WHITEPAPER

NovaSAF Pricing Framework

Strategic Insights for Offtakers

September 2025

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SYZYGY PLASMONICS

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Executive Summary

Understanding Syzygy's NovaSAF™ process

NovaSAF™ is Syzygy's biogas to sustainable aviation fuel (SAF) production process. NovaSAF combines Syzygy's proprietary Rigel E-Reforming photoreactor technology with Fischer Tropsch gas to liquid systems and hydrocracking technology. This combination transforms biogas from landfills, dairy farms and/or crop residue into an ASTM compliant fuel. This fuel can comply with RFNBO and Advance bioSAF requirements in the EU and is expected to qualify for LCFS/RFS and production tax credits in the US. Please see Syzygy's white paper Solving the SAF Trilemma which serves as an introduction to our pathway.

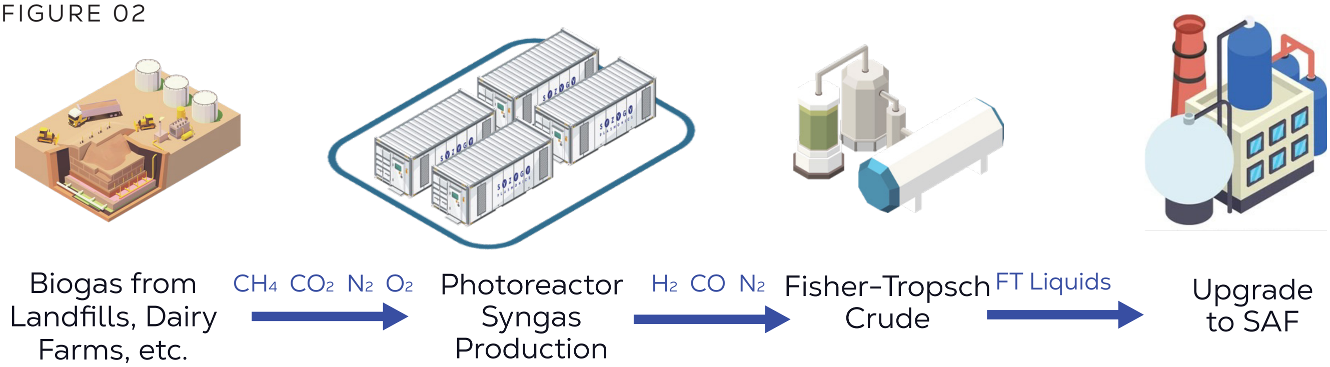
FIGURE 01

Syzygy's Rigel E-Reforming Photoreactor

Syzygy's Rigel e-Reforming photoreactor is a light-powered chemical reactor that replaces traditional combustion-based reactors, improving efficiency and operational flexibility.

Our goals for globally applying the NovaSAF™ process

FIGURE 02



Syzygy has identified that low-cost biogas feedstock presents a transformative pathway for producing sustainable aviation fuel (SAF) at equally low cost. This unlocks new opportunities for scalable, affordable decarbonization in aviation. Through our analysis, we can draw the following conclusions, which we will expound upon further in this paper.

Price of SAF

$3,000/ ton e-SAF in EU / UK

Potential for Jet Parity in USA, Brazil, and China

Timeline & Tonnage

Potential to achieve >1 million tons SAF by 2035

Mandate Qualification

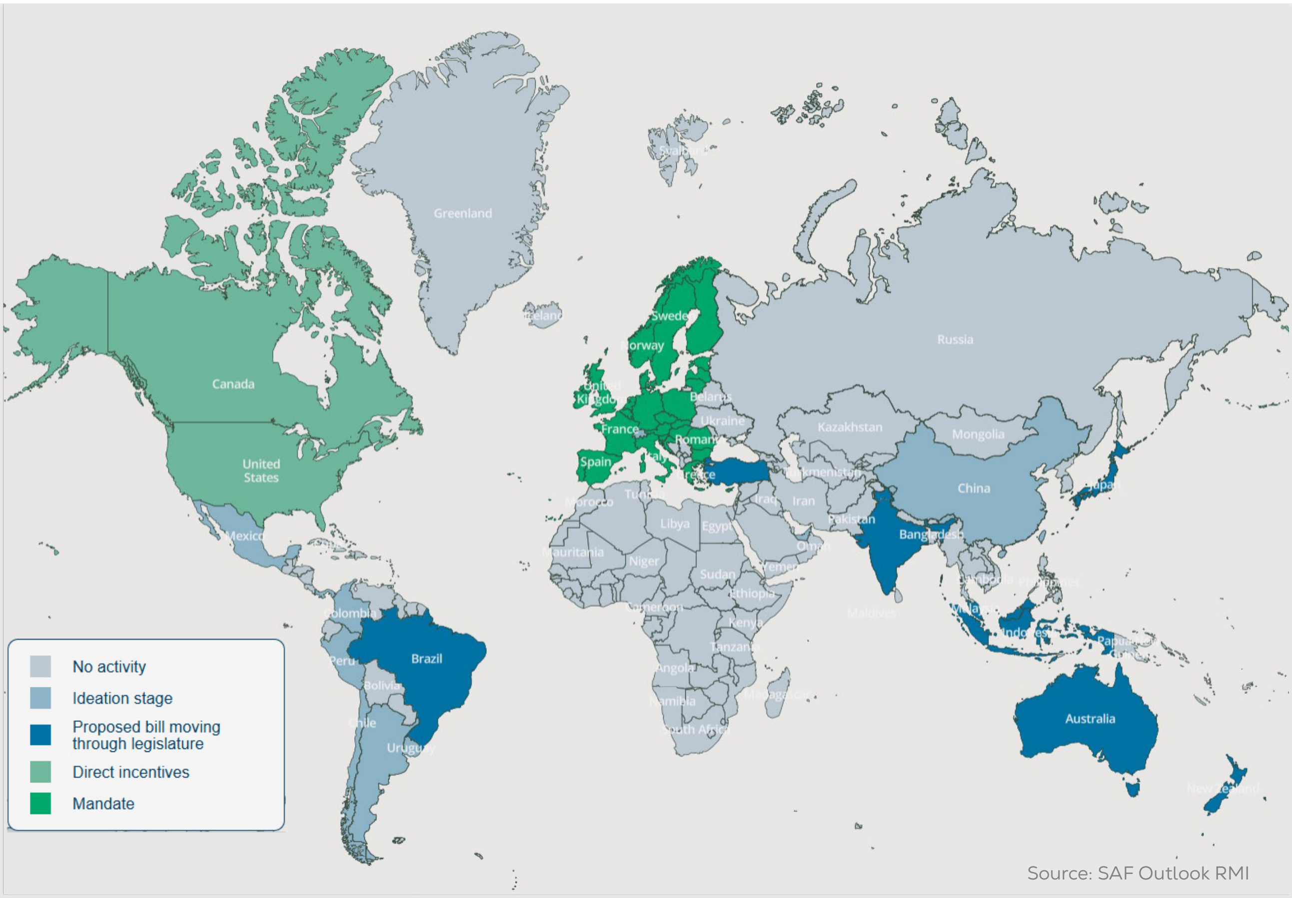
NovaSAF produces a stream that qualifies for RFNBO and Advanced BioSAF in EU

