Policies to curtail fossil fuels in view of meeting the Paris 2050 targets: The role of biofuels

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Biomass, conversion and low carbon renewable & recycle fuels

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To design the way forward we need to ask two questions:

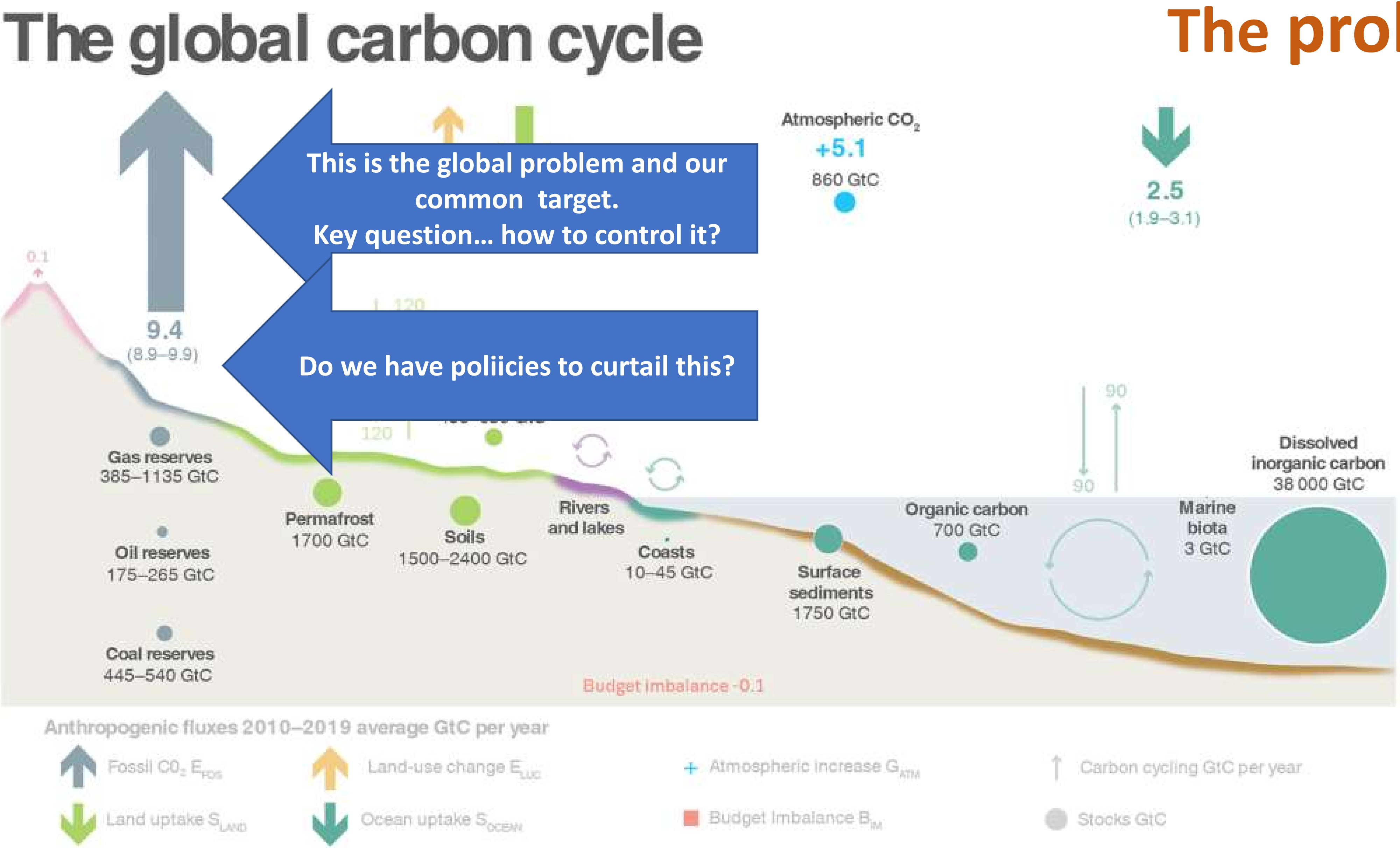
Do we have sufficient sustainable biomass quantities to be used as feedstock in the various value chains?

and,

Do we have the available technologies needed to convert the biomass into Advanced biofuels?

But first we need to look to the problem we face and the means we have to address it.

