

# Innovation Fund Sectoral workshop\_Refineries

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# Concawe mission

To conduct research to share impartial scientific information and understanding



# Concawe - Science for European Refining

## Concawe Membership

Concawe represents 40 Member Companies ≈ 100% of EU Refining  
Open to companies owning refining capacity in the EU





# Low Carbon Pathways

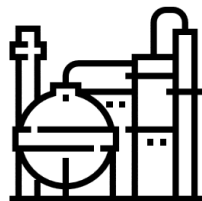


# Concawe - Low Carbon Pathways

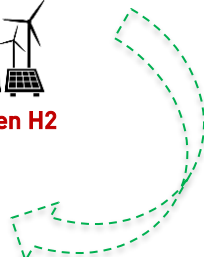
Reduced GHG intensity of Transport  
Well-To-Wheel

Well-To-Tank

Refining system



Green H2



Process improvement  
New high-efficiency technologies  
Integration with renewables  
Taking advantage of grid decarbonization  
CCS (& CCU)  
Waste Heat Use



Industrial symbiosis  
Beyond-the-fence opportunities



Tank-To-Wheel

Feedstock &  
Advanced fuels



Sustainable biofuels  
Advanced biofuels  
Synthetic fuels  
Power-to-Liquids

Product Quality  
for efficient use

Vehicle technology

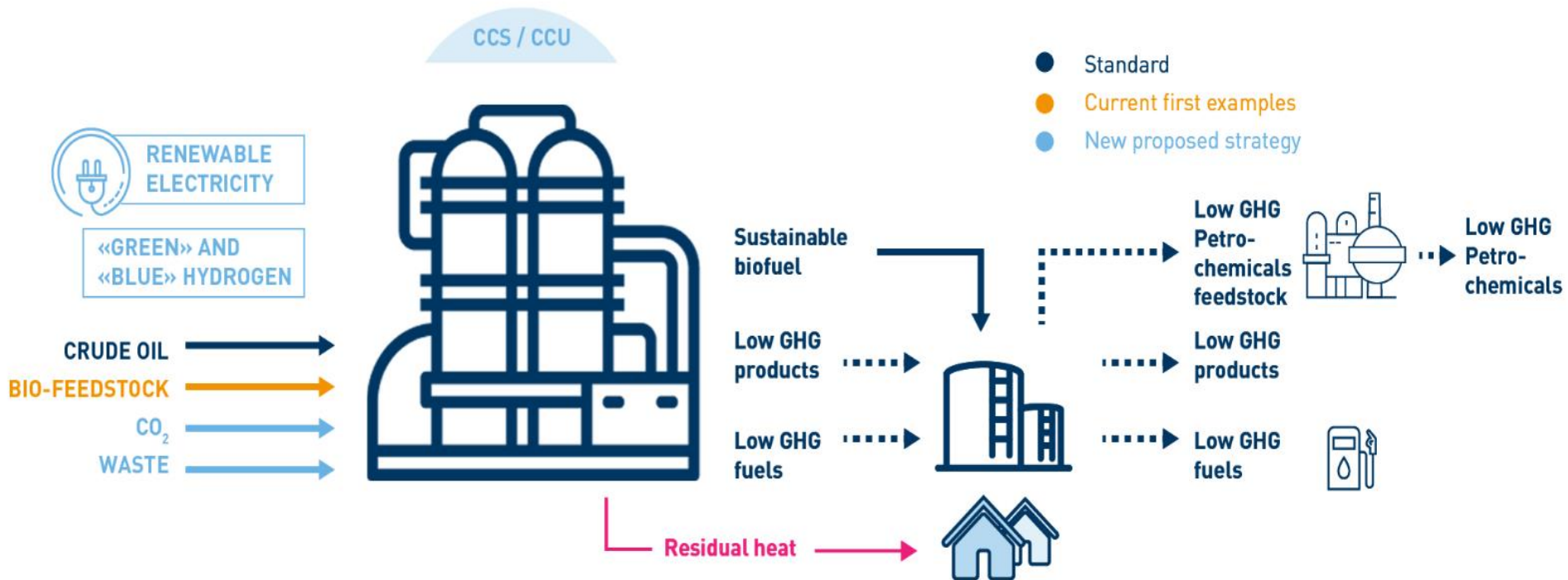


High octane fuels  
Fuel quality  
improvement  
New fuels

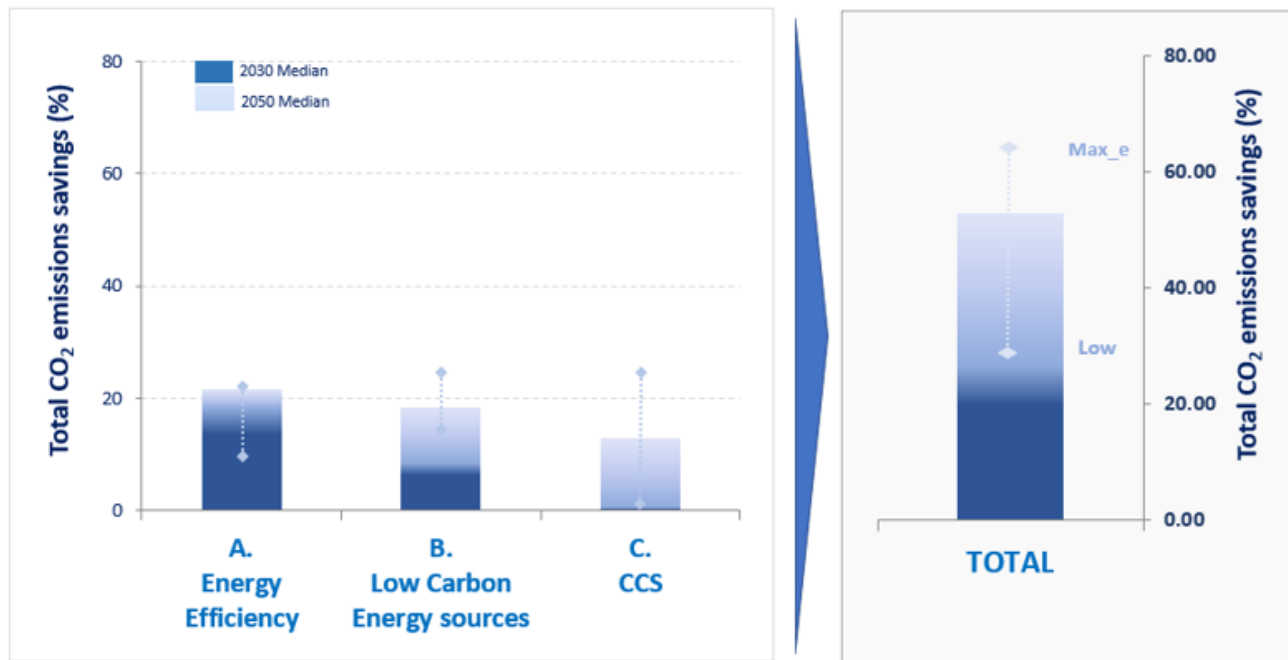
ICE & Hybrid energy  
efficiency enhancement  
On-board CCS

# Vision 2050: The refinery as an ENERGY HUB...

... within an INDUSTRIAL CLUSTER



# Refinery CO<sub>2</sub> reduction technologies 2030/2050



Note: Electrification may account for up to ~23% of the CO<sub>2</sub> reduction in the 2050 High electrification sensitivity case. This incurs significant additional capex outside the refinery not included in the scope of this assessment.

