Latin America Clean Transport Forum
Siemens eHighway

Irma Wilde

September 2nd, 2015
Latin America Clean Transport Forum, México City
Global political direction and goals

We emphasize that deep cuts in global greenhouse gas emissions are required with a decarbonisation of the global economy over the course of this century.

We support [...] the upper end of the latest IPCC recommendation of 40 to 70% reductions by 2050 compared to 2010

We commit to [...] achieve a low-carbon global economy [...] including [...] striving for a transformation of the energy sectors by 2050 - Leaders’ Declaration G7 Summit Elmau
Freight will replace passenger traffic as main source of CO$_2$ emissions from surface transport

Global transport emissions, by mode

- **CO$_2$ emission** (in billion tonnes)
- **2010**
  - Sea freight: 2 billion tonnes (53%)
  - Rail freight: 0.5 billion tonnes
  - Road freight: 0.7 billion tonnes
  - Air freight: 0.2 billion tonnes
  - Surface passenger: 0.3 billion tonnes

- **2050**
  - Sea freight: 7 billion tonnes (56%)
  - Rail freight: 0.8 billion tonnes
  - Road freight: 3.1 billion tonnes
  - Air freight: 0.4 billion tonnes
  - Surface passenger: 0.8 billion tonnes

Source: The ITF Transport Outlook 2015

Road freight will remain the majority emitter in the goods transport sector

Surface transport
- Freight: app. +275%
- Passenger: app. +100%
Siemens eHighway

Los Angeles case

September 2\textsuperscript{nd}, 2015

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Zero-emission trucks are possible with renewable energy, but efficiency varies greatly

### Pathway

#### Electric Road Systems

<table>
<thead>
<tr>
<th>Range Cost per km</th>
<th>Efficiency WTW</th>
<th>Example vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 km 19 ct/km</td>
<td>77 %</td>
<td><img src="Example_truck_1.png" alt="Image" /></td>
</tr>
<tr>
<td>96 kWh 12 ct/kWh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6 kWh/km</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Battery

<table>
<thead>
<tr>
<th>Range Cost per km</th>
<th>Efficiency WTW</th>
<th>Example vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>48 km 20 ct/km</td>
<td>62 %</td>
<td><img src="Example_truck_2.png" alt="Image" /></td>
</tr>
<tr>
<td>96 kWh 10 ct/kWh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 kWh/km</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Hydrogen

<table>
<thead>
<tr>
<th>Range Cost per km</th>
<th>Efficiency WTW</th>
<th>Example vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 km 55 ct/km</td>
<td>29 %</td>
<td><img src="Example_truck_3.png" alt="Image" /></td>
</tr>
<tr>
<td>93 kWh 15 ct/kWh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>115 kWh 18 ct/kWh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 kWh/km</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Power-to-Gas

<table>
<thead>
<tr>
<th>Range Cost per km</th>
<th>Efficiency WTW</th>
<th>Example vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 km 70 ct/km</td>
<td>20 %</td>
<td><img src="Example_truck_4.png" alt="Image" /></td>
</tr>
<tr>
<td>98 kWh 15 ct/kWh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>69 kWh 19 ct/kWh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 kWh/km</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: German Ministry of Environment
Electrification of hybrid trucks via an overhead catenary system

Advantages

- High **energy efficiency**
- **Reduced** operating **costs**
- **Swift integration** into existing infrastructure
- **Safe, reliable & open** technology
## Outlook for projects and market in LA

<table>
<thead>
<tr>
<th>Demonstrator</th>
<th>Near-dock rail connection</th>
<th>Interstate-710</th>
<th>Regional connection</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Demonstrator Image" /></td>
<td><img src="image2.png" alt="Near-dock rail connection Image" /></td>
<td><img src="image3.png" alt="Interstate-710 Image" /></td>
<td><img src="image4.png" alt="Regional connection Image" /></td>
</tr>
<tr>
<td><strong>Length:</strong> ~1 mile</td>
<td><strong>Length:</strong> ~5 miles</td>
<td><strong>Length:</strong> ~22 miles</td>
<td>~30 miles of East-West Freight Corridor (EWFC)</td>
</tr>
<tr>
<td><strong>Timeline:</strong> 2015</td>
<td><strong>Timeline:</strong> 2016-2019</td>
<td><strong>Timeline:</strong> 2020-2030</td>
<td>Planned before 2035</td>
</tr>
<tr>
<td><strong>EH-Vehicles:</strong> 4</td>
<td><strong>EH-Vehicles:</strong> 400</td>
<td><strong>EH-Vehicles:</strong> 46,000</td>
<td></td>
</tr>
</tbody>
</table>

Source: POLA/POLB strategic plan 2019

Source: I-710 Draft EIR/EIS

Source: SCAG regional transportation plan

Implementing Siemens’ eHighway concept in Southern California is an unique opportunity to make the area more sustainable through an innovative solution
Electrification is especially attractive on highly frequented routes

**eHighway application fields**

<table>
<thead>
<tr>
<th>Shuttle transport</th>
<th>Electrified mine transport</th>
<th>Electrified long-haul traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solution for high frequency shuttle transport over short and medium distances</td>
<td>Connection of pits and mines to storage or transit locations</td>
<td>Economical and sustainable alternative for road freight transport</td>
</tr>
</tbody>
</table>

The development path of road electrification is likely to echo that of rail electrification a century ago.
Summary

Siemens eHighway concept

- Hybrid-electric trucks with active pantograph for connecting to overhead wires
- Commercial truck development ongoing together with e.g. Scania & Volvo
- Near-term first demonstrations on public roads near ports and hinterland connections
- Reduces dependence on oil and is a low-CO$_2$ alternative for the decarbonisation of transport
- Especially viable for single transport routes with high heavy-duty traffic rates, e.g. connections between ports and inland logistics centers
- Compatible with and complementary to other alternative fuel technologies

Electric heavy-duty transport for road-based freight is technically feasible and realistic for many applications and transport routes
Contact us for more information

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Thank you

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