Year in Review 2025

January 2026

impact

ON SUSTAINABLE AVIATION

CONTENT

INTRODUCTION

Dr. Ulrike Ziegler

President of the Board of impact on sustainable aviation e.V. ***(impact)***

A YEAR OF TANGIBLE TRANSITION: *impact's* 2025 IN REVIEW

As we reflect on 2025 and look ahead to 2026, 2025 draws to a close, aviation's decarbonisation journey reveals a landscape shaped as much by progress as by pressure. The year delivered tangible breakthroughs that demonstrated what is possible when ambition, policy, and capital align. Most notably, Infinium became the first e-SAF project to reach final investment decision and secure project finance – supported by HSBC, an ***impact*** member – marking an important milestone for the sector.

At the same time, this momentum unfolded against a challenging backdrop. Signs of ESG fatigue became more pronounced, the dissolution of the Net Zero Banking Alliance raised questions about the durability of voluntary commitments, and the narrowing of the Corporate Sustainability Reporting Directive's (CSRD) scope for many companies, including aircraft lessors – while easing reporting requirements – risks creating a false sense of comfort. Policy uncertainty for SAF projects continued to weigh on investor confidence, even as global aviation CO_2 emissions resumed their upward trajectory. The message from 2025 is unambiguous: the transition is underway, but it will require greater clarity, coordination, and collective resolve to stay on course.

Policy developments reflected this duality. SAF mandates gained further traction, with new frameworks emerging in markets such as Japan and Turkey, adding to the UK's mandate, ReFuelEU Aviation, and an existing range of US incentives. Yet concerns that elements of the EU's eSAF sub-mandate could be diluted underscored the persistent volatility surrounding long-term policy signals. In parallel, we saw discussions around the potential expansion of the EU ETS, an upcoming EU decision that hinges on the absence of satisfactory adoption and delivery under CORSIA, becoming more pronounced. Despite these uncertainties, one trend was clear – environmental regulation continues to tighten rather than retreat.

Market signals in 2025 were equally mixed. While Infinium's FID provided a powerful proof point, voluntary SAF offtake volumes continued to decline over the year, with contracts shortening in tenor – reinforcing the importance of mandated demand to underpin project finance. Against the backdrop of a persistent SAF cost premium, demand aggregation mechanisms – such as those developed by Future Energy Global (FEG) and ATOBA – as well as CEO-led initiatives – like Project SkyPower, of which *impact* is a member and which facilitates the advancement of e-SAF projects in Europe to FID -, became increasingly critical.

At the same time, financial scrutiny intensified, with the European Banking Authority (EBA) raising concerns over data quality in transition risk assessments.

In this complex environment, *impact's* conviction that pre-competitive collaboration is essential was strongly validated. A landmark achievement in 2025 was the scientific vetting and publication of our Milestone Concept in a leading academic journal, significantly strengthening its credibility as a practical transition framework. To support its application, *impact* releases the "Practitioner's Guide - Milestone Concept" in January 2026. CDB Aviation became the first lessor to apply the Concept in its reporting, while ongoing work with airline partners is translating long-term targets into concrete, actionable case studies. In parallel, our network continued to expand, bringing new perspectives and expertise into the community.

Access the Practitioner's Guide here:

Looking ahead, the challenge is stark. Aviation emissions are rising, and the transition is no longer optional. *impact*'s role is to equip its members to navigate this complexity – broadening understanding across decarbonisation levers, enabling informed client dialogue, and strengthening risk management in a rapidly evolving landscape.

Lastly, we are pleased to announce the second edition of the by-invitation-only **IMPACT Forum** (the "Forum"), co-hosted by WTW, taking place in **May 2026 in London.** The Forum is the only platform convening willing and committed stakeholders from across the full aviation decarbonisation ecosystem to take stock of progress across all decarbonisation levers and to discuss concrete near-term actions. As we look toward its second edition, we reaffirm our commitment to fostering the shared learning and collaboration that will be essential for collective success.

ENGAGE WITH US – BECAUSE TOGETHER WE CAN MAKE THIS TRANSITION INVESTABLE, SCALABLE, AND REAL.

NOTE: Opinions expressed in this year-end publication are those of the contributing authors and do not necessarily represent the views of ***impact.***

impact WEBINARS

PROJECT ROADRUNNER: THE ROAD TO SECURING FID

On September 10, 2025, ***impact*** hosted its first dedicated webinar, *"Project Roadrunner: The Road to Securing FID"*, which drew over 140 participants to learn about Infinium's groundbreaking e-fuel project in Texas and its journey to reach final investment decision (FID) in mid-2025. Moderated by Alastair Blanshard (ICF), the panel featured Ayesha Choudhury (Infinium), Aaron Robinson (IAG), Rohan D'Sa (HSBC), and James Diaz-Sokoloff (AP Ventures) – each representing a crucial piece of the puzzle in bringing *Project Roadrunner* to life.

With a capacity of 23,000 metric tons per year and located in Reeves County, West Texas, *Project Roadrunner* is set to become the world's largest e-fuel facility once operational. The project follows the successful pilot *Pathfinder* in Corpus Christi (South Texas), scaling production tenfold.

The producer: Scaling with certainty

For Infinium, the challenge in *Roadrunner* was not only technological but commercial and structural. As Ayesha Choudhury (CFO, Infinium) explained, *Project Roadrunner's profile was* designed to attract infrastructure capital. This meant locking in long-term feedstock and offtake agreements, de-risking budget and execution, and aligning a diverse group of investors. The opportunity now lies in applying this blueprint to Infinium's growing global pipeline. With capacity already "sold out" at both *Pathfinder* and *Roadrunner*, Infinium is moving quickly to scale, supported by clearer policy signals and rising demand for e-SAF.

The investor: From risk capital to bankable infrastructure

As one of Infinium's earliest backers, AP Ventures shouldered the risk of supporting an unproven technology. James Diaz-Sokoloff (Senior Investment Manager, AP Ventures) underlined that the challenge for equity investors was to create a track record: demonstrating not just that the technology works, but that it can produce fuels on-spec, operate safely, and train teams to replicate operations on a larger scale. The opportunity is now shifting: *Roadrunner* proves that e-fuels can evolve from a high-risk "venture play" into infrastructure-grade assets, attracting mainstream capital. For AP Ventures, the next step is to continue supporting Infinium as it matures its technology, improves efficiency, and reduces cost through scale.

The financier: Building bankability step by step

From HSBC's perspective, the central challenge was underwriting a project in an emerging sector where risks – from hydrogen supply to construction execution – are still significant. As Rohan D'Sa, (Managing Director, Structured Finance, HSBC) explained, HSBC's 18-month engagement with Infinium provided confidence in the management team, the modular design, and the broader ecosystem of credible partners. Rather than focusing solely on optimizing the cost of capital, HSBC viewed *Roadrunner* as a proof point for contractual frameworks and bankability, paving the way for broader debt participation in future projects.

The opportunity lies in scaling lending in the e-SAF sector as projects multiply and risks become more standardized.

The offtaker: Securing scalable solutions

From the offtaker airline's perspective, Aaron Robinson (VP Sustainable Aviation Fuel, IAG) underlined why e-fuel is essential for IAG's decarbonization strategy. While IAG already leads globally in SAF use, with 162,000 tons consumed in 2024, its supply is entirely HEFA-based – a pathway constrained by limited feedstocks. To meet SAF mandates in the long-term and, especially, future e-SAF sub-mandates such as the UK's from 2028 and the EU's from 2030, e-SAF offers the only scalable solution. For IAG, certainty of delivery was more important than near-term affordability, making Infinium the most advanced and credible partner. Robinson also noted that long-term offtake agreements – spanning up to 15 years – are partnerships rather than transactions, requiring alignment, flexibility, and trust as policies and incentives evolve.

The importance of policy initiatives

Policy frameworks were repeatedly identified as critical enablers. While U.S. incentives like the 45Z Clean Fuels Production Tax Credit and 45V Hydrogen Credit provide helpful support, their short duration (until the end of 2029 and 2027, respectively) limits their role in underwriting investment. In contrast, the UK SAF mandate, with its e-fuel sub-mandate stretching to 2040, offers the long-term visibility needed for both producers and airlines to commit to binding agreements. As Choudhury noted, "policy certainty - even if imperfect - is better than policy volatility."

Conclusion

All in all, the panel painted a picture of both challenge and progress. For producers, it is about scaling while maintaining certainty. For investors, bridging the gap from venture risk to infrastructure-grade assets is critical. Financiers require sound risk structures that will unlock mainstream debt. And, for offtakers, it is about securing early, scalable solutions to meet looming mandates.

The message was clear: *Roadrunner* is not just a project – it is a template for the future of e-SAF. The session closed on a note of urgency and optimism. As Aaron Robinson put it: *"There are very few things faster than airplanes, but one of them is time. As an industry, we have to accelerate."*

impact would like to thank the panelists for sharing their valuable insights and expertise, which are essential to advancing aviation's decarbonization. Special thanks to Alastair Blanshard (Director Sustainable Aviation, ICF) for moderating this expert round and to ***impact's*** Reporting Workstream for organizing the webinar.

Watch the recording of the webinar here.

THE COST OF COMPLIANCE WITH ReFuelEU

On October 27, 2025, ***impact*** hosted the webinar **"The Cost of Compliance with ReFuelEU"**, bringing together policymakers, airlines, fuel suppliers, and analysts to discuss the financial, operational, and regulatory implications of the EU's new SAF mandate. Moderated by Andrew Doyle (Cirium), the session featured insights from Gregoire Le Comte (European Commission, DG MOVE), Dorottya Durucsko (Wizz Air), Nikhil Sachdeva (Roland Berger), and Dana Shoukroun (Invest Through Flying), who unpacked how ReFuelEU will reshape fuel procurement, reporting rules, and market dynamics across the aviation sector.

A regulation reshaping aviation economics

ReFuelEU introduces binding SAF blending mandates starting in 2025, with volumes increasing through 2050. Speakers emphasized that the regulation aims to provide long-term certainty for investors and producers, while ensuring a level playing field among EU carriers. However, compliance costs remain a central concern. Rising SAF prices, the need for physical uplift, and complex reporting requirements are creating new pressures for airlines, particularly low-cost carriers and smaller operators.

The airline perspective: Costs, transparency, and competitiveness

Airlines highlighted that the main challenge is not only the higher price of SAF but also uncertainty around pricing transparency, availability, and infrastructure readiness. Dorottya Durucsko (Head of Government Affairs and Sustainability, Wizz Air) stressed that clearer rules on reporting, more predictable SAF markets, and better visibility into price formation are needed to avoid competitiveness distortions - especially for airlines with thinner margins. The speakers agreed that the EU's competitiveness must be preserved, particularly as global SAF policies diverge. Ensuring that European carriers are not disadvantaged by regional disparities is a priority.

The regulatory view: Early implementation challenges

Gregoire Le Comte (Aviation Policy Officer, European Commission, DG MOVE) reflected on the early stages of ReFuelEU implementation. The biggest obstacle today is the requirement for physical SAF uplift, which limits the possibility of a flexible virtual SAF market and constrains airlines operating from airports with limited SAF supply.

Until this condition evolves, a fully fungible "book & claim" system remains out of reach. The Commission is continuously monitoring needs for adjustments, but stressed that the regulation's integrity relies on physical delivery and verifiable emissions savings.

Market risks and opportunities

The experts noted that airlines with stronger credit profiles are better positioned to secure early SAF contracts, creating potential inequalities. Fuel suppliers and investors emphasized

the importance of long-term policy visibility, which drives investment in production capacity and infrastructure.

From an analytical and market perspective, Dana Shoukroun (Director, Invest Through Flying) demonstrated that non-compliance with ReFuelEU could lead to sharply escalating costs due to penalties and EU ETS exposure, strengthening the economic case for early SAF adoption. Complementing this view, Nikhil Sachdeva (Principal and Global Lead for Aerospace and Aviation Sustainability, Roland Berger) highlighted structural supply chain challenges, noting that airport-level SAF markets and limited European production capacity risk creating price distortions and shifting value creation outside the EU.

Conclusion

The webinar highlighted both the complexity and necessity of ReFuelEU. The challenge for regulators is ensuring robust implementation without compromising competitiveness. Airlines must manage rising costs while navigating limited supply and strict reporting requirements. And lastly, suppliers' concern is scaling SAF production in a market which is still developing contractual and financial structures.

Despite uncertainties, the panel remained cautiously optimistic: clearer rules, better transparency, and continued policy support can turn ReFuelEU from a compliance challenge into a driver of long-term decarbonization.

impact thanks all speakers and participants for their contributions to this knowledge-building session.

Watch the recording of the webinar here.

VOICES OF COLLABORATION: BUILDING REGIONAL PARTNER-SHIPS TO UNLOCK THE FULL POTENTIAL OF ALCOHOL-TO-JET SAF

Written by **Eduardo Mariz,** Sustainability Lead and Senior Analyst at Ishka for ***impact***, with questions facilitated by ***impact's*** Reporting workstream.

