Implementing Electric bus operations - Amsterdam region - Transdev

Marc Vanhoutte
Transdev Global integrator of Mobility solution

6.7 bn net revenue
€4.1 bn outside France

83,000 employees, including 56,390 drivers

43,270 operated vehicle including 26,616 clean vehicles
(Euro 5 & 6, hybrid, electric, CNG, biogas, LPG)

3.5 bn carried passengers per year

N°1 EUROPEAN OPERATOR IN ZERO-EMISSION MOBILITY
994 electric vehicles worldwide (in operation + committed for 2020)

13 MEANS OF TRANSPORTATION
Ex: Super Shuttle, Tram (22 networks), Ferry in Sydney, CDG Val in Paris, etc.

20 COUNTRIES
Main operations in France, Germany, Sweden, The Netherlands, US, Canada, Australia and NZ
Transdev within North America

Serving North America

200 Contracts
400 Million Passenger Trips

Cities, countries, airports, and universities
In over 200 contracts in North America
Choose Transdev to manage and operate
One or more modes of their transportation systems

9,000 buses
12,500 employees

transdev
the mobility company
Transdev within the Netherlands

1.370 million Public Transport passenger km’s / year

3.136 Vehicles (buses + taxi)

113 ambulances

16 trains

8.900 employee

798 million revenues

297 e-buses: 50 million km driven
30 million km with battery buses
20 million km with trolley buses

6
The NL’s first mover within Europe regarding ZE PT

**Green deal**

The Green deal is an agreement between the Dutch National government and local authorities with the aim to improve emissions.

Public Transport is part of the Green deal, this means:

1. **By 2025** all new buses entering operation will be emission-free at the exhaust.
2. **By 2030**, at the latest all bus operations will be completely emission-free at the exhaust.

The new buses will use 100% renewable energy or fuel by 2025.

Public transport concessions have the best possible score on well-to-wheel CO2 emissions per passenger kilometer.
Concessions within the Netherlands

- The provinces and Transport Entities (VRA) are the Public Transport Authorities.
- They have different concessions within their region which are subject of a tender process.
- These tenders consider city, regional, student transportation.

Granting conditions

- Fixed yearly subsidy granted by the PTA
- Evaluation of different criteria (to which the PTO replies).
- Transition plan towards ZE buses during the concession period with regards of the green deal.
Public Transport organization within the NL’s

Evaluation of different criteria – example from AML tender (Amsterdam region)

✓ VRA is the Public Transport Authorities (Vervoerregio Amsterdam)
✓ They have different concessions within their region which are subject of a tender process. City of Amsterdam, Zaanstreek, Amstelland-Meerlanden (AML).

Granting conditions:

✓ Fixed yearly subsidy granted by the PTA
✓ Evaluation of different criteria (to which the PTO replies).
✓ Transition plan towards ZE buses during the concession period with regards of the green deal.

Exceptions – 3 cities where the PT is not subject of a tender process

✓ GVB: Amsterdam city transport
✓ RET: Rotterdam city transport
✓ HTM: The Hague city transport
The first PT concession with e-buses in The NL’s South East Brabant concession

The first concession requesting a complete transition towards ZE against 2025. Operation started in December 2016

Number of vehicles: 43 articulated E-buses

Charging method: Combination of overnight and opportunity charging.

Against end of 2024 the complete fleet (>200 buses will be electric)
Till end of 2019 > 9 million electric kilometers

VDL Citea-e
18 m (60 foot)
Amsterdam region – Amstelland Meerlanden
Amsterdam region – Amstelland Meerlanden
Amstelland - Meerlanden Public Transport tender

Transport Authority: VRA “Vervoer Regio Amsterdam”

Inhabitant within the Concession and the wider area of Amsterdam: 3.4 Million

Planning:
- Tender publication: June 8, 2016
- Submission date: November 21, 2016
- Awarding date: December 15, 2016
- Start concession: December 10, 2017
- Contract length: 10 years, ending at December 9, 2027
- Optional contract period: 5 years, contract ending at December 9, 2032

Once the operator has been chosen, a period of 6 weeks is provided for, during which any operator who has participated may submit an objection.

