



Towards a defossilisation of the chemical industry in Belgium

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Objective

Assessing the **role of non-energy demand** in a fully **defossilised** energy system.

Non-energy demand

“All the energy products used as **raw materials** among different sectors with **exception of fuels** production and **energy carriers**”.
E.g. raw materials for **plastics** or **fertilisers** production

Context

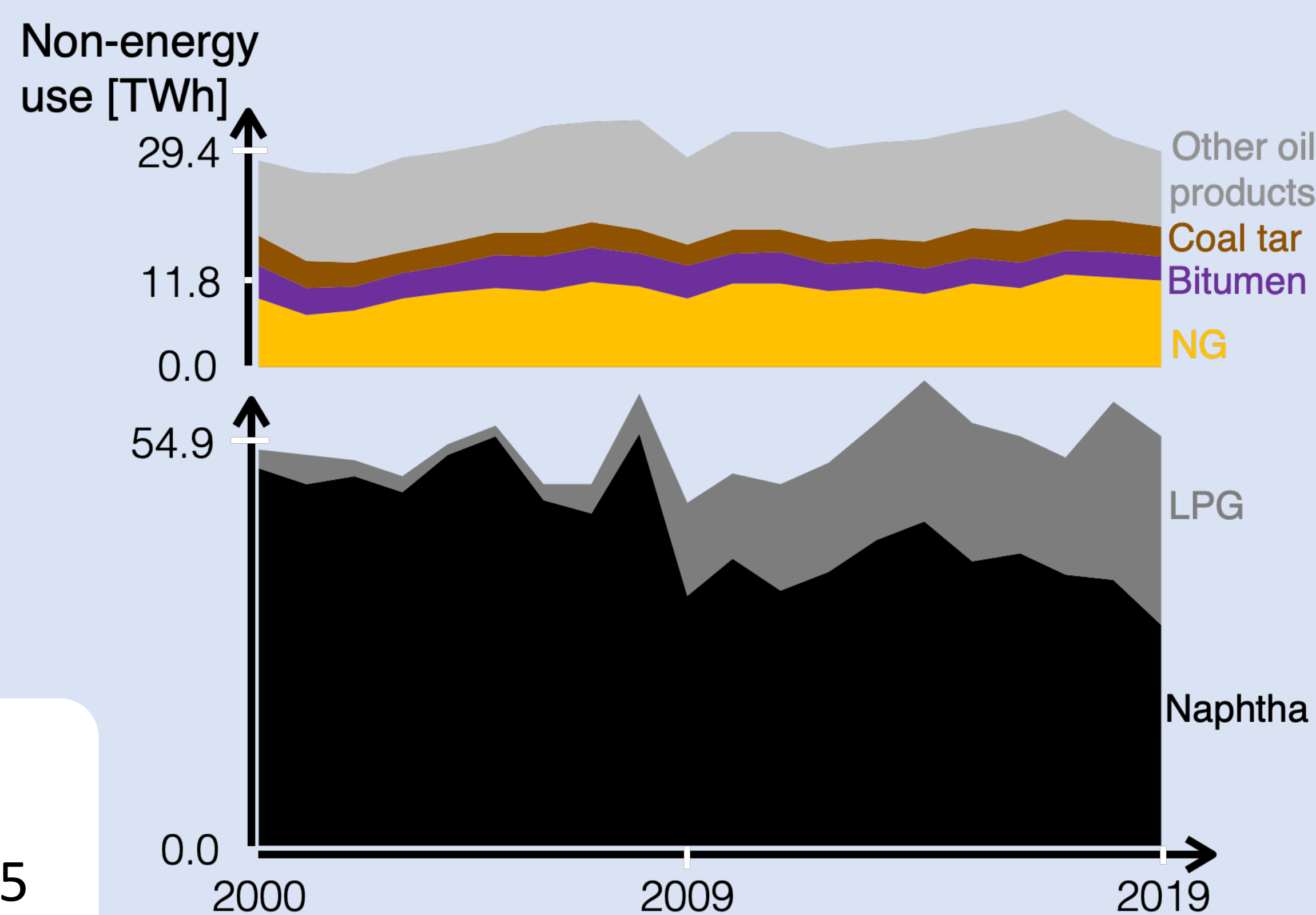
Non-energy demand plays a significant role in final energy consumption:

- **World:** 10% of final energy consumed
- **Belgium:** 20% of final energy consumed

Current production of intermediate products (ethylene, propylene, ammonia and methanol) is **heavily based on fossil sources (> 90%)**. Nonetheless, it is generally **overlooked in whole-energy system models**.

