CONAMA 2026

REBOUND

Un Proyecto emblemático de TECHNIP ENERGIES para la Descarbonización del Transporte Aéreo

Narrativa detallada del Proyecto (EN)

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1. Executive overview

REBOUND is a large-scale sustainable aviation fuel project planned in Dunkirk, in northern France

REBOUND is a large-scale sustainable aviation fuel project planned in Dunkirk, in northern France. The project is being developed to produce approximately 160,000 tonnes of sustainable aviation fuel, or SAF, per year. The selected production route is Ethanol-to-Jet, which converts advanced bioethanol into a synthetic paraffinic kerosene (SPK) suitable for aviation use. The expected investment is more than EUR 1 billion, with commercial production targeted for 2032.

The project is based on the observation that aviation will continue to need liquid fuels with a very high energy density, particularly for medium and long-haul flights. Electric propulsion may become relevant for smaller aircraft and shorter routes, while hydrogen-powered aircraft would require new aircraft designs and dedicated airport infrastructure. SAF is therefore expected to play a central role because it can be introduced progressively into the existing aviation system, subject to fuel certification and blending requirements.

REBOUND is designed to contribute to the increasing European demand created by the ReFuelEU Aviation regulation. The regulation requires fuel suppliers at European Union airports to incorporate a growing share of SAF into the aviation fuel they place on the market. The minimum share begins at 2% in 2025, increases to 6% in 2030 and then rises progressively to 70% in 2050. This creates a long-term market signal and requires new production projects to be developed well before the corresponding demand materialises.

The project brings together Technip Energies, Tereos, Airbus and Safran. The partners cover different parts of the value chain: project development, engineering and technology, advanced bioethanol market expertise, aviation technology, aircraft and engine knowledge, and access to the future SAF market. Technip Energies is the majority shareholder and lead developer of the joint venture.

From an environmental perspective, REBOUND is designed to achieve a lifecycle greenhouse-gas reduction of at least 70% compared with the fossil reference fuel, with an ambition to reach approximately 80%. At the expected production level, the project estimates that approximately 500,000 tonnes of CO2 emissions could be avoided each year. These figures will ultimately depend on the final feedstock mix, the carbon intensity of energy supplies, the selected technology configuration and the applicable lifecycle calculation methodology.

2. Project partners and organisation

REBOUND is structured as a joint venture between four industrial partners with complementary capabilities. The partnership is intended to cover the main elements required to develop and operate a large SAF project, from the supply of renewable feedstock to the delivery of a fuel that meets the needs of the aviation sector.

2.0. Technip Energies

Technip Energies is the majority shareholder and the lead project developer. Its role includes overall project development, coordination of the partners, evaluation and integration of the selected technologies, engineering studies and preparation for future project execution. Technip Energies also contributes experience in complex industrial facilities, energy transition projects and SAF production technologies. This role is important because the REBOUND facility will combine several process units, utility systems, storage areas, safety systems and external connections that must operate as one integrated industrial site.

2.1. Tereos

Tereos contributes expertise in the production, sourcing and trading of bioethanol. Within REBOUND, this experience supports the development of a long-term advanced bioethanol supply strategy. The project will need approximately 300,000 tonnes of advanced bioethanol per year, which means that feedstock availability, sustainability certification, traceability, price and logistics will be central to the economic and environmental performance of the facility. The intended supply base will be a mix of European feedstock, but also aggregated with others worldwide areas.

2.2. Airbus

Airbus contributes knowledge of the aviation market and the requirements of aircraft operators. Airbus can help the project understand future SAF demand, airline expectations, fuel qualification and the commercial mechanisms used in aviation fuel markets. Airbus is also described as a commercial facilitator and a potential SAF buyer. Its involvement gives the project a direct connection to the organisations that will ultimately use SAF and to the broader aviation ecosystem.

2.3. Safran

Safran contributes expertise in aircraft engines, fuel compatibility and the technical requirements of current and future propulsion systems. Safran is also described as a commercial facilitator and a potential SAF buyer. Its role is particularly relevant because

aviation fuels must comply with strict technical specifications and must demonstrate compatibility with aircraft and engine systems.

