Concawe

Environmental Science for European Refining

EU Fuels Manufacturer's Vision

Challenges

Mission

Strategy

Priorities

COPEX 2022

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Damien Valdenaire, Science Executive, Refining Technologies & oil Pipelines

Concawe – Climate, Environment & Health Science for EU Fuels Manufacturers

38 Member Companies ≈ 95% of EU Refining.

The European Fuel Manufacturers Association represents companies producing and distributing liquid fuels and products for mobility, energy & feedstocks for industrial value chains.

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Mission

Concawe' s mission is to develop Scientific Research about industry's products and operations together with research institutes, in order to:

- Increase advanced scientific understanding
- Promote Technology neutrality to achieve EU's environmental & Climate goals
- Contribute to an informed legislative decision
- Evaluate, for future scenarios, the potential role and contribution of our industry and its evolution.

1 Energy sectors & the challenges ahead

A needed transition towards EU Climate ambition

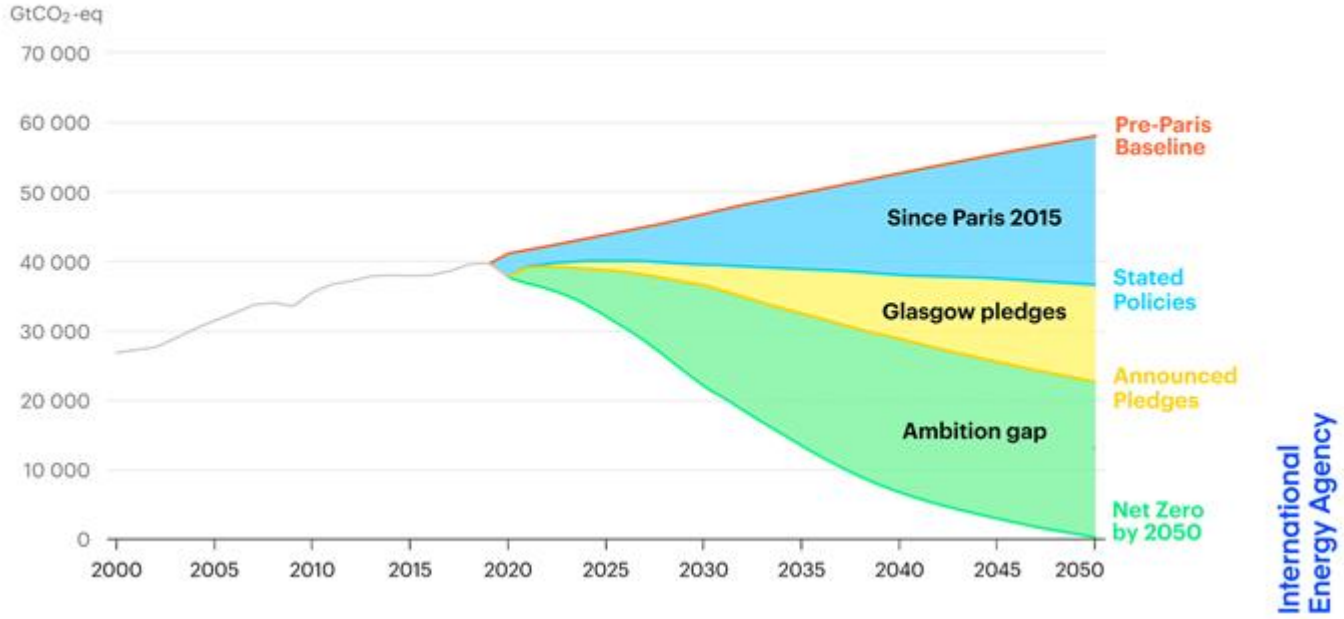
However, Energy Intensive Industry, **current perception**

- Goal driven (net zero 2050)
  - Evolving intermediate targets
    - Unprecedent speed (EU objectives for 2030)_ *"fit for 55", "RePower EU"*
      - Technological choices ahead of time
        - Uncertainty on resources availability
          - *(Some)* Technologies not proven at industrial scale

A new energy economy is emerging – but yet much too slowly to reach net zero emissions by 2050