The problem



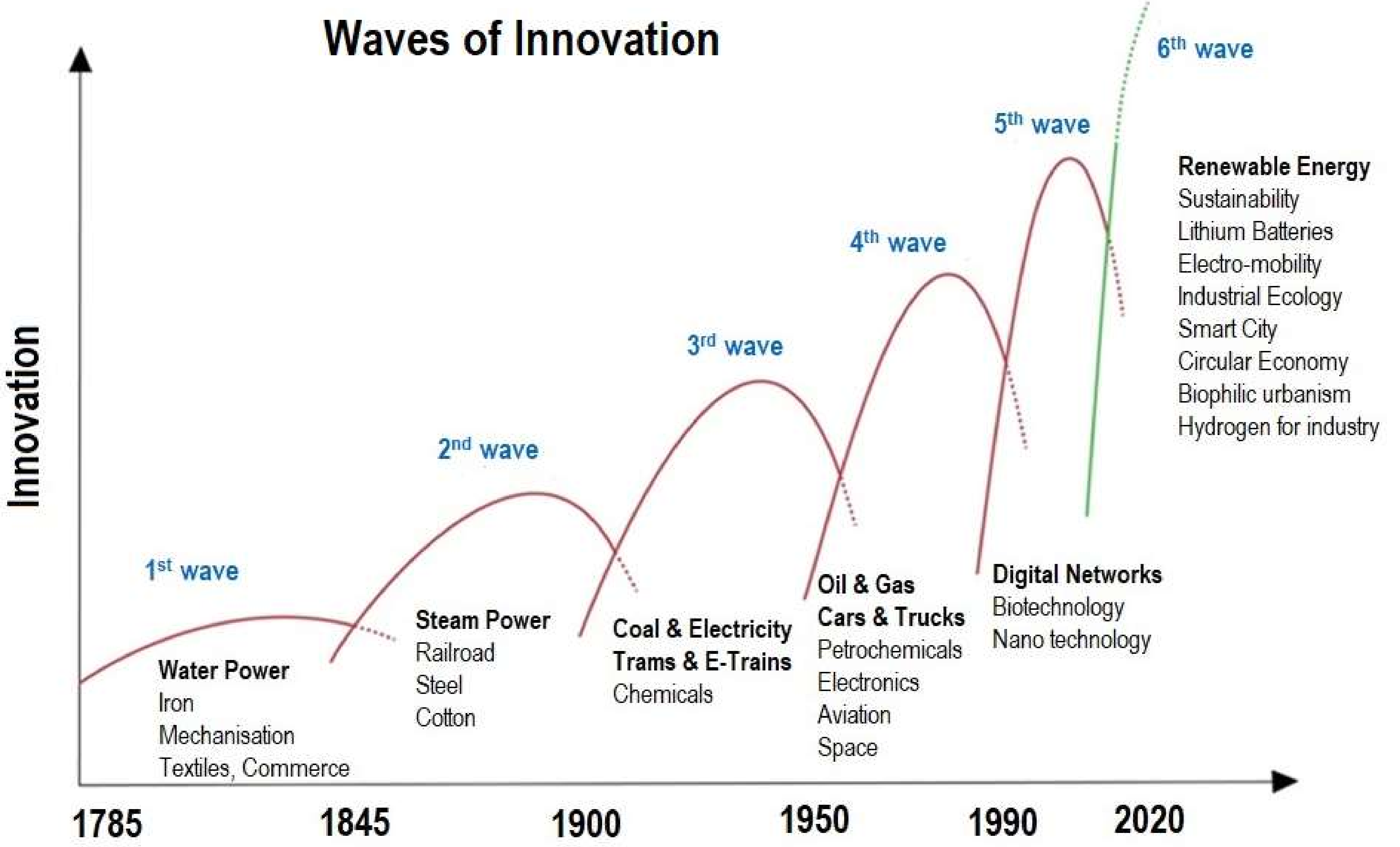
This is the global problem and our common target.
Key question… how to control it?

Do we have poliicies to curtail this?

Earth System Science Data, Global Carbon Budget 2020.

