Shaping a Cleaner and Greener Refining Industry

ERTC - 18 November 2020

Jean-Marc Sohier – Concawe Director

Agenda

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Concawe – Environmental Science for European Refining

Concawe Membership

Concawe represents 40 Member Companies

≈ 100% of EU Refining

Open to companies owning refining capacity in the EU

Concawe mission

To conduct research to provide **impartial scientific information**, in order to:

- scientific understanding
- Assist the development of technically feasible and cost effective policies and legislation
- Allow informed decision making and cost effective legislative compliance by Association members.

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02

A Clean Planet for All. Assessment on the potential impact for the European refining system

A Clean Planet for All

EU long-term strategic vision

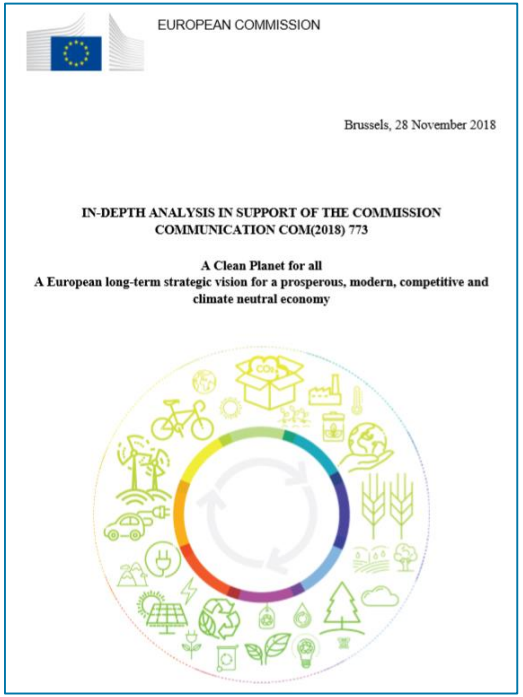
The **EU Commission published** on 28th Nov 2018 its **long-term strategic vision** for a prosperous, modern, competitive and climate neutral economy in Europe.

Recognising that **climate change** represents an **urgent threat to societies and the planet**, the **2015 Paris Agreement** sets the goal of keeping global warming well below 2°C above pre-industrial levels, and pursuing efforts to limit it to 1.5°C (global warming already reached 1°C).

The EU Commission strategy:

- ✓ confirms Europe's **commitment to lead** in global climate action
- ✓ provides an assessment, in accordance with the Paris Agreement, to reduce EU **greenhouse gas emissions**, starting at **-80% going up to -100% by 2050** compared to 1990.

Link: https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf


EUROPEAN COMMISSION

Brussels, 28 November 2018

IN-DEPTH ANALYSIS IN SUPPORT OF THE COMMISSION COMMUNICATION COM(2018) 773

A Clean Planet for all
A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy

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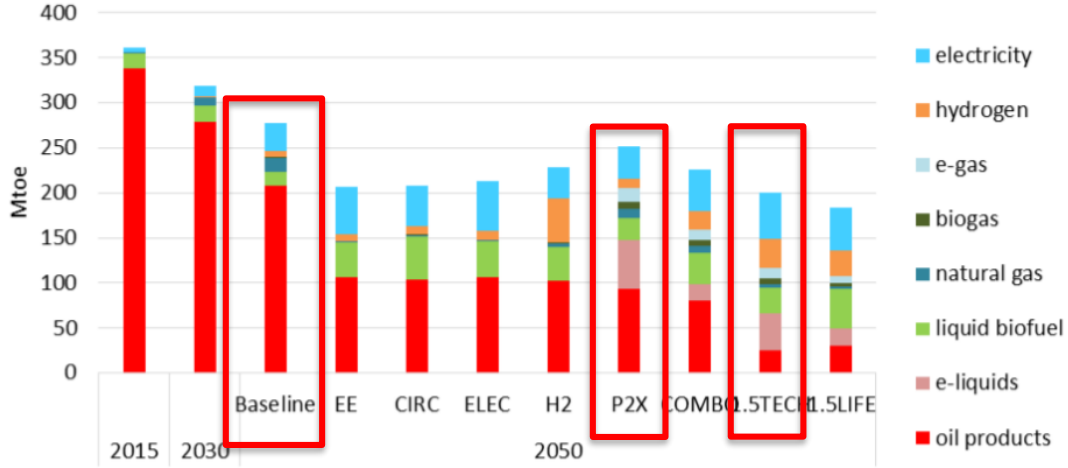
A Clean Planet for all assessment

Is it possible to satisfy the demand for fuels…
… according to *A Clean Planet for all*?

