



**Global  
Bioenergies**

**From cosmetics to SAF**  
Fostering the  
environmental transition  
through biosciences

*August 2024*

**Euronext Paris: ALGBE**



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# GBE at a glance

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## 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 CO<sub>2</sub> 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

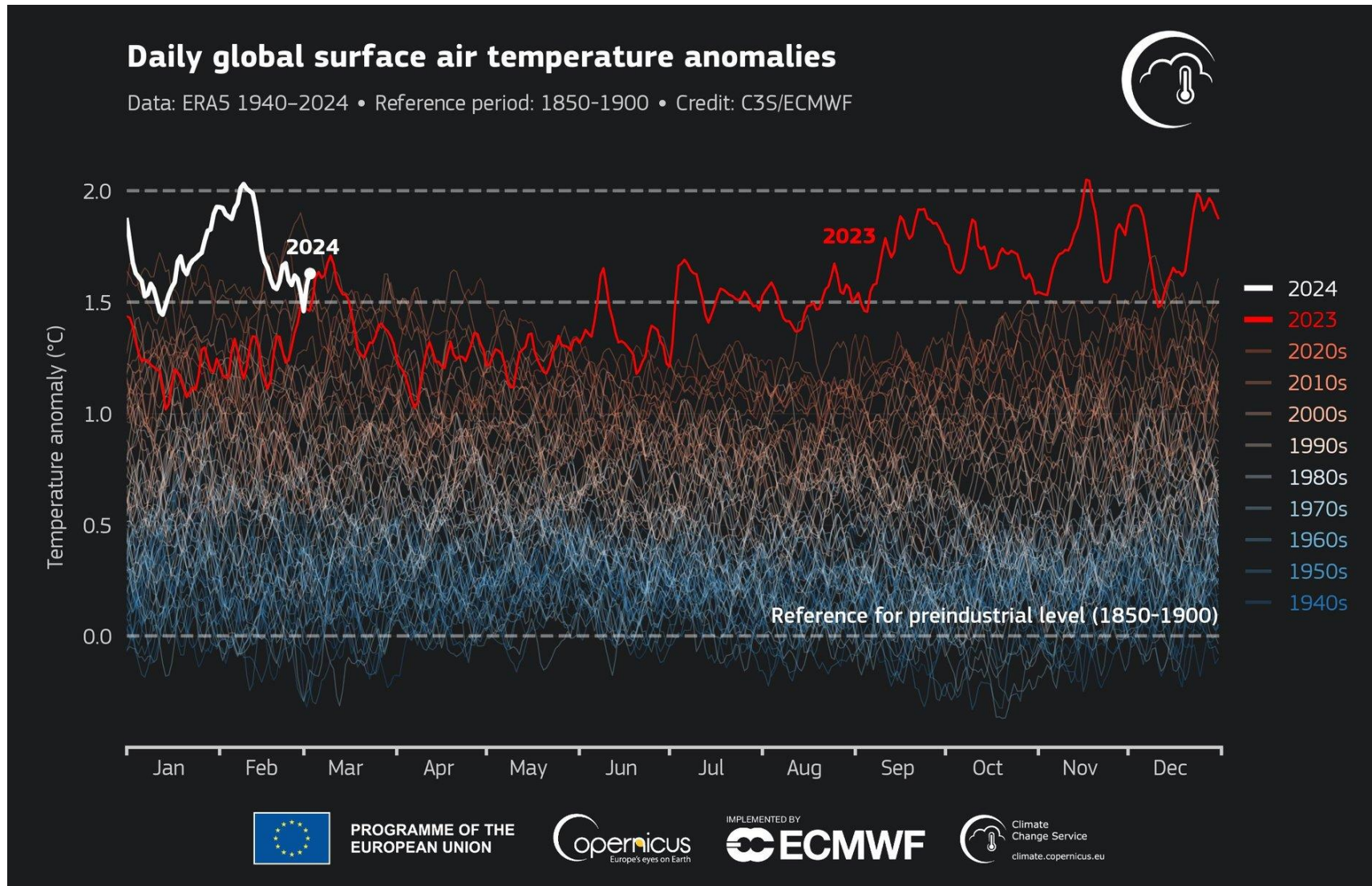


### Large volumes in Sustainable Aviation Fuels

ASTM-certified

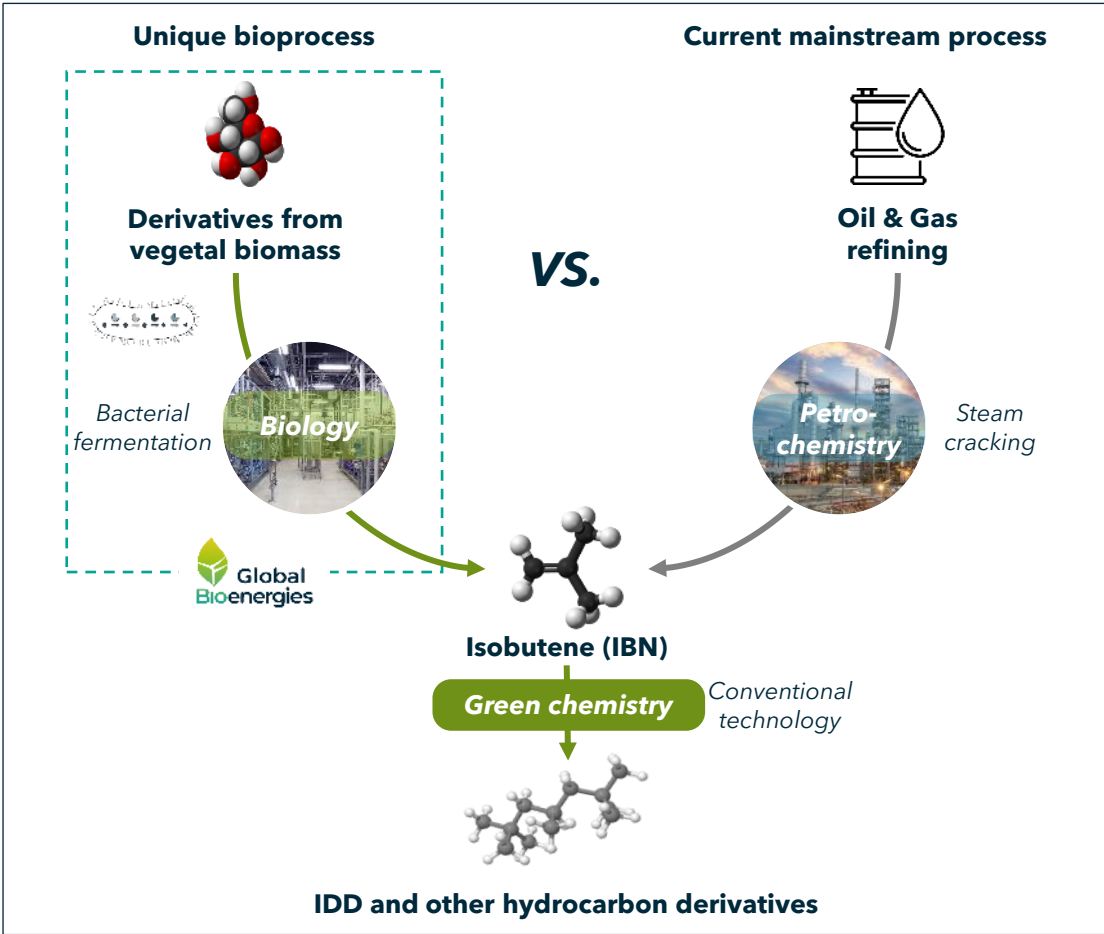


# Global warming is accelerating



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

## GBE has developed a unique alternative to petrochemistry ...



## ... 