IEA BIOENERGY T39

BIOFUEL NEWS

"Biofuels to Decarbonise Transport"

No. 3-2026 (72)

This year Task 39 is proud to celebrate 25 years in IEA Bioenergy TCP

In this issue

- Country report France
- Biofuels Without Borders: IICA's Agustín Torroba on sustainability, policy and the future of SAF
- From EV Euphoria to technological diversification
- Spain joins IEA Bioenergy Task 39



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IEA Bioenergy
Technology Collaboration Programme

IEA Bioenergy is a Technology Collaboration Programme (TCP) set up in 1978 by the International Energy Agency (IEA) with the aim of improving co-operation and information exchange between countries that have national programmes in bioenergy research, development and deployment. Twenty five countries plus the European Commission currently participate in IEA Bioenergy.

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THE ENGINE STRIKES BACK:

How biofuels and new combustion technology could reshape the future of transport



Editor-in-Chief, Tomas Ekbom, National Team Leader Sweden.

It started as a small tremor in October last year. Volkswagen reported its first quarterly loss in five years. Then came the first of many earthquakes with Stellantis in early February with record-losses on a magnitude not seen before. Since then, there has been shockwaves emanating through the global car industry. One of the epicentres for the earthquakes was Volkswagen, which is currently cutting production capacity by one million cars to address overcapacity and poor profitability. Overall, Volkswagen aims to cut capacity to 9 million cars worldwide per year from originally 12 million. The causes are political overconfidence in electric cars, competition from China, and low demand for biofuels due to uncertain policies. In December 2025, Volkswagen shut down a car factory – the first ever in their 88-year long history. 2026 will be a steel bath for the car industry, reports say.

On a global scale the end of electric vehicle euphoria has led to a significant financial impact on the global car industry, with at least $65 billion in write-downs, cancelled models, and restructured operations. The decision to throw out decades of expertise in combustion engines and switch entirely to batteries and electric motors has thus proved wrong. As a consequence, the automakers also gave up extensive know-how and technology in the transition for engines that can run on 100 percent biofuels. Biofuels are important in the energy system not only for its sustainability, but for its resilience, robustness and potential for high efficiency in the energy system. In the event of disturbances in the power grid and in global supplies of fossil fuels domestic biofuels production and capacity may be worth more than the value of the biofuel itself.

The national oil reserves of Sweden amount to 90 days of consumption. The gas reserves last for 12 hours of consumption. The backup power in the grid would run out in less than 1 minute if a nation-wide blackout would happen. The vehicles could then only run the mileages of what the charge the batteries have. If Sweden moves towards full electrification of the domestic transport sector some 5.8 TWh electricity would be needed equivalent to the 90 days of national oil reserves. This would correspond to a battery capacity equivalent of 2700 MW.

Even with a smaller blackout and less need for electricity as multiple backup systems could kick-in to support, there would still be a substantial power-need, which would be difficult to uphold. Thus, biofuels have the same role to play as base-load power production plants have for the national power grid. Biofuels cannot be excluded unless the function of important societal transport services like in emergency and military to work independent would change dramatically, as we know it.

The development in internal combustion engines has though not stood still, despite the hype of electric vehicles. In June 2026, reports came on a new turbo engine competing to be the most efficient engine per drop of fuel. Previously, extremely high efficiencies of over 45 percent have only existed in small 1.5-litre engines without a turbo. They are good at saving petrol, but they are far too weak to be put in a large family car. But now the state-owned car giant Dongfeng announced that their extremely powerful two-litre turbocharged engine, Mach Power 2.0T, has been certified. During tests, the engine reached a thermal efficiency of 45.5 percent.

Dongfeng's success in achieving this very low consumption is a huge breakthrough in technology. To reach this good result, the engineers have developed a completely new system for how the fuel burns in the cylinders. Through an extremely long stroke, the combustion is more stable than in a traditional engine. The engine also uses a direct injection system with a high pressure of 350 bar, combined with a high-performance ignition system. To make the engine run as smoothly as possible, Dongfeng coated the moving parts with a super-hard surface of diamond-like carbon (DLC). This ensures that the parts nearly eliminate friction and less energy is wasted.

Still, engine development has little value if not combined with biofuels. In just some five years India managed to go from some 0.5 percent ethanol blend in petrol to today's 20 percent as E20, nationwide. This is a significant step for the world's most populated country. In addition, India has decided on new fuel standards to be able to further increase the blending of ethanol. The standards include E22, E25, E27, and E30. This initiative aims to reduce crude oil imports, boost energy security, and support agriculture. This is a strong signal for countries looking at decreasing fossil fuel dependency and increase the use of renewable energy.

By increasing the use of domestically produced ethanol, the country also supports the agricultural sector. For boreal countries this would similarly support the forest sector.

Ethanol is also not a poor-quality fuel; on the contrary, it has valuable fuel properties. One key advantage of E20 is its higher-octane rating, around 95 RON, compared to regular Indian petrol, which typically ranges between 91 and 92 RON. This allows for smoother combustion and potentially better engine performance.

All in all, a healthy wakeup has begun in the global auto industry - although an extremely costly one – where once again biofuels play a vital part. The current geo-politics also show how important it is to secure the supply and to increase energy security. Biofuels check for each box to provide with need for any country and to offset fossil fuel burning. This is a good thing. For you, for me and for our children and generations to come. Let us keep advocating for this brighter, promising future for our world.

Beyond Technology: What Will It Take to Decarbonize Transport?

Decarbonizing land transport is not simply a technological challenge. It also requires understanding how available and emerging solutions can be implemented across regions with different vehicle fleets, infrastructure, energy systems, and economic realities.

This was the motivation behind the IEA Bioenergy Task 39 Industry Hearing, held in São Paulo, Brazil, on 8–10 September 2026, hosted by SAE Brasil and the Society of Bioenergy (SBE). The event brought together experts from industry, research institutions, international organizations, fuel producers, technology providers, and vehicle manufacturers to examine the practical challenges and opportunities for reducing greenhouse gas emissions from land transport.

Our objective was to discuss technological potential and address implementation: What is already feasible? What barriers remain? And how can international experience help identify effective solutions?

The discussions reinforced an important message: there is no single pathway to transport decarbonization. Sustainable fuels, electrification, and energy efficiency can make complementary contributions, but their effectiveness depends on regional circumstances, lifecycle greenhouse gas performance, and the characteristics of existing fleets and infrastructure.

The accompanying Concise Statement captures the principal insights from the Hearing and identify conditions that can support implementation, from regulatory predictability and technical compatibility to transparent emissions accounting and international cooperation.



Experts participating in the Industry Hearing on Sustainable Fuels for Land Transport Decarbonization, held on September 10, 2026, at the Agronomical Institute of Campinas in São Paulo, Brazil.

For Task 39, this initiative represents an opportunity to connect scientific evidence with industrial experience and strengthen international knowledge exchange. We hope its findings will inform future discussions and contribute to practical, evidence-based approaches to transport decarbonization.



Co-Editor
Dr. Glaucia Mendes Souza is a Full Professor at the Institute of Chemistry, University of São Paulo.
In addition to bioenergy sustainability, biotechnology, sugarcane biomass, biofuels, and bioproducts, Dr. Souza also focuses on the future climate resilience of crops.



SUSTAINABLE FUELS FOR LAND TRANSPORT

Technical Conclusions from the IEA Bioenergy Task 39 Industry Hearing

São Paulo, Brazil | 8–10 September 2026 - Hosted by SAE Brasil and Society of Bioenergy - SBE

Land transport decarbonization is a fleet, fuel, infrastructure and energy-system challenge. Between 2000 and 2023, transport energy demand grew by 37 EJ outside the OECD, compared with 3.7 EJ within it, highlighting regional asymmetries and the need for context-specific pathways combining near-term emissions reductions with longer-term technological change.

These conclusions from the industry hearing identify conditions under which sustainable fuels may contribute to land transport decarbonization within broader, context-specific technology portfolios:

- A portfolio of solutions is needed. Transport pathways should reflect differences in fleets, infrastructure, energy systems and regional conditions.
- Sustainable fuels can address existing fleets. Where sustainable and technically compatible, they can deliver near-term lifecycle GHG reductions alongside electrification and efficiency.
- Predictable, technology-open frameworks reduce uncertainty. Instruments may include blending mandates, carbon-intensity approaches and other mechanisms adapted to regional circumstances.
- Lifecycle GHG performance should guide comparison. Assessment requires transparent methods, credible data, traceability and periodic updates.
- Fleet and infrastructure compatibility is essential. Compatibility is already mature and proven at scale in many regions, while others may require vehicle validation, OEM engagement and targeted infrastructure upgrades.
- Interoperability can reduce market fragmentation. Greater alignment of certification, fuel specifications and lifecycle accounting can reduce duplication while accommodating regional differences.
- International cooperation can support implementation. Knowledge exchange, capacity building and mutual recognition can facilitate deployment across different markets.

Task 39 convened experts and participants from international organizations, research institutions, industry associations, fuel producers, technology providers and vehicle manufacturers to examine practical pathways for near-term reductions in GHG emissions from land transport, with a focus on bioethanol, biodiesel, biomethane and renewable diesel. The conclusions synthesize this multidisciplinary input and do not represent the position of any individual participating organization.

IEA Bioenergy
Technology Collaboration Programme
TASK 39
Biofuels for Decarbonization of Transportation

Follow up at: https://www.linkedin.com/showcase/task-39-biofuels-to-decarbonize-transport/

SAFmaps

Geospatial intelligence for Sustainable Aviation Fuel (SAF)

A public WebGIS platform providing geospatial data on promising SAF feedstocks, their supply chains, and datasets related to CORSIA sustainability criteria — in Brazil, Argentina and Colombia.

PROBLEM & IMPORTANCE

A lack of accessible, consistent and spatially explicit information hampers decision-making on sustainable SAF production.

SOLUTION

SAFmaps closes this gap with a comprehensive overview of feedstock availability, reducing environmental and social risks.

MAIN OBJECTIVES

- ✓ Geospatial data on SAF feedstock availability.
- ✓ Support investors, industry, researchers & policymakers.
- ✓ Enable SAF production scenarios (agronomic, technical, economic).
- ✓ Promote environmental and socioeconomic risks, spatially explicit alternatives.

DATA & SOURCES

- ✓ Agricultural suitability maps
- ✓ Expected productivity
- ✓ Estimated production costs
- ✓ Residue availability & potential
- ✓ CORSIA sustainability criteria

TARGET AUDIENCE

- Policymakers & government agencies
- Researchers & academia
- Aviation industry & SAF Producers
- Investors & private sector
- General public

WEBGIS PLATFORM – SAFmaps

Link: https://app.safmaps.com/

Feedstocks:
Eucalyptus (chips and residues), soybean, palm oil, macaw oil, sugarcane (and residues), corn, beef tallow, used cooking oil, steel off-gases.

KEY FEATURES

- Interactive maps & themes
- Advanced filtering by region/feedstock
- Download data & metadata
- Indicators & dashboards
- CORSIA criteria layers
- Multi-country layers
- Benria coverage

HOW IT WORKS

1. Data collection
2. Data processing
3. Data integration
4. WebGIS platform
5. Visualization & analysis

Authors: Walter, A.; Seabra, J. E. A.; Moreira, M. M. R.; Guarenghi, M. M.; Ayer, J. E. B.; Farrapo, A. C.; Cervi, W. R.; Potosi, J. K. C.; Hernandes, T. A. D.; Tamburini, R.; Souza, G. M.

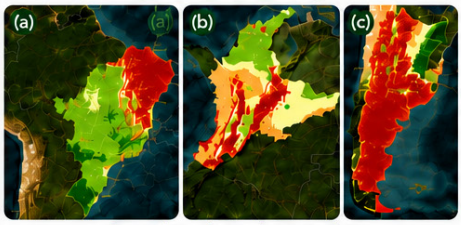
IEA Bioenergy · Task 39 - Part 1

Explore: https://safmaps.com/index.html
Datasets: https://app.safmaps.com/

COVERAGE & SCALE

(a) Brazil, (b)Colombia & (c) Argentina — multiple spatial resolutions, national to local.

Soybean suitability



Source: https://app.safmaps.com/

SAFmaps

Geospatial intelligence for Sustainable Aviation Fuel (SAF)

KEY MESSAGE

SAFmaps turns data into decisions for a more sustainable future in aviation.

Open. Reliable. Spatial. For everyone.

- Aligned with ICAO CORSIA
- Open
- Transparent
- Non-commercial

IMPACTS & RESULTS

- ✓ Evidence-based SAF policies & regulation
- ✓ Robust info for investors & industry
- ✓ Academic research & capacity building
- ✓ Transition to low-carbon aviation in Latin America

KEY NUMBERS

- 13 Feedstocks
- 90+ Geospatial layers
- 3 Countries
- ~12 million km² Area covered
- Open Public WebGIS — Accessible to ~7 billion people worldwide

WHY SAFmaps IS UNIQUE

- SAF feedstocks & supply chains, sustainability at the core
- Agronomic + economic + sustainability data in one platform
- Spatially explicit for scenarios & risk

ESSENTIAL REFERENCES

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Authors: Walter, A.; Seabra, J. E. A.; Moreira, M. M. R.; Guarenghi, M. M.; Ayer, J. E. B.; Farrapo, A. C.; Cervi, W. R.; Potosi, J. K. C.; Hernandes, T. A. D.; Tamburini, R.; Souza, G. M.

IEA Bioenergy · Task 39 - Part 2

Explore: https://safmaps.com/index.html
Datasets: https://app.safmaps.com/

Task 39 Members

Task 39 has 20 member countries participating as listed below. Each country is represented by a National Team Leader (NTL) and additional representatives as well as ExCo members. Furthermore, external experts may be involved.



Team leaders meeting at the EUBCE Conference in the Netherlands in May 2026.

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- Operating Agent(s) - Marlon Arraes
- Task Leader - Glaucia Mendes Souza
- Assistant Task Leader - Jean Felipe Leal Silva
- Communications Officer - Tomas Ekbom

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Austria	Andrea Sonnleitner (NTL) Dina Bacovsky	BEST	Hannes Bauer
Belgium	Robert Malina Sumit Maharjan	Hasselt University	Roland Verhé
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Denmark	Sune Tjalfe Thomsen (NTL)	UCPH	Ane Katharina Paarup Meyer
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The Netherlands	José Muisers Ayla Uslu	RVO TNO	Bas Heukels
United States	Ling Tao (NTL)	NLR	Daniel B. Fishman

PROJECT 5 | ALTERNATIVE FUELS TO REDUCE MARITIME EMISSIONS – TOWARDS SUSTAINABLE SHIPPING

Maritime transport remains heavily dependent on fossil fuels, with more than 99 percent of its energy demand currently met by conventional fuels, according to IEA Bioenergy Task 39. Decarbonising the shipping sector requires alternative solutions, including sustainable marine biofuels such as biomethane, bioethanol, biodiesel and renewable e-fuels. The Task 39 Project 5 study examines the technical, economic and regulatory challenges associated with these fuels, assessing their entire value chains from feedstock availability and production to distribution and onboard use. Using the Scalability–Availability–Sustainability (S.A.S.) framework, the research aims to identify commercially viable pathways and support the wider deployment of low-carbon marine fuels.

By Tom Walsh, National Team Leader Task 39 (NTL) Ireland.



1 WHY THIS MATTERS ?

Maritime transport is a significant source of global CO_2 emissions, making the decarbonization of the shipping sector essential to achieving climate targets and transitioning toward a cleaner, more sustainable maritime industry.

2 MARITIME FOSSIL FUEL DEPENDENCY

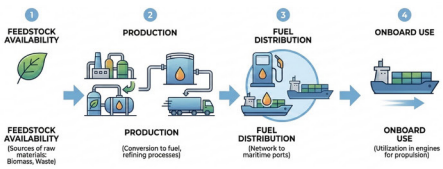
Although maritime transport remains overwhelmingly dependent on fossil fuels—including Heavy Fuel Oil (HFO), Marine Gas Oil (MGO), and Very Low Sulfur Fuel Oil (VLSFO), which together account for more than 99% of total energy demand, with only a marginal contribution from Liquified Natural Gas (LNG)—the marine fuel landscape is beginning to shift as regulatory pressure intensifies and zero-carbon alternatives gain momentum.