Together, the four partners provide a credible platform for addressing the major risks of the project. These risks include securing sufficient sustainable feedstock, selecting and integrating the right process technology, obtaining permits, financing a capital-intensive facility, constructing and commissioning the plant, and securing long-term access to the SAF market.

3. Project location and industrial setting

The REBOUND project is planned within the Grand Port Maritime de Dunkerque, in northern France. The proposed site is located on a rehabilitated part of the former SRD refinery area. The project is expected to occupy approximately 23 hectares. The use of a former industrial site is consistent with a brownfield development strategy, as it gives a new industrial purpose to previously developed land and can reduce the need to convert undeveloped land.

Dunkirk was selected because the area combines several conditions that are difficult to find in a single location. The port provides access to maritime transport and to established industrial logistics. The site is connected to major road and rail corridors. The region also has a substantial industrial base, with companies and contractors experienced in process plants, energy infrastructure, construction, maintenance and industrial safety.

The availability of low-carbon electricity is another important factor. REBOUND has requested a grid connection of approximately 63 MW. Electricity is required for the process units and site utilities and may also support the selected low-carbon hydrogen solution. The carbon intensity and reliability of this electricity supply will influence the lifecycle greenhouse-gas performance of the SAF produced by the project.

The location also provides access to the main areas of future SAF demand in north-western Europe. From Dunkirk, fuel can potentially be supplied to airports and distribution networks in France, Belgium, the Netherlands, Germany and the United Kingdom. The final logistics model may combine maritime transport, rail, road and existing or future fuel infrastructure. This flexibility is important because SAF may be delivered physically to a specific airport or placed into a wider certified fuel distribution system, depending on future commercial arrangements.

The European location is also relevant for feedstock supply. Advanced bioethanol could be sourced from production sites and trading networks in France, Belgium and other European countries. A port location provides additional flexibility if part of the supply needs to move by ship. However, the project will need to balance transport cost, carbon intensity, traceability and security of supply when determining the final sourcing portfolio.

Industrial water requirements are currently estimated at up to approximately one million cubic metres per year. The project is examining opportunities to optimise water consumption, recycle process water and manage wastewater. Other required utilities will include cooling, steam or process heat, instrument air, nitrogen, firewater and systems for the treatment of industrial effluents.



Figure 1: 3D model of Rebound Project

4. Production pathway and main process steps

REBOUND has selected the Ethanol-to-Jet pathway. This route starts with advanced bioethanol and converts it into hydrocarbons with properties suitable for aviation fuel. The process is not a simple blending operation. It involves several chemical conversion and purification steps, followed by product separation and quality control.

4.1. Bioethanol preparation

The first stage prepares the advanced bioethanol for conversion. The incoming bioethanol must meet the requirements of the selected process technology. Depending on the quality of the feedstock, preparation may include filtration, purification and the removal of compounds that could affect catalysts or process performance. The project will also need systems for receiving, storing and transferring bioethanol safely.

4.2. Dehydration of ethanol to ethylene

The prepared ethanol is then dehydrated. During this reaction, water is removed from the ethanol molecule to produce ethylene. Ethylene is a small hydrocarbon molecule that can be used as an intermediate for producing longer hydrocarbon chains. The water generated by the reaction must be recovered and treated. Part of the treated water may be reused within the facility, depending on the final design.

4.3. Oligomerisation

The ethylene is then sent to an oligomerisation stage. In this step, several ethylene molecules are chemically combined to form larger molecules. The objective is to create hydrocarbon chains in the range required for aviation fuel. Process conditions and catalysts must be controlled carefully to obtain the desired product distribution and to limit unwanted by-products.

