PLATINUM ESSENTIALS

Sustainable Aviation Fuel (SAF) growth positions platinum as a key driver of the aviation energy transition

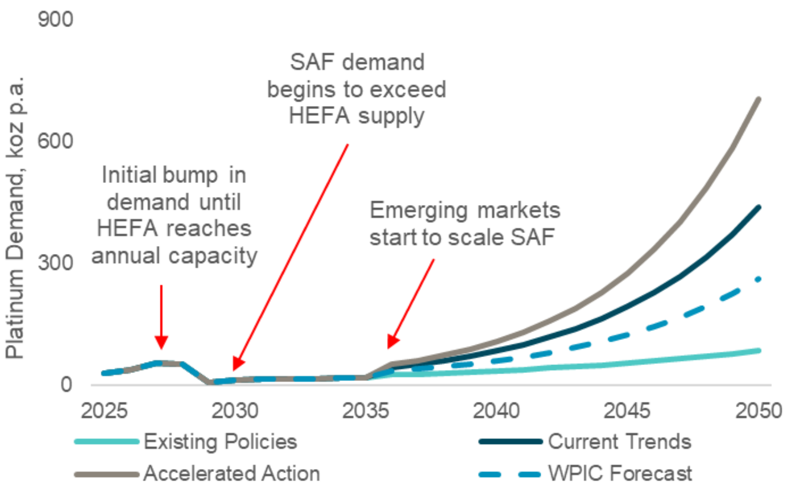
Aviation is a hard-to-abate sector, posing one of the biggest challenges to achieving net zero. Sustainable Aviation Fuel (SAF) is the only near- to medium-term drop-in solution for reducing emissions from long-haul flights. WPIC expects global SAF production to reach ~140 Mt by 2050f, meeting roughly a quarter of total aviation fuel demand. Annual platinum (Pt) demand from SAF rises nearly ninefold over the same period, to over 260 koz, more than offsetting declines in petroleum-related Pt use and positioning SAF as a key structural driver of future platinum demand.

Aviation contributes around 4% of global warming. Under the 1.5°C pathway, the International Council on Clean Transportation (ICCT) estimates the sector should use no more than 5% of the global carbon budget, yet with passenger demand set to triple by 2050f, it is likely to far exceed this limit. Pt is required across all major SAF pathways: Hydroprocessed Esters and Fatty Acids (HEFA), and less so Alcohol-to-Jet (AtJ), use it for isomerisation to meet freezing point requirements. Fischer-Tropsch (FT) and Power-to Liquid (PtL) also rely on Pt for isomerisation, and as a promoter in cobalt catalysts. PtL indirectly uses Pt in PEM electrolysers for green hydrogen production too. PtL is thus the most Pt-intensive SAF pathway, followed by HEFA, FT, and AtJ.

According to SkyNRG, global SAF adoption can be framed across three reference scenarios which reflect the evolution of policy and industry ambition. The “Existing Policies” scenario follows current legislation. The “Current Trends” scenario meets committed targets with supporting policies; and finally the “Accelerated Action” scenario anticipates faster growth through additional initiatives. WPIC’s forecast sits between *Existing Policies* and *Current Trends,* reflecting our view that aviation will fall short of its stated ambitions amid weakening green policy momentum, particularly evident in North America.

WPIC expects annual SAF capacity additions to increase eight-fold from ~2 Mt in 2025 to ~16 Mt by 2050. HEFA currently accounts for >95% of capacity but is projected to lose market share due to Fats, Oils, and Grease (FOGs) feedstock constraints from 2027f. As SAF demand outpaces HEFA supply through the 2030s, scalable technologies like PtL will need to expand rapidly, supported by policy and industry momentum. PtL capacity will increase from a negligible base to nearly 30% market share. Pt demand from SAF production is expected to increase from negligible volumes to ~260 koz p.a. by 2050f. We note that SAF will only represent some incremental platinum demand since, traditional petroleum-related Pt demand is expected to decrease by ~30% from 2030 to 2040 as global markets make their energy transition.

Figure 1. Annual platinum demand under different SAF adoption scenarios



Source: SkyNRG, WPIC Estimates

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Platinum demand from SAF is currently modest but set to rise sharply as production shifts from feedstock-limited fuels to synthetic, platinum-intensive pathways.

Growth depends on policy, technology scale-up, and catalyst deployment.

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Introduction

Sustainable aviation fuel (SAF) is emerging as a core concept of decarbonisation in aviation, which is a hard to abate sector. SAF production relies on a mix of mature feedstock-based pathways and emerging synthetic routes, with platinum serving as a critical catalyst in advanced fuel upgrading and hydrogen production. While current platinum demand from SAF is modest, its long-term role is expected to grow significantly as synthetic pathways scale. The pace of SAF adoption will be determined primarily by policy frameworks since SAF production is more expensive than traditional jet fuels. The intensity of platinum use in SAF production will be determined by feedstock availability and technological readiness since platinum requirements differ across each of SAF's production pathways.

SAF adoption will increasingly drive platinum demand as synthetic pathways scale.

The SAF landscape can be broadly divided into short-term, feedstock-constrained pathways, and longer-term, synthetic routes which differ in platinum intensity. Current production is dominated by feedstock-based SAF, which provides a reliable foundation for early decarbonisation but is constrained by the availability of oils, fats, and other sustainable inputs. Synthetic pathways - including Fischer-Tropsch and Power-to-Liquid (PtL) fuels - enable larger-scale production and deeper emissions reductions with PtL relying heavily on platinum-catalysed processes, particularly in hydrocarbon upgrading to meet jet fuel standards. Additionally, synthetic pathways further increase platinum intensity since green hydrogen is a core feedstock. Note that a key input for PtL is green hydrogen which is in itself a significant driver of future platinum demand. This demand is captured separately in our hydrogen analysis and is not included in the PtL platinum demand estimates presented here (see p. 16 for more information.

This research unpacks the evolving SAF market and platinum demand, focusing on:

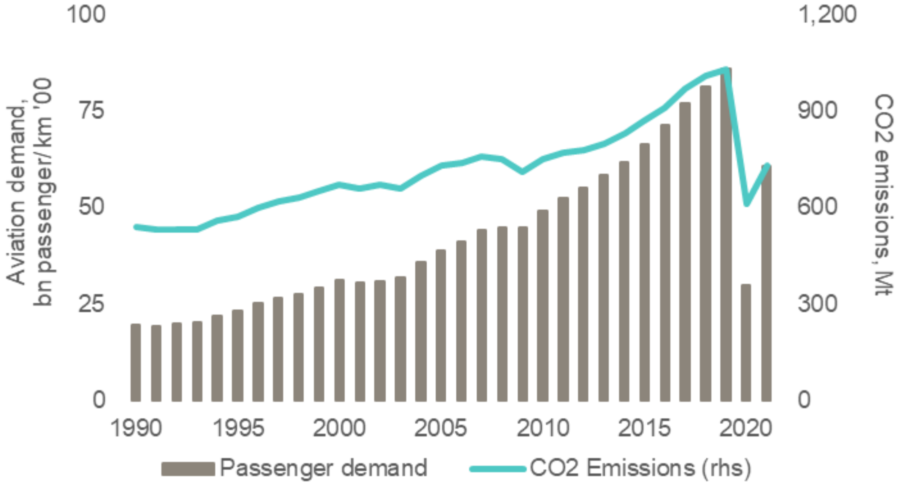
1. The drivers of SAF adoption, including policy mandates, voluntary commitments, and technological scale-up; and
2. The factors that influence platinum uptake, including pathway composition, catalyst intensity, and feedstock constraints.

In the near term, platinum demand from SAF will remain limited as feedstock-based pathways continue to dominate and feedstock availability limits the ability to scale up SAF production. From the 2030s onward, however, the shift to synthetic fuels will increase platinum requirements, both through their catalytic processes and their reliance on green hydrogen. This transition also matters in a broader energy context: as petroleum use declines over the longer term, platinum demand from refining is set to fall. Growth in SAF can help offset this decline, securing platinum's role in future fuel production and reinforcing its importance in the transition to low-carbon energy.

Impact of aviation

Aviation contributes around 3% of global CO_2 emissions. Including the release of nitrogen oxides, water vapour, soot, and the effect of contrails; it is estimated that aviation accounts for roughly 4% of global warming.

Figure 2. Growth in passenger aviation demand and the corresponding rise in CO_2 emissions

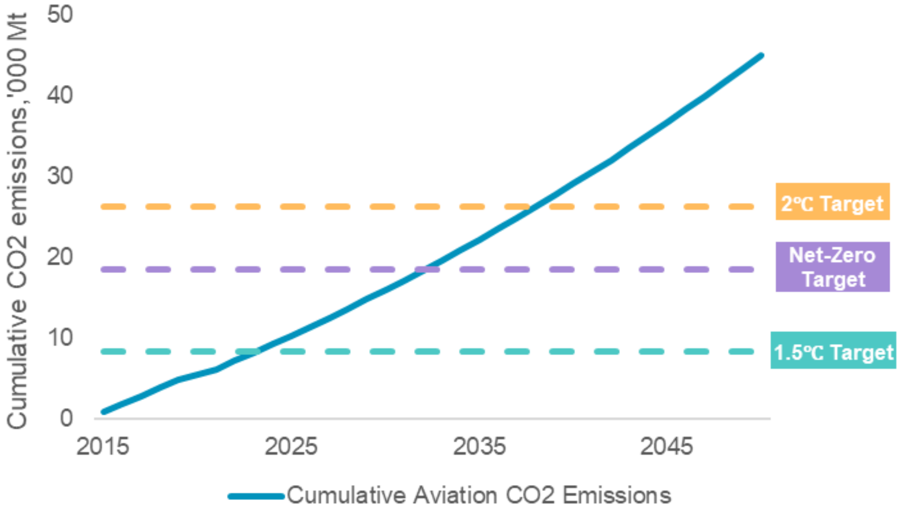


Source: Our World in Data, WPIC research

A single round-trip flight from Lisbon to New York emits as much CO_2 as heating an average EU home for a year.

Since 1990, CO_2 emissions from air travel have approximately doubled (Fig. 2) and emissions are projected to triple by 2050 if left unchecked, outpacing improvements in fuel efficiency. Although, carbon intensity has declined ~60% over the same period, it is not enough to offset the growth in passenger demand and ultimate rise in CO_2 emissions. The ICCT has defined a specific carbon budget for aviation of ~5% that corresponds to the sector's proportional share of the global 1.5°C carbon budget, based on the average of four international decarbonisation pathways and scenario models. By calculating lifetime emissions from the existing fleet and modelling new aircraft deliveries, ICCT shows that aviation has already exceeded its share of the 1.5°C carbon budget and unless industry-wide mitigation accelerates, aviation will exceed its net zero and 2°C sectoral budgets (Fig. 3). Ultimately, as aviation grows as a source of greenhouse gases, the industry could consume more than 10% of the remaining global carbon budget set for limiting global warming to 1.5°C above pre-industrial levels. Reducing aviation's climate footprint is therefore essential to stabilising global warming.

Figure 3. Aviation has already exceeded its share of the carbon budget, based on ICCT's definition, and it is at risk of consuming more than ~10% of the global carbon budget.



Source: ICCT, Our World in Data, WPIC Estimates

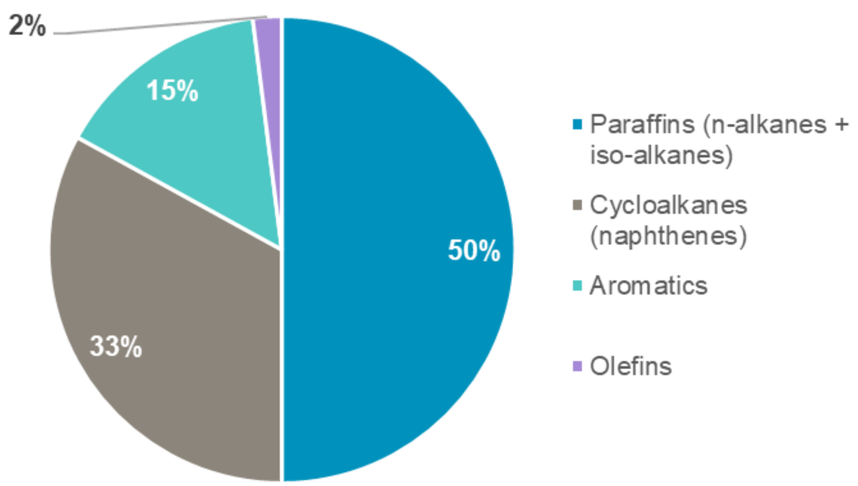
Aviation CO_2 emissions have already breached its share of the 1.5°C carbon budget, highlighting the sector's growing climate impact.

