Towards Zero Emission Public Bus Transport
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3. The Dutch Approach for transition ZE bus
4. Total Cost of Ownership: cost simulation
Rapporteur CoR

Rapporteur on behalf of the CoR, advice to the EP
1. Missing transport links in border regions (Febr 2017)
2. Delivering on Low emission mobility concerns 5 proposals (plenary session 5 July 2018)
   i. Delivering on low emission
   ii. Combined goods between member states
   iii. Common rules acces international bus and coach services
   iv. Clean and energy-efficient road transport vehicles
   v. Action Plan on Alternative Fuels Infrastructure
3. Streamlining measures for advancing realization TEN-T network (new)
Headlines advice low emission

• Europa as the world leader in innovation, digitisation and decarbonization. The transition to a low-carbon economy is both an opportunity and a challenge for EU industry
• Not only automobility but also cycling, railway and green shipping
• An interoperable solution for the provision of alternative fuels is needed. Technologically neutral, but each city and region should strive to attain economies of scale
• Plans for zero emission mobility should go beyond end of tail solutions, but be aligned to a roll out of green electricity production and distribution.
• Refueling should be easy to use and interoperable across borders. This requires European Action in order to create a single market
Province of Gelderland
Province of Gelderland = Sustainable
Public Transport in Province Gelderland

Administrative Agreement ZE Regional Public Transport by Bus

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
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<tbody>
<tr>
<td>2025</td>
<td>all new buses ZE</td>
</tr>
<tr>
<td>2030</td>
<td>100% renewable energy</td>
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<td>2030</td>
<td>all buses ZE</td>
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Planning

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
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<tbody>
<tr>
<td>2020</td>
<td>Start concession North</td>
</tr>
<tr>
<td>2023</td>
<td>Start concession South</td>
</tr>
<tr>
<td>2025</td>
<td>Start concession East</td>
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The Dutch Approach

1. Set conditions and create market forces
   Dillema: Do we chose to set conditions for a technique or an outcome?

2. Well-to-wheel approach
   Dillema: Is this the right approach or is it better to work Tank-to-Wheel?

3. Involve parties outside the mobility sector and reach several other goals
   Dillema: How do we finance the extra costs of zero emission public transport?
Different techniques

Greengas

Trolley 2.0

Opportunity charging

H2
Total Cost of Ownership: cost simulation

• Current bus fleet in upcoming procurement North:
  – 360 buses (117 urban, 183 peri/interurban, 60 mini/schoolbuses)
  – 49 biogas, others diesel
• Replacement scenario’s with cost simulation model

• Conclusion:
  – Favoured approach is Opportunity Charging
  – electrification of urban and peri/interurban lines by developing a network of ultrafast chargers on the road (placed mostly at bus and train stations) for battery buses
  – 10% interurban lines is more difficult, options are biogas, hydrogen and bigger battery buses
Cost simulations of ZE fleet

Network of OC ultrafast chargers at busstations and other strategic locations 20-25 km apart, supported by overnight depot charging, limits non-productive charging time of buses and reduces the reserve bus fleet to 5-7%. Buses are depreciated over 20 years, charging infra over 20 years. Mini/schoolbuses excluded. Note: work in progress
Conclusions: optimization reduces costs

• Model results show that cost-neutral electrification of a mixed urban and peri/interurban bus fleet is feasible
  – Fast interurban lines are most difficult but manageable using 25% more buses with larger battery packs and longer stops for charging
  – This is cheaper than hydrogen buses (higher capital and variable costs)

• Depreciation period is crucial
  – 20 year depreciation of electric buses and charging infra means operation at costs comparable to diesel buses.
More information?

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More Information

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