The optional contract extension was granted in December 2019.
**Awarding conditions**

Evaluation table used by the PTA for awarding the AML concession:

- The PTA provides a loan of 100 million Euros under certain conditions. (approx 101 M$)

- *Connexxion (Transdev NL)* has met these conditions as they were committing to start the operation with 100 electric articulated buses.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Subj/Obj</th>
<th>Max. score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased use of PT</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>Offered revenue growth</td>
<td>Obj</td>
<td>10</td>
</tr>
<tr>
<td>Development plan</td>
<td>Subj</td>
<td>15</td>
</tr>
<tr>
<td>Transport offering</td>
<td></td>
<td>48</td>
</tr>
<tr>
<td>Transport plan</td>
<td>Subj</td>
<td>10</td>
</tr>
<tr>
<td>Transport packages above minimum requirements</td>
<td>Obj</td>
<td>1</td>
</tr>
<tr>
<td>Number of time table kilometers</td>
<td>Obj</td>
<td>20</td>
</tr>
<tr>
<td>Transport packagesBasic mobility</td>
<td>Obj</td>
<td>1.5</td>
</tr>
<tr>
<td>Extra deployment on fixed routes for basic mobility</td>
<td>Subj</td>
<td>1</td>
</tr>
<tr>
<td>Alternative forms of basic mobility</td>
<td>Subj</td>
<td>2.5</td>
</tr>
<tr>
<td>Mobility chain director</td>
<td>Subj</td>
<td>3</td>
</tr>
<tr>
<td><strong>Comfortable and reliable PT</strong></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Rolling stock plan</td>
<td>Subj</td>
<td>8</td>
</tr>
<tr>
<td>Operation plan</td>
<td>Subj</td>
<td>4</td>
</tr>
<tr>
<td><strong>Sustainable PT</strong></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Euro standard rolling stock</td>
<td>Obj</td>
<td>6</td>
</tr>
<tr>
<td>Reduction of CO2 emission</td>
<td>Obj</td>
<td>6</td>
</tr>
<tr>
<td>Other SCR measures: environment</td>
<td>Subj</td>
<td>2</td>
</tr>
<tr>
<td>Other SCR measures: social return</td>
<td>Subj</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
The bus fleet is evaluated for as much as 20% of the total score. The PTA requested electric buses for the Schiphol network and the operator was challenged to provide as much as possible electric buses during the contract period. For this purpose, an evaluation system was set up that encourages bidding with e-buses.

Within the 20% is included:

- **Material plan**: 8 points
- **Euro standard**: 6 points
- **CO2 savings**: 6 points

**Evaluation of the material plan**

- **ZE buses**: 6 points/bus
- **Euro VI Hybrid buses**: 3 points/bus
- **Euro VI**: 1.5 points/bus
- **EEV**: 0 points/bus
Amstelland - Meerlanden Rolling stock specifications

- For the Schiphol network BHLS buses were requested (*buses with a high level of service*).
- **Additional requests:** Passenger air-conditioning system, Individual WIFI connections, USB, Kneeling systems, etc...

- The PTA's requirements do not indicate the number of buses that the operator should offer. It is up to the tenderer to determine the number of vehicles and the different vehicle sizes they are offering, taking into account the number of kilometers travelled and the transport guarantee he has to offer to the passengers.
Transport guarantee.

The operator must be able to transport every passenger present at a bus stop, on the next journey.

- **Rush hour**: it is accepted that passengers have to stand up.
- **Outside rush hour period**: there is a 90% chance of passengers being seated

In the event of unforeseen additional offers from passengers, the carrier must ensure that all passengers are carried as soon as possible after the scheduled time of arrival of the bus.
Amstelland - Meerlanden Rolling stock specifications

- **Alternative vehicles**
  - *Hydrogen buses*: are not allowed to drive through tunnels.
  - *Trolley buses*: are allowed, but impossible to have an agreement with several municipalities during the tendering period.

- **Transfer of buses at the end of the contract.**
  - The operator winning the next tender is obliged to take over all e-buses the residual value based on a linear depreciation over 15 years.
  - Investments in new batteries during the contract period will not be added to the bus value.
Amsterdam region – Amstelland Meerlanden

Preparing the offer – fleet composition

Electric buses at the start of the concession

- **Schiphol net:** *e-buses and BHLS compulsory*
  
  Proposed: **51** articulated e-buses based on the buses in operation at the South Brabant concession (Eindhoven): VDL Citea-e 18 m.
  
  **Yearly kilometer load Schiphol Net:** 105,000 km/bus

- **Options:** regarding the composition of a fleet with around 271 buses to be offered
  
  All other buses diesel Euro VI: impossible to win the tender.
  
  All other buses electric: not acceptable for the PTA (feasibility to have charging equipment for such a fleet in less than a year).
  