## Potential CO<sub>2</sub> savings:

**25% by 2030** (33 Mt)

**52% (65 Mt) by 2050** in the median scenario compared to 2030 Ref Case (125 Mt CO<sub>2</sub>/a).

**Up to ~60% (78 Mt) by 2050** in the high uptake sensitivity cases

## Total electricity

consumption: **130 TWh/y in 2050**

(4% of the electricity currently in EU).

## Report

CO<sub>2</sub> reduction technologies.  
Opportunities within the EU refining system (2030/2050).

Qualitative & Quantitative assessment for the production of conventional fossil fuels (Group 1 & 2)

Low Carbon Pathways



# The technologies are being developed....

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



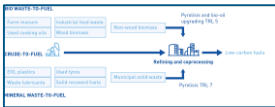
## Algae



## Green H<sub>2</sub>



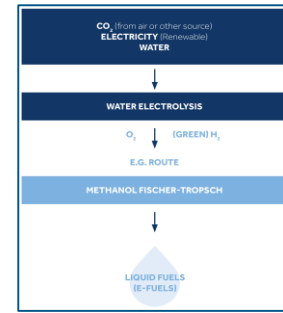
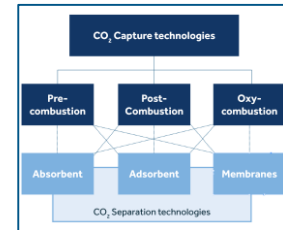
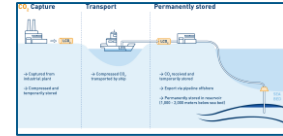
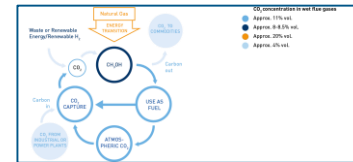
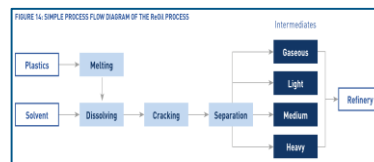
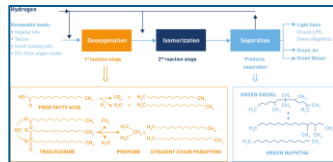
## Advanced bio ... from biomass



## ... from waste

## ... from plastics

## E-fuels





# The conceptual assessments ...

- Our Concawe scientific assessment work has just started:
  - **No single silver bullet technology**
    - *Multiple pathways can deliver significant GHG savings*
- **Refinery 2050:**
  - **Low-GHG intensive hydrocarbons**
  - **New opportunities for new business models**
  - **Low carbon feedstocks/products as an industrial choice for Europe**