Global SAF Market – Mandate Driven, Incentive Driven, Voluntary

NovaSAF produces a low-cost stream that qualifies for RFNBO and Advanced BioSAF in EU. Syzygy Plasmonics has engaged dozens of airline stakeholders globally and uncovered three distinct Sustainable Aviation Fuel (SAF) market drivers with differing supply needs. Airlines are racing to keep up with demand for SAF but face significant challenges in securing supply, as governments tighten climate regulations and corporations pursue aggressive sustainability goals.

- Mandate Markets: Regions with mandated supply such as the EU, UK, and CORSIA-aligned countries. Some regions have additional mandated requirements for renewable electricity-based fuels (RFNBO or PtL).
- Incentive Markets: A unique blend of voluntary demand and powerful state and federal incentives for fuel production as is present in the USA.
- Voluntary Markets: Countries and carriers pursuing SAF for ESG and Scope 3 goals without regulatory mandates or government incentives.

FIGURE 03 | 2025 SAF Policy Map



Source: SAF Outlook RMI

SAF Purchasing Realities for Airlines

Fuel is among the largest and most volatile operation expenses for airlines - typically around 20% of total costs. However, this share quickly exceeds 30%, even approaching 40% in more extreme price environments. We have clearly identified two price regimes within the SAF market to provide solutions to airlines.

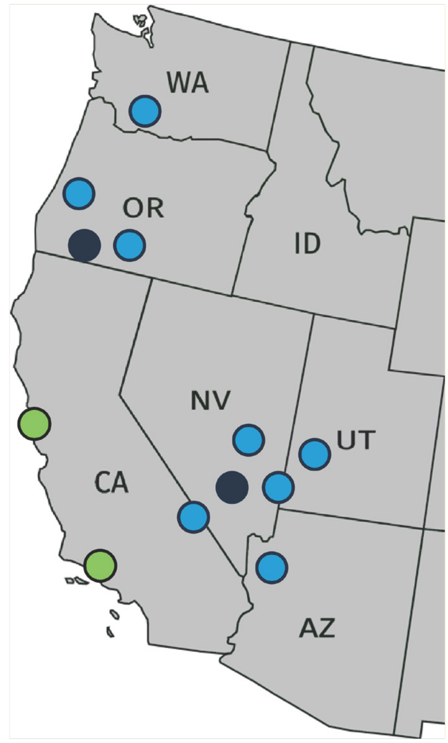
- Mandate Driven SAF Prices (SAF & e-SAF) – In mandated markets, SAF pricing is anchored to SAF market indices, regulatory requirements, and associated penalties (the “buyout price”). Limited supply pushes prices toward the buyout price; abundant supply narrows the gap toward conventional jet fuel parity.
- Incentive and Voluntary SAF Prices – Outside mandated jurisdictions, SAF demand is primarily price-driven. Airlines generally aim to purchase SAF at or near jet fuel parity, with only limited exceptions. When parity pricing is achievable, purchase volumes are determined by the supplier’s ability to reliably deliver.

NovaSAF Pricing and Volume Potential

Example Facility Overview

Syzygy's SAF production strategy uses a hub-and-spoke model to match the diversity of biogas sources. At the spoke level, modular e-reforming and Fischer-Tropsch (FT) technologies convert biogas into FT crude. These systems are designed to scale with the size of each site, making them ideal for both large and small biogas facilities such as landfills, crop residue zones, and dairy farms. The FT crude is then transported to a central hub, where it is upgraded into ASTM compliant SAF using hydrocracking– a process that scales best in large, custom-engineered facilities. Sites with sufficient volume scale will have hydrocracking onsite.

FIGURE 04



Likely offtake (eg. airport)

