A FOSSIL FUEL INDEPENDENT VEHICLE FLEET – EFFECTS ON THE SWEDISH ECONOMY

Initiativseminarium Electromobility – Back to the future, Chalmers

2018-09-13

Research Institutes of Sweden
PROJECT FACTS

- Run from Dec 2015 to March 2018
- Partners:
  - RISE Viktoria
  - Cambridge Econometrics
  - Fores
- Financed by the Swedish Energy Agency
  - Partly by European Climate Foundation

Project results, including project report and selected scenarios, are available at [https://20fifty.se/](https://20fifty.se/)
INTRODUCTION

- **Project purpose**
  - To explore different technology pathways for fossil independency for the Swedish vehicle fleet and their effects on the Swedish economy

- **Research questions**
  - What technology pathways are possible?
  - What are their effects on Swedish economy?

Background

- 1/3 of CO₂ emissions originate from the transport sector
- 80% of oil consumption is used in road transport
- Political agreement on goals:
  - Reduce CO₂ impact from domestic transports by 70% until 2030
  - Fossil fuel independency by 2045
THE MODELS

**Vehicle Stock Model**
- Partial model, based on annual vehicle cohort
- Includes passenger cars, buses and heavy goods vehicles
- Assumptions on future development of technology, power trains and fuel types

**E3ME**
- Econometric (non-equilibrium) model
- Input/output model
- Complete integration of energy and economy modules
- 53 regions, 77 economic sectors
method

1. Data collection
   - Statistics (data on vehicle cohort, fuel, mileages, average lifetimes etc)
   - Stakeholder workshops and meetings (industry, policy, research)

2. Scenario development
   - Three technology scenarios, which reduce CO$_2$ impact by 80% (targets from FFF report)
   - Update to Swedish policy development
     ELEC_BB – "Biofuel quota" policy and 70% reduction target

- All scenarios are based on biofuels, which can be mixed with fossil fuels (i.e. so called drop in fuels)
ASSUMPTIONS FOR BASE SCENARIO

- CO₂ reduction per year according to “Biofuel quota”

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</thead>
<tbody>
<tr>
<td>Petrol</td>
<td>3%</td>
<td>3%</td>
<td>4%</td>
<td>4%</td>
<td>5%</td>
<td>8%</td>
<td>10%</td>
<td>15%</td>
<td>20%</td>
<td>25%</td>
<td>30%</td>
<td>35%</td>
<td>38%</td>
<td>40%</td>
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<tr>
<td>Diesel</td>
<td>17%</td>
<td>19%</td>
<td>20%</td>
<td>21%</td>
<td>24%</td>
<td>26%</td>
<td>28%</td>
<td>30%</td>
<td>32%</td>
<td>34%</td>
<td>36%</td>
<td>38%</td>
<td>39%</td>
<td>40%</td>
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- NECESSARY pace of electrification (BEV + PHEV + HEV) per vehicle type

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<thead>
<tr>
<th>Vehicle Type</th>
<th>2020</th>
<th>2030</th>
<th>2050</th>
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<tbody>
<tr>
<td>Cars</td>
<td>60%</td>
<td>90%</td>
<td>100%</td>
</tr>
<tr>
<td>Buses</td>
<td>50%</td>
<td>70%</td>
<td>80%</td>
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<tr>
<td>Vans</td>
<td>50%</td>
<td>100%</td>
<td>100%</td>
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<tr>
<td>LHGVs</td>
<td>50%</td>
<td>100%</td>
<td>100%</td>
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<tr>
<td>MHGVs</td>
<td>12%</td>
<td>25%</td>
<td>55%</td>
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<tr>
<td>HHGVs</td>
<td>0%</td>
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MACROECONOMIC RESULTS – BASE SCENARIO

- **Results**
  - Positive results for both GDP, consumption, employment and investments, compared to CPI

- **Rational**
  - Imported fossil fuels are replaced by domestically produced fuel (electricity, biofuel)
  - Lower TCO for car owners results in increased consumer expenditure and increased economic activity across the economy
  - More investments in new infrastructure drive the demand side of the economy

![ELEC_BB (w 80% import) - relative to CPI](chart.png)
SENSITIVITY ANALYSIS – OIL AND ELECTRICITY PRICE

Method
- Adjust the oil (1) and electricity (2) price upward and downward by 30%

Results
- Effects of (1), in terms of GDP

- Standard scenario – based on IEA’s forecast
- Electricity price changes give the opposite results from oil price changes
SENSITIVITY ANALYSIS – BIOFUELS

- **Method**
  - 80% import (as today) has been compared to 100% Swedish production

- **Results**
  - Domestic production results in increased positive economic effects, compared to import (assuming equal cost structure)

- Swedish production of biofuels is needed!
LIMITATIONS

▪ Behavioural and societal changes
  ▪ Reducing road transport overall would help the transition

▪ Rebound effects – CO₂
  ▪ Total GDP growth is more important for CO₂ emissions than the rebound effects from the measures in our study
  ▪ It is important to reduce the CO₂ intensity in all sectors

▪ Potential technologies
  ▪ Electric roads – follow on-project started
  ▪ Autonomous vehicles, hydrogen/fuel cells, electro fuels
CONCLUSION

- It is possible to reach the targets!
  - A very speedy uptake of new technologies and new power trains is needed
  - Drop in biofuels are needed – to impact the current vehicle stock
- The effects can be positive for Swedish economy!
- Action is needed now!
  - Support to scale-up competitive and sustainable biofuel production - mainly of drop-in fuels - in Sweden
  - Scale-up of electrified vehicles in new vehicle sales is needed
    - Company car policies – all companies can make a difference today!
    - Improved battery charging possibilities, including a simplified tax treatment of workplace charging, which is crucial for the CO2 emission reduction effect of PHEVs.
  - Continued focus on “the third leg” – the societal and behavioral change needed to reduce overall road transport demand

- https://20fifty.se/
- Believe II
THANK YOU!

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