4.4. Hydrogenation

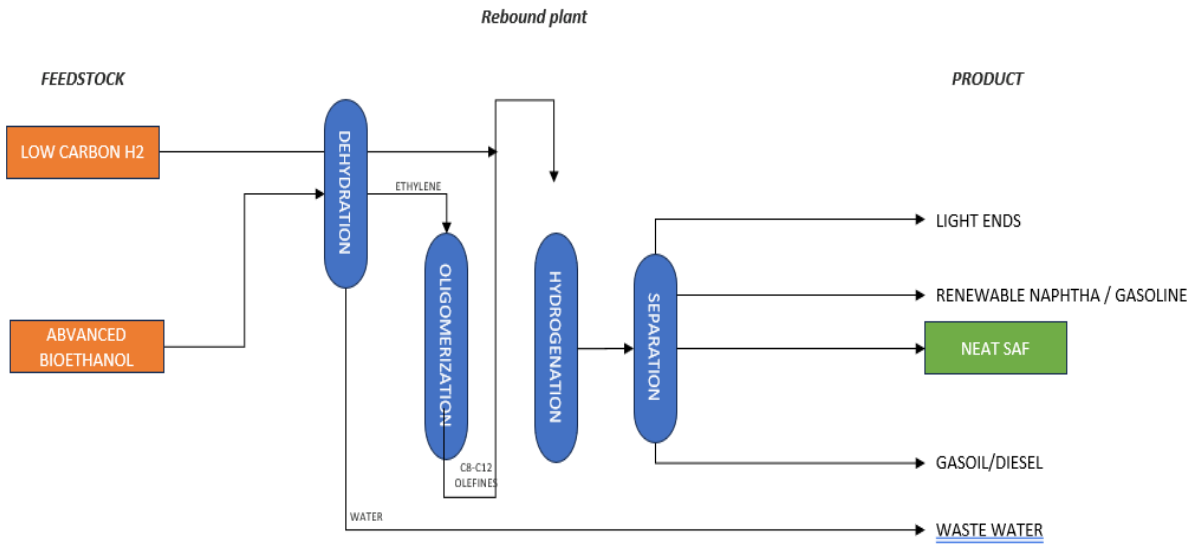
The hydrocarbons produced during oligomerisation are hydrogenated using low-carbon hydrogen. Hydrogenation stabilises the molecules and produces paraffinic hydrocarbons that are suitable for further upgrading and aviation fuel formulation. The project currently estimates a hydrogen requirement of approximately 2,000 tonnes per year. The final hydrogen production or supply solution will be selected on the basis of cost, carbon intensity, reliability and integration with the rest of the site.

4.5. Fractionation and final products

The hydrogenated product is separated into different fractions. The principal target product is SAF. Limited quantities of renewable co-products may also be produced, depending on the selected technology and operating conditions. These co-products could potentially be reused within the facility or sold into other fuel or chemical markets. The final SAF will need to meet the applicable technical specification before it can be blended and supplied to aviation customers.

The production units will be supported by conventional industrial utilities and safety systems. These include power distribution, cooling, water treatment, steam or heat generation, wastewater treatment, flare or relief systems where required, nitrogen, instrument air, fire protection, control systems and laboratories. The reliable integration of these systems is essential to achieving the expected production capacity and environmental performance.

SIMPLIFIED BFD



5. Regulatory context and reasons for the project

The principal regulatory driver for REBOUND is ReFuelEU Aviation. The regulation establishes minimum shares of SAF that must be supplied at covered European Union airports. The required share is 2% in 2025 and 6% in 2030. It then increases to 20% in 2035, 34% in 2040, 42% in 2045 and 70% in 2050. A specific sub-mandate applies to synthetic aviation fuels, creating a separate market for e-SAF within the overall SAF requirement.

This regulatory trajectory is important because it provides a degree of long-term demand visibility. SAF production projects require several years of development before investment and construction can begin. A project expected to start operation in 2032 must therefore be developed while the current market is still relatively small. The 2032 timing positions REBOUND between the first major 2030 regulatory step and the stronger increase required from 2035 onward.

The sustainability of the fuel and its feedstocks is also governed by European renewable-energy rules. The project will need to demonstrate that the bioethanol is produced from eligible feedstocks and that the complete supply chain is traceable. The lifecycle greenhouse-gas calculation must account for relevant emissions from feedstock production, collection, processing, transport, conversion and fuel distribution. The resulting reduction must be compared with the applicable fossil-fuel reference.

