



LTU TIMES group

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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 theses 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

Potential Users	Infrastructure	Storage	Producers
List potential users of Hydrogen, and mention what their alternative is.	<ul style="list-style-type: none"> • Medium • Pipe or Trucks or ... 	<ul style="list-style-type: none"> • To balance the hydrogen user demand/backup (local at user side) 	<ul style="list-style-type: none"> • Local versus Centralised versus Imported? • In connection to hydrogen users, power producers, harbour/CO2
	<p>* What is the alternative cost/implications for the power grid? (Should we distribute power or hydrogen or something else?)</p>	<ul style="list-style-type: none"> • To balance the power demand (where?) 	<ul style="list-style-type: none"> • From Electricity, Natural gas&CCS, Biomass

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**

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.