



**Global
Bioenergies**

From cosmetics to SAF
Fostering the
environmental transition
through biosciences

June 2024

Euronext Paris: ALGBE



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GBE at a glance

Our Company

- ✓ Founded in 2008
- ✓ ~50 employees in the Paris area
- ✓ IPO in 2011 - listed on Euronext Growth

Our Bio-Isobutene Process

- ✓ A unique & disruptive gaseous fermentation process
- ✓ Synthetic Biology x Green Chemistry = Deeptech
- ✓ Aim to significantly contribute to cutting CO₂ emissions
- ✓ Early commercial status

Our Purpose

'To foster the environmental transition through biosciences'

Our Products

First renewable isododecane (IDD) and isohexadecane (IHD)

Niche market in the cosmetics

Partnership with L'Oréal

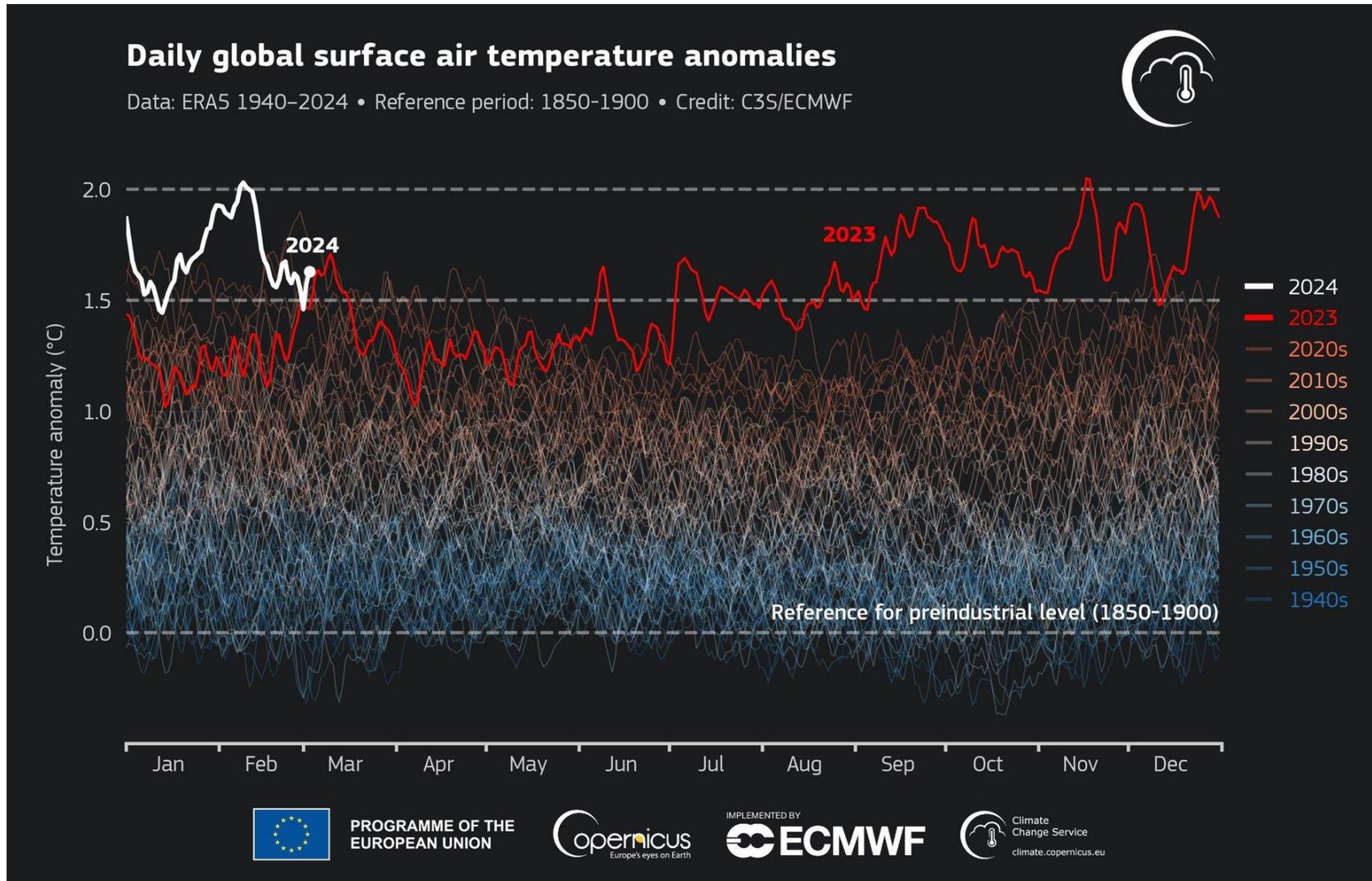


Large volumes in Sustainable Aviation Fuels

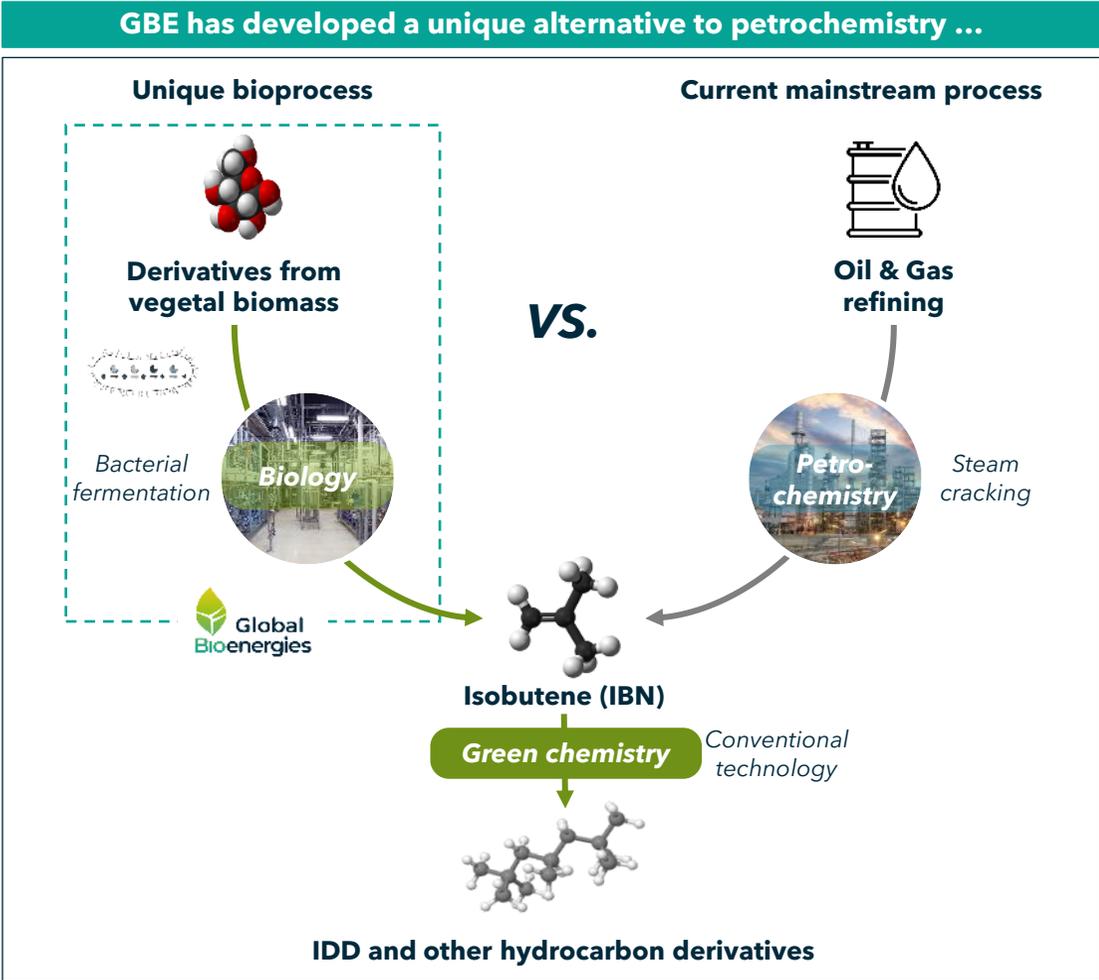
ASTM-certified



Global warming is accelerating



GBE has developed a unique bioprocess to synthesize isobutene from natural sources



