

# tcbi mass



Scaling SAF to meet 2050 goals



## The climate crisis is accelerating...



### **Bloomberg**

# **Planet's Breakneck Warming Likely to Pass 1.5°C, UN Scientists Warn**

Current climate policies won't be enough to keep alive the initial goal of the Paris Agreement, according to the latest report from the Intergovernmental Panel on Climate Change



Fossil-fueled war has taken over the headlines...

# FORTUNE

POLITICS • RUSSIA

## Putin's war in Ukraine is being fueled by the world's addiction to oil

BY NICOLE GOODKIND

March 2, 2022 1:07 PM CST



## The reaction to dealing with polycrisis



# The answer—partnership and collaboration



# SkyNRG has built a leading position in the SAF industry, with 15+ years of experience

We have completed over 30 supply chain projects across the globe



We have supplied over 40 airlines and cargo operators



We have built a corporate customer base with global brands



# We need a multi-stakeholder approach to accelerate SAF capacity



## Industry associations

We work with associations to advance technical SAF certification



## NGO network

We have built a global NGO network to keep us informed about regional specifics



**Solidaridad**



# Sustainability is at the core of SkyNRG

We continuously strive to produce and supply **the most sustainable aviation fuel**, which follows the “do no harm, do more good” principle

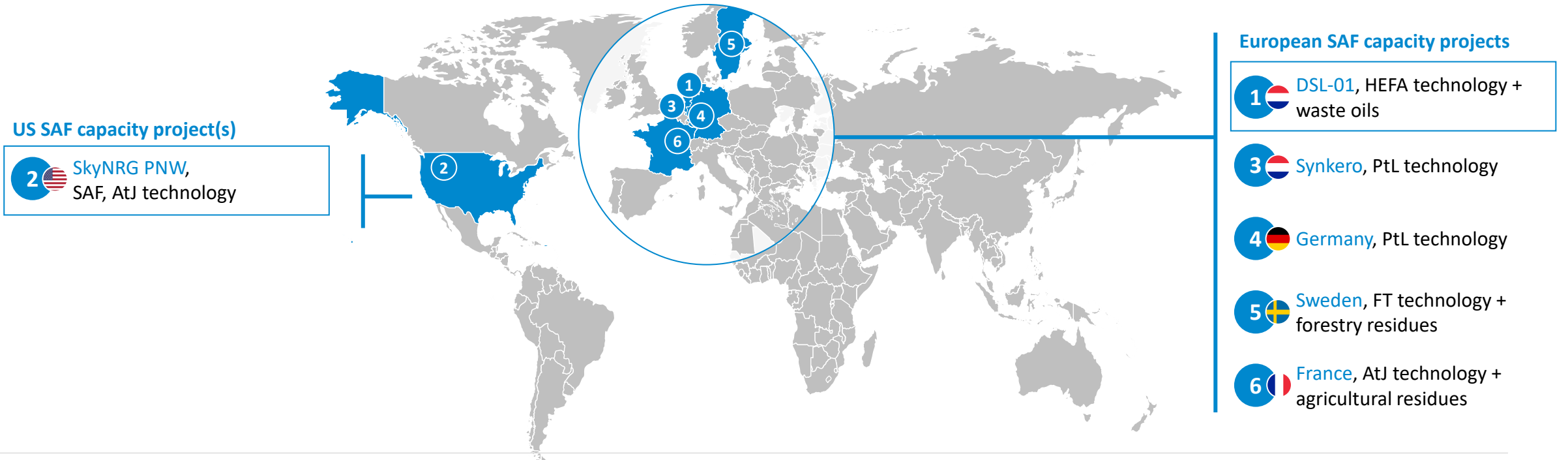
The **four pillars of our sustainability commitment** include:

- ▶ Our supply chains are fully **RSB and CORSIA certified**. We do not touch feedstocks competing with food and feed applications
- ▶ We have installed independent **Sustainability Boards** of leading NGOs and scientists, to advise us on feedstocks and our production strategy
- ▶ We are **B Corp™ certified** to further strengthen our sustainability governance for both the services we provide and our internal procedures
- ▶ We have built a **global NGO network** to keep us informed about regional specificities