3 OBJECTIVES OF TASK 39-P5

The primary objective of T39/P5 Marine Biofuels is to identify and assess the most promising biofuel pathways capable of supporting the maritime sector's transition towards carbon neutrality. The research examines the technical, economic, legal, and regulatory challenges associated with four sustainable fuel pathways—biomethane, bio-ethanol, biodiesel, and e-fuels/renewable methanol—through detailed case studies

4 SYSTEM BOUNDARIES

Each pathway is assessed across its entire value chain, from feedstock availability and production through to fuel distribution and onboard use, while taking into account regional production potential, infrastructure compatibility, and fuel storage and handling requirements.



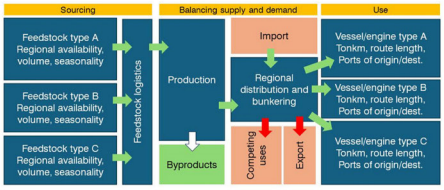
5 S.A.S. FRAMEWORK

The analysis applies the Scalability-Availability-Sustainability (S.A.S.) framework to each fuel pathway and explores their potential integration into Green Shipping Corridors as a means of demonstrating their technical and commercial feasibility under real-world operating conditions. The findings are intended to support the development of a roadmap for the large-scale deployment of sustainable marine fuels and accelerate the decarbonisation of the maritime sector.



6 BIOFUEL VALUE CHAIN ASSESSMENT

Assessing renewable marine fuels requires distinguishing theoretical potential from sustainable, certifiable supply across diverse feedstocks and production pathways.



Decarbonizing European refineries – significant potential for GHG reductions

Co-processing biogenic feedstocks in existing crude oil refineries offers a promising near-term solution for reducing greenhouse gas (GHG) emissions from transport fuels. A study entitled "Decarbonizing European refineries: GHG accounting framework and potential assessment for co-processed biofuels", authored by M. Buffi, N. Abdalla, N. Scarlat, T. Schlamp, H. Fehrenbach, A. Bouter and J. Saddler, examines four conversion pathways using used cooking oil (UCO) and pyrolysis oils.



The results demonstrate GHG emission savings of 73–96 percent compared to fossil fuels, exceeding the EU Renewable Energy Directive (RED) minimum requirement of 65 percent. The researchers also estimate a theoretical production potential of up to 13.9 million tonnes of biofuels annually across the EU refining system, assuming a 5 percent biogenic feedstock share at conversion unit inlets.

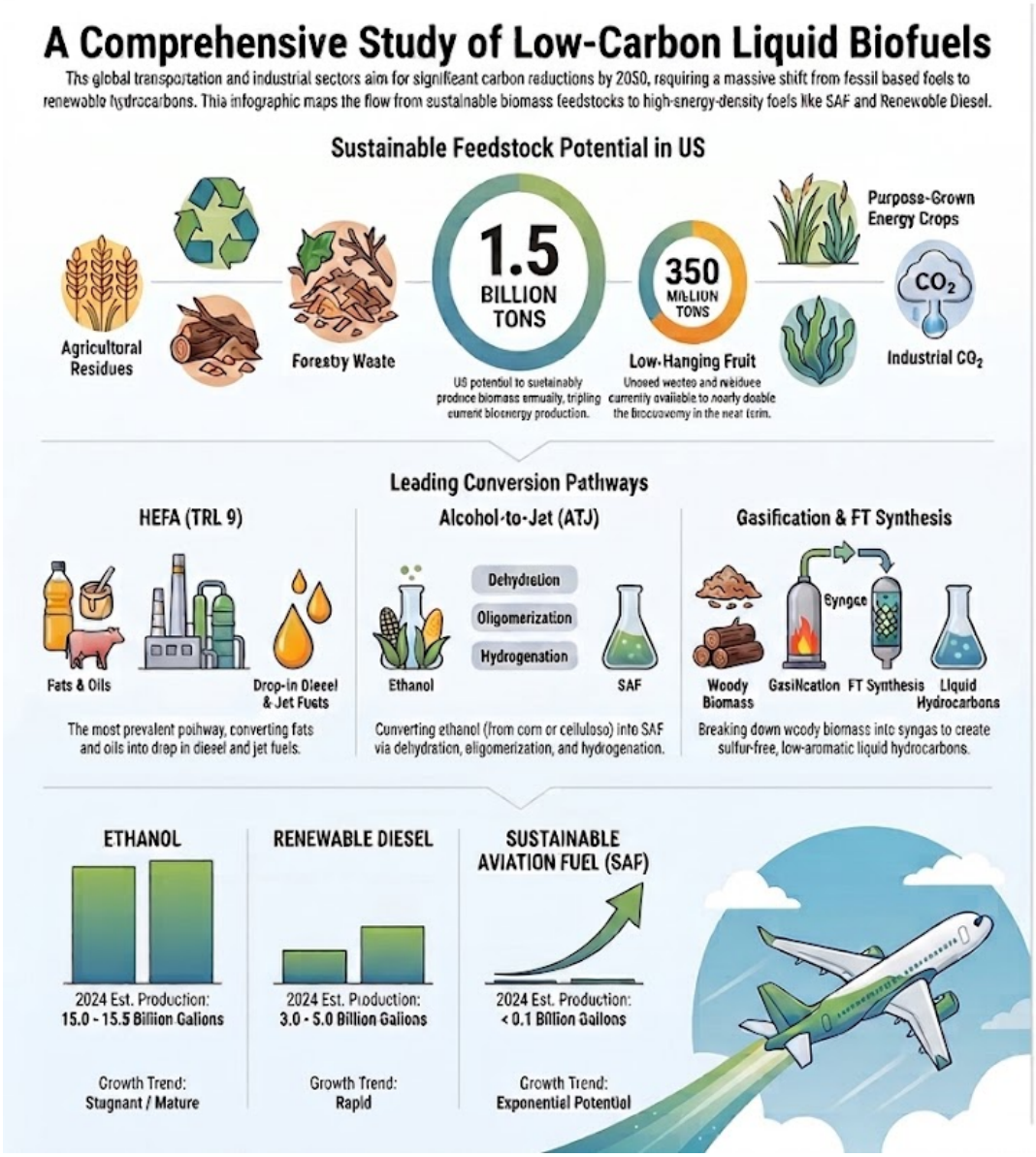
The findings highlight how existing refinery infrastructure could support the transition towards lower-carbon transport fuels.

The full research paper is available for download here: Link

PROJECT 3 | A COMPREHENSIVE STUDY OF LOW-CARBON LIQUID BIOFUELS

The transition towards low-carbon transportation is driving growing interest in sustainable liquid biofuels worldwide. From agricultural residues and forestry waste to purpose-grown energy crops, a wide range of renewable feedstocks offers significant potential to replace fossil fuels. This infographic provides an overview of key feedstocks, conversion technologies and production trends, highlighting the opportunities and challenges associated with scaling up renewable diesel, ethanol and sustainable aviation fuel (SAF) to support the decarbonisation of the transport sector.

By Ling Tao, National Team Leader Task 39 (NTL) USA.



STUDY SUMMARY

SUSTAINABLE LOW-CARBON LIQUID BIOFUELS

- Comprehensive review of global efforts to develop low-carbon liquid biofuels for diesel and jet sectors
- Assesses biomass feedstocks across multiple countries, focusing on availability and renewable fuel potential
- Describes key conversion pathways, including including HEFA, gasification-to-liquids, and alcohol-to-jet processes
- Evaluates global production capacities, technological readiness, and economic viability
- Identifies national strengths and challenges, including supply-chain limitations and resource competition
- Overall aim: support transportation-sector decarbonization through advanced biofuel development and implementation



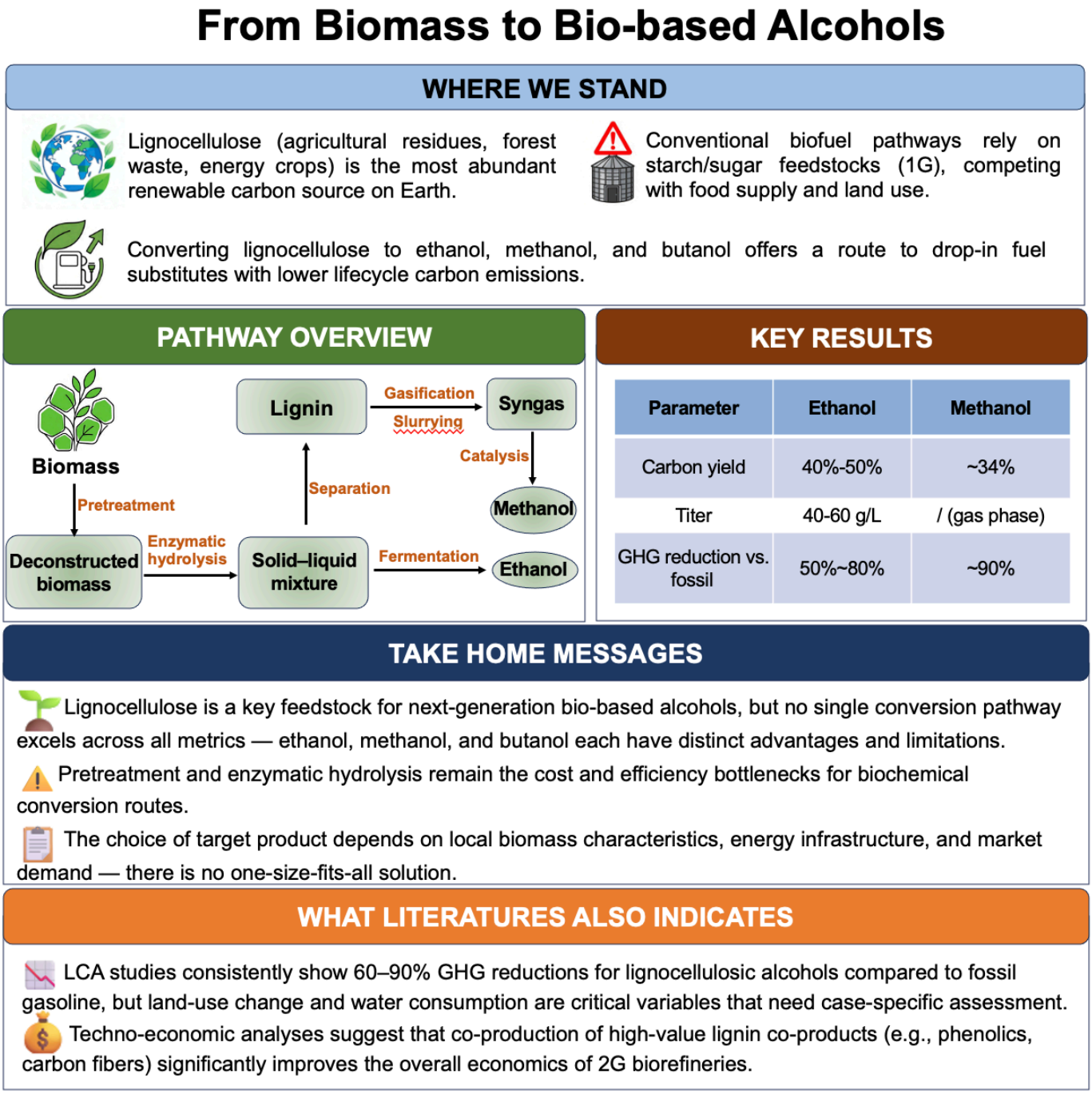
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PROJECT 6 | FROM BIOMASS TO BIO-BASED ALCOHOLS – PATHWAYS TOWARDS LOWER EMISSIONS

Agricultural residues, forestry waste and energy crops offer significant potential for producing next-generation bio-based alcohols, including ethanol, methanol and butanol. Through technologies such as enzymatic hydrolysis, fermentation and gasification, lignocellulosic biomass can be converted into lower-carbon alternatives to fossil fuels. The infographic highlights potential greenhouse gas emission reductions of 50–80 percent for lignocellulosic ethanol and approximately 90 percent for methanol, depending on production pathways and lifecycle assumptions. Despite promising environmental benefits, conversion efficiency, production costs and feedstock availability remain important challenges. Integrating valuable lignin co-products could further improve the economic viability of future biorefineries.

By Fuli Li, National Team Leader Task 39 (NTL) China.



Transforming industrial CO_2 emissions into a resource for e-fuels

Revcoo's patented CarbonCloud® technology captures industrial CO_2 emissions through an innovative cryogenic process, offering an energy-efficient, water-free and chemical-free solution. Designed for existing industrial facilities, it enables emissions reduction while making captured carbon available for storage or reuse.

Founded in 2019 in France, Revcoo is a cleantech company developing innovative solutions to help industrial businesses reduce their carbon emissions. Its mission is to make carbon capture accessible and economically viable, particularly for industries whose CO_2 emissions cannot be completely eliminated through conventional decarbonisation measures.



CarbonCloud®: A New Approach to Carbon Capture

At the heart of Revcoo's offering is CarbonCloud®, its patented cryogenic carbon capture technology. Designed to integrate directly into existing industrial facilities, the system treats post-combustion flue gases and separates the CO_2 through a controlled cooling process. The captured carbon dioxide is transformed into solid CO_2 ice before being converted into high-purity liquid CO_2, ready for transport, storage or utilisation.

Unlike conventional capture approaches that rely on chemical solvents, CarbonCloud® operates entirely on electricity, without chemical inputs or water consumption. Its modular, retrofit-ready design enables integration into existing production processes, helping industrial operators pursue decarbonisation without fundamentally changing their installations.

Applications Across Energy-Intensive Industries

Revcoo's technology is designed for a broad range of industrial sectors, including cement and lime production, glass manufacturing, metal processing, waste incineration and biomass-fired energy production. These industries face increasing pressure to reduce emissions while maintaining operational performance and competitiveness.

The captured CO_2 can be transported for permanent geological storage or used as a resource in industrial applications, including the production of synthetic e-fuels. By recovering carbon directly at the emission source, CarbonCloud® helps turn an environmental challenge into a potential resource.

Benefits for Industry and the Climate

Revcoo aims to combine environmental performance with industrial practicality. Key benefits include high-purity liquid CO_2, reduced dependence on chemical consumables and water, and compatibility with existing industrial infrastructure. Producing liquid CO_2 on-site also facilitates downstream logistics and provides flexibility for storage or utilisation.

The company's industrial pilot, designed to process 1,000 tonnes of liquid CO_2 per year, demonstrates its commitment to bringing the technology into real operating conditions. Revcoo is working towards broader industrial deployment, offering businesses a practical pathway to reduce emissions and prepare for a net-zero economy. The company recently announced a partnership with REAZN, a leading recycled zinc alloy producer, to develop a first-of-a-kind CarbonCloud® installation at its industrial facility in Kruisem, Belgium. The project is expected to move towards deployment by the end of 2028, following feasibility and engineering studies.



By Juliette POUPENEY, Director of Sales, Revcoo
Website: https://revcoo.com/

FROM EV EUPHORIA TO TECHNOLOGICAL DIVERSIFICATION:

REASSESSING AUTOMOTIVE POWERTRAINS, BIOFUELS AND ENERGY SECURITY

The end of electric vehicle (EV) euphoria has led to a significant financial impact on the global car industry, with at least $65 billion in write-downs, cancelled models, and restructured operations.

This downturn is attributed to a radical reversal in climate policy in the US, which forced carmakers to overhaul their EV product and investment plans. Companies like Stellantis, Ford, and Volkswagen have been particularly affected, with Stellantis taking a $26 billion charge to scrap some fully electric models. What caused this to happen and what will the future be for the auto industry in a changing world? Will this be a new beginning for biofuels?