... by leveraging breakthrough research



Process **unique in the world**



Like-for like substitute for petrochemical molecules



Bio-based molecules produced from agricultural and forestry byproducts⁽¹⁾



Gradual, proven improvement of process performance



Multi-patents protected process

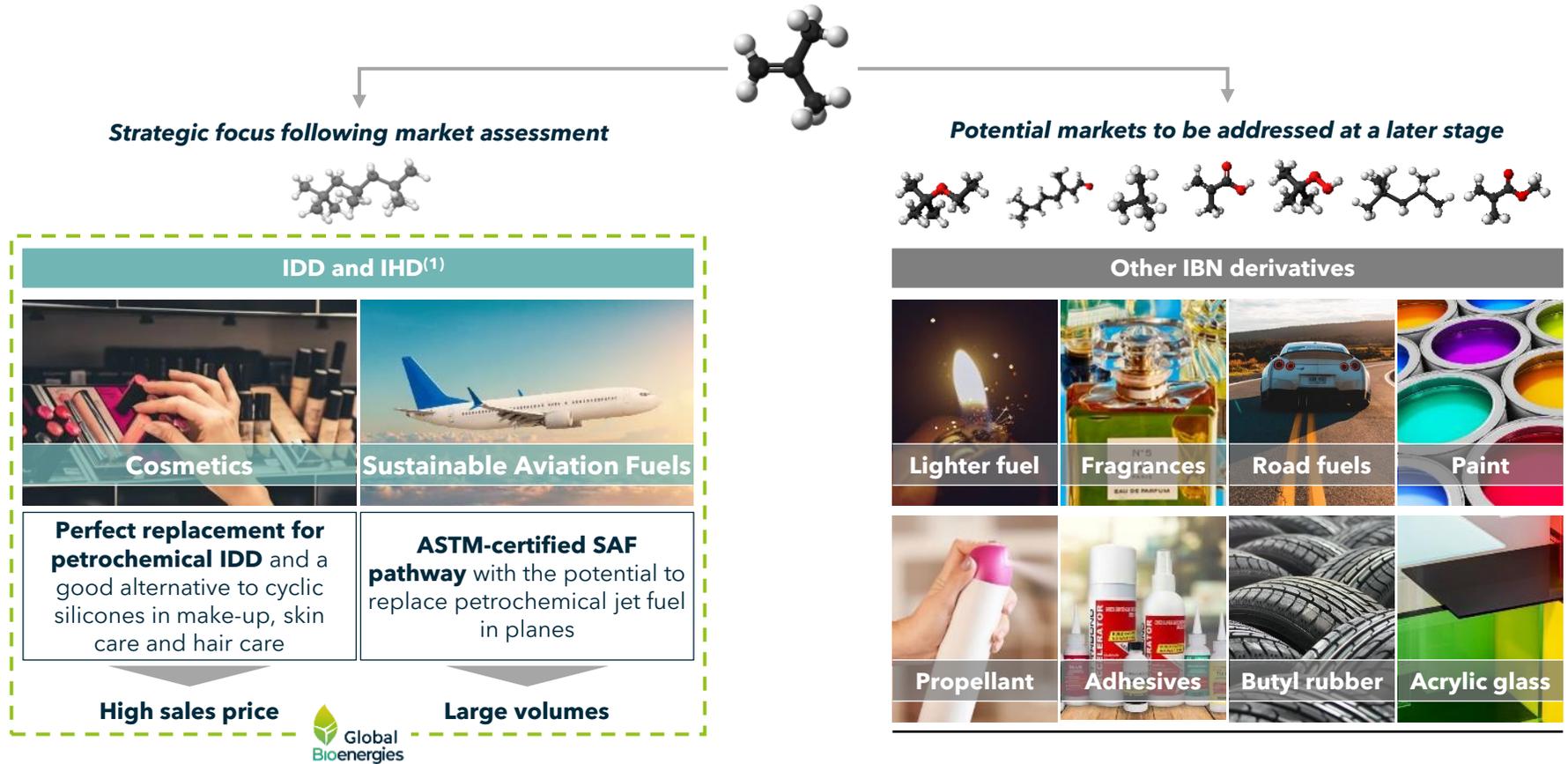
L'ORÉAL

Supported by L'Oréal, worldwide leader in cosmetics

Note: (1) Such as beet sugars, wheat starch, and wood chips

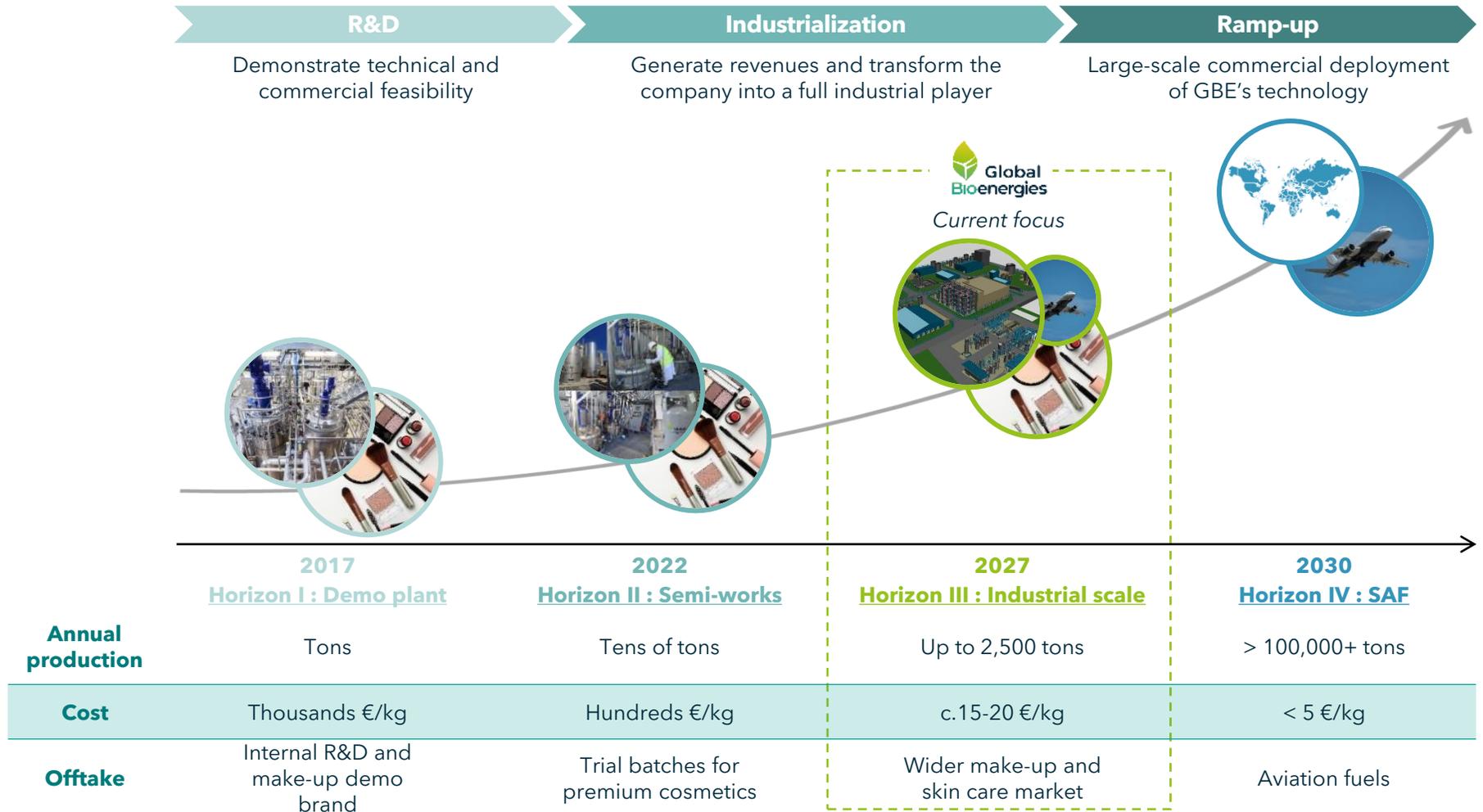
IBN derivatives have high-value applications in many markets