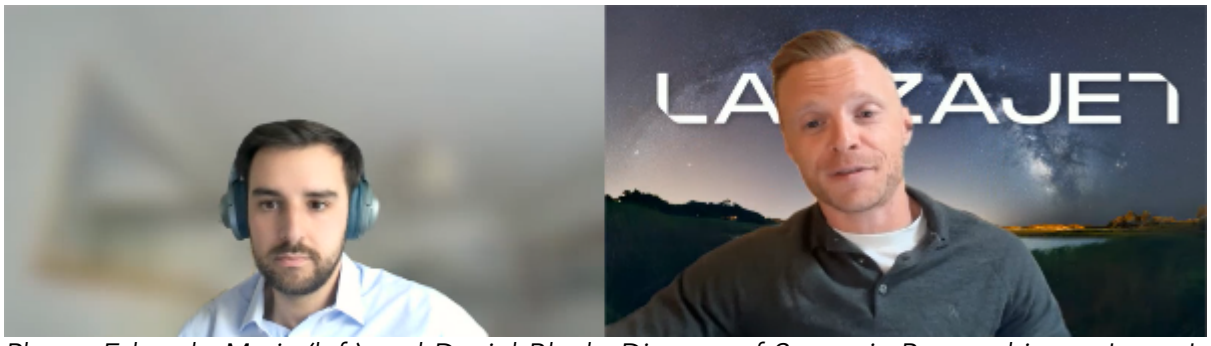


Photo: Eduardo Mariz (left) and Daniel Bloch, Director of Strategic Partnerships at LanzaJet (right).

As advanced SAF pathways further progress toward global deployment, building durable feedstock supply chains and opening new regional markets has become essential. For Daniel Bloch, Director of Strategic Partnerships at LanzaJet, this means building collaborative ecosystems and alliances that share risk, unlock domestic advantages, and create new sources of value. After two years with IATA, Bloch joined LanzaJet in 2024 to accelerate such partnerships. In this interview with ***impact***, he outlines how LanzaJet approaches geographic expansion, why strong supply-chain collaboration matters, and how SAF's value proposition could extend well beyond emission reductions.

The flexibility of AtJ

LanzaJet's patented Alcohol-to-Jet (AtJ) process is designed to produce second-generation SAF, with a view toward global scalability. Besides developing its own projects, the firm has technology partnerships with project developers around the world, seeking to produce SAF from a variety of local feedstocks.

"Ethanol is a very flexible molecule; it can be created from effectively any non-oil-based carbon waste stream, both biogenic and also synthetic […] we really set ourselves up for global replicability and scalability," Bloch explains.

While ethanol is often associated with sugarcane from Brazil or corn from the US, the company emphasizes that fermentation feedstocks extend far beyond raw commodities, encompassing wastes, residues, and low-value by-products from those crops, alongside a wide variety of other industrial-scale waste streams. "Ethanol exists in different forms, from different feedstocks, all around the world; the idea is to go in and really tailor ourselves to the local conditions and industries."

This includes exploring new bio-fermentation and gas-fermentation pathways for underutilized or unidentified feedstocks, in an effort to push the boundaries of known SAF feedstock potential. But as Bloch acknowledges, innovation brings risk. "It's tough when we have to address them all, you can't address all layers of risk alone. We can only do that by

bringing in strategic partners to take proportions of that risk," he adds, giving the example of British Airways, an investor in the company, as well as an offtaker.

Revenue from biological benefits

A unique advantage of advanced SAF pathways such as AtJ, Bloch says, is the potential to generate value streams beyond CO_2 reductions. "I'm finding that in the world of finance and big corporate institutions, they're starting to become attuned to this idea that ecosystem services and natural capital are directly tied to their bottom lines and financial performance - and that supply chains which improve these indicators hold emerging economic value," he explains.

Like most SAF market observers, Bloch believes that a pivotal point for advanced SAF pathways will be reached when technologies become more widespread and commercially competitive. To that effect, he argues that the feedstock production activities associated with advanced SAF pathways, especially those from the aggregation of waste streams or regenerative agriculture, can deliver measurable, reportable natural-capital appreciation across the likes of:

- Soil health and productivity gains
- Soil organic carbon improvements
- Water quality enhancements
- Natural waterway restoration
- Reduced nitrate and phosphate runoff
- Habitat restoration
- Biodiversity uplift

"These are not just co-benefits," he notes. "They can be materially valuable and monetizable, linked to growing corporate awareness around their dependency on ecosystem services. SAF can recognize the natural-capital appreciation that its supply chains enable and financially underwrite. You could then bundle these nature-based attributes into a stacked, high-integrity SAF, or separate the nature claim out and sell them as its own distinct instrument," he conceives.

Not losing track of the progress so far

SAF discussions often oscillate between high expectations and hard realities. But when asked how the sector can move faster, Bloch recommended maintaining perspective.

"Take a step back for a moment. Over the last five or six years, you can see that SAF volumes have scaled 100-fold, and that sees it outpacing the early trajectories of other renewable fuels, including wind and solar […] and we're only three years removed from ICAO committing to the UN's Long-Term Aspirational Goal (LTAG)," he says, referring to the UN's net-zero by 2050 goal for aviation.

Nevertheless, he acknowledges that the SAF market will need to move beyond the feedstock-constrained HEFA pathway, into greenfield facilities and advanced technologies like AtJ, Fischer–Tropsch (FT), and others like Hydrothermal Liquefaction (HtL) and Pyrolysis. "We need real, carved-out policies that are specifically designed to help enable these next-in-kind technologies."

Among those policies, Bloch notes that those seeking to help support projects forward through their financing journey are key. "Clearly, there's a big role for governments to help bridge the mezzanine finance part […] that point between the early development stages and project finance, when you're trying to finance the design or the detailed engineering of a facility, that's often really tricky," he highlights, pointing to the UK's Advanced Fuel Fund (AFF) as a good example.

He is hopeful that other governments will take on board industry feedback and develop mechanisms to address this and other financial gaps. Reflecting on the SAF policy leadership to date in Europe, the UK, and the US, Bloch sees "a trickle-down effect to the next-in-line markets," such as Australia, Japan, Singapore, India, and South Korea, with the investment outlook for SAF gradually improving.

What draws LanzaJet to certain geographies

"I don't think you can ever really assess the viability of SAF in a vacuum […] in very few cases do we have a really strong local SAF production market, coupled with a defined local consumption market," Bloch reflects on the importance of conducive SAF policy.

On its website, LanzaJet currently lists projects in the U.S. (Freedom Pines, in operation), the U.K. (with Project Speedbird, in collaboration with British Airways), as well as other projects in Australia (Project Ulysses, led by Jet Zero), India (in joint-venture with Indian Oil Corporation), Japan (led by Cosmo Oil) and Kazakhstan (led by KazMunaiGas).

Among the key considerations for embarking on projects in new geographies are the availability of pre-construction finance (a challenge for non-HEFA players without an existing facility to retrofit), compliant feedstocks, and utilities - the latter two being crucial in determining the end product's ability to succeed in its intended market. "You might have a plethora of a given type of feedstock, but if it's not compatible with the intended consumption market […] it might render the exercise entirely worthless." Other key elements include export infrastructure readiness and local demand policy.

"We're probably yet to see a sweet spot where you have an amazing production market and consumption market interoperating at the same time, in the one location. I think India could be one that stands out in that regard, in the foreseeable future," he hints.

The value of partnerships

As Director of Strategic Partnerships, Bloch interacts with a wide range of stakeholders - from airlines and corporates looking to invest in SAF, project developers pursuing new facilities, financiers seeking to provide capital, governments exploring policy support, right the way through to the farmers providing the necessary feedstocks. It is an uncharted task for which he feels his past work at **IATA** (two years spent as their SAF Specialist) has prepared him well.

"My time at IATA gave me a distinct appreciation for the complexity of building a global system, let alone a global system that tries to accept a profoundly new, different approach to energy," he explains.

In navigating this, he emphasizes the importance of "hyper-regionalizing" activities, ensuring that as new SAF ecosystems are built up, they gain buy-in from a broad range of domestic stakeholders, from "farmers and growers or the municipalities dealing with a waste issue," and

building up from there. “I think we make ourselves more relevant as an industry if we attach ourselves to more issues, to more stakeholders, if we make it more regionally focused.”

NAVIGATING AVIATION DECARBONIZATION: EXCLUSIVE EXPERT TALKS FOR IMPACT MEMBERS

Throughout 2025, ***impact*** hosted a series of expert presentations featuring leading voices from across the aviation finance supply chain and beyond. Representatives from SAF producers and aggregators, data providers, consultancies, law firms, manufacturers, investors, policy institutions, and other key stakeholders joined our bi-weekly members calls to share perspectives on the most pressing issues shaping aviation's path toward net zero.

The diversity of topics covered over the year reflects a fundamental reality: aviation's transition is not a single challenge with a single solution, but a complex, interconnected transformation. Progress depends not only on technological innovation, but equally on regulation, finance, data integrity, legal frameworks, market design, and risk management. Each session explored a different lever of change - and together, they illustrate how these elements must align to deliver credible, scalable decarbonization.

For ***impact*** members, these discussions provide early insight into emerging risks, opportunities, and decision points across the transition.

The executive summaries capture the key takeaways from each session. Read individually, they offer focused expertise. Read collectively, they underline a central message: managing aviation's decarbonization is a system challenge - and understanding that system and the building of a broad aviation transition stakeholder network is becoming a strategic necessity.

"THE REALITIES OF THE ENERGY TRANSITION"

Ehsan Khoman

Head of Research - Commodities, ESG and Emerging Markets (EMEA), MUFG

Global investments in the energy transition continue to reach unprecedented levels, with significant growth driven by advancements in renewable energy, electrified transport, and emerging technologies such as hydrogen and carbon capture. Investment in sustainable solutions has surpassed spending on fossil fuels, reflecting a strong commitment from the public and private sectors. Meanwhile, the aviation industry's journey to Net Zero by 2050 remains complex, with emissions growth outpacing efficiency gains despite progress in areas like sustainable fuels and fleet modernization. Achieving a cost-effective transition requires coordinated actions, prioritizing impactful measures, and addressing knowledge and investment gaps across the ecosystem.

"INTRODUCING THE EUROPEAN HYDROGEN BANK: ACCELERATING THE ESTABLISHMENT OF A FULL HYDROGEN VALUE CHAIN"

Javier García Fernández

Policy Officer, DG CLIMA / European Commission

Javier provided an overview of the EU's Innovation Fund (Fund) and explored the 2024 Innovation Fund Calls, including regular grants, competitive auctions, and other financial instruments available to industry stakeholders. Additionally, he highlighted successful aviation-related projects supported by the Fund, offering key insights for potential future applicants and interested parties.

"UPDATE ON EU COMPETITIVE COMPASS"

Emma Giddings

Partner, Norton Rose Fulbright

Emma gave an introduction to the EU Competitive Compass and shared the latest updates.

"CONSIDERING TECHNOLOGY CHARACTERISTICS TO PROJECT FUTURE COSTS OF DIRECT AIR CAPTURE"

Katrin Sievert

Postdoctoral researcher, ETH Zurich

Katrin Sievert shared insights on the future costs of Direct Air Capture (DAC), uncovering key drivers and uncertainties that will shape its economic viability. Using technology learning curves, the analysis projects cost trajectories for different DAC approaches. The talk concluded with an exploration of DAC's role in aviation, comparing its potential for synthetic fuel production (DACCU) and carbon removal offsets (DACCS) in achieving climate neutrality.

"UPDATE ON EU EC OMNIBUS PROPOSAL"

Lorraine McCann

Managing Director Sustainable Futures, KPMG

Lorraine provided an overview of the European Commission's CSRD Omnibus proposal, highlighting the significant reduction in scope, extended timelines under the "stop the clock" mechanism, and the shift towards simplified and more proportionate sustainability reporting requirements. She also emphasized the growing relevance of voluntary reporting frameworks, particularly the VSME standard, as a pragmatic way for companies to maintain momentum amid regulatory uncertainty.

"HOW TO SPEED UP AVIATION'S PATH TO CLIMATE-NEUTRALITY WITH POWER-TO-LIQUIDS (PTL)"

Regina Pouzolz

Director of Sustainable Flight, Deutsche Aircraft

Regina Pouzolz addressed the impact of aviation emissions on climate change and discussed the basics of aircraft design for a deep dive into the opportunities and limitations of electric aircraft, as well as the relevance of SAF as the key lever to minimize aviation's climate impact. In this content, Regina introduced the CLIM0ART project, a PtL-proxy flight test campaign by Deutsche Aircraft, German Aerospace Center (DLR), and Sasol.

"CFM ACTIONS TOWARDS A MORE SUSTAINABLE AVIATION"

Sandrine Lacorre

Product Marketing General Manager, CFM Engines

The presentation by Sandrine Lacorre highlighted CFM's initiatives aimed at improving the environmental impact of aviation. These initiatives include advancements in new engine technologies and architecture, the development of hybrid-electric systems, research and experience in hydrogen, and compatibility with sustainable aviation fuels.