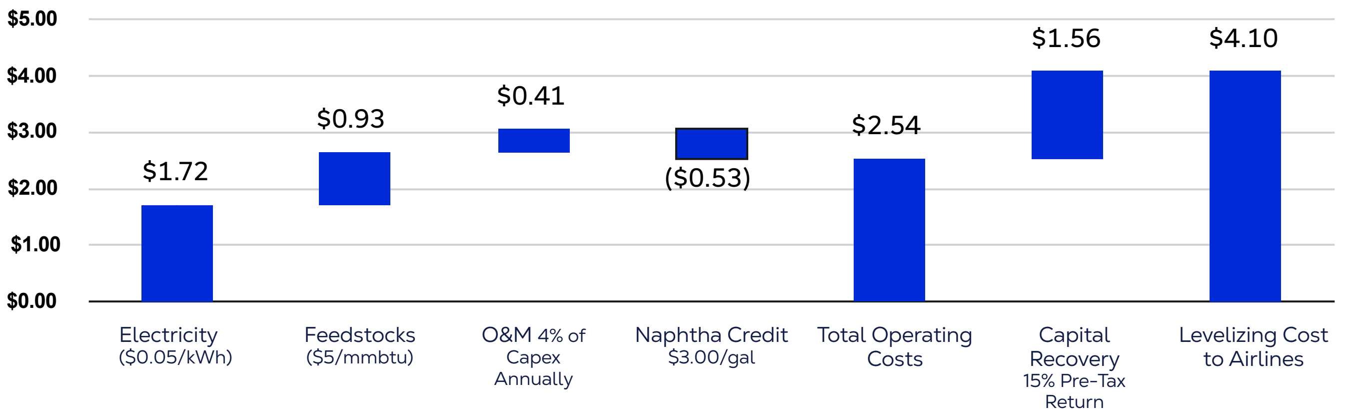
Satellite landfills for clusters

NovaSAF plant

Facility volumes may be as large as 1,000,000 tons per year, or as small as 25,000 tons per year. Based on the conversations we are having for a typical hub and spoke group of facilities, we see 100,000 tons of SAF per year as an economically viable starting point, based on our initial FEL-2 estimates of a $450M cost for construction. Assuming $0.05/kWh power and $5/MMBtu gas, you can see the production cost breakdown per gallon in Figure 05.

NovaSAF production economics are shaped primarily by two factors: the cost of renewable electricity and the required return on capital investment which account for more than two-thirds of total production costs. Biogas feedstock and overhead expenses represent a smaller portion.

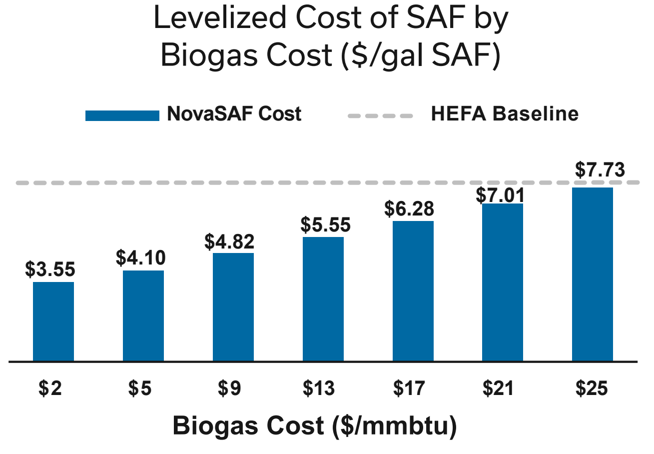
FIGURE 05 | NovaSAF Cost per Gallon Breakdown ($/gal SAF)

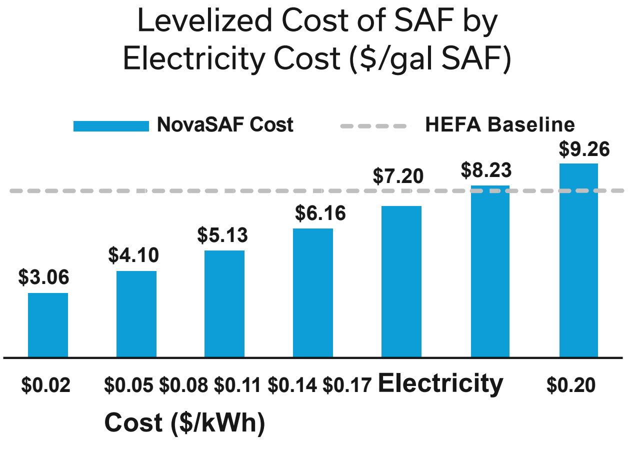


NovaSAF Cost Sensitivity to Inputs

Based on the previous analysis as a baseline, Syzygy's estimated costs of NovaSAF vary by electricity and biogas costs. Syzygy estimates it can provide SAF to the market below current biofuels (HEFA) prices when biogas costs are below $20-25/mmbtu or electricity costs are below ~$0.15/kWh for a large-scale facility, all else equal. Below we present how changing biogas costs or changing power costs affect Syzygy's overall cost of production.

