



**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

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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

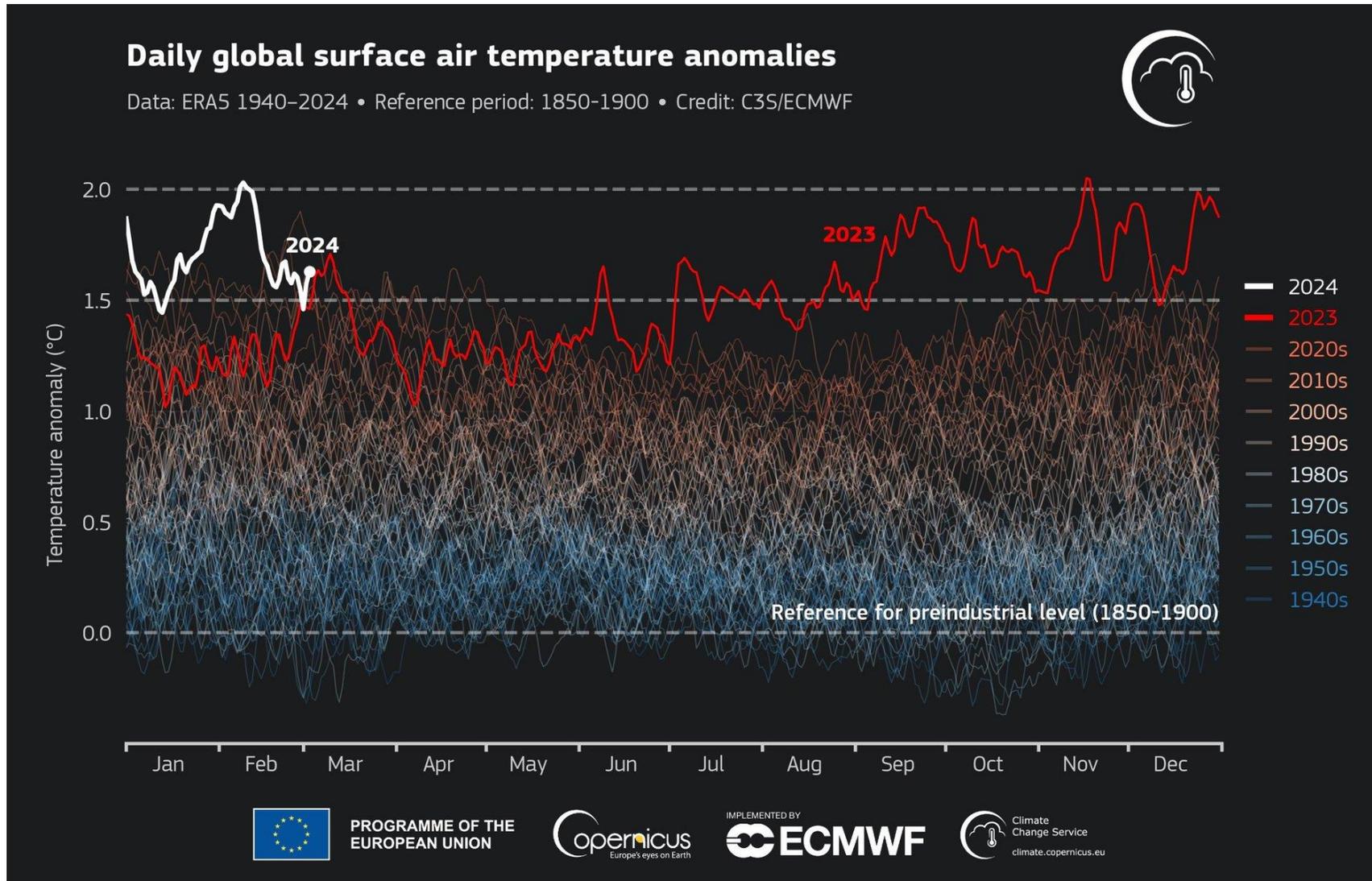


### Large volumes in Sustainable Aviation Fuels

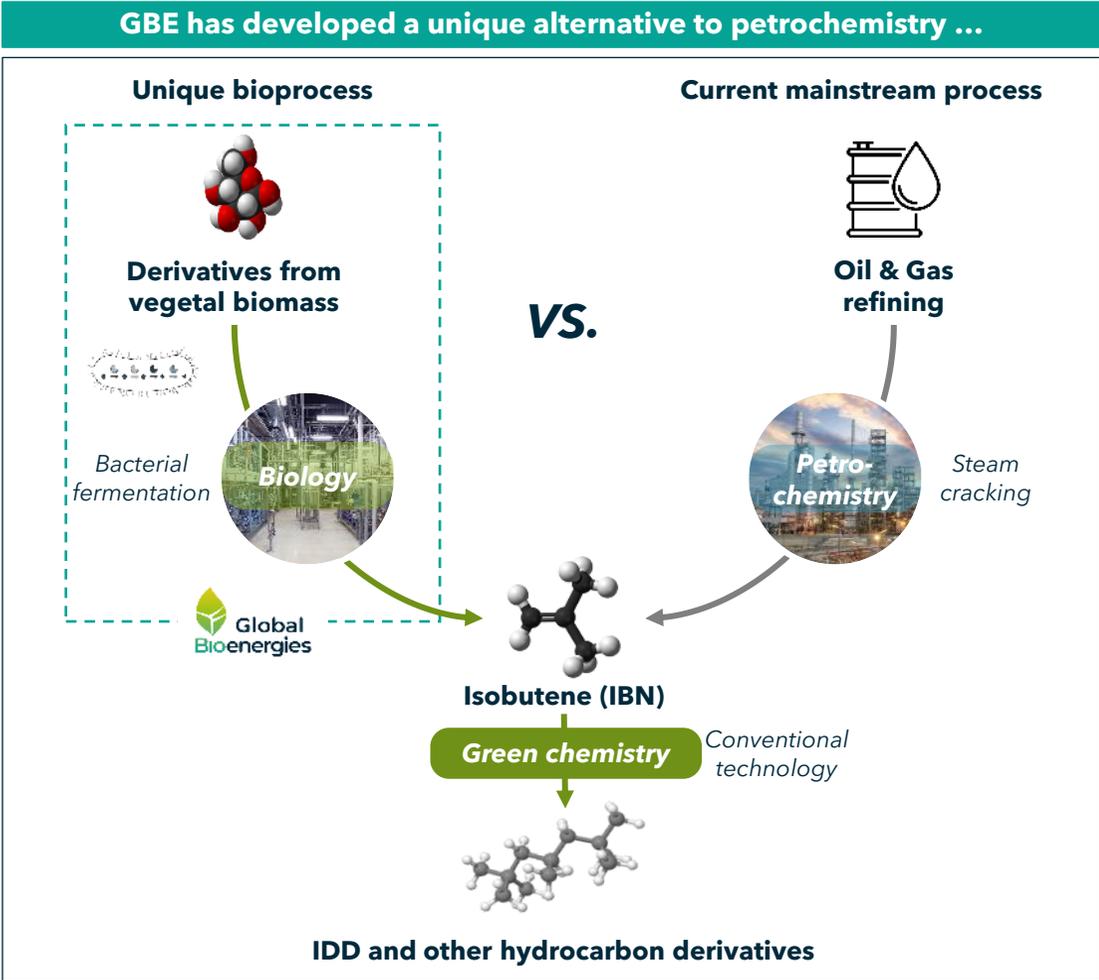
