

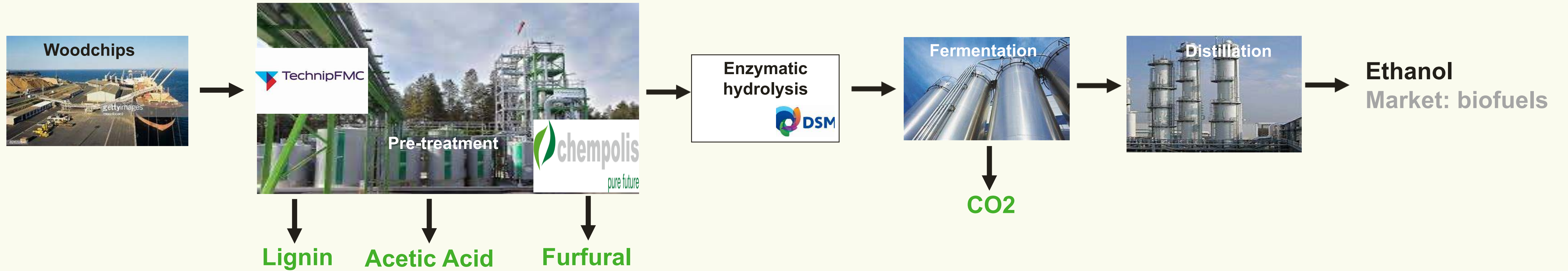
Biondoil: Advanced fuels and Chemicals from Lignocellulosic feedstock

Hennie Zirkzee

10/01/2021

Biondoil: Base scenario 1.0 for biorefinery

Green biobased chemistry + production of drop-in bioethanol

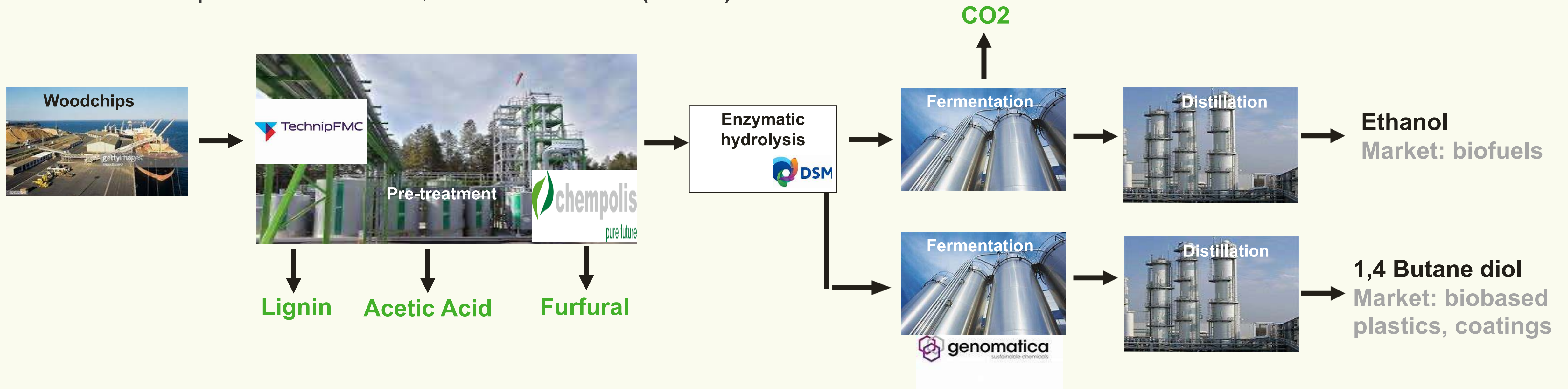


Results from Feasibility study

- Sustainable business case
- LCA (RED2 definitions) > 80% CO2 reduction
- Lignin valorisation scenario's in place
- Ethanol contains 20% of the biomass carbon
- Other products contains 80% of the biomass carbon

Optimization green chemistry portfolio (1)