"CLIMATE CHANGE & AVIATION 360°: ESG FATIGUE, ADDRESSING NON-CO_2 EMISSIONS, ADAPTATION STRATEGIES"

Maxime Meijers

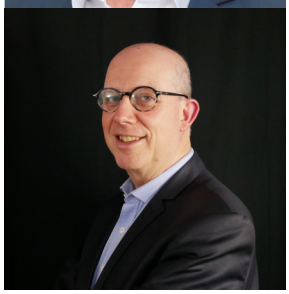
CEO & Co-Founder, Estuaire

In his presentation, Maxime offered a comprehensive exploration of the evolving climate challenges facing aviation, moving beyond a narrow focus on emissions. He addressed ESG fatigue, discussing how aviation stakeholders can recalibrate environmental strategies to sustain credibility and engagement. Maxime also focused on the growing importance of non-CO2 emissions – including contrails and nitrogen oxides - as high-impact climate agents, often overlooked in traditional mitigation efforts. Finally, he examined climate adaptation strategies, highlighting risk assessment methodologies, airport resilience planning, and the impacts on airlines of increasing weather phenomena.

"HOW DOMAIN-TRAINED AI CAN MAKE THE DIFFERENCE IN AN AIRLINE'S JOURNEY TOWARD EFFICIENCY AND SUSTAINABILITY"

Chris Brown

Partner, Head of KPMG Strategy, KPMG Ireland



Stéphane Nitenberg

SVP Strategic Partnerships, OpenAirlines

Artificial Intelligence's (AI) capacity to analyze extensive data, identify patterns, and make informed choices is paving the way for new possibilities to enhance operations and fuel efficiency. In this presentation, Chris Brown opened the call with a high-level market overview, outlining how AI is being deployed across the aviation value chain. Stéphane Nitenberg (OpenAirlines) explored how AI transforms data analytics and revolutionizes decision-making processes. He also explained how AI-driven insights can maximize fuel efficiency and drive sustainable practices.

"SAF FINANCIAL VALUE CHAIN RISK MANAGEMENT AS THE KEY TO UNLOCK PRODUCER FIDS"

Arnaud Namer

CEO and Co-Founder, ATOBA energy

ATOBA is the midstream sustainable aviation fuel (SAF) aggregator, accelerating the aviation industry energy transition by solving the SAF financial dilemma between airlines and producers. ATOBA brings high security and competitiveness to the SAF supply chain for its airline partners, while providing producers with long-term offtake agreements that unlock their Final Investment Decisions (FID).

"AN UPDATE ON CORSIA"

Lev Gantly

Partner, Philip Lee LLP

Adelfio Ronci

Director Environmental Products, ICE

In their presentation, Lev Gantly and Adelfio Ronci gave an overview of CORSIA's role in aviation sustainability, highlighted recent technical and legal updates, and outlined possible EU positions. It also covered trends in supply, demand, and pricing for CORSIA credits, and explored how lenders and lessors can support these efforts.

"SKYNRG'S 2025 SAF MARKET OUTLOOK"

Anna Liznerova

Senior Analyst, SkyNRG

Anna Liznerova introduced SkyNRG's 2025 market outlook, which highlights both the progress made and the important steps still needed to ensure a resilient, scalable SAF industry capable of meeting long-term decarbonization goals. The market outlook provided insights on demand, projected capacity, and the expected HEFA tipping point.

"100% ELECTRIC REGIONAL AIRCRAFT: MARKET POTENTIAL AND CERTIFICATION TIMELINE"

Ivor van Dartel

CEO & Co-Founder, VÆRIDION

The session explored the benefits of a small electric aircraft for the Regional Air Mobility market. Ivor shared insights into how advanced propulsion technologies shape aircraft design and highlighted the potential implications for airport infrastructure and ground operations. Moreover, the presentation focused on certification and the role regulation plays in achieving operational targets.

"ENABLING SAF INVESTMENT: THE BOOK & CLAIM OPPORTUNITY"

Max Eichelbaum

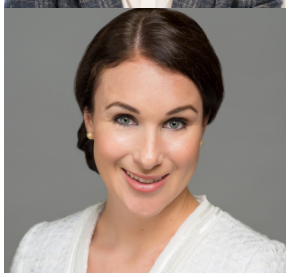
Associate Director of Digital Solutions and Book & Claim, RSB

Max Eichelbaum gave an overview of how Book & Claim can address key uncertainties and bring greater clarity for market participants, especially around financing and SAF funding. In this session, Max also emphasized the ongoing efforts in registry harmonization to ensure trust, transparency, and alignment across systems.

"CARBON DIOXIDE REMOVAL: A KEY LEVER IN AVIATION'S NET-ZERO TRANSITION - MARKET UPDATE"

Ian Collier

Business Development Director, 1PointFive



Anna Stukas

VP Strategic Partnerships, 1PointFive

1PointFive is leading the commercialization of Carbon Engineering's ground-breaking technology that captures carbon dioxide directly from the atmosphere, providing two complementary solutions to help the aviation industry address emissions: carbon dioxide removal and sustainable aviation fuel. Ian Collier and Anna Stukas shared details on 1PointFive's first commercial project, Stratos, and explained how 1PointFive can support the aviation sector in reaching its goals.

"CLIMATE AND ESG LITIGATION: AN UPDATE ON LESSONS LEARNED FROM RECENT LITIGATION AND REGULATORY ENFORCEMENT AND PRACTICAL RISK MITIGATION STEPS"

Katie Stephen

Co-Head of the Contentious Financial Services Group, London, Norton Rose Fulbright

Stuart Neely

Partner, Norton Rose Fulbright

Katie and Stuart cut through the ambiguity of the current ESG landscape. They note that despite mixed regulatory signals, litigation risk is rising as courts around the world increasingly recognize corporate climate responsibilities. Their session highlights practical steps to mitigate these risks, emphasizing the importance of aligning

climate strategy with public statements, ensuring strong governance, and understanding evolving due diligence expectations to help protect companies from future claims.

"EASA'S 2025 REPORT: REFUELEU AVIATION ANNUAL TECHNICAL REPORT"

Ben Chapman

Director Aircraft & Sustainability, ICF

The session provided an overview of the first EASA Annual Technical Report under RefuelEU Aviation, outlining early insights into SAF supply, pricing, and market readiness ahead of the 2025 compliance phase. Ben shared key challenges such as documentation mismatches, transparency gaps, and the concentration of SAF supply, while also discussing the outlook for scaling advanced biofuels and e-fuels toward 2030 targets. Overall, the presentation offered a concise picture of where the EU SAF market stands and what improvements are expected in the coming reporting cycle.

"TOWARD JET A COST PARITY: SYZYGY'S LIGHT-DRIVEN, NON-HEFA ROUTE TO COST-COMPETITIVE SAF"

Trevor Best

CEO & Co-Founder, Syzygy Plasmonics Inc.

This session explored Syzygy Plasmonics' innovative approach to producing cost-competitive RFNBO and BioSAF. Trevor Best shared insights into their light-driven reactor, which combines biogas and renewable electricity to achieve very low carbon intensity without the need for expensive electrolysis installations. The presentation highlighted the technology's investment readiness, ISCC pre-certification, first-of-a-kind commercial scale, and global deployment potential.

SAF MANDATES – TIME FOR A COURSE CORRECTION?

Hemant Mistry

Director Net Zero Transition Sustainability & Economics, IATA

2025 was an important year for aviation net-zero policy testing, not least to see how the SAF mandates would work in the EU and UK. Mandates for a 2% blend of SAF across the total jet fuel volume uplift were launched across both the EU and the UK from 1 January 2025. At the end of the year, we can now take stock to see the impact - the results are not very positive, but also not entirely surprising. Of course, any viewpoint on whether something is positive or negative also depends on one's own perspective. For the purpose of this article, we will try to focus on the viewpoint of supporting net-zero for air transport, and that means scaling SAF production and supporting the development of a liquid market to ensure efficiency and a viable energy transition.

Review of the impact of mandates in the EU and the UK

The construct of mandates for SAF can take various forms. Previous experience in energy mandates shows that they would not be the best policy tool when it comes to SAF because of its nascent market stage. Mandating any product that is in scarce supply will only push up prices. This is particularly the case when the suppliers and procurement options for the end price taker (the airline) are limited. This is the situation in both the EU and UK, where the mandates were imposed on the fuel suppliers at the airports, who in turn have chosen to add on the price differential to existing jet fuel contracts, leaving little transparency or procurement options for the airlines. Worse still, airlines pay the extra costs for SAF on every tonne of jet fuel purchased, often before any drop of SAF is delivered, and there remains no assurance that airlines will receive the necessary documentation for the environmental attributes of the SAF they paid for.

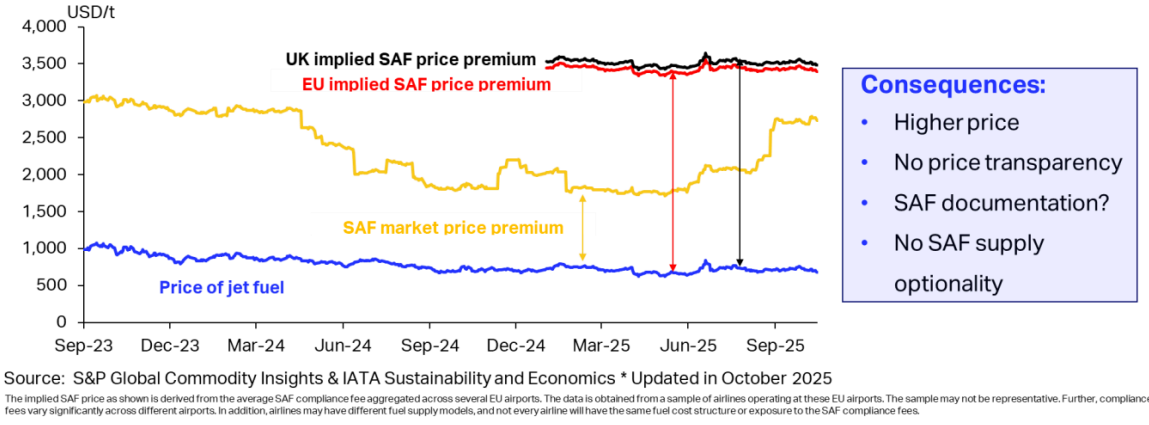


Figure 1. Unintended (but predictable) consequences of mandates, IATA Sustainability and Economics

This has resulted in a cost impact to airlines, which is double the SAF market price premium (the price airlines would normally pay if buying SAF directly), and making SAF up to five times more expensive than conventional jet fuel. In fact, if airlines were able to use the additional money paid under mandates to upgrade other fossil jet fuel purchases to SAF, they would have been able to abate a further 2.4 million tonnes of CO_2 on top of the 2.6 million tonnes expected to be abated with the 2% mandates (assuming a 75% emissions reduction factor).

Impact on SAF availability

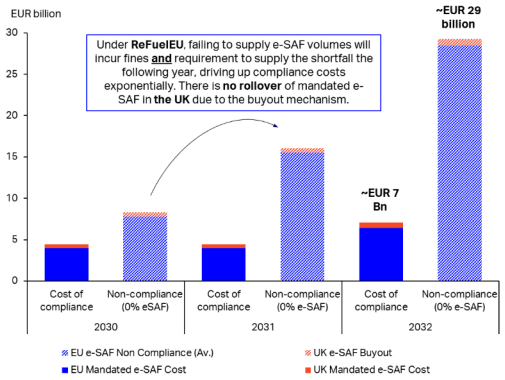
While SAF production may have increased to address the volume required under the mandates, this has not supported development towards market liquidity. Actually, it may have been counterproductive. Given the lack of procurement options and the additional costs imposed on airlines, we start to see a reduction in voluntary demand, which was growing consistently before the introduction of the mandates. Furthermore, there is no clear indication that the mandates directly support diversification into pathways beyond HEFA (Hydroprocessed Esters and Fatty Acids), which uses used cooking oils and other waste fats or greases. Pathway diversification is fundamental if aviation is to have access to the scale of SAF volumes needed for achieving net-zero.

Targeted incentives and support for research and development (R&D) are what is needed for SAF scale-up and air transport's energy transition. Mandates, as they have been implemented in the EU and UK, seem to have been pushed too early in the process. Mandates certainly have an important role to play in the energy transition, but may not have a clear objective at such an early stage of the SAF market. There are numerous examples, including the Renewable Fuel Standard in the U.S, where mandates by themselves have not succeeded, especially when meeting the objective requires research, development, and investment.

In all cases, the success of any policy instrument should be measured by the outcome, not based on the legislation's passing. This is particularly so in the early stages of any energy transition. Corrections are possible in the case of mandates in the EU and UK, which could, for example, allow price transparency and flexibility for airlines in terms of procurement. It will be critical for these to be implemented as early as possible if the mandates are to be brought back on track to meet expectations for supporting air transport's net-zero journey.

And regarding e-SAF

The development of these issues for bio-SAF raises a broader question now on how mandates for e-SAF will perform from 2030. Given the examples of costs for risks associated with mandates being passed on to airlines, e-SAF poses additional risk, given the lack of production capacity and the potential costs involved. IATA's review of e-SAF projects shows there is not enough e-SAF production capacity projected to be ready to meet the mandated volumes. In fact, the production capability in 2030 is likely to be well short of the target set in the EU mandate. The ramifications of this are very serious in terms of the potential costs that airlines could be further hit with. It's time for corrective action, which could involve some flexibility in volumes or definitions, but clearly, more direct support is required for the project developers. The ramp-up of e-SAF is very important for air transport's net-zero journey, but mandating something that doesn't exist will not support this.



- Under ReFuelEU, the longer it takes to establish a sufficient e-SAF supply, **the greater the impact** on the cost of non-compliance.
- In the **absence of e-SAF** supply, the potential cost of non-compliance could go from **EUR 7 bn** in 2030 **up to EUR 29 bn** in **2032**.