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<sup>(1)</sup>



**Gradual, proven improvement** of process performance



**Multi-patents protected process**

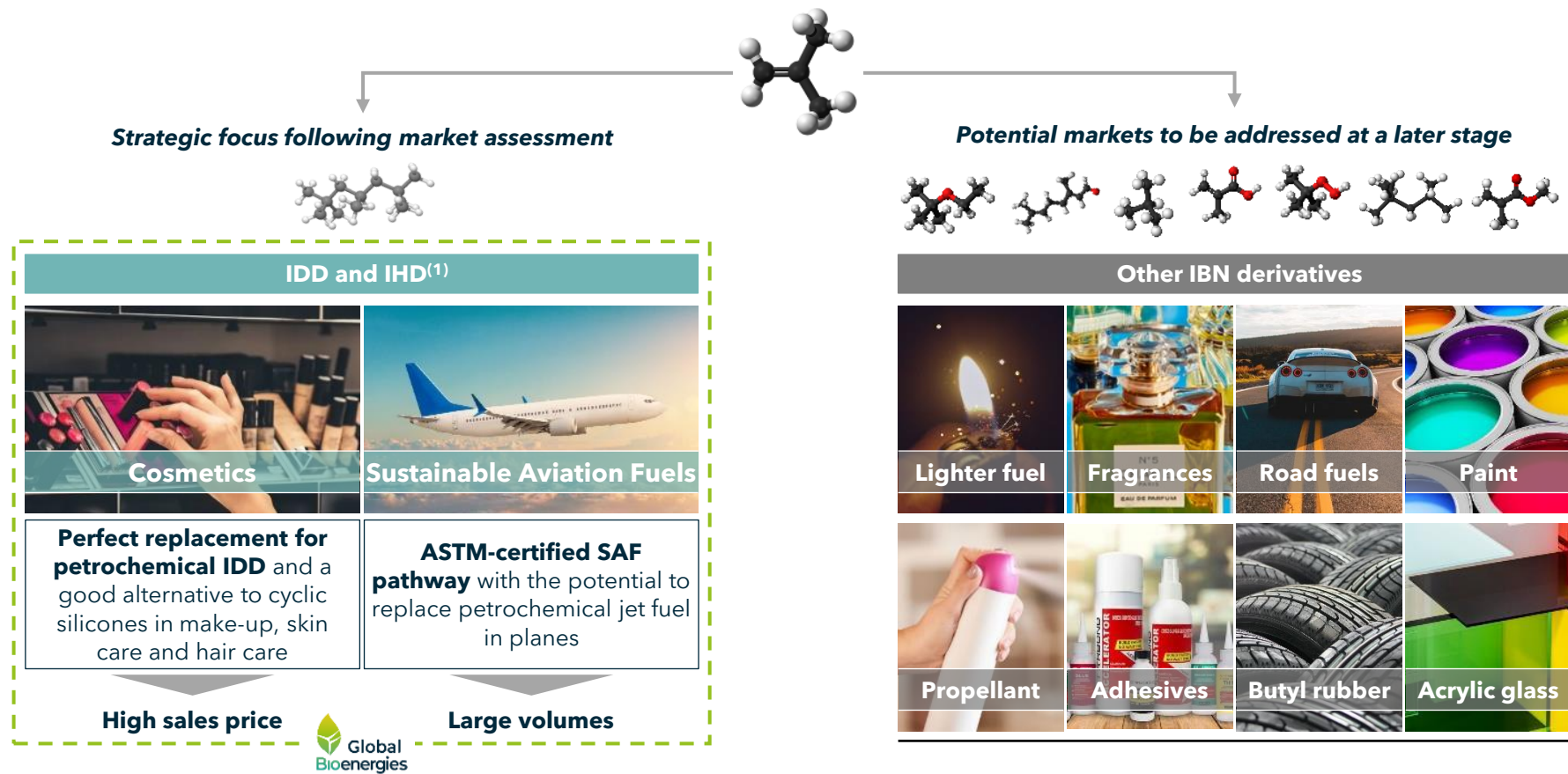
L'ORÉAL

**Supported by L'Oréal**, worldwide leader in cosmetics

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

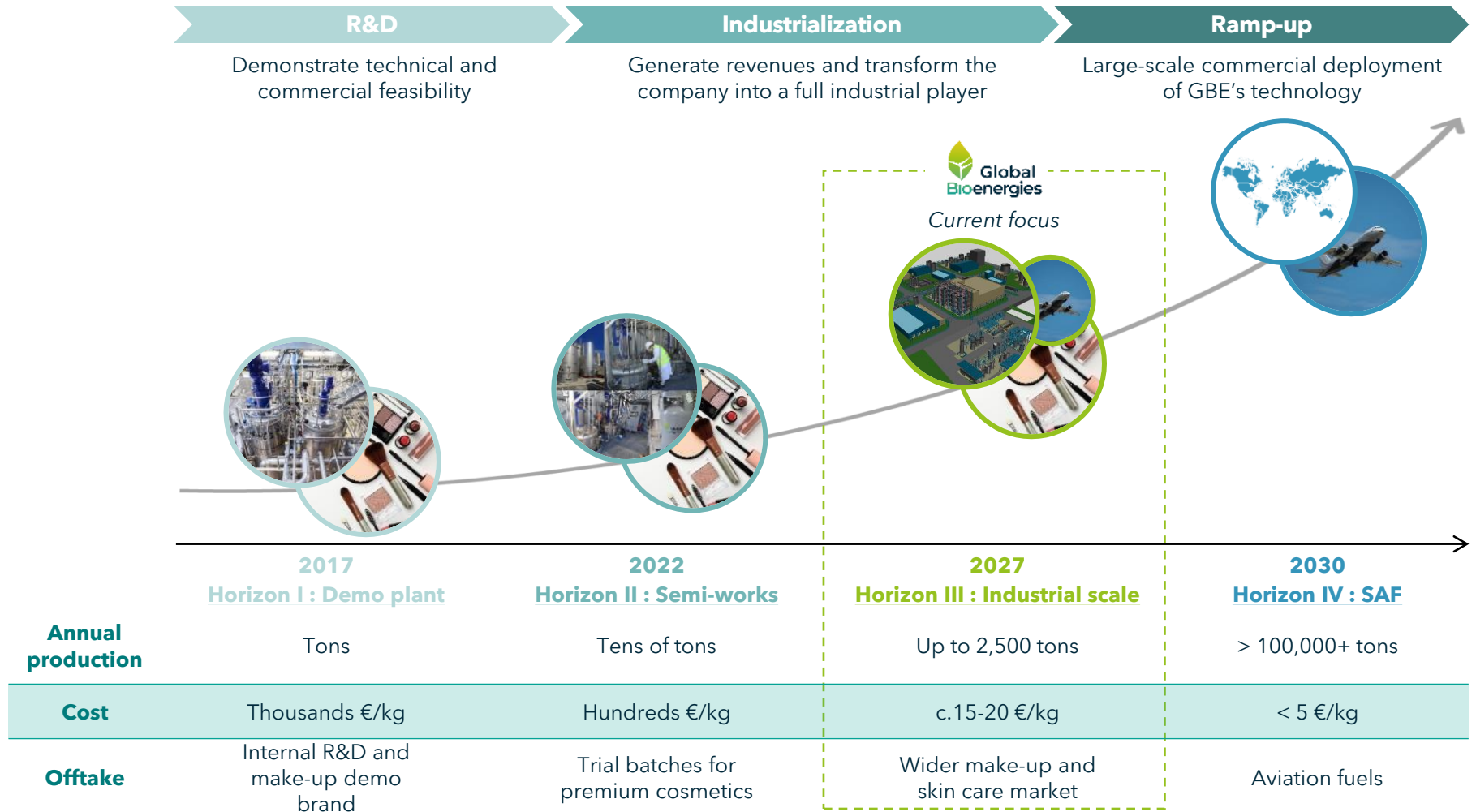
# IBN derivatives have high-value applications in many markets

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

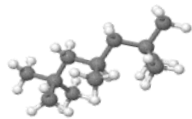
**€30m+**

# 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

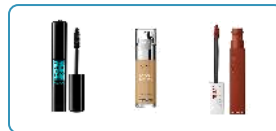
With the **same molecular composition and properties**, GBE's Isonaturane™ can replace petrochemical IDD/IHD **on a like-for-like basis** and is also a good alternative to cyclic silicones (CS)