Focussing on 3 of the scenarios (2050 baseline, Power-to-X and 1.5TECH), Concawe has conducted an assessment on the implications of A Clean Planet for all for the EU refining sector.

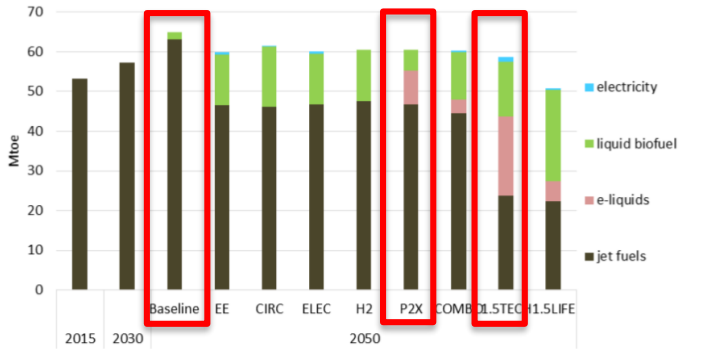
Figure 57: Fuels consumed in the transport sector in 2050



Source: PRIMES.

Zoom into Aviation

Figure 52: Aviation fuels mix in the Baseline and scenarios reaching -80% to net zero emissions by 2050 in 2050



80% GHG reduction

100%

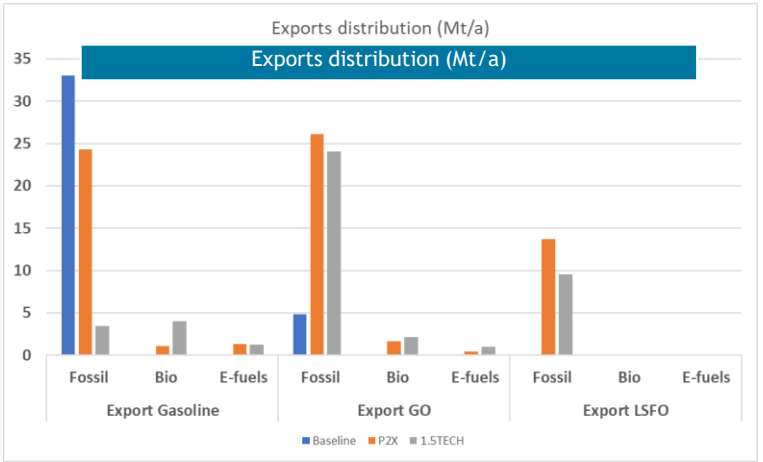
Concawe's *A Clean Planet for All* related report

Is it possible to satisfy the demand for fuels…
… according to *A Clean Planet for All*?

Challenge for the EU refineries of the future

The fossil fuels consumption mix foreseen by the European Commission's report is so weighted towards Jet fuel in P2X and mainly 1.5TECH scenarios that:

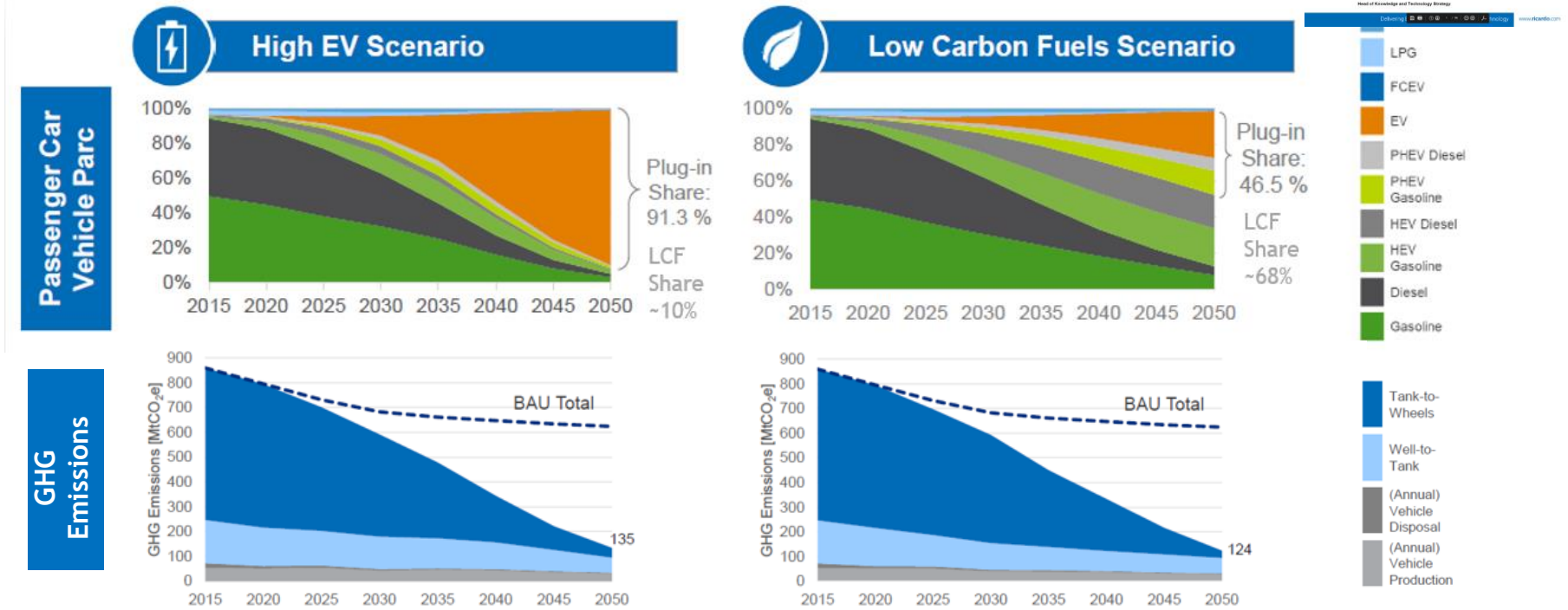
- EU Refining cannot come close to technically realising this yield on the crude barrel.
- A major portion of its output is surplus and needing to be evacuated outside the EU.
- This could not be economically feasible for the refining system in Europe with the consequent additional refinery closures.
- Jet fuel imports from other regions of the world to Europe would be necessary, with no benefit for climate change globally.



03

Concawe alternative scenario towards climate neutrality for Refining and transport

Light Duty Vehicles : different ways to achieve GHG reduction Mass EV vs Low Carbon Liquid fuels.



The two main scenarios feature significant electrification and use of low carbon fuels (biofuels and eFuels)
All scenarios reduce GHG emissions and meet reduction objectives at lower overall cost than BAU

 https://www.concawe.eu/wp-content/uploads/Mass-EV-Adoption-and-Low-Carbon-Fuels-Scenarios.pdf

Source: Ricardo (2018)