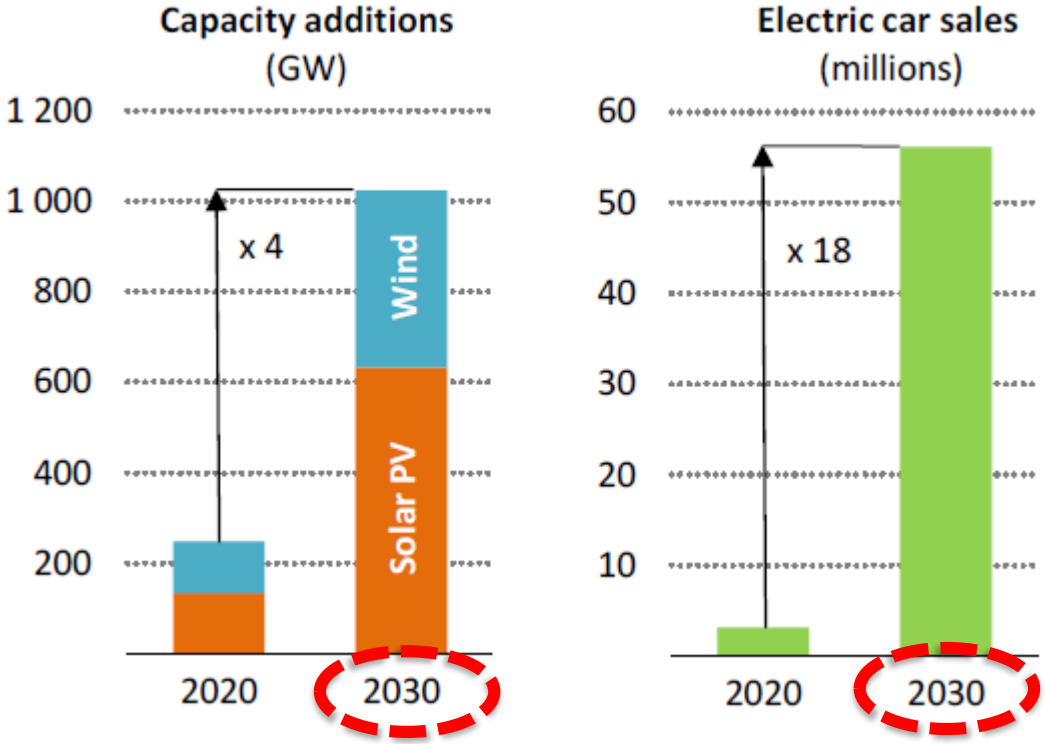
World Energy Outlook 2021

Global CO_2 emissions by scenarios, 2000-2050
World Energy Outlook 2021



Source: *https://www.iea.org/reports/world-energy-outlook-2021/scenario-trajectories-and-temperature-outcomes*

Key clean technologies expected to ramp up already by 2030 in the net zero pathway



2030

Source: https://www.iea.org/reports/net-zero-by-2050

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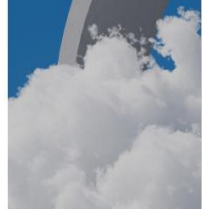
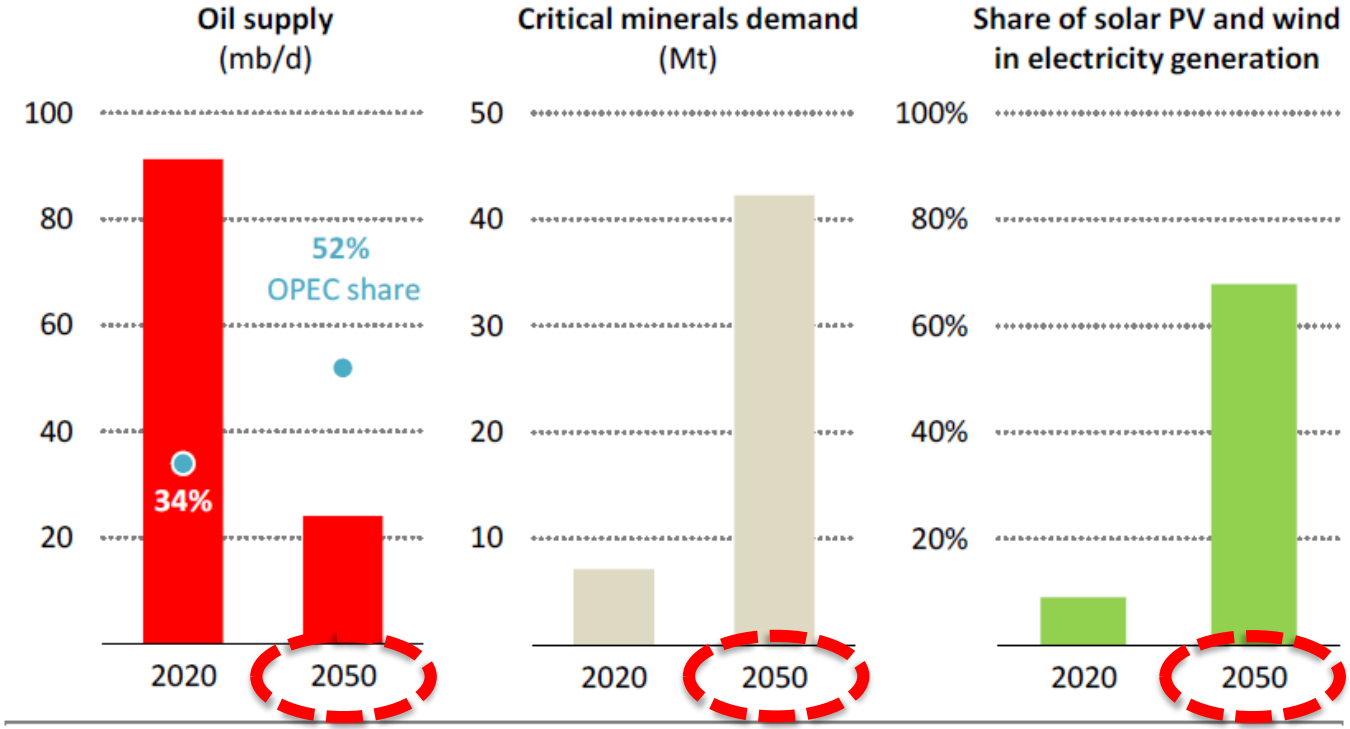
Global energy security indicators





2050

Note: mb/d = million barrels per day; Mt = million tonnes.