### 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**

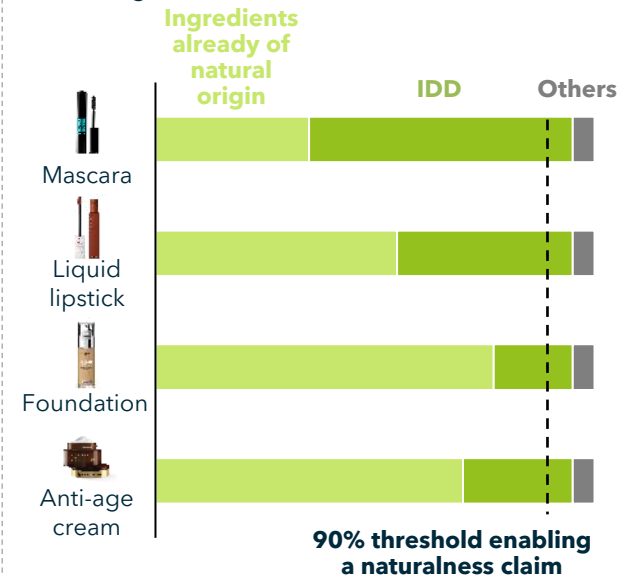
**c.2,500 tons**

## 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<sup>(1)</sup>)

### 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**

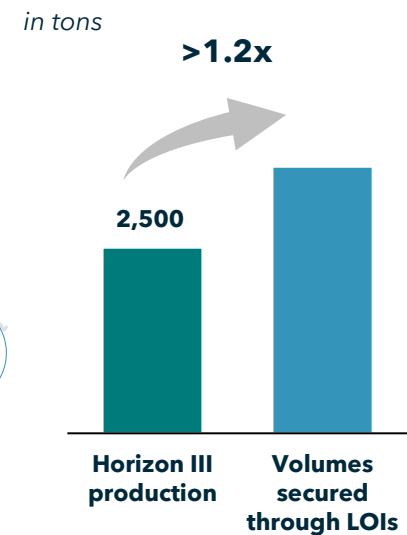
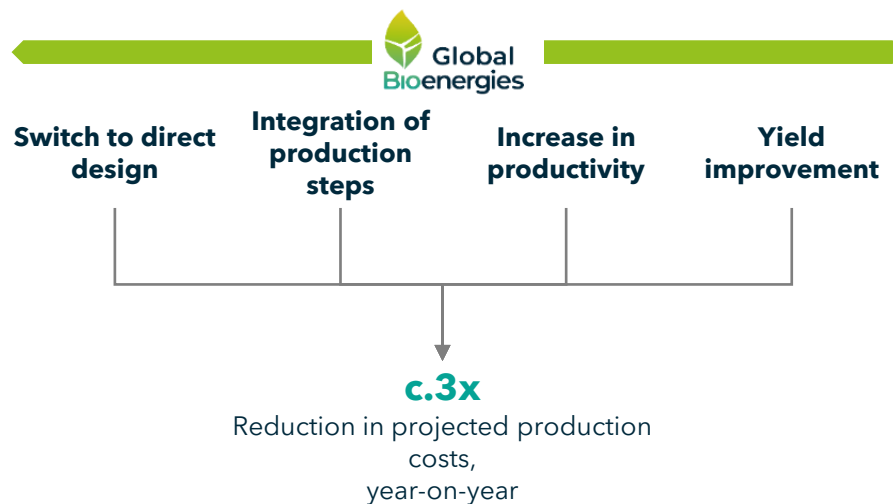
GBE has managed to obtain over the past months several **letters of intents** from renowned cosmetics players **worldwide** and has **ongoing discussions** for additional volumes - with several regions yet to be tapped

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<sup>(1)</sup>



**Up to 2,500 tons**

Annual production capacity



**c.15-20 €/kg**

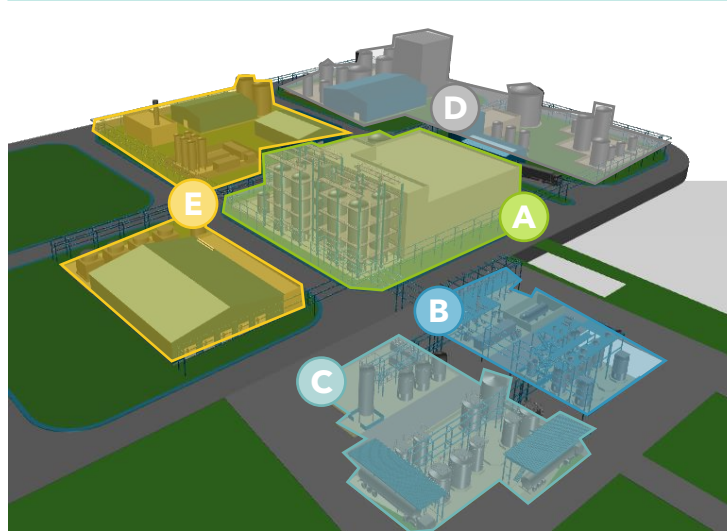
Production costs



**> €70m**

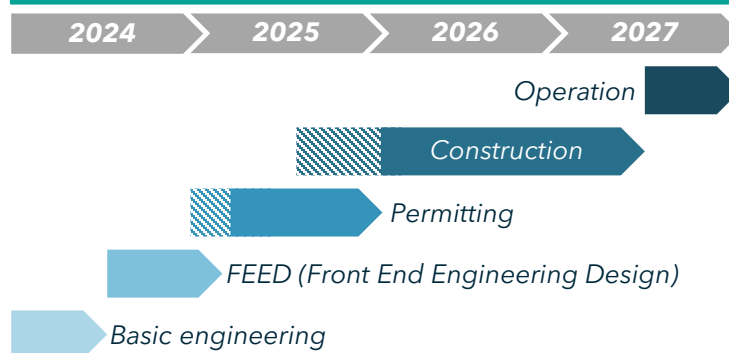
Run-rate revenue

## 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

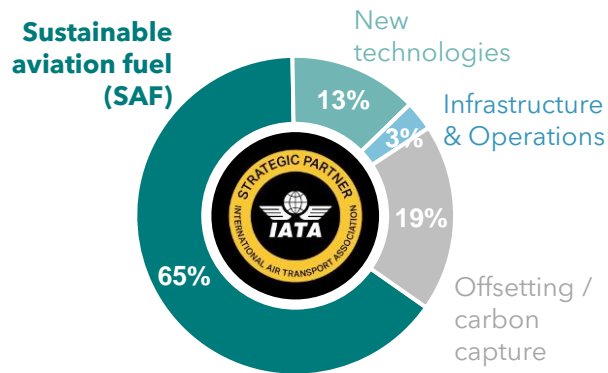
# Once Horizon III is operational, GBE will commercialize its IDD to the rapidly-growing SAF market