IBN is the **smallest branched carbon structure** on Earth, which can be converted into numerous **high-performance compounds**. These performances **cannot be obtained from molecules extracted from Nature**. Today petrochemical IBN is a global market of 15m tons, worth \$20bn



Note: (1) IDD = isododecane, IHD = isohexadecane

GBE's strategic roadmap: from cosmetics to biofuels





Horizon III : Industrial scale Market & roadmap till 2027

First large-scale bio-based isobutene plant at sight



Global Bioenergies (GBE) has developed a **unique process to synthesize bio-based isobutene (IBN)** and its numerous **high-performance derivatives**



After **successfully ramping up its process to reach commercial status**, GBE is now **looking to scale up its production to 2,500 tons per year**



IBN and its derivatives, currently produced from oil, are a **\$20bn market worldwide** with a wide array of applications, from **cosmetics to fuels**, for which GBE's process provides a **path to decarbonation**



The plant production will **primarily serve** the cosmetics market, which is **actively looking for natural alternatives** to replace petrochemicals ingredients



GBE has already **received several letters of intent received** from renowned cosmetics players at **attractive prices, for volumes exceeding plant capacity**



Bpifrance has granted GBE **c.€16m of public financing** as part of the **"Première usine" program of the France 2030 plan**

Total plant CAPEX

c.€80m

Production offtake (through LOIs)

Fully secured

Production capacity

Up to 2,500 tons

Projet IRR

> 30%

EBITDA run-rate

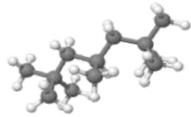
€30m+

Horizon III production will be mainly dedicated to the global cosmetics market

IDD and IHD are key ingredients in cosmetics

IDD and IHD have been **used for decades in cosmetics** for their unique properties

IDD's main properties



IDD's strongest case is in **long-wear, waterproof and no transfer** make-up and skin care formulas



Powerful solvent



Highly volatile



Aerial emollient



Safe to use

Isonaturane™ is a perfect replacement for petrochemical IDD/IHD

With the **same molecular composition and properties**, GBE's Isonaturane™ can replace petrochemical IDD/IHD **on a like-for-like basis** and is also a good alternative to cyclic silicones (CS)

Core global addressable market for GBE

in tons

Make up

Mascara, lipstick, foundation



c.7,650 tons

2,400

900

4,350

IDD

IHD

CS

Skin care

Anti-ageing, moisturizing creams



c.12,700 tons

450

1,200

7,650

IDD

IHD

CS

GBE market share

15%

c.17,000 tons

c.2,500 tons

Using GBE's Isonaturane™ is the only way for brands to claim naturalness

Switching from petrochemical IDD to GBE's natural product enables a **strong marketing claim** and product differentiation for cosmetic brands at a **limited increase in sourcing costs** (below 0.5% of the total retail price⁽¹⁾)

Impact of switching to GBE's IDD on naturalness

in % of ingredients



Source: Frost & Sullivan

Note: (1) Assuming an Isonaturane™ sale price of €30/kg

Switch to direct design and recent process improvements have yielded significant commercial success

High production costs were the main obstacle to commercial success

Initial production costs drove GBE to seek higher prices for the Horizon III plant to be financially attractive. This would have meant a **significant extra cost for brands** compared to their oil-based IDD/IHD expenses

Improvement in production costs

... but direct design and process improvements have reduced costs massively

By **improving the performance of its proprietary bacterial strains** and **integrating several processing steps**, GBE has achieved a major decrease of the production cost of IBN derivatives

