CITY SOLUTIONS

- Zero-emission zones
- Hybrid buses
- Silent zones
- Indoor bus stops
- Electric hybrid buses
- Rapid charging
- Full-electric buses

Volvo Buses
Volvo Buses – a global business in sustainable transport solutions

20,000 MSEK Sales
10,000 Buses
8,000 Headcount
GLOBAL LEADER IN ELECTROMOBILITY

MOR THAN 3000 HYBRID AND FULL-ELECTRIC BUSES SOLD
New standard/base offer - decides the future

1959 Seat belts no longer optional

1976 Three way catalyst no more optional

2014 Hybrid city buses no more optional

To return to the past is no alternative.
Volvo Buses
A complete new range

City buses
- Diesel buses
  - Volvo 7900
  - Volvo 7900 Gas Articulated
- Gas buses
  - Volvo 7900 Gas Articulated
  - Volvo 7900 Hybrid
- Hybrid
  - Volvo 7900 Hybrid Articulated
- Electric Hybrid
  - Volvo 7900 Plug-in Articulated
  - Volvo 7900 Plug-in

Regional buses
- Gas buses
  - Volvo 8900 Gas Articulated
- Hybrid
  - Volvo 8900 Hybrid
- Electric
  - Volvo 8900 Plug-in Articulated

Line-haul routes
- Diesel buses
  - Volvo 9700
- Gas buses
  - Volvo 9700 Gas Articulated
- Hybrid
  - Volvo 9700 Hybrid
  - Volvo 9700 Plug-in
## Drivetrain. Energy and drive modes - Yearly average for average user

<table>
<thead>
<tr>
<th>Technology</th>
<th>Fuel kWh/km</th>
<th>Electricity kWh/km</th>
<th>Energy Total</th>
<th>Hybrid mode</th>
<th>Electric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel</td>
<td>5.0</td>
<td></td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hybrid</td>
<td>3.1</td>
<td></td>
<td>61%</td>
<td><img src="image" alt=" " /></td>
<td>7%</td>
</tr>
<tr>
<td>Electric Hybrid</td>
<td>1.0</td>
<td>1.0</td>
<td>40%</td>
<td><img src="image" alt=" " /></td>
<td>80%</td>
</tr>
<tr>
<td>Electric</td>
<td>1.25</td>
<td></td>
<td>25%</td>
<td><img src="image" alt=" " /></td>
<td>100%</td>
</tr>
</tbody>
</table>

Results depend on duty cycle and climate.
Total Cost of Ownership

European Cost Data
- 12 years life time
- Low floor bus 12 m
- Hybrid bus: Volvo 7900
- Electric Hybrid: Volvo 7900 with opportunity charging
- Li-ion battery
  4/6 years life time
- Average speed 20 km/h
- Route length 10 km
- Average stop 400 m
- Total cost for reference during 12 years €3 000 000
- Main cost: driver expenses

At status quo, hybrids buses bring the lowest cost over the life-time. Further oil price increase, split the market into Hybrids, Electric Hybrids and Electric Buses. Environmental values and increased attractivity brings further value to the city.
Paradigm shift

Volvo Buses

City Buses

2010

Future

100%

Diesel

Energy

Electricity

Hybrid

Electric

Hybrid

Diesel

Electricity

80%

40%

20%
Plug-in Bus
– new opportunities for city planning

Residential area

Lakeside

City zone
Emission-free
Low noise

Shopping

Old town
Services and ITS solutions

Vehicle Management

Traffic Management

Fleet Management

Workshop planning

Capacity Management

Full service leasing

Zone management

Emissions

Safety

Noise

Bus stop services
Democratic public transports are affordable

~25% of the Swedish population have limited access to cars.

"Volvo City Mobility solutions grow with the city"

Jessica Sandström
SVP City Mobility
Bus system

- Electric Hybrid Buses
- High Power Charging
- High capacity and feeder
- Attractive design
- IT support systems
- Silent and emission free
- Opportunity Charging

Volvo - the first and only city mobility transformer
Buses are ideal for electromobility

1. Buses run close to people where noise and emissions have the most severe impact on their lives
2. Buses have the highest cost efficiency per passenger kilometer, with exception of bikes
3. The "City Mobility" path will lower the cost further, step-by-step
4. One modular system (of hybrids, plug-in and electric buses) will match the demand for different routes with a common infrastructure
5. Quality of life impact on travel time
6. Considering different duty cycles buses match the demands for profitability best:

<table>
<thead>
<tr>
<th>Daily Duty (hours)</th>
<th>Predicatable route</th>
<th>Charging opportunity time between opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cars</td>
<td>2</td>
<td>30%</td>
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<tr>
<td></td>
<td></td>
<td>9h</td>
</tr>
<tr>
<td>Delivery trucks</td>
<td>6</td>
<td>60%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3h</td>
</tr>
<tr>
<td>Buses</td>
<td>12</td>
<td>90%</td>
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<tr>
<td></td>
<td></td>
<td>1h</td>
</tr>
</tbody>
</table>
The new bus systems are profitable
-the Swedish market struggles with competing incentives

- Sweden lack a "Supermiljöbusspremie"
  - CO₂ emissions relative Diesel

- Fuel subsidies are increased to a sufficient level to create economic incentives for all buses to change to biofuels.
  - Thereby no or little interest in saving fuel by electrification is left.

- Cities have strong advantage of less noise but lack routines for utilizing the new bus systems.
Cost for Emissions, CO₂ and Noise

EU (Directive 2009/33/EC)

Volvo 7900 Diesel

Volvo 7900 Biogas

Volvo 7900 Hybrid

Particulates

Noₓ

CO₂

Energy

k€ 225

k€ 264

k€ 130

k€ 160

Noise

0.2 €/km*

*Tystare stadsbussar kravställning vid upphandling för minskat källbuller (1 to 4 SEK/km)

http://www.k2centrum.se/getfile.ashx?cid=141365&cc=4&refid=2

Volvo Buses
Electromobility
Welcome to the WORLD OF GREEN EFFICIENCY

Spoil your citizens