A few years ago, it was clear – car manufacturers around the world would abandon some 140 years old liquid fuel-based internal combustion engine (ICE) technology and develop electric motors. A ban on sales of new ICE cars starting 2035 in the European Union was the acting like the slow ferry over the River Styx to the inevitable, an inescapable death of ICE in cars. The electric motor was to become a future core competence and a "must" to keep car companies like Volvo Cars competitive.

This was the reasoning of many manufacturers a few years ago. It was the European strategy in 2020 and in many other countries globally. This became a strategic mistake of historic proportions.

In 2010, the world's second largest car manufacturer at the time Volkswagen declared they needed 50,000 people, increasing the global workforce to 450,000 employees. The target was set. Take down Toyota from first place and become the world's largest manufacturer. In March 2026, Volkswagen sent a press release saying they needed to dismiss 50,000 employees from work by 2030. Not long thereafter sources told the German Manager Magazin that Volkswagen had plans to cut its workforce by as many as 100,000 employees and close four German factories in the coming years. This was unheard of. What happened to cause this major change?

In December 2025 Volkswagen closed a factory for the first time in their 88 years long history as automaker. The plan which was later confirmed in July by the Volkswagen CEO Oliver Blume and the board will be the largest restructuring in automotive industry history. It would be comparable to major shake-ups by GM leading up to and during its 2009 bankruptcy and in the early 1990s when it cut as many as 74,000 jobs over four years and shut or idled 21 plants, Reuters wrote.

Like its European rivals, Volkswagen have been pressured by tariffs and cheaper Chinese EV models. But the change in profitability and sales had started long time ago with a series of mistakes. According to the Financial Times the major losses emanated after the shake-up in the markets because of the change in climate policy in the United States and the general reduced support for electric-charged cars. Car companies which most quickly abandoned the petrol engine in favour of EV have been hit the hardest, when the demand for battery cars has not developed as expected.

The automotive industry's rapid investment in EV has had an expensive aftermath. Volkswagen has not been alone in this downturn. Over the past year, global car manufacturers have been forced to write-down values equivalent to at least $65 billion, after strategies were changed and investments were cancelled. Ford took a $19.5 billion hit in December 2025, and GM reported it will take a $6 billion charge. However, Stellantis accounted for one of the most notable write-downs. In February Stellantis was noted for a full-year 2025 net loss of €22.3 billion euros (their first ever) impacted by €25.4 billion in write-downs as the firm sharply scaled back its electric vehicle strategy and several fully electric models had to be scrapped.

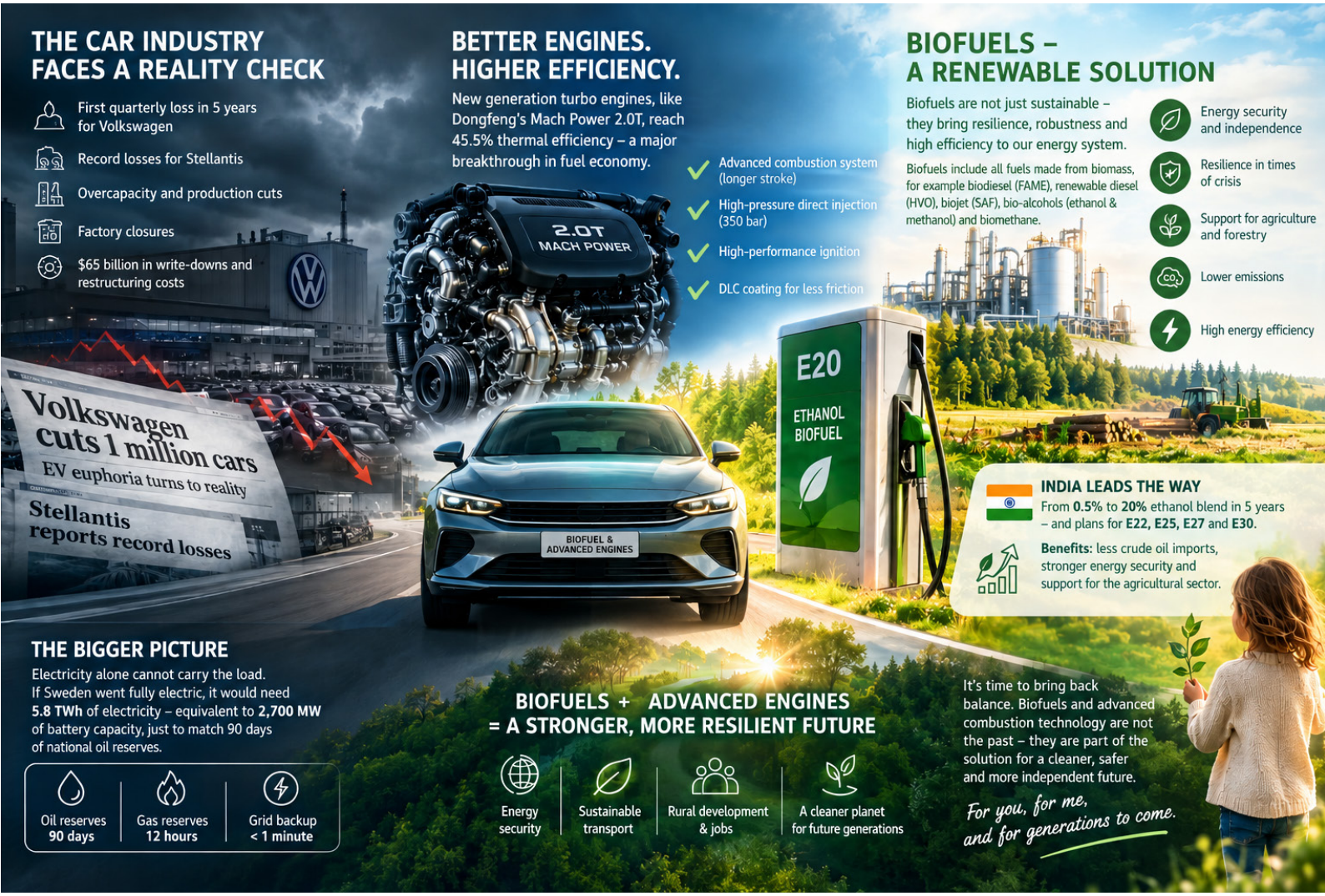
One consequence of the crisis for Stellantis has been the withdrawal from their enormous investment in a battery factory in Canada. The joint-venture company NextStar Energy with LG Energy built the $3 billion battery factory in Windsor, Ontario. Stellantis has now donated their share to LG – for $100. Stellantis is a giant, formed in 2021 through the merger of the French PSA Group and Italian American Fiat Chrysler Automobiles. The company designs, manufactures, and markets vehicles under 14 brands: Abarth, Alfa Romeo, Chrysler, Citroën, Dodge, DS Automobiles, Fiat, Jeep, Lancia, Maserati, Opel, Peugeot, Ram, and Vauxhall. At its height at the time of the merger, Stellantis employed some 300,000 people, with manufacturing operations in 30 countries.

This major, strategic betting on EV in the global car industry is interesting from number of perspectives. Other industries have made the same change in direction for consumer products. Sometimes caused by disruptive technologies vs. traditional like the mobile phone (stationary telephone), the computer (typewriter), web-based video (tv and cinema), news websites (newsprint), digital cameras (analogue film cameras) etc. Some have been successful and some are still not a clear winner providing all benefits, which were promised.

Another current disruptive technology, which gathers large investm ents and seen as very strategic is in artificial intelligence (AI). Wall Street Journal estimates global total AI investments to be in the order of €10 000 billion during 2026-2032. In first financial quarter reports there are large revenues coming from the massive investments, but there are also critical voices that question the market's ability to pay, which gives the anticipated high rates of return for the investors. Still, if this much capital is available for AI, then there should be capital available for development of advanced biofuels, which are crucial for climate mitigation within aviation and long-haul transport. It is important that investments continue in renewable energy and especially for biofuels, which have much potential and lends to much promise to cut down carbon emissions.

The development in internal combustion engines has also not stood still, despite some manufacturers ill-made decisions. In March 2026 Scania revealed its new super engine that reduces diesel consumption by seven percent. The secret behind it is the engine's variable valve timing. The cam phases play a crucial role, said Scania's product manager Andrew Spencer. The new super engine is called Super 11. Compared to Scania's previous 9-litre engine, several exciting innovations are expected. Among other things, higher torque provides faster response and longer lifespan. In the Super 11 engine, Scania has installed cam phasers. They allow the intake and exhaust valves to open and close at different times, continuously, depending on how the engine is running. They have been able to remove the intake throttle, exhaust brake, and exhaust gas recirculation and replaced all these components with cam phasers.

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>> Also in March 2026, Horse Powertrain, which owns an engine factory in Sweden, announced that together with the Spanish energy company Repsol, it has presented a new small hybrid-engine built on the HR12 platform. It is said to achieve an efficiency of 44.2 percent and a fuel consumption of under 0.33 litres per 10 kilometres with renewable fuel, roughly 40 percent lower than the average for new European passenger cars in 2023. This new gasoline engine could become one of the most fuel-efficient engines ever. A range of 100 kilometres on only three litres of petrol is a significant feat. However, it is mainly intended as an auxiliary engine together with an electric motor but could also, if successfully sold, serve as a main engine in cars and trucks. The engine combines a compression ratio of 17:1 with an updated EGR solution for exhaust gas recirculation, optimized turbo, stronger ignition system, and a new hybrid transmission.

Unlike a conventional engine, the design lacks both a crankshaft, valves, and camshafts. Instead, eight pistons in four cylinders work against each other. The motion is converted into rotation via special cam plates, which replace the traditional mechanics that have existed for over a hundred years. The principle is not entirely new. Opposed pistons were already used in older aviation and diesel solutions, but here the concept has been shrunk into something more resembling a suitcase than an engine block. The explanation lies in how frequently combustion occurs. The technology is described as a "1-stroke" system, even though in practice it functions like a modern two-stroke engine where combustion occurs much more frequently than in a four-stroke engine. Since the pistons move symmetrically, they also cancel out each other's vibrations. This makes the engine unusually smooth in operation, something that has been demonstrated in tests where vibrations have been minimal compared to conventional designs. The future for the engine, which has an 140-year history, looks promising and the more immediate threat of an early death is avoided. It is thus fair to quote Mark Twain with the famous "The reports of my death are greatly exaggerated."

By Tomas Ekbom,
National Team Leader Sweden
AI-generated image

Reference:

E20 petrol now the main fuel in India from April 1. What this big shift means, and can your car handle ethanol-blended fuel? - The Economic Times

BIOFUELS PRODUCTION AND DEVELOPMENT IN FRANCE



Scenic spring view of vibrant colza fields and lush green hills in Creuse, France. Photo: André Cogez

HIGHLIGHTS



France is one of Europe's leading agricultural and forestry countries, with around 69 million inhabitants, a GDP of approximately €3,500 billion, 29.4 million hectares of agricultural land and 17.6 million hectares of forest. Its biomass resource is estimated at approximately 309 million tonnes of dry matter per year, mainly from agriculture (255 Mt), forestry (38 Mt) and waste (13 Mt). The country has a mature biofuels market, with consumption of around 41.7 TWh in 2024, dominated by biodiesel and bioethanol, while sustainable aviation fuel (SAF) production is emerging. France therefore holds strong potential for sustainable biofuel development, particularly for advanced biofuels, biomethane and SAF, provided that competition with food production, material uses and biodiversity is carefully managed.

- **In 2024, France consumed approximately 41.7 TWh of biofuels, representing around 10% of renewable energy consumption and 9.4% of the energy consumed in the transport sector.**
- **The biofuel mix is dominated by biodiesel and bioethanol, while biokerosene remains marginal.**
- **Biofuels are mainly blended in limited quantity with fossil fuels (diesel, gasoline and kerosene) for so-called drop in uses.**
- **The sector still relies predominantly on food crops (mainly rapeseed, cereals) for conventional biofuel production.**
- **Advanced biofuels are increasing their share, particularly in aviation, using residual resources listed in Annex IX of RED III.**
- **France is a net importer of biodiesel to cover its domestic needs. By contrast, it is largely self-sufficient in bioethanol production capacity (even though not all the resources are French).**
- **Under RED III, for the transport sector, France has chosen to target a 14.5% reduction in carbon intensity of fuels by 2030.**
- **For 2026, biofuels incorporation targets stand at 10.5% for gasoline and 9.4% for diesel.**
- **E85 in France: 4,000+ filling stations (~42% of the national network) and around 418,000 flex-fuel vehicles on the road, roughly two-thirds retrofitted with approved E85 conversion kits.**

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Biofuel production and consumption in France: volumes, sectors and industrial facilities

France is one of the leading producers and consumers of biofuels in Europe. Biofuel deployment forms part of a decarbonization policy guided by increasing incorporation targets since the 2000s.

1. Biofuel consumption: strong growth since 2005 and recent stabilization

Consumption rose sharply between 2005 and 2015 as a result of supportive public policies and has since remained high and relatively stable. Biofuels are used mainly in transport (road transport and, more recently, aviation and maritime).

In 2024, biofuel consumption reached 41.7 TWh, corresponding to 9.4% of the energy consumed in the transport sector.[1] In volume terms, this corresponds to approximately 5.3 million m³ blended into a total fuel consumption of 53.8 million m³ (Figure 1).

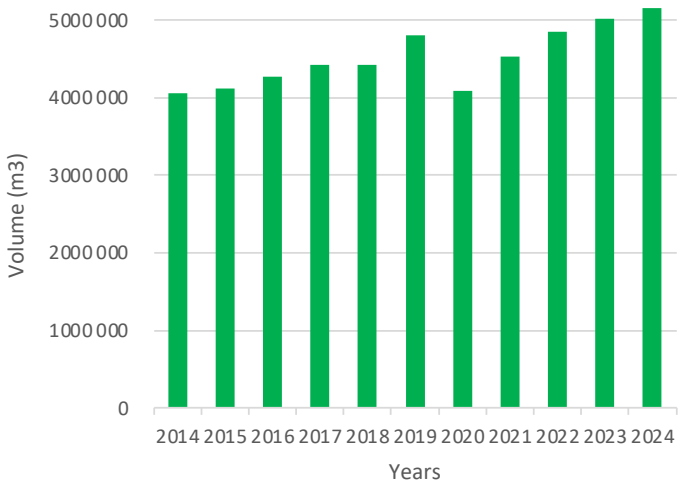


Figure 1: Biofuel volume consumption in France (m3), 2014–2024.[2]

Biodiesel accounts for 64% of the total volume, while bioethanol accounts for 34%; the remaining 2% corresponds to SAF (Figure 2). Since 2022, the jet fuel sector has also been incorporating biofuels in the form of hydrotreated esters, initially under France's national TIRUERT mechanism; the sector is transitioning to ReFuelEU Aviation obligations, which apply from 2025 (see the regulations section). Volumes reach 91 000 m³ in 2024 (2% of total incorporation in 2024).