Figure 2. Cost of e-SAF mandates: Compliance vs non-compliance, IATA Sustainability and Economics

UNDERSTANDING AFRICA'S SAF POTENTIAL: PERSPECTIVES FROM AFRISAF AND THE WORLD BANK

Megersa Abate

Senior Transport Economist, the World Bank

Kwame Bekoe

Co-Founder and CEO, AfriSAF

Questions by ***impact's*** Reporting Workstream, interviews by **Ulrike Ziegler, *impact*** and **Eduardo Mariz,** Sustainability Lead and Senior Analyst at Ishka. Written by **Eduardo Mariz** and **Leonie Brugger**, Policy and Innovation Manager at ***impact***.

At present, Africa does not have binding demand policies driving SAF adoption nor installed SAF production capacity, restricting all SAF sold to imports for voluntary use. But while the continent may be behind other regions, it does not lack reasons for playing a larger part in the global energy transition.

To explore the role of SAF in Africa, ***impact*** spoke with Megersa Abate, World Bank, D.C., and Kwame Bekoe, AfriSAF, a UK firm acting as an enabler for projects to unlock the potential of SAF feedstock and production in Africa. The two shared insights on Africa's untapped feedstock potential, the infrastructure hurdles that stand in the way, the persistent challenge of accessing capital, and the promising role SAF could play in strengthening energy security across the region.

A large feedstock potential

For SAF to become the primary energy source of global aviation, synthetic fuels are seen as the most scalable. However, the potential of feedstocks that lie between today's commercially-ready HEFA SAF and power-to-liquid (PtL) fuels is still being explored, and few regions remain as underutilised as Africa, with abundant biomass resources, agricultural residues, and potential for resistant energy crops.

IATA's in-depth assessment of global feedstocks for SAF estimates that out of the 4,200 Mt of potential feedstocks that could be unlocked by 2050, the Middle East and North Africa (MENA) and sub-Saharan Africa have an expected combined availability of 220 Mt in 2050, accounting for approximately 14% of the global total. However, IATA's estimate only takes into account a few countries in Africa, and makes assumptions on the percentage of feedstock that aviation could capture.

"We believe there's over 500 Mt of waste from agriculture produced across the continent, which is typically burnt off on fields [and/or] left to decay, or discarded in landfills, which leaves a lot of value and opportunity ultimately on the field," comments Bekoe, whose firm offers a digital marketplace platform connecting feedstock owners with buyers and managing feedstock. He notes that beyond waste feedstocks, underutilised land could also be used for cultivating energy crops: "This is usually deserted, damaged or marginal land, which doesn't have an impact on food production."

Feedstock strengths vary by country

Africa's SAF feedstock potential is far from uniform, varying widely due to differences in resources, infrastructure, and policy. Bekoe notes that feedstock potential varies strongly region-by-region, from palm oil waste to cocoa, coconut, and cashew production waste, to waste from rice, maize, or cassava processing, which he names as examples. In the case of Cocoa, Ghana and Ivory Coast are the world's largest producers of this product, and up to 75% of the fruit is wasted once the cocoa beans are processed. As the 10th largest agricultural residue waste in Africa, this presents itself as a prospect for the future.

Homing in on the feedstock potentials of four large African nations (Ethiopia, Kenya, Nigeria, and South Africa), the World Bank in mid-2025 published its *Fueling Africa's Flight* report. Its four authors, including Abate, use a techno-economic approach to showcase the continent's SAF potential through those four countries and identify favourable production technologies based on the feedstocks with the most potential in each one: UCO and castor oil for HEFA in Kenya, sugarcane/molasses and municipal solid waste for Alcohol-to-Jet (AtJ) and Fischer-Tropsch (FT) in Ethiopia, lipids for co-processing in Nigeria, and green hydrogen and industrial waste carbon for PtL in South Africa.

However, Abate cautions, there is still a considerable knowledge gap between 'potential' and deployable feedstocks to ensure they can be scaled without impacting biodiversity and food security. "A lot of countries in the southern hemisphere will need to do a lot of due diligence, argue for more feedstock diversity to be on [ICAO's CORSIA eligible fuels] list." Later in the conversation, Abate notes that while there is limited research and development efforts in Africa to identify and test new biofuel feedstocks, R&D efforts aimed at food security and agricultural development may have already produced relevant findings.

Another "fundamental question," Abate adds, is whether feedstock supply chains are being built in a way that helps developing countries move up the value chain or whether they risk remaining primarily feedstock exporters.

On more advanced SAF, Abate notes the potential for PtL fuels in countries with vast wind and solar renewable energy potential for green hydrogen, such as Namibia, Mauritania, or Morocco. "These countries are attracting a lot of investment without really doing much on the

policy side. Maybe this is because the demand drivers for this are not necessarily Africa or the citizens on the continent per se," he explains.

Germany-backed **PtX Hub** and the EU's **Global Gateway Investment Package** are leading European efforts supporting green hydrogen projects in Africa, which in turn could support PtL production. "So the policy, in that sense, is driving outside the continent, but in a good way in some cases, because this is creating investment on African soil."

The case for energy security

For most regions, SAF production capacity has the potential to strengthen their energy security and boost economic resilience by reducing reliance on imported jet fuel and creating new value chains across agriculture and industry. For Africa, both Abate and Bekoe agree that the energy security aspects are even more critical.

"I would say it would have even greater value in energy and economic security," comments Abate, adding that African countries spend around USD 10 billion annually on importing jet fuel due to a lack of localised refining capacity, worsening many countries' foreign exchange deficit.

Bekoe notes several opportunities that SAF could bring to Africa, including green jobs, improved air quality and health, waste management through aggregation and greater energy independence. "One of the things we see is that energy security follows food security, which follows political security," he explains - highlighting the underlying importance of scaling SAF production on the continent.

The opportunity to grow sustainably

An Airports Council International (ACI) capital expenditure outlook estimates that out of the USD 2.4 trillion in airport capital investments needed to address long-term demand trends to 2040, Africa's share stood at a mere 0.13% or USD 32 billion, of which 40% corresponded to greenfield airport investment. Abate sees an opportunity for SAF facilities to be created as part of these developments, such as Ethiopia's planned USD 10 billion airport 40 kilometres south of Addis Ababa, which would become Africa's largest. "I don't know whether a SAF project is included in this or not, but that's where maybe we need to look closely."

Equally, Bekoe argues that consistently framing Africa's investment potential as negligible percentage figures based on current trends may actually be counterproductive, discouraging potential investors from recognising the broader opportunity. "If investors are constantly seeing a 1% opportunity in a region that already has a high perception of risk, that region is always going to be left alone, and nothing is going to be done." Nevertheless, Bekoe agrees with the potential to pair SAF projects with ongoing airport expansion efforts. "I think working with airport infrastructure makes sense, particularly with where airports are typically based. Obviously, airports understand the challenge and the opportunity as well. And many of the airports have access to a lot of land as well."

One potential demand avenue to start developing production capacity is export markets and Book and Claim sales, where the environmental benefits of the fuel are sold to global customers, even if the physical fuel is used locally. "I think down the line, Book and Claim needs to be something that works to really spearhead SAF and the opportunity in Africa

because the market isn't going to be the local region. The airlines [in Africa] don't want to know about SAF, to be honest.", Bekoe adds.

Capital access and costs

Large refining infrastructure in Africa can be built and operated successfully, as Nigeria's Dangote oil refinery, the world's largest single-train refinery, shows. The USD 19 billion refinery has been producing kerosene since 2023 and, since 2024, it exports Jet A-1 to Europe. Any discussion about the viability of SAF production plants in Africa today inevitably covers the Dangote example.

"Just goes to prove that you can produce plants of this scale once you have the right level of expertise and experience on board. […] When it comes to risk, particularly political risk, many countries in the West have a higher political risk than those in Africa. It's more a perception issue that is faced than an actual issue," Bekoe says about the project.

Abate says the World Bank has produced a yet unpublished "background report" with a SAF investment decision index to guide investors to the most suitable locations in the continent, based on supply, demand, and policy considerations. At present, he says, the policy pillar remains largely empty, except for Kenya's 'Nairobi SAF Policy Roadmap' announced last October and Ethiopia's SAF blending target. Some existing biofuel policies for other sectors, however, could be scaled for other modes of transport, including aviation, Abate notes.

For a better understanding of how SAF policies could support SAF investment in the region, the already published World Bank report, however, contains a minimum selling price (MSP) for SAF in modelled country scenarios under various potential country-level incentives. For the countries analysed, baseline MSPs are above the current global SAF benchmark, "Most of this has to do with the risk premium these countries have," Abate explains. However, modelled policy and de-risking packages can reduce MSPs to around or below current global average SAF prices.

Bekoe agrees, also referring to the World Bank report, noting that it proves "a lot of the cost impact when it comes to SAF in Africa is […] linked to risk or risk perception. So, we need […] to make sure we're de-risking as much as possible in every single way possible." He says this can be done "by really understanding the stakeholders coming into place, working with the government, working with the different agencies, the financial institutions."

The newly-launched **ICAO Finvest Hub**, an initiative to mobilise investment into SAF, has the potential to assist in mitigating this by steering projects to the most suitable financing partners to counter key risks.

However, the challenge to create a conducive environment for SAF projects goes beyond SAF-specific policies - countries must also develop new logistical infrastructure to enable international export and local distribution. Pipeline systems, for instance, only exist in a few countries in Africa, and Abate points out that there is limited investment going into further pipeline development. "We cannot talk about SAF in isolation. We have to think about it in a holistic infrastructure project in the context of Africa."

PASSING ALTITUDE: SAF'S NEW INCENTIVE LANDSCAPE IN THE U.S.

Kenneth Hill

Managing Director, BioCarbon Strategies

*Contributions by **Jim Spaeth**, Managing Director, Aerovida Bio*

The passage of the One Big Beautiful Bill (OBBB) in July 2025 didn't clip the wings of the sustainable aviation fuel (SAF) industry in the United States. Instead, it reshaped the sky. The bill reworks familiar tax incentives like the Clean Fuels Production Tax Credit (45Z), the Clean Hydrogen Production Tax Credit (45V), and the Carbon Oxide Sequestration Credit (45Q), while reshuffling the role of federal loans and loan guarantees. At the same time, the Environmental Protection Agency's (EPA) Renewable Fuel Standard (RFS) proposed volume obligations for 2026 and 2027 underscore the demand runway, and states from Washington to Kentucky are pushing forward their own SAF incentive programs. The result is a new mosaic of opportunity and complexity that SAF developers, investors, and airlines must navigate with greater care than ever.

Federal incentives in transition

The centerpiece of OBBB's tax provisions for SAF is a restructured 45Z Clean Fuel Production Credit. The earlier USD 1.75 per gallon (~€500.00 per tonne) premium for SAF is gone, replaced by a maximum of roughly USD 1.00 per gallon (~€285.00 per tonne) beginning in 2026. The credit is now tightly linked to carbon intensity (CI), which means producers will have to work harder to unlock value - sourcing cleaner power, integrating hydrogen, or capturing emissions. OBBB also limits qualifying feedstocks to those grown or produced in the U.S., Canada, or Mexico. That restriction excludes several international supply chains and requires careful feedstock contracting. Imports of used cooking oil and sugarcane-based ethanol to the U.S. will have the biggest negative impacts on the SAF supply chain. Additionally, negative emissions for SAF are disallowed: except for certain animal manure feedstocks, negative emissions (which could drive extremely low or negative emissions intensity scores) are excluded in calculating the credit. And indirect land-use change emissions are excluded from lifecycle greenhouse gas (GHG) emissions for 45Z after 2025, simplifying and often lowering CI scores for many land/feedstock-based pathways. Unfortunately, the initial 45Z guidance issued by the U.S. Treasury Department in January 2025 will have to be updated. Typical delays in this tax guidance can have an impact on projects claiming the credits.

Clean hydrogen projects face their own compressed timeline. The 45V hydrogen tax credit, which maxes out at USD 3.00 per kg, now requires projects to commence construction by the end of 2027, versus the original expiration of December 2032, creating a narrow window for SAF developers pursuing power-to-liquid or other pathways. For some, this deadline

accelerates investment decisions, demanding earlier commitments on hydrogen offtake and SAF facility construction. The good news about this credit is that if a project qualifies, it can claim the credit for 10 years. Also, the final guidance issued by the Treasury in January 2025 remains in effect, providing a well-defined path for projects to claim the credit using the 45VH2-GREET (GHG, Regulated Emissions, and Energy use in Technologies) life cycle assessment model.

Meanwhile, the 45Q carbon capture credit has emerged as a stabilizing element in the stack. OBBB left it largely intact and, in some respects, simplified access. The primary change to this credit was moving toward a single maximum rate of USD 85.00 per tonne for captured CO_2 (USD 180.00 per tonne for direct air capture) regardless of its disposition, including geological storage, utilization, and enhanced oil recovery. For projects that can capture CO_2 from fermentation, reforming, or other stages of production, 45Q offers a critical second stream of revenue. It also directly lowers CI scores, making the same gallon of fuel worth more under 45Z. It is also important to point out that claiming the 45Q tax credit does not eliminate the opportunity to sell Carbon Dioxide Removal credits in third-party marketplaces.