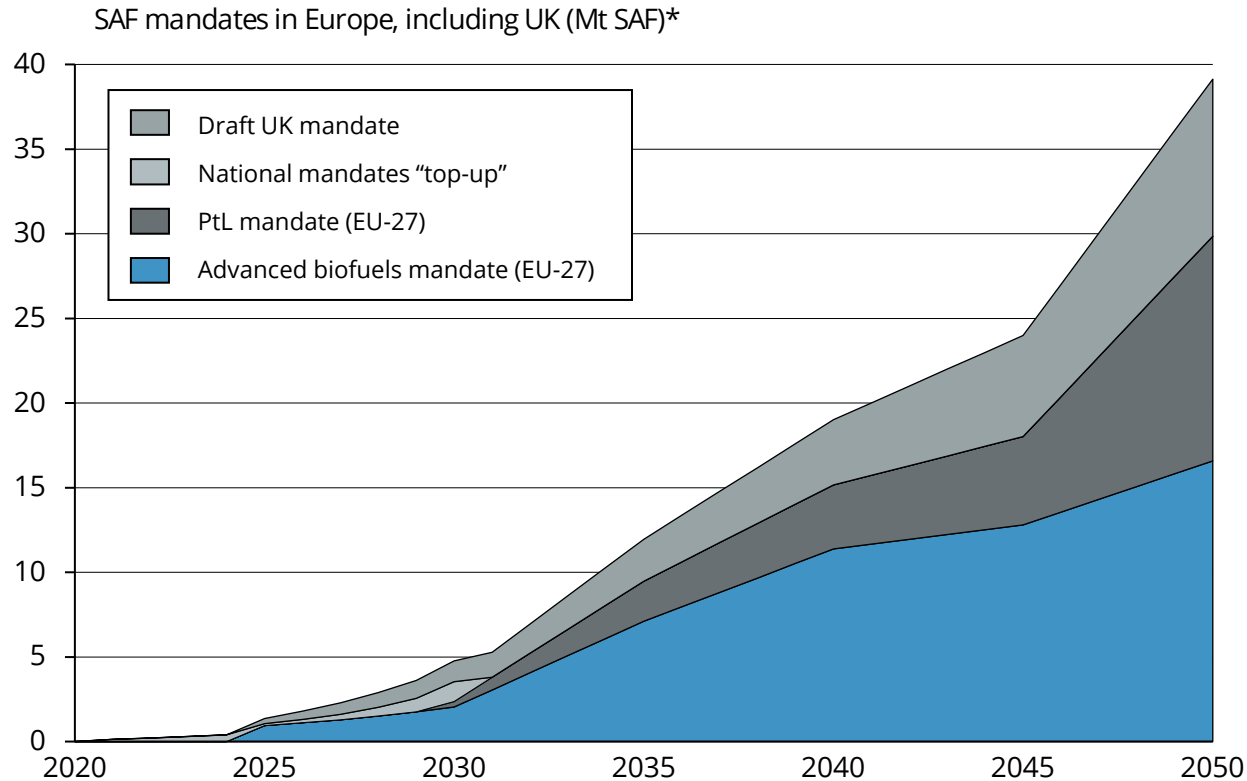
# SkyNRG has an active pipeline of diversified low CI SAF capacity projects in different phases of development across the globe



Abbreviations: = Hydroprocessed Esters and Fatty Acids; AtJ = Alcohol-to-Jet; FT = Fischer-Tropsch, PtL = Power-to-Liquids; FEED: Front-end engineering design



# Policy is driving markets: EU and UK markets compliance markets → 40Mt in 2050



Please note: Graph does not include voluntary SAF commitments from airlines and corporates

\* Based on: EC, Proposal for a Regulation of the European Parliament and of the Council on ensuring a level playing field for sustainable air transport, 2021 ([link](#)), communication on national mandates

<sup>2</sup> Source: [EURACTIV](#) (2022)

Based on: Department for Transport, Sustainable Aviation Fuel Mandate - A consultation on reducing the greenhouse gas emissions of aviation fuels in the UK, Scenario E - Early SAF breakthrough ([link](#))

## Key takeaways

- ▶ RefuelEU—SAF blending mandate
  - 5% in 2030, 32% in 2040, and 63% in 2050, with split sub-targets for Bio-advanced SAF and Power-to-Liquid (PtL) SAF.
- ▶ Additional EU national mandates
- ▶ UK considering SAF mandate that would start at 10% in 2030, increasing to 75% by 2050 resulting in 9.3 Mt SAF
- ▶ Total SAF demand in 2050 of 40 million tonnes of SAF in the EU+UK alone.