In 2023, France was the world's seventh-largest producer of bioethanol (11 Mhl), behind the United States (591 Mhl), Brazil (328 Mhl), India (55 Mhl), China (38 Mhl), Canada (17 Mhl) and Thailand (13 Mhl). At European level, France was the leading consumer of gasoline biofuel for transport (843 ktep) in 2023, ahead of Germany (786.7 ktep) and the Netherlands (257.5 ktep).[4]

Also in 2023, France was the world's fifth-largest producer of biodiesel (2.8 billion litres), behind Indonesia (13.6 billion litres), Brazil (6.8 billion litres), the United States (6.1 billion litres) and Germany (4 billion litres). At European level, France was the leading consumer of diesel biofuels for transport (2.4 Mtep), ahead of Germany (2.2 Mtep) and Spain (1,8 Mtep).[5]

2. Incorporation rates and trends

Biofuels are mainly used in blends with fossil fuels. The blending ratios vary depending on the fuel in question. Currently, the fuels distributed throughout the country are (Figure 3):

- For the gasoline sector, three fuel categories are available SP95-E5 (95 octane unleaded petrol and up to 5% by volume of bioethanol), SP95-E10 (up to 10% by volume of bioethanol), and E85 (containing between 60% and 85% by volume of bioethanol, for dedicated vehicles). This sector is mainly oriented towards passenger cars.
- For the diesel sector, B7 (up to 7% by volume of FAME -Fatty Acid Methyl Ester), B10 (up to 10% by volume of FAME), B30 (up to 30% by volume of FAME) and B100 (up to 100% by volume of FAME, for captive fleets). This sector is aimed at passenger cars and heavy goods vehicles, with B100 being particularly targeted at the latter. The diesel distributed in France may contain HVO RD (Hydrotreated Vegetable Oil Renewable Diesel), but its share remains small.
- For the jet fuel sector, biokerosene (HEFA-based SAF (Hydroprocessed Esters and Fatty Acids Sustainable Aviation Fuel) can be blended at up to 50 vol% with conventional jet fuel but currently accounts for only a small share of total jet-fuel consumption).[6]

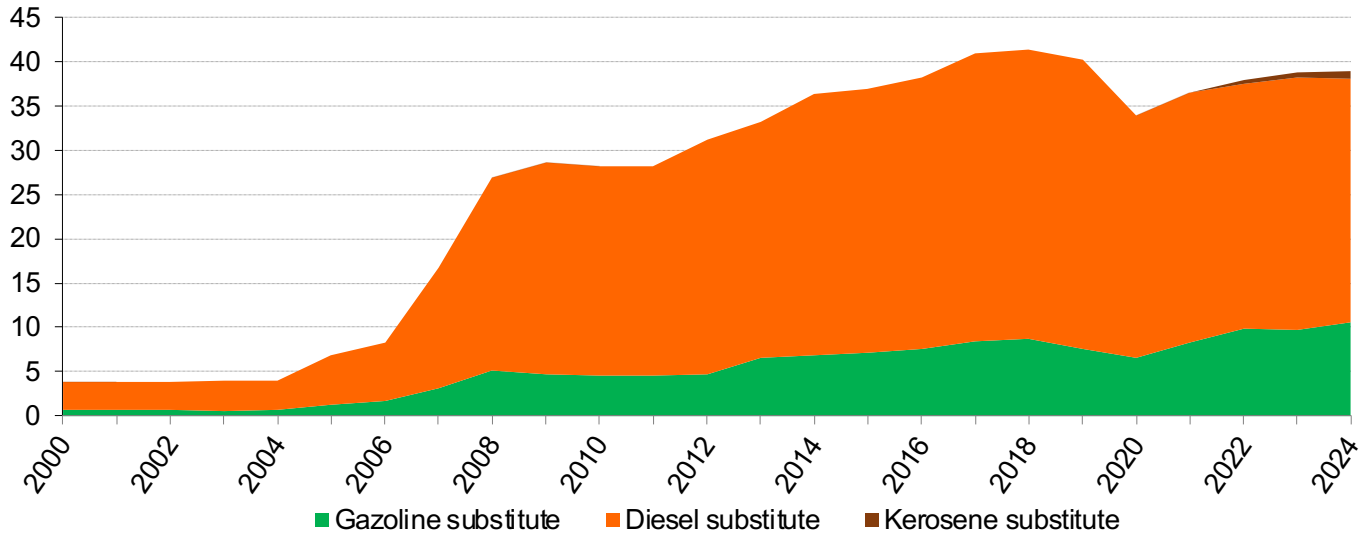


Figure 2: Final biofuels consumption by sector.[3]

Biofuel production and consumption in France: volumes, sectors and industrial facilities

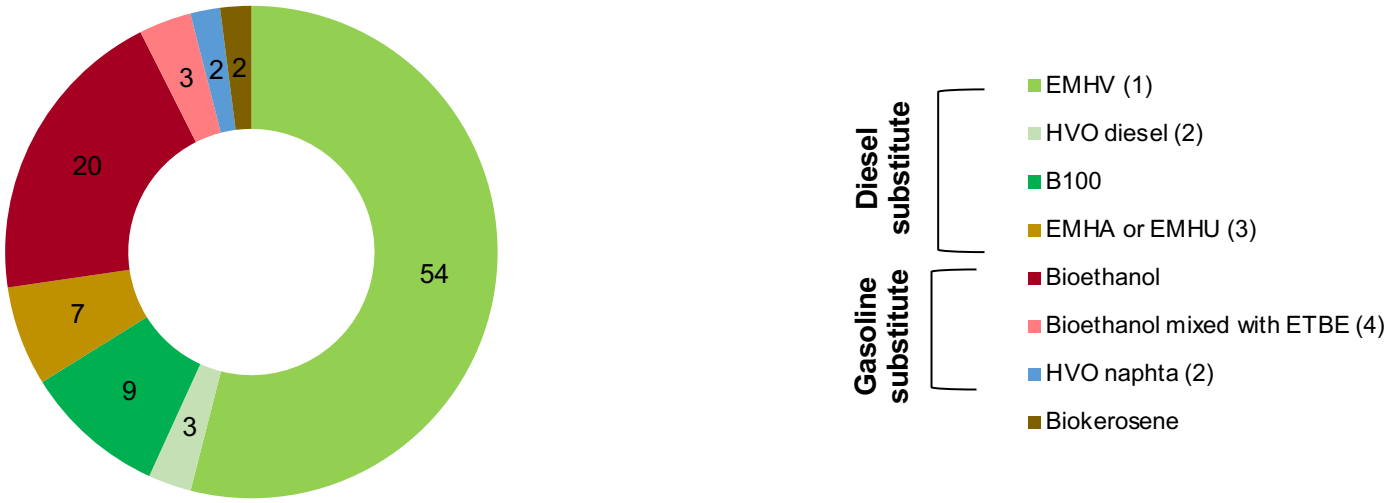


Figure 3: Final biofuel consumption by sector in 2024 (TWh - SDES-DGEC France).[7] Source: SDES from DGEC.

3. French production

The volumes of biofuels blended in France do not reflect French production. Imports of biofuels or the raw materials used to produce them are substantial and can account for a significant proportion of the sector: in 2024, French biofuel production did not exceed 25 TWh (compared with 41.7 TWh consumed).

France is one of Europe's leading producers of bioethanol: French production reached 15.4 million hl in 2024, close to domestic consumption of 15.5 million hl. The French bioethanol sector, which utilizes maize, wheat, sugar beet, as well as pomace and lees from wine-making, separately sources 98% of its raw materials in France.

For the French biodiesel sector, which primarily involves rapeseed, sunflower, waste oils and animal fats, the proportion of raw materials of French origin is estimated at 59.8%. France is therefore a net importer of FAME. In 2024, 94% of FAME imports came from Belgium (45%), the Netherlands (32%) and Spain (17%).[8]

a) Gasoline substitute sector (bioethanol and ethyl tert-butyl ether)

Today, the main biofuel blended into gasoline remains bioethanol. Bioethanol is a product of the processing of sugar (fermentation followed by distillation) and starch (hydrolysis followed by fermentation and distillation). French bioethanol production is mainly carried out by four major groups: Tereos (a union of agricultural cooperatives specializing in sugar beet and starch), Cristal Union, Bioénergie du Sud-Ouest (a subsidiary of the Spanish company Vertex Bioenergy) and Roquette Frères.

- Tereos - The two production plants in France, at Origny-Sainte-Benoîte and Lillebonne, each have a production capacity of 240 kt/year (making a total of 480 kt/year) in 2025.

- Cristal Union - The total European production of the group reached 2 million hl/year in 2025. The Cristanol production plant (in Bazancourt) has an annual production capacity of 280 kt/year in 2025.

- Bioénergie du Sud-Ouest (BSO) - A subsidiary of the Vertex Bioenergy group, BSO has a production capacity of 200 kt/year in 2025 at its AB Bioenergy plant (in Lacq).

- Roquette Frères – The agro-industrial firm's Beinheim plant produces bioethanol from certified biomass. Its production capacity is 160 kt/year in 2025.

Biofuels in the gasoline sector also include ethyl tert-butyl ether (ETBE). ETBE is an oxygenated fuel additive commonly used in the production of gasoline from crude oil. It can be blended into gasoline at up to 15% by volume. Only the renewable ethanol-derived fraction of ETBE is counted as biofuel. In France, ETBE production is mainly carried out at TotalEnergies' industrial plants (total production of 200 kt/year).

b) Diesel substitute (Biodiesel B7, B100 and HVO RD)

French production of diesel substitute is mainly carried out by two major groups: Avril (through its subsidiary SAIPOL – Société Agro-Industrielle de Patrimoine Oléagineux) and TotalEnergies.

• Avril -- A pioneer in biodiesel with the Diester brand in the 1990s, Avril is now the market leader in B100 biofuel with the Oleo100 brand. Its subsidiary SAIPOL is one of Europe's leading companies in the sector of vegetable oil crushing, refining and biodiesel production. Today, the group's total production capacity in France stands at 1.89 Mt/year: Grande Couronne (510 kt/year), Sète 1 (200 kt/year), Le Mériot and Bassens (250 kt/year each), Sète 2 (280 kt/year) and Baleycourt (400 kt/year).

TotalEnergies -- the sole producer in France of HVO RD. Until 2019, all HVO RD consumed in France was imported. The trend began to change in 2019 with the conversion of the La Mède refinery into a biorefinery (with a production capacity of 500 kt/year of renewable products).

• There are other production sites in France: Nord-Ester in Dunkirk (part of the Daudruy Van Cauvenbergue group, 100 kt/year); the Centre Ouest Céréales agricultural cooperative in Chalandray -- COC (52 kt/year); SARP Industries in Limay (a subsidiary of Veolia, 20 kt/year); the joint venture between Groupement des Mousquetaires and Saria in Le Havre (the ESTENER site, 75 kt/year)

c) Sustainable aviation fuels sector

French SAF production remains very limited, with two TotalEnergies facilities currently producing HEFA-based SAF. Part of the production volume from La Mède is destined for the aviation sector (15 kt/year). The conversion of the Grandpuits refinery into a biorefinery will enable an additional 230 kt/year of SAF to be produced by the end of 2026.

The biofuels consumed in France are produced from a diverse mix of domestic and imported agricultural feedstocks, organic waste and industrial residues (Figure 4).

For the production of gasoline substitute, the main feedstocks are corn and wheat, and to a lesser extent sugar beet, other cereals or agricultural residues such as grape marc and wine lees, sugar by-products or residual starch.

For the production of diesel substitute, the main feedstocks are rapeseed for FAME products, and used cooking oil, animal fats or greasy industrial waste for advanced biodiesel products.

In 2024, crops used to produce conventional biofuels occupied no more than 2.29% of France's utilized agricultural area (UAA[10]).
In 2024, advanced products accounted for 22% of diesel substitute and 31% of gasoline substitute. The resources used for the production of advanced biofuels must be exclusively residual, in order to comply with the criteria set out in the European RED III regulations. The list of resources eligible for use in advanced biofuels is set out in Annex IX of the same directive. The aim is to limit competition with food resources and reduce the impact on agricultural land. Nevertheless, other potential environmental impacts can be cited, such as effects on water quality and soil. An LCA (life-cycle assessment) currently being carried out by ADEME will provide a more comprehensive overview of the potential impacts of conventional and advanced biofuels produced and consumed in France by 2030 in the road and aviation sectors (due to be published in late 2026).

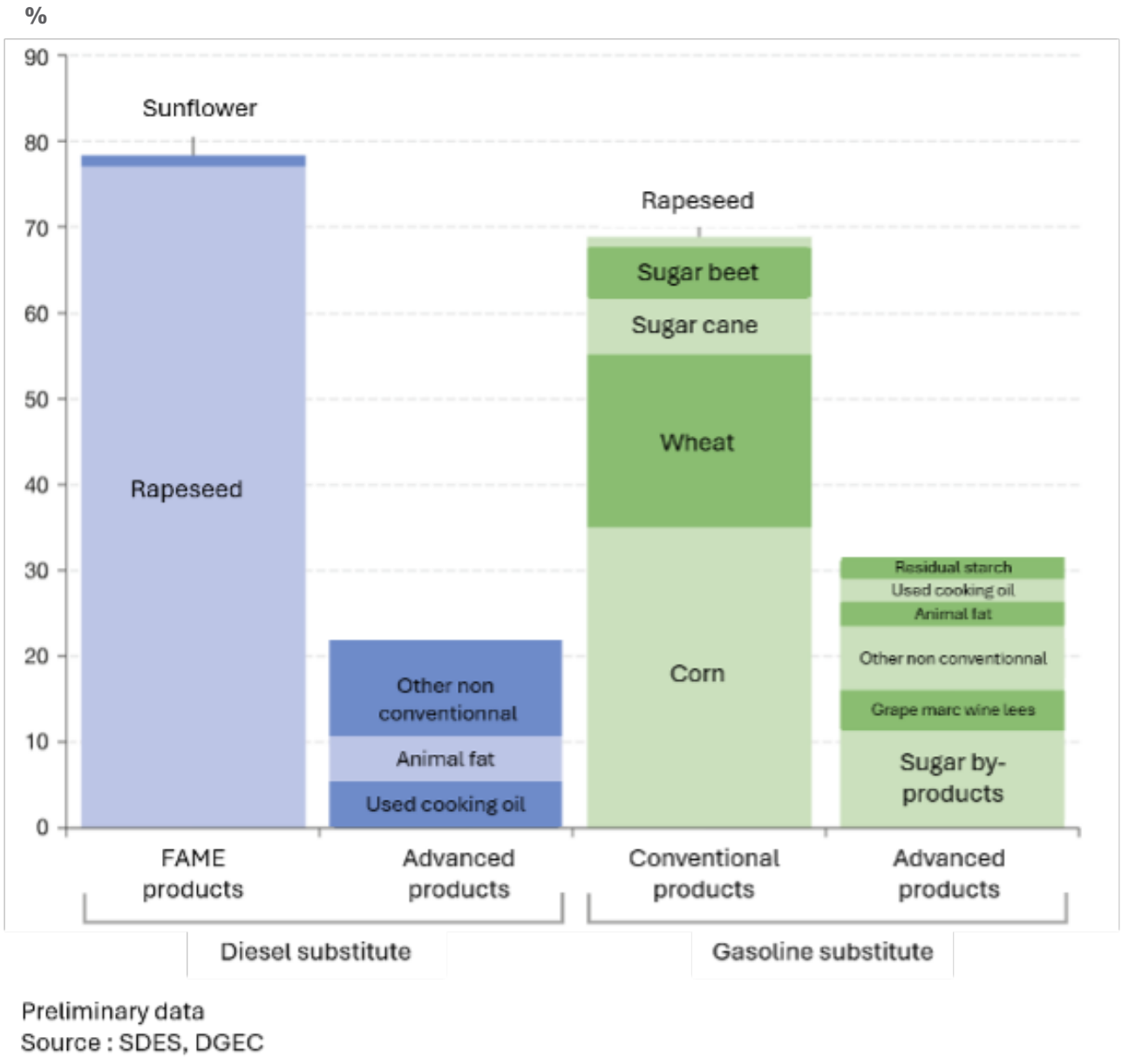


Figure 4: Final biofuels consumption by feedstock in 2024 - (% - SDES-DGEC France).[9]

Annex IX to Directive (EU) 2018/2001 amending by (EU) 2024/1405 of 14 March 2024

Feedstocks Part A – (advanced biofuels and biogas)

(a) Algae if cultivated on land in ponds or photobioreactors;
(b) Biomass fraction of mixed municipal waste, but not separated household waste subject to recycling targets;
(c) Biowaste from private households subject to separate collection;
(d) Biomass fraction of industrial waste not fit for use in the food or feed chain, including material from retail and wholesale and the agro-food and fish and aquaculture industry, excluding feedstocks listed in Part B;
(e) Straw;
(f) Animal manure and sewage sludge;
(g) Palm oil mill effluent and empty palm fruit bunches;
(h) Tall oil pitch;
(i) Crude glycerine;
(j) Bagasse;
(k) Grape marcs and wine lees;
(l) Nut shells;
(m) Husks;
(n) Cobs cleaned of kernels of corn;
(o) Biomass fraction of wastes and residues from forestry and forest-based industries, namely bark, branches, pre-commercial thinnings, leaves, needles, tree tops, sawdust, cutter shavings, black liquor, brown liquor, fibre sludge, lignin and tall oil;
(p) Other non-food cellulosic material;
(q) Other ligno-cellulosic material except saw logs and veneer logs;
(r) Fusel oils from alcoholic distillation;
(s) Raw methanol from kraft pulping stemming from the production of wood pulp;
(t) Intermediate crops, such as catch crops and cover crops that are grown in areas where due to a short vegetation period the production of food and feed crops is limited to one harvest and provided their use does not trigger demand for additional land, and provided the soil organic matter content is maintained, where used for the production of biofuel for the aviation sector;
(u) Crops grown on severely degraded land, except food and feed crops, where used for the production of biofuel for the aviation sector;
(v) Cyanobacteria.