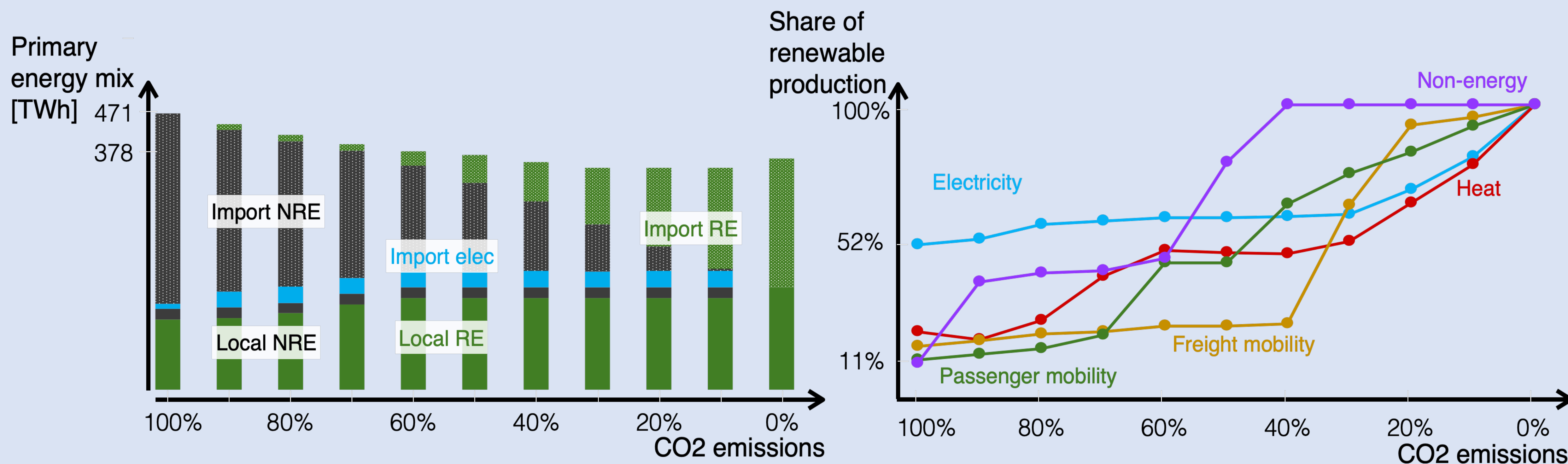
Method used

- EnergyScope Typical Days [1]
- Whole-energy system model
- Linear optimisation model
- Cost minimization
- “Snapshot” analysis in 2035
- Belgian energy system