## SAF are key to decarbonizing the global aviation

SAF are the **main technological solution** to decarbonize aviation and have the potential to **reduce CO<sub>2</sub> emissions by up to 80%**

### Achieving Net Zero Carbon by 2050

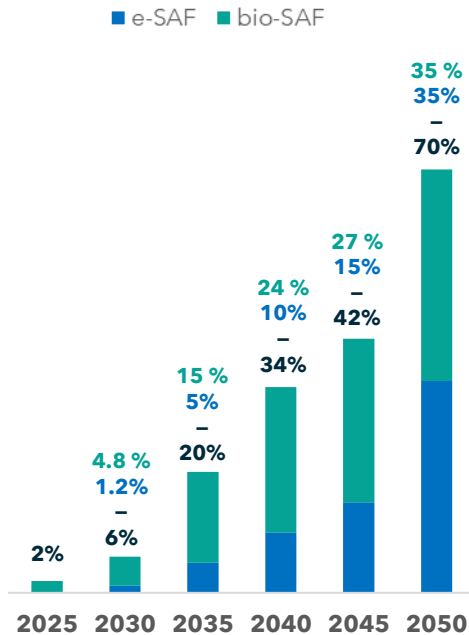
% of contribution to carbon mitigation



## 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

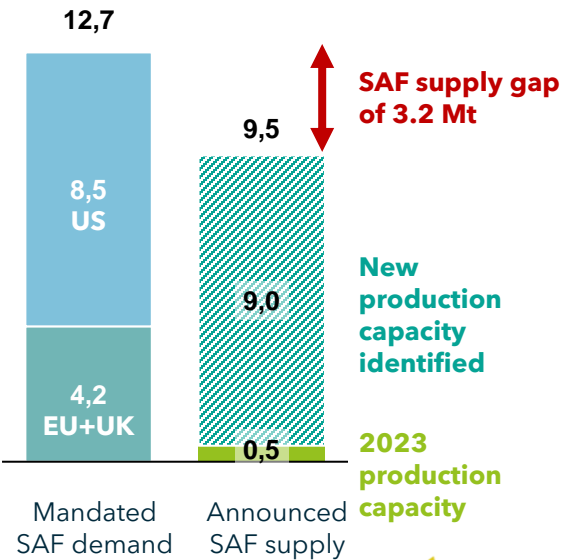
### Mandated share of SAF in the EU



## The SAF market is massive and largely unaddressed




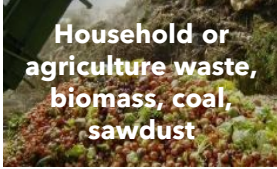





The **global SAF market will amount to c.€60bn in 2030<sup>(1)</sup>**. Out of those, **€16bn are not identified today**. In Europe, reaching 2050 objectives means deploying **c.150 SAF refineries**

### Global SAF supply gap in 2030 (in Mt)



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

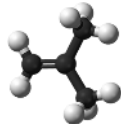
# GBE's complementary SAF solutions: **bio-IBN-SPK** and **e-IBN-SPK**

Pathway	Oleochemistry	Fermentation (Annex 5 of ASTM D7566)		Thermochemistry	
Mandate	bio-SAF		e-SAF	bio-SAF	
Techno	Hydrotreated Esters and Fatty Acids (HEFA)	ETJ-SPK	<b>GLOBAL BIOENERGIES</b> <b>bio-IBN-SPK + e-IBN-SPK</b>	Power-to-Liquid (PtL) Fischer-Tropsch (FT)	
Feedstock	 Used cooking oil, waste and vegetable oils	 1G (US only): corn, cane sugar 2G: wood chips (e.g., birch trees)	 CO <sub>2</sub> + renewable electricity	 Household or agriculture waste, biomass, coal, sawdust	
Maturity	 2020 Technology already implemented at large scale	 2024 First large-scale plant project built	 2027 Alba plant project in France Unique, flexible and complementary solution to expand in all possible geographies	 2030 First small-scale pilot plants starting	 2030 Several industrial scale projects
	<b>Production to plateau at ~10 million tons in 2030</b>	<b>Production expected to ramp up in sugar and ethanol-producing countries (USA, Brazil, SE Asia...)</b>	<b>The only long-term option for regions where vegetal resources are scarce (Europe, China...)</b>	<b>Industrial scale-up difficulties</b>	