ASTM-certified



# Global warming is accelerating



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

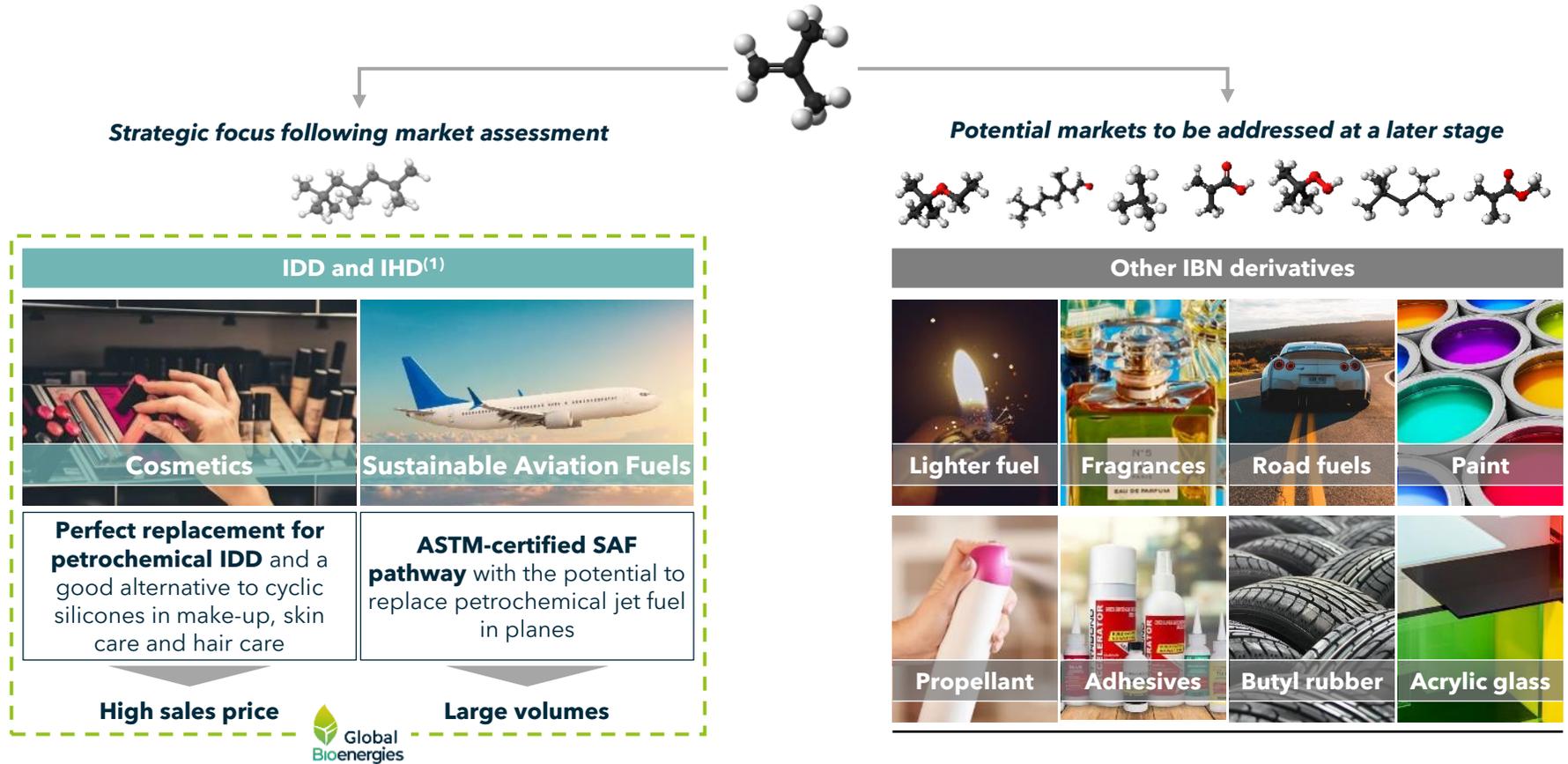


- ... by leveraging breakthrough research**
- Process **unique in the world**
  - Like-for like substitute for petrochemical molecules**
  - Bio-based molecules** produced from agricultural and forestry byproducts<sup>(1)</sup>
  - Gradual, proven improvement** of process performance
  - Multi-patents protected process**
  - Supported by L'Oréal**, worldwide leader in cosmetics