Fuel options for aviation

Current jet fuel standard

The jet fuel primarily used in aviation today is a type of kerosene (Jet A-1), a liquid hydrocarbon mixture made up mainly of paraffins (straight- and branched-chain alkanes), cycloalkanes and smaller proportions of aromatics. This blend provides the high energy density and stability required for aviation. Aromatics are kept below 25% to minimise soot and emissions, while a higher share of iso-alkanes is preferred due to their lower freezing point.

Figure 4.Typical hydrocarbon composition of jet fuel by volume



Source: IATA, Science Direct, ATSDR

Jet fuel is defined by its ignition point, freezing point, energy content, flow rate, sulphur content, and density characteristics to ensure safe and efficient engine performance.

When burned, kerosene produces CO_2 and water vapour, along with smaller amounts of carbon monoxide, nitrogen oxides, particulates, and sulphur dioxide (if sulphur impurities are present). To ensure safety and performance, all aviation fuels must meet strict American Society for Testing and Materials (ASTM) standards, including minimum energy content, low freezing points, suitable viscosity, and controlled sulphur levels (Fig. 5).

Figure 5. ASTM standards of aviation jet fuel

Criteria	Explanation	Jet A-1 specification
Flash point	The temperature at which the fuel ignites in the engine to cause combustion to occur (°C)	38° minimum
Freezing point	The temperature at which the fuel would freeze (°C)	-47°
Combustion heat	The amount of energy that is released during combustion, per kilo of fuel (MJ/kg)	42.8 MJ/kg minimum
Viscosity	The thickness of the fluid or ability to flow (mm2/s)	8.000 max
Sulphur content	The amount of sulphur in the fuel (parts per million)	0.30
Density	How heavy the fuel is per litre (kg/m3)	775-840

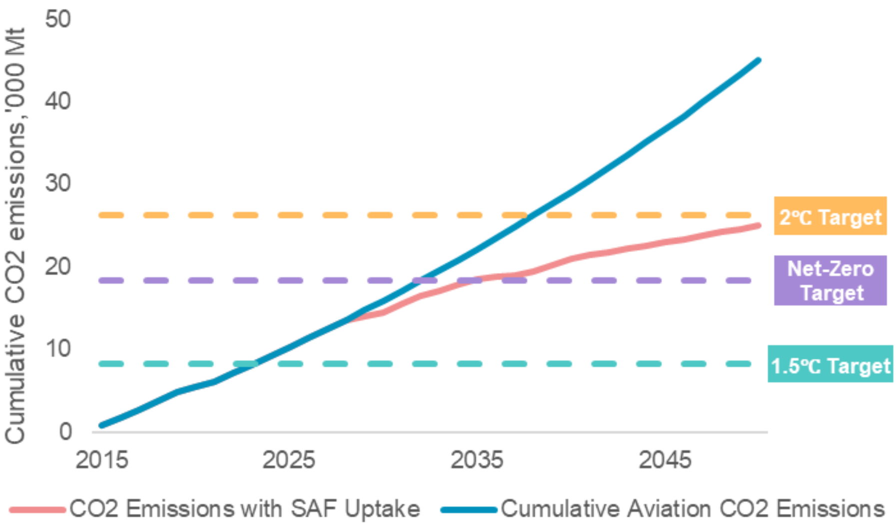
Source: ICCT, Our World in Data, WPIC Estimates

Sustainable Aviation Fuel: A viable alternative

Sustainable Aviation Fuel (SAF) has emerged as a leading renewable substitute for kerosene, developed to reduce the carbon footprint of air travel and mitigate its impact on the climate. Unlike petroleum-based kerosene, SAF is produced from sustainable, non-petroleum feedstocks such as waste oils, agricultural residues, municipal solid waste, or via synthetic e-fuels combining renewable electricity with captured CO_2. SAF can deliver lifecycle emission reductions of up to 80%, while e-fuels in particular have the potential to be near climate-neutral. ICCT scenario modelling demonstrates that widespread adoption and efficient production of SAF - especially when paired with fuel efficiency improvements - can significantly alter the sector's future emissions pathway, bringing cumulative aviation CO_2 emissions below ICCT's estimated 2°C target carbon budget for the industry (Fig. 6).

SAF and e-fuels offer major aviation emissions reductions, with e-fuels close to carbon-neutral.

Figure 6. Projected Aviation CO_2 Emissions versus Carbon Budget from Paris Agreement 2015 when SAF is efficiently produced and utilised



Source: ICCT, Our World in Data, WPIC Estimates

For aviation viability, fuels must meet three criteria:

- **Performance**: high energy density, clean combustion, and thermal stability for long, safe flights.
- **Operability:** reliable performance under extreme conditions, such as very low temperatures.
- **Drop-in:** seamless integration with existing aircraft and fuel infrastructure.

SAF satisfies all three criterial under the major production pathways. Its hydrocarbon profile closely mirrors that of fossil kerosene (Jet A-1), enabling certification under the same ASTM standards and use in current aircraft without modification. At present, SAF is typically blended up to 50% with conventional kerosene, though future advancements aim for 100% use. This compatibility is achieved through upgrading processes such as hydroisomerisation, which convert straight-chain n-alkanes into branched iso-alkanes. This lowers the freezing point and improves combustion efficiency - a key step in which platinum plays a catalytic role, as discussed in later sections.

However, widespread adoption is still constrained: SAF is currently up to eight times more expensive than conventional jet fuel, global production capacity is limited, and e-fuels require vast amounts of renewable energy, making large-scale deployment challenging.

Limits of electrification and hydrogen in aviation

Although battery electric, hydrogen fuel cell and other emerging technologies show some promise for short-haul flights, none can currently meet the energy, weight, and operational requirements of aviation at scale. Solar-powered aircraft are technically feasible but impractical for commercial passenger flights due to severe physical and engineering constraints: the limited energy collected from solar panels, low power output relative to required speeds, sensitivity to weather and night-time conditions, and the need for extremely large wing surfaces make them unsuitable for planes carrying significant payloads.

Batteries are far less energy-dense than jet fuel – aviation-grade jet fuel provides around 12,000 Wh/kg, whereas even the most advanced lithium batteries achieve less than 300 Wh/kg. To match the range of conventional aircraft, batteries would be excessively bulky, drastically reducing payload and efficiency. Unlike fuel, battery weight does not decrease during flight, meaning the aircraft must carry the full battery mass for the entire journey. While electrification may be feasible for very short regional or urban flights, it is not suitable for most commercial operations.

Emerging electric and hydrogen technologies fall short of commercial needs, making SAF the practical path for decarbonising aviation.

Hydrogen based aviation offers better prospects than batteries but still faces drawbacks compared to SAF. Hydrogen has low volumetric energy density, meaning fuel tanks must be large which reduces range and payload. Furthermore, cryogenic hydrogen storage adds further complexity and safety concerns to aviation. Beyond the technical implementation of hydrogen, widespread adoption would require major upgrades to airport infrastructure, fuel handling systems, and safety protocols.

Ongoing development of battery electric, hydrogen, and solar-powered technologies may improve their respective use cases for aviation. However, these energy sources only remain likely for use in short-range, light operations. For the foreseeable future, SAF remains the only viable drop-in solution capable of powering the existing fleet, integrating with current infrastructure, and substantially reducing emissions across the entire aviation sector.

SAF in the broader energy transition

The International Energy Agency (IEA) projects global oil demand to increase by around 2.5 million barrels per day (mb/d) between 2024 and 2030, reaching a plateau of roughly 105.5 mb/d by the end of the decade. Henceforth, petroleum demand is expected to decline as electrification spreads across road, transport, heating, and power. Aviation, however, is one of the few sectors where liquid fuels remain essential, meaning SAF will play a key role in decarbonising the sector while continuing to meet long-haul and high payload energy needs in a world where petroleum consumption is gradually falling. This positions SAF as both a critical enabler of aviation's net-zero transition and a structurally growing segment of the fuel market, even as overall oil demand declines.

Types of SAF

There are currently eleven ASTM-approved pathways for producing SAF, including three for co-processing, which involves blending renewable feedstocks with fossil fuels during the refining process. While each pathway uses different feedstocks and technologies, they share common goals: improving feedstock availability, reducing lifecycle carbon emissions, and balancing processing complexity with cost, which are outlined in Figure 7.

Figure 7. ASTM approved SAF and synthetic fuel pathways

	Pathway	Feedstock	Abbreviation	Blend limit*	Pt Usage	Pros and Cons
Most deliverable SAF routes	1) **Hydroprocessed Esters and Fatty Acids**	Waste fats, oils, greases (FOGs) from vegetable and animal sources	HEFA	Up to 50%		✓ Commercially mature ✓ Lower cost ✗ Feedstock supply cap ✗ Lower sustainability score
	2) **Alcohol-to-Jet**	Sugar, starch crops, lignocellulosic biomass	ATJ	Up to 50%		✓ Diverse and abundant feedstock ✓ Proven technology ✗ Life cycle emissions ✗ Lower energy density
	3) **a) Fischer-Tropsch**	Energy crops, lignocellulosic biomass, solid waste	FT	Up to 50%		✓ High GHG savings ✓ Wide feedstock range ✗ High capital cost ✗ Complex process
	b) Power-to-Liquid *(approved under Fischer-Tropsch)*	Captured CO2, water, renewable energy	PtL	Up to 50%		✓ Highest GHG reduction ✓ No biomass required ✗ High capital cost ✗ Early-stage market
Less deliverable SAF routes	4) **Synthesized iso-paraffins from Hydroprocessed fermented sugars**	Biomass that contains sugars e.g. cellulosic biomass such as herbs, or sugar-containing crops like sugarcane and corn	HFS-SIP	Up to 10%		✓ Renewable sugar feedstock ✗ Low yield ✗ High cost
	5) **Fischer-Tropsch with Aromatics**	Energy crops, lignocellulosic biomass, solid waste	FT-SKA	Up to 50%		✓ Meets full jet fuel specs ✓ Lower emissions than crude aromatics ✗ Less mature add-on tech ✗ No scale yet
	6) **Catalytic Hydro thermolysis Jet Fuel**	Waste fats, oils, greases (FOGs) from vegetable and animal sources	CHJ	Up to 50%		✓ Uses low-quality oils/greases ✓ Makes cycloalkanes ✗ Immature ✗ Complex process

	7) Synthetic Paraffinic Kerosene with Aromatics	C2-C5 alcohols from biomass	ATJ-SKA	Unknown	🔴	✗ Matches spec fully ✗ Needs renewable aromatics ✗ Soot/NOx penalty
	8) HEFA from Algae	Micro-algae oils	HC-HEFA-SPK	Up to 10%	🟢	✓ No food/land use ✓ High theoretical yield ✗ Not commercial, v high cost ✗ Immature feedstock
	9) FOG Co-Processing	Waste fats, oils, greases (FOGs)	FOG-CP	Up to 5%	🔴	✓ Leverages existing refinery ✓ Quick incremental SAF bump ✗ Low blend cap ✗ Scaling limits
	10) FT Co-Processing	Fischer-Tropsch biocrude	FT-CP	Up to 5%	🔴	✓ Leverages existing refinery ✓ Fast ramp-up ✗ Low real SAF output ✗ Certification/tracking challenge
	11) HEFA Co-Processing	HEFA from biomass	HEFA-CP	10%	🔴	✓ Cost-effective, existing units ✓ Short term biogenic carbon pump ✗ Low blend limit ✗ Renewable tracing issues

Key	
🔴	Minimal platinum use
🟠	Some platinum use
🟢	Significant platinum use

*Source: International Civil Aviation Organisation (ICAO), Aviation Benefits Beyond Borders, ASTM International, * the maximum proportion of SAF that can be mixed with conventional jet fuel before it can be used in an aircraft.*