For REBOUND, the target is a lifecycle greenhouse-gas reduction of at least 70%, with an ambition of approximately 80%. This performance cannot be achieved solely through the conversion technology. It depends on the carbon intensity of the advanced bioethanol, the electricity used at the site, the source of hydrogen, transport distances, process efficiency and the treatment of co-products. The final operating model must therefore be developed around both technical performance and certified carbon performance.

The project also responds to a broader industrial-policy objective. Europe will require large quantities of SAF, and a significant share could otherwise be imported. Developing production capacity in France can strengthen energy and industrial sovereignty, create skilled employment, support European feedstock chains and reduce exposure to international supply constraints.

Voluntary airline and corporate decarbonisation commitments may create additional demand, but the project is primarily supported by a regulated market. This distinction is important for financing. Regulatory demand offers a stronger long-term basis for investment than a market depending only on voluntary purchases, although long-term commercial agreements will still be required to allocate price and volume risks.

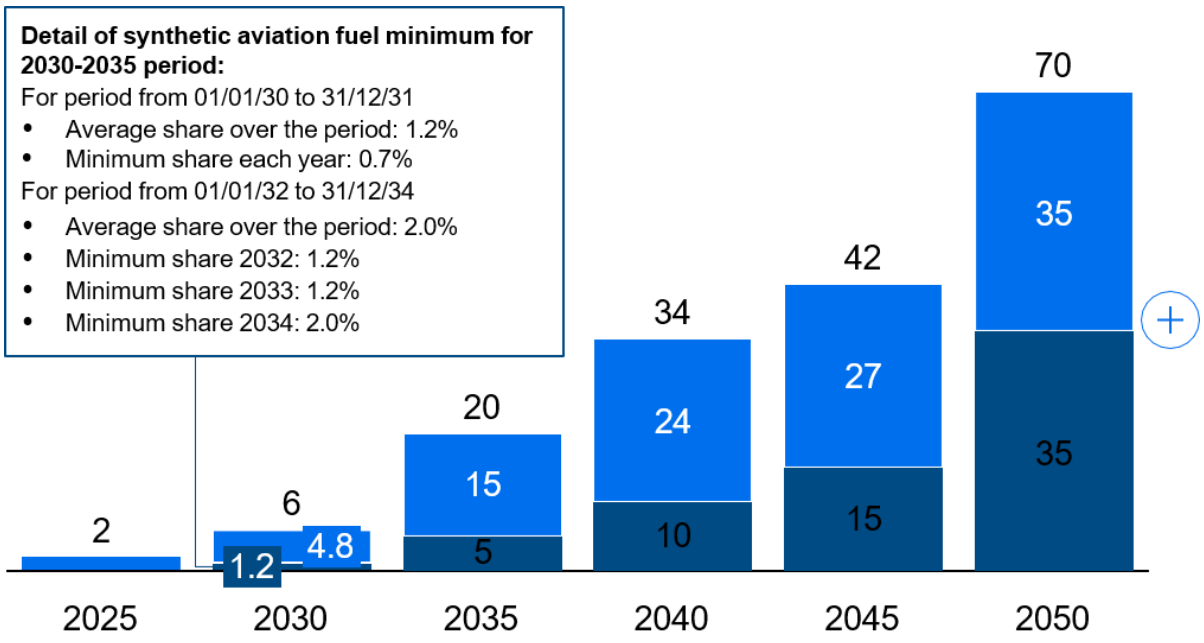


Figure 2: SAF quota in EU regulation, in % of total aviation fuel

6. Why Ethanol-to-Jet was selected

The future SAF market will require several production pathways. Each pathway has specific advantages, constraints and development times. REBOUND selected Ethanol-to-Jet because the partners consider it a credible solution for producing significant volumes of advanced bio-SAF during the 2030s.