Source: https://www.iea.org/reports/net-zero-by-2050

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2 STRATEGIC Working Plan

Strategic topics addressing Climate, Environmental & Health impact of Refining Industry

Strategic topics addressing Climate, Environmental & Health impact of Refining Industry

Refineries

- ✓ Electrification & Green Power Requirement
- ✓ Conventional Refining syst. Adaptation
- ✓ Low Carbon Feedstocks, Fuels & Technologies
- ✓ Life Cycle Analysis of current and future fuels
- ✓ Refining & Transport
  - ✓ ETS & CBAM, Evolution & implications
  - ✓ Energy supply (1) / Security

(1) Including renewable electricity for e-fuels

Fuels

- ✓ Euro 7/VII evaluation
- ✓ Constrained environment: Systemic evaluations of transport solutions
  - Light-duty (incl. Fuel specs and renewable fuels)
  - Heavy duty (incl. Fuel specs)
  - Maritime and aviation
  - Gaseous fuels (L/C-NG, H2, NH3)
- ✓ Road fuel surveys

Air Quality

- ✓ Industrial Emissions Directive (IED) and EPRTR
- ✓ REF BREF
- ✓ Ambient Air Quality Directive (AAQD)
- ✓ Compliance at Refinery Sites
  - Low Carbon Energy Transition
  - AQ and Climate Links
  - Natural events and biogenic emissions

Toxicity

- ✓ Chemical Strategy for sustainability
- ✓ Revision of REACH
- ✓ New endpoints : terrestrial toxicity, endocrine disruptor (ED), neurotoxicant, immunotoxicant, Persistant, Bioaccumulative/Mobile and Toxic (PBT/vPvB/PMT/vPvM)
- ✓ Animal Testing program for Health and Environment
  - Development of New and Alternative methods (NAM)

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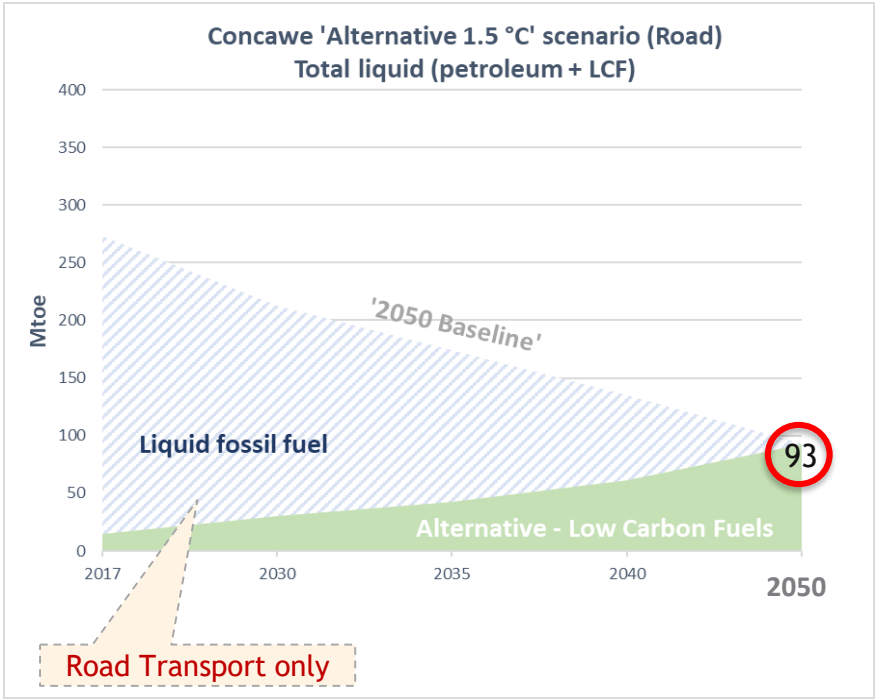
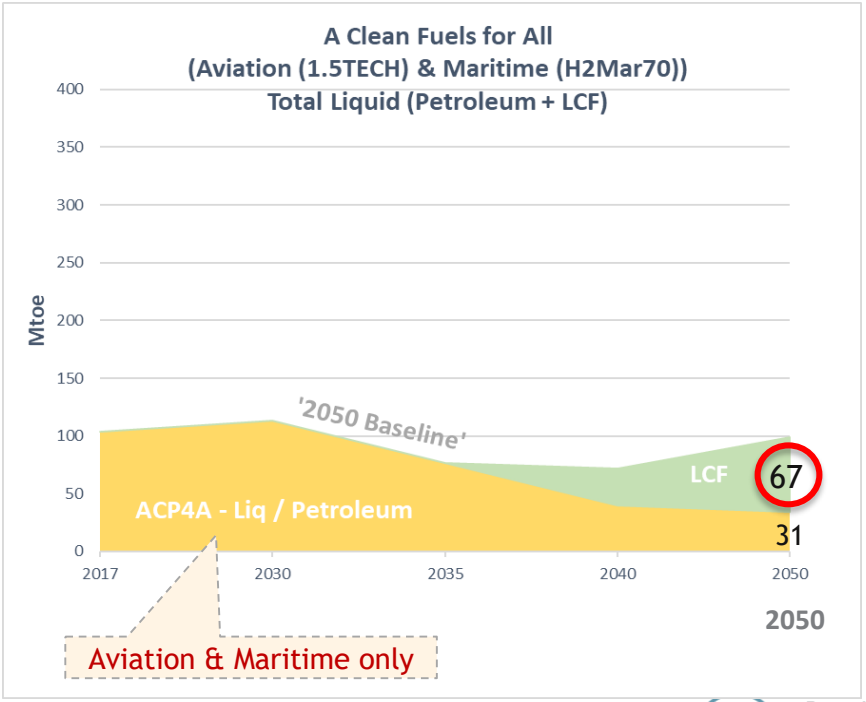
3 Possible contribution to EU climate ambition from EU refining

Concawe Alternative 1,5°C Scenario - Refining contribution to EU Climate Ambition

"BASELINE "scenario ("A clean Planet for All", EU Commission, 2018), but covered by Low Carbon Liquid fuels





Source: https://www.concawe.eu/wp-content/uploads/Rpt_21-7.pdf

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's **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.