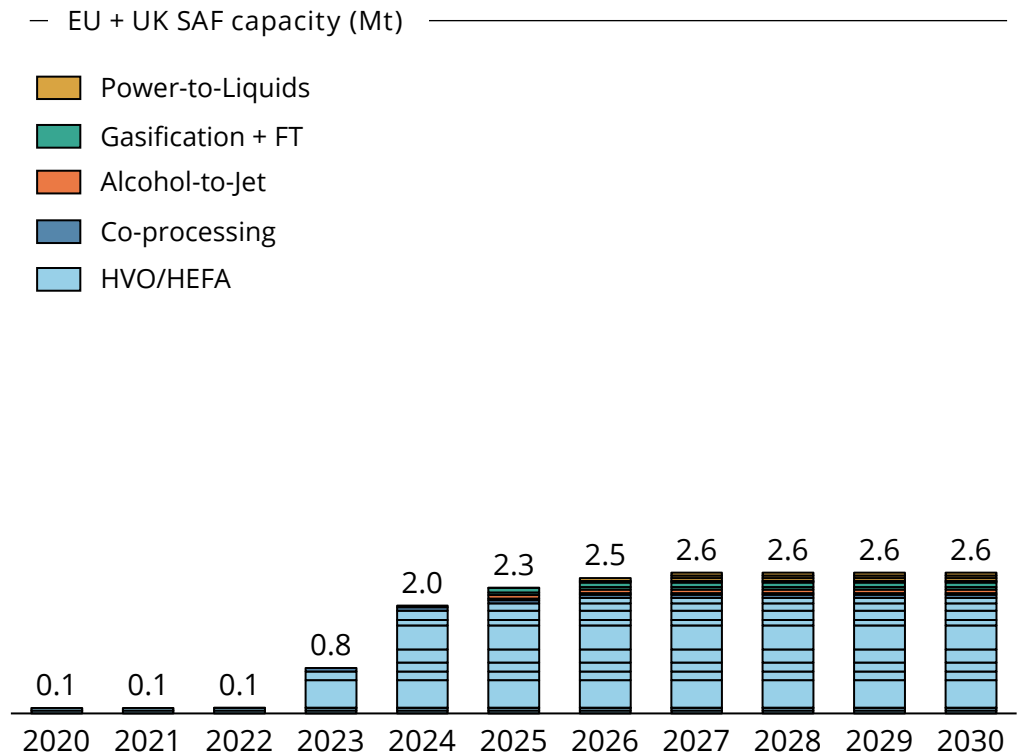
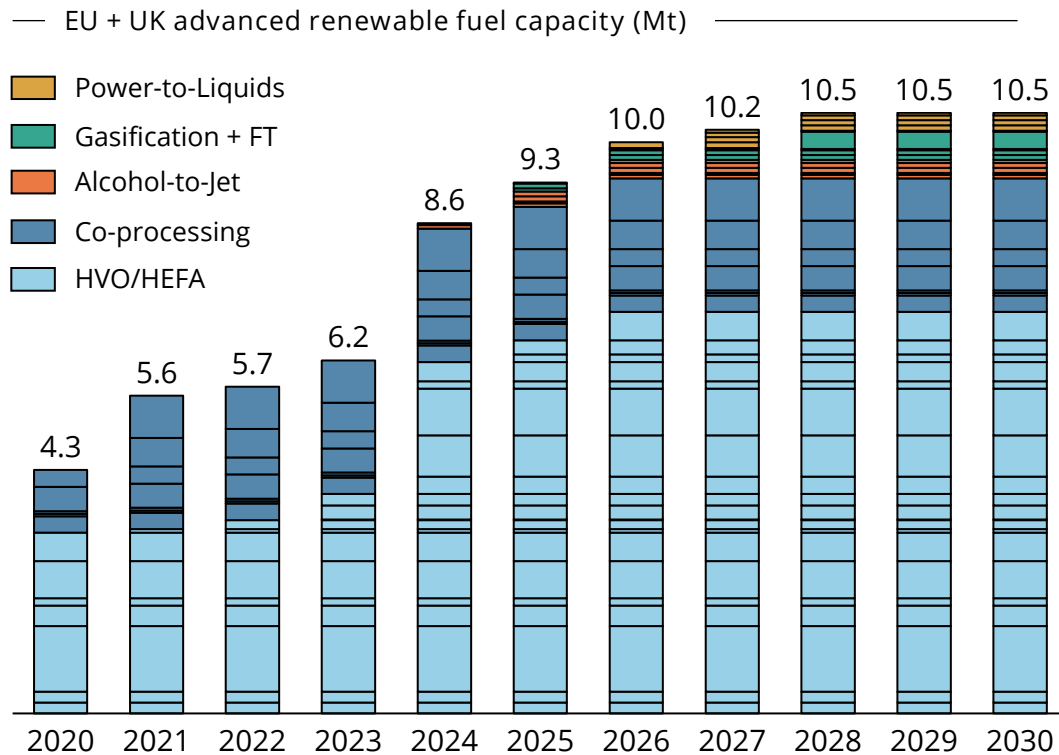
# Realistic SAF production in EU/UK is expected to be 2.6 Mt in 2030