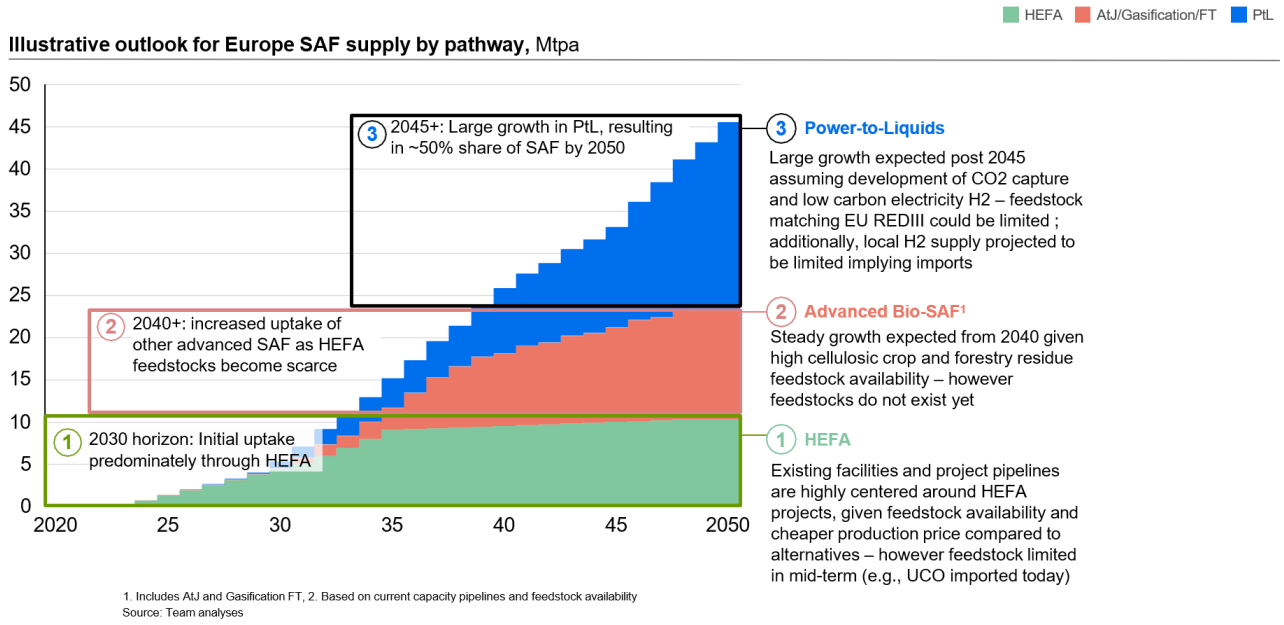


Figure 3: Illustrative outlookfor UE SAF Supply, Mtpa

6.1. Limits of relying only on HEF 2

HEFA, or Hydroprocessed Esters and Fatty Acids, is currently the most mature and widely deployed SAF pathway. It generally uses waste oils, used cooking oil, animal fats and other eligible lipid feedstocks. HEFA is expected to provide a large share of early SAF supply. However, the availability of eligible sustainable oils and fats is limited. Competition also exists with renewable diesel and other uses. As demand grows, the supply of appropriate feedstocks could constrain the volume of additional HEFA capacity. Europe therefore needs pathways that use different feedstocks.

6.2. Role and timing of e-SAF

Synthetic aviation fuel, often referred to as e-SAF or Power-to-Liquid fuel, uses low-carbon hydrogen and a sustainable source of carbon dioxide. The pathway has very high long-term decarbonisation potential and is specifically supported by the ReFuelEU synthetic-fuel sub-mandate. However, e-

SAF requires very large quantities of low-carbon electricity and hydrogen. Production costs are expected to remain high during the early deployment period, and the required electricity, hydrogen and CO2 infrastructure must be developed at significant scale.

6.3. Position of Ethanol-to-Jet

Ethanol-to-Jet provides an intermediate and complementary option. It can use an established liquid feedstock that is already produced, transported and traded at industrial scale. When the ethanol is produced from eligible advanced feedstocks and has a low carbon intensity, the resulting SAF can achieve substantial lifecycle emission reductions. The pathway also requires less hydrogen than fully synthetic fuel production.

The route allows the SAF industry to diversify away from a narrow dependence on oils and fats. Advanced bioethanol can be produced from residues, wastes and other eligible non-food materials. The precise feedstock portfolio will determine both sustainability eligibility and carbon performance, so the project must establish robust certification and traceability systems across the complete supply chain.