As a result, GBE has demonstrated the market appetite for its products

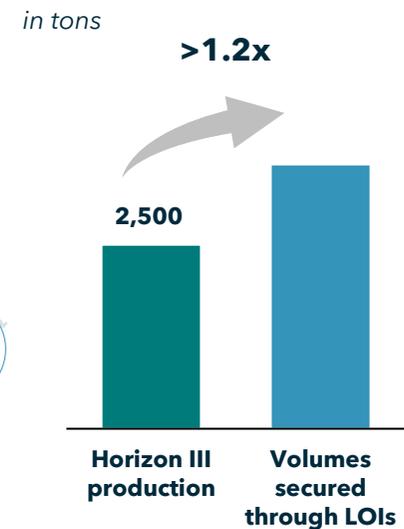
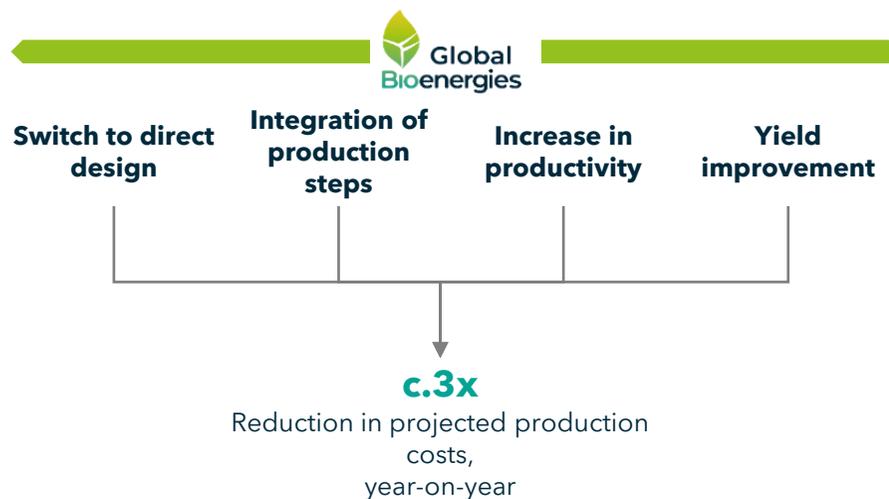
GBE has managed to obtain over the past months several **letters of intents** from renowned cosmetics players **worldwide** and has **ongoing discussions** for additional volumes - with several regions yet to be tapped

Origin of LOIs received

Total volumes now exceed plant production capacity

The **Horizon III production is largely oversubscribed**, confirming the market's interest for IBN and IBN derivatives - at **prices ensuring an attractive return profile for the project**

Prod. capacity vs. offtake volume



GBE has achieved industrial scale with its semi-works unit, but Horizon III will be its first large plant