Feedstocks Part B – (biofuels and biogas)

(a) Used cooking oil (UCO);
(b) Animal fats classified as Categories 1 and 2 in accordance with Regulation (EC) No 1069/2009;
(c) Damaged crops that are not fit for use in the food or feed chain, excluding substances that have been intentionally modified or contaminated in order to meet this definition;
(d) Municipal wastewater and derivatives other than sewage sludge;
(e) Crops grown on severely degraded land excluding food and feed crops and feedstocks listed in Part A of this Annex, where not used for the production of biofuel for the aviation sector;
(f) Intermediate crops, such as catch crops and cover crops, and excluding feedstocks listed in Part A of this Annex, that are grown in areas where due to a short vegetation period the production of food and feed crops is limited to one harvest and provided their use does not trigger demand for additional land and provided the soil organic matter content is maintained, where not used for the production of biofuel for the aviation sector.

1. European context

The European Commission introduced the Green Deal in 2019 to help the EU achieve climate neutrality by 2050, through a broad set of measures across the energy, mobility, agriculture and waste sectors

The latest revision of the Renewable Energy Directive (RED), officially adopted in October 2023 and known as RED III, focuses on increasing the share of renewable energy in the EU's total energy consumption. The binding EU-wide target is at least 42.5% by 2030, with an additional indicative collective ambition of 45%. Additionally, the directive introduces sector-specific goals, particularly for transport and industry. For industry, recognizing the decarbonization potential of hydrogen, the directive sets ambitious objectives: at least 42% of hydrogen used in industry must come from renewable fuels of non-biological origin (RFNBOs) by 2030, and 60% by 2035.

In the transport sector, the directive allows Member States to choose between two goals: a 14.5% reduction in the carbon intensity of energy used in transport or achieving at least 29% renewable energy in final energy consumption by 2030. Additionally, it sets a combined sub-target of 5.5% for the incorporation of advanced biofuels and biogas (Annex IX, Part A) and RFNBOs, of which at least 1% point must come from RFNBOs, by 2030.

In the aviation sector, the ReFuelEU Aviation regulation mandates that fuel supplied at Union airports gradually incorporate SAF from 2025, with an additional sub-mandate for synthetic aviation fuels from 2030. The overall SAF blending mandate starts at 2% in 2025 and progressively increases to 6% by 2030, 20% by 2035, and up to 70% by 2050. The share of synthetic aviation fuels will start at 1.2% and gradually increase to 10% by 2040 and 35% by 2050. Responsibility for supplying SAF at EU airports lies with aviation fuel suppliers.

For the maritime sector, the FuelEU Maritime regulation does not prescribe the use of a specific fuel. Instead, it sets a progressive reduction in the GHG intensity of energy used on board ships, relative to a 2020 baseline: -2% by 2025, -6% by 2030, -14.5% by 2035, -31% by 2040, -62% by 2045, and -80% by 2050. In parallel, RED III requires Member States with maritime ports to endeavour to ensure that, as of 2030, at least 1.2% of the energy supplied to the maritime sector is composed of RFNBOs.

2. The French regulatory framework

a) Biofuels obligations

The RED III Directive entered into force across the EU on 20 November 2023; Member States were required to transpose it into national law by 21 May 2025. In France, transposition is still ongoing, and RED II remains applicable in the interim. Of the two options available under RED III for the transport sector, France has proposed to target a 14.5% reduction in the carbon intensity of fuels by 2030 through the DDADUE bill (a bill adapting French law to EU law), which is currently going through the legislative process.

Introduced on 1 January 2022, the TIRUERT (Taxe Incitative Relative à l'Utilisation d'Énergie Renouvelable dans les Transports - Incentive Tax on the Use of Renewable Energy in Transport) is France's primary national fiscal instrument for driving the uptake of renewable fuels. Fuel distributors supplying gasoline and diesel are subject to a tax proportional to the gap between their renewable-fuel incorporation and the set target. This creates a strong financial incentive to blend biofuels into their supply, with advanced biofuels given priority status: eligible volumes benefit from double counting, subject to feedstock-specific caps and traceability requirements. The TIRUERT has played a key role in shaping the structure of the French biofuels industry. For 2026, energy-content incorporation targets remain unchanged from 2025 at 10.5% for gasoline and 9.4% for diesel.

Building on this blending incentive framework, two additional biofuels - E85 and B100 - have been introduced in France, enabling higher renewable-fuel shares than standard E10 and B7 blends. E85 has been on the market since 2007, while B100 has been authorized since 2018 for use in professional captive fleets, around 20,000 trucks as of 2024, as part of a wider initiative to decarbonize heavy-duty transport. To encourage their production and uptake within the road transport decarbonization agenda, they have benefited from targeted reductions in excise duty.

The proposed IRICC mechanism (Incitation à la Réduction de l'Intensité Carbone des Carburants - Incentive for Reducing the Carbon Intensity of Fuels) is intended to replace TIRUERT as part of France's transposition of RED III transport provisions and is expected to come into force in 2027. Unlike the TIRUERT, the IRICC sets out targets of carbon intensity reduction in legislation until 2035, giving investors in advanced biofuels and other innovative fuels the long-term certainty they need. Aviation will be entirely carved out of the IRICC's scope, given that the sector is already bound by mandatory SAF incorporation requirements under the ReFuelEU Aviation regulation. In the version put out for consultation, the carbon intensity reduction target for road transport would start at 7.3% in 2027 and climb to 18.1% by 2035, while the advanced biofuels mandate would begin at about 1% in 2027 before reaching about 2% in 2030 and 2.6% in 2035. All figures remain subject to change pending the outcome of the legislative process.

b) France: a pioneer in SAF uptake

France is one of the pioneering countries in the development and use of sustainable aviation fuels.[12] This momentum was notably structured around the Green Growth Commitment (Engagement pour la Croissance Verte - ECV), concluded in December 2017 between the French State, Air France, Airbus, Safran, TotalEnergies and Suez Environnement.[13] Following the work carried out under this framework, and even before the European Commission proposed the ReFuelEU Aviation Regulation, France published a national roadmap setting incorporation targets of 2% in 2025 and 5% in 2030.[14] France was also one of the first countries to introduce, through the TIRUERT, a 1% incorporation mandate for sustainable aviation fuels in aviation fuel supplied in France as of 2022. When the ReFuelEU Aviation regulation entered into force on 1 January 2025, it effectively scaled up to the European level a trajectory that France had pioneered years before. On 18 June 2025 at the Paris Air Show, the aviation industry reached a significant milestone with the signing of the Sustainable Aviation Fuels chapter of the "New Energy Systems" Strategic Sector Contract 2024-2027, a joint initiative led by the French State (the Ministries of Economy, Industry and Transport), Air France, and the sector's partners.[15] This roadmap aims to structure and accelerate the emergence of a competitive, sovereign French SAF industry, a key condition for decarbonizing air transport.

c) Deployment of SAF: government funding through CARB AERO

Since 2022, ADEME (the French Environment and Energy Management Agency) has supported the development of sustainable aviation fuel production plants through two France 2030 calls for projects:

• CARB AERO - 2022: call for projects focusing on pre-FEED studies and demonstrators to develop a French sustainable aviation fuel sector (advanced biofuels and e-fuels).

• CARB AERO 2 – 2025: a call for projects targeting industrial projects for the production of sustainable aviation fuels (advanced biofuels and e-fuels). The four successful applicants were announced in April 2025, will receive approximately €100 million for their FEED studies,

and will result in the production of 270 kt/year of sustainable aviation fuels by 2030, provided that investment decisions are taken (France KerEAUzen, TAKE KAIR, DéZIR and BioTJet projects – Table 1).[16]

d) **The maritime sector: an early mover on decarbonization**

France's maritime decarbonization agenda took shape as early as April 2023, when the sector published its first roadmap identifying levers to reduce emissions across each fleet segment in alignment with IMO targets.[17] The process was broad-based from the outset, involving shipowners, ports, shipyards and energy companies, and sits within the government's wider France Mer 2030 strategy.

Building on those foundations, the industry reached a significant milestone on 12 May 2025 with the signing of the Strategic Decarbonisation Plan for Maritime Transport, a joint initiative led by Armateurs de France, the GICAN (Groupement des Industries de Construction et Activités Navales - the French naval industries association) and the Union des Ports de France.[18] The plan converts the ambitions of the initial roadmap into concrete actions and deepens the shared commitment between public and private stakeholders to achieve carbon neutrality by 2050.

Independently of this French roadmap, the EU's FuelEU Maritime regulation came into force on 1 January 2025, setting binding decarbonization requirements at European level (see above).



BioTfueL - Demo plant



The development of advanced biofuel and synthetic fuel production projects in France is shaped by the EU's transport-decarbonisation framework (RED III, ReFuelEU Aviation and FuelEU Maritime — see the Policies section), which creates demand signals for investment in advanced biofuel and synthetic fuel production capacity.

France 2030 is a €54 billion investment plan launched by the French government in October 2021 to accelerate the ecological transition, strengthen industrial sovereignty, and create jobs in future-oriented sectors.[19] As part of this plan, the national acceleration strategy "Bio-based Products and Industrial Biotechnologies -- Sustainable Fuels" aims to develop a competitive French industrial sector for bio-based products and sustainable fuels by supporting R&D, innovation, and the deployment of breakthrough technologies to decarbonize transport, particularly aviation and road transport.

The NACRE project fits into this dynamic. It aims to establish an industrial lignocellulosic biorefinery producing advanced bioethanol on the Induslacq platform near Pau. This is the first French advanced bioethanol production project based on the French Futurol® technology, developed by IFPEN (and its partners) and licensed by Axens.[20] The biorefinery will utilize non-food lignocellulosic resources (wood, agricultural residues, dedicated crops) to produce approximately 30 kt/year of bioethanol, as well as co-products: 55 kt/year of lignin, 5 kt/year of biomethane, and 41 kt/year of biogenic CO_2.[21] Biomass supply will prioritize short supply chains and the valorization of local resources.

In direct links with on-going incentive Aviation regulations, almost all current projects dedicated to sustainable fuels production are SAF (Sustainable Aviation Fuels) oriented meaning that the produced kerosene fraction is optimized, naphtha being thus considered as a valuable co-product. Major announced projects are reported in Table 1; SAF oriented projects in the top part of the Table are classified according to their production pathways and respective fuel capacity, methanol and advanced ethanol being reported in the bottom part of the Table. When known, the fuel distribution is mentioned, keeping in mind that the distribution between SAF and naphtha may evolve along the project life since being a trade-off between capital and operational costs vs incentives and fuel sales. Table 1 shows the name of the project, the fuel capacity, the leading company or the partners of the project, the associated technology and the status.

Key routes for SAF production[22] include Lipid-to-biojet with HEFA (biorefinery conversion Grandpuits), Power to Liquid (PtL) with Fischer–Tropsch synthesis (Take Kair, KerEAUzen, BELAir) and e methanol production (eM Rhône) which may be followed by methanol to jet (VERSO Energy projects, H4 Marseille Fos), Power-and-Biomass to Liquid (PBtL also named as e-BtL) based on biomass gasification and water electrolysis (BioTJet), and Alcohol to Jet (AtJ) (Rebound, ERA) from advanced bioethanol.

Capacities range from small plants (~15 kt/y) to large industrial facilities (50–230 kt/y). The project with the largest capacity (Grandpuits) is the only one under construction; it will produce HEFA, the most mature and commercially proven route to sustainable aviation fuel. The projects based on advanced technologies (Ptl, e-BtL) have all capacities less than 100 kt/y.

Several SAF or e-methanol projects (BioTJet, eM Rhône, Verso's ReSTart/Lichen, Take Kair) have secured significant French public support or Innovation Fund recognition, reflecting national and EU priorities for energy sovereignty and decarbonisation. Challenges highlighted across projects include water and low carbon electricity supply needs (requiring large electrolyser installations, tens to hundreds of MW), CO_2 sourcing logistics (biogenic capture or pipelines like GOCO2), high CAPEX and the need for long term commercial contracts to justify final investment decisions (FIDs).

The French portfolio shows a diversified, complementary strategy—combining biomass based and e fuel routes—to scale SAF and other low carbon molecules for aviation, maritime and chemical markets. Projects based on Fischer–Tropsch synthesis, whether via the PtL or e-BtL route (Take Kair, BioTJet, KerEAUzen), aim to maximize SAF production for aviation sector and reduce the share of co-produced naphtha. The market for naphtha — whether blending into the gaso-

Examples of announced projects in France (as of July 2026)

Project Name	Location	Capacity (kt/y)	Company / Partners	Technology	Status/Operation date
Grandpuits [23]	Grandpuits	230 SAF	TotalEnergies	HEFA	Operation 2026
BioTJet [24]	Lacq	120 SAF (60% e-SAF & 40% bio-SAF)	Elyse Energy	e-BtL via Fischer-Tropsch	Operation 2031
KerEAUzen[25]	Le Havre	70 SAF 12 naphtha	Engie	PtL via Fischer-Tropsch	Operation 2031
DéZIR [26]	Rouen	81 SAF	VERSO Energy	PtL via methanol (MtJ)	Operation 2030
ReSTart[27]	Tartas	81 SAF (tbc)	VERSO Energy	PtL via methanol (MtJ)	Operation 2030
LiCHEN [28]	Saillat-sur-Vienne	81 SAF (tbc)	VERSO Energy	PtL via methanol (MtJ)	Operation 2030
H4 Marseille Fos[29]	Marseille Fos	75 SAF	Hy2gen & H2V	PtL via methanol (MtJ)	Operation 2030
Take Kair [30]	Saint-Nazaire	37.5 SAF 12.5 naphtha	Hynamics (EDF)	PtL via Fischer-Tropsch	Operation 2032
ERA[31]	ND	50 SAF	Axens	AtJ	Operation 2030
Rebound [32]	Dunkerque	160 SAF	Safran, Airbus, Tereos, Technip	AtJ	FID 2029
BELAir[33]	Caen	15 SAF	T.H2 (jv TERTU & INERATEC)	PtL via Fischer-Tropsch	Operation 2029
eM-Lacq [34]	Lacq	200 MeOH	Elyse Energy	PtL	Operation 2027
eM-Rhône[35]	Roches-Roussillon	150 MeOH	Elyse Energy	PtL	Operation 2028
NACRE	Lacq	30 EtOH	NACRE, Axens, Euralis	Advanced Ethanol	Operation 2028

line pool or as a feedstock for the chemical industry in a steam cracker — currently lacks strong incentives. Notably, methanol projects are e-fuels projects. They are targeted mainly for direct use in the maritime sector or to aviation sector through Methanol-To-Jet (MtJ) conversion. Conversely, ethanol projects are lignocellulosic biomass based and are increasingly directed toward aviation via Alcohol To Jet (AtJ) pathways, reflecting a shift of bioethanol deployment toward SAF production.