Transferability of these tax credits was maintained in the OBBB. This is good news for small and medium-sized enterprises that have little to no tax liabilities to offset. Expect increased scrutiny on foreign entities of concern (FEOC) and ownership/eligibility rules in adjacent credits - even where 45V avoided some FEOC restrictions, counterparties and lenders will diligence supply chains and control structures more aggressively.

The OBBB changes don't stop at production tax credits. The U.S. Department of Energy's (DOE) newly christened Office of Energy Dominance Financing (OEDF - formerly the Loan Programs Office) - long viewed as a lender of last resort for capital-intensive and less proven technology projects - is entering a new era. While the OBBB left a majority of the lending authority in place (more than USD 250 billion between all programs), credit subsidy funding was clawed back, increasing the borrowing costs for program borrowers. The OBBB also replaced the Energy Infrastructure Reinvestment program, meant to repurpose, retrofit, or redevelop brownfield infrastructure with GHG-reducing technologies, with the Energy Dominance Financing program, focused on expansion of energy production without regard to GHG reduction, particularly fixed non-intermittent electricity production. The OEDF has also experienced significant budget and staffing cuts, leading borrowers to worry about staff bandwidth and application processing time. The trajectory of the OEDF is still being developed. But SAF projects that once looked to federal loan guarantees for balance sheet relief may need to rely more on private capital, state green banks, or syndicated transfer markets.

Federal grant opportunities: Shifting but significant

Although tax credits dominate headlines, federal grant and cost-share programs remain available, albeit at a much-reduced scale, and can be vital to SAF buildout. The OBBB did not eliminate all of these funding opportunities, but the new administration has drastically reduced the availability of new funding opportunities and/or cancelled awards from several agencies. However, some initiatives, while still in flux, continue and provide funding opportunities for biofuels and SAF:

- **DOE Bioenergy Technologies Office (BETO):** While many programs were reduced or eliminated, BETO still has two active Notices of Funding Opportunity in 2025. These include funding for *Sustainable Propane and Renewable Chemicals* and *Maximizing Algal System Yield*. The outcome of these funding opportunities and any future opportunities, particularly for SAF, is in question as new restrictions limit the scope and support BETO can mobilize for new, large-scale demonstration projects after 2025.
- **US Department of Agriculture - Biorefinery, Renewable Chemical, and Biobased Product Assistance Programs:** Grants and loan guarantees targeting rural projects, especially those that integrate with agricultural supply chains. This program provides loan guarantees up to USD 250 million to assist in the development, construction, and retrofitting of new and emerging technologies. These technologies include advanced biofuels, renewable chemicals, and biobased products.
- **Department of Defense - Operational Energy Initiatives**: Ongoing procurement testing and pilot programs through the Air Force and Navy continue to provide limited amounts of funding.
- **Department of Transportation's FAST-SAF Grants:** This program was halted. Although ongoing funding is expected for most of the 22 grant awardees announced in 2024, no future funding is anticipated.

The competitive landscape is tightening - these grants will not replace tax credits, but they increasingly act as gap financers, bridging early construction costs or underwriting technology risks so projects can access equity and debt at tolerable terms. However, program budgets are being reduced in the current fiscal year in many non-Department of Defense programs, so the overall availability of funding for grants may be reduced. In some cases, discretionary grant funding that previously went into competitive opportunities for industry projects is being prioritized for keeping existing federal staff and federal national laboratory staff maintained.

Regulatory demand signals: RFS market implications

Despite slimmer federal credits, the demand picture for biofuels is brightening in the U.S. EPA's proposed 2026–2027 Renewable Fuel Standard volumes raise the floor for advanced fuels, with biomass-based diesel and SAF allocations climbing steadily. By aligning with OBBB's regional feedstock sourcing rules and clamping down on imports, EPA's approach reinforces the domestic market.

For SAF producers, this shift means there will be customers. Obligated parties – refiners and importers – must secure Renewable Identification Numbers (RINs) to comply. SAF, generating D4 or D5 RINs, offers a compliance pathway with lower CI and higher policy alignment. As SAF gallons scale, they will compete directly with renewable diesel (HVO) in the RIN market, potentially tightening supply-demand balances and lifting RIN values.

Airlines, for their part, are increasingly entering offtake agreements that blend compliance demand with voluntary decarbonization goals. By locking in SAF contracts, carriers can hedge against RFS market volatility while meeting CORSIA and international climate reporting obligations. This dual demand – compliance-driven and voluntary – suggests that SAF will become a premium credit generator in the RFS system.

The rise of State incentives

With the U.S. Government paring back federal generosity, the action has shifted to state capitols. Several states have already enacted SAF-specific incentives, and many more are considering them. These policies often layer on top of federal credits, creating regional hotspots where projects are suddenly bankable. In Washington state, for example, a tax credit of up to USD 2.00 per gallon (€570.00/tonne) sits on top of the state's Clean Fuel Standard, giving producers dual revenue streams for every gallon of SAF[1]. Minnesota followed with a refundable USD 1.50 per gallon (€430.00/tonne) credit, cleverly designed to provide liquidity to producers that may not yet have taxable income. Nebraska has passed a smaller credit that begins in 2027, while Illinois offers a purchase credit aimed squarely at airlines.

State SAF Incentives (2025)

State	Incentive	Status
Washington	Up to $2.00/gal + Clean Fuel Standard	Enacted
Minnesota	$1.50/gal refundable (2024–2030)	Enacted
Nebraska	$0.75/gal + CI bonus (2027 start)	Enacted
Illinois	$1.50/gal purchase credit	Enacted
Nevada	$2.50/gal proposed	Pending
New Mexico	Clean Fuel Standard	Enacted
New York	SAF credit proposal	Pending
Michigan	Credit package advancing	Advancing
Kentucky	$2.50/gal credit (proposed)	Introduced
Pennsylvania	SAF provisions in EDGE	Introduced
Wisconsin	Credit + forestry package	Introduced
Indiana	Considering measures	Under review

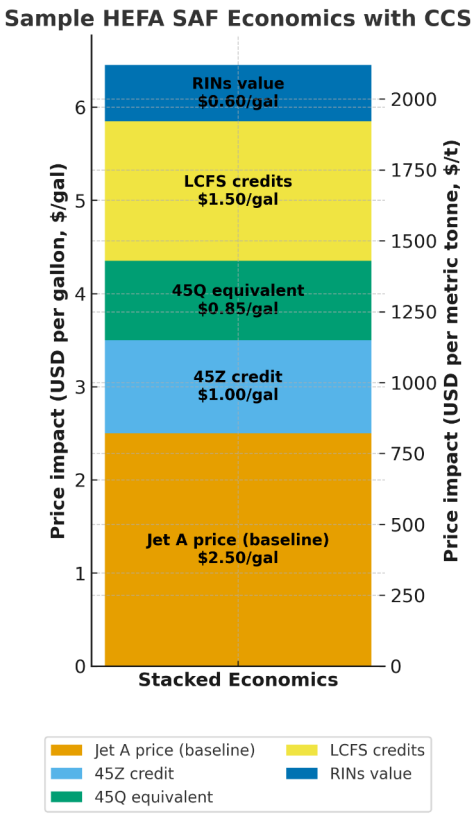
Other states are moving rapidly. Nevada floated one of the most ambitious proposals – USD 2.50 per gallon for in-state SAF use – but the bill stalled this year. New York, Michigan, Kentucky, Pennsylvania, Wisconsin, and Indiana are all at various stages of advancing SAF credits or integrating SAF into broader clean fuel frameworks. And New Mexico has already enacted a Clean Transportation Fuel Standard, with rulemaking underway that could make it the fourth U.S. state with a full clean fuel program by 2026.

1 Trigger threshold: production capacity requirement: The tax credit cannot be claimed until there is at least one or more SAF production facilities in Washington with a cumulative production capacity of at least 20 million gallons (60 KTA) per year.

Strategy roadmap: Navigating the incentive patchwork

For developers and investors, the new policy environment demands a multi-dimensional strategy

- **Carbon Intensity Management**: Maximizing the 45Z credit depends on squeezing CI scores lower – through renewable power, CCS, green hydrogen, and advanced farming practices.
- **State-Level Arbitrage**: Projects should locate where states effectively align with federal policy. Washington, Minnesota, and Illinois already look like prime geographies; others will follow.
- **Capital Markets Adaptation**: With LPO guarantees less accessible, projects must secure creative capital stacks – syndicated tax credit transfers, private equity, and infrastructure funds.
- **Offtake Optimization**: Airlines are buyers, but so are refiners under RFS. Structuring offtake to capture both compliance and voluntary markets is essential.
- **Export Positioning**: While domestic demand will dominate, European and Asian markets offer long-term outlets. U.S. projects with ultra-low CI and aligned sustainability verification can tap these export channels.



Conclusion: A Tighter but Clearer Flight Path

The OBBB narrowed federal margins but did not diminish SAF's trajectory. Instead, it shifted the center of gravity toward carbon intensity performance, regional feedstock sourcing, and state-level innovation.

Federal grants and RFS mandates continue to push the sector forward, while state programs now determine which projects can truly take flight. For investors, this means careful portfolio curation: projects that cannot achieve competitive CI or locate in the right state risk falling behind.

The conclusion is both sobering and exciting. The easy money era is over. The future belongs to developers who master CI accounting, align with multiple policy layers, and navigate the complexity of compliance and voluntary carbon markets simultaneously.

If they succeed, U.S. SAF producers will not only supply domestic airlines and refiners but could also emerge as export leaders, supplying high-value markets in Europe and Asia. The OBBB may have clipped excesses, but it has clarified the new rules of the game. Those who adapt and play them well will find that the sky is still wide open.

SAF DEMAND AGGREGATION: A LOOK AT THE APPROACHES OF FUTURE ENERGY GLOBAL (FEG) AND ATOBA ENERGY

Arnaud Namer

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Written by **Justine El Amrani-Joutey**, Analyst at Ishka SAVi

Obtaining the required financing conditions to reach FID remains one of the largest bottlenecks in scaling Sustainable Aviation Fuel (SAF). Even as mandates tighten and incentives expand, offtake agreements often remain too small and short to win over the long-term financing partners that project developers need to get steel in the ground – particularly for projects deploying advanced SAF production pathways, such as Alcohol-to-Jet (AtJ), Gas Fischer-Tropsch (G-FT), and Power-to-Liquid (PtL).

This article, combining insights from Ishka's interviews with Future Energy Global (FEG) and ATOBA, explores how the two SAF demand aggregators are attempting to reshape the way risk is distributed through the value chain.

The structural bottleneck

Once their technology is sufficiently proven, SAF project developers often reach a similar bottleneck: they can line up fuel buyers with an interest in committing to early volumes, but these are rarely of sufficient duration, size, and credibility to underpin mainstream project finance. Financiers in the past few years have described bankable offtakes as those with "binding" and "take-or-pay" clauses, or including "pricing commitments." This shows that SAF supply Memoranda of Understanding (MoU) or Letters of Intent (LoI) are not considered satisfactory risk mitigants by commercial debt providers – and that is when they are not already laying down further criteria, such as key equity participation.

By contrast, in the nascent advanced SAF market, which is expected to achieve scale cost efficiencies over the next few years, there is a clear first-mover disadvantage for airlines, which are famously tight-margin businesses and used to small, shorter-term fuel supply deals – especially medium-sized and smaller airlines, and especially for more advanced SAF pathways.

This mismatch is a key barrier to the scaling of the industry, which both FEG and ATOBA attempt to address, from different angles, with different tools, and targeted at different segments of the SAF market.

FEG: demand aggregation for the voluntary market

Future Energy Global (FEG) operates in the voluntary market, aiming to bundle the fragmented willingness-to-pay of airlines and corporates into aggregated, multi-year demand that producers can leverage to reach FID. Rather than leaving the producer with the bundling of small offtake volumes of unsatisfactory lengths, FEG steps in as the offtaker, with the backing of multiple end-customers to whom the various SAF emissions attributes – Scope 1 or Scope 3- will be distributed over multiple years. Crucially, Patrick Edmond, FEG's Chief Marketing Officer, says the company can "contract for more volume than [FEG] immediately [has] airline commitments for, because I know that I can place it subsequently," solving for the mismatches.

This mirrors the logic of aircraft leasing: a lessor signs a speculative order, places the aircraft later, and transforms fragmented end-user demand into a single, creditworthy contract for the OEM.

The model is not aimed at the largest airlines, who have the scale to contract directly, but at the "next tier down," who lack the experience, bandwidth, or confidence to navigate long-term SAF offtakes alone.

Book and Claim as the enabling mechanism

FEG's specific flavour of demand aggregation relies on Book and Claim to separate physical uplift from environmental allocation. Book and Claim expands the supply and demand pool outside local markets and their dynamics – for example, expensive SAF in Europe and cheaper SAF in the US. This has benefits for producers in expanding their customer reach and for buyers in broadening their sourcing options.

Book and Claim also enables the monetisation of Scope 1 and Scope 3 attributes separately. Corporations can purchase Scope 3 certificates, reducing the effective premium borne by the airline purchasing Scope 1. This, Edmond argues, can create genuine additionality: passing part of the premium to corporates can unlock higher total SAF production than if airlines acted alone.

