



GLOBAL BIOENERGIES

*Becoming a pillar of the  
energy and environmental  
transition*

November 2016



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## Challenges and solutions

- ▶ The world faces two major challenges:
  - **Global warming** linked to the massive production of greenhouse gases
  - **Rising energy demand** in the context of uncertainty regarding fossil resources
- ▶ The world therefore needs a new, less carbon-intensive, energy mix
- ▶ To counter these threats, two solutions are available:
  - **Renewable electricity** (hydro, wind, solar) for domestic and industrial uses, rail, short range road transport
  - **Industrial biology** for Biofuels (long range road transport, air transportation) and Biomaterials (plastics, rubbers, chemicals...)

## Industrial Biology

- ▶ Conversion of renewable resources (sugars, cereals, agricultural and forestry waste, CO<sub>2</sub>, ...) into chemicals, with applications in fuels and materials.
- ▶ Hundreds of ethanol plants have been built worldwide in the last two decades. OECD countries have reached the blend wall (10% in gasoline)
- ▶ The production of other molecules is hampered by overly complex purification schemes
  - The need of better biofuels and renewable commodity chemicals remains unmet

## Global Bioenergies investment highlights



1

### A breakthrough innovation bypassing the limitations of the field

- ▶ A unique gaseous fermentation process with a simple and robust purification scheme
- ▶ A platform drop-in molecule, isobutene, easily converted into bio-gasoline, bio-kerosene and various biomaterials

2

### A mature technology with a huge industrial potential

- ▶ In the short term, the construction of numerous plants could be launched

3

### A perfect timing to invest in the company

- ▶ An attractive price, the oil glut having pushed down the value of all industrial biology companies
- ▶ The oil glut is losing pace, the whole sector should take off
- ▶ The company is entering into its commercial phase

4

### A seasoned management team

- ▶ The company founders have long academic and entrepreneurial track record in the field.
- ▶ International senior managers have joined the team these recent years