Ethanol-to-Jet technology is less mature than HEFA, but commercial-scale projects are emerging. This creates both an opportunity and a risk. REBOUND could benefit from early positioning in a pathway expected to grow rapidly, but the project must manage technology scale-up, performance guarantees, catalyst life, product yield and commissioning risk. The partners intend to reduce these risks through technology selection, engineering studies and experience from reference facilities.

Economically, the pathway is expected to occupy a competitive position during the 2030s. The final cost of production will depend on the price and carbon intensity of bioethanol, energy consumption, hydrogen cost, capital expenditure, financing terms, plant availability and the value of any co-products. Long-term contracts for feedstock and SAF sales will be important to manage exposure to market volatility.

7. Main project quantities and expected performance

The target production capacity of REBOUND is approximately 160,000 tonnes of SAF per year. This is a large industrial capacity for an Ethanol-to-Jet facility and is intended to provide sufficient scale to reduce unit costs and justify the required infrastructure. Actual annual production will depend on plant availability, feedstock supply, maintenance requirements and the performance of the selected technology.

The facility is expected to consume approximately 300,000 tonnes of advanced bioethanol per year. The ratio between feedstock input and SAF output reflects the chemical conversion yield, the production of water and process losses, and the possible production of renewable co-products. The final material balance will be established during the engineering and technology-selection phases.

The hydrogen requirement is estimated at approximately 2,000 tonnes per year. Although this quantity is much lower than the hydrogen requirement of an e-SAF plant with comparable output, the hydrogen must still have a sufficiently low carbon intensity to support the project greenhouse-gas target. The final solution could involve on-site production, external supply or a combination of sources, subject to further studies.

The requested electricity connection is approximately 60 MW. This figure represents a connection capacity rather than the annual electricity consumption. The actual power profile will vary according to operating conditions, the selected process technology, the hydrogen solution, utility integration and maintenance periods. Electricity supply reliability will be important because continuous process units are sensitive to interruptions.

Industrial water use is currently estimated at up to approximately one million cubic metres per year. This estimate will be refined as the engineering design develops. The project is considering opportunities for water recycling and optimisation, as well as the treatment and controlled discharge of wastewater. The final water strategy will need to respond to local resource constraints and regulatory requirements.

The estimated investment is more than EUR 1 billion. This amount covers the main process units, utilities, storage, site development, external connections, engineering, construction and commissioning. The amount remains subject to final technology selection, design development, contracting strategy, inflation, financing conditions and the final scope of infrastructure provided by the project or by third parties.

During operation, the project expects approximately 200 direct jobs and 80 indirect jobs. The operating workforce would include process operators, maintenance technicians, laboratory staff, engineers, safety specialists, logistics personnel and administrative functions.

The minimum lifecycle greenhouse-gas reduction target is 70%, with an ambition to reach approximately 80%. At the expected production capacity, the project estimates annual avoided emissions of approximately 500,000 tonnes of CO2 compared with fossil aviation fuel. This estimate will need to be updated using the final lifecycle assessment and verified operating data.

8. Development schedule and principal milestones

The REBOUND schedule is structured around development, consultation, engineering, permitting, investment decision, construction, commissioning and commercial operation. The sequence is indicative and may evolve as technical studies, regulatory procedures and commercial negotiations progress.

During 2025 and 2026, the partners carried out or planned the early development activities required to define the project. These activities include site assessment, feasibility studies, evaluation of production pathways, preliminary technology work, discussions with potential suppliers and customers, land allocation and establishment of the joint venture.

Public consultation is planned from November 2026 to February 2027. The objective is to present the project, explain its purpose and main characteristics, discuss potential impacts and alternatives, and collect comments from stakeholders. The outcomes of this consultation may lead to adjustments in the project design, environmental studies or stakeholder-engagement approach.