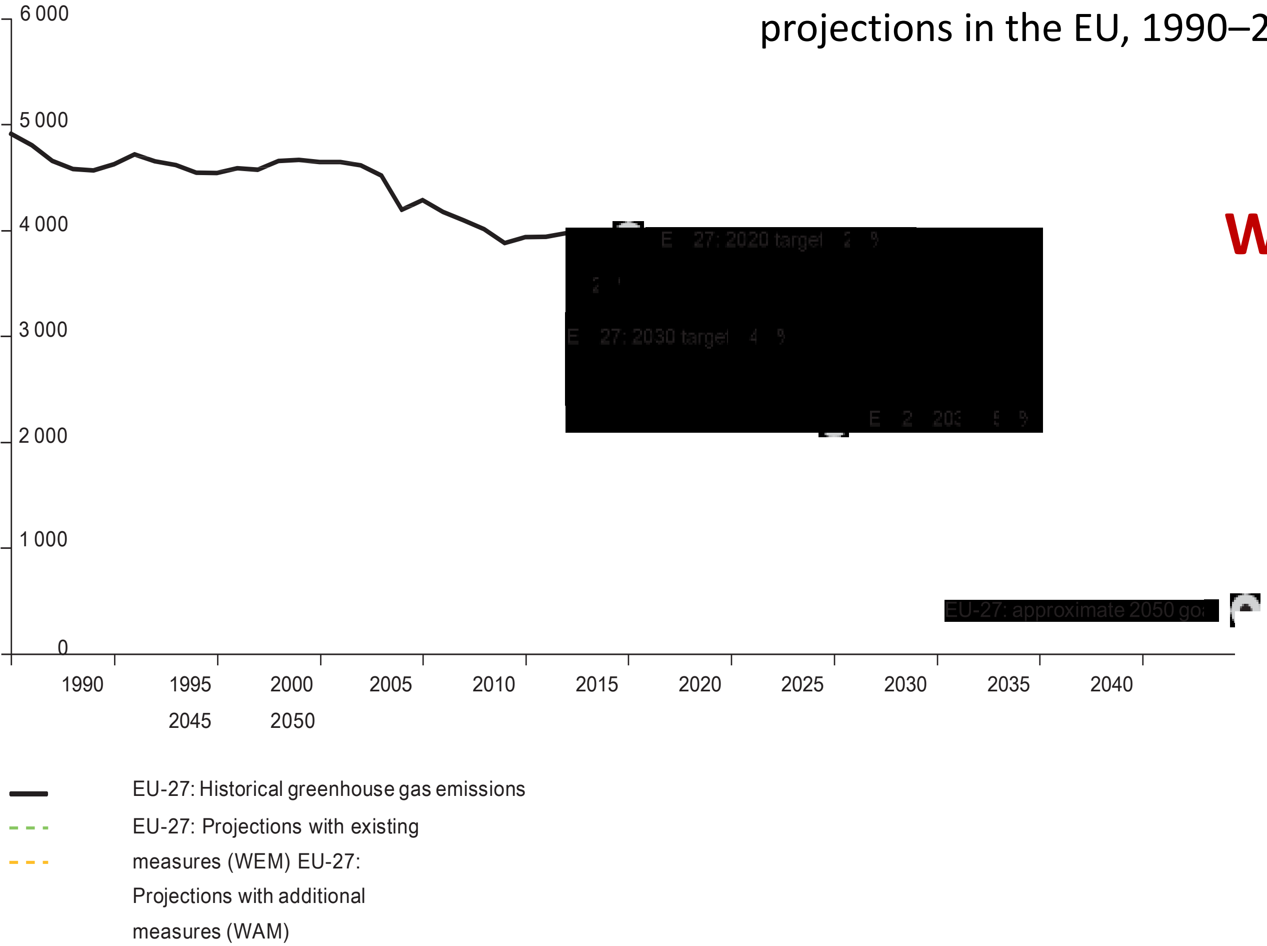
During the 2010–2019 period the additions of CO_2 from fossil fuels averaged 9.4 Giga tons Carbon/year (GtC/y),

Our means



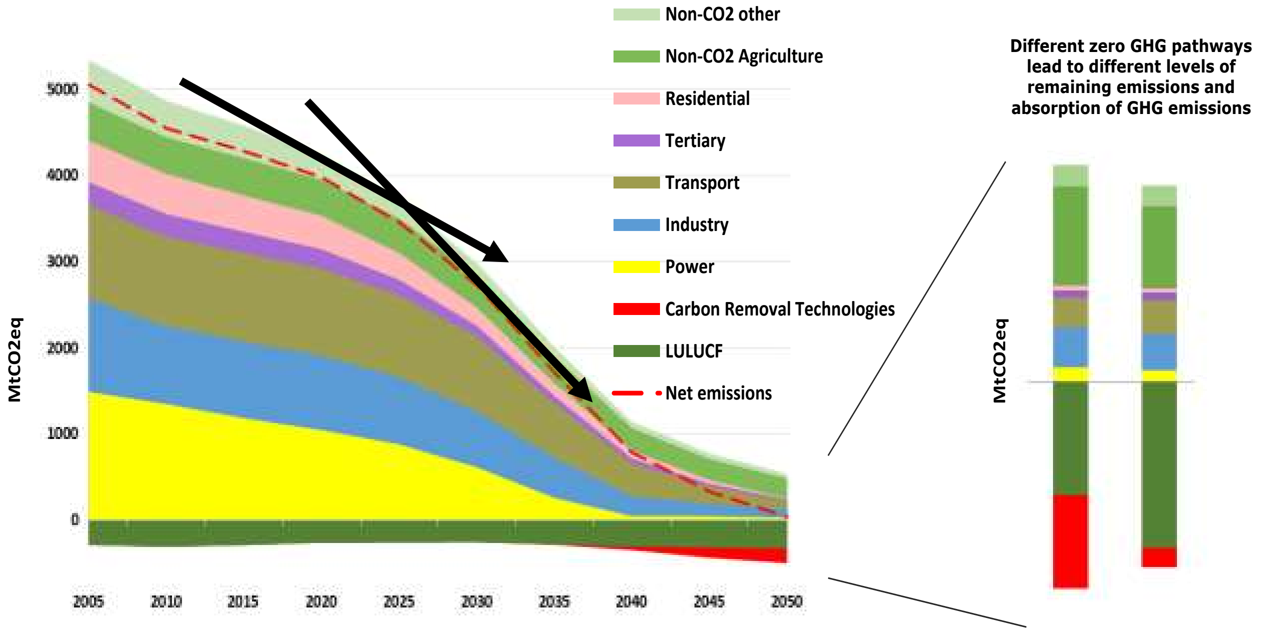
Waves of Innovation following 'creative destruction' through industrial history with prospects for the future, reproduced/Adapted with permission from Newman P

Greenhouse gas emission targets, trends and EU Member States' MMR projections in the EU, 1990–2050, European Environmental Agency