## **1. Technology**

2. Markets and business model

3. Team

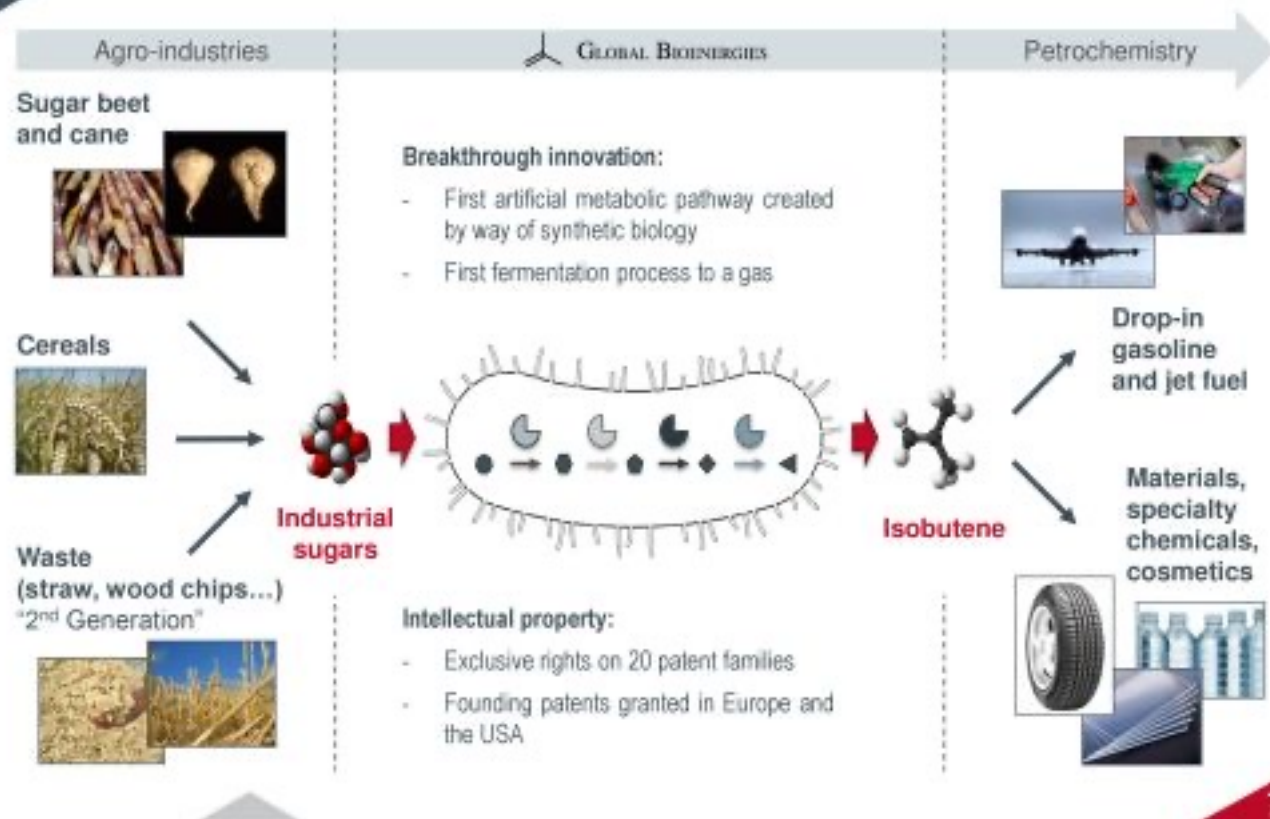
4. R&D pipeline

5. Financials

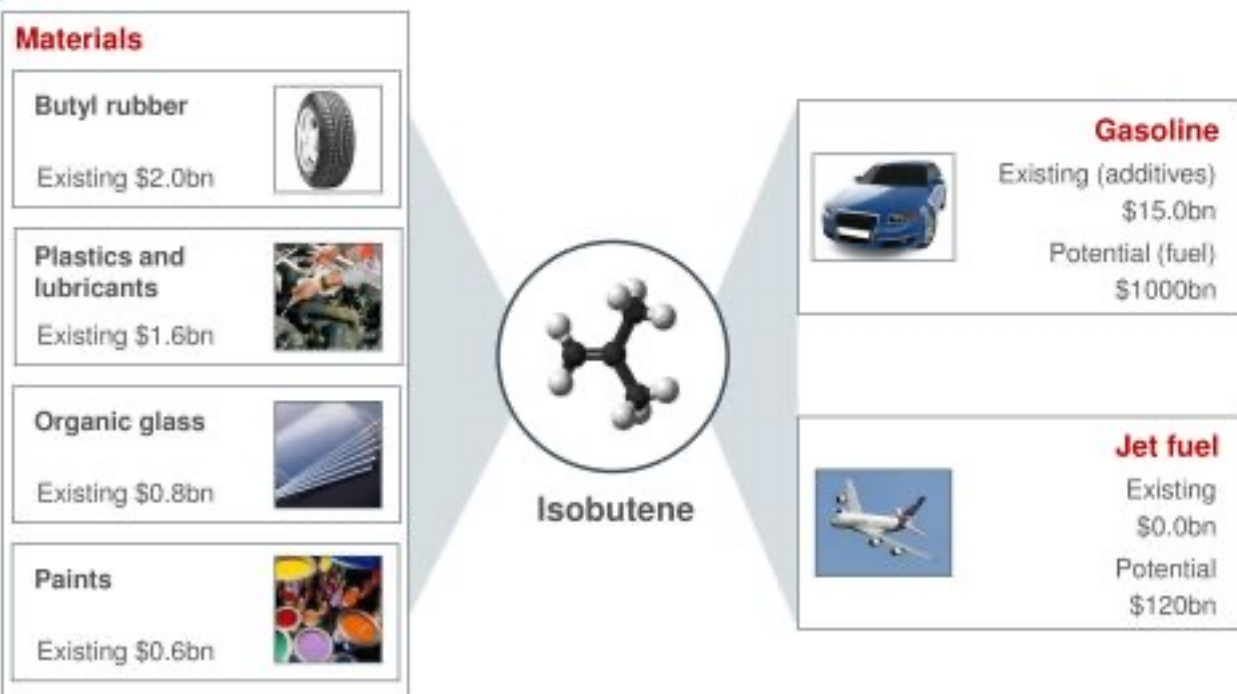
6. Perspectives



## Converting renewable resources into fuels and materials



## Isobutene: a key petrochemical market



Existing market for fossil isobutene >\$20bn with vast further market potential



## A simple and robust two-steps technology



Glucose  
Sucrose