The limits: Mandates, registries, and PtL realities

FEG's model is constrained by policy and registry boundaries. Mandated markets do not currently accept Book and Claim for mandate compliance, although this is under consideration by the EU. Registries diverge too: RSB and ISCC exclude mandated SAF from Book and Claim systems due to lack of additionality, while IATA is more permissive. FEG aligns

with the conservative stance: "if it's being bought because of a mandate […] then it doesn't make sense […] to be selling Scope 3s."

Another point to consider is that FEG does not solve the structural cost challenge of PtL. PtL producers have approached FEG for commercialisation help, but, as Edmond puts it, "we're not magicians." With customers highly price-sensitive and PtL's cost profile far above today's market, he believes PtL will remain primarily "a policy-driven market for the foreseeable future."

Already live: An active global portfolio

Despite these limits, and critics who may argue that Book and Claim has limitations, FEG's business is already live. "We are already doing deals, we are already generating revenue, we're already registered traders with RSB and ISCC, I think we did the first ever transaction on the ISCC registry. We're actually doing it."

Demand is global and, Edmond explains, deeper than publicly visible: while US airlines publicly demand price parity with jet fuel - effectively setting the value of environmental benefits at zero – "in private they'll maybe go above zero a little bit". In Europe and in Asia, he sees a recognition that there is "a valid SAF premium."

ATOBA: supply aggregation for mandated and voluntary markets

Paris-based ATOBA begins with the same market diagnosis as FEG: developers need long-term, bankable offtakes, while airlines resist locking in high, uncertain premiums over a decade or longer. But rather than aggregating demand, ATOBA aggregates **supply**.

ATOBA co-founder and CEO, Arnaud Namer, argues that SAF is not scaling because "the risk isn't distributed across the value chain." Currently, risk is often "pushed completely to the airlines" or "pushed completely to the producers." ATOBA's premise is that neither configuration works: the solution is a portfolio-based mechanism that spreads that risk across multiple projects and multiple years.

The model: an index price and a portfolio that must 'beat' it

ATOBA aggregates SAF production projects, focusing on advanced pathways with high technology readiness levels (TRL), and sells SAF to airlines at a transparent SAF index price co-developed with General Index. This index is built on a regionalised "production-cost-plus-margin" methodology.

ATOBA then bears the risk that its portfolio must outperform the index or at least meet it. Airlines are guaranteed a competitive, market-tracking price. Producers get predictable revenue streams, enabling project finance. A typical ATOBA contract spans roughly ten years – the tenor producers need for FID – and physical SAF delivery is handled through logistics partners.

ATOBA's use of an independent index to anchor long-term offtakes is its key differentiator: a transparent rule that allows producers to secure finance while giving airlines confidence that their SAF costs will track the market's evolution. The company's exposure to that index, and its ability to "beat" it through careful portfolio selection, is both its strength and its risk – success

will depend on how effectively new technologies enter its portfolio over time and whether lower cost projections pan out.

Managing the risk

Committing to long-term contracts means taking on portfolio management long-term risk. ATOBA manages that risk by building a portfolio that mirrors the expected evolution of SAF costs and the "overall SAF landscape" in a given region. "Over time, we're increasing our portfolio with new projects at lower cost and improved technology", explains Namer, and each new project lowers the weighted cost of ATOBA's portfolio, allowing it to meet or beat the index.

To keep the portfolio balanced, only projects that meet strict sustainability, maturity, and scalability criteria qualify. "The obvious criteria […] is the guaranteed relevance of the feedstock's sustainability, but then […] what we need in order to manage the risk of the overall SAF industry is a portfolio of diverse technologies, which are at high TRLs, and have the ability to scale at a commercial level." ATOBA typically steps in "just before" FID, precisely when developers most need binding commitments.

Namer explains their business is "mainly about new production technologies driven by companies that require long-term offtake contracts," or the segment of the SAF market least able to self-finance, namely AtJ, G-FT, and PtL projects. This is also advantageous for airlines, who are looking to diversify their SAF sources. Even though "there is [HEFA] supply today, there's expected to be more constrained supply arriving in the late 2020s and in the 2030 timeframe when HEFA reaches its limitations in terms of feedstocks".

Conclusion

Unlike brokers or traders, whose involvement is largely short-term and transactional, both FEG and ATOBA position themselves as long-term intermediaries shaping how SAF commitments are structured. FEG does this by coordinating voluntary-market demand through Book and Claim, creating multi-year collaboration, and taking on placement risk. In contrast, ATOBA introduces an indexed pricing mechanism and manages the associated price exposure through portfolio construction. As mandates tighten and advanced SAF becomes essential to meeting sub-targets, these forms of risk-absorbing intermediation could play a growing role, whether through demand aggregation, supply aggregation, or future hybrids.

ICF SUMMARY OF THE REFUELEU AVIATION ANNUAL TECHNICAL REPORT 2025, 2024 IN REVIEW

Ben Chapman

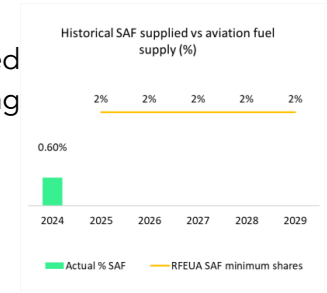
Director Aircraft & Sustainability, ICF

Introduction

The RFEUA Regulation, effective from January 2025, requires aviation fuel suppliers to provide a minimum blend of SAF and for aircraft operators to report on SAF purchases. The 2025 EASA ReFuelEU Aviation Annual Technical Report (ATR) was prepared by EASA with principal consultancy support from ICF to provide insights into data from the 2024 reporting period. The 2024 reporting period served as a "dry run" to set a baseline of compliance rates and highlight areas for improvement in monitoring, reporting, and verification (MRV). This document summarises the key findings from this report.

Compliance rates

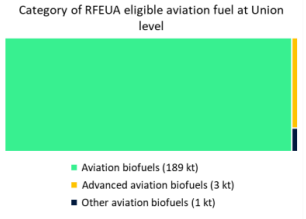
67% of aviation fuel suppliers and 74% of aircraft operators submitted reports. Data gaps and inconsistencies were noted, particularly among smaller operators and their suppliers.



SAF supply and market performance

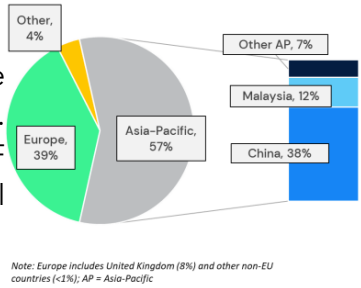
Aviation fuel and SAF supply:

In 2024, 32.1 million tonnes of aviation fuel were supplied to Union airports, of which 192,700 tonnes (0.60%) were SAF. This is below the 2% share mandated from 2025; however, the obligation was not yet in force and indicates a promising trend towards future compliance.



SAF characteristics: Nearly all SAF supplied (98%) was classified as "aviation biofuels" (HEFA), predominantly produced from used cooking oil (81%) and animal fats (17%). Only minor volumes were advanced, or other biofuels, and 40% of all SAF reported by suppliers was imported.

Feedstock origin: 69% of SAF feedstock originated from outside the EU, with China (38%) and Malaysia (12%) as major sources. Finland was the largest EU contributor (10%). Over 40% of SAF supply in 2024 came from imports, despite the growing regional capacity



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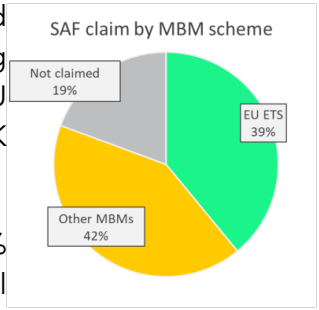
SAF operators purchases and claims: Aircraft operators purchased 357,600 tons of SAF, but also higher fuel consumption, indicating inconsistencies in the "dry run" year. 39% was claimed under the EU ETS, 42% in other market-based measures (MBMs) such as the UK ETS. None was claimed in CORSIA or CH ETS.



Market concentration: Fewer than ten suppliers accounted for 80% of SAF supplied, indicating a nascent market dominated by a small number of mature actors. SAF was delivered to 33 airports in 12 states, but five states (France, Netherlands, Spain, Sweden, Germany) accounted for 99% of the supply.

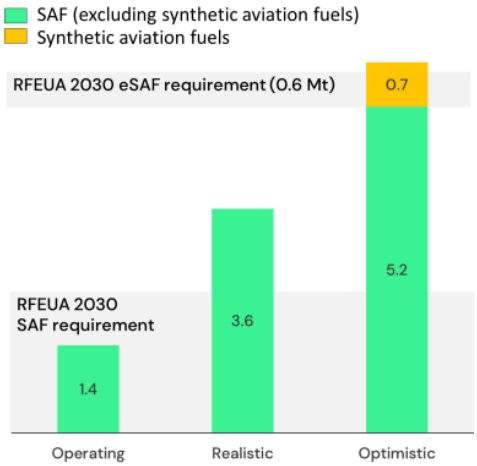
SAF production capacity outlook

EASA's assessment of EU SAF production capacity uses three scenarios for 2030:

Operating Scenario: Only currently operating facilities are included, projecting 1.4 Mt of SAF

Realistic Scenario: Adds facilities under construction, raising projected capacity to 3.6 Mt.

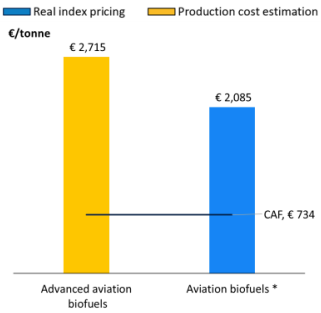
Optimistic Scenario: Includes credible announced projects, projecting 5.2 Mt of SAF plus 0.7 Mt of e-SAF.



The Realistic Scenario is sufficient to meet the 2030 SAF mandate (excluding synthetic fuels), but the synthetic sub-target is at risk unless several facilities reach Final Investment Decision (FID) by 2026. Meeting the 2035 targets will be significantly more challenging, requiring a rapid scale-up of both SAF and synthetic fuel production.

Reference prices and market dynamics

Reference prices: For 2024, EASA set the reference price for aviation biofuels at €2,085/tonne and for conventional aviation fuel at €734/tonne. Synthetic aviation fuels were estimated at €7,695/ tonne. Actual prices paid by operators often exceeded these reference values, sometimes approaching double, due to contractual and market factors.



Key challenges and outlook of the current SAF market

Market maturity: The SAF market is still in its early stages, with high concentration and limited feedstock diversity. The majority of SAF is produced from waste-based feedstocks, and the sector is highly dependent on international supply chains.

Production scale-up: Achieving future mandates will require significant investment, timely commissioning of new facilities, and diversification of feedstock sources. The lag in synthetic fuel and advanced biofuel project FIDs poses a risk to meeting mid-2030's targets.

Policy and price signals: The regulation provides a stabilised demand outlook, but price transparency and contractual clarity remain concerns for operators. Reference prices will be updated in 2026 based on observed 2025 pricing.

ICF comment

The ReFuelEU Aviation Annual Technical Report 2025, 2024 in review, shows that the EU has made progress in SAF adoption and capacity development and is expected to meet the mandates in 2030. However, work is still required to meet the 2035 mandates, and the sector must address market concentration, feedstock imports reliance, and the required investment decisions to facilitate the scale-up of advanced biofuel and e-SAF production. Continued policy support, investment, and ongoing improvements to reporting will be essential to ensure the EU's aviation sector transitions to a more sustainable future.

KEY TAKEAWAYS ON THE EU STIP PACKAGE ANNOUNCED ON 5TH NOVEMBER 2025

Eduardo Mariz

Sustainability Lead and Senior Analyst, Ishka SAVi

The European Commission, on 5th November 2025, adopted a transport package to mobilise €2.9 billion ($3.3 billion) by 2027 to boost investment in renewable and low-carbon fuels for aviation and shipping. The **Sustainable Transport Investment Plan (STIP)** also contained a commitment to launch an e-SAF Early Movers Alliance of EU member states (established last December) and, "in the medium term," work towards a revenue certainty mechanism for e-SAF.

STIP also contains pledges to address EU SAF mandate implementation failures, a possible extension to EU ETS free allowances for SAF, and, for the first time, a recognition that Book and Claim may have a role to play in unlocking the e-SAF scale-up.

Key features of the STIP plan

The key features of the STIP plan for aviation can be divided into three categories: short-term measures for first-mover e-SAF projects, medium-term measures to catalyse investment into e-SAF, and pledges to address the shortcomings of existing SAF policies.

Short-term measures: In the short term, STIP will mobilise all resources under current EU funding programmes, like the Innovation Fund, Horizon Europe, and InvestEU, amounting to at least €2.9 billion ($3.3 billion) of EU support for sustainable fuels (for both aviation and shipping).

- **Innovation Fund:** The Commission will support synthetic aviation fuel projects with €153 million and maritime fuel projects with €293 million under the 2024 general call. That **€153 million ($175 million)** for e-SAF is part of an award of funds announced this week, which also includes allocations for aviation projects outside of synthetic fuels. In addition, the Commission is inviting EU countries to consider providing support for other high-potential projects.
- **Hydrogen Bank under Innovation Fund:** The Commission will open a specific call with a dedicated budget of €300 million ($344.5 million) to support the production of sustainable aviation and waterborne fuels in December 2025.
- **InvestEU:** The Commission expects to mobilise investment of around €2 billion ($2.2 billion) for sustainable alternative fuels until 2027 under InvestEU.
- **European Investment Bank (EIB):** The Commission pledges to "intensify" its work to mobilise more funding through the EIB Group's TechEU programme. There is no set

funding pledge for aviation or shipping fuels here, but it notes that €250 billion ($287 million) will be mobilised by 2027 by the programme.

