Concawe
Environmental Science for European Refining

Refinery 2050:
Concawe modelling exercise

Concawe Symposium – 18th March 2019 – Antwerp

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01

Refinery 2050: Opportunities and challenges

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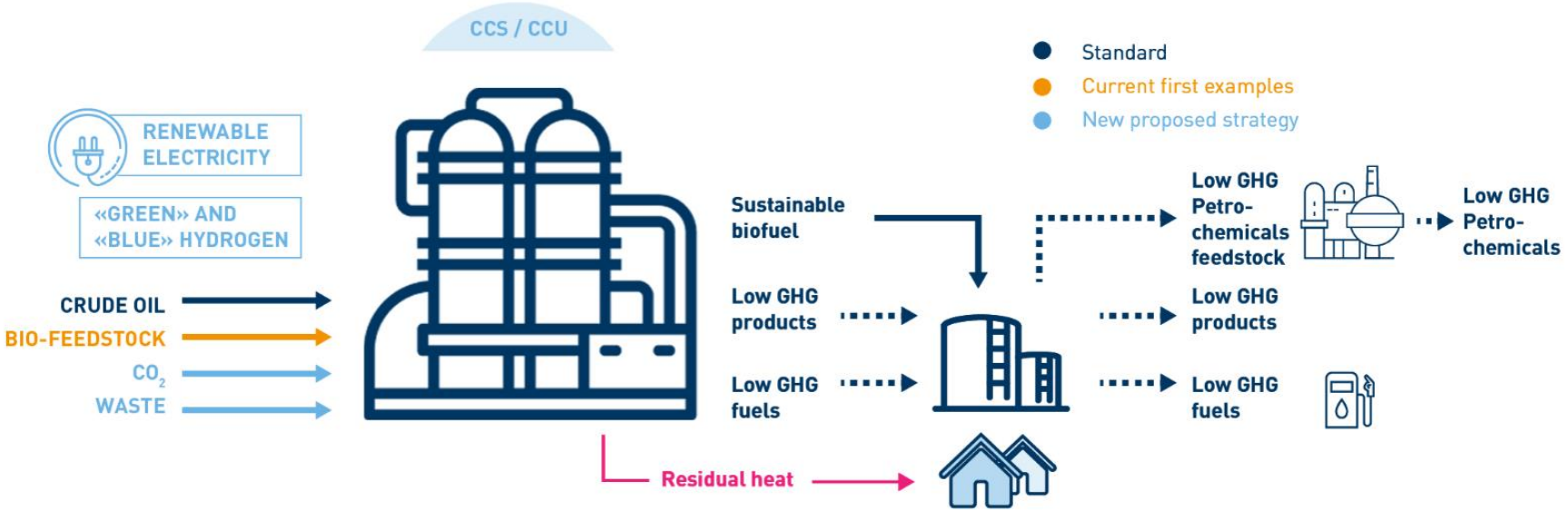
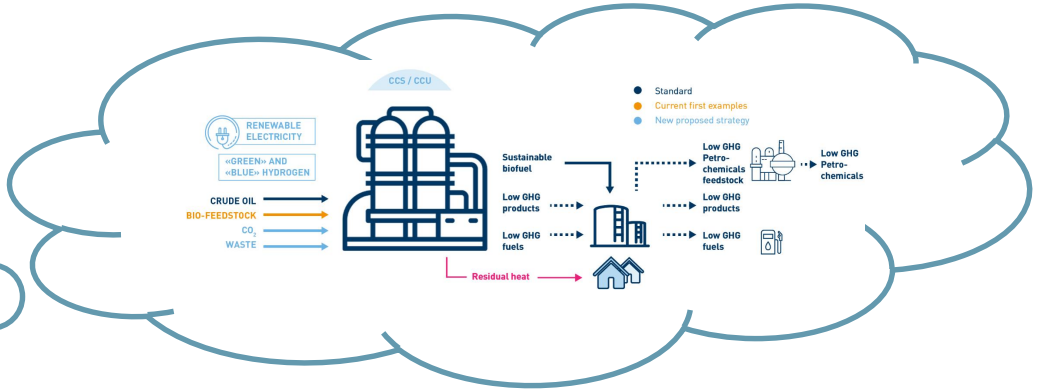
Vision 2050: The refinery as an ENERGY HUB…

… within an INDUSTRIAL CLUSTER



Vision 2050: The refinery as an ENERGY HUB…



Which technologies can be realistically implemented?