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

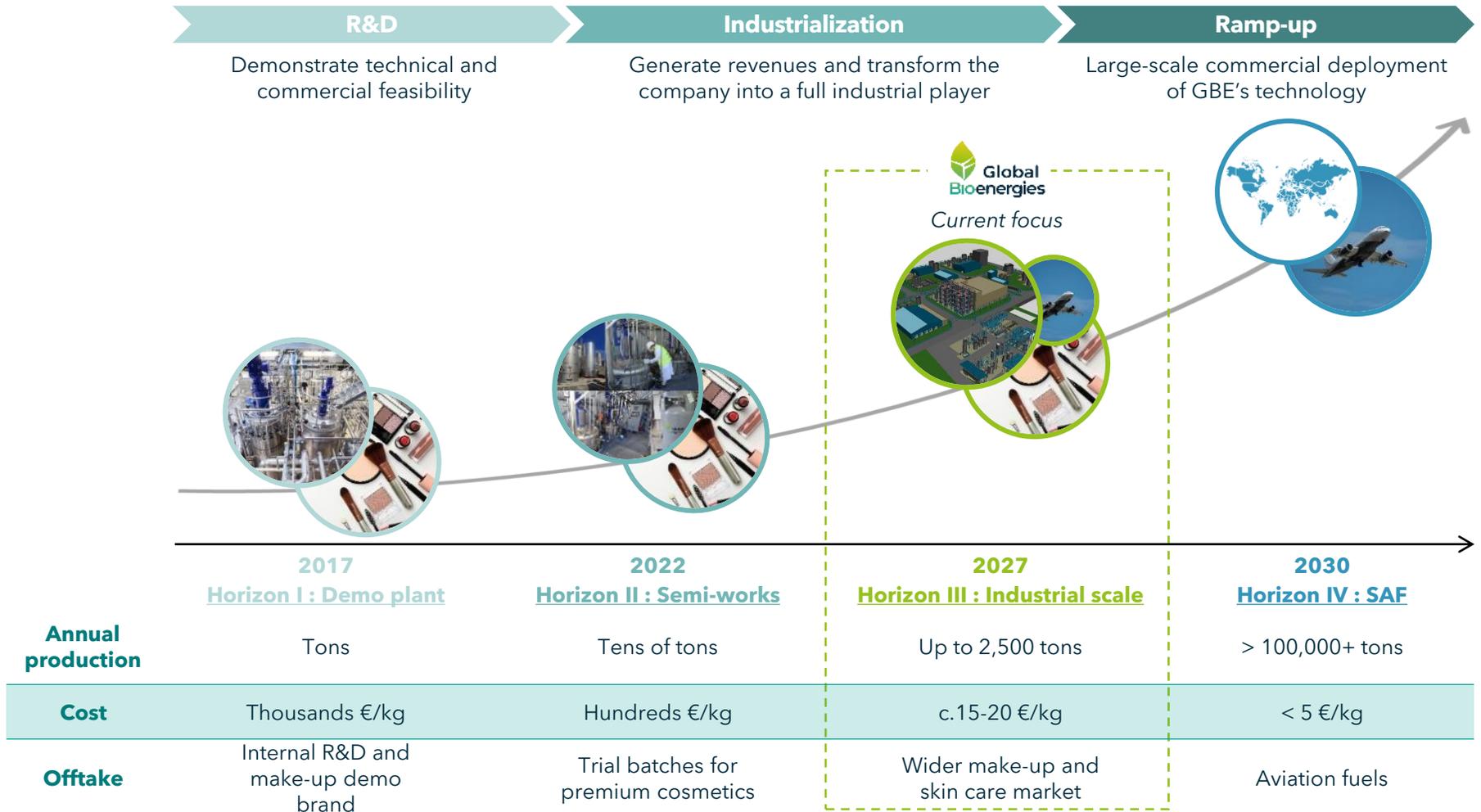
# IBN derivatives have high-value applications in many markets