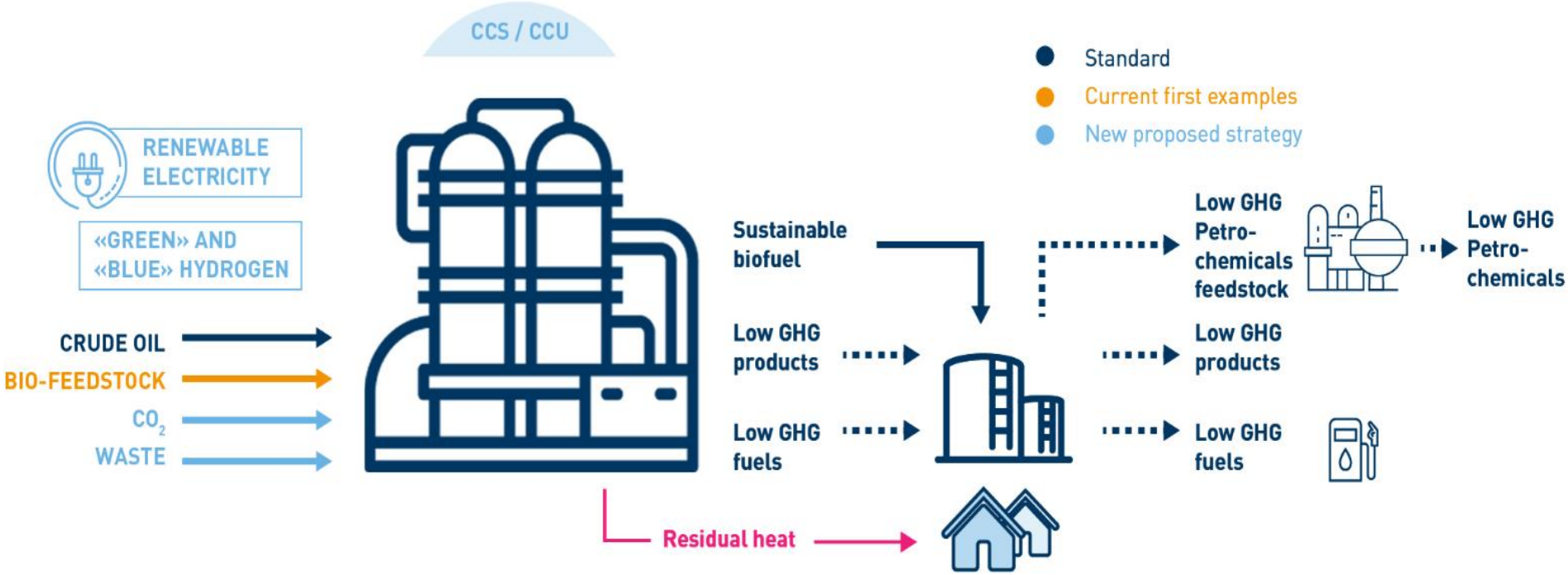
The Refining industry contribution

Accelerating:

- 1st-of-a-kind
- Supply chain
+ market creation!