## Step 1: Renewable fuel capacity

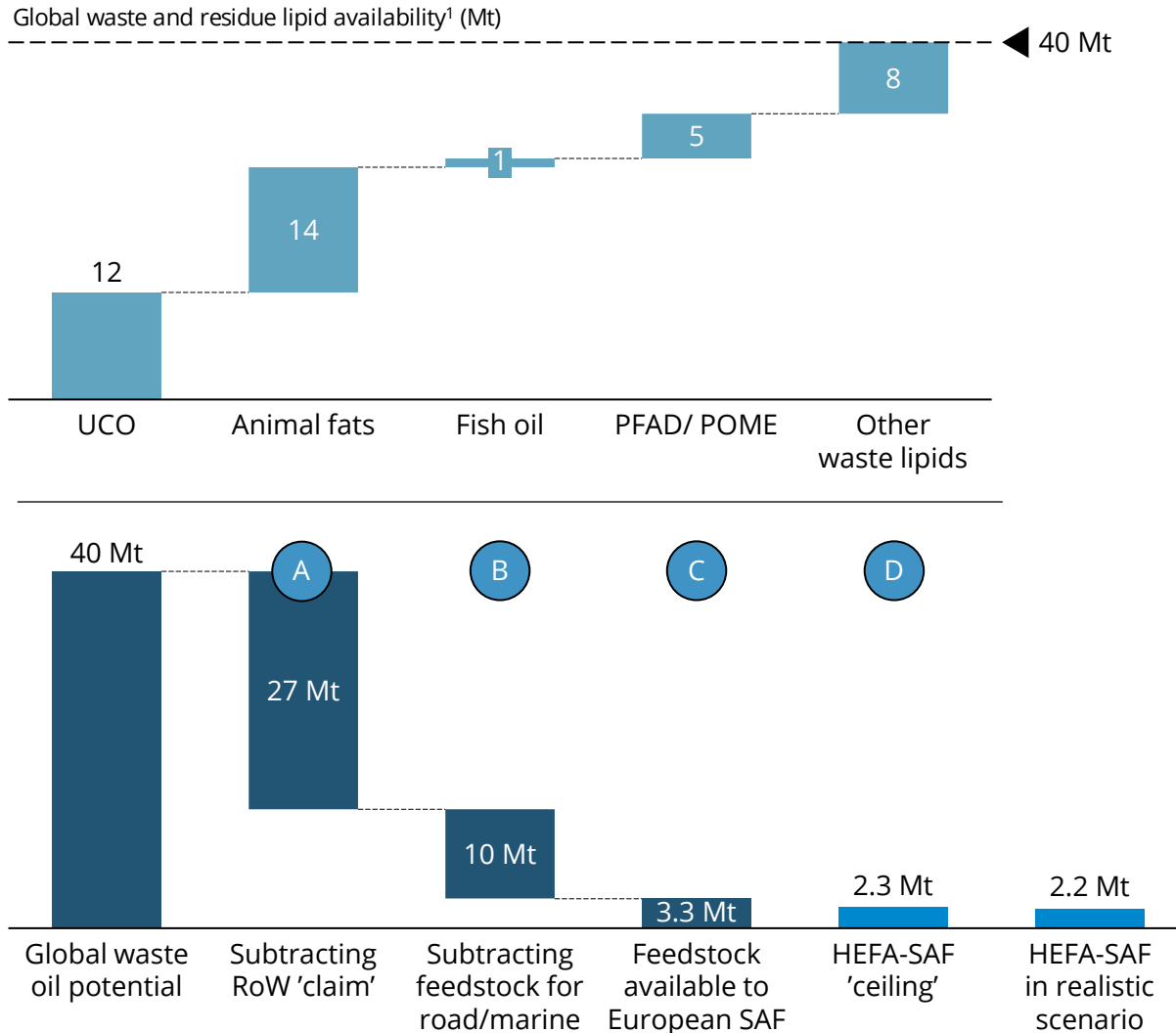
- ▶ To go from announced renewable fuel capacity to realistic SAF capacity in the EU + UK, SkyNRG reached out to project and technology developers. We correct for:
  1. a realistic SAF yield;
  2. projects that do not mention SAF;
  3. projects that are unlikely to materialize (on time)

## Step 2: Realistic SAF capacity

- ▶ SAF capacity is estimated to be ~3.9 Mt in 2030 after applying criteria 1 and 2. This can be seen as a technical maximum SAF capacity at that time from SAF announcements.
- ▶ A further 1.3 Mt is removed in the third step, coming to a total estimated realistic SAF capacity of 2.6 Mt in Europe by 2030.



# Feedstock check: waste oil availability to SAF in Europe is capped at ~3 Million tons. This is already reached with current announcements