We need stable policies to attract the investors

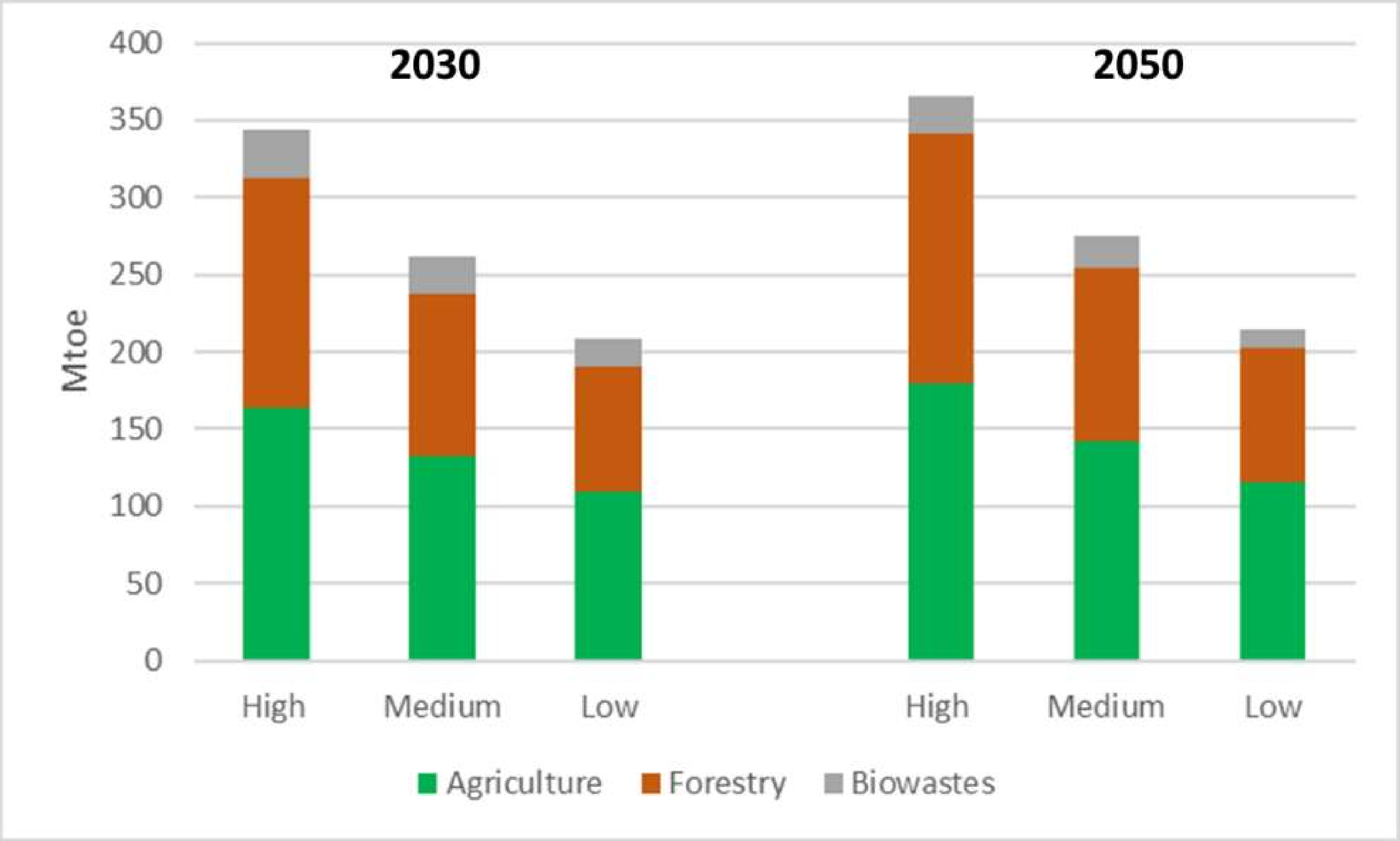
EU GHG emission trajectory for 1.5 ˚C



THE RED II is the only EC legislative action that has been revised twice before the MS could transcribe it into national legislation. It is clear that sometime in 2019-2020 the EC realised that the RED II Targets were inadequate to meet the EU's Paris 2050 obligations.

The Fit for 55 was then proposed…. *at least 55% emission reduction target which the EU has set for 2030*.

Biomass availability for bioenergy in the EU (Annex IX Part A & B)