FIGURE 06

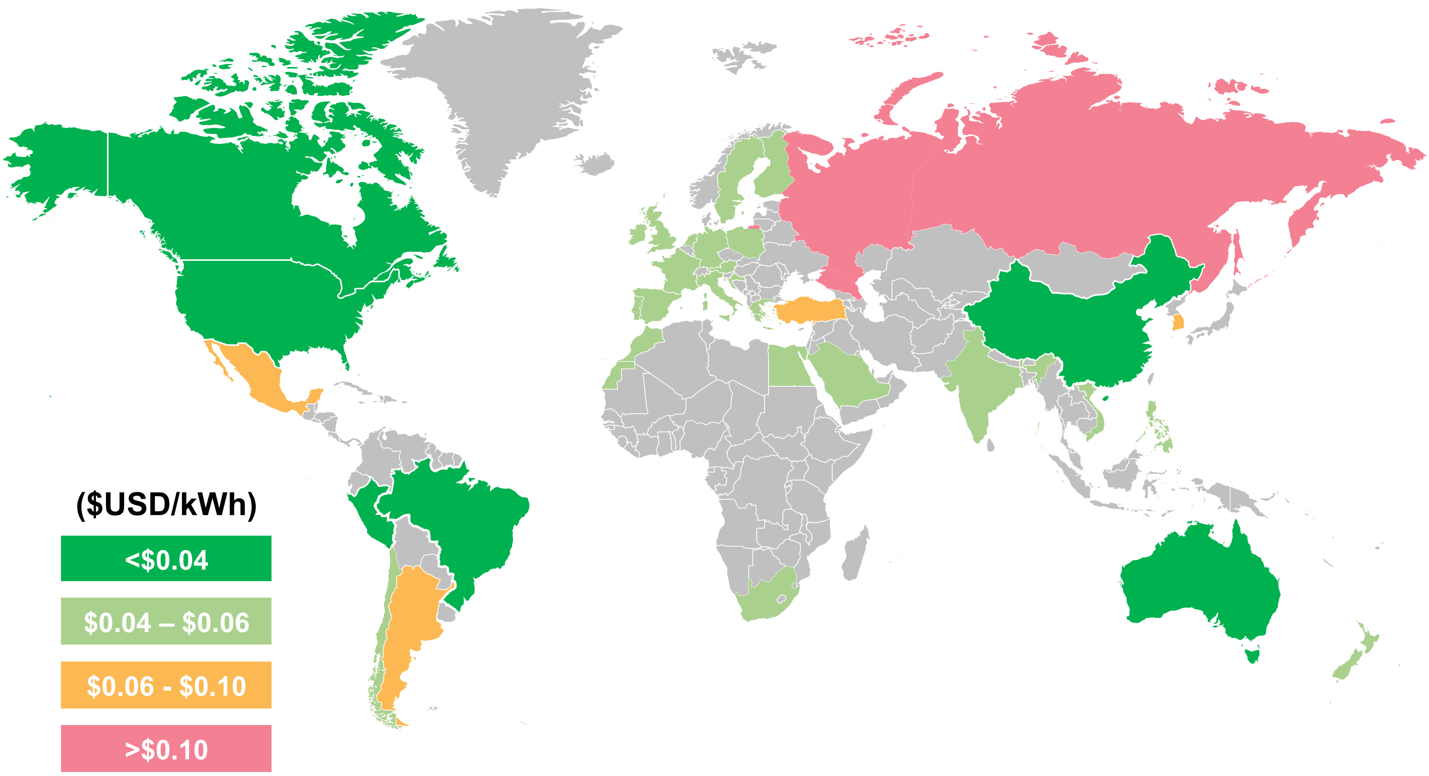




Now that SAF production costs are understood, it is important to look at how geography affects input prices. Both electricity and biogas pricing is highly regional, influenced by local market dynamics and resource availability.

Figure 07 shows the approximate cost of renewable electricity PPA's in different regions. We see that many areas have the potential to meet power cost targets.

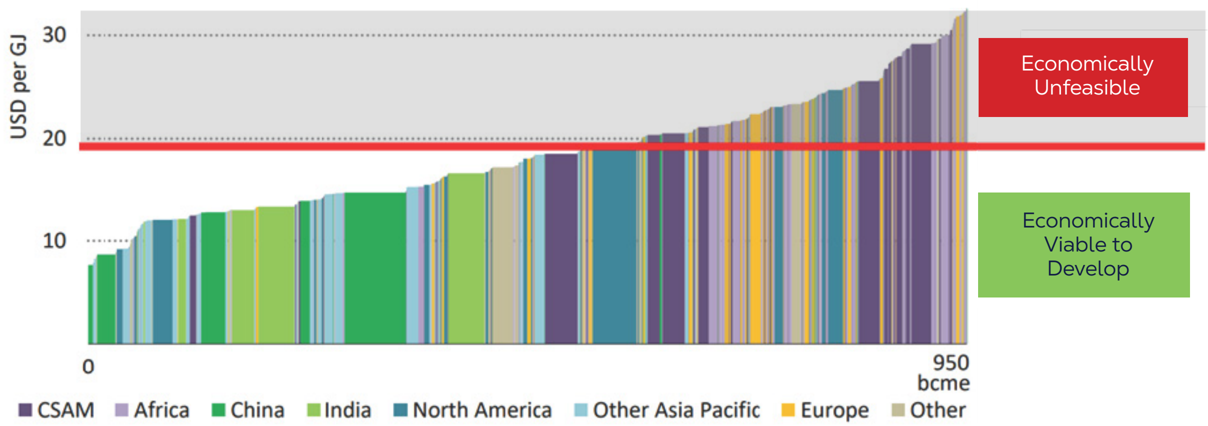
FIGURE 07 | Levelized Cost of Renewable Electricity - Project Potential



Source: Our World in Data and IRENA - Renewable Power Generation Costs in 2024. International Renewable Energy Agency, Abu Dhabi (2025).

Biogas availability is discussed in our previous white paper, Solving the SAF Trilemma. Figure 08 depicts biogas development costs by region. Syzygy estimates \$4–6 per MMBtu of this cost can be avoided by eliminating CO_2 separation and pipeline fees. NovaSAF avoids these costs by purchasing the raw biogas (containing both CH_4 and CO_2) and co-locating biogas development directly with the SAF project. This approach unlocks access to roughly 70% of the global biogas market priced below \$20/MMBtu (\$19/GJ) - a critical threshold for achieving SAF costs below conventional biofuel benchmarks.