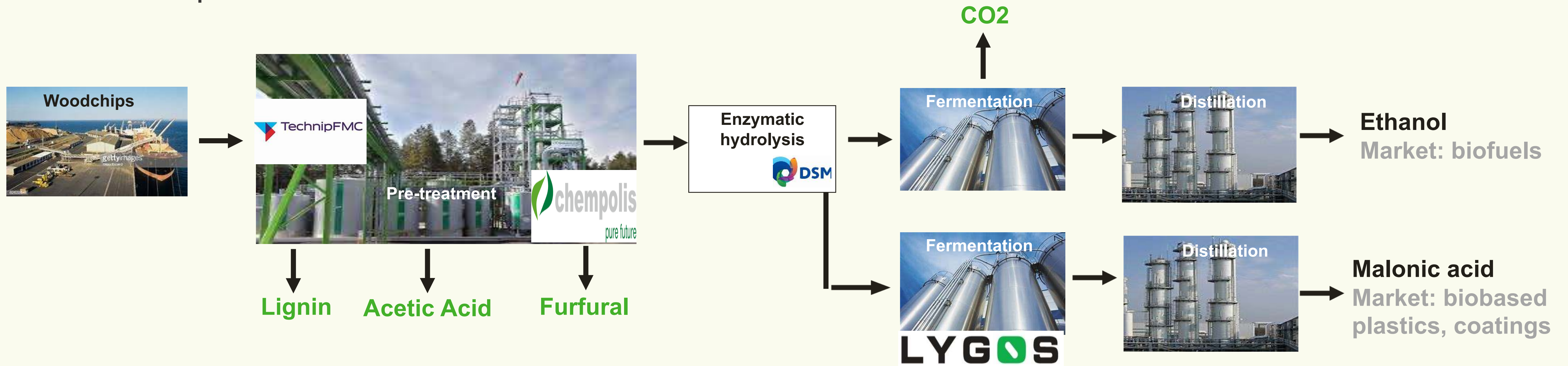
Additional production of 1,4 Butane diol (BDO)



- Keep Pre-treatment infrastructure intact
- Feasibility study with recognized fossil based BDO producer and Genomatica
- Price setting fossil vs biobased
- LCA performance fossil vs biobased
- Is there a business case??

Optimization green chemistry portfolio (2)