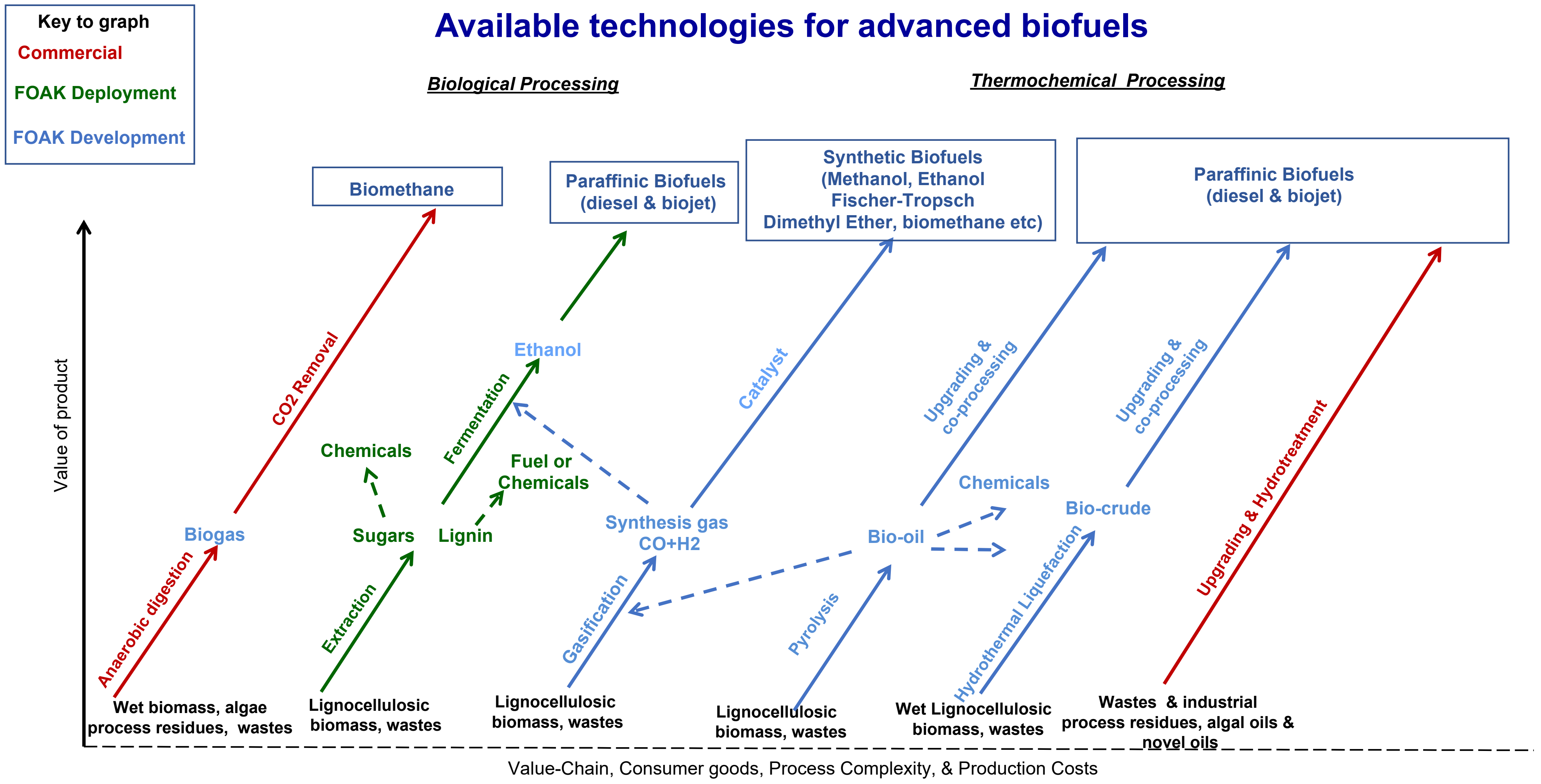
Three scenarios have been analysed:

i) Low biomass mobilisation,

ii) Improved mobilisation in selected countries due to improvements in cropping and forest management practices, and,