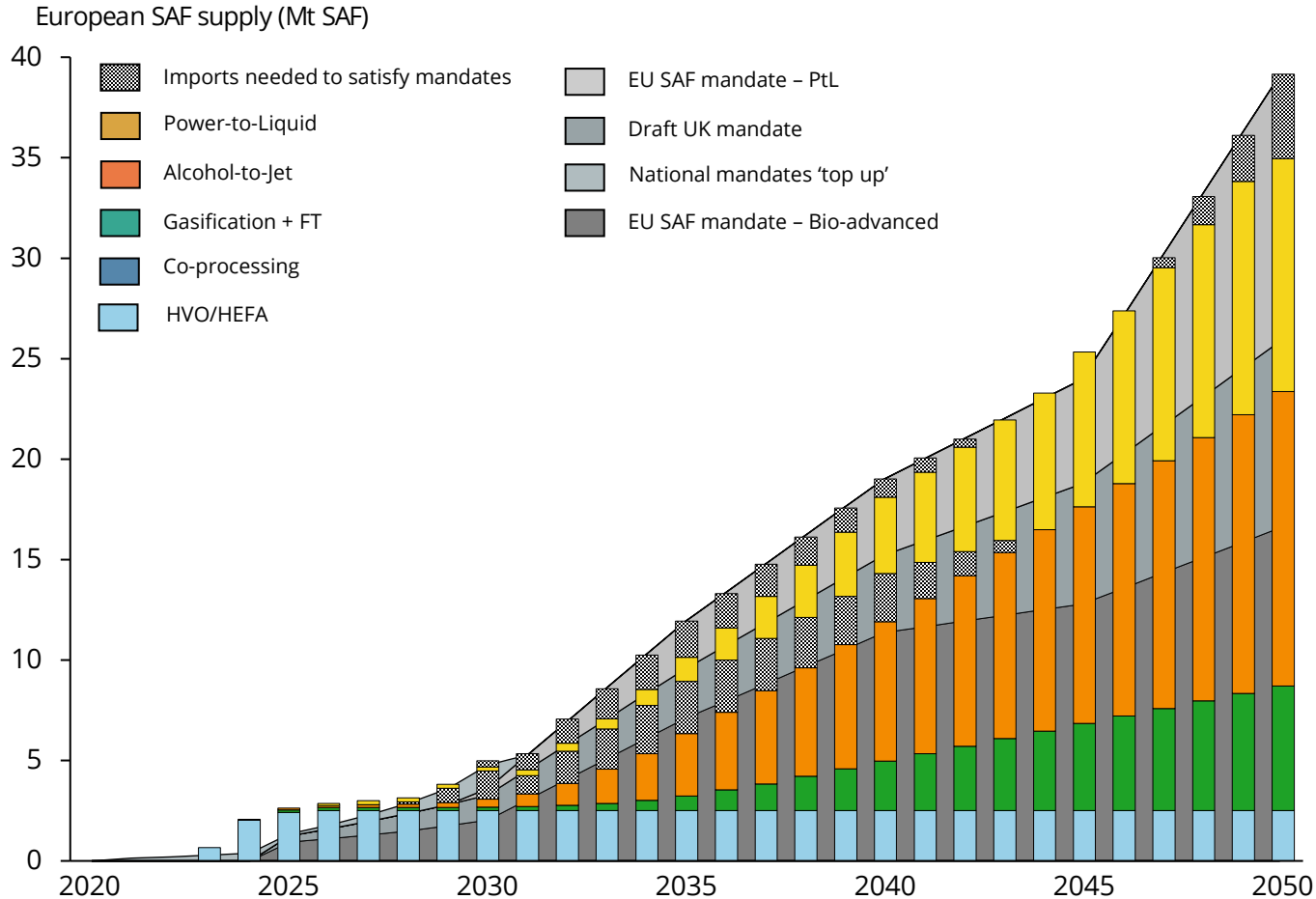


## Assumptions

- A** ▶ We consider that the EU can likely claim a maximum of a third of the global pool by 2030, which it currently already does for UCO. This means the EU could claim about 13 Mt waste oil feedstock.
- B** ▶ Significant share (at least 10 Mt) of this European waste oil claim will already be required to satisfy EU road and maritime targets
- C** ▶ When we subtract this feedstock demand for road and maritime, we arrive at 3 Mt of waste oils and fats available to the EU SAF sector until 2030. As a result, waste oil feedstock availability to the SAF sector is capped at 3 Mt.
- ▶ Any higher demand will lead to feedstock diversion from other transport sectors or other regions of the world, with undesirable associated indirect GHG impacts.
- ▶ This is roughly equal to 45 – 70% of all European waste oil supply potential by 2030
- D** ▶ Using a 70% conversion ratio of feedstock to jet fuel, HEFA-SAF using waste oil feedstock is capped in Europe at about 2.3 Mt.
- ▶ Based on the announcements and expected diesel capacity switches, this ceiling is practically reached in Europe.

<sup>1</sup> Source: [McKinsey/WEF](#) (2020)