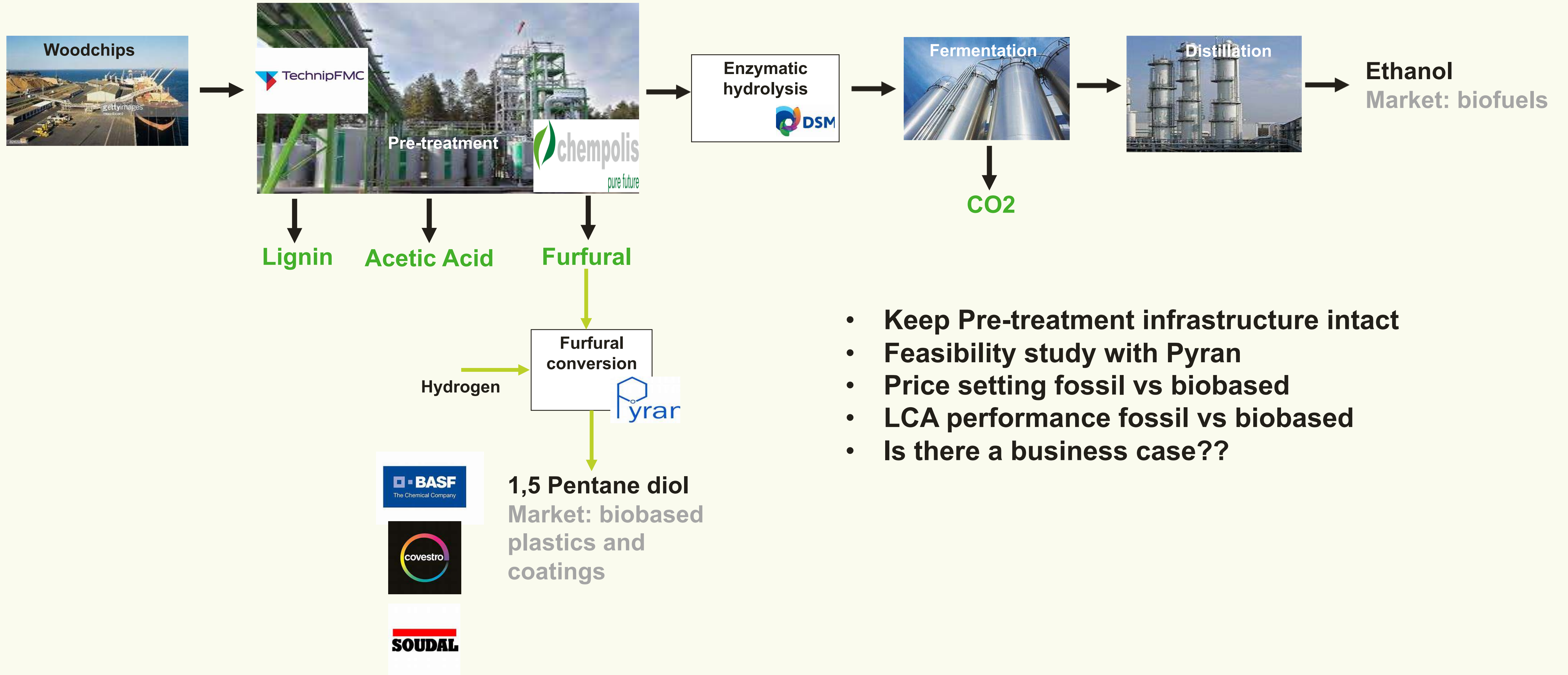
Additional production of Malonic acid



- Keep Pre-treatment infrastructure intact
- Feasibility study with Lygos
- Price setting fossil vs biobased
- LCA performance fossil vs biobased
- Is there a business case??

Optimization green chemistry portfolio (3)