Many projects target commercial operation in the 2027–2032 window; their successful delivery will depend on permitting, grid and CO_2 infrastructure, and stable policy & market incentives.

From this Table, three main technologies arise. The first one is producing HEFA, standing for Hydroprocessed Esters and Fatty Acids and is currently the most commercially mature technology, similar to the process for HVO (Hydrotreated Vegetable Oil) production deployed at industrial scale for road-fuel application. For jet-fuel, Hydroprocessed Esters and Fatty Acids Synthetic Paraffinic Kerosene, HEFA-SPK, has been certified and added to Annex 2 of the ASTM D7566 standard in 2011 with a maximum certified blend limit of 50 vol% with conventional jet fuel.

A block flow diagram of the HEFA-SPK production route is shown in Figure 5. The HEFA route relies on well-established hydrotreating refining technologies (steps 3 and 4), it is fully commercial and is operated by large industrial producers. Lipid feedstocks, such as vegetable oil, used cooking oil (UCO), waste vegetable oil, animal fats and other fats, contain contaminants that require pre-treatment. This step aims at reducing metals (Na, Ca, K, Ni...), phosphorus, chlorides, water and other impurities contents to ensure efficient downstream catalytic conversion. Impurities may indeed deactivate hydroprocessing catalysts and further reduce catalyst lifetime, increase pressure drop and eventually generate corrosion risks in the high-pressure equipment. Hydrotreatment removes oxygen by hydrogen addition, and is typically operated at 315–400 °C and 40–100 bar using NiMo or CoMo alumina-supported catalysts. Hydroisomerisation and hydrocracking aim at first, increasing the yields towards the product of interest, mostly jet fuel in the present projects, and second, at ensuring that physical properties meet the fuel specifications. Note that bio-based LPG and naphtha can both be considered as high-value steam cracker feedstocks; they can be used for olefins (ethylene, propylene) production in the petrochemical industry for further sustainable bio-based plastics production.

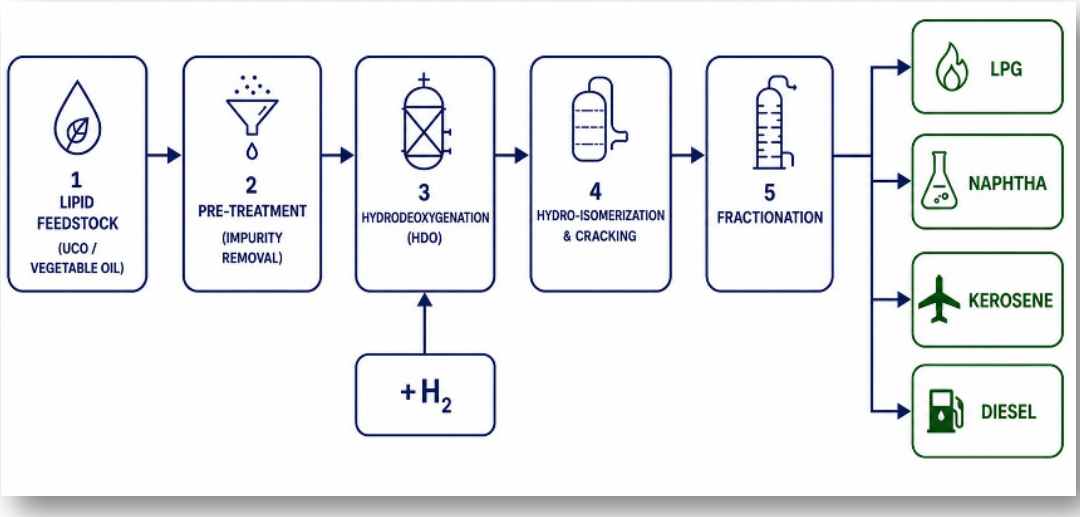


Figure 5: Block Flow Diagram of SAF production – HEFA route.

The second technological route is based on the Fischer-Tropsch synthesis that transforms syngas, a CO and H_2 mix, into fuels. Two main pathways can be considered. The first one is the Biomass to Liquid pathway, BtL, and its e-BtL variant, in cases where low carbon electricity is used to achieve higher yields. The second one is the Power to Liquid pathway, PtL ; it may represent an interesting long-term option for producing synthetic fuels from low-carbon electricity, water and captured CO_2 meeting the long-term net zero target. Those two pathways are illustrated in Figure 6.

The biomass feedstocks for the BtL pathway consist mainly of lignocellulosic solids, biogenic wastes such as forest or agricultural residues, dedicated energy crops or biogenic fraction of municipal solid waste. After a pre-treatment step (2), the biomass is sent with steam and oxygen to a high temperature gasifier (800 - 1,500°C) in which gasification/partial oxidation take place (step 3), the sub-stoichiometric oxygen may come from air-separation unit. The raw biomass-based syngas follows a conditioning step (4) which aims at removing particulates and tar but also sulphur compounds; it may integrate a water-gas shift (WGS) unit used for adjusting the H_2/CO ratio and an AGR unit (Acid Gas Removal) for CO_2 removal. The resulting clean syngas is then sent to the Fischer–Tropsch reactor (FT - step 5). This technology converts the H_2 and CO mixture into a distribution of linear hydrocarbons using iron or cobalt-based catalysts. The FT syncrude or wax is further hydrotreated, hydrocracked, isomerised and fractionated within an integrated process flow scheme that maximizes the production of a jet-range synthetic paraffinic kerosene.

The e-BtL pathway combines the conversion of lignocellulosic biomass with an input of low carbon electrical energy to produce hydrogen from water electrolysis. In such pathway, oxygen used for the gasification/partial oxidation of the pre-treated biomass is an electrolysis co-product. Adding hydrogen to adjust the H_2/CO ratio during syngas conditioning eliminates the need for a water-gas shift unit, thereby avoiding CO_2 production inherent to this step. Therefore, the e-BtL pathway maximizes the conversion of biogenic carbon into fuels, thereby doubling the carbon yield compared with the BtL pathway.[36]

PtL pathway uses low-carbon electricity, water and captured CO_2 as feedstocks for producing e-fuels. CO_2 is converted to CO in a reverse water-gas shift unit (RWGS) in the presence of hydrogen produced by water electrolysis (Figure 6).

In order to guarantee a positive effect of e-fuels on GHG emissions, European Union's delegated acts[37] set sustainability criteria for e-fuels production depending on energy sources: Renewable Fuels of Non Biological Origin (RFNBO), produced with renewable electricity and Low-Carbon Fuels (LCF), produced from non-renewable low-carbon energy sources. Eligible CO_2 sources are of different types. CO_2 could be captured from fossil-based industrial sources to enable the CCUS value chain deployment in a short-term vision, however since the carbon used would remain fossil it makes

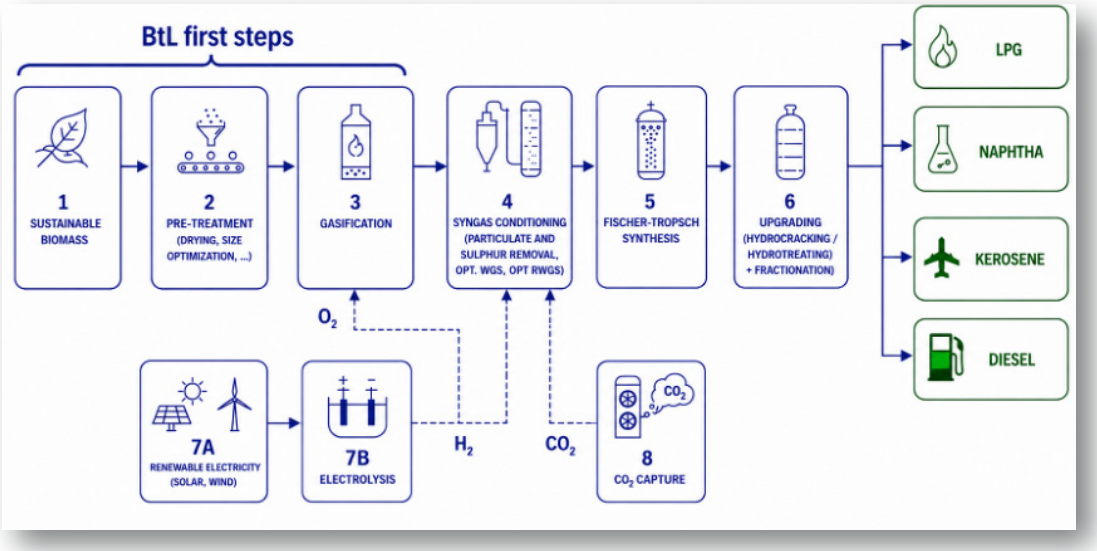


Figure 6: Block Flow Diagram of SAF production combining PtL and BtL routes.

it incompatible with long term net zero objective. End-dates for eligibility is 2035 for fossil CO_2 captured from power plant and 2040 for fossil CO_2 captured from all other industrial processes (such as steel, cement, chemicals, or glass). CO_2 can be biogenic, produced as a by-product from fermentation or by biomass-fired furnaces equipped with post-combustion carbon capture unit. Those technologies are available at commercial scale. CO_2 can be captured directly from ambient air, leading to zero net atmospheric carbon upon e-fuels combustion. Atmospheric CO_2 represents an infinite feedstock, however Direct Air Capture (DAC) technology needs further R&D work to lower the high energy demand.

The third technological pathway is the Alcohol-to-Jet (AtJ) route. As illustrated in Figure 7, AtJ technology converts light alcohol intermediates, primarily ethanol (C_2H_5OH) and methanol (CH_3OH), into synthetic paraffinic kerosene through a sequence of three catalytic processes, dehydration, oligomerisation and hydrogenation. All three processes are well-established in the refining and chemical industries. Certification of AtJ-SPK under ASTM D7566 Annex A5 sets a maximum blend limit of 50 vol%, and defines the feedstocks as methanol, ethanol, isobutanol and isobutene-derived intermediates. These alcohols can be produced through lignocellulosic biomass hydrolysis, fermentation of industrial off-gases or e-methanol synthesis from low-carbon hydrogen and captured CO_2. Feedstock flexibility, supported by the availability of existing production and logistics infrastructure, is a major advantage of the AtJ pathway. In addition, the operating conditions and the recycle streams optimisation between the different process steps can readily be adjusted to modify the product-yield distribution. Within the integrated process configuration shown in Figure 7 the current priority is to maximise the jet-range cut and, consequently, the overall SAF yield.

Note that the hydrogen required at the hydrotreatment steps in all pathways (HEFA, BtL, AtJ) may be fossil-based or produced by water electrolysis using low-carbon electricity. Lifecycle emissions of SAF depend strongly on electricity and hydrogen sources. Low-carbon electricity, i.e. nuclear or renewable power, can reduce GHG emissions. Among renewable power, solar and wind represent the most scalable and policy-aligned solutions for SAF production.

Eligibility depends on the regulatory frameworks such as CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation adopted by the International Civil Aviation Organization, ICAO) and EU RED II/III.

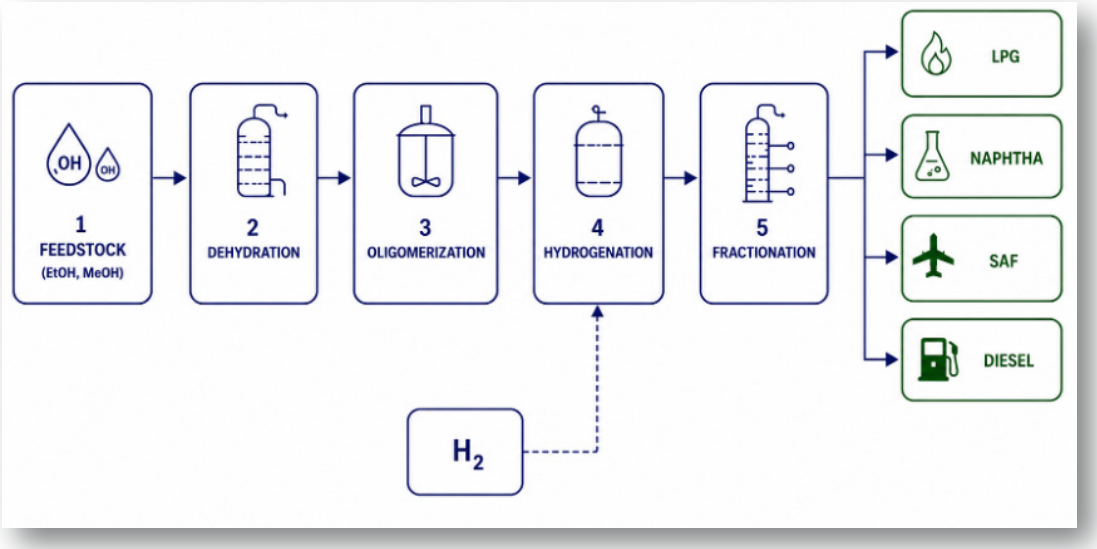


Figure 7: Block Flow Diagram of SAF production – AtJ route.

SUPPORT FOR THE DEPLOYMENT OF SUSTAINABLE FUELS AND RESEARCH EFFORTS AT LOW TECHNOLOGY READINESS LEVELS

In France, the development of sustainable fuels is supported by both efforts to accelerate their industrial deployment and early-stage research aimed at developing the sustainable fuel technologies of tomorrow. These efforts are mainly supported by an internationally recognized public research center, IFP Energies nouvelles, and two large-scale structuring programs forming the backbone of France's efforts to develop biobased products and sustainable fuels.

1. IFP Energies Nouvelles (IFPEN)

France has an internationally recognized public research center, IFP Energies Nouvelles (IFPEN), whose missions include developing technologies for the production of low-carbon liquid fuels. IFPEN has built on its expertise in producing conventional fuels and first-generation biofuels to develop innovative pathways for the production of advanced biofuels. IFPEN's distinctive strength lies in its ability to integrate catalysis, process engineering and scale-up expertise to develop innovative, industrially viable pathways for low-carbon liquid fuels. In particular, IFPEN continues to improve these pathways through better use of biogenic carbon, reduced energy consumption, and enhanced catalytic performance, leading to greater selectivity toward higher value fuels.

2. PEPR (Programmes et Equipements Prioritaires de Recherche)

The PEPR Bioproductions (B BEST), led by INRAE and IFPEN (≈€65M over seven years starting 2023), focuses on early stage research (TRL 1–4) to build a competitive national industrial base for bioproducts and sustainable fuels. The principal research axes are the following:

- Feedstock science: advanced physico chemical and molecular char acterisation of diverse biomass (lignocellulose, oil crops, algae, residues).
- Biological engineering: metabolic and strain engineering, consortia/co culture strategies, non GMO improvement routes.
- Hybrid conversion pathways: integration of biochemical, thermochemical and catalytic processes; new catalytic chemistries for upgrading biobased intermediates.
- Process intensification & digitalisation: reactor design, process modelling, digital twins and process control strategies.
- Sustainability assessment & governance: prospective life-cycle analysis, socio economic analysis, territorial integration and stakeholder engagement.

The PEPR EBIOCARB ("Hybrid sustainable fuels: e biofuels") is coordinated by the Agence de Programme pour la recherche sur les Energies Décarbonées and led by CEA with a scientific program driven by IFPEN (total budget 26M€, grant 15M€, over five years starting 2026). It aims to design competitive e biofuel value chains for aviation and shipping by integrating technological building blocks, ensuring feedstock flexibility and optimizing mass /energy balances. Its activities cover the following research axes:

- Integration engineering: system design to combine CO_2 to fuel electrochemical routes, biomass conversion, and fuel synthesis units.
- Multi scale and multi physics modelling: from material and catalyst scales to process and territorial system models to optimize mass/energy balances.
- Feedstock flexibility studies: comparative assessment of CO_2 sources, biomass residues and algal feedstocks.