  Mix of diesel and e-buses has been chosen: **49** articulated e-buses offered for R-net
  
  **Yearly kilometer load R-Net:** 105,000 km/bus.

Integration plan for the introduction of e-buses during the contract period (10 years)
Fleet of buses at the start of the contract

Supporting net:
- VDL Sprinter 8 + 1 x1
- Iveco Crossway x7
- Iveco Crossway x14

Basic mobility:
- Total fleet of 271 buses x4

R-net:
- 13 m Low Entry Diesel x47
- Double Decker Diesel x18
- 20 m artic diesel x33
- 18 m artic diesel x40
- 18 m artic Electric x49

SchipholNet:
- 18 m artic BRT Electric 51x
Opportunity charging at Amstelland – Meerlanden

**R-Net:** Electric articulated buses:
- 49 Buses with 3 double doors
- Battery capacity: 170 kWh
- Passenger capacity: 127

**Schiphol-Net:** Electric articulated buses:
- 51 Buses with single door at front and 3 double doors.
- Battery capacity: 170 kWh
- Passenger capacity: 124
Amstelland - Meerlanden Charging infrastructure

- Charging points, charging equipment, connection to the electricity grid
  - **Charging points:**
    - Feasibility to be examined by the operator (charging strategy – permits)
    - No guaranty that the proposed plan can be realized (permits).
  - **Connection to the grid:**
    - Connection to the grid for two charging hubs and depot Cateringweg together with the transformers on Schiphol land are provided by Schiphol authorities.
    - Connection to the grid and transformers for the bus depot at Amstelveen is on the responsibility of the operator.
  - **Charging equipment:**
    - Development, charging strategy and installation of equipment on the responsibility of the operator.
Transfer of charging equipment
- The operator winning the next tender is obliged to take over all charging equipment at the residual value on linear depreciation over 15 years.

Special conditions
- A loan of 100 million Euros is granted if the chosen operator fulfills the condition regarding the level of investment within e-buses.
- Conditions for extending the contract with 5 years
  - 42 MEUR investment within the first 5 years of the contract regarding electric buses and charging infrastructure.
  - Receive an adequate rating from the start of the concession in the PT customer barometer.
**Charging infrastructure**

1. **Schiphol, Cateringweg, depot**: 51 ZE buses
   - 7 fast chargers, 450 kW (opportunity charging)
   - 21 depot chargers, 60 kW with 2 contact hoods
   - Grid connection: 5 MW

2. **Schiphol, P 30 – parking** (charging hub)
   - 4 fast chargers 450 kW
   - Grid connection: 2 MW
Charging infrastructure

3

Schiphol, Node – North (charging hub)
- 4 fast chargers 450 kW
- Grid connection: 2 MW

4

Amstelveen, Meerlandenweg, depot
49 ZE buses
- 8 fast chargers, 450 kW (opportunity charging)
- 21 depot chargers, 60kW with 2 contact hoods
- Grid connection: 5 MW (10 MW phase 2)
Amstelveen depot
Delayed introduction of electric buses

- Start concession December 10, 2017
  Start Electric buses 1. April 2018

Delay caused by:
- Delay in obtaining the necessary permits for the construction at Schiphol and Amstelveen.
- Soil contamination at P30
- Soil stability examination – Heavy construction
- Connection towards the energy grid at Amstelveen depot
ELECTRIC BUSES AT AND AROUND SCHIPHOL AIRPORT

2018
UPON INTRODUCTION 100 BUSES
Largest electric bus fleet of Europe

phase 2
>210 ZERO EMISSION BUSES

15,000 ton reduction a year

24/7 in company

4 charging stations

30,000 ELECTRIC KILOMETRES A DAY
Phase 2: December 2020.

- As described within the initial offer, before the start of 2021 additional electric buses will be put in operation.
- These buses will be put on the R-net.
- The Dutch manufacturer named Ebusco won the tender for new electric buses, they will supply:
  - 56 units 12 m (40 foot) 2 door low entry buses
  - 21 units 13 m (43 foot) 2 door low entry buses

Both of these bus types will be equipped with a battery pack of 362 kWh, LFP (lithium Iron phosphate) for slow charging.
Phase 2: December 2020.

56 units 12 (40 foot)
21 units 13 m (43 foot)
They will also supply:

- 34 units 18 m (60 foot) 3 door low floor buses
- Battery capacity: 544 kW

All Ebusco buses are besides the plug also equipped with a pantograph for charging the batteries – compatibility with VDL buses
Phase 2: December 2020.

Charging equipment – consequences

- 6 additional charging hubs
- Primary charging hubs for Ebusco buses in the city of Haarlem with:
  - 46 chargers with a capacity of 50 – 60 kW (t.b.d)
  - 15 chargers with a capacity of 240 kW
- “Schiphol South” charging hub with
  - 45 chargers with a capacity of 50 – 60 kW (t.b.d)
  - 2 chargers with a capacity of 240 kW
- The articulated Ebusco buses can be slow charged with 450 kW therefore
  11 chargers with a capacity of 450 kW will be recuperated from the
  existing equipment and divided over 3 of the new charging hubs.
Phase 2 : December 2020.

For the neighboring public transport concession where Connexxion is also the operator, they have also ordered:

• **45 Ebusco 12 m buses**

The buses will also be partly used for the inter-concession connections towards Amstel-land - Meerlanden.