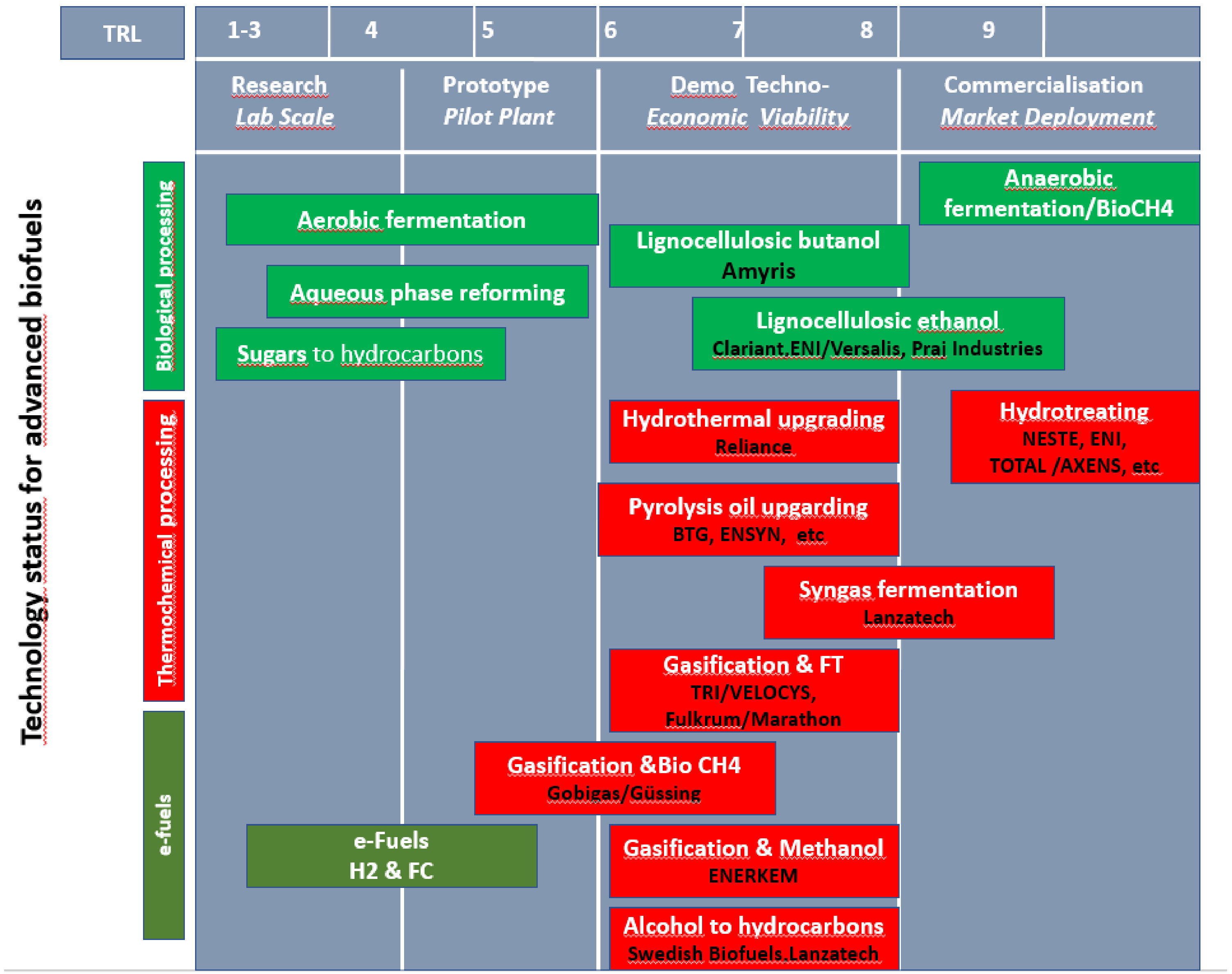
iii) Enhanced availability through Research and Innovation (R&I) measures as well as improved mobilisation due to improvements in cropping and forest management practices.

Status of Biomass Convesrion Technologies for Advanced Biofuels



Adding value to biomass by processing to advanced biofuels and to biochemicals

Status of advanced biofuels technologies based on their TRL level as well as their status based on the technology development roadmap



Comparison of biomass available for biofuels among this study including imports and PRIMES allocation to other non-transport sectors (Mtoe) and total estimated biomass for biofuel

	2030	2050
Estimated biomass for bioenergy (this study)	208-344	215-366
Estimated biomass imports (this study, see Annex 2)	48	56
Estimated biomass for advanced biofuels (*): balance of biomass for biofuel accounting the demand for other uses estimated by PRIMES (EU Commission)	78 – 214	45 – 196
Total estimated biomass left for biofuels in transport (with imports)	126 - 262	101.- 252

(*) Estimated biomass for advanced biofuels if the power, industry, services & agriculture and residential heat demand biomass allocation estimated by PRIMES is taken into account.

Assumptions for the technology conversion

Assumption N°	Description
1	By 2050 there is abundance of renewable hydrogen (RH) that can also be used in advanced biofuel production.
2	Fischer-Tropsch (FT) is commercial by 2030. The drop-in characteristic of FT facilitates blending in various applications in addition to using FT neat in diesel engines.
3	Conversion yield for FT increases to 40% (mass) in 2050 with hybrid gasification + Renewable Hydrogen (RH). Using RH in the gasification process allows significant conversion of the carbon from carbon dioxide and carbon monoxide to fuel resulting in significant higher carbon conversion efficiencies.
4	Pyrolysis FCC-coprocessing is commercial by 2030.
5	Stand-alone fast pyrolysis with Renewable Hydrogen is commercial by 2050. Using RH to upgrade the bio-oil allows in-situ production of hydrocarbon fuels.
6	Hydrothermal liquefaction (HTL) is commercial by 2030 and is applied with the FCC coprocessing.
7	Stand-alone HTL with Renewable Hydrogen is commercial by 2050. Using RH to upgrade the bio-crude allows in-situ production of hydrocarbon fuels.
8	All biomethane produced in 2030 and 2050 is fed to the natural gas grid.
9	Conversion of biomass to hydrogen is not considered for simplification.
10	Conversion of biomass to methanol is not considered for simplification. There are no prospects at present to increase the oxygen content in the petrol EN228 standard. Methanol is considered by the shipping industry as a potential fuel but there are also several other alternatives for shipping.
11	Cellulosic ethanol is commercial by 2030.
12	Ethanol conversion to hydrocarbons is considered in 2050. Light duty vehicles are expected to be completely electrified by 2050. This will facilitate the utilisation of ethanol in aviation and other sectors.
13	For well-established commercial technologies such as hydrotreated vegetable oils (HVO) biomethane via anaerobic digestion and ethanol via gasification and fermentation, no improvement in conversion yield is foreseen in 2050