What are the external requirements?

When starting the transition?

Why to transition?

02

Refinery 2050 Modelling work

Can the EU refining industry can effectively contribute to a low CO_2 economy?

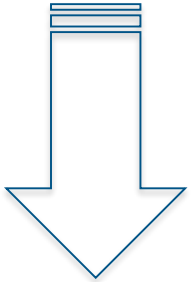
1 **Early-stage**
High efficiency operation

2 **Evolution**
Progressive introduction of low-emission components and low-carbon feedstocks

3 **Future-stage**
Hub for production and distribution of low-emission energy products and raw materials

Concawe Modelling work (EU Refining system)

CO_2 efficiency *report*
(2030 and a look into 2050)



Refinery 2050 *report*

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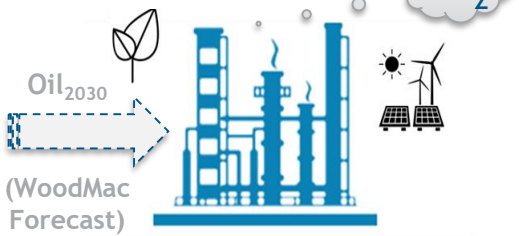
Step 1. CO_2 efficiency

1 2008

2008 EU Refining System Benchmark

2 2030 Ref

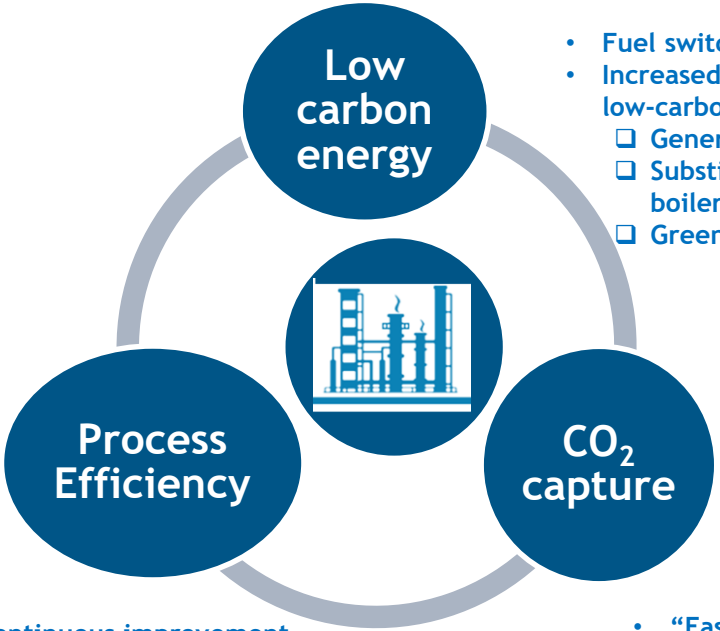


CO_2 efficiency technologies

3 2030 Improved

Potential Tech deployment towards 2050

CO_2 efficiency technologies



- Fuel switch
- Increased use of imported low-carbon electricity
  - ❑ General electrification
  - ❑ Substitution of fired boilers and heaters
  - ❑ Green H_2

- Continuous improvement
- Energy Management
- Major capital projects

- "Easy-to-capture" (H_2 production)
- Other plants

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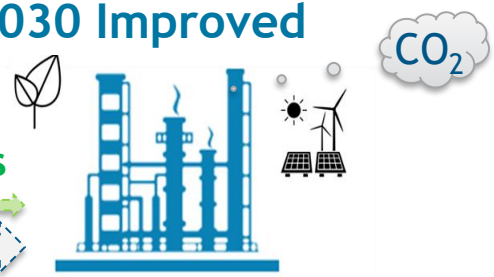
Step 2. Refinery 2050