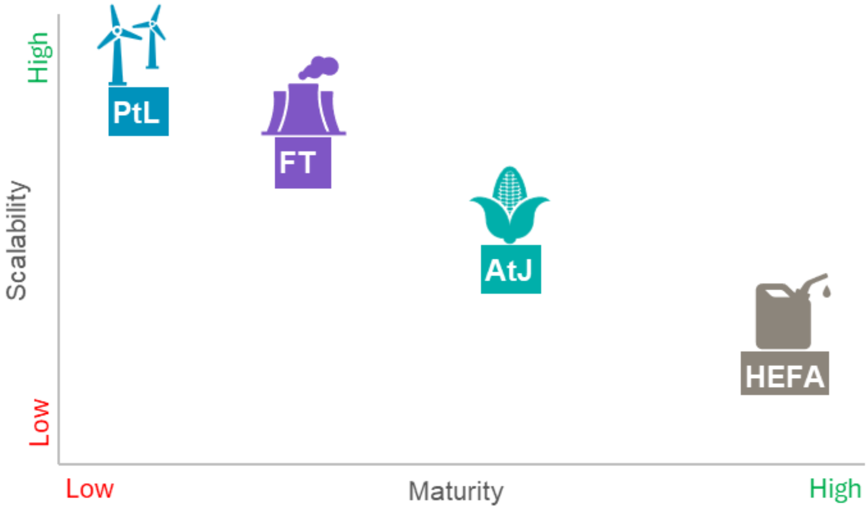
In practice, the four main pathways expected to dominate SAF production through 2050 are:

- **Hydroprocessed Esters and Fatty Acids (HEFA):** The most commercially mature and widely deployed pathway today, though its growth is limited by the availability of feedstocks such as waste oils and fats.
- **Fischer-Tropsch (FT)**: A highly scalable pathway with the ability to use a wide range of feedstocks but requires significant capital investment and catalysts.
- **Alcohol-to-Jet (AtJ):** Flexible in feedstock use and technically proven, but less advanced commercially than HEFA.
- **Power-to-Liquid (PtL / e-fuels):** Considered the most promising long-term solution due to virtually unlimited scalability when coupled with

renewable energy, though production costs and renewable energy requirements remain major hurdles.

The remaining pathways are largely exploratory but provide valuable innovation, particularly in niche feedstocks like algae or co-processing with fossil fuels.

Figure 8. SAF pathways differing maturity and scalability (illustrative)



Source: SkyNRG, IATA, BP

SAF pathways range from mature HEFA to scalable FT, with PtL/e-fuels offering long-term potential.

Breakdown of four main SAF Pathways

Hydroprocessed Esters and Fatty Acids (HEFA)

HEFA converts vegetable oils, waste oils, or fats into SAF using hydrogenation. Oxygen is removed via hydrodeoxygenation. The resulting straight chain paraffins are cracked and isomerised to produce hydrocarbons of jet fuel length.

HEFA is the most mature and commercially established SAF pathway, currently accounting for over 90% of global production. It is favoured for its relatively low capital expenditure requirements and the high energy density of its feedstocks, which closely resemble fossil jet fuel. Importantly, HEFA is the only pathway currently operating at commercial scale (Mt).

However, its long-term expansion is constrained by feedstock availability. Sustainable oils and fats are increasingly in demand from competing sectors such as biodiesel and rising global population and consumption patterns are expected to intensify this competition. Projections suggest that HEFA feedstock demand could exceed supply as early as 2030, signalling a potential inflection point for this pathway. Beyond this, growth will depend on diversifying feedstocks and developing alternative SAF technologies.

HEFA dominates SAF production today but is constrained by limited feedstock availability.

Policy trends are already responding to these limitations. For example, the UK has introduced caps on HEFA-based SAF to reflect feedstock sustainability risks: 100% of SAF in 2025–2026, falling to 71% by 2030 and 35% by 2040. The remaining SAF demand is expected to be met by alternative, more sustainable SAF pathways, discussed below.

Fischer-Tropsch (FT)

Developed in the 1920s by Franz Fischer and Hans Tropsch, the FT pathway produces SAF by converting solid materials such as biomass or municipal waste into synthetic gas (syngas). This syngas is then processed through FT synthesis into liquid wax, which is subsequently upgraded via conventional refinery hydroprocessing and isomerisation to yield SAF and by-product naphtha.

While more complex than HEFA, FT has significant scalability potential as it can utilise a wide range of feedstocks, including waste materials that would otherwise be discarded. This makes it a strong candidate for commercial-scale SAF production. A drawback to FT is its high capital-intensity and technical challenges to operate efficiently. Supportive policies and regulatory frameworks will be essential to accelerate its deployment.

Alcohol-to-Jet (AtJ)

AtJ produces SAF by converting sugar- and starch-based crops into alcohols, which are then upgraded into jet-range hydrocarbons through a series of refining steps. First, sugars are fermented into ethanol or iso-butanol. The alcohols then undergo deoxygenation to remove oxygen, before being joined together through oligomerisation to form longer hydrocarbon chains. These are subsequently hydrogenated and fractionated to meet jet fuel specifications. Currently, only ethanol and iso-butanol are approved as feedstocks, although the pathway does not specify their origin, providing some flexibility in sourcing.

Scaling AtJ may present logistical challenges since sugarcane as a feedstock must be processed into ethanol within 48 hours of harvest. This means feedstock production works need to be located close to ethanol facilities. Commercial-scale AtJ activity is now underway, led by the opening of LanzaJet’s Freedom Pines plant in the United States in 2025 - the first facility to produce SAF from ethanol at industrial scale. Nevertheless, global capacity remains limited, as AtJ projects compete with ground transport fuels for ethanol supply. As road transport electrifies and dedicated ethanol or waste-based feedstocks expand, the pathway’s growth potential strengthens. Emissions savings are generally lower than other SAF pathways, but these can be improved by switching ethanol mills from natural gas to biogas, using biofuels in farm machinery, or incorporating carbon capture and storage (CCS).

Beyond HEFA, emerging SAF technologies offer greater production scale and feedstock flexibility.

Power-to-Liquid (PtL)

PtL is a synthetic jet fuel produced using renewable electricity, with water and CO_2 serving as the primary inputs. It utilises electrolysis to generate green hydrogen and captured CO_2 (from the atmosphere or industrial sources). This creates a climate-neutral carbon feedstock. These components are then combined through chemical processes such as FT synthesis to form liquid hydrocarbons, which are subsequently refined into a kerosene-equivalent fuel.

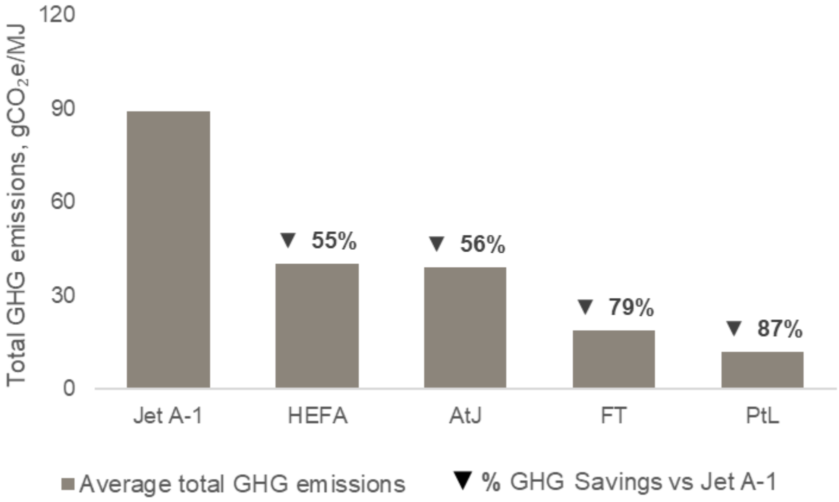
A defining feature of PtL is the recycling of CO_2; the carbon released during fuel combustion can be recaptured and reused, effectively closing the carbon loop. This approach enables PtL to achieve sustainable reductions in new greenhouse gas emissions, with lifecycle emissions up to 90% lower than conventional jet fuel.

Despite its potential, PtL production today remains expensive and limited in scale. Expansion is closely linked to the growth of the green hydrogen market, and industry analysts project that wider commercial availability could be achieved over the coming decade. However, slower progress in Direct Air Capture (DAC) technology, which supplies the CO_2 feedstock for PtL, could further constrain its scale-up.

Decarbonisation potential under each pathway

All major SAF pathways deliver emissions reductions relative to conventional Jet A-1 (~89 gCO_2e/MJ), though to different extents (Fig. 9). HEFA and AtJ reduce lifecycle emissions by around 55-56%, limited by upstream emissions from cultivation, processing, and hydrogen use. FT achieves deeper savings at ~79% particularly when based on waste. PtL delivers the largest reductions, up to ~87%, thanks to its closed carbon loop from using captured CO_2 and renewable electricity and has the potential to be carbon neutral.

Figure 9. Greenhouse gas emissions reductions under different jet fuel production pathways



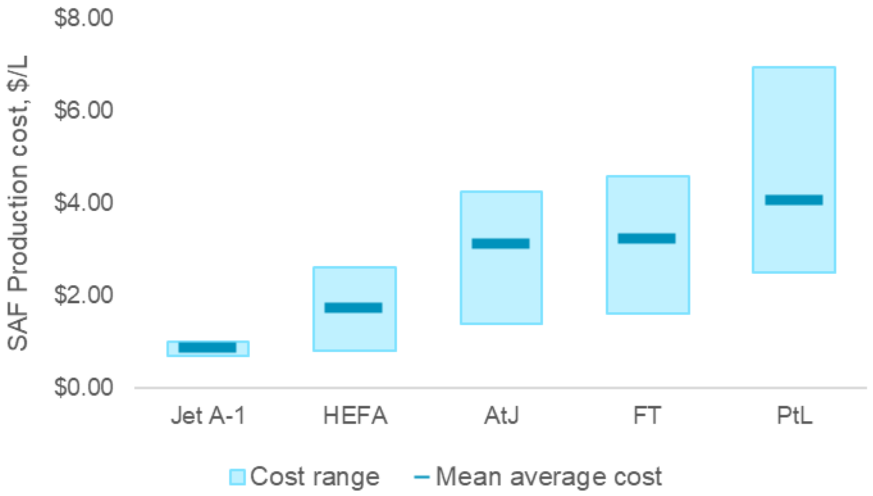
All SAF options emit less CO_2 than jet fuel, with PtL the cleanest and HEFA the least.

Source: Resource, Conservation and Recycling (Science Direct), WPIC Estimates

Cost disparities between aviation fuel pathways

While emissions benefits are clear, costs remain a significant barrier to SAF adoption (Fig. 10). Jet A-1 remains the cheapest options at ~\$0.70-1.00/L, against which all SAF pathways must compete. HEFA is currently the lowest-cost SAF (~\$0.79-2.60/L), benefitting from commercial maturity and existing infrastructure, but still averages about twice the cost of fossil jet fuel. AtJ and FT are more expensive, with mean costs around \$3.10–3.20/L due to higher capital intensity and process complexity. PtL is the costliest pathway by far, averaging over $4.00/L and reaching nearly $7.00/L at its most expensive, largely driven by renewable electricity and green hydrogen requirements.

Figure 10. Relative cost to produce aviation fuel through conventional and sustainable pathways



Source: Resource, Conservation and Recycling (Science Direct), WPIC Estimates

How is platinum involved?

Platinum is a critical enabler in SAF production, with applications across several of the key pathways. Its most significant role is in isomerisation, where it functions as a catalyst to transform straight-chain hydrocarbons into branched isomers with superior cold-flow properties. Without this step, SAF would fail to meet the strict freezing point requirements necessary for safe, high-altitude flight.

Platinum underpins SAF production, enabling cold-flow performance and boosting catalysts across upgrading and hydrogen technologies.

Platinum also plays an important supporting role in FT synthesis. Iron catalysts dominate biomass FT and do not use platinum. However, cobalt catalysts are preferred in PtL FT and these use platinum as a promoter. Even at very low concentrations, platinum improves cobalt catalyst reduction, stability, and dispersion, resulting in higher efficiency and longer lifetimes.