3. Other research activities

Other initiatives, through ANR (Agence Nationale de la Recherche) projects, improve value chains, processes and industrial diagnostics. FULL OIL develops cutting edge analytical methods to precisely characterize bio oils from pyrolysis and hydrothermal liquefaction, supporting process optimization and industrial monitoring. LowCoBio addresses corrosion challenges associated with bio oils by optimizing pretreatments, liquefaction steps and materials selection, and by conducting techno economic and life-cycle analysis studies to accelerate industrial commercialization (target ~2030). REBBAR works on engineered bacterial strains (Clostridia) and cocultures to valorize agricultural residues and better convert lignocellulose with mild pretreatment, aiming to reduce pretreatment costs and improve yields. TRABOULE develops modelling tools and scale up extrapolation for aerobic fermenters, creating digital twins to improve pilot to industrial extrapolation of fermentation processes critical for biotechnological fuel and product production.

Across these efforts, a multi scale and multi technology approach is evident: conventional chemistry, biotechnology, electrochemistry, photoconversion and thermochemical routes (pyrolysis, gasification) are coupled to unlock synergies. There is a strong emphasis on evaluation tools (prospective life-cycle analysis, socio economic analyses, territorial studies, and risk/safety assessments), on training and capacity building (PhD/postdoc funding, strengthening experimental platforms such as IBISBA), and on networking and industrial deployment. Expected impacts include emission reductions via SAF and marine fuels, production of low carbon fuels, and development of pathways with sequestration potential (e.g., biochar).

Key technological priorities identified as most promising are: integrating electrolysis (H_2) with gasification to optimize syngas and feedstock flexibility (GeniusFuels); converting CO_2 into e fuels to enable a circular carbon economy (POWERCO2, SOLAR fuel); developing high energy density algal oils (AlgAdvance); improving processing and characterization of bio oils to make industrial valorisation viable (LowCoBio, FULL OIL); and advancing lignocellulose bioconversion through optimized strains and better fermentation process scale up methodologies (REBBAR, TRABOULE).

CONCLUSION

France stands as a key player in the biofuels sector, benefiting from its status as a pioneer in first-generation biofuels and a well-established agriculture-fuel ecosystem on its territory. This success is built on technologies developed and mastered domestically, ensuring independence and competitiveness for the industry. Research and development centers play a central role in this dynamic, continuously optimizing existing generations while actively preparing those of tomorrow, with advanced biofuel technologies already validated and ready for industrial use.

Having proven technologies is a first step, but their industrial deployment still requires several challenges to be met. Supported by a favourable regulatory framework, advanced pathways are currently being deployed, and their scale-up depends on several conditions. Investors have yet to be convinced to finance the first commercial plants. Producers are also seeking to secure buyers willing to commit to large volumes over the long term, since advanced biofuels remain more expensive to produce than conventional ones. Finally, supply chains for agricultural and forestry residues are yet to be structured.

Addressing these issues is the next step, and France's constant capacity for innovation puts it in a strong position to do so and to support the energy transition in the transport sector. As environmental requirements become more stringent, this combination of expertise, technology and research forms a genuine strategic asset. France thus has all the levers needed to continue showcasing its expertise in biofuels, both domestically and internationally. France thus has all the levers needed to continue showcasing its expertise in conventional and advanced biofuels and synthetic fuels, both domestically and internationally.

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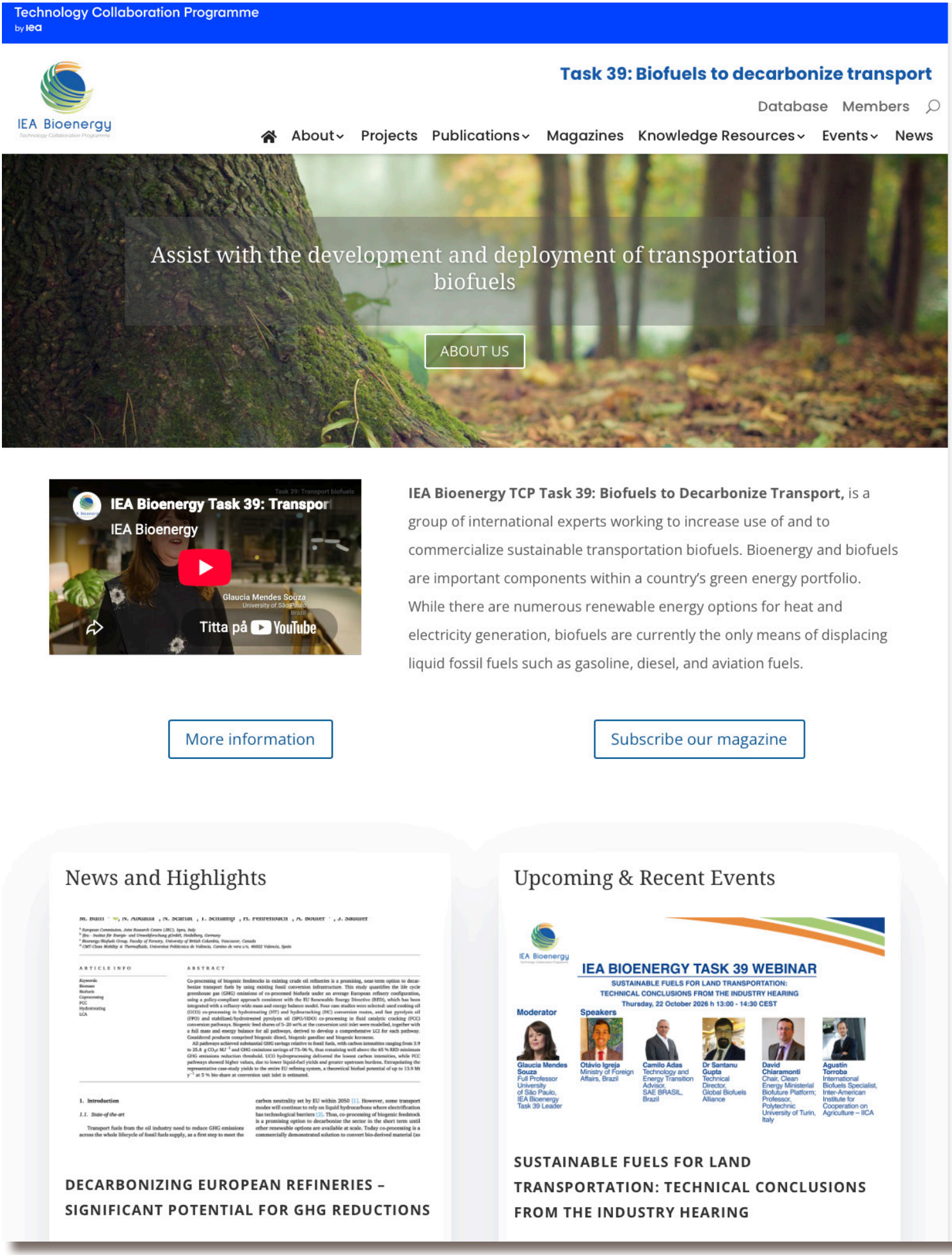
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Visit https://task39.ieabioenergy.com

Spain Joins IEA Bioenergy Task 39: Sharing Expertise and Advancing Biofuels

In this interview, Carlos Alberto Fernández López (NTL) discusses Spain's biofuel expertise, its ambitions for IEA Bioenergy Task 39, and the role of advanced biofuels in decarbonizing aviation and maritime transport.

1. We are delighted to welcome you a new member, and what decided Spain to join Task 39 and why now?

For us, joining IEA Bioenergy was a long-envisaged endeavour, stemming from the beginning of the 2010's. Eventually, the circumstances have made it possible, and we are really happy of being part of the TCP, an in particular of Task 39.

Decarbonizing transport is a major challenge, and biofuels have a major role to play in it. In this sense, the European Union has developed a strong regulatory framework to tackle this issue and Spain is following suit, so we think that the timing is perfect to jump on board.

2. What kind of expertise will IDAE bring to Task 39 and what areas of biofuels are you looking most forward to getting value from Task 39?

We are very aware of the talent and experience in this field of each and every one of the members of the group, so we enter Task 39 with humility, but at the same time we are very excited to be of help for the ongoing projects and to share our expertise of decades of working together with all the stakeholders of the biofuels market and value chain in Spain.

On the other hand, and regarding our approach to the scope of the Task, all areas related to the decarbonization of transport are of major interest for us, but these days the importance of using advanced biofuels for the aviation and maritime sectors is difficult to overstate.



3. Given the last years with heightened interest in securing energy and supply-chains along with the need to lower carbon emissions, where do biofuels stand in the future energy mix of Spain to reach a climate-neutral transport sector?

As for any other member of the European Union, the place of biofuels within the energy mix was determined by the National Climate and Energy Plan. The last revision, approved in 2024, sets out the target of greenhouse gas intensity reduction in the transport sector in 2030 in an ambitious 16.3%, well above the 14.5% established in the Renewable Energy Directive. To achieve this, the share of renewable energy in transport will reach 28% in energy content, and even though it includes renewable electricity, it is worth mentioning that it also includes a combined target for Renewable Fuels of Non-Biological Origin and advanced biofuels and biogas from the annex IX.A of the renewables directive of 17,26%.

To achieve those goals European and national regulations are of paramount importance. In this sense, the recently approved Royal Decree 611/2026, which transposes the last version of the renewables directive, includes modal targets in the horizon of 2040 and is the main pillar sustaining the promotion of the use of biofuels in Spain to decarbonize the transport sector.

4. Please tell us of the most exciting biofuels project currently in development in Spain!

The development of conventional ethanol and FAME facilities seem to have plateaued, but there are some interesting projects on HVO and HEFA production in refineries, together with developments in the pretreatment of raw materials, as residues and wastes become increasingly important in the feedstock pool.

Road transport accounts for the lion's share of biofuels demand, but the aviation and maritime sectors have turned into major markets and good opportunities for project development. As an example of this, and regarding the latter, we are following with great interest the development of projects aimed at producing biomethanol from municipal solid waste.

Interview by Tomas Ekbom

This year Task 39 is proud to celebrate 25 years in IEA Bioenergy TCP

Biofuel News magazine talks to **professor Jack Saddler of UBC Canada**, who was there at the start – what started it all and why Task 39 is important.



Dear Jack, delighted to have you on the call and speak about the beginning of Task 39! As the first newsletter says, Task 39 held its initial kick-off meeting in Paris on 2 April, 2001.

How did you become involved and what started it all?

- The origins of Task 39 were catalyzed by the same forces that formed the International Energy Agency (IEA), essentially, the OPEC generated "oil-crises" of the late 20th century.

At that time, early in the 21st century, I lead a Canadian group whose primary mission was to try and make ethanol from biomass residues. Brazil was leading the world in sugar-to-ethanol and the US was quickly catching up, making ethanol from corn.

However, to avoid the food-vs-fuel conundrum, if biomass residues (agriculture/forestry wastes) could be used as feedstocks to make ethanol, the world could avoid that dilemma.

Despite a lot of excellent research and a significant investment by government and industry to scale up "cellulosic-ethanol", it proved very difficult to make this economic, emphasizing how clever nature was in making biomass biodegradable, but difficult to accelerate the process.

Of the nine member countries at the start there were National Team Leaders (NTLs) such Kyriakos Maniatis from the European Commission, Manfred Wörgetter of Austria, Kai Sipilä of Finland and Raymond Costello of USA and Lars Tegner & Lars Vallander of Sweden, and more – all who became distinguished, key biofuel experts in this field.

How was it to then explore and develop the biofuel scientific field as pioneer?

- We all recognized that it had taken about a hundred years to bring the oil-sector to its current format and that the volumes (oil) involved were huge. Therefore, it was great to be part of IEA Bioenergy that looked at everything from fast-rotation crops, to what was the best route (thermochemical, bio-chemical, etc) to make a transportation fuel from biomass.

Task 39 did a great job of getting industry involved, from some of the best enzyme companies in the world, such as Novozymes, DSM and Genecor, forest products companies such as Borregaard through to oil companies such as Valero and Neste. However, about this time, climate change started to be better recognized. The focus moved more towards the Carbon Intensity (CI) of the fuels, as well as yield or the percentage of the low-CI fuel that could be blended with the fossil fuel.

A few months before Task 39 officially started there was a technical meeting in Honolulu, Hawai'i in December 2000. Two great scientists, prof. Guido Zacchi (Sweden) and Dr. Michael Antal (US) made key developments in cellulosic fuel-ethanol and presented their results at the meeting.

Don Stevens of the US's Pacific Northwest National Laboratory was the first Task 39 leader. In his first newsletter he then wrote that the Task would "provide a framework on policies and regulations and technical issues on ethanol from wood and reduction of fuel prices".

However, even after decades of great research and well-funded attempts to commercialize the cellulosic-ethanol process, this technology is still not able to compete with the sugar/starch-to-ethanol processes.

Task 39 seems we have moved away from wood/cellulosic ethanol to large-scale lipids-based diesel and SAF? What are the reasons for this?

- I became a Subtask leader around 2000. At the same time, the automotive sector was increasingly being electrified while there was also an increasing focus on decreasing the carbon-intensity (CI) of transport. The Task increased its focus on the hard-to-electrify long-distance transport sector, such as marine, aviation and trucking, while getting more involved in the way to determine the CI of various fuels using Life Cycle Analysis (LCA) tools.

However, the geopolitical conflicts in the Middle East and Eastern Europe indicates that there is nothing more "motivational" than high-priced fossil-derived transportation fuels! Some sectors, such as aviation, will have to use biojet/Sustainable Aviation Fuel (SAF) if they are to stop using fossil fuels.

Task 39 is well positioned to play an important role, with most of aviation involving international travel. However, as well as technical challenges, the same way as ethanol is taxed differently in various countries, the policies or LCA models used to assess SAF will need to have some sort of commonality, if growth in biojet/SAF production and use is to succeed.

Task 39 is now 20 countries strong, the largest of all the Tasks in IEA Bioenergy. What has been the key to its success in your opinion over all the years to interest people in biofuels and to work in this field?

- Great people and an international perspective. It is not possible to grow sugar-cane in Canada (Editor: or in many other boreal countries) but we have lots of wood. Task 39 allows us to work with world-class people and learn from the successes-and-failures of enlightened colleagues.

As recent years have shown with heat waves and forest fires, climate change is real and the world must decarbonize. IEA has shown the great progress that has been made in solar and wind. For bioenergy Task 39 has the expertise and capacity to pull together the needed technical, LCA, commercial, modelling and other areas of expertise, to find the necessary solutions.

Interview by Tomas Ekbom

Biofuels Without Borders: IICA's Agustín Torroba on Sustainability, Policy and the Future of SAF

In this interview, **Agustín Torroba, biofuels and renewable energy specialist at the Inter-American Institute for Cooperation on Agriculture (IICA)**, shares his perspectives on the future of sustainable biofuels in the Americas and beyond. He discusses the importance of harmonized sustainability standards, stronger investment incentives, and the opportunities for scaling up sustainable aviation fuels (SAF) and marine biofuels to accelerate transport decarbonization while fostering rural development and innovation.

The Inter-American Institute for Cooperation in Agriculture, IICA, is the specialized agency for agriculture of the Inter-American System that supports the efforts of Member States to achieve agricultural development and rural well-being. Task 39 has established a collaboration with IICA for a report on biofuels in the Americas and had a chance to talk to Agustin Torroba, their biofuel and renewable energies specialist.

Welcome to our Task 39 group of experts and our common work in promoting sustainable biofuels! From your perspective, living in Argentina and working in Pan-America, what are the largest differences in mindset for biofuels policies in the Americas, Europe and Asia?