2027

Plant targeted commissioning



c.€80m

Total CAPEX⁽¹⁾



Up to 2,500 tons

Annual production capacity



c.15-20 €/kg

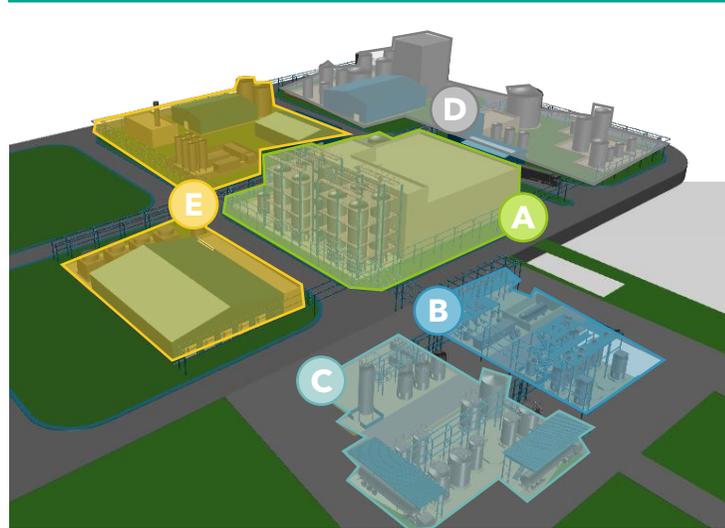
Production costs



> €70m

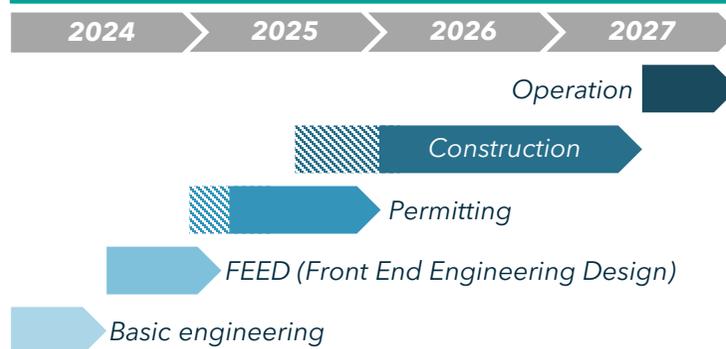
Run-rate revenue

Preliminary plant design



- A** Production of IBN through fermentation
- B** Purification of IBN
- C** Conversion of IBN to IDD/IHD by oligomerization and hydrogenation
- D** Wastewater treatment
- E** Utilities (electricity, cooling water, hydrogen, etc.)

Projected timeline



Note: (1) Factoring 40% uncertainties



Horizon IV: SAF Market & roadmap

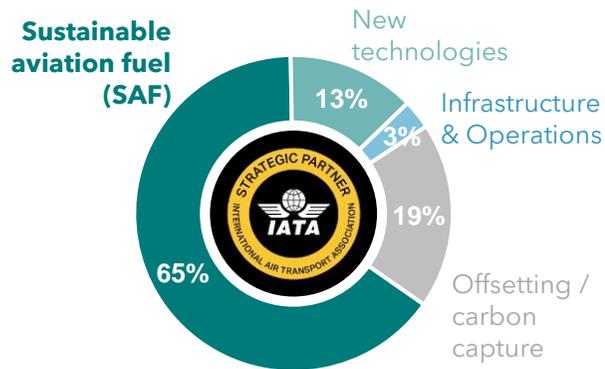
Once Horizon III is operational, GBE will commercialize its IDD to the rapidly-growing SAF market

SAF are key to decarbonizing the global aviation

SAF are the **main technological solution** to decarbonize aviation and have the potential to **reduce CO₂ emissions by up to 80%**

Achieving Net Zero Carbon by 2050

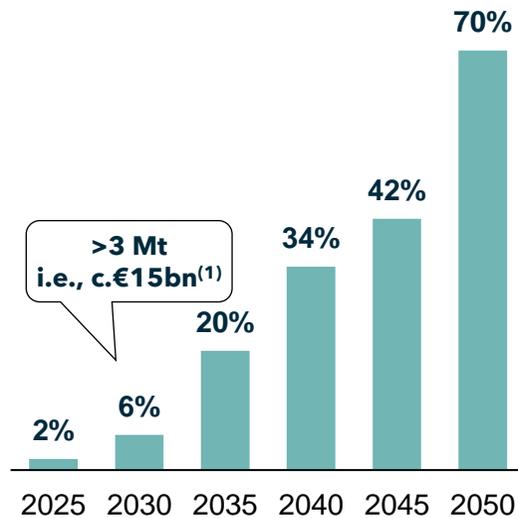
% of contribution to carbon mitigation



Public regulation will cause the SAF market to soar in the next years

Public regulations are driving an **exponential market growth from 2030 onwards**: ReFuelEU Aviation initiative in the EU, IRS financial incentives in the US

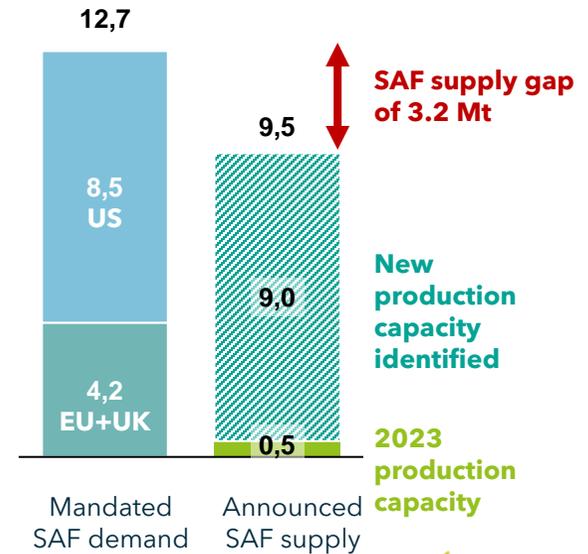
Mandated share of SAF in the EU



The SAF market is massive and largely unaddressed

The **global SAF market will amount to c.€60bn in 2030⁽¹⁾**. Out of those, **€16bn are not identified today**. In Europe, reaching 2050 objectives means deploying **c.150 SAF refineries**