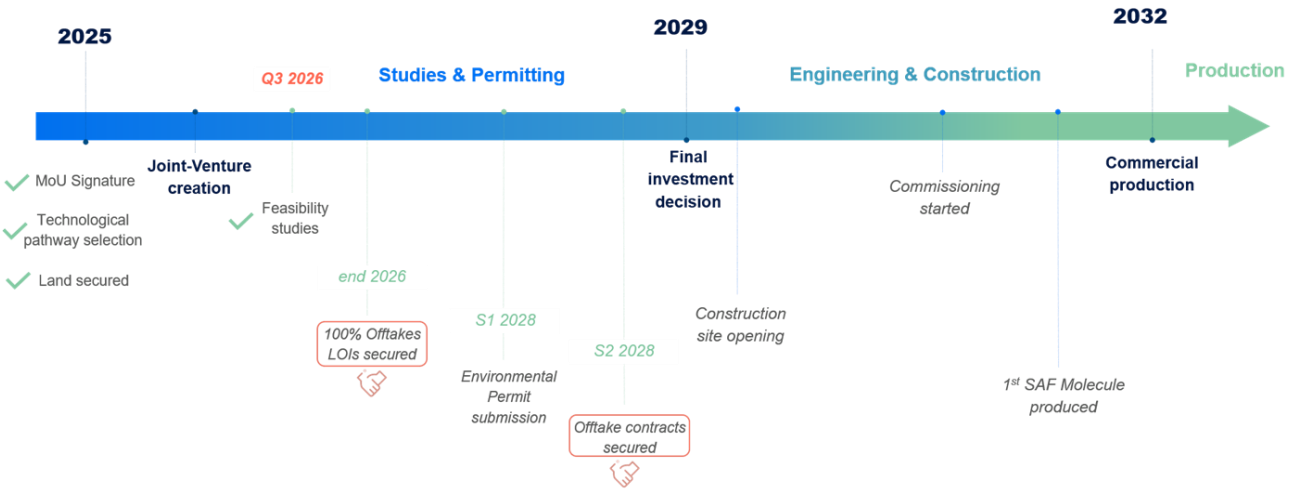
Engineering and environmental work will continue during 2027 and 2028. The project intends to prepare the environmental permit application during this period,. The authorities will then examine the application. A public inquiry and the main permit decisions are targeted during 2028, subject to the duration of the regulatory process and the completeness of the required studies.

The final investment decision is targeted for 2029. Before taking this decision, the partners will need sufficient confidence in the capital cost, operating cost, schedule, permits, technology performance, feedstock supply, energy supply, SAF offtake, financing and risk allocation. The final investment decision is therefore not a single administrative milestone. It is the point at which the complete technical, commercial and financial package is considered mature enough for the shareholders to commit the required capital.

Construction is expected to begin after the final investment decision and to last approximately three years. The work will include site preparation, foundations, buildings, process structures, equipment installation, piping, electrical systems, instrumentation, utilities, storage and external connections. Construction planning will need to manage the limited site area, delivery of large equipment, interfaces with port infrastructure and the mobilisation of a large workforce.

Commissioning will begin progressively as systems are completed. Utilities generally need to be commissioned before the process units. The plant will then move through equipment testing, introduction of feedstock, production of intermediate products, initial SAF production and performance testing. Commercial start-up is targeted for 2032, followed by a ramp-up period before stable operation at the target capacity is achieved.

The schedule is exposed to several risks. These include delays in technology selection, permitting, grid connection, equipment procurement, financing, construction productivity and commercial contracting.


2025
2029
2032
Q3 2026
Studies & Permitting
Engineering & Construction
Production
MoU Signature
Technological pathway selection
Land secured
Joint-Venture creation
Feasibility studies
end 2026
100% Offtakes LOIs secured
S1 2028
Environmental Permit submission
S2 2028
Offtake contracts secured
Final investment decision
Construction site opening
Commissioning started
1st SAF Molecule produced
Commercial production

9. Main benefits, risks and conditions for success

REBOUND could provide several strategic benefits. The project would create a significant volume of domestically produced SAF and would contribute to the European regulatory target. It would diversify the SAF supply base beyond HEFA and would support the development of an advanced bioethanol value chain. The project would also reuse a brownfield industrial site and contribute to the low-carbon reindustrialisation of the Dunkirk area.