- **Horizon Europe:** Around €133 million ($153 million) will be mobilised under a new SET Plan flagship and the next Horizon Europe call for 2026 to support R&I projects, part of the €600 million ($689 million) earmarked under the CID earlier this year. These projects will look at de-risking renewable fuel technologies and value chains at the EU, national, regional, and local levels.
- **European Innovation Council (EIC):** Under the EIC's 2026 programme, renewable and low-carbon fuels early-stage research is also eligible for a call of up to €300 million ($344.5 million), which the Commission is considering replicating again in 2027.

Medium-term measures: Arguably, the most anticipated component of the STIP package, a revenue support mechanism for SAF, is now a **"medium-term" objective**.

To accelerate the creation of a "double-sided auction" and "field test solutions," on 4th December 2025, the Commission launched an e-SAF Early Movers Coalition of eight countries (Austria, Finland, France, Germany, Luxembourg, Netherlands, Portugal, and Spain), which together will mobilise at least €500 million ($574 million) for synthetic fuel projects. This will be done through the organisation of the first pooled double auction pilot for e-SAF in 2026. This could be implemented using existing mechanisms such as the H2 Global Foundation.

Building on this pilot, the Commission "will launch preparations, in early 2026," for setting up an "EU-wide mechanism for an EU-wide double-sided auction for SAF and sustainable maritime fuel (SMF) production, without prejudice to the proposals on the next MFF (Multiannual Financial Framework) and new own resources." The MFF is the EU's spending plan and is updated on a seven-year cycle, with the current one running through to 2027. This preparatory work will:

- Identify the best options for the design and governance of the EU market intermediary.
- Identify methodologies for mobilising sufficient funding at the EU and Member State level, including possibly through the Innovation Fund and other instruments. They could include the European Competitiveness Fund available after 2027;
- Analyse suitable auction models. "To this end, **a study is ongoing** to assess appropriate governance frameworks and identify the legal requirements that would be necessary," the Commission noted.

The Commission also calls on EU countries to:

- Make use of the Clean Industrial Deal State Aid Framework (CISAF) to make further **state aid allocations** to support e-fuels;
- "Urgently conclude" negotiations – deadlocked for the past four years – on the Energy Taxation Directive (which under Fit for 55 proposals could include an **end to jet fuel's exclusion from taxation**) and "review subsidies and taxation regimes" favourable to fossil fuels;
- Reinvest EU ETS revenues "on actions to decarbonise the aviation and maritime sectors" – echoing a recurring demand by European airlines.

MARKET ACCELERATOR INDICATOR – HOW AVIATION CAN NOW CREATE BANKABLE SAF PROJECTS

Adam Klauber

Chief Sustainability Officer, World Energy

To scale sustainable aviation fuel (SAF), we need low-cost capital. Energy producers that lack large balance sheets need external financing to build or retrofit refineries. Banks have viewed SAF plants as high risk in part due to the structural challenge that supply is costly, and airlines have limited ability to absorb fuel premiums on what is often already their highest operational cost. To address this "bankability' barrier, World Energy partnered with the Roundtable on Sustainable Biomaterials (RSB), Microsoft, RMI, and the Green Finance Institute to create a bankable contract playbook and launch a system to certify those agreements.

Like the electricity market, the incumbent energy providers have been slow to make infrastructure investments that compete with the existing fossil-based assets. Wind and solar developers have leveraged the Power Purchase Agreement (PPA) to sign contracts with the utility rate payers, and these contracts have been responsible for approximately 90 percent of the renewable electricity capacity over the last decade. And using a "Book and Claim" chain of custody that transfers emission reductions independently of the actual electron transmission. Developers locate the optimal power generation sites without geographic constraints.

The team drew on its experience helping to pioneer PPA scale-up and help to apply this expertise to "bankable offtake" for SAF. Applying solar and wind procurement and through interviews with Finance experts in banks, the following key requirements derisk the commercial aspects of SAF projects:

1. **Creditworthy counterparty** – bankable contracts require buyers with investment-grade credit ratings, often associated with the letter "A" or better from the big three credit agencies.
2. **Duration** – ideally, an offtake agreement matches the lifespan of the asset. For solar and wind, PPAs can be as long as 20 years. For SAF, the target should be 10 years when possible.
3. **Binding commitment** – a "take-or-pay" agreement provides the necessary level of assurance that both parties are committed. The buyer will have the first responsibility to find an alternative user, and alternatively, the producer will need to find an alternative supply that meets the contract specifications if a refinery is shut down for an extended period. MOUs are not bankable.

4. **Proven technology** – banks will not provide low-cost capital to first of a kind (FOAK) refinery. The second and beyond (Nth-of-a-kind) ideally operated by personnel who have direct experience with the same technology.
5. **Pricing strategy to address volatility –** fluctuating market forces for feedstocks, process-related energy, and government incentives increase risks for firm prices. Ideally, buyers can accept a flexible cost structure that can include indices like fossil jet fuel, burden sharing for extended periods with negative market dynamics, and third-party verification of actual costs.

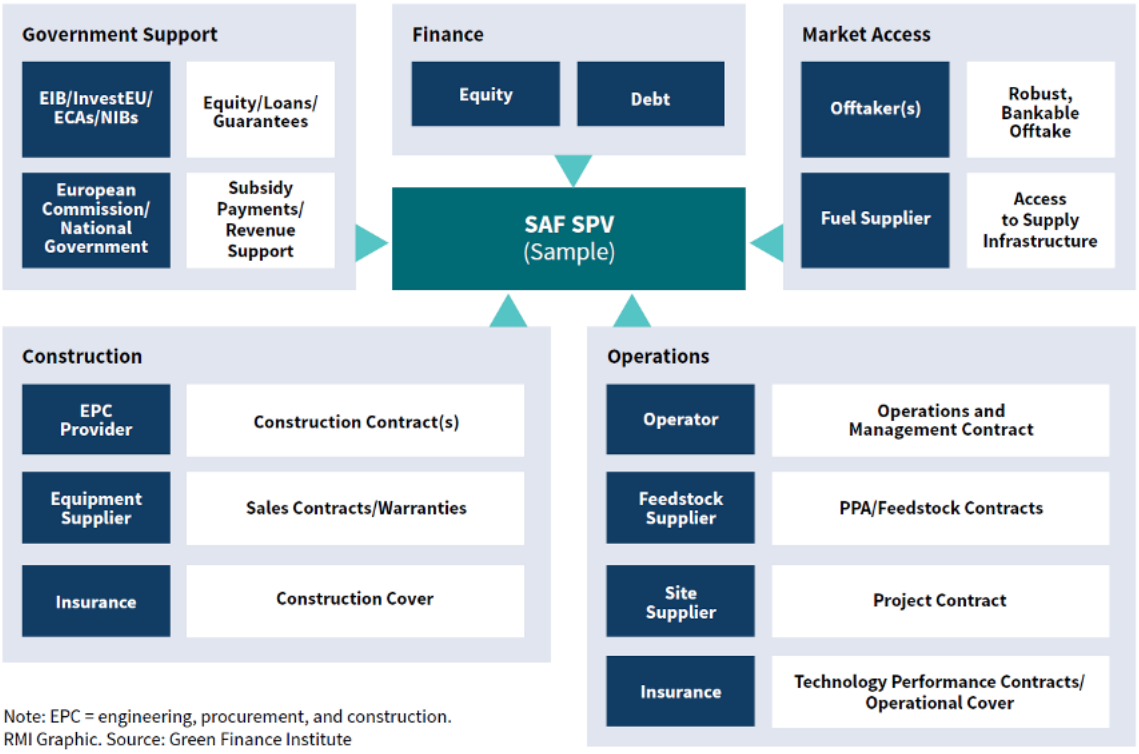


Figure 1. Relationship of Offtake within a SAF Special Purpose Vehicle (SPV)

In addition to the five requirements above, contracting likely requires that the emission reduction credits, commonly referred to as Environmental Attribute Certificates (EACs), are decoupled from physical fuel. The actual molecules can be delivered to the most carbon-efficient airport location, and the EAC ownership is transferred via a digital ledger such as the RSB Registry. Like PPAs, bankable SAF offtakers are not limited by the location of their operations when they want to mitigate their emissions. But how will SAF contracts demonstrate that they have achieved bankability?

RSB built a system to recognize and certify bankable SAF offtake, which is named "Market Acceleration Indicator (MAI)." In December 2025, RSB published its MAI methodology, which provides the requirements for SAF contracts to earn certification as "bankable." The resource provides the aviation industry with a template for producers and their customers on how to prove that their agreement addresses commercial risks associated with new SAF production plants.

In the future, verifiers can assess the contracts to certify agreements, and in theory, if the offtake meets requirements at the time of Final Investment Decision, presumably all

subsequent volumes under that contract should prove "economic additionality" despite future policy changes that may occur. Beyond emission reductions, buyers can demonstrate that their action contributes to financing new production capacity. Producers will be able to secure lower-cost capital, and they can pass these savings on to their customers. And banks can streamline their due diligence process by recognizing the MAI certification, which can reduce the burden of detailed contract review.

Does your firm want to participate in bankable SAF offtake? RSB is ready to test the MAI concept and is actively recruiting pilot participants for 2026. Please reach out to Gill Alker at Gill.Alker@rsb.org to learn more and visit the RSB website to read more about the MAI standard.

CONTRAILS: THE BARRIERS TO AVIATION'S LOW-HANGING FRUIT

Justine El Amrani-Joutey

Analyst, Ishka SAVi

Aviation's climate conversation has long centered on CO_2 mitigation, but non-CO_2 impacts, particularly contrails, are now moving rapidly up the agenda. Updated aviation climate roadmaps, including the International Council on Clean Transportation's (ICCT) Aviation Vision 2050 roadmap earlier this year, are increasingly pointing to non-CO_2 impacts as an area for achievable short and medium-term action. More broadly, industry attention to contrail science is growing, particularly in Europe, where the EU's first non-CO_2 monitoring framework is compelling airlines to monitor non-CO_2 impacts.

Often described as aviation's climate problem's 'low-hanging fruit', contrails could be avoided with modest flight-planning changes, at costs far below SAF, and with almost-immediate climate benefits.

With inputs from advocacy group Blue Lines and aviation climate data platform Estuaire, this report explores why – beyond the EU's monitoring framework – so little has happened since the 2020 EASA landmark report that propelled policymaker and industry awareness of the climate-warming potential of contrails.

Recap: the case for contrail action

Contrails form when jet engine exhaust meets cold, humid air at cruising altitude. Most vanish quickly, but under specific atmospheric conditions, some can persist and spread into cirrus clouds that trap heat at night. As a result, their contribution to aviation's warming effect operates on a different timescale to CO_2, hours to days rather than centuries. "If we consistently avoid making contrails, we effectively cool down the planet almost immediately," underlines Joachim Majholm, founder of **Blue Lines**, an environmental advocacy group focused on contrails. "This is very unique. CO_2 warms very slowly over hundreds of years, but the warming contrails produce is massive compared to CO_2."

The ICCT's revised modelling, released in September 2025, estimates that contrail avoidance alone accounts for 40%–43% of avoidable aviation warming by 2050. By comparison, SAF contributes around 21% and hydrotreating fossil jet fuel and operational efficiency about 11% each. The report puts contrail avoidance at about USD 5–20 per ton CO_2 equivalent, compared with more than USD 300 for SAF. On a fleetwide basis, avoiding 95% of contrails

from flights leaving high- and upper-middle-income countries would add about 1% to fuel burn.

Unlike other aviation emissions, the most climate-impactful contrails are highly concentrated in certain regions. **Estuaire**, a climate-impact data platform focused on reducing aviation emissions, estimated that in 2023, just 2.9% of global flights generated 80% of contrail radiative forcing. Avoiding them would require an increase in fuel consumption of only 0.4-0.5%, Estuaire estimates. "So, a few hundred kilos, if not tens of kilos of extra kerosene, and on some specific flights, you can get back 20 times the amount in terms of climate savings. That's why it's a low-hanging fruit," explains Estuaire's CEO Maxime Meijers.

Contrail avoidance through rerouting or altitude changes is the most effective lever. But other measures also contribute. Studies show that low-aromatic fuels – whether SAF or hydrotreated fossil jet fuel – can reduce contrail formation. "Engine types seem to have a large impact on contrail warming," Majholm also observed, as illustrated by findings from Imperial College London[1], although tactical avoidance still offers the fastest global solution.

Challenges – and their possible solutions

If the case for contrail avoidance is so strong, why has action been limited?

Remaining scientific uncertainty: Industry skepticism of action on contrails has long been based on two key uncertainties: the true scale of contrails' climate impact, and the accuracy of prediction models. "What is the precise climate impact? Is it big, like half of CO_2, or huge, twice as big? That is still the question," Majholm concedes, but he insists that either way, "it is big enough for us to address it."

