Alternative energy and new technology for heavy-duty vehicles,

Advanced bus technologies and alternative fuels

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A tremendous growth in travelling.....
CO2 emissions from road transport in Sweden

HD Trucks +39 %  
Buses and coaches

CO2 (million tons per year)

Cars
Sustainable supply of energy to transportation is a crucial issue.

• Transportation is a cornerstone in a modern society.
• But climate change and shortage of crude oil are real threats.
• Due to these threats, use of fossil fuels has to be reduced to a fraction of the volumes today.
The most interesting questions are:

- How can transportation get a secure supply of sustainable energy?

- How can a 2-degree target be combined with mobility worldwide?
All sectors have to contribute...

To achieve the sufficient level of CO2 reduction in road transport,

Vehicles have to be much more efficient and renewable energy must be commercialized.

The need for transport within cities and between cities have to be reduced and transportation have to be organized in a much more efficient way.
What is the fuel consumption of a Volvo V50?

**T5 230 hk (283.900 SEK)**
- 9,0 l/100km
- 211 g/km

**1.6 Drive 109 hk (248.900 SEK)**
- 3,8 l/100km
- 99 g/km

53 % reduction!
A radical shift in Swedish car sales….
To get more efficient trucks is more complicated..

Continuously reduced fuel consumption

No development in fuel consumption

40 ton vehicle in real life)
Scenario for biofuels in Sweden 2020 (TWh)

- **Sugarcane**
  - Import
  - 3 plants
- **Wheat**
  - 3 plants
- **Cellulosic**
  - 1 demo
- **Waste**
  - Local
- **Gasification**
- **Black liquor**
  - 1-2 plants
- **HVO/FTD**
- **Rapeseed oil**
  - Etc.
- **Ethanol**
- **Bio methane**
- **DME**
  - "Green Diesel"
- **FAME**
- **Methanol gasification**
- **Blending in gasoline**
  - 200,000 FFV-cars
- **Blending in diesel**
  - 5000-10,000 Heavy vehicles
- **Buses and Trucks**
  - 5000-230,000 Cars
- **Blendings in diesel**
  - 5000-10,000 Heavy vehicles

1,0-1,5

8-12 TWh i.e 12-18 % of the total transportation energy is substituted
Substitution of fossil diesel oil is crucial!

Threats

- Already shortage of Diesel oil in Europe
- Higher share of diesel cars due to regulations of fuel consumption.
- Aviation fuels and diesel oil are competitors
- Environmental marine regulations will raise demand for diesel oil?

Solutions

- Biofuels ought to be be used in heavy vehicles
  - Biomethane
  - Synthetic diesel oil
  - Dimethyleter (DME)
- Electrification of roads...
Biofuels substituting diesel oil:

- Sugar cane
- Grain
- Cellulosic

- Ethanol ED95
- Waste
- Gasification of biomass
- Black liquor
- F-T diesel
- HVO
- Rape seed etc.

- Biomethane
- DME
- "Green Diesel"

- "Drop in" but far from breakthrough
- "Drop in" but limited potential
- Limited potential

- HD Vehicles
- Blendings

Low blends more cost effective
Synergy with natural gas, Cost of distribution crucial
Excellent emissions but "chicken and egg"

Ethanol, ED95
Sugar cane
Grain
Cellulosic

F-T diesel
HVO
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Blendings
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HD Vehicles
Biomethane
Gasification of biomass
Black liquor
Waste

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Low blends more cost effective
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Excellent emissions but "chicken and egg"
The whole chain must be considered!

- Production processes are often "bottlenecks".
- Commercialisation of cellulosic ethanol or syngas fuels will take time.
- Developing new fuel processes is multiple times more consuming than adapting engines to new fuels.
- Different technologies have different degrees of maturity.
Conclusions:

Sustainable supply of Energy

- HD transportation have few options
- Substitution of fossile diesel oil is urgent

Incentives must

- Consider the whole chain.
- Be Long term predictable
- Consider the degree of maturity
- Be International harmonized if possible
- Be accepted the minister of finance 😊
Means of promoting EECs in Sweden

Incentives addressing the cars
• Incentives for EECs bought by private car buyers
• Tax exemption for 5 years for EEVs
• Procurement of vehicles purchased by governmental authorities
• Exemption from congestion taxes in Stockholm
• Free parking in bigger cities
• Reduced taxation of car benefit
• Vehicle taxation based on CO2 emissions
• Obligation for fuelling stations to provide biofuels

• Incentives addressing the fuels
• Exemption of energy- and CO2-taxation for biofuels
• Support to pilot plants