

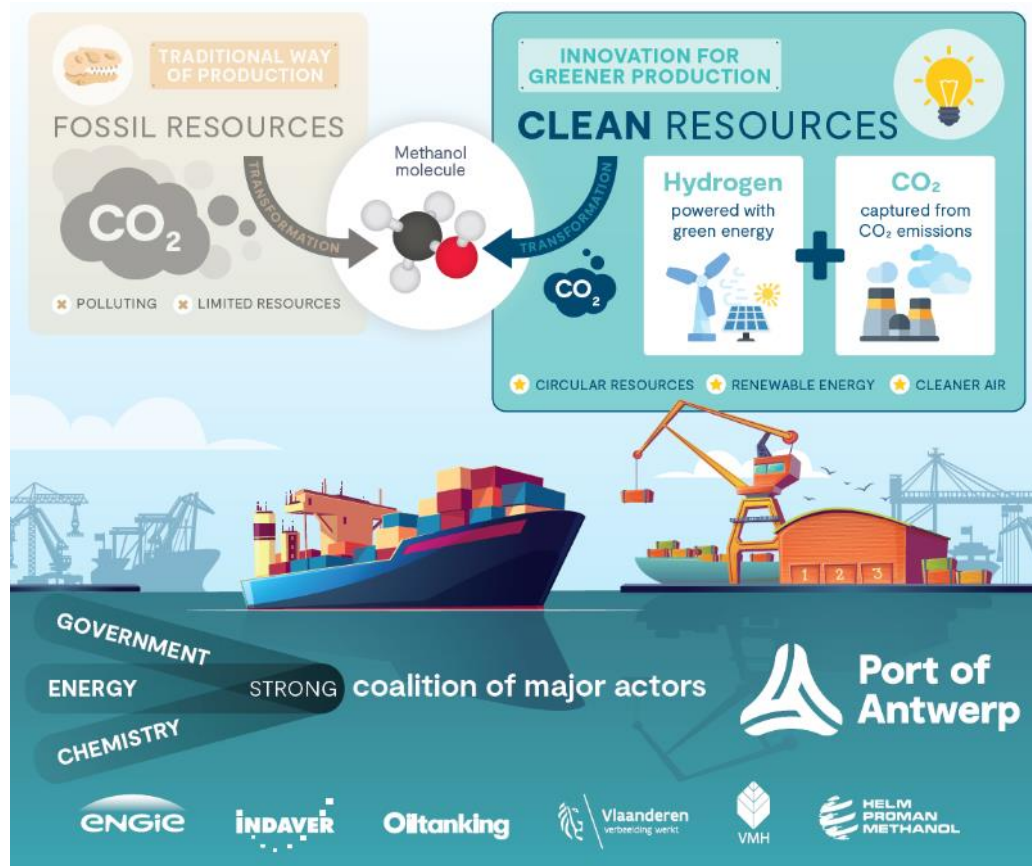
Port of Antwerp

Power-to-methanol demonstration
project



First application with green hydrogen

Power-to-Methanol demonstrator



Main demonstration drivers

Learning by doing:

how process efficiency copes with operational flexibility

how synergy with industrial waste stream can increase viability

Proving: how flexibility can lead to viability

Using energy market flexibility to mitigate energy costs

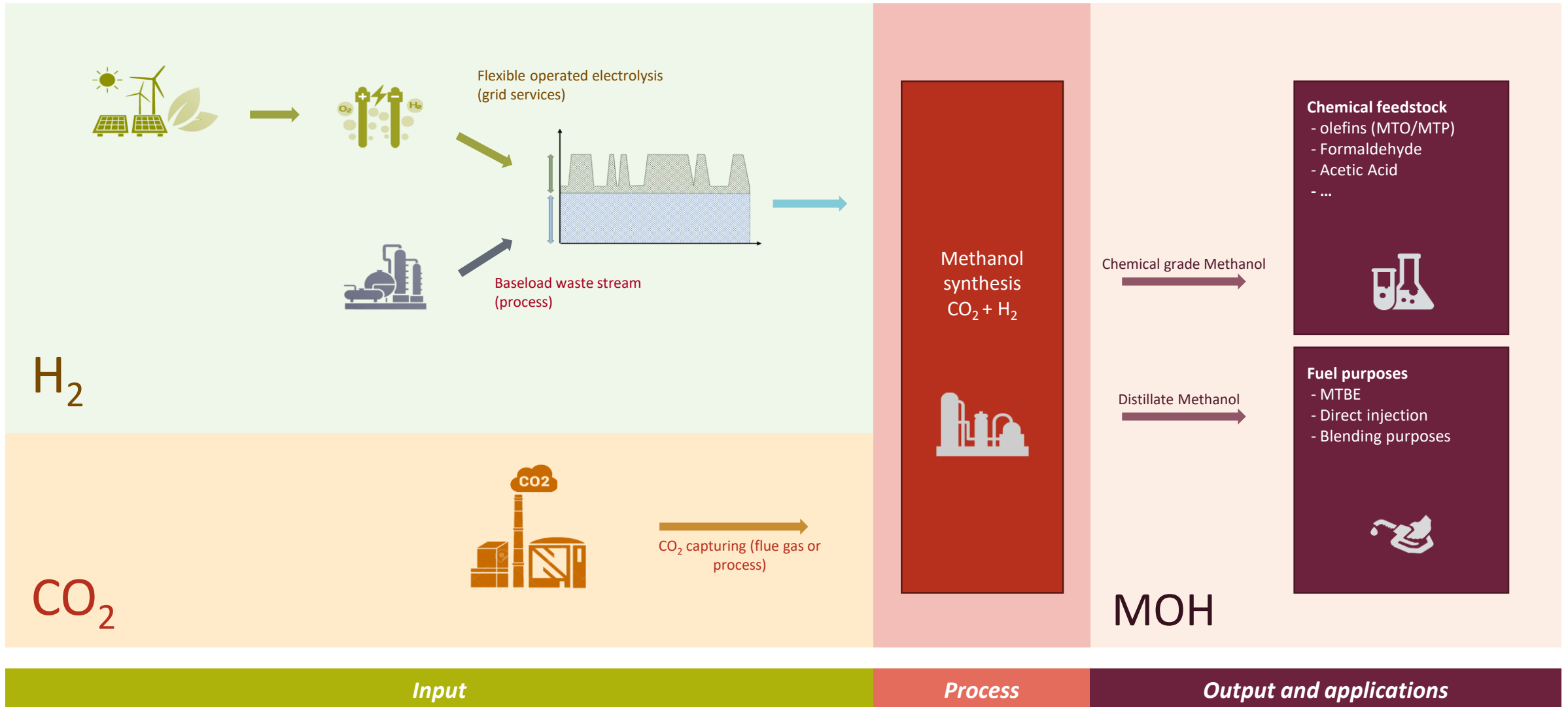
amortising the cost impact of flexibility by waste hydrogen synergy

Showing: how CCU-based-molecules can enable transition in energy, chemistry and fuels