1

2030 Improved



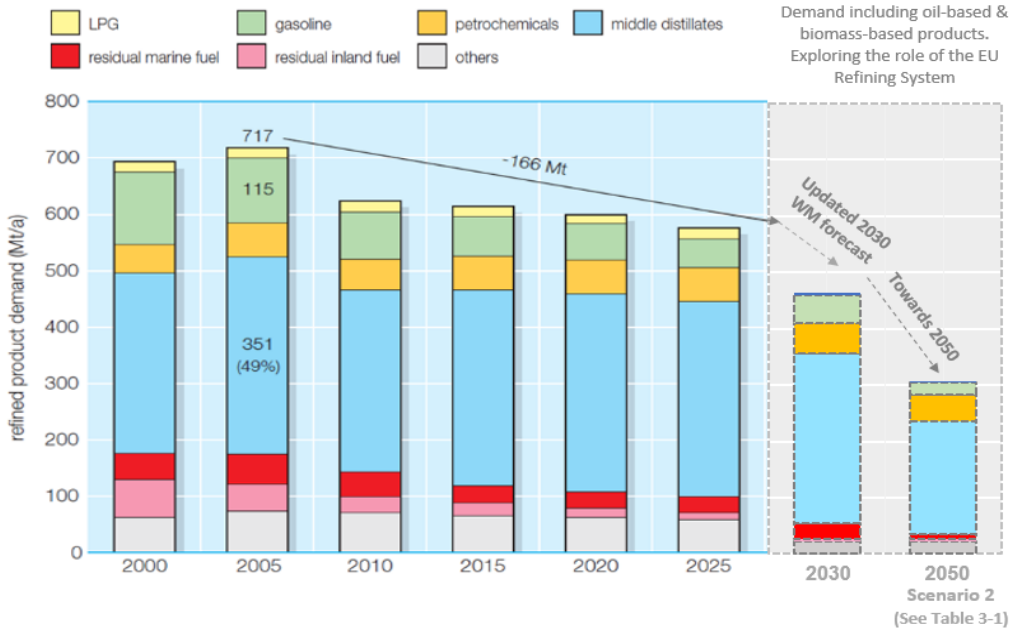
Demand scenarios 2030….. 2050

2

2050
+ Demand Scenarios

Scenario **2** (Demand)
(-30% vs 2030 Ref)

Demand for Oil-based + Low Carbon fuels



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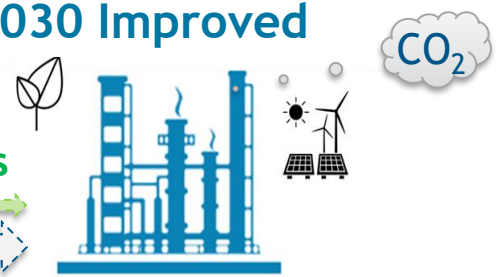
Step 2. Refinery 2050