### 1 Fermentation

Breakthrough technology:  
direct fermentation to a gas

- ▶ No toxicity for production strains (product does not accumulate)
- ▶ Pre-purification by product volatilization



### 2 Purification

Combination of proven  
petrochemical modules

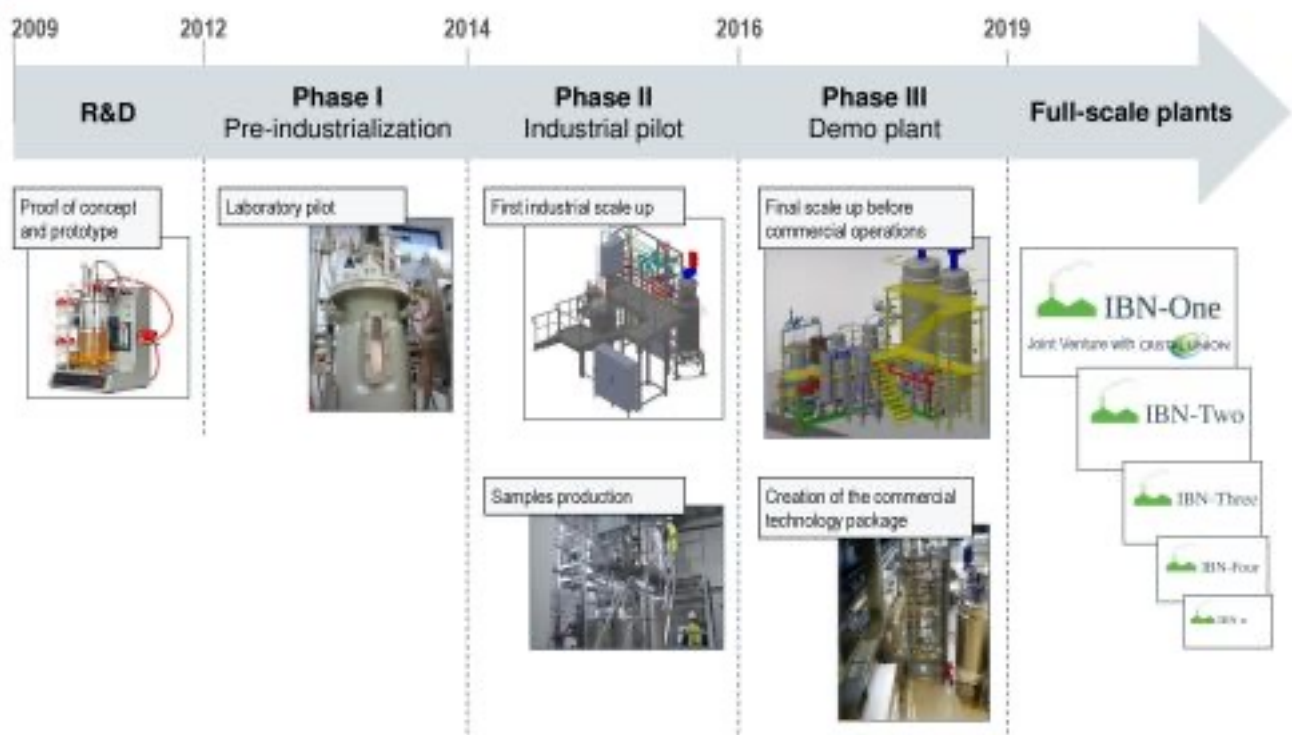
- ▶ Simple
- ▶ Robust
- ▶ Cost efficient



Isobutene

*Illustrations are not representative of current Global Bioenergies' installations*