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

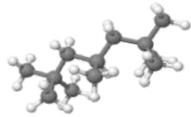
**€30m+**

# 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**

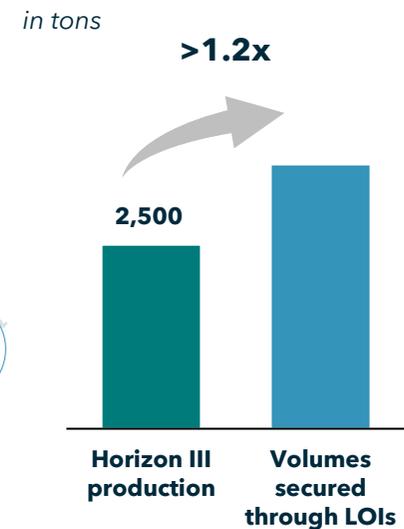
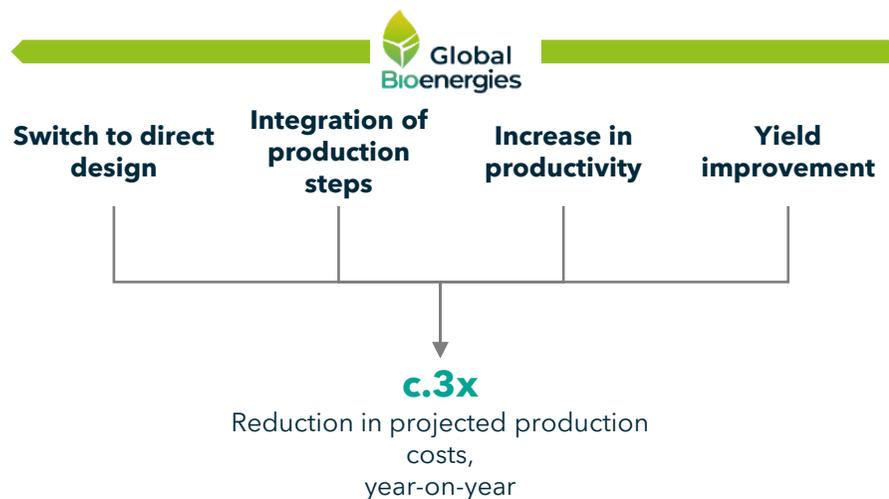
GBE has managed to obtain over the past months several **letters of intents** from renowned cosmetics players **worldwide** and has **ongoing discussions** for additional volumes - with several regions yet to be tapped