Downstream valorisation of intermediate streams

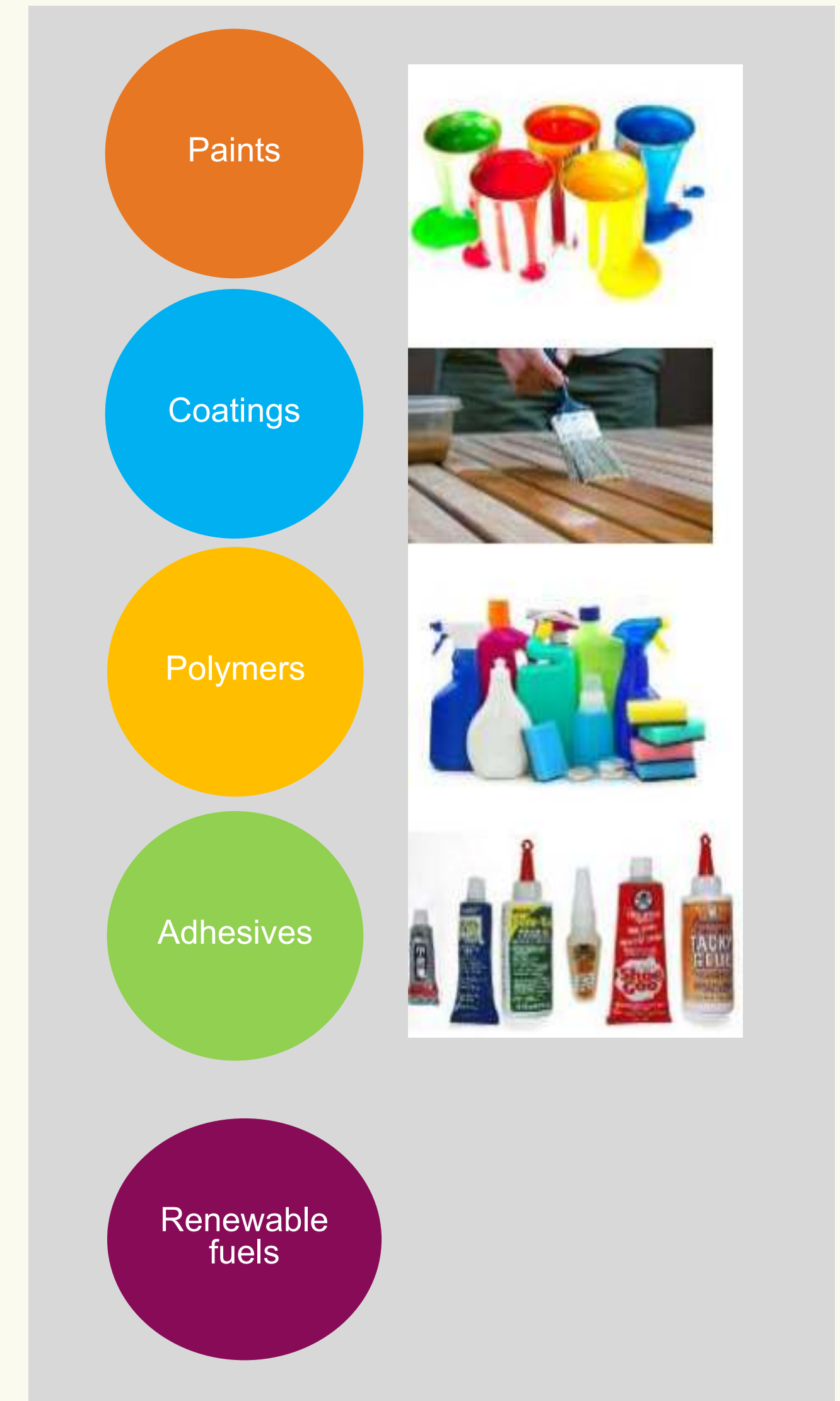
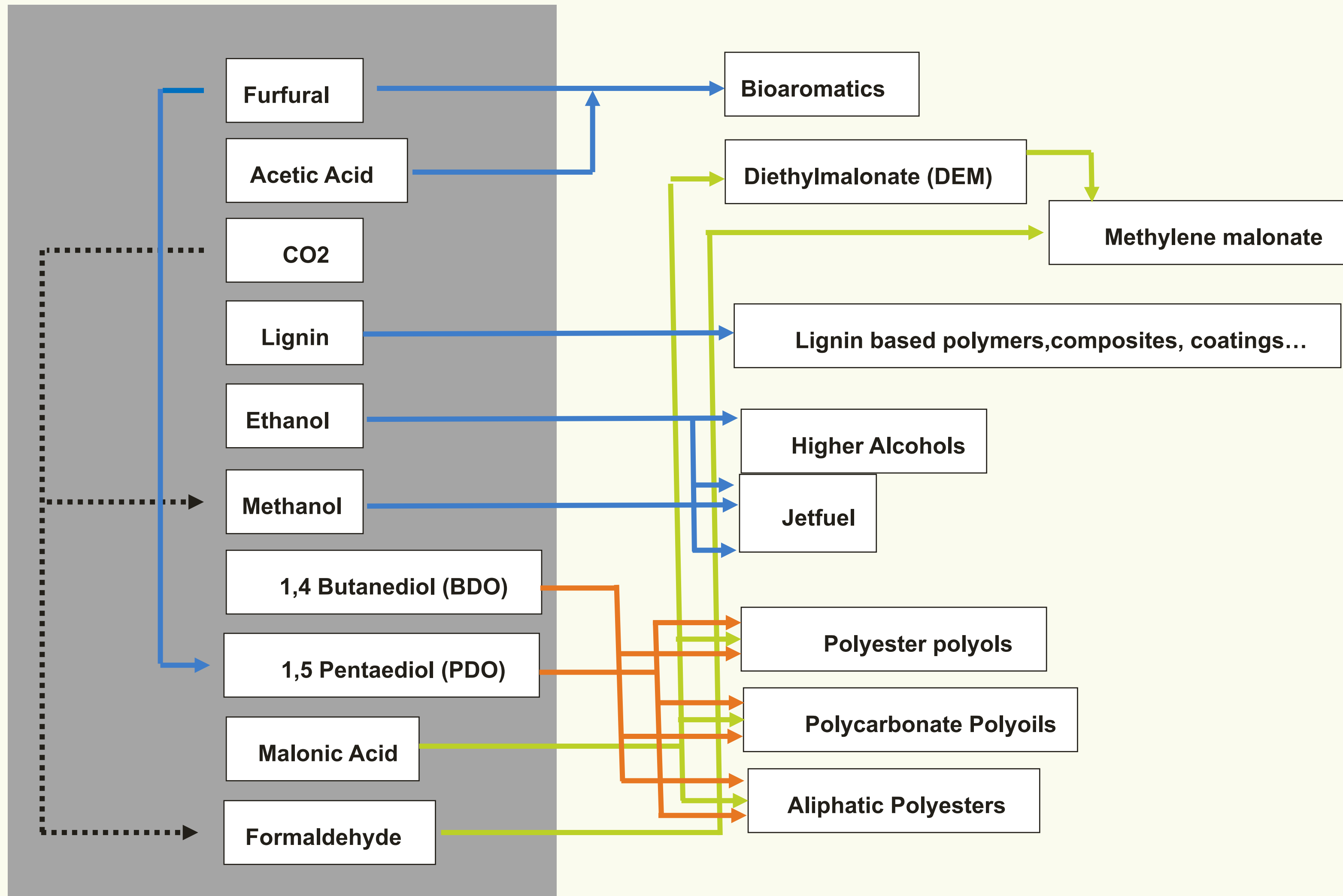