FIGURE 08

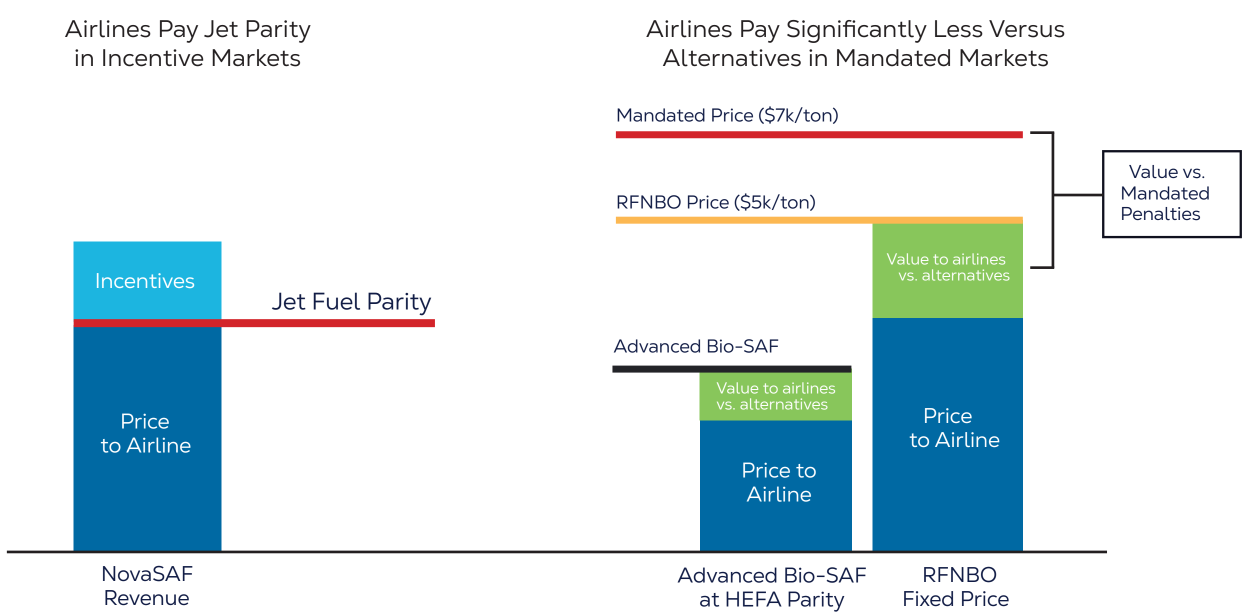


Source: IEA Outlook for Biogas and Biomethane, May 2025

Fuel Pricing Strategy

Syzygy's fuel pricing strategy is focused on index-based pricing, which is currently available for both jet fuel and HEFA based SAF. For e-SAF, for which there is not yet an index, Syzygy will be pricing this at a point that ensures the project financiers make an adequate return (capital recovery) while still offering a best-in-class price to airlines.

FIGURE 09 | Airlines Prices in Incentive and Mandated Markets



Syzygy will sell fuel to airlines at price parity with jet fuel in markets where strong incentives are present, and for a select number of facilities where power and feedstock costs are exceptionally low, Project financiers will make their returns through the associated government incentives and carbon abatement credit markets.

For markets that are mandate driven, primarily in the EU and UK, Syzygy will sell the bioSAF portion of our product at HEFA parity, and the RFNBO SAF portion at a set price that enables the project to be financed.

Fuel Tonnage and Timeline

The following geographies are ideal for development based on the availability of feedstock, low-cost power, and overall good project economics. Syzygy has begun active development of projects in each of the following areas.

TABLE 01

Geography	Feedstocks	Potential Fuel Tonnage by 2030
India	Manure, Crop Residue	100,000
USA	Landfill, Crop Residue	150,000
Brazil	Crop Residue	50,000
China	Landfill, Crop Residue	150,000
Europe (select areas)	Manure, Crop Residue	50,000

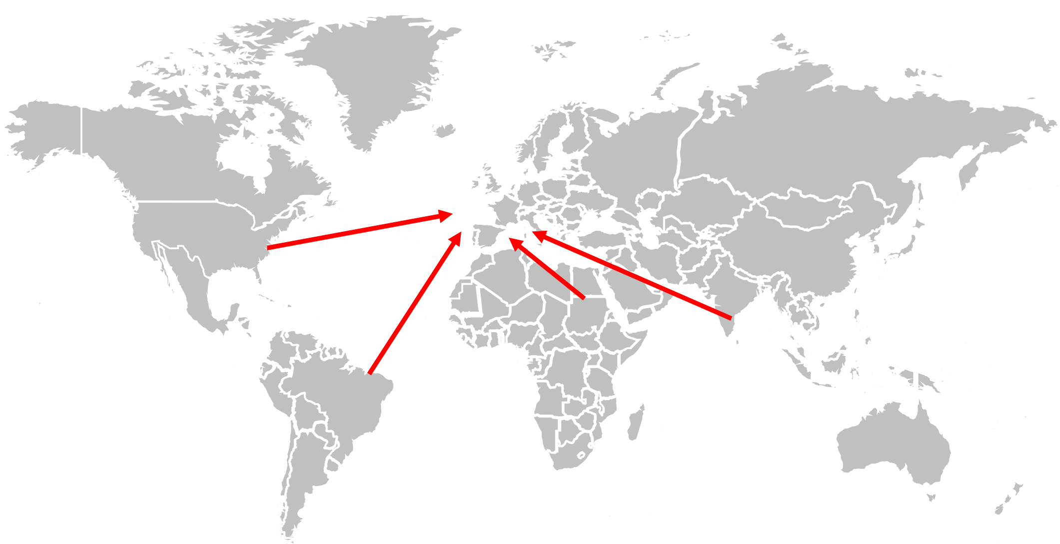
Mandate Market Case Study: European Union

Case Study Overview

Syzygy's NovaSAF process yields fuels that classify as RFNBO SAF and Advanced BioSAF. Syzygy will split and sell these volumes separately so that they may be applied against the appropriate mandate. Fuel will be delivered with all documentation necessary to qualify it against the associated program (ReFuelEU Aviation, RED III, the UK SAF Mandate, etc).

Syzygy aims to produce large quantities of fuel in geographies that have ideal characteristics, and where necessary import these volumes into the EU. Syzygy's goal is to develop hub and spoke projects capable of delivering more than 100,000 tons of SAF per year into the EU by 2030.

FIGURE 10 | NovaSAF Cost Difference vs. HEFA



Fuel Pricing in the European Union

For the Advanced BioSAF portion of our fuel, pricing will be indexed against HEFA. We estimate the average future HEFA price to be around $1,800 per ton.

For the e-SAF portion of our fuel, Syzygy estimates that numerous projects can be economically viable at a price of $3,000 per ton.

NovaSAF Fuel Classification Under European Regulations

EU regulations allow fuels to be classified as both RFNBO and advanced bioSAF when both feedstocks are present in the process, as is the case with NovaSAF.

Advanced BioSAF is defined in the EU regulations as a sustainable aviation fuel made from non-food materials listed in Annex IX Part A, including specific types of biogas. This includes methane and carbon dioxide captured from landfills, farms, and wastewater treatment plants.[iii] Based on this definition, a portion of fuel produced by a NovaSAF plant will be classified as advanced bioSAF.