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**

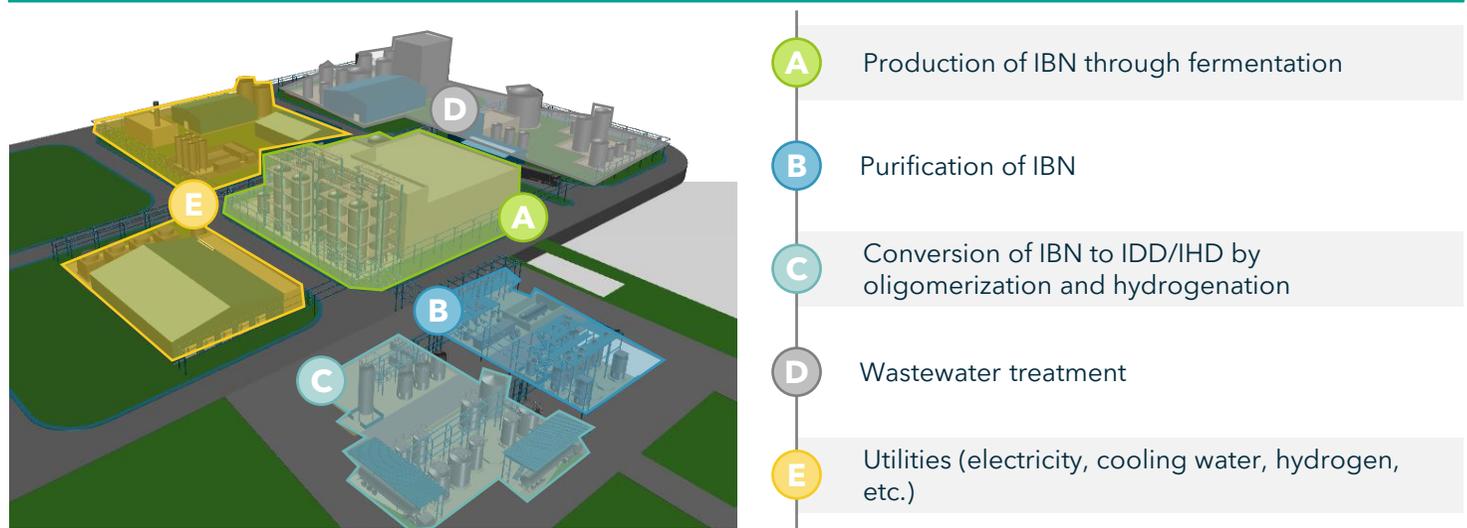
Production costs



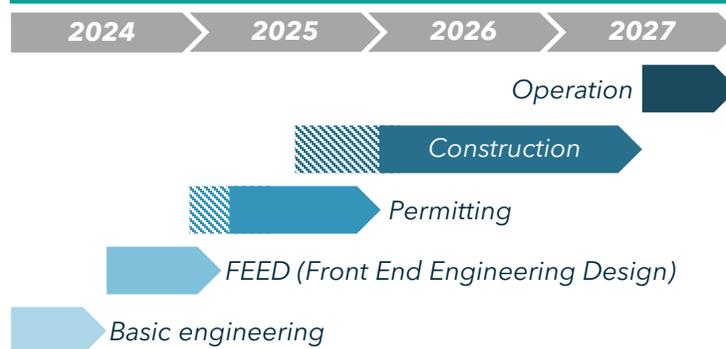
**> €70m**

Run-rate revenue

## Preliminary plant design



## Projected timeline



**Note:** (1) Factoring 40% uncertainties



## Horizon IV: SAF Market & roadmap

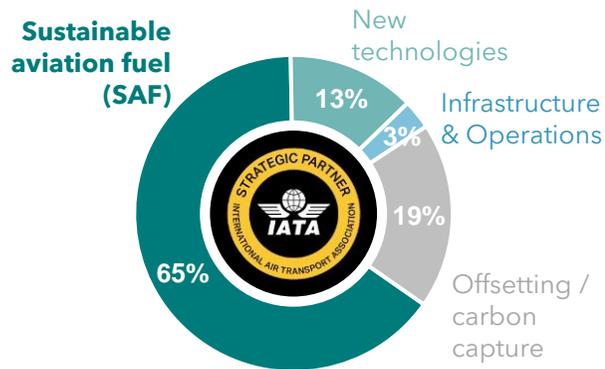
# Once Horizon III is operational, GBE will commercialize its IDD to the rapidly-growing SAF market