Finally, platinum demand is embedded upstream in PtL green hydrogen production. Proton exchange membrane (PEM) electrolysers, used to split water into renewable hydrogen and oxygen, require platinum at the electrodes to catalyse the hydrogen evolution reaction. This links platinum not only to SAF upgrading steps, but also the hydrogen feedstocks that underpin PtL scale-up.

Together, these applications illustrate platinum's strategic importance across the SAF value chain. It is central to both the upgrading processes that make SAF jet-ready and to the enabling technologies that will allow synthetic fuels to scale in the coming decades.

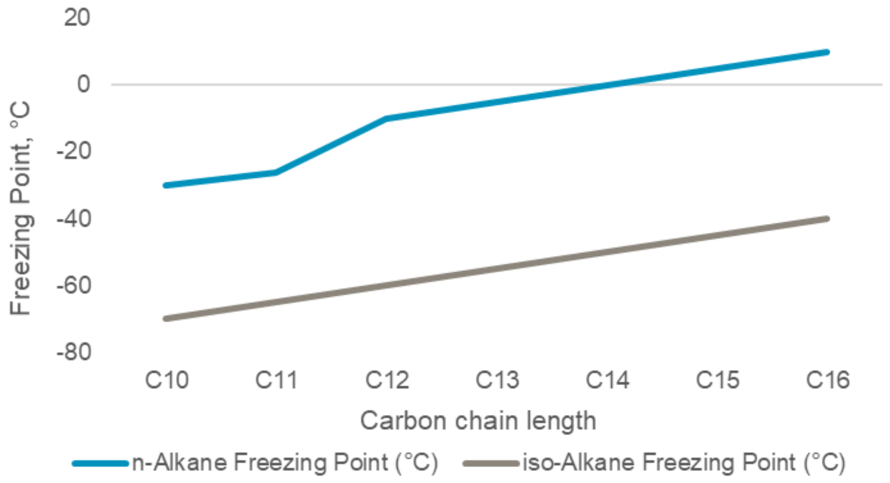
Hydroisomerisation and the role of platinum

Isomerisation is arguably the most important upgrading step for SAF, as it determines whether the final product meets the strict freezing point requirements of jet fuel. Hydroisomerisation improves cold-flow properties by converting straight-chain n-alkanes, which would otherwise begin to solidify before reaching in-flight temperatures, into branched iso-alkanes that remain liquid under the extreme cold of flight.

Platinum is essential to this process. Acting as a bifunctional catalyst alongside acid sites, platinum carries out three key transformations:

1. Dehydrogenation of n-alkanes to alkenes on platinum sites.
2. Isomerisation of these alkenes to branched intermediates via carbocation mechanisms on the acid catalyst.
3. Hydrogenation of the branched alkenes back to saturated iso-alkanes on platinum sites

Figure 11. Freezing point reduction when converting of n-alkanes and iso-alkanes as carbon chain length increases



Source: Science Direct, WPIC Research

By refining hydrocarbon structure and boosting catalyst performance, platinum is key to scalable, jet-ready SAF.

This sequence ensures high selectivity, conversion efficiency, and fuel stability. Hydroisomerisation is therefore a critical step in multiple SAF pathways:

- **HEFA:** n-alkanes formed after hydroprocessing must undergo Pt-catalysed isomerisation to reduce the freezing point.
- **Fischer–Tropsch (biomass FT / PtL FT):** the paraffinic hydrocarbons produced are upgraded through hydroisomerisation to meet jet fuel standards.
- **Alcohol-to-Jet (ATJ):** the final product sometimes contains a significant number of n-alkanes, requiring hydroisomerisation for tailored cold-flow properties.

The amount of platinum used in the isomerisation process of each largely depends on the feedstock.

Platinum's role in Fischer-Tropsch

In FT synthesis, platinum's role depends on the catalyst system to convert syngas ($CO + H_2$) into hydrocarbons. For biomass FT, we estimate that ~80% of production relies on iron catalysts, which do not require platinum promotion. The remaining ~20% is cobalt-based, and within this share we assume ~75% uses platinum as a promoter at 0.05 wt%, with the balance relying on alternatives such as rhenium or ruthenium.

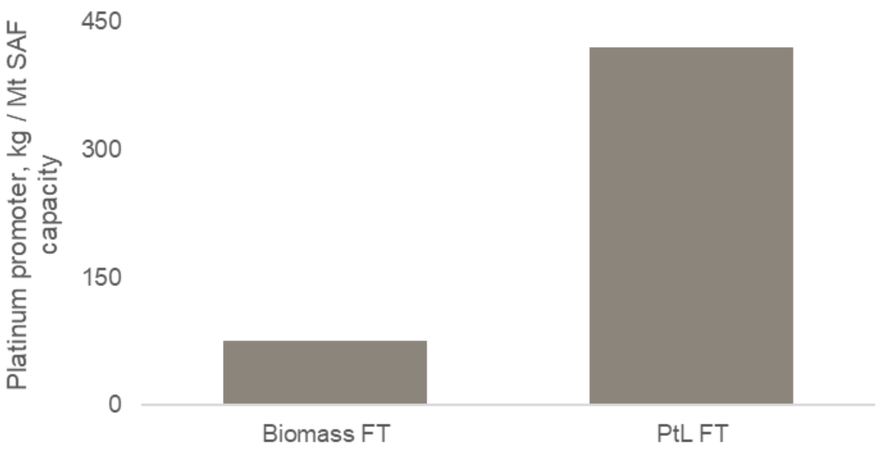
By contrast, PtL FT is assumed to rely much more heavily on cobalt catalysts (~ 75%), with ~25% using iron. As with biomass FT, ~75% of cobalt catalysts are assumed to use platinum at ~0.05 wt%. Platinum's role, even at trace levels, is to enhance cobalt catalyst reducibility, dispersion, and resistance to deactivation, leading to higher conversion rates and longer catalyst lifetimes.

This distinction means platinum intensity is higher in PtL FT than in biomass FT. Biomass feedstocks are carbon-rich, are less in need of catalytic transformation (~1,000 tonnes of catalysts per million tonnes of SAF), and are dominated by platinum-free iron systems. PtL syngas, however, requires more catalysis (~1,500 tonnes per million tonnes of SAF) and is cobalt-heavy, so platinum usage is more pronounced. On average, 1 Mt of annual SAF production capacity requires an estimated 75 kg of platinum in biomass FT, but more than five times as much (~420 kg) in PtL FT (Fig. 11).

Platinum is thus required in two distinct ways for FT-based pathways:

1. As a promoter in cobalt catalysts (especially in PtL).
2. As a hydroisomerisation catalyst in upgrading steps post-synthesis of biomass-FT or PtL-FT.

Figure 12. Platinum usage in a cobalt catalyst for biomass FT compared with PtL FT (kg Pt required per Mt SAF)



*Source: WPIC Estimates, Science Direct, * Estimates are rough*

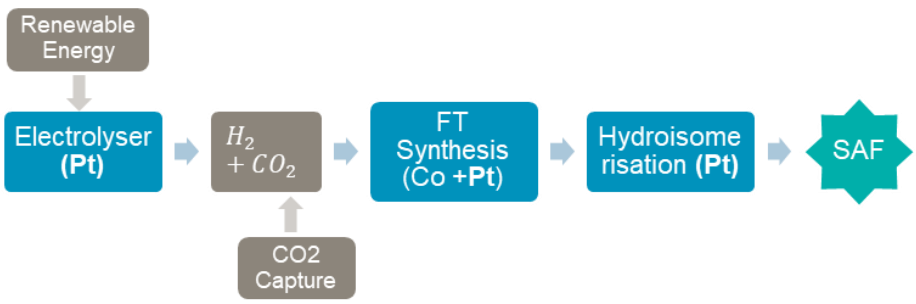
Platinum use in Power-to-Liquid green hydrogen

A final, indirect use of platinum occurs through green hydrogen production, which is a key feedstock for PtL pathways. PtL production relies on large volumes of renewable hydrogen, typically produced via platinum-containing Proton Exchange Membrane (PEM) electrolysers (alkaline electrolysers less suited to the variable power loads associated with renewable power). We estimate that PEM electrolysers will account for around ~55% of global green hydrogen production through the 2030's.

PEM electrolysers rely on platinum to produce the renewable hydrogen that powers PtL SAF.

Although this platinum demand is already captured within WPIC's platinum forecast under "hydrogen other and stationary," it is worth highlighting that platinum demand from green hydrogen production is directly linked to the scalability of PtL as a SAF pathway. As SAF deployment grows, it is expected to create a significant demand pull for green hydrogen, which in turn could accelerate economies of scale in hydrogen production and help drive down the levelized cost of hydrogen (LCOH).

Figure 13. Flow diagram of PtL SAF production and platinum's involvement



Source: Airbus, WPIC research

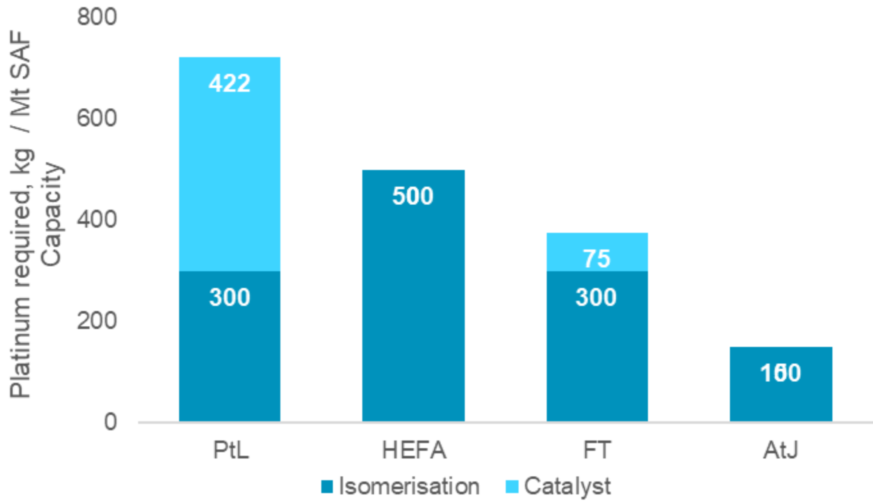
Estimated platinum demand across all SAF pathways

Platinum demand in SAF production arises from two primary sources: **isomerisation** and **catalyst promotion**.

Isomerisation is used in all four of the commercial SAF pathways we discuss, to improve cold-flow properties and meet jet fuel specifications. HEFA requires the most platinum for isomerisation, roughly 500kg per Mt of annual SAF production capacity, because its deoxygenated lipid feed is dominated by long straight chain paraffins that must all be isomerised. FT and PtL syncrudes, which are more compositionally diverse, require ~300 kg/Mt SAF, while AtJ feedstocks, with fewer long n-paraffins require only about 150 kg/Mt. This establishes the hierarchy of platinum demand for isomerisation alone as: HEFA > FT/PtL > AtJ.

Catalyst promotion further increases platinum requirements in certain pathways. In cobalt-catalysed FT and PtL processes, platinum acts as a promoter to enhance reaction efficiency and selectivity. This adds roughly 75 kg/Mt for FT and 420 kg/Mt for PtL. When isomerisation and promoter contributions are combined, PtL emerges as the most platinum-intensive SAF pathway overall, with total platinum demand per Mt SAF of ~720kg, compared with ~500 kg for HEFA, ~375 kg for FT and ~150 kg for AtJ.

Figure 14. Relative platinum requirements for SAF pathways, highlighting PtL as the most platinum intensive.



