The Contribution of Advanced Renewable Transport Fuels to Transport Decarbonisation in 2030 and beyond

Case Sweden
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Sweden

- Larger than Finland, but still small
  - 447 000 km², 1 600 km from North to South
    - 63% is forest
    - 9% is lakes and rivers
  - Population approximately 10 million
    - 23 persons/km²

- Important industries for ART fuel
  - Forestry
  - Vehicle manufacturer

- Infrastructure
  - 225 000 km of roads (excluding forestry roads)
  - 15 000 km of railways
Energy consumption and GHG emissions

Energy consumption by sector 2017

- Industry: 39%
- Domestic transport: 38%
- Dwelling, service and other: 23%

GHG emissions by sector 2017

- Industry: 29%
- Domestic transport: 33%
- Dwelling, service and other: 38%
Use of biofuel in road transport

![Graph showing the use of biofuel in road transport from 2011 to 2018. The graph compares the usage of fossil fuels and renewable biofuels over the years.](image-url)
Road transport fuels (liquid and gaseous)

<table>
<thead>
<tr>
<th></th>
<th>Fossil</th>
<th>Biopetrol</th>
<th>HVO</th>
<th>FAME</th>
<th>Ethanol</th>
<th>Biomethane (GWh)</th>
<th>Renewable share (GWh/GWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel MK1 (m³)</td>
<td>4 432 695</td>
<td>1 008 537</td>
<td>316 225</td>
<td>23%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bensin MK1 (m³)</td>
<td>2 819 304</td>
<td>30 944</td>
<td>159 449</td>
<td>6.30%</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>HVO100 (m³)</td>
<td></td>
<td>445 942</td>
<td></td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>FAME100 (m³)</td>
<td></td>
<td></td>
<td>109 543</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>E85 (m³)</td>
<td>13 008</td>
<td></td>
<td></td>
<td>57 668</td>
<td>82%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle gas (GWh)</td>
<td>92</td>
<td></td>
<td></td>
<td></td>
<td>1 528</td>
<td>94%</td>
<td></td>
</tr>
</tbody>
</table>

Total share 23%
Bioshare is high, but...

- Very high share of imported fuels/feedstock
- High use of bioenergy need high volumes of sustainable feedstock, for example from forestry or waste
- Small reduction in biofuels use in 2018
Number of passenger vehicles by fuel
Number of passenger vehicles by other fuel
New registration October 2018- October 2019

- Petrol: 159,805
- Diesel: 115,753
- BEV: 16,060
- PHEV: 23,628
- Hybrid: 28,750
- Ethanol: 276
- Methane: 4,847
Example: Ethanol

- Annual sales of E85 vehicles in Sweden
  - 2008: 57,900 vehicles
  - Last 12 months: 276

- Why this change in just 10 years?

- Political measures
  - Pumping act
  - Environmental cars subsidy
  - Reduced annual vehicle tax
  - Free parking
  - No congestion fee
  - Tax exemption on E85

- Challenges
  - Fuel standard (sulphate)
  - Emission requirements
  - Durability
  - Food, Feed, Fuel
Swedish Climate policies

• Paris agreement
• Sweden will become one of the world’s first fossil-free welfare countries
• Climate law
  – reduction of emission of CO2 from domestic transport with at least 70% by 2030 compared with 2010
  – No net emission of CO2 by 2045
Three principles to reduce the emissions from the transport sector

1. Transport efficient society
2. Efficient vehicles and operation
3. Renewable energy
Example of measures: Fuels

• Tax exemption for pure biofuels
  – Both CO2 and Energy tax exemptions or reductions
  – Only valid until end of 2020 (EU state aid rules)
    – Tax reduction is adjusted twice a year

• Reduction obligation
  – 2021: 21% CO2 reduction for diesel and 4.2% for petrol
    – Tentative obligation by 2030: 30%
  – Penalty: Up to €700/ton CO2
Example of measures: Vehicles

• Bonus Malus for vehicles
  – Purchase premium for cars with CO2 emissions below 60g/km
    – 10 000 SEK at 60 g/km
    – 60 000 SEK at 0 g/km
    – CNG/CBG fixed bonus of 10 000 SEK
  – Increase tax for 3 years for cars with CO2 emissions above 95 g/km
    – 95-140: 82 SEK/g
    – >140: 107 SEK/g
    – Normal tax: 22 SEK/g
  – CNG/CBG and ethanol cars are exempted from malus
Example of measures: Others

- **Pumping act**
  - All points of sales of petrol or diesel must provide at least one renewable fuel
  - If total sales exceed 1 000 m3
  - Supplemented with investment support for other technologies than ethanol

- **Investment support**
  - Climate investment program for any investment that reduce CO2 emissions
  - Climate stride for climate investment at local level
  - Public procurement of environmental friendly vehicles
Need for additional measures

Carbon dioxide emission (million ton)

- Traffic development
- Forecast based on existing decisions
- Climate goal 70% reduction to 2030 and no net emissions 2045
- History

History
Existing decisions and measures
Additional measures needed

- Traffic development
- Forecast based on existing decisions
- Climate goal 70% reduction to 2030 and no net emissions 2045
- History
Summary

• Ambitious climate targets
  – No net emissions of CO2 by 2045
  – 70% reduction of CO2 emission for domestic transport by 2030

• High share of biofuel in transport sector
  – Import dependent

• Parallel measures needed
  – Renewable energy
  – Efficient vehicles and operation
  – Transport efficient society
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More information: https://iea-amf.org/content/news/TD-WS
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