The Americas currently produce 85% of the world's ethanol and 50% of its biodiesel. The region has certain specific characteristics that have fostered the development of biofuels. First, there is a historical factor: without a doubt, Brazil's Proálcool program in the 1970s and the subsequent push in the United States were the precursors that made it possible for biofuels to be produced at scale today and consumed in 13 countries across the continent. The region also has efficient and sustainable agricultural value chains; it is a net agro-exporting region of feedstocks while also being an importer of fossil fuels. For this reason, biofuels are fundamental: they allow countries to add value to their agricultural chains, decarbonize transport, and at the same time replace fossil fuel imports.

The feature that perhaps distinguishes the Americas from Europe is its vision of neutrality or agnosticism regarding feedstocks.

In the recent meeting in Montreal in June, the IICA called together with the Pan American Liquid Biofuels Coalition (CPBIO) for greater international harmonization of the sustainability standards used to measure the carbon footprint of biofuels and sustainable aviation fuels, and the adoption of clear economic incentives that promote new investments in the sector. How do you see this to move forward and what outcomes would you like to see?

I see this process as a key opportunity to build technical and regulatory convergence. Today, there are different sustainability schemes that use different criteria, assumptions, and methodologies to measure one of the most important environmental attributes: the carbon footprint of biofuels and SAF. This fragmentation creates uncertainty, increases certification costs, and can limit access for countries in the Americas to international markets, even though the region has a highly competitive supply of sustainable feedstocks.

To move forward, it is essential that organizations such as IICA, together with CPBIO, continue facilitating dialogue among governments, the private sector, international organizations, and technical institutions. At this moment, we are trying to advance the development of a robust, transparent, and science-based regional carbon footprint measurement methodology that can be harmonized with or recognized by other international schemes.

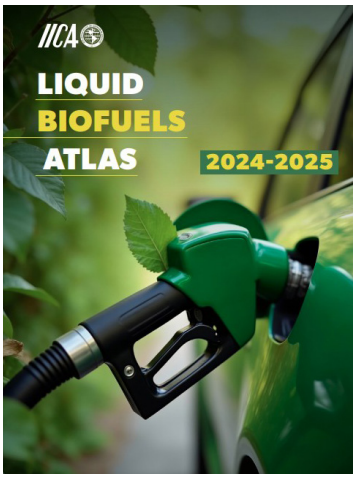
It is also important to prevent highly uncertain variables, such as indirect land-use change (ILUC), from becoming regulatory barriers that unfairly penalize the region's agriculture.

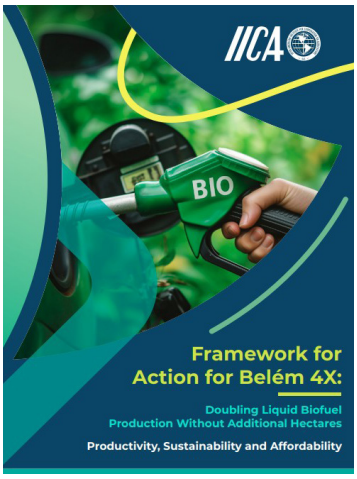
The outcome I would like to see is a framework for the mutual recognition of carbon footprint methodologies, accompanied by clear economic incentives that provide long-term signals for investment in new plants, logistics infrastructure, certification, and the production of biofuels in general, and SAF and marine biofuels in particular. If we achieve more harmonized rules and stronger economic signals, the Americas can play a central role in transport decarbonization, especially aviation, while also generating rural development, employment, and agro-industrial innovation.

The Institute provides cooperation services through close and permanent work with its 34 Member States, addressing their needs in a timely manner. If there is such, what secrets to success can we learn from you in our work in Task 39 having 19 countries as members and the European Union?

Technical cooperation plays an important role in the regional agenda. I believe that both IICA and Task 39 have a clear role in generating evidence and communicating on frontier issues. In the case of biofuels, I believe there are two areas that will be part of the next wave of innovation: SAF and marine biofuels. In addition, our organizations have a key role in helping ensure that schemes and standards are based on the best available scientific knowledge. And when this is not the case, it is our role to work so that this changes.

Just to give one example: whenever we have the opportunity to raise the issue in relevant international forums, we have maintained







Agustín Torroba, biofuels and renewable energy specialist at the Inter-American Institute for Cooperation on Agriculture (IICA)

that, given the current state of international methodological development and the high levels of associated uncertainty, indirect land-use change (ILUC) should not be considered an environmental impact category directly attributable to a crop, nor a regulatory variable that can be robustly quantified in relation to biofuels. This is not an arbitrary position. Our position is based on references from the Intergovernmental Panel on Climate Change (IPCC), the scientific authority of reference within the United Nations system, which neither defines nor operationalizes ILUC in its official inventory methodologies, limiting accounting to observed and directly attributable land-use changes. While it recognizes the possible existence of indirect effects, it highlights their strong dependence on models and significant levels of uncertainty, keeping ILUC as an area of research rather than as a quantified regulatory variable.

The report you will bring to our project on implementation agendas on biofuels for a series of countries will be very interesting as it will contribute to the focus on emerging markets. What will be the most interesting find do you think in your report?

I would like to highlight two recent studies that, from my perspective, provide very concrete elements to advance this agenda. The first is the policy brief "How to Meet the Belém 4x Biofuels Target," which shows that it is possible to achieve strong growth in liquid biofuels by closing productivity gaps in the six main agricultural value chains. This would make it possible to secure abundant, affordable, and sustainable feedstocks, without the need to expand the agricultural frontier or ask governments to allocate resources to feedstocks that, due to their costs or scale limitations, we know are unlikely to succeed.

The main lesson from that work is that transport decarbonization must rely on scalable solutions. The experience of terrestrial liquid biofuels shows that mass markets are built on available, competitive, and sustainable feedstocks. In this regard, the Americas have a strategic advantage: they have agricultural productivity, technical knowledge, consolidated agro-industrial chains, and a strong capacity to transform biomass into low-carbon liquid fuels.

The second study I would like to highlight is "Strengthening CORSIA to Accelerate the Deployment of Sustainable Aviation Fuels (SAF)." It analyzes that, for SAF to scale globally, it is not enough to recognize its environmental importance: stronger, more predictable, and long-term economic signals are needed. CORSIA can be a central tool for the aviation energy transition, but it must be strengthened and better harmonized with other sustainability schemes, especially regarding carbon footprint measurement.

In the last Climate Week, 2026 which was organized by the International Civil Aviation Organization (ICAO), participants discussed the main obstacles that continue to limit the global expansion of the sustainable aviation fuel (SAF) industry. Can you please share those obstacles, your analysis and what other interesting discussion results were presented.

From my perspective, one of the main obstacles to scaling SAF is the weakness of current economic signals. CORSIA is a central instrument for the decarbonization of international aviation, but it still does not generate a carbon price or incentives strong enough to close the cost gap between fossil jet fuel and sustainable aviation fuels. Without predictable, robust, and long-term signals, it will be difficult to mobilize the investments needed in new plants, logistics infrastructure, certification, and supply chain development.

I also believe that the accumulated experience of terrestrial liquid biofuels provides a very clear lesson: to build massive and competitive markets, we must rely on abundant, affordable, and sustainable feedstocks. In the Americas, we have a highly relevant agro-industrial base — alcohols, vegetable oils, residues, co-products, and new feedstocks — that can contribute to SAF development. In addition, the work on closing agricultural productivity gaps shows that the region can significantly increase biomass production without necessarily expanding the agricultural frontier, by improving yields, production efficiency, and the availability of inputs for bioenergy.

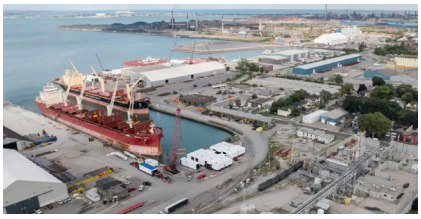
Finally, I consider it essential to harmonize CORSIA with the rest of the national and regional biofuel sustainability schemes, especially regarding carbon footprint measurement. The coexistence of different methodologies, assumptions, and criteria creates regulatory uncertainty, additional costs, and barriers to market access. Therefore, a desirable outcome would be to move toward greater mutual recognition among schemes, technically sound methodologies, and comparable criteria, so that producing countries can transparently demonstrate the environmental performance of their biofuels and SAF.

Interview by Tomas Ekbom

Biofuel News Autumn 2026

MCBC & HOPA Ports to restart Hamilton biodiesel facility

July 2, 2026



In Canada, HOPA Ports and the Mississaugas of the Credit Business Corporation, the entity representing the business development interests of the Mississaugas of the Credit First Nation, have partnered to save a critical biodiesel production facility in Ontario from permanent closure.

Read more

Acelen Renewables selects Alfa Laval pre-treatment tech for Bahia biorefinery

July 6, 2026



Sweden-headed Alfa Laval AB, a global leader in heat transfer, centrifugal separation, and fluid handling has announced that it has been selected by Acelen Renewables to deliver pre-treatment technology in a transformational sustainable aviation fuel (SAF) project in Brazil.

Read more

VAROPreem acquires world's largest CTO biorefinery

July 10, 2026

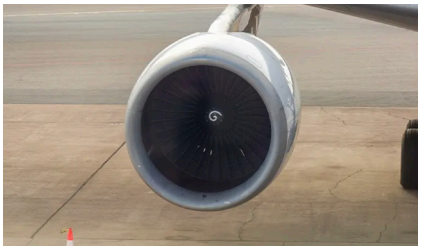


In Sweden, oil refiner and renewable products major VAROPreem has announced that it has completed the acquisition of a 100 percent interest in Sunpine AB, the world's largest Raw Tall Oil biorefinery.

Read more

Axens launches a new ERA for French SAF

July 29, 2026



Global chemical process technology provider Axens, an IFP Group company, has announced the launch of the Ethanol to Refuel Aviation (ERA) project, the first French production unit for sustainable aviation fuel (SAF) based on advanced bioethanol using its proprietary "Jetanol" ethanol-to-jet technology.

Read more

KBR selected to provide PureSAF tech for first SAF plant in Kazakhstan

August 25, 2026



Global science, technology, and engineering solutions major KBR Inc. (KBR) has announced that it has been awarded a contract by KazMunayGas-Aero LLP (KMG-Aero), a subsidiary of NC KazMunayGas JSC, and KazFoodProducts (KFP) to license technology for Kazakhstan's first Sustainable Aviation Fuel (SAF) production plant.

Read more

Expander Energy selects Axens FT upgrading tech

September 2, 2026

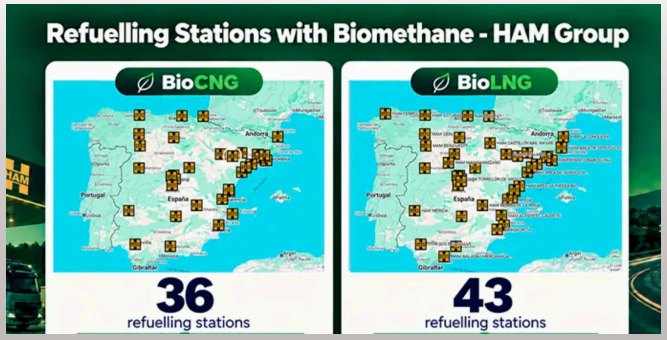


Global chemical process technology provider Axens, an IFP Group company, has announced that it has been selected by Expander Energy Inc., a Canada-based producer of sustainable aviation fuel (SAF) and renewable diesel (RD), to provide its advanced FT Liquid Upgrading technology.

Read more

HAM GROUP ACHIEVES RNG DISTRIBUTION MILESTONE

November 2, 2026



In Spain, natural gas refueling technology developer, gas distributor, and service provider HAM Group has reached a new milestone in its sustainability strategy by completing the transition to biomethane (aka renewable natural gas - RNG) at all its refuelling stations across the country.

Read more

Biofuel News Autumn 2026

Axens & Wison Engineering sign MoU to advance SAF & eSAF project development

September 10, 2026

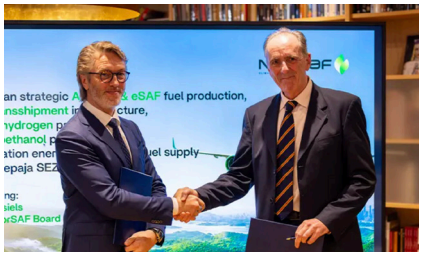


Global chemical process technology provider Axens, an IFP Group company, and Wison Engineering, a leading provider of EPC services and integrated technology solutions for the energy and chemical industries have signed a Memorandum of Understanding to explore collaboration opportunities on global sustainable aviation fuel and eSAF projects, including the Fischer-Tropsch pathway.

Read more

Nova Pangaea to develop ethanol plant for NorSAF

October 2, 2026

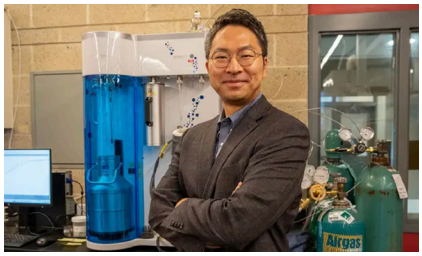


The UK cleantech business Nova Pangaea Technologies Ltd has announced that it has signed a Memorandum of Understanding (MoU) to collaborate with NorSAF, the company behind the Baltic's largest sustainable aviation fuel (SAF) project, to develop an advanced ethanol production plant in Latvia to supply the new facility.

Read more

Rowan researchers receive NSF grant for biomass-to-SAF

October 12, 2026



The United States is working to reduce its reliance on petroleum-based aviation fuel by increasing the use of sustainable aviation fuel (SAF) derived from renewable resources by 2050. A Rowan University research team is studying ways to produce these fuels.

Read more

UPM inaugurates pioneering Leuna biorefinery

October 15, 2026



Finland-headed forest industry major UPM has inaugurated its biorefinery in Leuna, Germany, marking the start of a new industrial platform for renewable chemicals made from wood. The biorefinery converts lignocellulosic biomass, primarily wood from sustainably managed forests and sawmill residues, into biochemicals.

Read more

Joint venture for large-scale e-methanol project

October 30, 2026

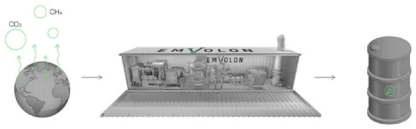


In Canada, ethanol major Greenfield Global, Inc., & Danish renewable power major European Energy A/S have announced a joint venture (JV) agreement to develop an electro-methanol (e-methanol) project adjacent to Greenfield's existing ethanol facility near Montréal, Québec.

Read more

Emvolon raises US$22M in Series A round to roll-out waste-to-fuel plants

October 30, 2026



In the United States (US), Emvolon, Inc., a Massachusetts Institute of Technology (MIT) spinout commercializing technology that converts methane-rich waste gases into high-value liquid fuels, has announced that it has raised US$22 million in its Series A funding round with participation from MassVentures, VX Ventures, Wagner Carbon, amongst others, and non-dilutive federal and state grants.

Read more

THE WORLD'S LARGEST CROSS-SECTOR FUTURE FUELS CONFERENCE AND TRADE SHOW



International Future Fuels Week (IFFW) 14-17 June 2027 will bring aviation, maritime and land transport together around a shared commercial reality: all three sectors are competing for the same constrained supply of future fuels feedstock and resources.

Built Together is the theme for this inaugural edition. The molecules already work, SAF, green methanol and biofuels. What's been missing is the forum where the people who scale them, feedstock producers, financiers, certification bodies, policymakers, and offtake buyers, actually meet. IFFW brings aviation, maritime and land transport together for the first time, on the belief that these sectors grow faster building the supply together than competing for it apart.

More info



IEA Bioenergy

Technology Collaboration Programme

IEA BIOENERGY TCP TASK 39

IEA Bioenergy is a Technology Collaboration Programme (TCP) set up in 1978 by the International Energy Agency (IEA) with the aim of improving cooperation and information exchange between countries that have national programmes in bioenergy research, development and deployment.

Twenty five countries plus the European Commission currently participate in IEA Bioenergy.