# After 2030, SAF capacity increase in Europe will need to come from cellulosic material and PtL



## Key takeaways

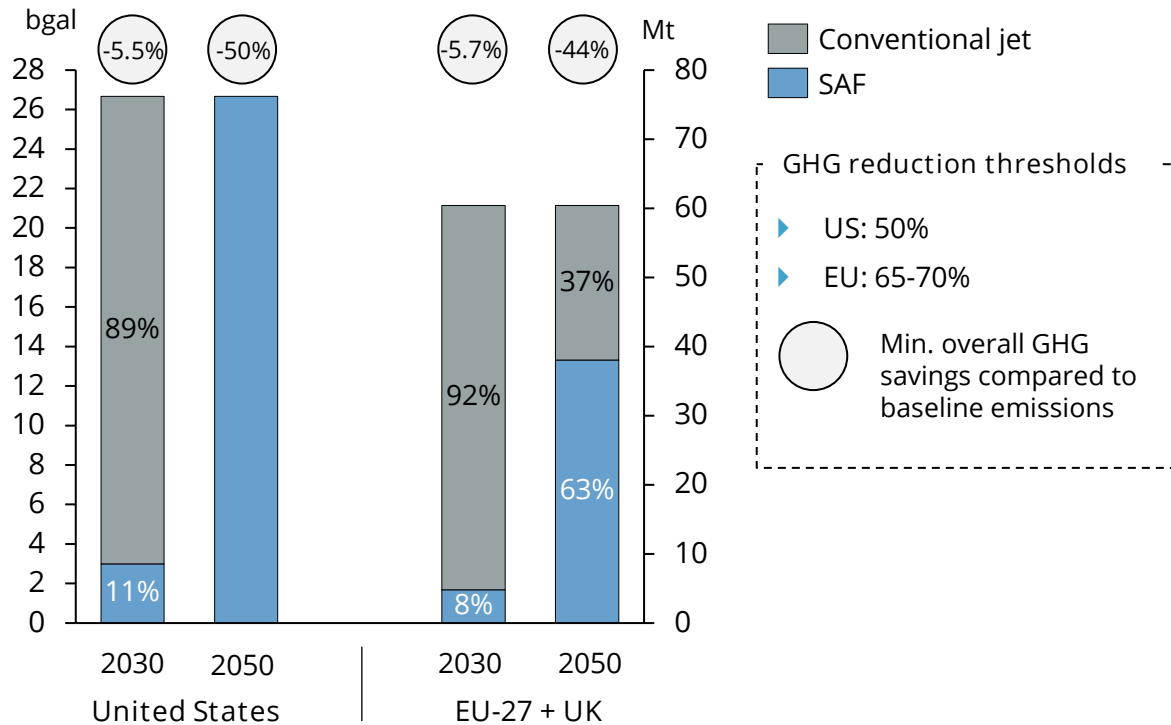
- ▶ About 400 SAF plants will be required to fulfil the expected European mandates by 2050 (vs. ~25 EU plants currently announced)
- ▶ Pathways depending on cellulosic (waste & residue) feedstock will become essential to achieving mandated volumes
- ▶ Rapid deployment of new technologies (FT, AtJ, PtL) and feedstock mobilization required to supply mandated volumes post 2030
- ▶ Imports are needed to achieve mandated volumes

## Key boundary conditions in this analysis

- ▶ Upscaling of plants is limited by global feedstock availability in case of HEFA, and EU feedstock availability for other pathways
- ▶ A maximum of 10 advanced biofuel plants are realized per year, with a maximum of 10 for PtL
- ▶ Imports amount to a maximum of 30% of the total SAF supply
- ▶ Product slates of FT and HEFA technologies are not fully jet-optimized due to expected fuel demand from road sector
- ▶ UK mandate assumed at same PtL/bio split as EU mandate
- ▶ See Methodological Annex for detailed methodology

# United States ambition to produce 3 billion gallons of SAF by 2030—credits and incentives

— 2030/2050 jet fuel demand by type and GHG savings (bgal/Mt)



NB: Assuming 2030 jet fuel demand stays constant from pre-Covid levels; EU-27 + UK SAF volume includes more ambitious national mandates and the draft UK mandate

Source: based on average of 1.74 mbpd, EIA [\[link\]](#)