# Wide range of fully compatible resources

Bio-SAF	E-SAF	
<p><b>1G sugars</b></p> <p>Beetroot, sugar cane, etc.</p> <p>Partnership with <b>Cristal Union</b>, #2 European sugar player</p>	<p><b>2G sugars</b></p> <p>Wood chips, straw, etc.</p> <p>Partnership with <b>Fibenol</b>, #1 producer of wood-extracted sugar worldwide</p>	<p><b>e-acetic acid</b></p> <p>Made from carbon-captured CO<sub>2</sub> and green hydrogen</p> <p>Ongoing discussions with leading acetic acid producers</p>

Fermentation



IBN conversion

bio-IBN-SPK

+

e-IBN-SPK

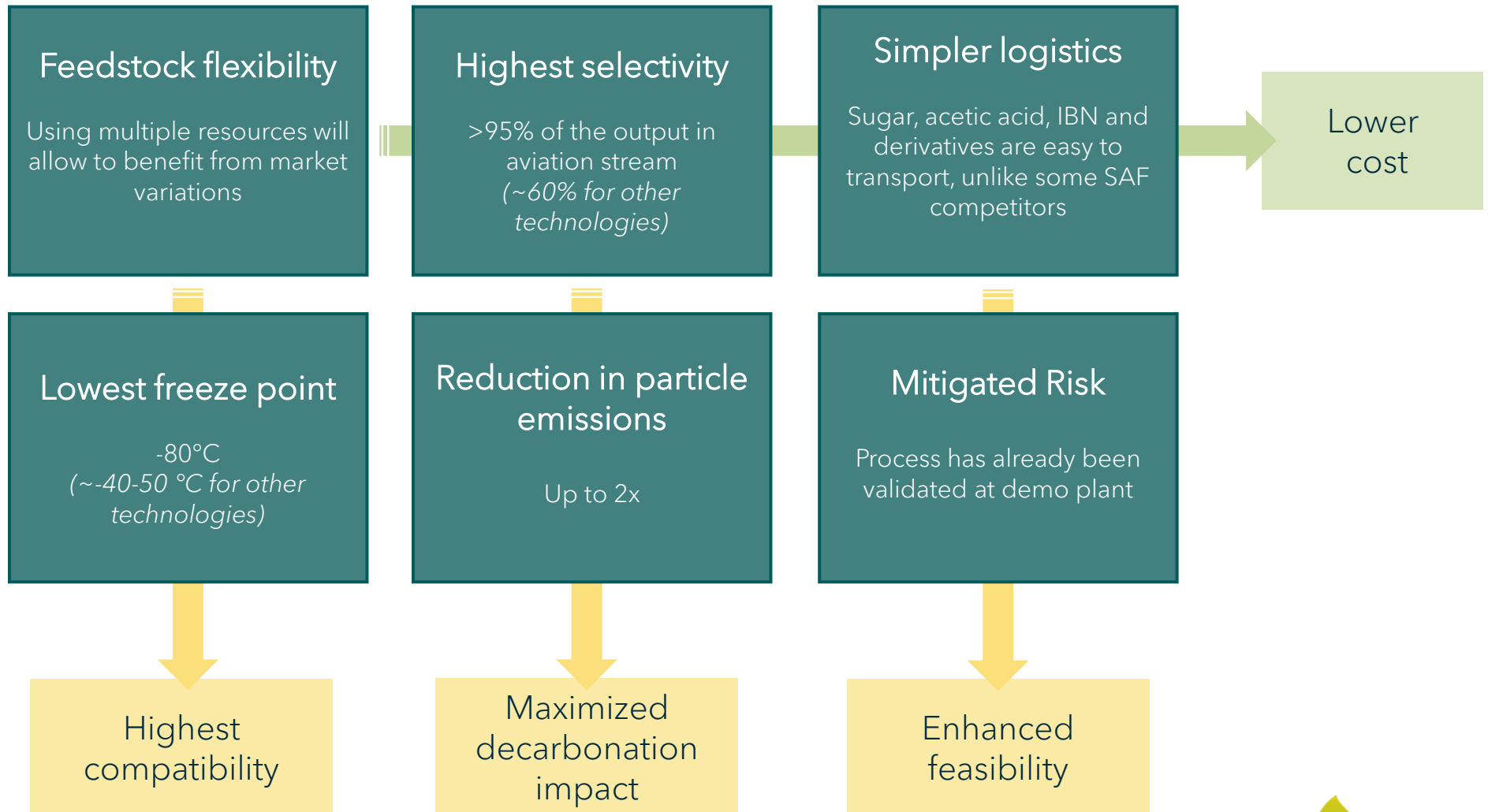
✓  