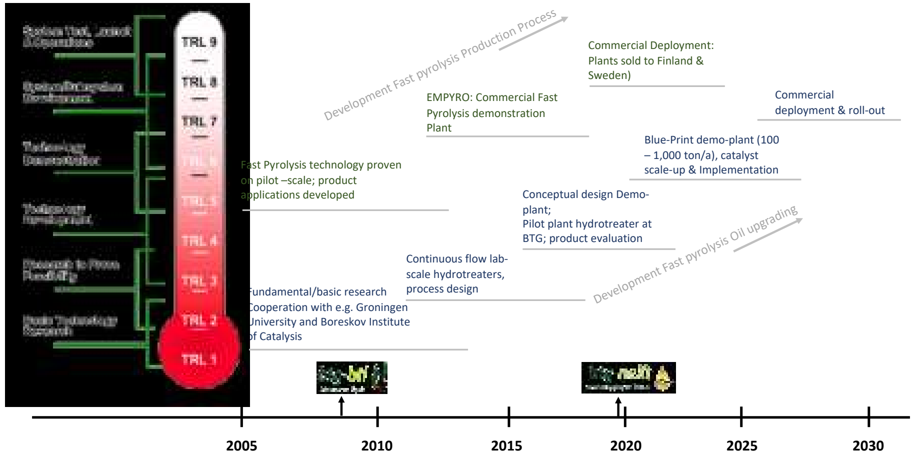
High Technology Scenario: Potential advanced biofuel quantity per feedstock for 2030 and 2050, taking into account the maximum yields per pathway and the total sustainable biomass for bioenergy)

Biofuel	Feedstock	2030 Estimated advanced biofuel quantity (Mtoe)	2050 Estimated advanced biofuel quantity (Mtoe)
Hydrotreated Vegetable Oil /renewable diesel	Waste oils and fats	1.9	1.9
	Used Cooking Oil (UCO)	2.6	6.5
Biomethane	Sewage sludge	0.1 - 0.2	1.0 - 1.2
	Manure (solid and liquid)	1.1 - 1.3	0.4 - 0.4
	Agricultural residues (high moisture; sugar beet leaves, etc.)	0.1	0.1
Ethanol and hydrocarbons from Enzymatic hydrolysis & fermentation	Agricultural residues (straw-like)	21.0 - 25.3	N/A
	Lignocellulosic crops (grassy)	5.5 - 16.6	6.5 - 19.6
Fischer-Tropsch from Gasification + catalytic synthesis	Biowaste	9.2 -16.8	13.2 - 24.4
	Solid industrial waste (secondary agro and forest industries)	27.9 - 40.1	56.8 - 84.0
	Agricultural residues (straw-like)	N/A	54.4 - 62.4
	Agricultural (woody) & forestry residues	1 - 1.5	2.4 - 3.2
	Lignocellulosic crops (woody)	7.6 - 22.7	16.8 - 50.8
Total		**78.0 – 129.1**	**160.0 – 254.5**

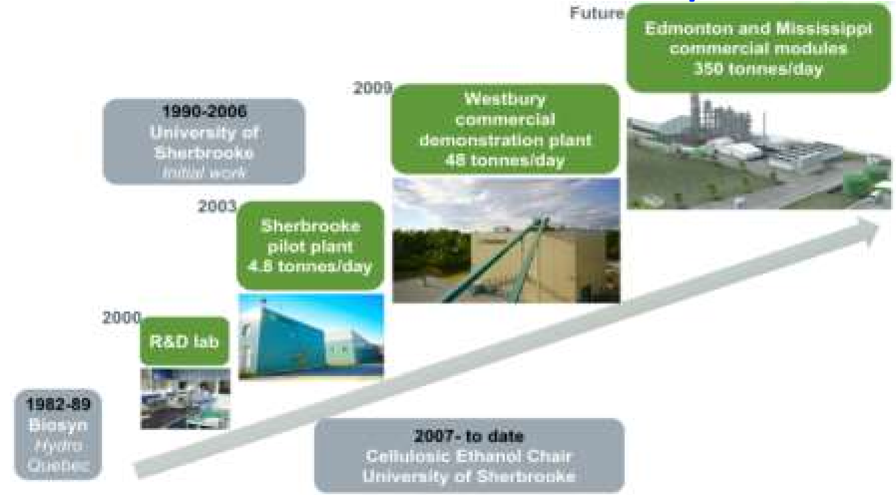
Significant carbon conversion increase in gasification for FT with renewable hydrogen

It takes a long time to bring a technology from lab scale to First-of-a-Kind and market deployment