4 Takeaways

The future refinery: ENERGY HUB… within an INDUSTRIAL CLUSTER



Source: *https://www.fuelseurope.eu/clean-fuels-for-all/*

Refiners as long-term fuel suppliers

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

- 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.*

For details, see our public Reports

Downloads from our web site,

- **Report 7/21 on “Transition towards Low Carbon Fuels by 2050”**

https://www.concawe.eu/wp-content/uploads/Rpt_21-7.pdf

- **Report on “Sustainable Biomass availability”**

https://www.concawe.eu/publications/joint-publications/

Back up's

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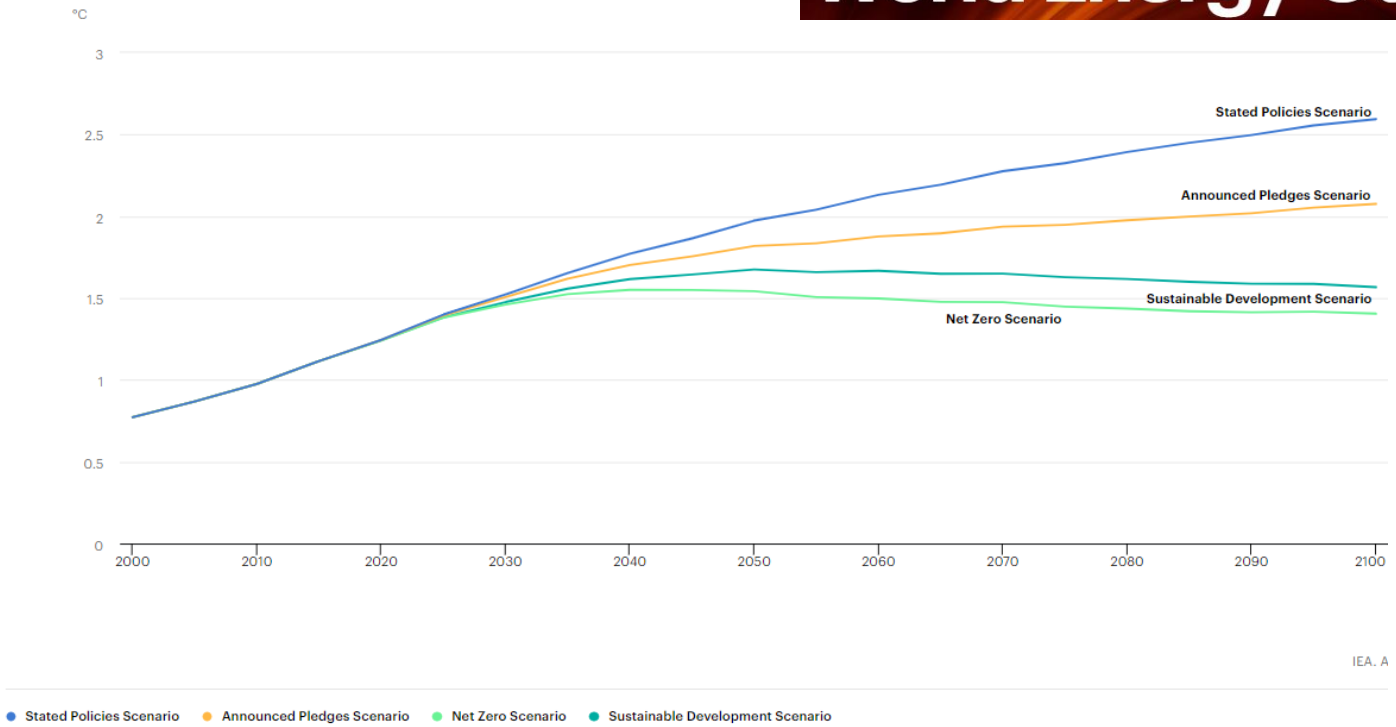
A new energy economy is emerging – but much too slowly to reach net zero emissions by 2050

World Energy Outlook 2021

Global median surface temperature rise in the WEO-2021 scenarios, 2000-2010

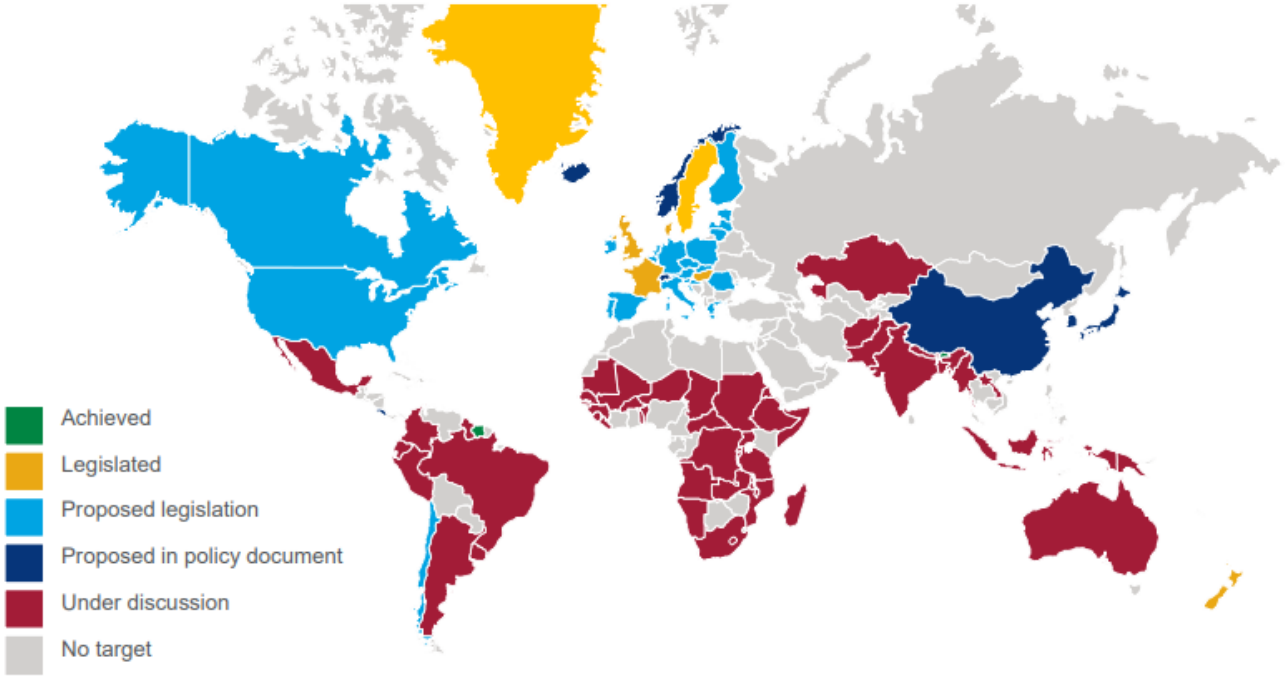


Source: https://www.iea.org/reports/world-energy-outlook-2021/scenario-trajectories-and-temperature-outcomes

Countries responsible for 60% of global CO2 emissions have set a net zero target

While more countries are likely to confirm net zero emissions in the run-up to COP26, no major economy is on track to meet the near-term target for 2030