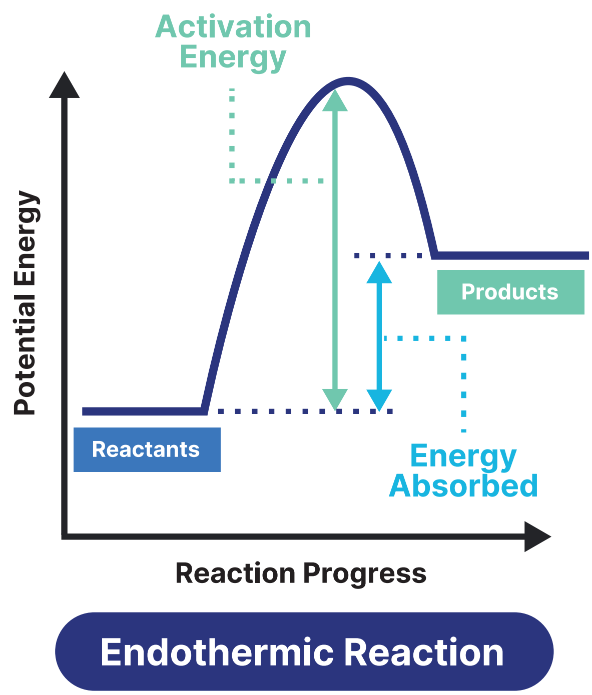
Renewable Fuels of Non-Biologic Origin (RFNBO) are defined in the EU regulations as a "liquid or gaseous fuels which are used in the transport sector other than biofuels or biogas, the energy content of which is derived from renewable sources other than biomass.[iv] The most common source of RFNBOs is renewable electricity. Only renewable electricity sources "that are used to enhance the heating value of the fuel or intermediate products are considered relevant towards the contribution of RFNBO production.[v] As Syzygy's e-Reforming biogas to syngas step is a highly endothermic reaction, the renewable electricity used in this intermediate step goes towards the production of fuel classified as RFNBO.

This assessment has been confirmed by Peterson Solutions, a EU-based consultancy with deep expertise in ISCC implementation. Streams which contain both RFNBO and other inputs are covered in the Commission Delegated Regulation (EU) 2023/1185, Annex Section 3a (page 5), "the fraction of renewable liquid and gaseous transport fuels of non-biological origin shall be determined by dividing the relevant renewable energy input into the process by the total relevant energy inputs into the process." The calculation can be found in Figure 11.

FIGURE 11

$$RFNBO\ \% = \frac{Input_{ren.energy}[MJ]}{Input_{total\ energy}[MJ]}$$

FIGURE 12



The Delegated Acts in Article 1 further clarify that non-electrolysis routes are acceptable when it is stated "these rules shall apply to the production of renewable liquid and gaseous transport fuels of non-biological origin via electrolysis and analogously for less common production process".

NovaSAF Fuel Classification under the UK SAF Mandate

NovaSAF also meets the UK's Sustainable Aviation Fuel (SAF) Mandate, including the Power-to-Liquid (PtL) sub-obligation, through a synthesis pathway that integrates renewable electricity and captured carbon. Under the SAF Mandate, PtL fuels are classified as Renewable Fuels of Non-Biological Origin (RFNBOs) and must meet stringent carbon and sustainability criteria, including lifecycle greenhouse gas (GHG) emissions thresholds and additionality requirements, as outlined in Chapter 3.2 of the RTFO and SAF Mandate Technical Guidance 2025.

To quantify eligible PtL volumes, NovaSAF applies the Department for Transport's prescribed energy-based allocation formula, detailed in Chapter 4.33 of the same guidance:

FIGURE 13

$$\text{MJ of RFNBO / PTL} = \left(\frac{\text{MJ of eligible inputs}}{\text{MJ of all energy inputs}}\right) \times \text{MJ of fuel produced}$$

Eligible inputs under the SAF mandate include renewable (non-bioenergy) sources. The NovaSAF platform maximizes the proportion of eligible energy inputs, thereby increasing the certifiable RFNBO output.

The UK regulations support mass balance chain of custody tracking and third-party verification of feedstock origin, conversion efficiency, and emissions intensity. Acceptable chain of custody systems and mass balance rules are described in Chapter 5.2.

Based on the UK Department for Transport's official guidance, compliance with the ISCC EU voluntary scheme is recognized as sufficient to meet the UK's carbon and sustainability (C&S) requirements for SAF. This is confirmed in its List of Voluntary Schemes Approved for the RFTO and SAF Mandate which lists ISCC EU among the approved schemes, and is also one of the approved voluntary schemes listed by the UK government for demonstrating compliance with both the RTFO and SAF Mandate.

This means that if NovaSAF's production and supply chain are certified under ISCC EU, the associated SAF volumes can be counted toward both the main SAF obligation and the PtL sub-obligation under the UK program, as per Chapter 6.1.3.

By aligning NovaSAF's sustainability documentation and verification processes with ISCC EU standards, Syzygy ensures that its SAF output is eligible for certification and crediting under the UK mandate. This streamlines regulatory compliance and enables fuel suppliers and airlines to confidently claim SAF volumes toward their UK obligations without duplicative verification efforts.

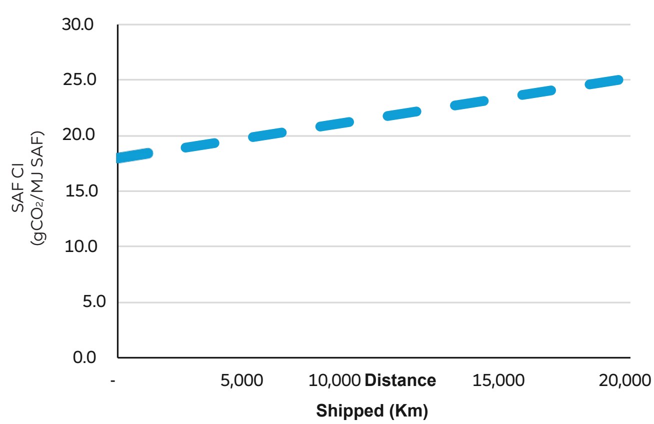
Carbon Intensity of Produced and Imported Fuels

To qualify as a sustainable aviation fuel under REDIII, the fuel must achieve a carbon intensity reduction of at least 70%. As it currently stands, the maximum allowable CI is ~28g CO_2/MJ. Projects that have an overall lifecycle carbon intensity above this level will not qualify. Because of this, Syzygy must take care when advancing projects to ensure that the overall carbon intensity stays below these thresholds.