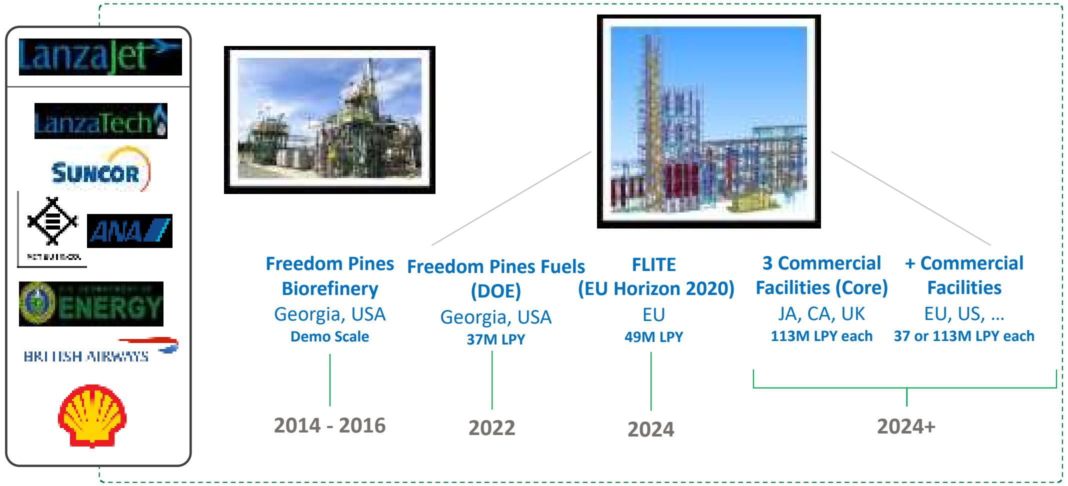
BTG Fast pyrolysis

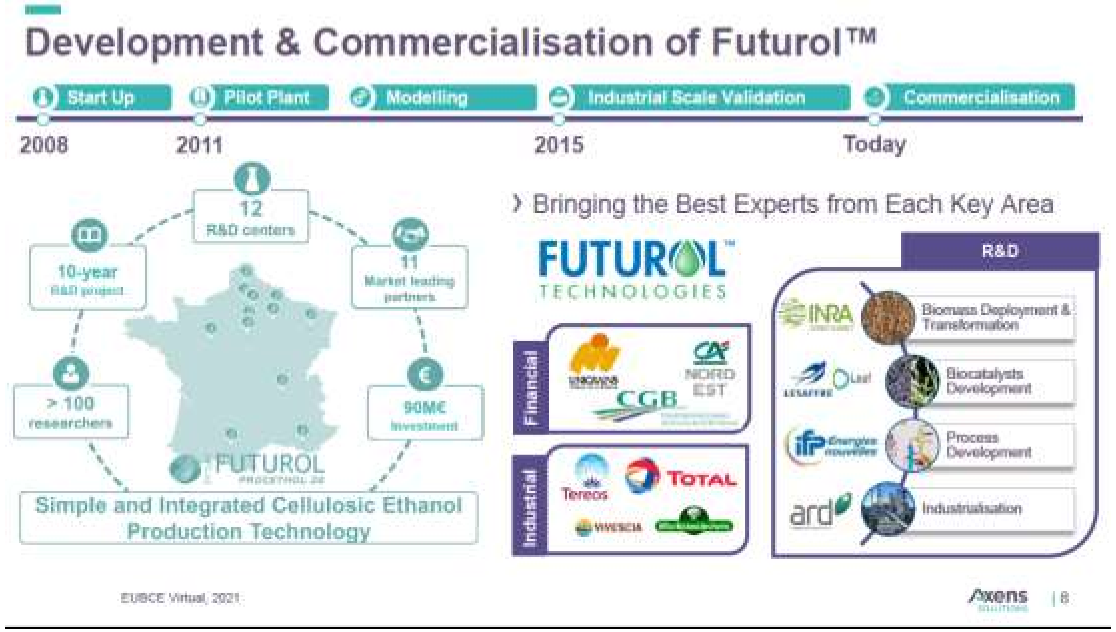


ENERKEM Gasification to ethanol/methanol



Commercial Scale-up of Sustainable Aviation Fuel





Significant progress has been achieved on electrolysis batteries etc, and several technologies are approaching commercialisation.

However, their cost remains very high.

CCS/CCU remain still elusive and little progress has been reported.

Promoting the use of renewables, although a successful policy, is inadequate to ensure the 1.5 °C scenario by 2050.

This can only be ensured if new legislation will be enacted to actual limit and reduce the use of fossil carbon on a fixed, continuous and determined road map to 2050. The lack of such policies puts in question the Fit for 55 and achieving the EU 2050 targets.

The EU oil Majors and several other in the US has put forward their net-zero 2050 strategies. The industry has to undertake a leadership role in close coordination with governments and the civil society.

Biomass and bioenergy are critical to meet the 2050 targets.

There are sufficient quantities of sustainable biomass to produce sustainable advanced biofuels.

At present they need policy and financial support since they complete against fossil fuels.

Should policies be enacted to curtail fossil fuels on a steady, continuous and fixed roadmap,
the policy and financial support for biomass and bioenergy (as well as all renewables)
will start to decrease significantly.

Biomass could become indispensable for:

- Stabilising the power grid,
- Providing sustainable biofuels in sectors such aviation, heavy duty transport and maritime,
- Securing negative emissions via CCBS,
- Providing job in rural areas.

And its contribution shouldn’t be ignored or minimized so long as land management is sustainable.

Thank you for your attention

https://www.concawe.eu/publication/sustainable-biomass-availability-in-the-eu-to-2050/

"Post COVID-19 Recovery and 2050 Climate Change Targets: Changing the Emphasis from Promotion of Renewables to Mandated Curtailment of Fossil Fuels in the EU Policies"
https://www.mdpi.com/1996-1073/14/5/1347/pdf