The climate benefit is potentially substantial, but it depends on the complete lifecycle. A high conversion yield is not sufficient if the bioethanol or hydrogen has a high carbon intensity. The project will therefore need strict sustainability criteria, reliable chain-of-custody systems and verified emissions data from suppliers. Changes in feedstock origin or energy supply could materially affect certified performance.

Feedstock supply is one of the principal commercial risks. The project requires approximately 300,000 tonnes of advanced bioethanol every year. The available market must be sufficient in terms of volume, eligibility, sustainability, quality and price. Long-term supply arrangements may reduce risk, but they can also reduce flexibility if market prices or regulatory rules change. A diversified sourcing portfolio will probably be required.

Technology risk is also material. Ethanol-to-Jet includes established chemical operations, but the integration and scale of the complete pathway are less mature than conventional refining or HEFA production. The project must obtain appropriate performance guarantees and should pay particular attention to catalyst performance, product yield, energy consumption, plant availability and the ability to meet aviation fuel specifications consistently.

Commercial risk remains important even in a regulated market. SAF is more expensive than fossil jet fuel. The allocation of the price premium between fuel suppliers, airlines, corporate customers and public support mechanisms will influence demand and contracting. REBOUND will need bankable offtake arrangements that provide sufficient price visibility while remaining compatible with the evolving European market.

The project must also secure timely infrastructure. This includes the electricity connection, water supply and treatment, logistics access, bioethanol storage, SAF storage and dispatch, and potentially hydrogen infrastructure. Delays in third-party infrastructure could affect construction or start-up even if the plant itself is ready.

Successful execution will therefore depend on several conditions being met at the same time: a robust technology package, eligible and competitive bioethanol supply, low-carbon energy, permits,

infrastructure, financing, long-term customers and effective project management. The strength of the partnership is intended to improve the project ability to manage these interdependent conditions.

10. Conclusion

REBOUND is intended to become a major European advanced bio-SAF project. Its objective is to produce approximately 160,000 tonnes of SAF per year from advanced bioethanol using the Ethanol-to-Jet pathway. The proposed location in Dunkirk gives the project access to a large industrial and logistics ecosystem, low-carbon electricity and major aviation markets in north-western Europe and UK market.

The project addresses a clear need. European regulation requires the share of SAF in aviation fuel to rise progressively from 2% in 2025 to 70% in 2050. Existing and announced HEFA projects can support the first stage of the market, but eligible lipid feedstocks are limited. e-SAF is essential for long-term decarbonisation but requires very large quantities of low-carbon electricity and hydrogen. Ethanol-to-Jet provides a complementary pathway that can contribute significant volumes during the 2030s.

The partnership between Technip Energies, Tereos, Airbus and Safran brings together the capabilities needed to develop the project. Technip Energies leads project development and engineering. Tereos supports the advanced bioethanol supply strategy. Airbus and Safran contribute aviation-sector expertise, market access and knowledge of aircraft and engine requirements.

The project remains under development. Several elements must still be confirmed, including the final process technology, detailed material and energy balances, feedstock contracts, hydrogen strategy, infrastructure arrangements, permits, financing and SAF offtake agreements. The figures stated in this document should therefore be read as current project targets rather than final operating guarantees.

If the project progresses according to the current schedule: the final investment decision would be taken in 2029, construction and commissioning would take place between 2029 and 2032, and commercial SAF production would begin in 2032.

At full scale, REBOUND expects to invest more than EUR 1 billion, create approximately 200 direct and 80 indirect permanent jobs, and avoid approximately 500,000 tonnes of CO2 emissions per year. The final impact will depend on the confirmed design and the certified lifecycle performance of the fuel.

Overall, REBOUND combines a relevant technology choice, a strategic location, complementary industrial partners and a regulatory market with long-term growth. The project is designed to deliver meaningful SAF volumes at the point when Europe will require new production pathways beyond the initial HEFA-led phase of market development.

REBOUND - Un Proyecto Emblemático de Technip Energies para la Descarbonización del Transporte Aéreo

TechnipEnergies | General | Anyone - No Protection