1

2030 Improved

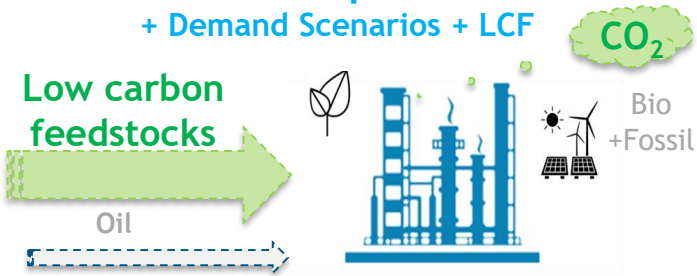


Boost CO_2 eff improvement (Step 1) + LCF

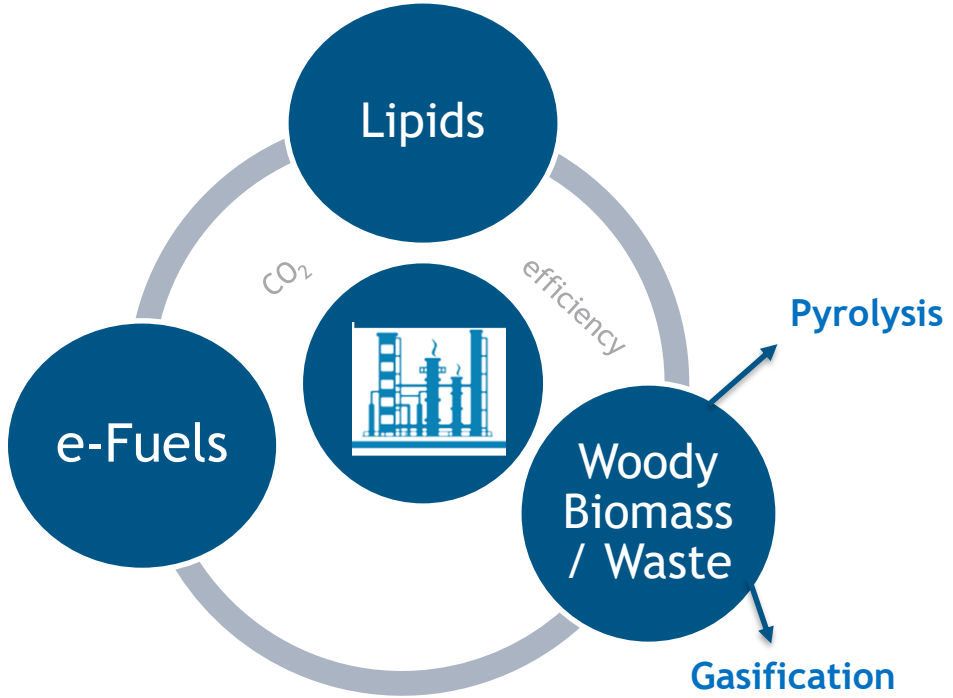
2

2050 Improved

+ Demand Scenarios + LCF



Low Carbon Feedstocks (LCF)



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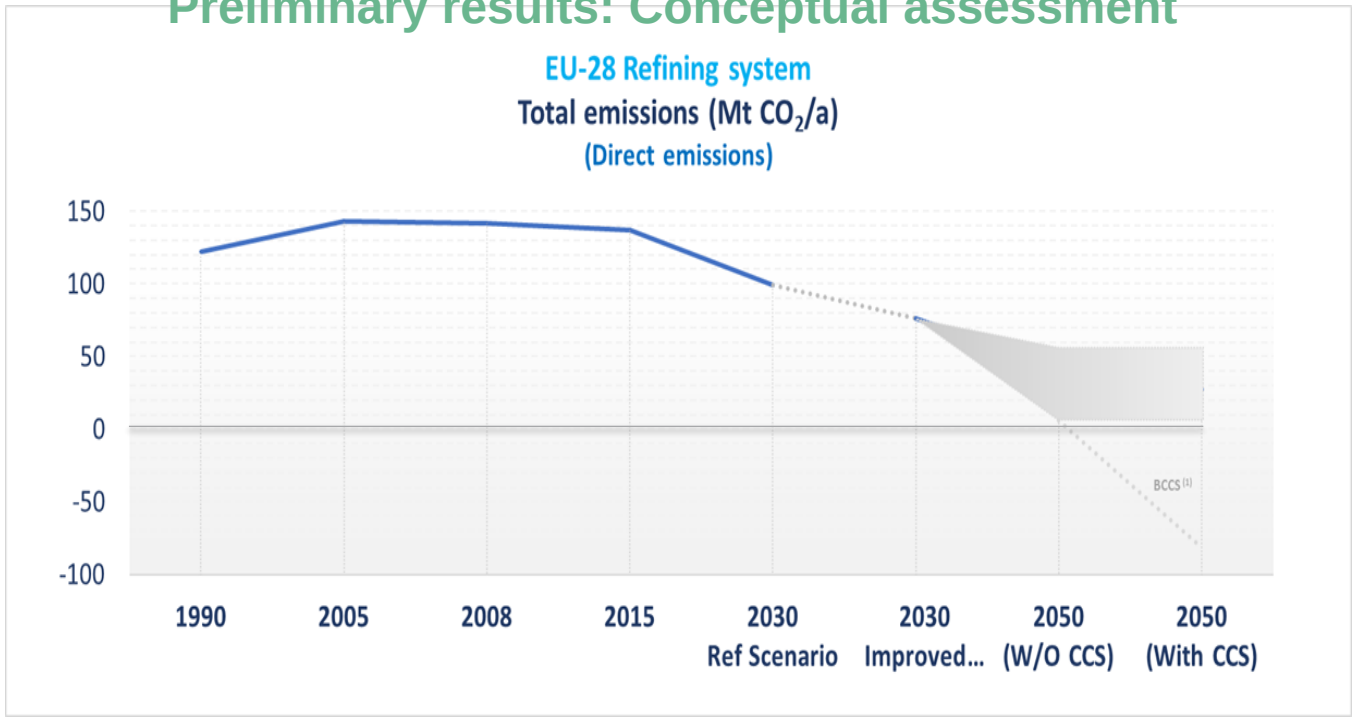
Step 2. Refinery 2050