If the right requirements are met, renewable electricity is considered as zero emission under RED II. Beyond the electricity, there are several processes within a NovaSAF plant that may add to the CI score. Our estimation for a typical NovaSAF facility is that the CI score will be around 18 gCO_2/mj at the plant gate. The final contributor to carbon intensity is the distance the fuel is transported. Global transportation can add up to 7 gCO_2/MJ to the final carbon intensity of the fuel, so projects that already have borderline carbon intensity will need additional scrutiny if there are long logistics supply chains to get the fuel into Europe.

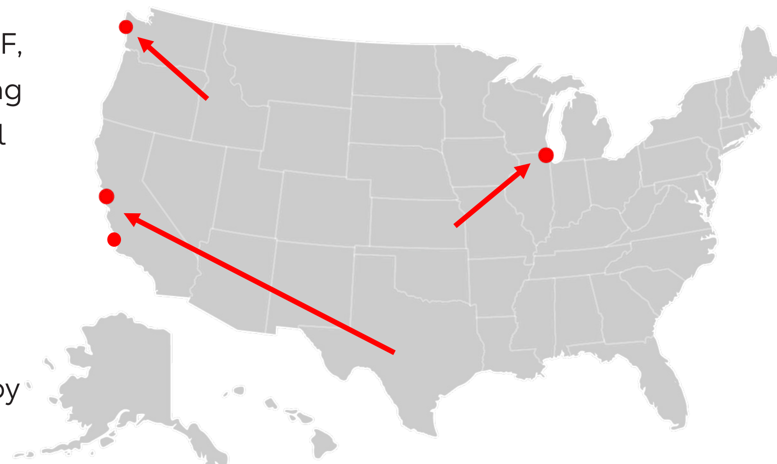
When we look at how our NovaSAF process can apply globally, we see that a vast majority of projects globally will have a CI score that meets the 70% reduction vs jet fuel across the value chain when coupled with renewable electricity. This includes all reasonable considerations for the carbon emissions during fuel production, transportation, and distribution into the wing of an airline.

FIGURE 14 | SAF Carbon Intensity by Distance Shipped



Incentive Market Case Study: United States Case Study Overview

FIGURE 15



The US offers one of the most robust and multi-layered incentive environments for SAF, making it a primary market for airlines seeking cost-effective decarbonization. NovaSAF will most likely qualify for all major federal and state programs and deliver exceptional financial performance.

Syzygy aims to develop US projects capable of more than 100,000 tons of SAF per year by 2030 for delivery of fuel into LAX, SFO, SEA, or ORD.

Fuel Pricing in the United States

SAF Price at Jet Fuel Parity

Due to the robust incentive system available in the US, Syzygy is able to offer our fuel at Jet Parity to airlines.

NovaSAF Fuel Classification Under US Regulations

NovaSAF will be able to qualify for three key incentive programs:

•Renewable Fuel Standard (RFS): NovaSAF will earn D3 RINs, the highest-value renewable identification numbers, due to its cellulosic biogas feedstock and low carbon intensity. These credits are tradable and can generate up to $4-5/gal in revenue.

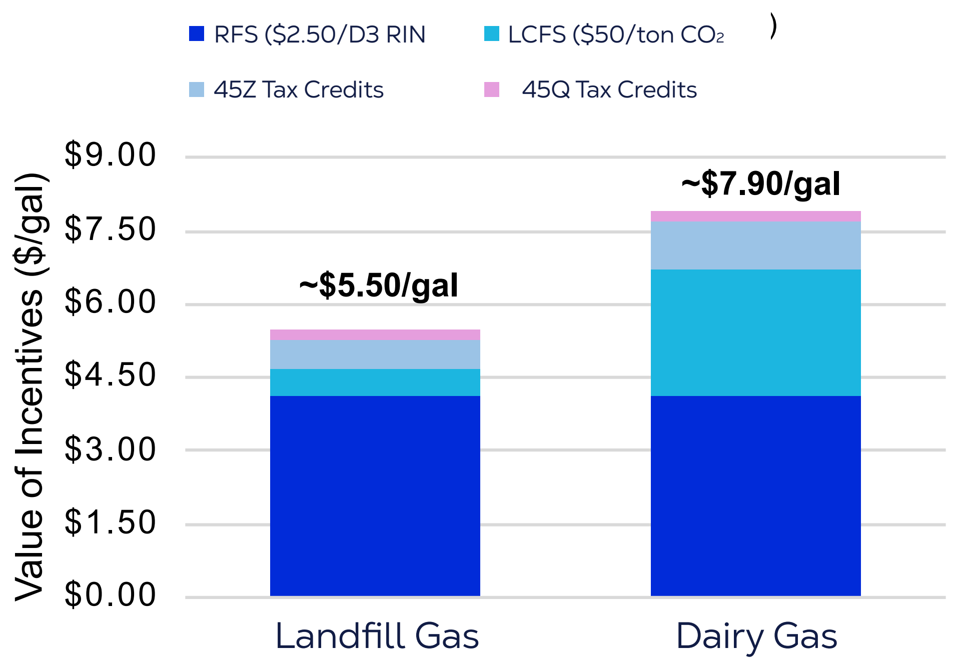
•Low Carbon Fuel Standard (LCFS): In California and other participating states, NovaSAF CI scores yield high LCFS credit values—often exceeding $2/gal with manure-based feedstocks which include avoided methane emissions and therefore see 300-400% CI reductions or ~$0.50/gal for landfill feedstocks. 16

•Inflation Reduction Act (IRA) 45Z: Starting in 2025, NovaSAF would qualify for production tax credits of up to $1.00/gal, based on lifecycle emissions reductions compared to fossil Jet-A.