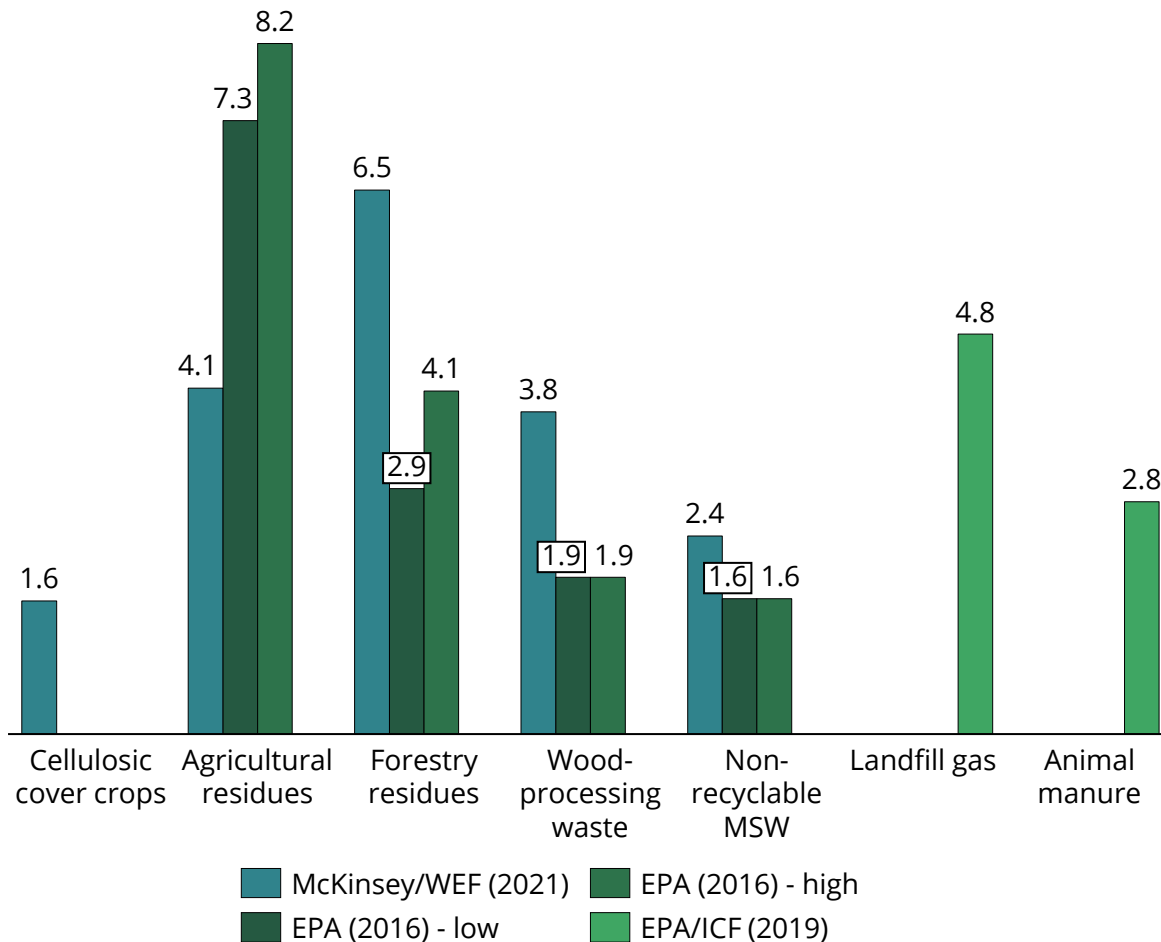
## Key takeaways

- ▶ Sustainable Aviation Fuel Grand Challenge--increase production of SAF to 3 billion gallons by 2030.<sup>1</sup>
- ▶ Production in the US is expected to be driven by a SAF Blenders Tax Credit, Renewable Fuel Standard (RFS).
- ▶ A key eligibility criterion will be GHG savings, where SAF will have to achieve 50% GHG savings compared to conventional jet fuel. This is a lower threshold compared to the proposed mandates in Europe and brings overall GHG savings compared to baseline closer to that of the EU.
- ▶ Another key differentiator between Europe and the US is related to the eligible feedstocks:
  - the RFS in its current form allows the production of fuels from food/feed crops, like soy, canola and corn, which is not allowed under the mandates in Europe.
  - the RFS nor other incentives currently incentivize production of renewable fuels of non-biological origin, like Power-to-Liquids SAF, despite its vast potential.

<sup>1</sup> Source: [White House](#) (2021)

# Cellulosic and MSW resources are abundant in the US

– US SAF potential by feedstock in 2040 (in bgal/y)