Status of net zero emissions targets by country



Country/ region	Target for 2030 vs baseline*	Achieved by 2020 vs baseline*	Net zero emissions target date
UK	68% reduction	-47%	2050
EU-27	55% reduction	-35%	2050
US	50-52% reduction	-16%	2050
Japan	46% reduction	-16%	2050
South Korea	40% reduction	-7%	2050
Canada	40-45% reduction	-3%	2050
Australia	26-28% reduction	-10%	Under discussion
China	Peak emissions by 2030	+79%	2060
India	No peak before 2030	+69%	Not yet announced

*Targets are set against a range of base years so are challenging to compare on a like-for-like basis

Source: Wood Mackenzie

Legislative framework

- **Analysis of implications of "FitFor55" package for 2030 refining industry:**
  - Acceleration of electrification in passenger cars
  - Penetration of Low-carbon fuels in aviation/maritime
  - Boost green H2 and low carbon energy use in industry
  - Regulations (ETS, RED II(I), REfuelEU, CO2 standards in light/heavy duty, ICAO & IMO's targets, etc).

- **Business evolution: Contribution to EU Green Deal**
  - Carbon Intensity (CI) ↘
  - Refineries transition (towards 2050)
  - Life-Cycle Assessments (LCA) for actual and future liquid fuels
  - Satisfy energy needs for transport
  - CAPEX, OPEX, production and CO_2 abatement cost (alternative feedstock & technologies)
  - Sustainability & biodiversity implication …

Fit for 55 package (14 July 2021)

- Implementation of European Green Deal
- Bring EU policy framework in line with climate objective of -55% emissions by 2030.
- 13 initiatives, of which 11 with direct effects on transport

European Commission

Source : presentation Dr. A. Volkery, Deputy-Head of Unit, DG Mobility and Transport, European Commission

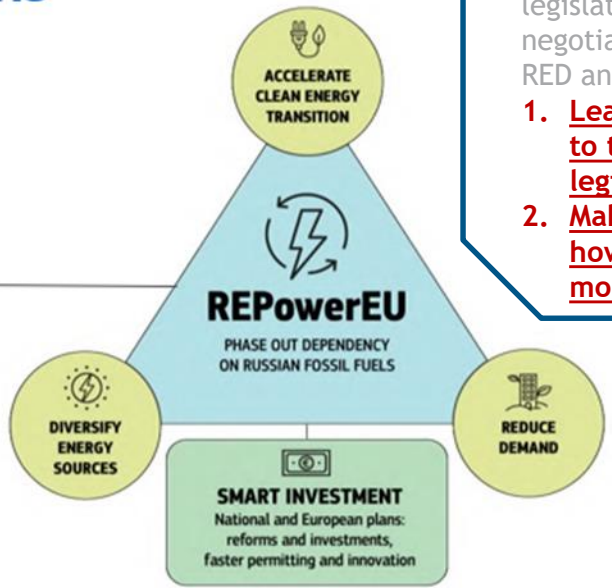
Overview: the Communication* (political) objectives

- Reduce dependence on Russian fossil fuels by:
  1. Increasing the penetration of renewables → **increase RED target**
  2. Reduce energy consumption (especially gas) → **Energy Efficiency**

REPowerEU: from goals to actions

Independence from Russian fossil fuels by 2030

- Increase imports of liquefied natural gas (LNG) by 50 bcm
- Increase pipeline gas imports by 10 bcm
- Increase biomethane production by 3.5 bcm
- EU-wide energy saving to cut gas demand by 14 bcm
- Rooftop solar to reduce gas demand by 2.5 bcm
- Heat pumps to reduce gas demand by 1.5 bcm
- Reduce gas demand in the power sector by 20 bcm by deployment of wind and solar



