Tender requirements and preferences.

Can trolleybus defeat diesel bus in a procurement procedure?
Tender requirements

Customer expectations behind the new requirements:

1. Possibility to drive without overhead network
   • Flexibility to drive in old towns, city centers, green zones, etc. – where there is no overhead network,
   • Emergency driving in case of construction work or overhead network malfunction
2. Improved driver comfort (standard solutions)
3. Improved passengers comfort and safety
4. Reduction of overall costs (energy consumption, maintenance)
5. BRT look – metro style
6. Higher reliability and durability
7. Faster and more efficient service support
New tender requirements:

1. APU (diesel generator or battery)
2. Automatic current collectors
3. Dedicated HVAC for driver
4. Various types of driver cabins
5. Standardized driver place
6. Dedicated HVAC system for passengers
7. Isolation monitoring devices in relation to double isolation
8. Energy consumption (test results, supercaps)
9. Remote diagnostic
10. BRT look – metro style
Problems with the new requirements:

APU (diesel generator or battery – sizing)
- dynamic requirements for diesel generators no described in details
- missing route profiles for battery selection

Current collector and collector shoe description
- missing detailed description of infrastructure

Various types of driver cabins
- not enough details of driver cabin

Standardized driver place
- does not make easy to implement more and more new functions of trolleybus

Isolation monitoring devices
- missing detailed description about operation requirements

Energy consumption
- test specifications and way of measurement

Remote diagnostic
- only very overall description of customer expectations (difficult to compare proposed systems)

BRT look
- details of how BRT shall look like to meet the customer requirements
Can trolleybus defeat diesel bus in a procurement procedure?
EU Directive 2009 / 33

Emission costs:

<table>
<thead>
<tr>
<th>Emission</th>
<th>Cost (€)</th>
</tr>
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<tbody>
<tr>
<td>CO2</td>
<td>0.03</td>
</tr>
<tr>
<td>NOx</td>
<td>0.44</td>
</tr>
<tr>
<td>PM</td>
<td>8.7</td>
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<tr>
<td>NMHC</td>
<td>0.1</td>
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</tbody>
</table>

Assuming:
- 12m meter bus with Euro 5 engine
- making 60,000 km per year in 16 years (960,000 km)

Cost of bus emissions in comparison with trolleybus + 50,000 € - not enough to cover the difference in trolleybus vs. diesel bus price

But it is not enough to compare only emission costs difference of trolleybus and diesel bus.
### Trolleybus vs. diesel bus comparison challenges

<table>
<thead>
<tr>
<th></th>
<th>Trolleybus</th>
<th>Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment</td>
<td>16 or more years</td>
<td>8 -12 years</td>
</tr>
<tr>
<td>Infrastructure cost</td>
<td>Overhead network, tools, people</td>
<td>Tools</td>
</tr>
<tr>
<td>Operating cost</td>
<td>Electric energy</td>
<td>Diesel oil</td>
</tr>
<tr>
<td>Maintenance cost</td>
<td>Vehicle maintenance and infrastructure</td>
<td>Vehicle maintenance</td>
</tr>
<tr>
<td>Environmental effect /cost</td>
<td>Zero emission</td>
<td>Emissions</td>
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<tr>
<td>Future cost changes</td>
<td>???</td>
<td></td>
</tr>
</tbody>
</table>

In standard procurement procedure trolleybus has no chance with diesel bus, even considering EU directive 2009/33
Economic Advantages

LCC (Life-cycle costs) of diesel bus and trolleybus systems are almost equal


Trolleybus vs. diesel bus
Trolleybus vs. diesel bus

Economic Advantages

Rise in electricity prices is lower than rise in diesel prices
Trolleybus vs. diesel bus

Salzburg **SVB** operates trolleybuses and diesel buses

Based on SVB comparison and experience:
- Trolleybus in many applications is better solution than diesel bus
- Trolleybus will exist next to diesel bus
Maybe the answer for trolleybus and diesel bus comparison is electric Bus
Thank you for your attention!

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