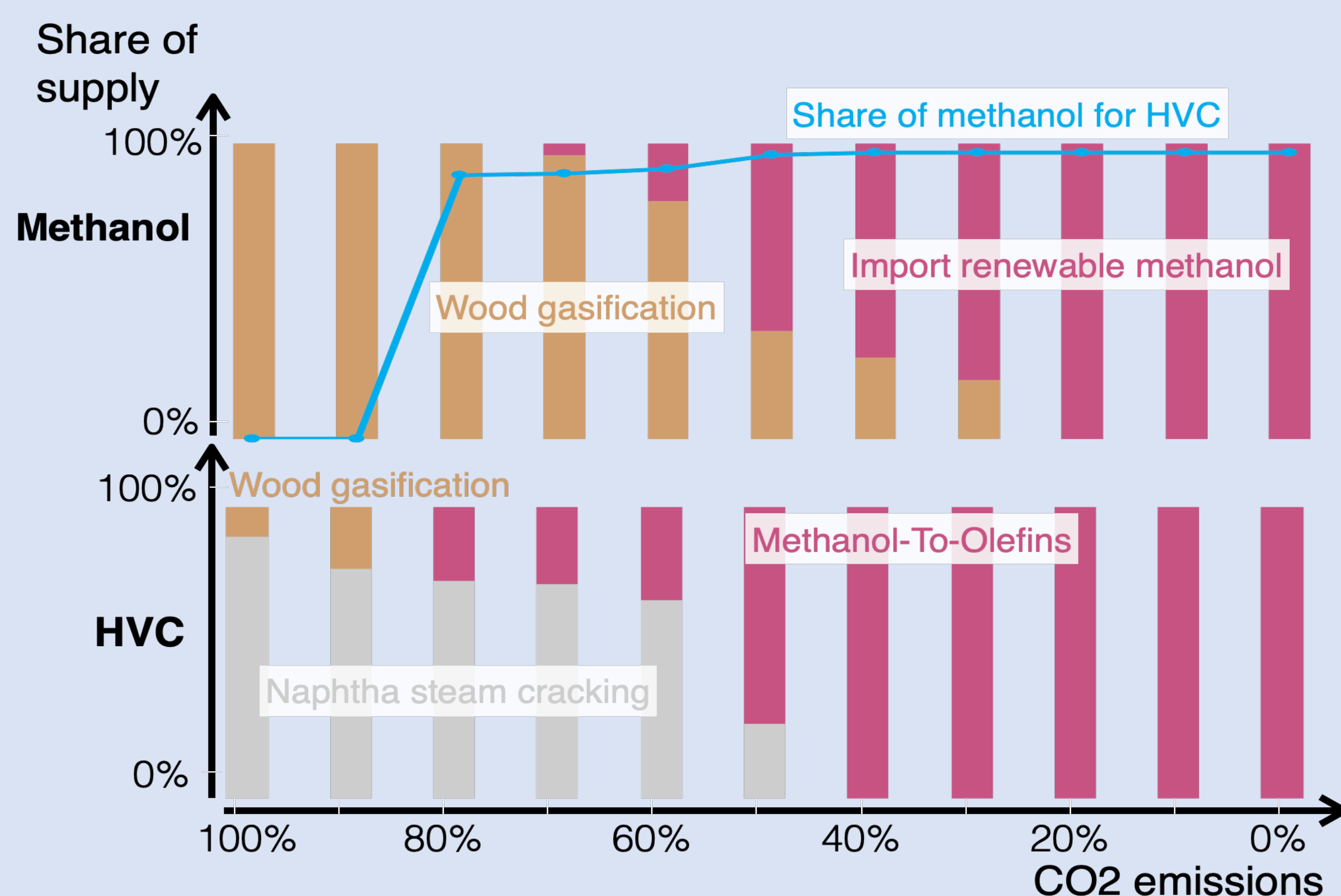
Historical trend of molecules used in production processes unrelated to mobility, heat or electricity end-uses

Path to defossilisation

Non-energy demand is the **first candidate** for defossilisation in the **path to carbon neutrality**.Fully renewable production achieved already at **40% CO2 emissions** compared to 2035 estimates (100% scenario).

Cost-optimal share of renewable production per end-use demand for different CO2 limits

Technologies used to supply methanol and HVC for different CO2 limits



100% → 80% CO2-emissions:

- Switch to higher conversion efficiencies
- **Higher wood gasification for HVC production**
- Import of renewable NH3

80% → 40% CO2-emissions :

- Phase-out of naphtha
- **High increase of import of methanol**

40% → 0% CO2-emissions :

- Full potential electricity imports
- Heat: use of biomass and further electrification through heat pumps
- Mobility: fuel cells penetration and further electrification through trains

Perspectives

The key role of methanol suggests possibilities of synergies with the energy demand in mobility.

Conclusions

The non-energy demand is the first sector to be defossilised.
Methanol turns out to be the key molecule.
The Belgian system is highly dependent on import of e-fuels.