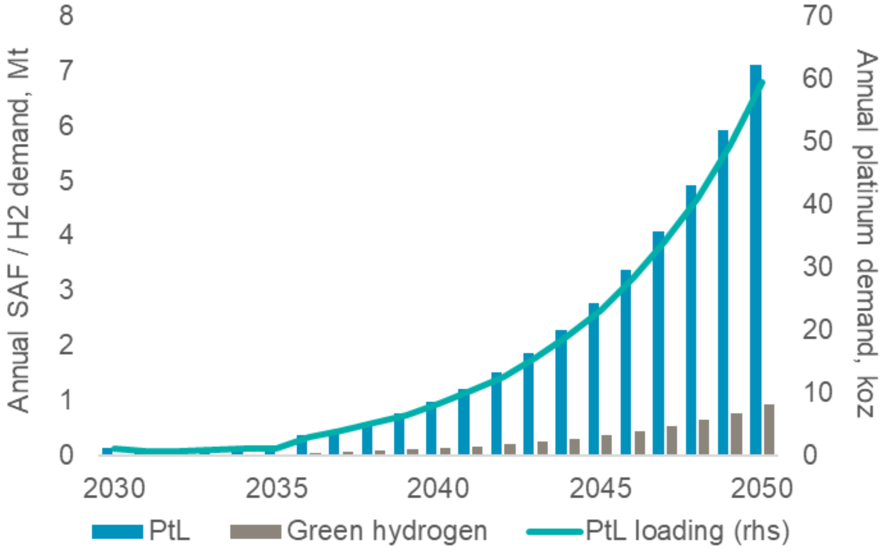
*Source: WPIC Estimates, Journal of Catalysis (Science Direct), Multidisciplinary Digital Publishing Institute (MDPI), * Estimates are rough*

SAF demand is set to grow, with platinum use rising as production shifts from HEFA to advanced pathways.

Platinum demand in green hydrogen production

Beyond these direct process-related uses, PtL also drives platinum demand indirectly through its dependence on green hydrogen. Producing 1 Mt of PtL SAF requires approximately 130 kt of hydrogen equivalent to around 2.6 GW of electrolysis capacity. PEM electrolysers, which are widely used for green hydrogen production, would therefore require approximately 260 kg (~8.4 koz) of platinum per Mt of SAF annual production capacity. As PtL production scaled, the growing hydrogen demand can support economies of scale in electrolysis, which in turn increases platinum consumption. This upstream platinum requirement is captured within WPIC’s supply/demand model under “hydrogen and other stationary” applications and is not capture the SAF platinum intensity figures presented here. Nonetheless, this highlights how the rate of PtL adoption directly influences the growth of green hydrogen infrastructure and associated platinum demand.

Figure 15. Projected scale-up of WPIC forecast PtL SAF production and its impact on green hydrogen volumes and annual platinum demand (2030–2050)



*Source: WPIC Estimates, Journal of Catalysis (Science Direct), Multidisciplinary Digital Publishing Institute (MDPI), SkyNRG, * Estimates are rough*

Policy and regulatory landscape

The growth of SAF is inseparable from policy. Binding mandates, carbon pricing schemes, and targeted incentives determine both the pace of deployment, and which pathways are commercially the most viable. At the international level, the International Civil Aviation Organisation's (ICAO's) Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) provides a framework for airlines to reduce offsetting requirements through SAF use, becoming mandatory in 2027. Within the EU, the Emissions Trading System and the ReFuelEU Aviation mandate require rising SAF blending levels, including dedicated sub-targets for synthetic fuels such as PtL.

SAF growth depends on policy: mandates and caps shape which pathways scale, with HEFA dominating early but PtL needed as feedstocks hit limits.

National and regional approaches vary: the UK introduces a SAF mandate from 2025 with a cap on HEFA, reflecting the sustainability and supply constraints of its feedstocks due to demands from competing sectors, and sets a minimum e-SAF requirement of 3.5% of total jet fuel by 2040 to encourage more sustainable SAF pathways. The US relies on production incentives under the Inflation Reduction Act; while Asia, Latin America, and the Middle East are rolling out roadmaps and early blending mandates through the 2030s.

A common feature across all frameworks is the HEFA ceiling: near-term growth is dominated by HEFA, but feedstock limits and policy caps force a pivot toward scalable, platinum-intensive fuels like PtL in the longer term. This policy foundation sets the stage for the market outlook that follows. Detailed information on individual countries' policies and the global regulatory landscape can be found in the Appendix.

Market outlook for SAF

The global market for SAF is expected to grow rapidly over the next three decades, supported by regulatory mandates, voluntary commitments, improvements in fuel efficiency, changes in fleet composition, evolving policy landscapes, and the technological maturity and feedstock of different SAF pathways.

SkyNRG, a Dutch SAF supplier that pioneered the first commercial SAF flight in 2011, published a market outlook for SAF adoption in 2025 which outlines three possible trajectories:

- **Existing Policies:** Growth in SAF production is tied to existing government policies and mandates already legislated today. In this case, volumes expand gradually, led by mature pathways such as

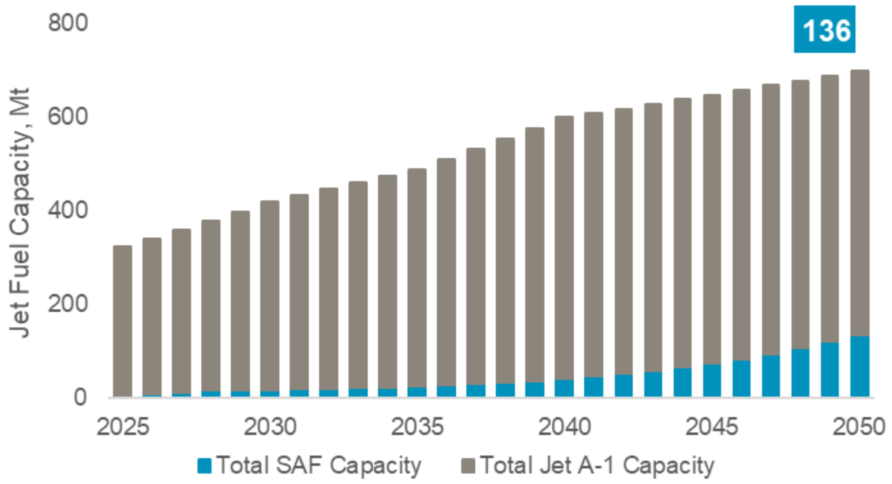
HEFA. Platinum demand remains relatively modest, as catalyst use is concentrated in specific processes like hydroisomerisation.

- **Current Trends:** SAF adoption accelerates in line with industry commitments and incremental policy measures. Supply begins to diversify beyond HEFA as feedstock availability becomes constrained. Under the "Current Trends" scenario, PtL gains market share which increases platinum demand.
- **Accelerated Action:** Ambitious climate policies are enacted with strong financial and regulatory incentives that enable a rapid technological scale-up and step-change in SAF penetration. In this scenario, PtL expands significantly, requiring greater use of PGM catalysts. Platinum demand could rise substantially under this pathway.

Alongside these, we incorporate **WPIC's own forecast** which lies between 'Existing Policies' and 'Current Trends,' reflecting a trajectory where SAF demand grows beyond the levels implied by policies already in place, but does not fully reach the scale of currently stated industry ambitions. This assumes incremental policy strengthening, gradual build-out of infrastructure, and selective achievement of national targets, resulting in a more balanced and realistic growth pathway. This acts as our baseline scenario.

HEFA will be the dominant SAF pathway across all scenarios in the near term due to its technological readiness and lower cost. However, as HEFA approaches feedstock limits, the expansion of advanced synthetic fuels (PtL and FT) becomes increasingly important beyond 2030, to meet both regulatory requirements and voluntary commitments. AtJ pathways also contribute incrementally, but their uptake is smaller compared with FT and PtL due to feedstock and processing constraints.

Figure 16. Under our WPIC forecast, SAF capacity will increase to ~140Mt by 2050, representing ~25% of aviation fuel demand while conventional jet fuel capacity starts to decline from 2045



Source: Organisation Internationale des Constructeurs d'Automobiles (OICA), WPIC research

SAF production rises steadily as conventional jet fuel slowly declines from 2045.

Existing Policies Scenario

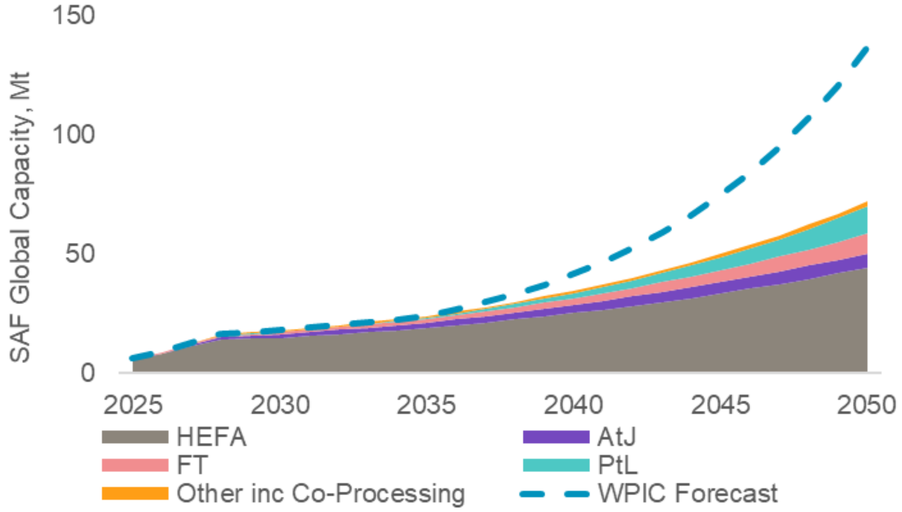
Under the "Existing Policies" scenario, SAF production grows steadily but limited to only meeting the policies already legislated today, without additional mandates or aggressive voluntary commitments. HEFA remains the dominant pathway due to its technological maturity and cost-effectiveness, while FT, PtL and AtJ only scale up only incrementally over the coming decades.

Total SAF Capacity Outlook

SAF production rises gradually from negligible levels in 2019 to around 72 Mt by 2050. HEFA accounts for the majority of production throughout this period, although its market share declines from ~98% in 2025, when capacity is just under 6 Mt, to around ~62% by 2050, as growth is limited by finite feedstock availability. PtL starts with no production in 2025 but expands to nearly 700 kt by 2035 and over 11 Mt by 2050, representing ~16% of total SAF production. FT capacity grows from less than 40 kt in 2025 to over 8 Mt by 2050, or ~12%

of SAF, while AtJ rises from just under 80 kt to nearly ~6 Mt, accounting for ~8% of total output. Other pathways contribute the remaining ~3% of production, e.g. co-processing. WPIC's forecast projects stronger growth than this, reflecting the expectation that additional policy support and market mechanisms will emerge beyond what is already in place today.

Figure 17. Total SAF capacity outlook until 2050 under Existing Policies scenario

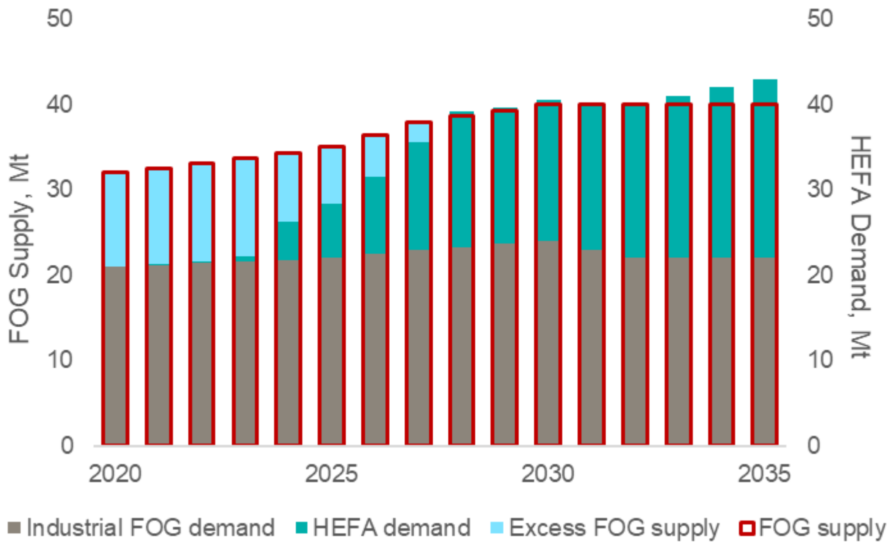


Source: SkyNRG, WPIC estimates

Limits to HEFA Growth

HEFA remains the primary contributor to SAF supply in the near term supported by its commercial readiness maturity and relatively low production costs. However, its longer-term growth is constrained by the availability of suitable feedstocks, particularly Fats, Oils and Grease (FOGs), which are fully utilised from around 2027. These feedstocks are limited because they are by-products of other industries (such as food production and waste cooking oil), meaning supply is finite and cannot increase indefinitely. Competition from renewable diesel production and other industrial uses further restricts the volume available for SAF.