Global SAF supply gap in 2030 (in Mt)



Note: (1) assuming a sales price of 5 €/kg
Sources: IATA, SkyNRG 2023 SAF Market Outlook

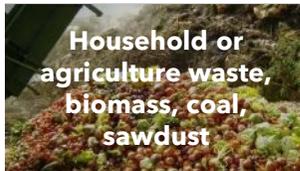
GBE's IBN-SPK jet fuel is well positioned to succeed in the SAF market



	As a drop-in fuel , GBE's biofuel can safely be blended with fossil jet fuel, using the same airplanes and infrastructure (no retrofit required)	up to 50% GBE's SAF maximum share in blend ⁽¹⁾
	100% derived from natural sources , GBE's SAF emits significantly less CO₂ than the fossil fuels it replaces and contributes to the decarbonization of transport	Up to 70% expected reduction in CO ₂ emissions
	GBE's biofuel has cleaner combustion properties , reducing particles emissions in contrails (a key driver of global warming) and in turn improves fuel efficiency	Important decrease of particles emissions ⁽²⁾
	Among SAF technologies, GBE's jet fuel boasts the lowest freezing point and has better cold flow	Acting as antifreeze
	Due to its unique qualities, GBE's SAF may be used as a performance booster to complement other SAF solutions	Compatibility with HEFA and other SAF
	GBE's biofuel, having passed the ASTM certification , is among the few solutions in the world that have obtained approval to fly	1,400+ experts' approval
	To produce SAF, GBE will use the same exact molecule and process as those used in Horizon III for cosmetics	Full demonstrability through Horizon III

Notes: (1) Current authorization - can theoretically go up to 92% (2) Decrease observed in car engines, using 30% of IBN derivatives
(2) registered name for GBE's bio-based IDD in the SAF market

GBE's SAF solution is among the few solutions currently being developed with a realistic path to scale-up

Pathway	Oleochemical path	Biochemical path		Thermochemical path	E-fuels
Technology	Hydrotreated Esters and Fatty Acids (HEFA)	Fermentation (ATJ-SPK) Fewer steps than ETJ-SPK ETJ-SPK IBN-SPK 		Fischer-Tropsch (FT)	Power-to-Liquid (PtL)
Feedstock	 Used cooking oil, waste and vegetable oils	 1G (US only): corn, cane sugar 2G: wood chips (e.g., birch trees)		 Household or agriculture waste, biomass, coal, sawdust	 CO ₂ , renewable electricity
Maturity	 2025 Technology already implemented at large scale	 2030 First large-scale plant project built	 2030 Large-scale plant projects in preparation	 2030 Several attempts at industrial scale, unsuccessful for now	 2035 First small-scale pilot plants starting
ASTM certification					
	Insufficient feedstock availability to meet demand from 2030 onwards	Expected to be the next generation in SAF with potential synergies to be leveraged between main SAF producers		Industrial and commercial scale-up difficulties	Costly process (energy consumption) unproven at industrial scale

Horizon IV: several SAF plants in 2030

Project	Horizon IV.1 <i>Large-scale replica of Horizon III</i>	Horizon IV.2 <i>Adaptation to 2G feedstocks</i>	Horizon IV.3 <i>Integration through retrofit of existing plants</i>	Horizon IV.4 <i>Integration through retrofit of existing plants</i>
Location			<p>TBD (likely to be in Europe or in the US)</p>	
Tech readiness				
Feedstock	1G resources (sugar cane)	2G resources (wood chips from birch leftovers)	1G/2G	1G/2G Biogenic CO ₂
Conditions	<ul style="list-style-type: none"> ■ Improve yield and productivity of existing GBE processes 	<ul style="list-style-type: none"> ■ Improve yield and productivity of existing GBE processes ■ Demonstrate availability and feasibility of feedstock at scale 	<ul style="list-style-type: none"> ■ Industrial partner ■ New technological setting ■ OPEX synergies 	



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