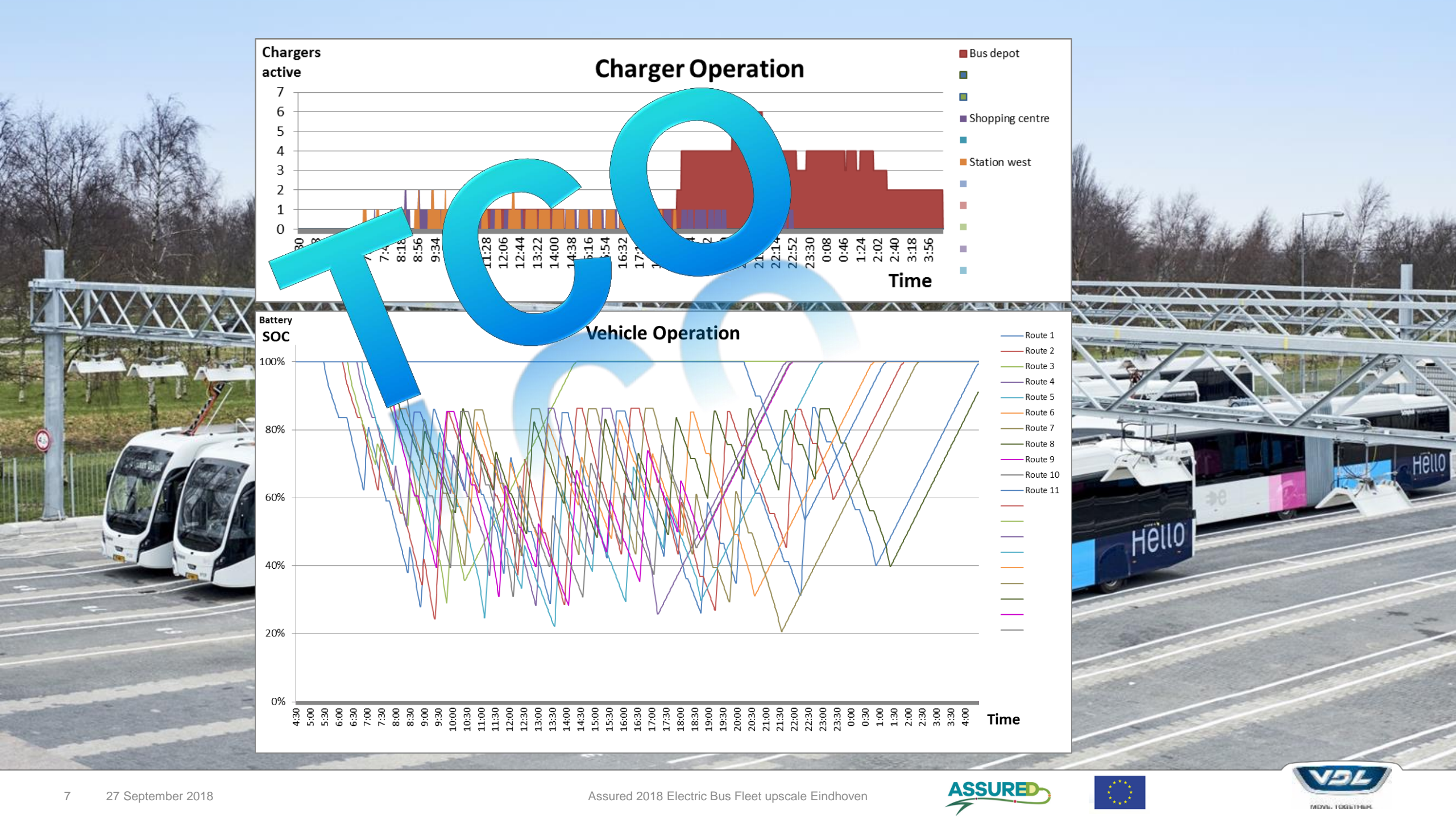
2nd phase choices 2020-2021 !

(ASSURED TASK 8.4)

- Buffer locations on Eindhoven bus station are 12m (≠ 18m vehicle length) and fit needed vehicle length of 12m
- Which mix to charge 100+ EV's?
 - In main depot Eindhoven?
 - On bus station buffer locations?
 - On the route (end points)?
 - On the de-centralized depots/hubs?
- 3 main parameters to determine where to charge:
 - Operational excellence (location of chargers is more important than charger and energy costs)
 - Grid capacity (Peak)
 - Charging strategy (overnight y/n, fast y/n, off peak y/n)
- Charging time vs. driving time determines the amount of vehicles needed.
- Install grid connection that is future proof (Future city and 3th phase needs)
- System simultane factor 1 to x ;combined with smart charging strategy to guarantee 100% redundancy.



TCCO





Thank you for your attention!