Figure 18. FOG availability levels off around 2027, creating a supply ceiling for HEFA production, even as demand continues to grow through the 2030s.

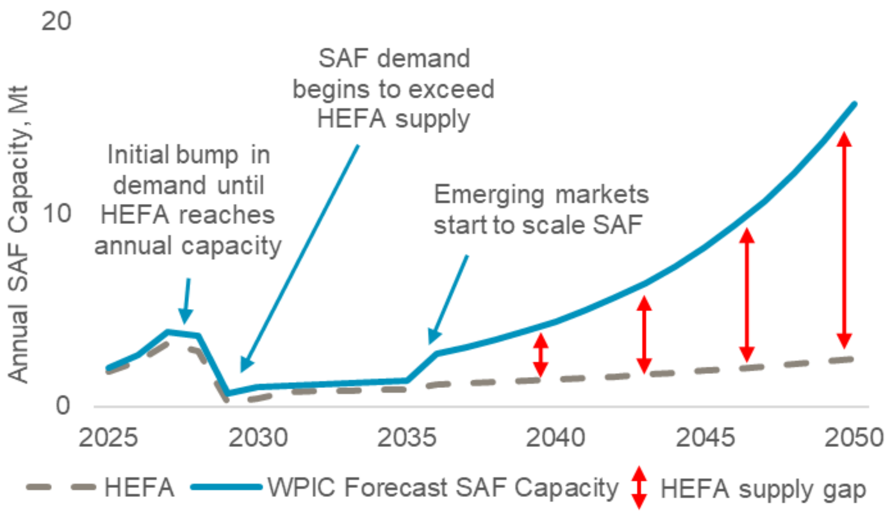


*Source: International Council on Clean Transportation (ICCT), WPIC estimates, *Industrial FOG is mainly being used for making biodiesel which is then used as a blend in diesel engines. It also used for biogas.*

HEFA supply is capped by finite FOG feedstocks; as demand grows, the ceiling around 2027 forces a shift to alternative SAF pathways.

As HEFA production grows, these feedstock constraints become increasingly significant around 2030 when output is expected to reach roughly ~14 Mt. Although production continues to rise over the following decades, it cannot keep pace with overall SAF demand. By the mid-2030s, HEFA is likely supply only part of total SAF demand.

Figure 19. Projected HEFA production relative to WPIC forecasted annual SAF demand, highlighting the volume shortfall to be met by advanced SAF pathways.



Source: SkyNRG, WPIC estimates

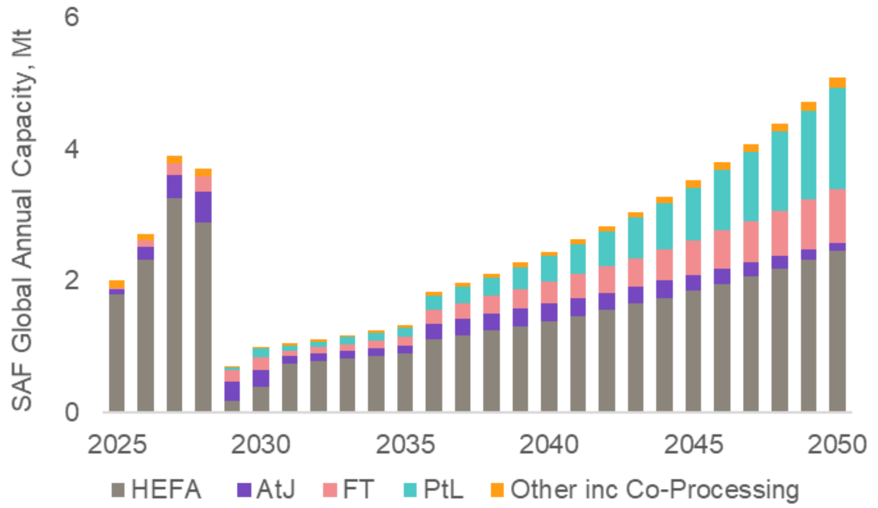
As SAF demand continues to rise, the industry will face a widening gap that cannot be met by HEFA alone. This structural constraint underpins the declining relative market share of HEFA across all scenarios, even as absolute production rises. Modest increases after 2030 reflect incremental efficiency gains and regional ramp-up rather than structural expansion. This means HEFA volumes continue to edge upward but fall increasingly short of total SAF demand. Meeting the shortfall will require more scalable, though currently less mature, technologies such as PtL and FT, which rely heavily and moderately, respectively, on platinum in their catalytic processes. For platinum demand, the implication is clear: while HEFA provides a steady baseline, the pace at which PtL and FT scale will largely determine future platinum consumption.

Across all scenarios, HEFA growth is capped by finite FOG feedstocks, meaning its contribution rises at the same limited pace regardless of policy or demand.

Annual SAF Production Dynamics

When production is analysed on an annual basis, rather than cumulative, the limitations of HEFA become more apparent. In the late 2020s, HEFA production reaches its FOG-constrained ceiling, causing a temporary plateau in annual SAF output. Newer pathways - PtL, FT and AtJ - have not yet reached commercial scale, and it is only from the mid-2030s onward that annual output resumes some meaningful growth. Nevertheless, even by 2050, production from those pathways is insufficient to close the long-term supply gap fully.

Figure 20. Annual SAF production capacity additions under Existing Policies scenario



Source: SkyNRG, WPIC estimates

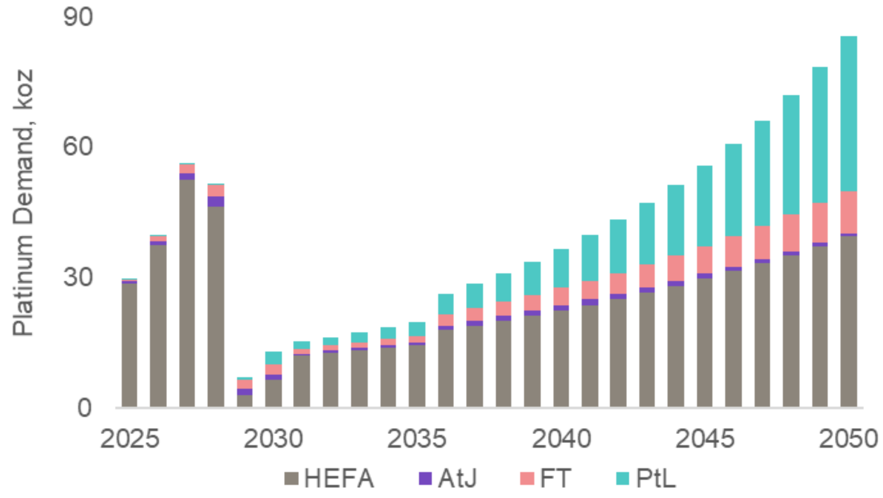
Although HEFA reaches its feedstock ceiling by the late 2020s, its absolute output continues to grow year-on-year. This is because the cap on HEFA applies as a percentage of total SAF demand, not a fixed volume. As total SAF demand increases over time, the same capped share allows HEFA to contribute to a larger absolute tonnage, even if the feedstock supply itself is limited. In addition, modest efficiency improvements in processing or the incremental use of alternative fats and oils can slightly expand the available feedstock, supporting gradual annual growth. Nevertheless, these increases are small relative to overall SAF demand, meaning that beyond the late 2020s, most of the additional growth must come from more scalable, platinum-intensive pathways such as PtL.

Platinum Demand Implications

Platinum demand initially grows with new SAF capacity start-ups, then falls as the pace of commissioning slows despite growing total SAF output.

Annual platinum demand from SAF production is tied to new capacity start-ups as opposed to cumulative capacity. This follows most industrial demand applications for platinum where, bar small annual losses, the metal is not physically consumed in the production process. Demand is therefore driven by the amount of platinum required to populate a production facility for ongoing operations upon commissioning. Accordingly, platinum demand from SAF may initially spike in 2027/28f, reflecting the rapid scale-up of HEFA production. However, as HEFA approaches its maximum contribution to total SAF supply by 2030f, further growth slows, resulting in lower incremental platinum demand. This results in platinum demand falling from almost 30 koz p.a. in 2025 to just 13 koz p.a. by 2030.

Figure 21. Annual platinum demand under the "Existing Policies" Scenario



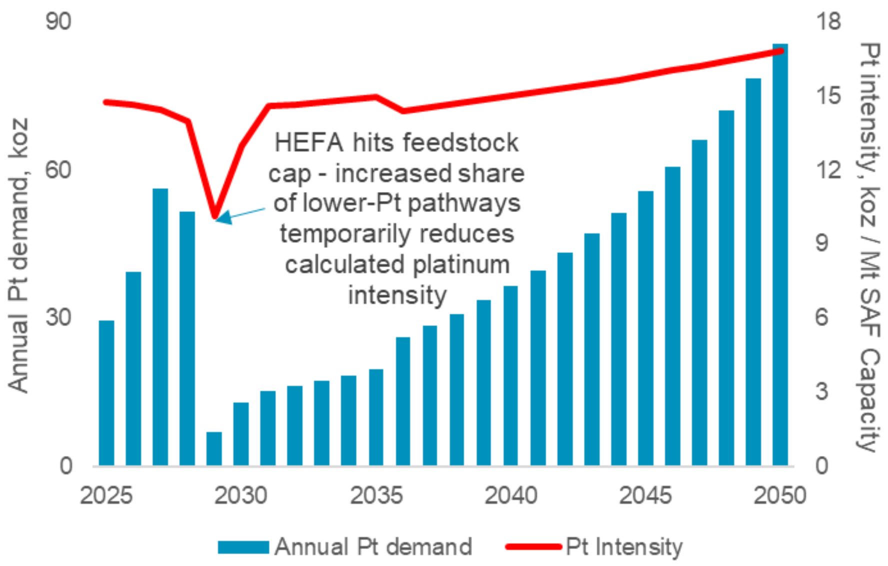
Source: SkyNRG, WPIC estimates

PtL drives a late surge in platinum demand under existing policies.

From the mid-2030s onwards, demand begins to recover as FT and PtL gradually scale. By 2050, the total platinum requirement exceeds 80 koz, more than doubling from the 2040 level, with PtL alone accounting for nearly 40% of total demand despite its smaller SAF production share.

Platinum intensity – the amount of platinum required per Mt p.a. SAF – closely follows the relative contribution of the highest platinum-demanding pathways. Initially high due to HEFA's relatively high platinum requirement, it dips when HEFA saturates in the late 2020s, then climbs steadily from 2030 onwards as PtL production accelerates. HEFA continues to provide a steady baseline demand, while FT contributes a moderate level. This pattern highlights that the combined influence of HEFA and PtL largely determines the overall platinum intensity trajectory for SAF production.

Figure 22. Platinum intensity as annual platinum demand rises over time, highlighting the importance of platinum in both HEFA and PtL

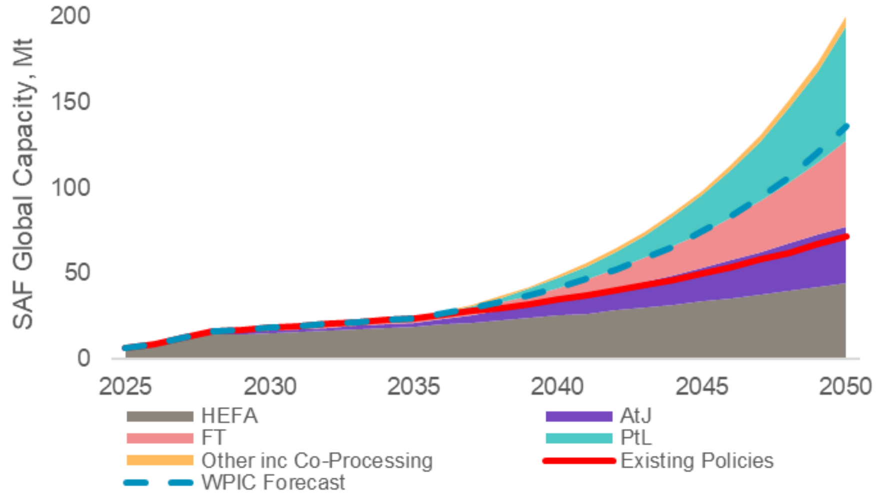


Source: SkyNRG, WPIC estimates

Current Trends Scenario

Relative to the "Existing Policies" case, the "Current Trends" scenario shows a markedly stronger expansion of SAF total capacity, particularly from the 2030s onwards. In the early years, the two pathways look very similar, with both reaching around 6 Mt by 2025 supplied almost entirely by HEFA. The divergence begins once HEFA reaches its feedstock limits and plateaus near 20 Mt under "Current Trends" with PtL and FT ramping up much faster from the late 2030s onwards. By 2040, total output is already ~50 Mt under "Current Trends" compared with ~35 Mt under "Existing Policies". The gap widens further by 2050, when "Current Trends" reaches around 200 Mt versus just 72 Mt in "Existing Policies". At that point, PtL contributes to ~33% of the SAF market share and FT ~25%, together supplying over three-quarters of SAF compared with less than half in the Existing Policies case. WPIC's forecast lies slightly below this level, reflecting a more conservative pace of policy delivery and industry mobilisation, where some - but not all - current commitments are realised.