On the modelling side, re-routing flights to avoid contrail susceptible zones requires identifying thin, shifting layers of very cold, humid air where persistent contrails form. Boundaries can be unclear, which complicates dispatch decisions. "A lot of work is going on all over Europe and the US to get better at predicting the zones, […] the models are improving," Majholm explains, reflecting on takeaways from contrails.org's third annual Contrails Workshop, held at Imperial College London in September 2025.

Lack of regulation: With the science maturing, the larger barrier is now funding for airlines. "The feedback of the industry is moving from 'there's not enough data' to 'there's not enough incentives,'" explains Meijers, whose company supplies data and builds contrail avoidance systems.

Tactical avoidance – minor altitude or route adjustments to bypass contrail-prone layers – is the most immediate lever and the one most likely to scale quickly once air traffic control (ATC) actively manages it or suitable operator incentives exist. However, operators lack an economic incentive without a mechanism to offset the fuel penalty that arises from diverting from flight plans.

[1] Roger Teoh & Marc Stettler (2023) using data from EASA and ICAO Aircraft Engine Emissions Databank (07/2021).https://cdn.ishkaglobal.com/assets/ckfinder/images/Events_assets//Imperial%20College%20Aircraft%20nvPM%20Charts.jpg

"Airlines have large expenses. It's as simple as that […] if you don't have that small incentive that pays for the extra fuel, even burning tens of kilos of extra kerosene on a short-haul flight is not in anyone's interest to do."

As for airline sustainability reporting, while some airlines have made contrail mitigation efforts part of their sustainability narrative, most find themselves unable to account for contrail action. Contrails are also not counted in the Science Based Targets Initiative (SBTi) or other voluntary frameworks, so there is currently little incentive to feature them from an ESG reporting perspective.

Operational scale-up: Securing broad participation is further complicated by the economic reality that contrail avoidance will most likely never resemble a multi-billion-dollar industry. Unlike SAF, which "attracts capital because it is a guaranteed product, every flight needs fuel, and mandates create demand", for contrail avoidance "you just need a prediction software function in your flight planning [...] That is not a multi-billion-dollar business," argues Majholm.

This limited commercial upside means there is little financial incentive for industry players to fund extensive flight trials, slowing progress toward large-scale implementation. In the absence of regulatory incentives, Meijers points to Europe's ETS-funded Innovation Fund, SESAR (Single European Sky ATM Research, the technological pillar of the Single European Sky), or similar vehicles as possible financing mechanisms for large-scale contrail flight trials.

*This article has been adapted from a report published by **impact** member Ishka.*

ELECTRIC FLIGHT ISN'T JUST AN IDEA: VÆRIDION'S PRAGMATIC APPROACH TO ZERO-EMISSION REGIONAL AVIATION

Written by Bozhena Hryvnak, Head of Growth at Vaeridion

A turning point for regional aviation

Regional aviation is entering a decisive phase of renewal. It plays a vital role in connecting communities, supporting local economies, and ensuring mobility where other modes of transport fall short. It links smaller cities and remote areas to major hubs, enabling economic growth, tourism, and access to essential services. As the backbone of regional connectivity, this segment is crucial not only for accessibility but also for achieving the climate targets. Modernizing regional fleets presents a unique opportunity to pioneer clean technologies, reshape the role of smaller airports, and lay the foundation for broader decarbonisation across the entire aviation sector.

The regional aviation sector, in particular, remains structurally underserved. The average ≤9-seater aircraft is now 23 years old and due for renewal. Meanwhile, the commuter turboprop segment under 40 seats continues to decline. Currently, only two 19-seat models (Cessna SkyCourier and Dornier 228) are still being produced. A few larger turboprops, such as the ATR 42 in the 20–50-seat category, are still in production, leaving a structural gap for a modern and sustainable alternative in the smaller regional aircraft segment.

As fleets continue to age, they will not meet environmental and economic expectations, e.g., increasing maintenance costs. While large aircraft programs remain years away from zero-emission propulsion, the regional segment offers the most immediate testing ground for innovation: a scale small enough to adapt quickly, yet significant enough to influence the entire sector.

This transition is not just technological – it's systemic. It requires alignment between aircraft design, airport infrastructure, energy supply, and public policy. Regional airports are already evolving into energy hubs, integrating renewable generation, electrified ground operations, and the first high-capacity charging systems for next-generation aircraft.

The Microliner: Innovation through pragmatism

The regional aviation sector faces significant challenges that demand pragmatic and forward-looking solutions. Electric flight must balance innovation with operational reality – it must be safe, efficient, and compatible with existing systems while setting new standards for sustainability and meeting certification criteria.

The Microliner embodies this pragmatic approach. As a nine-passenger commercial aircraft, designed for a 400 km range plus IFR reserves, it addresses routes where conventional combustion-engine aircraft currently dominate today.

Its clean-sheet, proprietary design features a glider-inspired wing with integrated modular batteries and a multi-engine, single propeller electric propulsion system, resulting in one of the most energy-efficient configurations in its class. As battery technology advances, VÆRIDION anticipates extending the range further, potentially enabling pan-European connectivity.

The Microliner benefits from its innovative aerodynamic design: its wing-integrated battery architecture optimizes structural weight and maximizes range. Combined with a novel powerplant architecture, it delivers tangible energy efficiency without compromising safety or passenger comfort. Proprietary technology patents further protect these innovations, reinforcing the company's role as a trailblazer in zero-emission commercial aviation solutions.

And progress continues: VÆRIDION has reached an important regulatory milestone, becoming the first General Aviation company to finalize a Pre-Application Contract with the European Union Aviation Safety Agency (EASA), which significantly reduces the risks associated with its core innovations and streamlines the path toward certification.

With its first commercial customer, ASL Group has signed up the momentum is building. ASL Group is planning on expanding its semi-scheduled network and will serve as the aircraft's inaugural commercial operator upon entry into service.

Johan Maertens, CO-CEO, ASL Group: *"ASL Group was amongst the first to enter into an R&D agreement with VÆRIDION, recognizing the potential of its revolutionary yet no-nonsense electric Microliner design already back in Summer 2023. The nine-seater VÆRIDION Microliner with nine seats and a range of at least 400 kilometres exactly hits the demand sweet spot for efficient, affordable, and clean air travel in the Low Countries, the UK, France, and Germany. Hence, the Group is a strong believer in the VÆRIDION Microliner aircraft and aims to be first in line to operate it once certified, bringing affordable air travel to a wider audience and unlocking the potential of regional airports with less noisy and cleaner operations.*

ASL Group is active in business, charter, medical, and semi-scheduled aviation with around 50 aircraft flying principally from the Benelux, where the Group also operates FBOs at several airports, a Part 145 maintenance organisation, a catering unit, and a flight school. ASL Group is a pioneer in sustainability, being the first to operate fully electric Pipistrel training aircraft in Belgium and offering its customers the option to buy SAF on every flight, in collaboration with Azzera.

With a projected cost of below € 0.50/passenger-kilometre, it has the potential to improve operators' profitability, translating into an economically compelling option for fleet renewal. Progress also extends to market collaboration: VÆRIDION has established a Market Advisory Committee composed of leading stakeholders from across the aviation ecosystem, ensuring that product requirements are integrated early and aligned with real-world operational needs.

Building the ecosystem for electric aviation

Electric aviation cannot succeed in isolation. It depends on a synchronized ecosystem that brings together technology developers, regulators, operators, financiers, and energy providers. Europe's regional airports are playing a crucial role in this ecosystem-wide transformation.

Across Europe, many airports are modernizing infrastructure to support the transition of aviation by electrifying ground support equipment, installing EV chargers, and planning high-capacity charging systems for vehicles and trucks. Airports like Stavanger in Norway and Groningen in the Netherlands are also incorporating on-site solar parks and other renewable energy sources, reducing both carbon emissions and energy costs. Expanding this infrastructure to accommodate next-generation electric aircraft represents a logical and strategic next step in creating a fully integrated multimodal regional mobility network.

A high number of underutilized regional airfields could be reimagined as nodes in a low-emission transport network, generating new economic activity and connecting communities in cleaner, quieter ways.

Horizon 2030

The shift toward zero-emission regional flight is already underway. By focusing on achievable milestones, capital efficiency, and regulatory alignment, the company is advancing electric aviation as an enabler in regional mobility. Building on this momentum, VÆRIDION is

targeting its first flight in 2027, with EASA certification and entry into service expected by 2030.

The goal is not simply to introduce another aircraft type but to prove that regional air travel can be economically viable, socially beneficial, and environmentally regenerative, while filling a void in the regional aviation sector.

By offering a compelling and competitive business case for regional operators, VÆRIDION is poised to bridge the longstanding gap in the regional aviation sector. Beyond this, the Microliner seeks to contribute to the evolution of regional travel by improving connectivity and operational flexibility, fostering greater accessibility and sustainability across regional networks. With proven technology, a clear certification pathway, and growing market demand, commercial **electric flight is not a distant dream – it's a reality ready to be executed.**

UNLOCKING CAPITAL FOR A CLIMATE-COMPATIBLE FUTURE IN AVIATION

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Leading authority on sustainable aviation systems, UCL Air Transportation Systems Laboratory

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Prof. Thomas Conlon

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A new investment framework to accelerate deep decarbonisation in one of the world's hardest-to-abate sectors

Aviation faces an increasingly untenable climate challenge. While a wide range of promising technologies exists - from next-generation aircraft and sustainable fuels to breakthrough propulsion systems - investment is flowing far too slowly to scale these innovations at the speed required. A new research paper from leading academics, including members of ***impact***'s Science Team, proposes a transformative investment model designed to reward

sustainability-minded investors for backing the high-risk, high-impact innovations essential for decoupling aviation's growth from its CO_2 emissions.

This work, published by experts from the University of California San Diego, University College Dublin, University College London, and Johannes Gutenberg University Mainz, outlines a practical and scientifically grounded framework to steer capital toward technologies capable of delivering real, measurable climate progress.

Why a new model is needed

Aviation is a hard-to-abate sector - fuel-intensive, globally integrated, and reliant on long-lived assets. While billions of dollars continue to flow into the industry, the vast majority of capital is directed toward low-risk, incremental improvements that barely dent overall emissions. Decoupling aviation's economic output from its climate footprint demands **bold, near-term investment in frontiers technologies**, even if these innovations carry higher levels of uncertainty.

The new research argues that traditional sustainability-linked finance has reached its limits. Investors and lenders cite rising emissions, inconsistent reporting, and the prevalence of intensity-based metrics that can obscure real-world outcomes. The result: climate-aligned capital is available but not flowing to where it matters most.

A transformative scoring framework

The paper introduces a first-of-its-kind scoring methodology that evaluates aviation decarbonisation projects by their potential to deliver genuine emissions–growth decoupling.

The framework allows investors to:

- Identify innovations with real, not symbolic, decarbonisation potential
- Score and compare high-risk projects using transparent, science-based criteria
- Reward projects that meet ambitious performance thresholds with tangible financial incentives
- Channel capital into technologies capable of transforming the industry rather than marginally optimising it

This approach offers a simple and meaningful alternative to the ever-growing complexity of sustainability reporting. Instead of dozens of inconsistent metrics, it focuses on one question: *Is this investment helping aviation grow without growing emissions?*

INSIGHTS

A key finding is that aviation is trapped in a maze of sustainability reporting - with airlines tracking dozens of metrics for multiple organisations. This fragmentation hinders both transparency and accountability. The authors argue that focusing on decoupling outcomes provides a clearer and more robust signal to investors, policymakers, and the public.

Aviation is foundational to global mobility, economic development, and social equality. Decarbonising the sector reduces climate risk, creates jobs, supports sustainable industry growth, and strengthens long-term resilience in the global transport system.

The proposed framework offers policymakers a practical tool to assess how individual projects - or entire investment portfolios - contribute to aviation's climate transition. It also complements the emerging Aviation Sustainability Index (aka Milestone Concept), developed by *impact* on sustainable aviation, which has the potential to shape and create sustainability-linked and transition-linked financial products.

A moment of change

This research arrives at a pivotal time. The disbanding of the Net Zero Banking Alliance has exposed the fragility of voluntary climate commitments and the need for more credible, progress-based frameworks. Rather than relying on symbolic targets, decarbonisation efforts must provide investors with clear, transparent, and investable pathways - exactly what this new model aims to deliver.

With aviation's transition accelerating - and with global market, regulatory, and scientific pressures mounting - this work provides a credible blueprint for unlocking the trillions needed to fund transformational innovation.

impact is a non-profit, neutral coordinating platform founded by aviation finance institutions, reflecting the central role of finance as the backbone of the aviation sector. By meeting the industry's core funding needs and mobilizing capital for the transition, financiers sit at the center of gravity of aviation's pathway to net zero.

Building on this foundation, impact develops a carefully constructed ecosystem that brings together selected industry, scientific, and policy expertise to support financiers in identifying transition-related risks, constraints, and opportunities across the aviation value chain. This ecosystem is designed to inform capital allocation decisions, enhance comparability, and provide clarity where scientific, technological, and regulatory developments are evolving rapidly.

Through structured working groups and targeted initiatives, impact translates complex external developments into finance-relevant, actionable guidance, enabling pre-commercial collaboration, reducing duplication, and supporting the efficient deployment of capital toward scalable, measurable solutions consistent with Net Zero 2050.

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