- Keep Pre-treatment infrastructure intact
- Feasibility study with Pyran
- Price setting fossil vs biobased
- LCA performance fossil vs biobased
- Is there a business case??

Biondoil Base Chemicals Scenario 2.0 (2025-2035)

Intermediate product portfolio Scenario 2.0 (2030-2050)

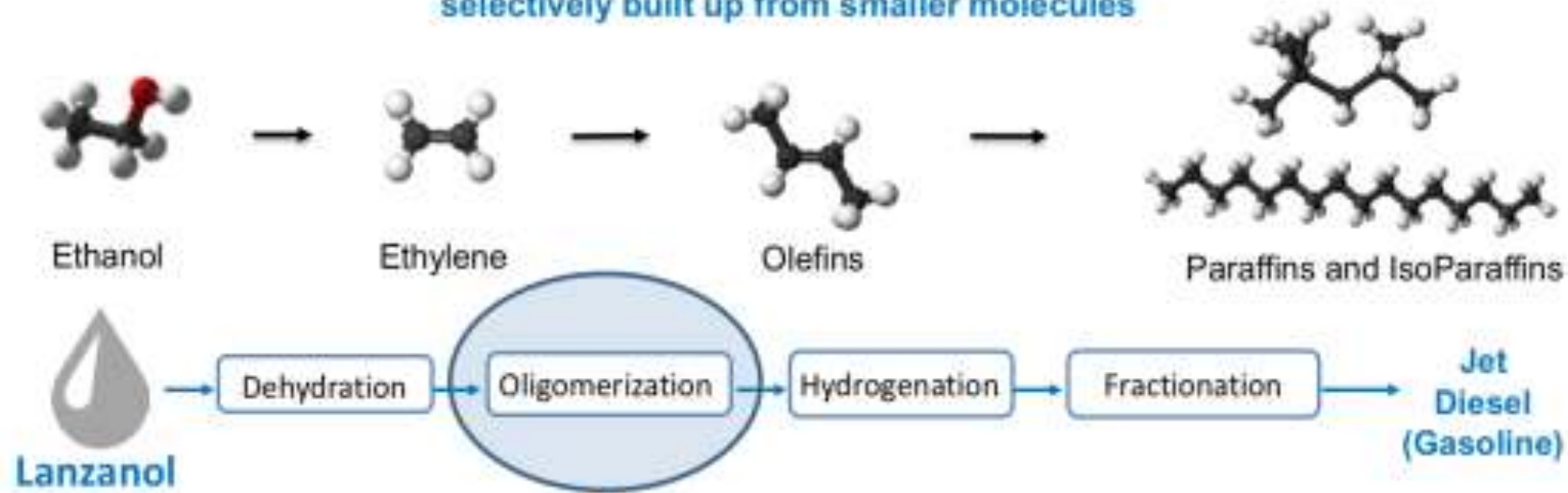
Targeted markets



Renewable Marine and Jet fuel from Ethanol

LanzaTech/PNNL Alcohol to Jet Process

Jet range hydrocarbons (C8-C16)
selectively built up from smaller molecules



Requirements for Synthetic Paraffinic Kerosene (SPK)

- Control oligomerization to desired chain lengths, avoiding polymerization
- Produce targeted branched hydrocarbons, without aromatics

*Primary Technical Challenge:
Oligomerization of ethylene to olefins*

Alcohol to Fuels Process development: Biondoil and Fraunhofer Umsicht

Process diagram using primary alcohols as an example