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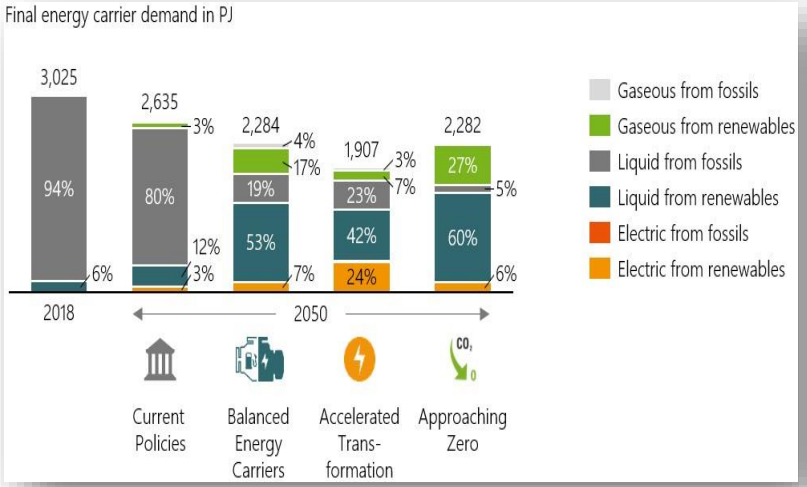
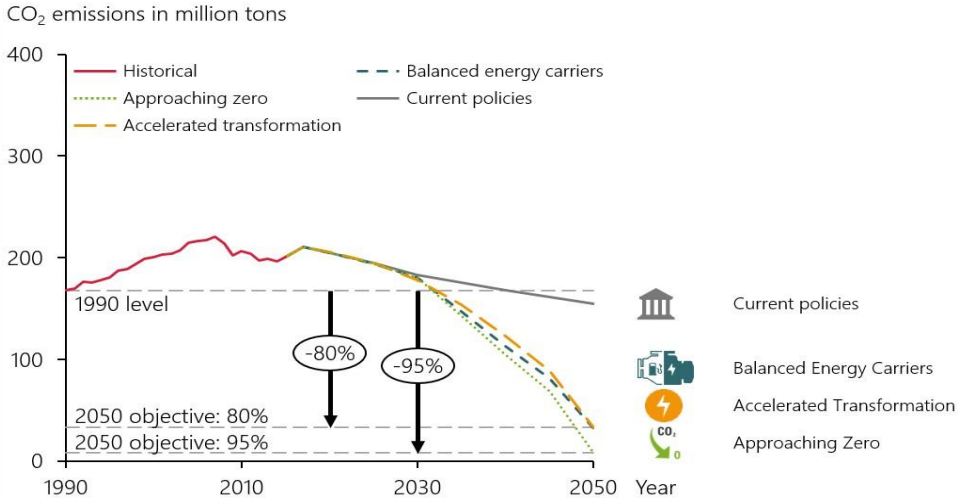
Heavy Duty Vehicles : Different ways to achieve GHG reduction by 2050





Source: FEV (2019)

https://www.concawe.eu/wp-content/uploads/Low-Carbon-Pathways-Until-2050-Deep-Dive-on-Heavy-Duty-Transportation-FEV-report-Concawe.htm

What are Low-Carbon Liquid Fuels?

- Sustainable liquid fuels from non-petroleum origin, produced from new feedstock such as biomass, renewables, waste and captured CO2.

- With no or very limited net CO2 emissions during their production and use compared to fossil-based fuels.
- These feedstock are sustainable and comply with the existing EU sustainability standards.
- Low-Carbon Liquid Fuels are complementary to electrification and hydrogen. We will need all technologies to deliver climate neutrality.

Assesment of the role of Low Carbon liquid Fuels in Road Transport - Methodology

Concawe theoretical assessment of the potential contribution of EU refining industry to reach climate neutrality in Road transport by 2050

SCOPE

EU Refining system

EU Transport (Road - Light and Heavy Duty, Aviation & Maritime)

Well-To-Wheels (*Wake/Propeller*) analysis to assess % GHG savings versus a baseline

Demand hypothesis for refining liquid fuels based on the penetration of alternative powertrains and fuel efficiency measures

TECHNOLOGIES

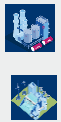
Low Carbon Technologies to reduce WTW GHG intensity at EU Level.

Different scenarios assessed by developing and deploying:

a) **Sustainable low carbon liquid fuels (WTW)**
Boosting R&D and accelerating penetration of:

- 1G biofuels (maximizing current capacity)
- HVO (VEgOil+Residues)
- Lignocellulosic and waste feedstocks (Biomass-To-Liquid technology as a proxy)
- E-fuels (Power-To-Liquids)

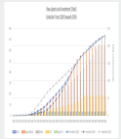
b) **Refining related technologies (WTT)**



- Clean H2 progressively replacing Steam Reformers for H_2 production
- Refining CO2 capture and storage (CCS). When applied to biofuel/e-fuel production processes, this could generate negative CO2 emissions.