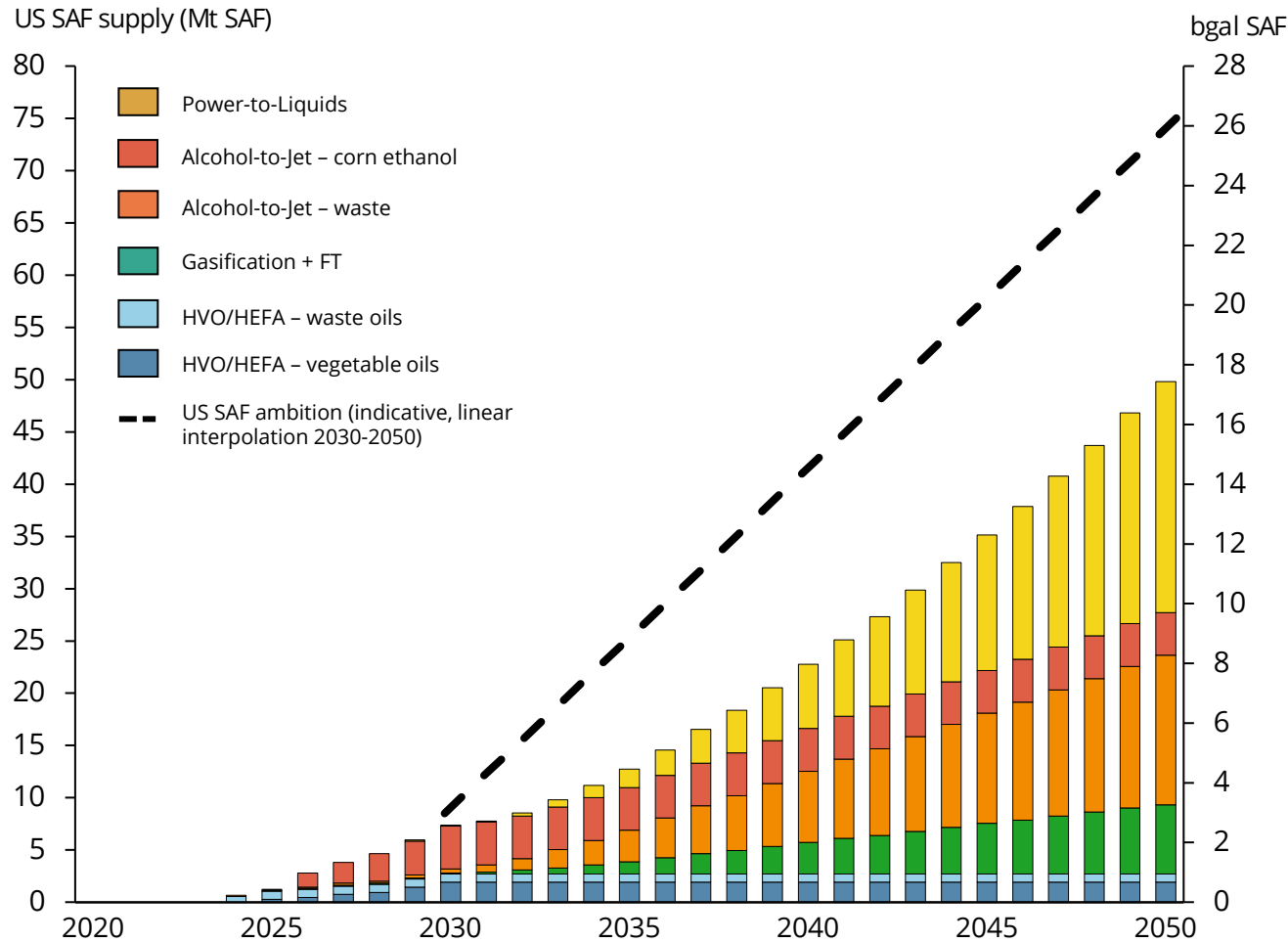
## Key takeaways

- ▶ The pool of cellulosic waste and MSW feedstocks in the United States is enormous. If all were converted into SAF, supply could reach 14–18 bgal/y by 2040.
- ▶ Given this huge potential and the incentives in place today, waste-based AtJ and G+FT are expected to close the gap to meet the target.
- ▶ This leaves Power-to-Liquids absent, despite having a large potential

## Assumptions

- ▶ Considering that:
  - Total SAF potential by 2040 is 14–18 bgal by 2040;
  - SAF capacity scales linearly over time;
  - it takes ~4 years from initiation to operation;
 we arrive at a technical potential of 6–7 bgal (17–21 Mt) SAF by 2030.
- ▶ Even though aviation is considered a hard-to-abate sector, the sector may face increasing competition over these feedstocks with other sectors and the aviation claim will be smaller.
- ▶ Given this significant technical potential, we consider it possible that AtJ and G+FT pathways will be able to fill the remaining gap to reach the US SAF target by 2030 of 1.1 bgal (3.1 Mt).

# After 2030, SAF production increase in the US should mainly come from cellulosic material and PtL



## Key takeaways

- ▶ About 750 SAF plants will be required to fulfil the expected US SAF ambition by 2050 (vs. ~15 dedicated plants currently announced)
- ▶ Pathways depending on cellulosic (waste & residue) feedstock and renewable power will become essential to achieving the SAF ambition
- ▶ Rapid deployment of new technologies (FT, AtJ, PtL) and feedstock mobilization required to meet 2050 target
- ▶ Even at ambitious deployment, potential SAF production in the US will not be sufficient to meet 100% of demand. Imports or demand-side measures will be needed to increase likelihood of meeting the target

## Key boundary conditions in this analysis

- ▶ Additional incentives are put in place for PtL and cellulosic SAF
- ▶ Deployment is limited by US feedstock availability for all pathways
- ▶ Max. 10 advanced biofuel plants per year, with a maximum of 20 for PtL
- ▶ Imports of SAF or intermediates do not contribute to the production goal
- ▶ Product slates of FT and HEFA technologies are not fully jet-optimized due to expected fuel demand from road sector
- ▶ Soy exports are curbed for domestic use; crushed into veg oil for SAF
- ▶ SAF target of 100% SAF by 2050 is linearly interpolated from 3 bgal in 2030
- ▶ See Methodological Annex for detailed methodology



An aerial photograph of a dense forest with trees in various shades of green, yellow, and orange, suggesting autumn. A large, dark shadow of an airplane is cast across the upper left portion of the forest canopy.

## Key Takeaways

- ▶ Decarbonizing aviation is part of an existential challenge that will require massive collaboration
- ▶ Biomass potential (waste and residues) and Power to Liquids will be critical to meeting ambitious SAF targets
- ▶ Policy and partnerships will drive success of the SAF market

**Thank you for your time**

For any further questions,  
feel free to reach out to us

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