TRADE

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TIMES-Sweden

BACKGROUND
• Main aim during last years has been on national netzero CO2 targets, thus all sectors and also industry processes in detail (to capture process emissions as well as commodity interactions).
• When electricity & district heating sector (ELC) is close to zero in Sweden, we have during last years focused on non-ELC sectors.
• Sweden is net exporter of electricity. One of the main reason for trade variations is availability of wind power, thus issues not captured by our model.

MODEL
• Sweden as one region (plans to split up into Nordpool price regions).
• 12 time slices
• Exogenously import and export of electricity (with constrains in line with present cross-borders cables and grid-connections).
• Checking the feasibility of the resulting power mix with power system studies of Sweden.
Import/Export prices based of LCOE
From Krook-Riekkola (2015)

- 12 TS
- For each TS and year, identify a marginal technology.
- For each of these technologies, calculating the LCOE based on the same techno-economic parameters, fuel-prices, taxes as the rest of the model sees. (Done in a scenario-file, capturing data through ~Fill tables).

PRO: Consistency with data, will not start importing/exporting due to having prices based on favourable/unfavourable assumptions.
This was especially important for the scenario analysis we performed at the time. Looking at different climate mitigation pathways both for Sweden as well on a global basis (in which we e.g. different EU-ETS price levels).
## Hydrogen from a system perspective

<table>
<thead>
<tr>
<th>Potential Users</th>
<th>Infrastructure</th>
<th>Storage</th>
<th>Producers</th>
</tr>
</thead>
</table>
| List potential users of Hydrogen, and mention what their alternative is. | • Medium  
• Pipe or Trucks or ... | • To balance the hydrogen user demand/backup (local at user side) | • Local versus Centralised versus Imported?  
• In connection to hydrogen users, power producers, harbour/CO2 |

* What is the alternative cost/implications for the power grid? (Should we distribute power or hydrogen or something else?)  
• To balance the power demand (where?)  
• From Electricity, Natural gas&CCS, Biomass

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In each step – Compare with electricity/electrification

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Biofuels, synthetic fuels, fossil-CO2, bio-CO2 and bio-olefines (plastic input material)
(Plans to include hydrogen trade (due to plans in the North)

Impossible (?) to find good price-projections for the European and global biofuel markets → Need to make assumptions

For each fuel commodity:
• For past trades are align with statistics
• Present trades (next upcoming years), upper boundary of imports to max traded over last five years.
• Future trades: Assume no net import of biofuels, synthetic fuels not bio-olefines.
• Future trades - Exports: Exploring different scenarios

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TIMES-City models

- Differ between indirect (occurring outside the geographical area) and direct emissions (occurring inside the geographical area).
- Direct: Like we usually do
- Indirect: Define emission factors on the import process, considering the CO2-footprint of each fuel.

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