RED II CCUfuel lighthouse project

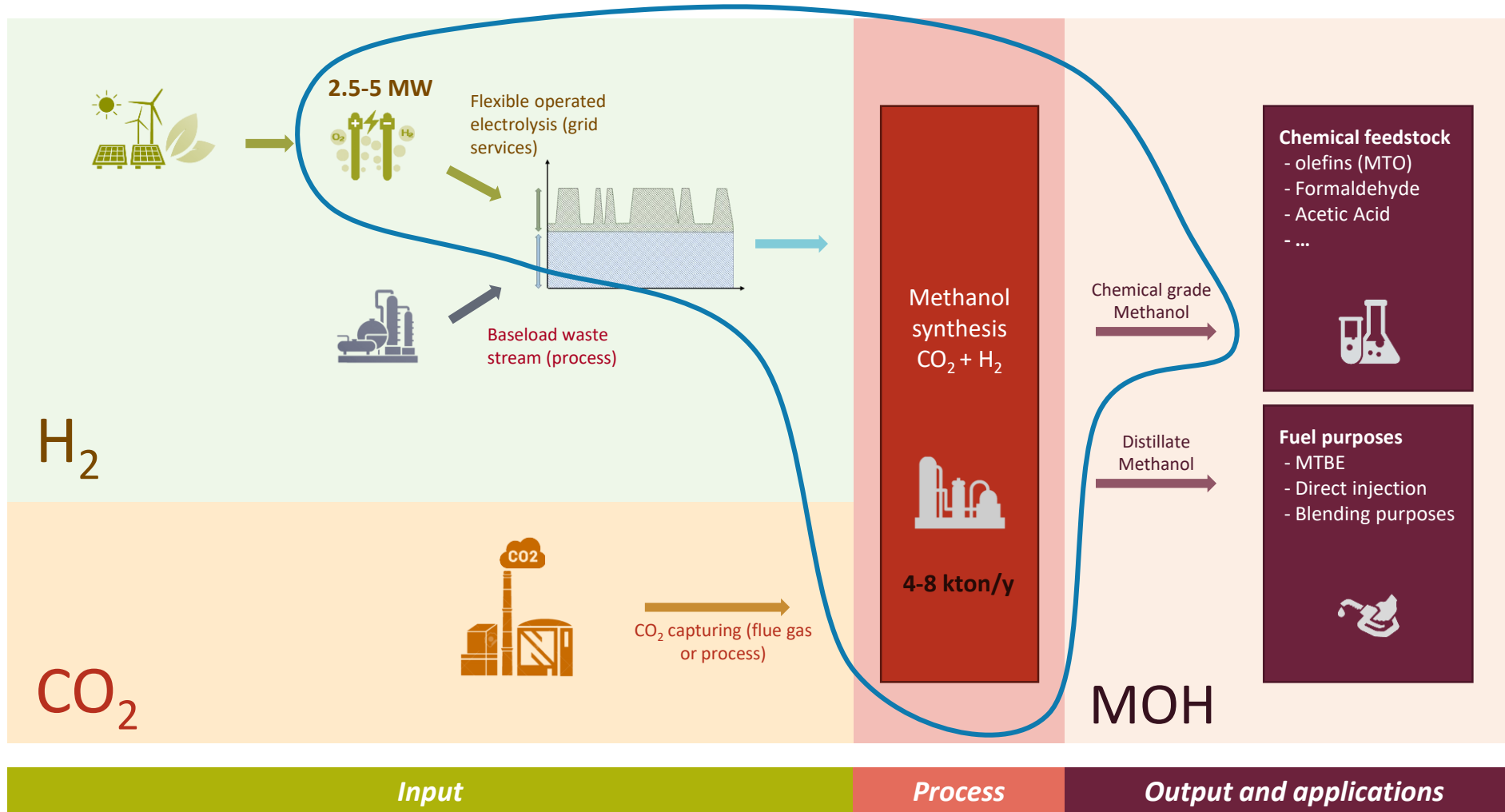
In support of climate action plans

High level concept



High level concept

Scope, size & costs



Scope

In scope (Capex)

- ✓ Electrolyser
- ✓ Synthesis reactor
- ✓ Distillation

Out of scope (Opex)

- ✗ Renewable energy production
- ✗ CO₂ capturing
- ✗ Waste stream Hydrogen

Size

- 2-5 MW electrolyser
- 4-8kton synthesis

Costs

- investment reactor & distillation ± 6-9 M€
- invest. Electrolyser 2-4 M€
- investment BoP 1-4 M€
- ➔ total: 10-17 M€

➔ Expected subsidy rate of 40% due disadvantage of scale

GHG reduction potential

Which markets will be targeted?

Pilot

11.200 ton CO₂



8.000 ton MOH

Market 1: low impact transport (e.g.: shipping)

**RED II framework to valorise green methanol!*



**If 100% green H₂ input and 100% green energy used for process for a 8 kton installation. -> direct impact on GHG emissions!*

- 11.200 ton CO₂



Market 2: low impact chemistry (e.g.: methanol to olifins)

**valorise methanol in niche markets and 'volunteering' companies?*

GHG reduction potential?

RED II -> methodology?

RED II Fuel cat.

Main scope

PtM demo case

relevance

Art. 27 Energy funnel

GHG reduction
benchmark

GO book&claim

H2 options:

Refunbio's

1. from electrolysis based on RE cfr RED II art, 27 funnel

→ LCA GHG burden: renewable and thus 0? or other allocation basis

2. from chlorine electrolysis (grid mix RE-part)

→ LCA GHG burden: renewable and thus 0? or other allocation basis

3. from dehydrogenation (renewable propane/ethane)

→ LCA GHG burden: energy based/value based/mass balance...?

CO₂ options: additional industrial point sources:

• Non-ETS:

• A large scale waste incinerator, with two options: a ca 55% bio-waste household waste stream or a dedicated B-Wood incinerator;

• ETS:

Delegated act

• A gasification process with biogas-production

• And ethylene oxide process with existing Carbon capture-installation

• A post-combustion process source

→ LCA: Captured atmospheric/fatal CO₂ thus LCA GHG burden: 0?

→ 'Emitter stays accountable' principle, so the 'Utiliser' received booked CO₂

Timeline