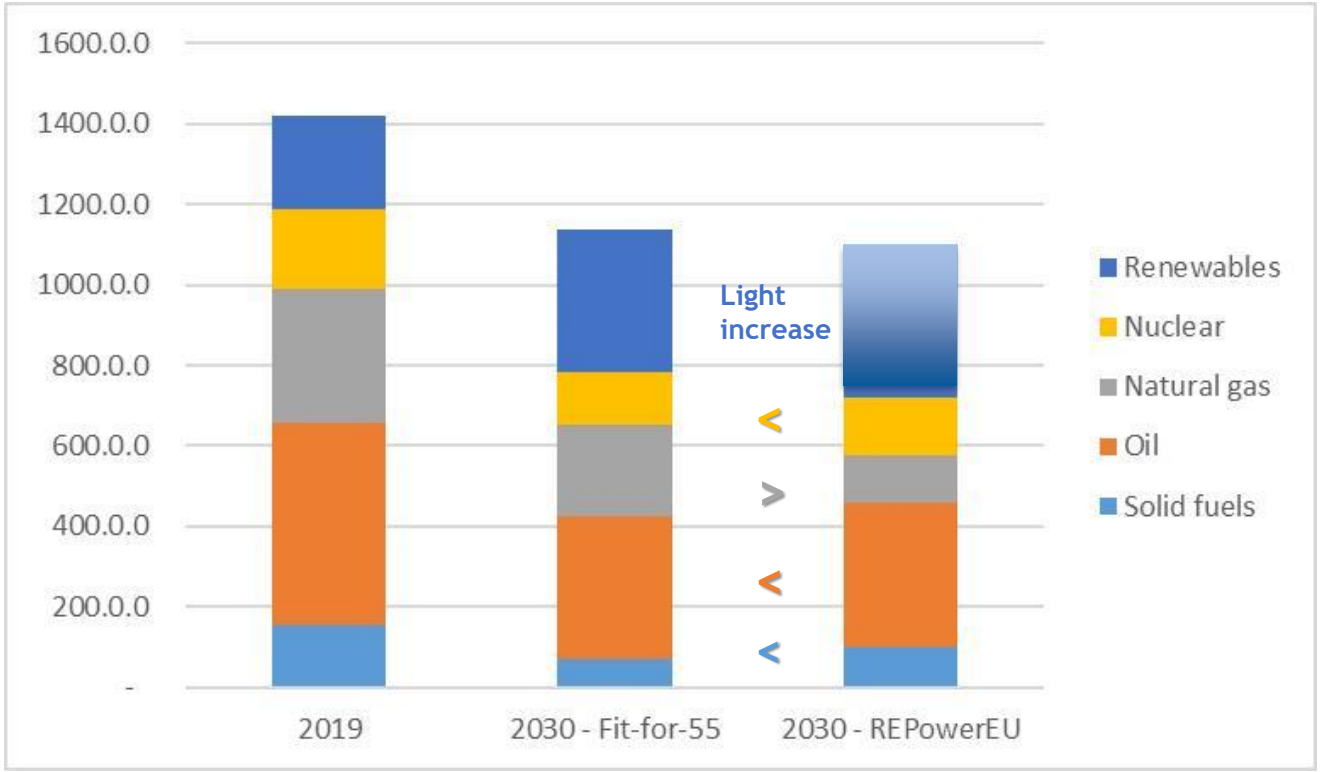
Peculiarity

The European Commission published a COMM on legislations that are in the negotiation phase (notably RED and EED), leading to:

1. **Lead to Amendments to the existing legislation**
2. **Make suggestions on how MSs could be more ambitious**

*https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131

Gross inland consumption by fuel in 2019 and in 2030 in the Fit-for-55 and REPowerEU scenarios



- Keep more nuclear reactors active
- Decrease nat. Gas
- +/- same oil
- Keep more solid fuels

Renewables in RePowerEU scenario

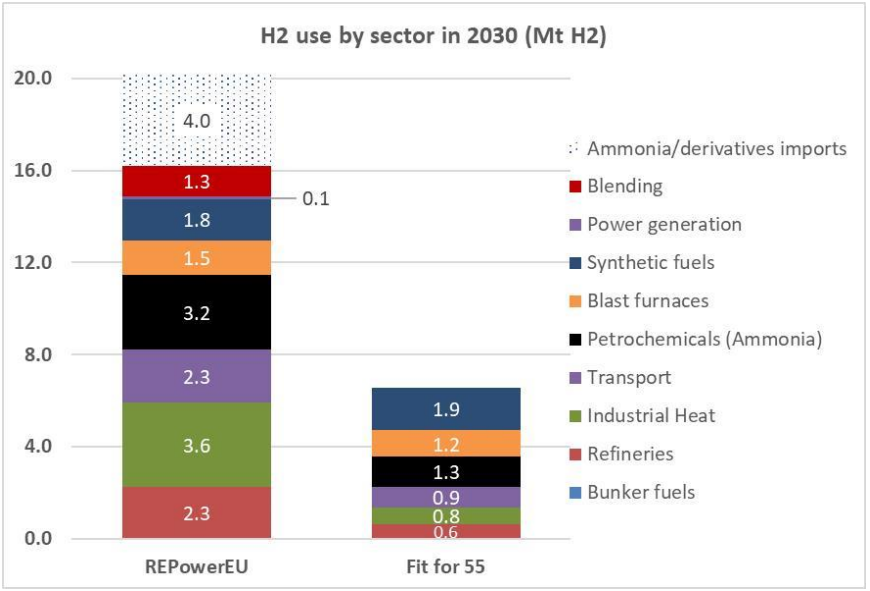
Renewables penetration targets			
	RePowerEU	FF55	Changes
Overall RES target	45%	40%	+12.5%
Heating & Cooling	2.3%	1.5%	+53,3%
District Heating & Cooling	2.3%	2.1%	+9,5%
Buildings	60%	49%	+22,4%
Transport			
RES-T share in 2030/GHG intensity reduction in transport	32%/16%	28%/13%	**+14,3%/23,1%**
Share of advanced biofuels in 2030	2.2%	2.2%	0%
Share of RFNBOs in 2030	5.7%	2.6%	**+119,2%**
Biomethane production beyond transport sector	35bcm	18bcm	**+95%**
Industry			
RES share in industry - Average yearly increase for 2020-2030 at EU level	1.9%	1.1%	+72,7%
RFNBOs in industry	78% of hydrogen consumed in industry is renewable	50% of hydrogen consumed in industry is renewable	+56%

- RFNBOs penetration in transport & industry (almost eradication of natural gas and 4x higher target – 2,273kt for hydrogen use compared to FF55 target)

New energy efficiency targets are distributed equally to all sectors of economy.