## 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

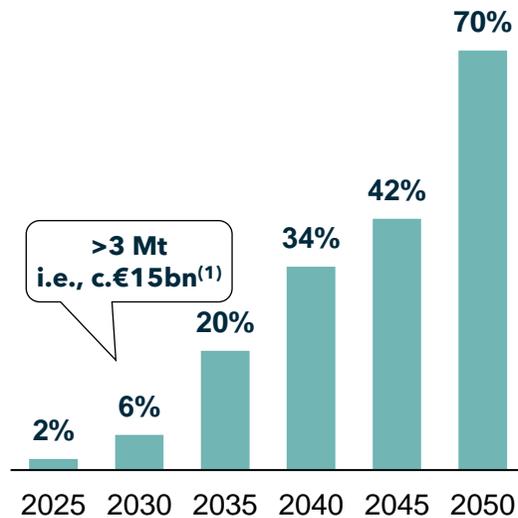
% of contribution to carbon mitigation



## 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

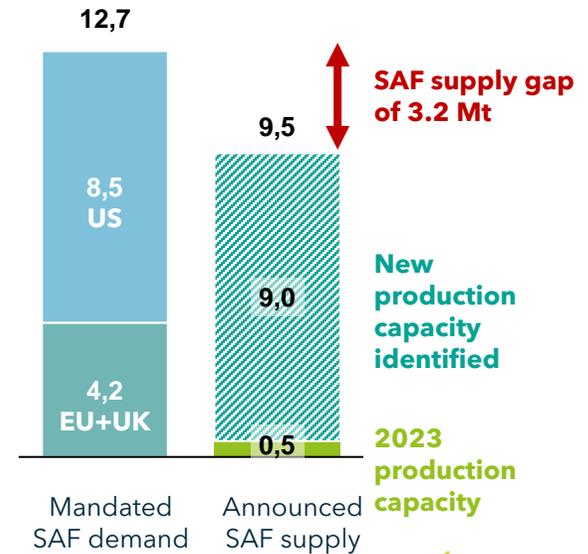
Mandated share of SAF in the EU



## 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 IBN-SPK jet fuel is well positioned to succeed in the SAF market



	As a <b>drop-in fuel</b> , GBE's biofuel can <b>safely be blended</b> with fossil jet fuel, <b>using the same airplanes and infrastructure</b> (no retrofit required)	<b>up to 50%</b> GBE's SAF maximum share in blend <sup>(1)</sup>	
	<b>100% derived from natural sources</b> , GBE's SAF <b>emits significantly less CO<sub>2</sub> than the fossil fuels it replaces</b> and contributes to the decarbonization of transport	<b>Up to 70%</b> expected reduction in CO <sub>2</sub> emissions	
	GBE's biofuel has <b>cleaner combustion properties</b> , reducing <b>particles emissions in contrails</b> (a key driver of global warming) and in turn <b>improves fuel efficiency</b>	<b>Important decrease</b> of particles emissions <sup>(2)</sup>	
		Among SAF technologies, GBE's jet fuel boasts the lowest <b>freezing point</b> and has <b>better cold flow</b>	Acting as <b>antifreeze</b>
	Due to its unique qualities, GBE's SAF may be used as a <b>performance booster to complement other SAF solutions</b>	<b>Compatibility</b> with HEFA and other SAF	
	GBE's biofuel, having <b>passed the ASTM certification</b> , is among the <b>few solutions in the world</b> that have obtained <b>approval to fly</b>	<b>1,400+</b> experts' approval	
	To produce SAF, <b>GBE will use the same exact molecule and process</b> as those used in Horizon III for cosmetics	<b>Full demonstrability</b> 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)	<b>Fermentation (ATJ-SPK)</b> Fewer steps than ETJ-SPK ETJ-SPK   <b>IBN-SPK</b> 		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 <sub>2</sub> , renewable electricity
Maturity	 <b>2025</b> Technology already implemented at large scale	 <b>2030</b> First large-scale plant project built	 <b>2030</b> Large-scale plant projects in preparation	 <b>2030</b> Several attempts at industrial scale, unsuccessful for now	 <b>2035</b> First small-scale pilot plants starting
ASTM certification					
	<b>Insufficient feedstock availability</b> to meet demand from 2030 onwards	<b>Expected to be the next generation in SAF with potential synergies to be leveraged between main SAF producers</b>		<b>Industrial and commercial scale-up difficulties</b>	<b>Costly process</b> (energy consumption) <b>unproven at industrial scale</b>

# 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			<div style="border: 1px dashed gray; padding: 10px; text-align: center;">           TBD            (likely to be in Europe            or in the US)         </div>	
Tech readiness	<div style="display: flex; justify-content: center; gap: 10px;"> <span>✓</span> <span>✓</span> <span>✓</span> </div>	<div style="display: flex; justify-content: center; gap: 10px;"> <span>✓</span> <span>✓</span> </div>	<div style="display: flex; justify-content: center; gap: 10px;"> <span>✓</span> </div>	<div style="display: flex; justify-content: center; gap: 10px;"> <span>✓</span> </div>
Feedstock	1G resources (sugar cane)	2G resources (wood chips from birch leftovers)	1G/2G	1G/2G Biogenic CO <sub>2</sub>
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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