RESULTS

From today until 2030, 2035, 2040 & 2050 timeframe, different scenarios provide an initial assessment on:



- Level of deployment of low carbon liquid technologies (**number of plants** in the period)

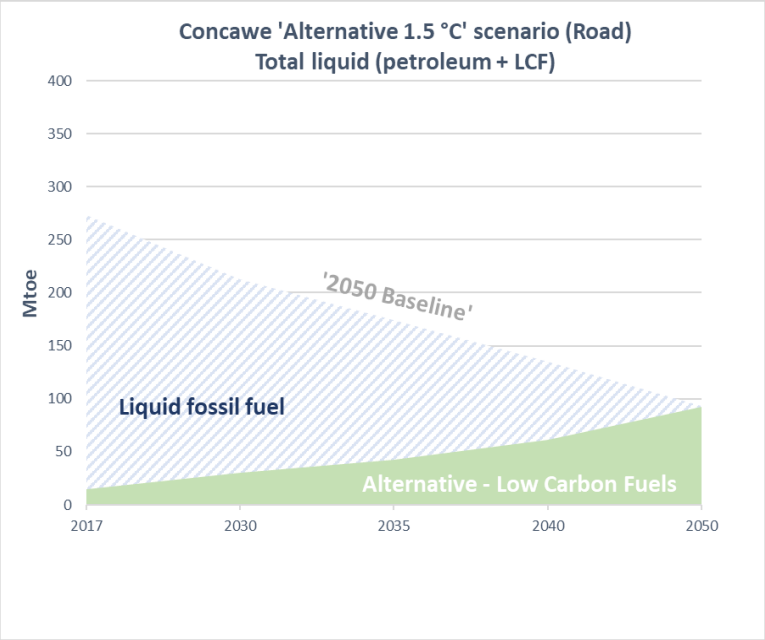
- Total volume of low carbon liquid fuels in transport (Road + estimate for aviation / marine)

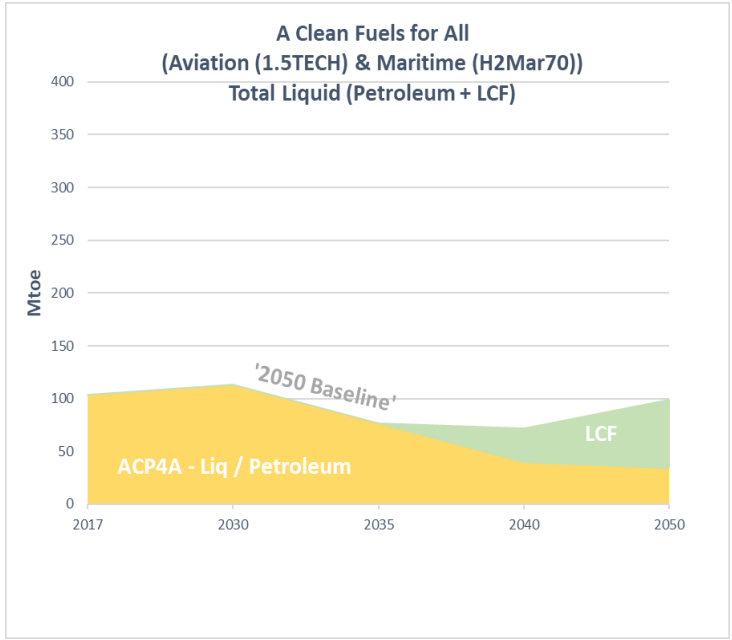
- CO_2 emissions savings

- Level of investment

Concawe Alternative Scenario - Refining contribution to EU Climate Ambition

Concawe Alternative 1.5°C Scenario: Same demand as in the “BASELINE “scenario, but covered by low carbon liquid fuels