Energy Efficiency (Mtoe)		
	RePowerEU	FF55
Industry	196	203
Residential	174	186
Tertiary	121	130
Transport	221	229

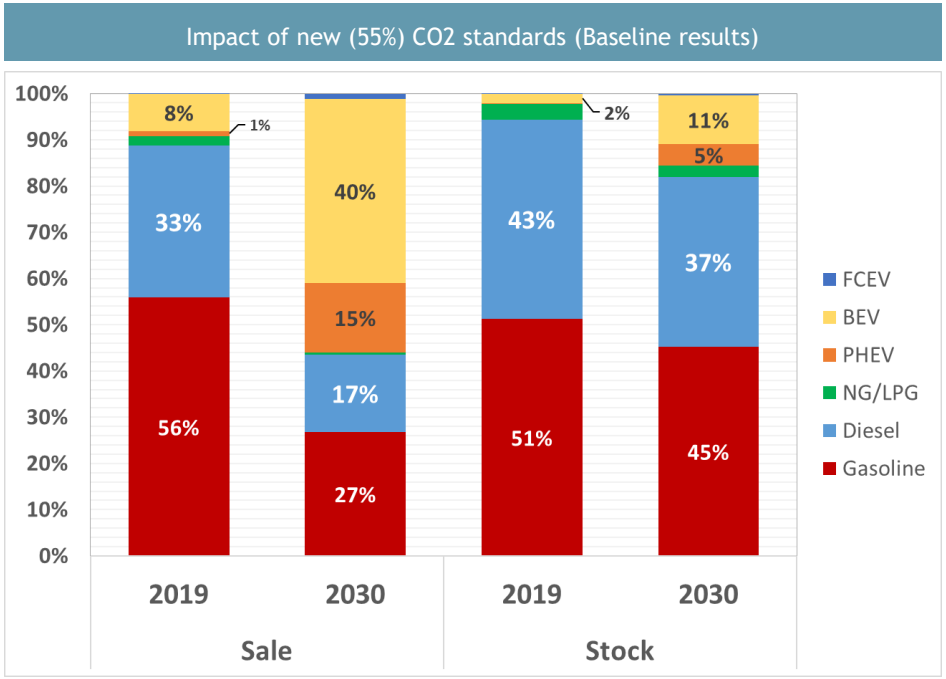
Hydrogen use by sector in 2030

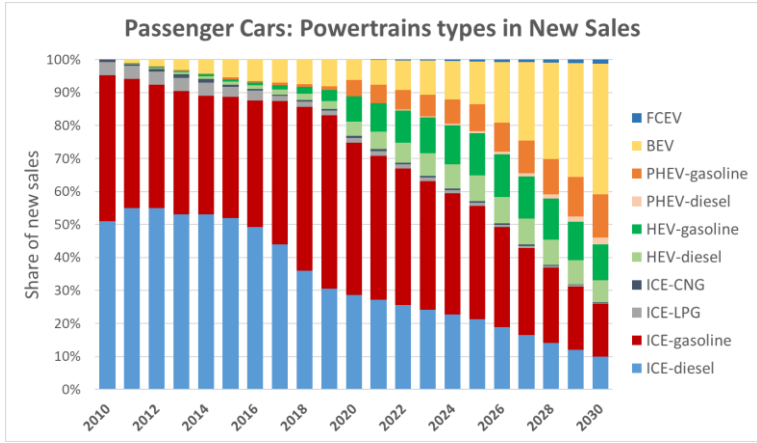


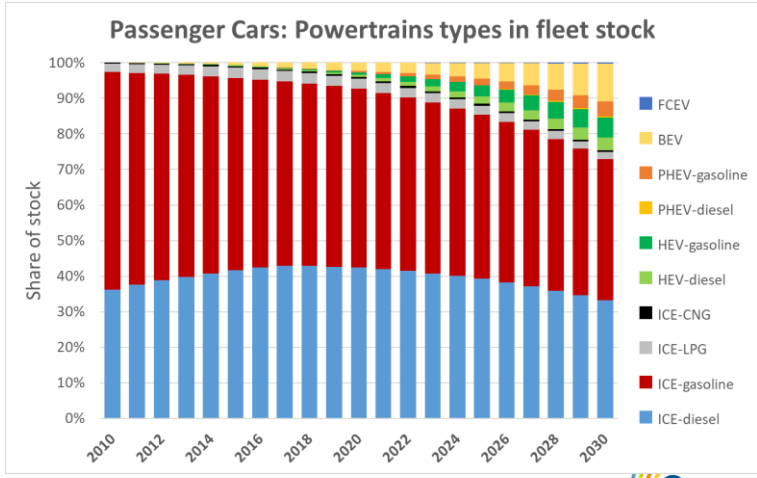
- According to the EC modelling, uptake of higher volumes of renewable H2 targets will result in higher shares of renewable H2 and RFNBOs in the industry sector, increasing from 50 to above 75%.
- H2 production based on natural gas should be replaced in ammonia production and in hydrogen use by refineries by 2030 and the steel industry should see the start of the shift from the use of coking coal to hydrogen.
- The share of hydrogen and derived fuels (renewable fuels of non-biological origin) in the transport sector would also increase to above 5%.
    - Higher H2 consumption in hard-to-abate transport sectors, especially in heavy duty trucks and through the production of sustainable fuels for aviation and waterborne

Refineries should replace natural gas-based hydrogen with renewable hydrogen by 2030 (modelling shows decrease from 7.4 bcm to 1.2 bcm, increase of renewable hydrogen from 613kt to 2273kt)

Road Transport: Passenger Car Fleet Mix







EV Sales in 2030 (EU27):

- BEV: 5.2 M
- PHEV: 2.0 M
- Total Sales: ~13 M

EV Stock in 2030 (EU27):

- BEV: 29 M
- PHEV: 12.5 M
- Total Stock: ~272 M

New model / Update. Calibrated to EU-27 (2020). NEDC to Real World factors per powertrain (~30-35%)