**ASTM-certified process**

✓  
**Several tons produced in GBE-operated plants**

**Proof of concept achieved, ongoing process development**



# Intrinsic qualities to be the best-in-class SAF solution

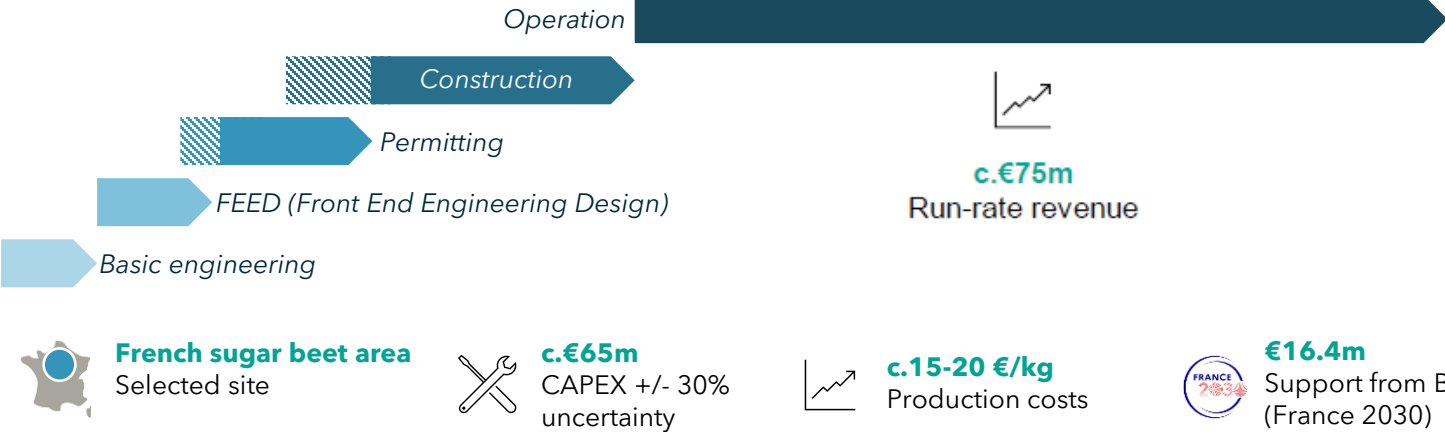


# Timeline



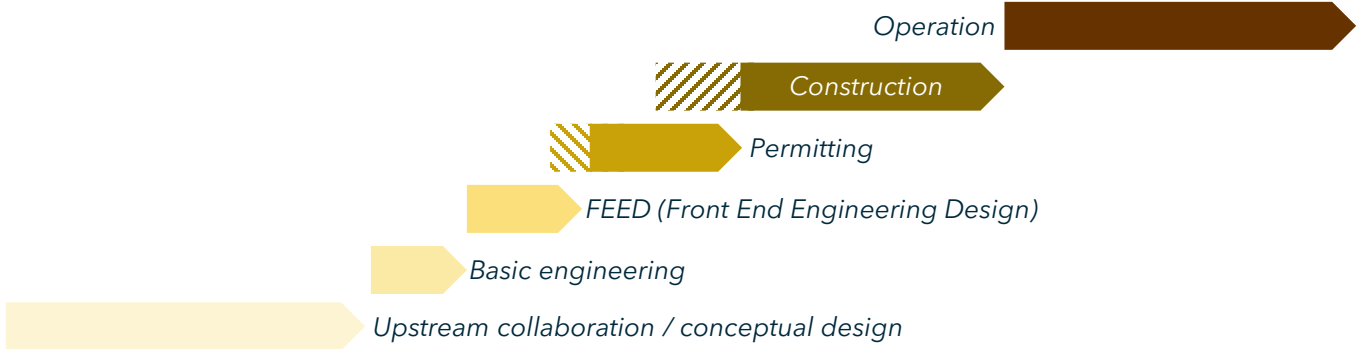
**Alba plant**

First-of-its-kind plant, producing 2.5k tons of IBN derivatives p.y.









**Future SAF plants**

30-50k tons of IBN derivatives p.y.



# Horizon IV: several SAF plants in 2030

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



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