Figure 23. Cumulative SAF capacity under "Current Trends" until 2050 compared with "Existing Policies" outlook

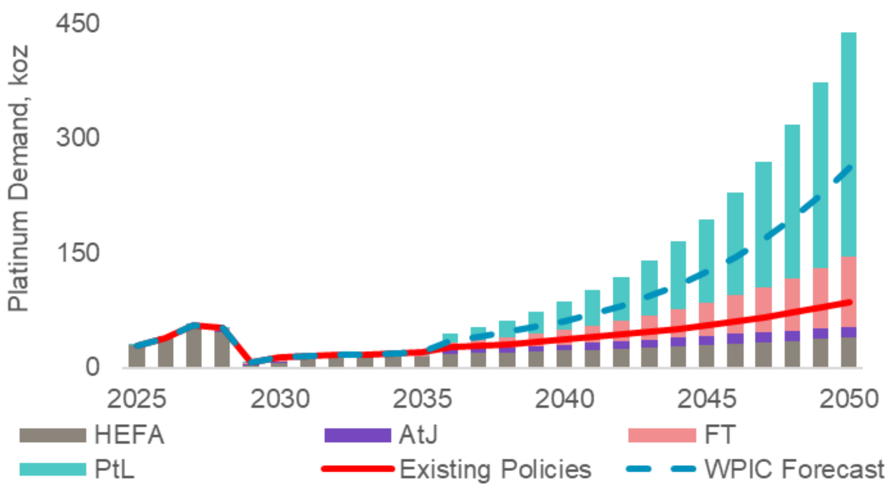


Source: SkyNRG, WPIC estimates

SAF scales steadily under Current Trends, as HEFA feedstocks hit limits and FT and PtL expand to dominate production by mid-century.

The platinum demand profile follows a similar pattern. Demand in the 2020s is modest and almost identical across both scenarios, reflecting the dominance of HEFA. But from 2030 onwards, "Current Trends" shows a steep divergence, driven by the platinum-intensive nature of PtL and, to a lesser extent, FT. By 2050, platinum demand exceeds 400 koz p.a. - five times the level under Existing Policies. PtL alone contributes over 260 koz annually, far outpacing its share of SAF output, while HEFA provides only a steady baseline.

Figure 24. Annual platinum demand under the "Current Trends" scenario



Source: SkyNRG, WPIC estimates

In short, while both scenarios look alike in the near term, even a modest acceleration in policy and industry ambition reshapes the long-term picture - from a flat, HEFA-led demand profile to one dominated by platinum-intensive synthetic pathways.

Accelerated Action Scenario

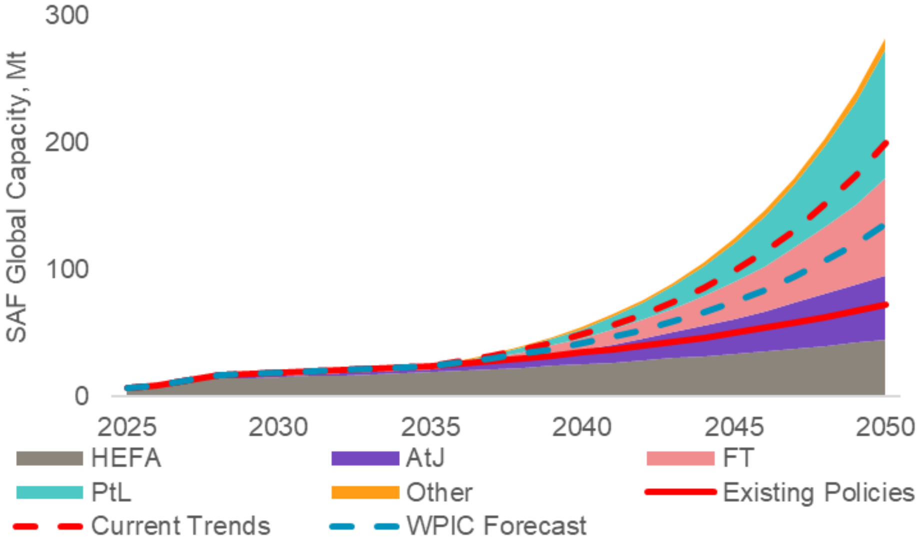
Relative to the “Current Trends” pathway, the “Accelerated Action” scenario shows a much steeper trajectory for SAF deployment. In the near term, production is broadly similar across all three scenarios reaching ~6 Mt by 2025, almost entirely from HEFA. By the late 2030s, however, “Accelerated Action” begins to pull ahead. With total cumulative capacity of ~60 Mt by 2040 compared with the same level only being achieved with “Current Trends” a few years later and under “Existing Policies” just under a decade later. This acceleration is driven by the earlier and faster scale-up of PtL and FT, supported by very ambitious policy and strong financing signals.

By 2050, the gap between scenarios is substantial: “Accelerated Action” reaches a cumulative 282 Mt of total SAF capacity versus 200 Mt in “Current Trends”, and 72 Mt in “Existing Policies”. PtL alone contributes ~102 Mt under “Accelerated Action”, more than 50% higher than in “Current Trends”. FT also plays a much larger role, providing over 76 Mt compared with 50 Mt in “Current Trends”. Together, PtL and FT supply nearly ~80% of total SAF in 2050, compared with around ~75% under “Current Trends” and less than half under “Existing Policies”. HEFA remains capped at ~44 Mt in all cases, highlighting that additional growth must come from synthetic pathways.

Ambitious policies and rapid scale-up push SAF output sharply higher, with advanced, platinum-heavy pathways dominating capacity expansion by mid-century.

WPIC does not assume deployment at this pace, since it would require full realisation of current policy ambitions, rapid commercialisation of emerging technologies, and coordinated industry action at a scale far exceeding today’s commitments. These conditions make this scenario an aspirational upper bound rather than a central forecast.

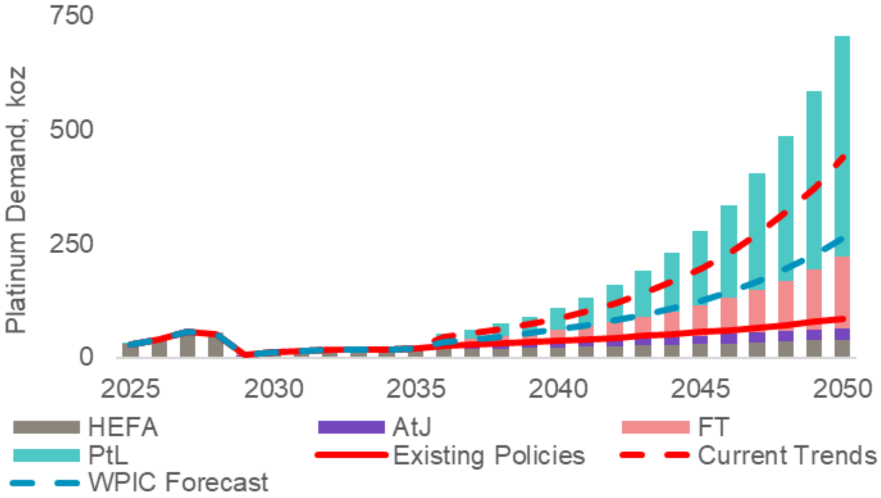
Figure 25. Cumulative SAF capacity outlook under “Accelerated Action” until 2050, compared with “Existing Policies”, WPIC Forecast and “Current Trends”



Source: SkyNRG, WPIC estimates

The platinum demand outlook reflects this faster scaling. Demand is essentially identical across all three scenarios in the 2020s – ~30 koz p.a. in 2025 and ~12-13 koz p.a. in 2030 – as HEFA dominates and reaches its ceiling. The divergence, again, begins in the early 2030s when PtL and FT start to expand under “Accelerated Action”. By 2040, platinum demand is already ~102 koz p.a., compared with ~81 koz p.a. under “Current Trends” and just ~20 koz p.a. under “Existing Policies”. The gap widens further by 2050: platinum requirements exceed an annual 640 koz under “Accelerated Action” versus the ~400 koz seen in “Current Trends” and just ~113 koz in “Existing Policies”. PtL accounts for the bulk of this difference, contributing more than ~430 koz p.a. – nearly 70% of the total – while FT adds a further ~150 koz p.a.

Figure 26. Annual platinum demand under the Accelerated Action scenario compared with "Existing Policies" and "Current Trends"



Source: SkyNRG, WPIC estimates

Accelerated Action demonstrates how stronger policy and faster technology deployment translate into both higher SAF output and much greater platinum intensity. The scenario underlines that while HEFA provides an early foundation, it is the rapid scaling of PtL and FT that drives long-term growth - and that doing so multiplies platinum requirements severalfold compared with more gradual pathways.

Rapid PtL scale under Accelerated Action drives SAF growth and a sixfold jump in platinum demand.

Figure 27. Summary of annual platinum demand (koz) in 2050 across the three different scenarios and SAF pathways

Scenario	HEFA	AtJ	FT	PtL	Total
Existing Policies	39 koz	0.6 koz	10 koz	36 koz	**86 koz**
Current Trends	39 koz	13 koz	93 koz	293 koz	**439 koz**
Accelerated Action	39 koz	25 koz	157 koz	484 koz	**705 koz**

Source: SkyNRG, WPIC Estimates

Platinum demand in transition: from petroleum to low-carbon fuels

While petroleum refining has historically underpinned a 2-3% share of platinum demand, this contribution will diminish over time as fossil fuel use declines. The structural fall in petroleum consumption is a central feature of the broader energy transition and implies a long-term contraction in refining-related platinum requirements.

The expansion of SAF offers an important offset. As shown in the preceding scenarios, platinum's role in synthetic fuel pathways such as PtL and FT is set to rise substantially, providing a new structural source of demand that counterbalances the decline in petroleum. Rather than disappearing from fuel markets altogether, platinum's role is therefore shifting - from supporting conventional refining to enabling advanced low-carbon fuels.

Platinum's role evolves, underpinning low-carbon fuel production as fossil use falls.

This dynamic highlights the resilience of platinum demand through the transition: even as global reliance on petroleum weakens, the scaling of SAF ensures that platinum remains embedded in the production of liquid fuels for decades to come.

Future Platinum Outlook

Market Risks and Uncertainties

Despite the strong growth trajectory for platinum driven by SAF adoption, several factors could influence the pace and scale of demand:

- Policy changes: Delays, weaker mandates, or shifts in government incentives could slow SAF adoption, reducing platinum consumption in catalytic processes.
- Technological bottlenecks: Scaling PtL production and green hydrogen electrolysis may encounter operational or cost challenges, limiting platinum-intensive processes.
- Feedstock constraints: HEFA growth is restricted by the availability of sustainable oils and fats, potentially delaying the transition to sustainable jet fuel through alternative pathways.
- Platinum supply and cost: Should market dynamics or supply disruptions act to limit platinum availability or promote price volatility, this could constrain catalyst deployment, affecting SAF production rates. It should be noted that the quoted platinum demand figures are forecasts: current data on platinum usage in SAF production is extremely limited, and producers may explore alternative catalysts or recycling methods.

Platinum demand faces policy, technological, and supply risks, but SAF scale-up – especially PtL – provides a durable growth driver.