Preliminary results: Conceptual assessment



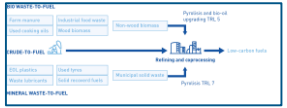
The technologies are being developed….

Algae

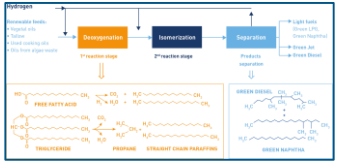
REFHYNE
CLEAN REFINERY HYDROGEN FOR EUROPE

Green H_2

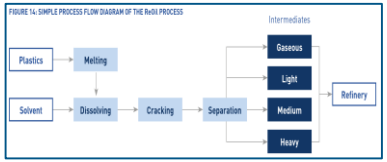
Advanced bio
… from biomass



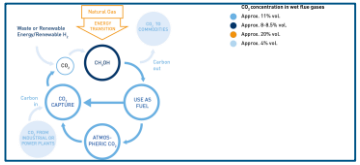
… from waste



… from plastics

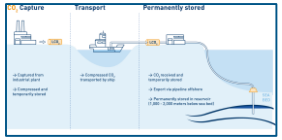


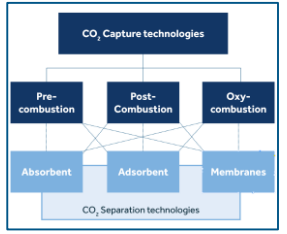
E-fuels

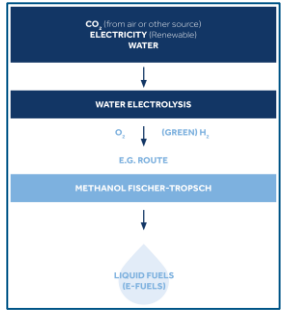


…….and this is
just a sample of all the
R&D and Innovation projects
currently underway

CCUS







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03 Takeaway's ...

The conceptual assessments …

- Explore the **suitability of existing refineries** for processing **low-carbon feedstocks**
- **Not intended to be a roadmap**
- **Multiple additional** pathways/feedstocks could be developed

The initial results show that:

- **Declining** in **demand** impacting the EU Refining system
- The EU Refining System can effectively contribute to EU long-term ambition in CLIMA
    - Availability of huge amounts of both renewable electricity and low-carbon feedstocks would be required
    - Challenges go beyond the refining battery limits
    - Strong R&D and financial support needed!