•IRA 45Q: Allows for CO_2 utilization or sequestration pathways to earn up to $85/ton CO_2 utilized, providing a ~$0.20/gal benefit for NovaSAF.

When stacked, these incentives can generate up to $5-8/gal in value, transforming the economics of SAF production and enabling airlines to secure long-term offtake at Jet-A parity.

FIGURE 16 | Potential NovaSAF Incentives in the U.S.



Carbon Intensity of Produced Fuels

Under California's LCFS, SAF can generate credits if its lifecycle carbon intensity is lower than the fossil jet fuel baseline (~82 gCO_2e/MJ in California). CI is calculated using the CA-GREET model, which incorporates California-specific data on feedstocks, electricity, and transport emissions. CARB publishes certified CI values for all approved fuel pathways, including SAF, and requires direct use of renewable electricity to reduce CI—RECs or grid-average mixes are not accepted unless the renewable source is physically connected.[viii] While SAF is eligible for credit generation, it is not currently a mandated fuel under LCFS.[ix] This allows SAF producers like Syzygy to access the valuable voluntary carbon markets on top of the RFS/LCFS programs. At the federal level, the RFS evaluates CI using lifecycle greenhouse gas analyses based on GREET-derived models. SAF qualifies for D3 RINs if it achieves at least a 60% GHG reduction compared to petroleum fuels. EPA-approved pathways include SAF produced from cellulosic biomass, landfill gas, and separated municipal solid waste, provided the production process uses biogas or biomass as the sole energy source.

This alignment between LCFS and RFS methodologies allows SAF producers to pursue dual compliance strategies, leveraging both credit systems when lifecycle emissions are properly validated, while also accessing the valuable voluntary carbon markets.

Voluntary Markets Unlocking Demand Beyond Mandates

The voluntary market for SAF is rapidly becoming a critical growth channel, driven by corporate climate commitments, investor pressure, and brand differentiation. Unlike mandate markets, voluntary demand follows a similar trajectory to incentive markets. There is little demand at high prices and the airlines need SAF prices to approach jet fuel parity for them to participate.

A key element of voluntary SAF purchases is the valorization of the Scope 3 emissions reductions in markets without established mandates. These scope 3 credits are purchased by corporations that have meaningful amounts of air travel and desire to support decarbonization. Aviation is often the largest contributor to corporate travel emissions, and companies are increasingly seeking credible ways to reduce their carbon footprint. Airlines are responding by offering low-carbon travel programs and partnering with coalitions like SABA, Clean Skies for Tomorrow, and the First Movers Coalition to aggregate demand and secure supply.

Syzygy's NovaSAF model enables sustainable aviation fuel (SAF) production near jet fuel parity by leveraging low-cost renewable electricity and biogenic feedstocks in select global regions—primarily South America, Australia, China, and parts of North America and Asia. Voluntary Scope 3 credit purchases, typically in the \$100–\$200/ton CO_2 range, further reducing costs and making SAF more accessible without relying on regulatory incentives.

To support adoption outside regulated markets, Syzygy offers flexible offtake models including Scope 1 and Scope 3 options, and book-and-claim systems that allow buyers to claim environmental benefits regardless of delivery location. Syzygy also actively participates in SABA's voluntary credit program and is expanding partnerships with credit brokers to scale market engagement.

Conclusion: Partnering to Power the Future of Aviation

The global aviation sector is entering a decisive decade for the future of SAF. Regulatory mandates in the EU, UK, and beyond are no longer distant targets—they are here, accelerating demand for compliant, low-carbon fuels. The SAF market is also becoming more established, with economics and technology meeting the needs of the day. Airlines that act now to secure long-term SAF and eSAF supply will not only safeguard compliance but also gain a competitive edge in cost management, sustainability leadership, and customer trust.

Syzygy, through our NovaSAF platform, is ready to partner with airlines to meet these challenges head-on. Our tailored offtake agreements align with your specific compliance obligations under ReFuelEU Aviation, RED III, the UK SAF Mandate, and CORSIA—while providing flexibility to adapt as regulations evolve. By leveraging currently untapped low-cost feedstock, we minimize supply competition, stabilize pricing, and ensure your sustainability investments deliver maximum value.

This is the moment to secure your future fuel supply. By engaging in structured offtake discussions today, you lock in access to scalable, compliant SAF and eSAF volumes—guaranteeing both regulatory alignment and a clear pathway toward your net-zero commitments.

NovaSAF is built to scale, powered by cutting-edge technology and a commitment to transparency, certification integrity, and lifecycle GHG reductions. Together, we can accelerate the transition to a low-carbon aviation future and make sustainable flight the new standard.

References

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iii Commission Delegated Directive (EU) 2024/1405 of 14 March 2024 amending Annex IX to Directive (EU) 2018/2001 of the European Parliament and of the Council as regards adding feedstock for the production of biofuels and biogas

iv Directive (EU) 2018/2001, Article 2(36) See: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32018L2001.

v Directive (EU) 2018/2001, Article 2(36); Commission Delegated Regulation (EU) 2023/1185, Annex Section 3a; ISCC EU 205-1, pages 7 and 18.

vi Commission Delegated Regulation (EU) 2023/1184. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1408&qid=1755564053699

vii Commission Delegated Regulation (EU) 2023/1184, Article 1. https://eur-lex.europa.eu/eli/reg_del/2023/1184/oj/engvii Sustainability Certification for the Transport and Energy Sector in the European Union https://www.iscc-system.org/certification/iscc-eu/

viii LCFS Pathway Certified Carbon Intensities – CARB

ix Low Carbon Fuel Standard Program Overview – CARB

x Overview of the Renewable Fuel Standard Program | US EPA

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