Opportunities for Platinum Demand Growth

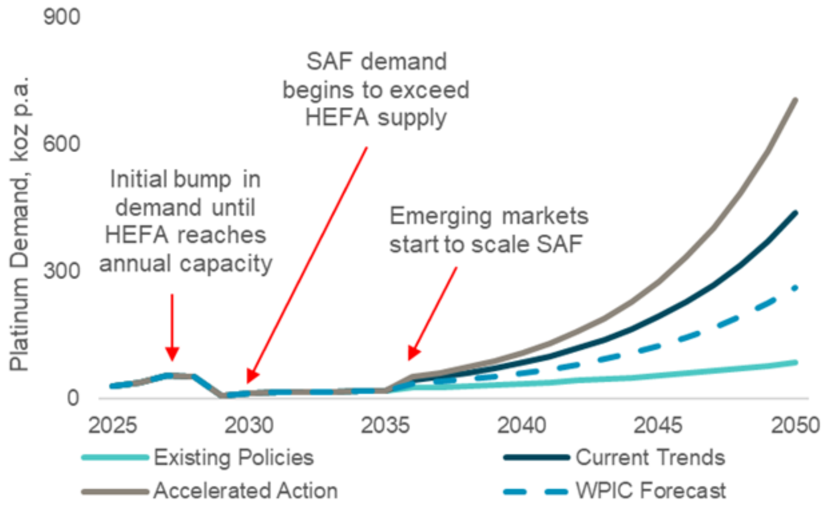
Platinum is set to play an increasingly important role in enabling the scale-up of advanced SAF technologies. High-value technological growth in PtL pathways and PEM hydrogen production is particularly platinum-intensive, embedding the metal at the core of the synthetic fuel value chain. As SAF deployment accelerates beyond HEFA's feedstock limits, these technologies are expected to drive the bulk of incremental production – and with it, platinum demand.

Under the WPIC forecast, total platinum demand from SAF is projected to increase almost ninefold between 2025 and 2050, rising from around 30 koz to more than 260 koz, with PtL accounting for more than 60% of that growth. This reflects not only its role in fuel synthesis but also its indirect pull through PEM electrolysis for green hydrogen, which underpins PtL's carbon-neutral production process.

At the same time, advances in catalyst design, efficiency improvements and increased recycling rates could help mitigate primary supply pressures, enabling the large-scale deployment of platinum-intensive technologies in a more sustainable way.

As airlines and governments implement progressively higher SAF blending mandates and invest in synthetic fuel infrastructure, platinum's role will shift from being concentrated in early HEFA production to becoming a strategic enabler of large-scale decarbonisation. This creates a durable, structural demand driver for platinum that is closely aligned with the aviation sector's transition pathway and broader climate objectives.

Figure 28. Projected Platinum Demand under all three SAF Scenarios (koz p.a)



Source: SkyNRG, WPIC estimates

Platinum demand will rise with SAF, shifting from HEFA to PtL/FT as the sector decarbonises.

Concluding Outlook

The trajectory of platinum demand will closely mirror the pace and scale of SAF deployment. While near-term growth is dominated by HEFA, medium- to long-term expansion into PtL and FT pathways will drive substantial increases in platinum use. Regulatory support, technological progress, and feedstock availability will be the key levers determining the magnitude of this demand, positioning platinum as a critical metal in the decarbonisation of the aviation sector.

Appendix

Policy and Regulatory Landscape

The SAF capacity and platinum demand outlook presented above is fundamentally shaped by the regulatory landscape. Ambitious growth in PtL and FT pathways is only possible under binding mandates, market-based measures, and targeted financial incentives. Governments and international bodies therefore play a decisive role in both the pace of SAF deployment and the scale of associated platinum demand.

Internationally, two core policies underpin the SAF market:

- **ICAO'S CORSIA** (Carbon Offsetting and Reduction Scheme for International Aviation): CORSIA allows airlines to use SAF that meets ICAO sustainability and greenhouse gas reduction criteria to reduce their offsetting requirements. Compliance is voluntary until 2027, after which participation becomes mandatory for all International Civil Aviation Organisation (ICAO) member states.
- **EU Emissions Trading System (ETS):** Within the EU, airlines must surrender emissions allowances and can benefit from a zero-emission factor for SAF certified under the Renewable Energy Directive (RED III). A dedicated SAF allowance mechanism is in place through 2030, and blending mandates require increasing SAF and synthetic fuel shares over time. Airlines can receive addition allowances for SAF use to close the price gap.

Regionally, policies vary but together establish the demand foundation:

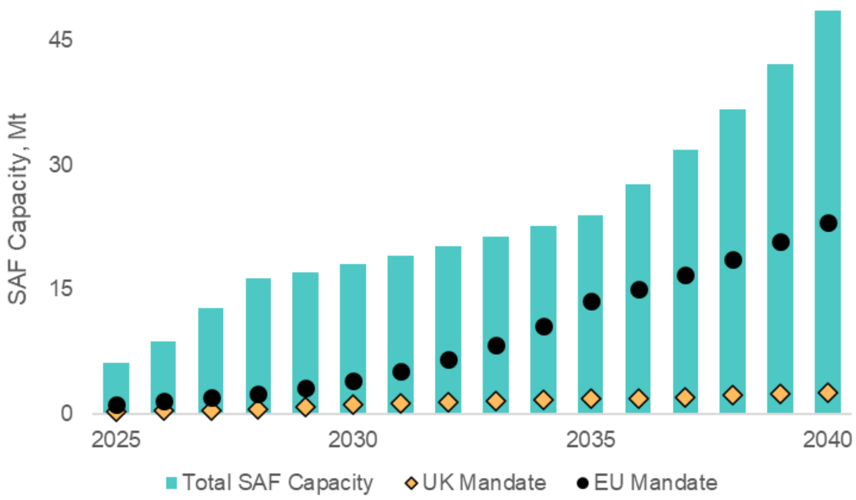
- **European Union:** The ReFuelEU Aviation Regulation mandates a 2% SAF blend beginning in 2025, increasing gradually to 70% by 2050. Within this, a dedicated sub-mandate requires synthetic or PtL fuels to make up 35% of aviation fuel supplied at EU airports by 2050. This progressive scaling of both total SAF and PtL use forms a key pillar of the EU's decarbonisation strategy. While it underpins the strong platinum demand trajectory assumed in the Accelerated Action scenario, achieving such outcomes globally would require all major regions to adopt mandates of comparable stringency - not just Europe.

- **United Kingdom:** A SAF mandate starts in 2025 and requires 2% of total UK jet fuel to be SAF. SAF blending increases to 10% in 2030 and 22% in 2040 along with a minimum e-SAF (PtL) requirement of 3.5% of total jet fuel, remaining here until there is greater certainty surrounding SAF. A HEFA cap is also in place to contribute a maximum 71% of SAF demand in 2030 and 35% in 2040 to meet its obligation. These measures ensure diversification into platinum-intensive fuel production pathways by 2040.
- **United States:** The US does not have a medium-term blending target but aims for a non-binding production target of 3 billion gallons (~9 Mt) annually by 2030. The Inflation Reduction Act (IRA) introduced a SAF tax credit of up to $1.75 per gallon, making the United States one of the most attractive markets for SAF developers. However, these incentives expired at the end of 2024, and legislation passed in July 2025 reduced the successor producer credit under Section 45Z to $1.00 per gallon from 2026 onward.
- **Asia:** Japan is targeting 10% SAF blending by 2030; Singapore mandates 1% by 2026, rising to 3-5% by 2030; and China and India are developing roadmaps that introduce mandates in the early 2030s. These markets are initially HEFA-led but will require PtL scale-up to meet long-term goals.
- **LatAm & Middle East:** Brazil's "Fuel of the Future" legislation sets a ~10% SAF target by 2037, while the UAE has committed to 1% by 2031, with stronger mandates likely. Both regions represent important growth markets in the 2030s and 2040s

A central regulatory challenge is the HEFA tipping point. While HEFA is projected to account for ~82% of global SAF output by 2030, feedstock limits mean it cannot sustain long-term growth. Caps on HEFA use, coupled with incentives and mandates for PtL and FT, will therefore be critical to shifting production towards scalable, platinum-intensive pathways.

The alignment of mandates in Europe and Asia, incentives in the US, and emerging frameworks in Latin America and the Middle East explains why SAF production in both the Current Trends and Accelerated Action scenarios accelerates sharply after 2030. Without these measures, platinum demand from SAF would remain marginal. Instead, regulation ensures that SAF capacity continues growing and thus sustained structural demand growth for platinum.

Figure 29. UK and EU SAF mandates compared against projected SAF production (Mt) to 2040



*Source: Organisation Internationale des Constructeurs d'Automobiles (OICA), WPIC research, *Current Trends scenario*

Glossary

1. **Accelerated Action** - High-growth scenario assuming rapid SAF scale-up via strong policy and financial support
2. **Alcohol-to-Jet (AtJ)** - SAF pathway converting sugars or starches into jet fuel
3. **ASTM** - American Society for Testing and Materials; sets aviation fuel standards
4. **ASTM Standards** - Specifications ensuring aviation fuel meets safety, energy and performance
5. **Blending Mandate** - Government requirement to mix a minimum % of SAF into conventional jet fuel
6. **Carbon Budget** - Maximum allowable greenhouse gas emissions to limit warming to a specific target
7. **Catalyst Promotion** - Use of metals like platinum to enhance catalyst activity and stability
8. **CORSIA** - The International Civil Aviation Organisation's (ICAO) Carbon Offsetting and Reduction Scheme for International Aviation; reduces offsetting requirements through SAF
9. **Current Trends** - Medium-growth SAF scenario reflecting incremental policy measures and industry commitments
10. **Drop-in Fuel** - Fuel compatible with existing aircraft engines and infrastructure
11. **E-SAF** - Synthetic SAF (e-fuel), such as Power-to-Liquid
12. **EU ETS** - European Union Emissions Trading System; regulates European aviation emissions with allowances and SAF incentives
13. **Existing Policies** - SAF growth scenario assuming only policies already legislated today
14. **Fats, Oils, and Greases (FOGs)** - By-products from food and industrial processes used as a HEFA feedstock

15. **Feedstock Ceiling / Limit** - maximum % of sustainable oils, fats, or other materials available for SAF production
16. **Fischer-Tropsch (FT)** - Synthetic SAF pathway converting biomass or waste into hydrocarbons
17. **Freezing Point** - Temperature at which fuel solidifies, critical for high-altitude performance
18. **Green Hydrogen** - Hydrogen produced via electrolysis using renewable electricity
19. **HEFA Cap** - Regulatory limit on the share of SAF that can be produced via HEFA
20. **Hydroisomerisation** - Catalytic process improving fuel properties, often platinum-dependent
21. **Hydroprocessed Esters and Fatty Acids (HEFA)** - Most commercially mature SAF pathway converting waste oils and fats into jet fuel using hydrogenation
22. **Inflation Reduction Act (IRA)** - US legislation providing tax credits, in this case to incentivise SAF production
23. **Iso-alkanes** - Branched hydrocarbons with improved cold-flow properties
24. **ICAO** - International Civil Aviation Organisation
25. **Jet A-1** - Conventional kerosene-based aviation fuel
26. **Jet fuel demand** - Total volume of aviation fuel required by airlines
27. **Platinum intensity** - Amount of platinum required per unit of SAF production (kg/Mt)
28. **Power-to-Liquid (PtL)** - Platinum-intensive synthetic fuel pathway using CO_2 and water with renewable electricity
29. **Proton Exchange Membrane (PEM) Electrolyser** - Device that splits water into hydrogen and oxygen, requiring platinum
30. **SAF Pathway** - Production route for SAF e.g., HEFA, FT, PtL, AtJ
31. **SkyNRG** - SAF supplier providing commercial flights and market outlooks
32. **Sustainable Aviation Fuel (SAF)** - Renewable alternative to kerosene for reducing aviation emissions
33. **Syngas** - Mixture of carbon monoxide and hydrogen, intermediate in FT and PtL processes
34. **Volumetric Energy Density** - Energy stored per unit volume of fuel; important for aircraft range and payload
35. **WPIC Forecast** - Baseline market projection for SAF and platinum demand between Current Trends and Existing Policies

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