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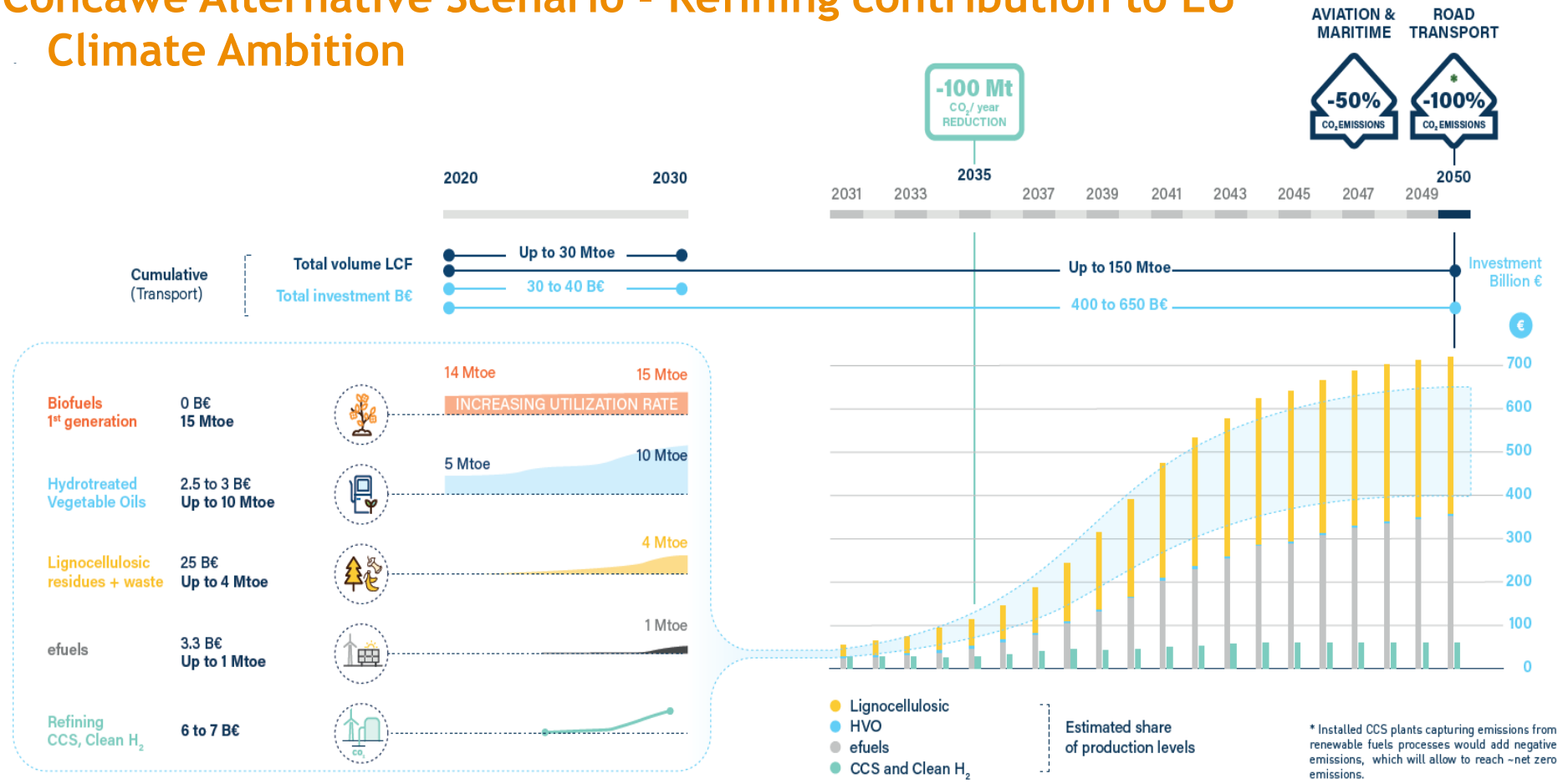

04

(Our) main takeaways

Main takeaways

- **Refineries can contribute to the Europe's objective of (net) climate neutrality in 2050 by delivering low-carbon fuels.**

- **The scenarios defined in the *A Clean Planet for all* have the risk of adding significant burdens to the EU refining system in 2050.**
  - *The materialisation of these scenarios could potentially lead the refining system to a no technical and economic feasible operation, with the consequent refinery closures, being replaced by fossil jet fuel imports from other regions of the world to Europe, with no benefit for climate change globally.*

- **The scenario explored by Concawe (Refining contribution to EU2050 Climate Ambition) shows feasibility to reach climate neutrality in transport by 2050 with low carbon liquid fuels.**
  - *High investment with R&D efforts on technology scale up and rapid deployment, mobilization of resources across the whole value chain and high engineering/construction resources.*

- **These studies will be re-evaluated of basis of new Impact Assessment, published by the European Commission on September 17th, 2020.**

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Environmental Science for European Refining

Thank you

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