Transforming Transportation: Clean and Efficient Technologies for Buses

March 14th, 2018
Africa Clean Mobility Week 2018
Nairobi, Kenya
Pollution killing more people than war and violence, says report

Pollution kills more people each year than wars, disasters and hunger, also causing huge economic damage, a study says. Almost half the total deaths occur in just two countries.


Lancet Commission on Pollution and Health:
http://www.thelancet.com/commissions/pollution-and-health
Diesel Engines are a Key Target for improving human health

“The scientific evidence was compelling and the Working Group’s conclusion was unanimous: diesel engine exhaust causes lung cancer in humans.”

-Dr. Christopher Portier

Diesel vehicles tailpipe emissions that are regulated by Emission Standards

- CO, HC
- Nitrogen Oxides, NO and NO$_2$ = NOx
- Particulate Matter (PM)/Carbono Negro (BC)/Polycyclic Aromatic Hydrocarbons (PAH)
Between 60% and 80% of uncontrolled diesel exhaust is black carbon.

As a short-lived climate pollutant, BC can cause over 3,000 times as much warming as an equivalent amount of CO₂ over a brief 20-year period.
What Technologies Deliver Soot-Free Performance?

ANY Euro VI or EPA 2010 (or newer) engine

OR

Filter-equipped diesel

Gas Engine (Euro VI)

Zero Emission Electric Drive
Soot-Free Buses 20 Targeted Megacities

Committed
Commitment Under Development
Not Committed

Updated SEP 2017
Even with high carbon intensity grids, BEBs have lower CO2 compared to diesel buses.

**Figure 9.** WTW greenhouse gas emissions of soot-free buses operating in low-speed urban driving conditions in 20 megacities, ranked by climate impact.  

Fleet sizes in targeted cities

Global Industry Partnership on Soot-Free Clean Bus Fleets
Global Industry Partnership on Soot-Free Clean Bus Fleets

1. **We commit** to make soot-free engine technology available in all 20 targeted cities; where clean fuels are available today, this technology will be available no later than 2018; cities without clean fuels must first make these available.

2. **We commit** to provide to all 20 cities a list of soot-free bus and engine technology that is available to purchase in each city, including all relevant and publicly available product specifications.

3. **We commit** to provide to all 20 cities the name and point of contact we designate to advise and consult on product specifications, demonstration, and procurement.

4. **We commit** to publicly report the number of soot-free buses and engines we have sold in the most recent year.

5. **We commit** to update this information on an annual basis.

Total Cost of Ownership Changes the Financing Perspective – e.g. Bangkok, Thailand

a) Purchase Price

<table>
<thead>
<tr>
<th>Technology</th>
<th>Large bus (12.5 to 15 meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euro IV diesel</td>
<td>0%</td>
</tr>
<tr>
<td>Euro VI diesel</td>
<td>2%</td>
</tr>
<tr>
<td>Euro VI hybrid</td>
<td>43%</td>
</tr>
<tr>
<td>Euro VI gas</td>
<td>43%</td>
</tr>
<tr>
<td>BEV</td>
<td>178%</td>
</tr>
</tbody>
</table>

b) Total Cost of Ownership

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</tr>
<tr>
<td>Euro VI gas</td>
<td>-17%</td>
</tr>
<tr>
<td>BEV</td>
<td>-16%</td>
</tr>
</tbody>
</table>

Cost component:
- Maintenance
- Operating
- Net Inf Acquisition
- Net Bus Acquisition

Technology colors:
- Euro IV diesel
- Euro VI diesel
- Euro VI hybrid
- Euro VI gas
- BEV
## Governmental and Commercial Sources of Bus Finance

<table>
<thead>
<tr>
<th>Source</th>
<th>Examples</th>
<th>Financial products</th>
<th>Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multilateral development banks</td>
<td>World Bank; Inter-American-, African-, and Asian Development Banks</td>
<td>Concessional loans, grants, guarantees, results-based financing</td>
<td>Bus and infrastructure acquisition and operations</td>
</tr>
<tr>
<td>Climate finance (including for NDCs)</td>
<td>Clean Technology Fund, Green Climate Fund, Global Environment Facility</td>
<td>Concessional loans, grants, guarantees, equity</td>
<td>Incremental cost of low carbon investments</td>
</tr>
<tr>
<td>National development banks</td>
<td>China Development Bank, Bancóldex (Colombia), Development Bank of the Philippines</td>
<td>Loans to buyers; credit lines to manufacturers</td>
<td>Intermediary for co-financing, blending of governmental and commercial sources</td>
</tr>
<tr>
<td>Export-import banks</td>
<td>OECD list of official export credits agencies; Berne Union association</td>
<td>Loans, guarantees, and insurance to exporters</td>
<td>Supports exporters</td>
</tr>
<tr>
<td>Commercial banks</td>
<td>List of 10 largest banks</td>
<td>Loans, lease financing, insurance</td>
<td>Largest volume of financing</td>
</tr>
<tr>
<td>Manufacturer leasing</td>
<td>Scania, Proterra</td>
<td>Lease financing for bus, infrastructure, or battery;</td>
<td>Partial or full coverage of purchase cost</td>
</tr>
<tr>
<td>Specialized leasing companies</td>
<td>Connect through manufacturers</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Actions to Expand Investment in Soot-Free Bus Technology

LOCAL

- Adopt minimum ‘soot-free’ emission requirements for public procurement of vehicles
- Request soot-free technology options in public bids
- Favor least total cost of ownership when comparing competitive bids

FINANCE INSTITUTIONS

- Favor minimum ‘soot-free’ emissions in finance projects
- Favor least total cost of ownership in bus procurement
- Issue guidelines for access to ‘soot-free’ project finance

NATIONAL

- Euro VI emissions and 10ppm S fuel quality standards
- HD fuel consumption and CO2 emission standards
- Low-carbon fuel and infrastructure development

http://www.theicct.org/publications/financing-transition-soot-free-urban-bus-fleets-20-megacities
PUBLICATION
Financing the transition to soot-free urban bus fleets in 20 megacities
http://www.theicct.org/publications/financing-transition-soot-free-urban-bus-fleets-20-megacities

PUBLICATION
Low-carbon technology pathways for soot-free urban bus fleets in 20 megacities

INDUSTRY PARTNERSHIP
Global Industry Partnership on Soot-Free Clean Bus Fleets
Thank you!