## A technology approaching commercial maturity

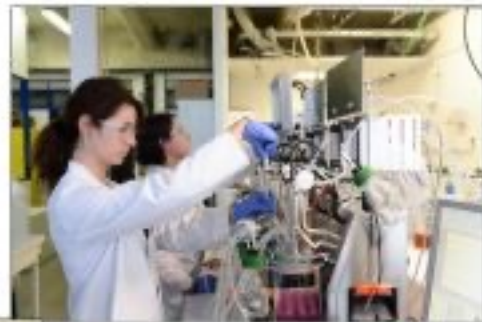


## Evry: Headquarters, R&D, lab piloting

Evry  
55 employees



- Unique technology platforms oriented toward gaseous fermentation



## Pomacle: Industrial pilot

Pomacle

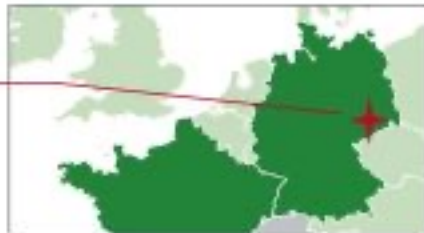


- ▶ 10 tons/yr capacity
- ▶ €10.5m program
- ▶ €5.2m public financing
- ▶ Consortium with **ARKEMA** and **CIF**
- ▶ Up and running since Nov. 2014
- ▶ Operated by **ard** a **CRISTAL UNION** affiliate
- ▶ Purified isobutene shipped to numerous industrialists
- ▶ Conversion into e-gasoline for **Audi**
- ▶ Yield > 70% of commercial target



## Leuna: Demo plant

Leuna



- ▶ Capacity: 100 tons/yr
- ▶ CAPEX: €10m
- ▶ €5.7m public financing
- ▶ €4.4m bank loan
- ▶ Engineering done by *Linde*
- ▶ To be operated by *Fraunhofer*
- ▶ Construction completed in November 2016
- ▶ Startup expected in December 2016





Champagne  
region



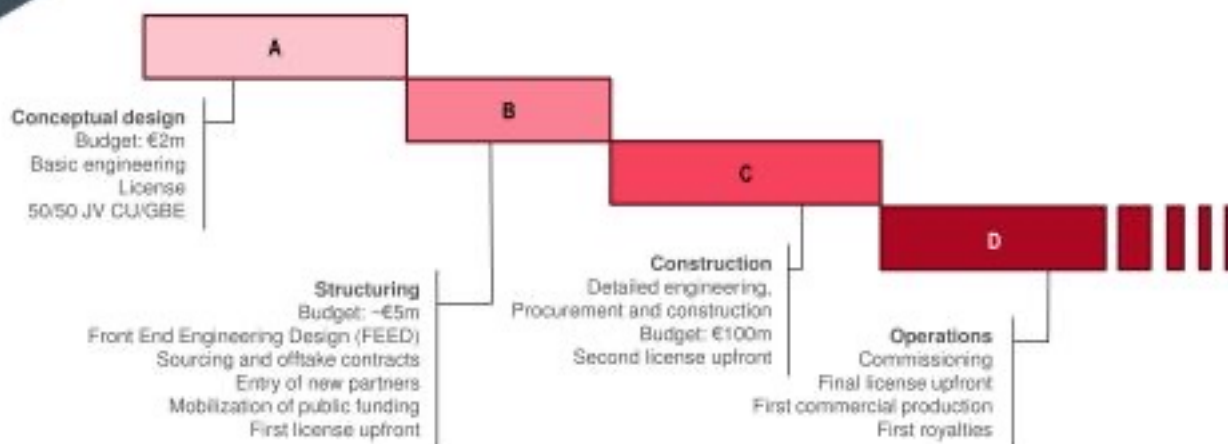
## First commercial plant



- 1 200Kt sucrose are converted into 50Kt gaseous, low purity isobutene
- 2 The purification unit isolates isobutene from surrounding fermentation gases
- 3 Liquid high purity isobutene (99.7%) storage and shipping for chemical applications
- 4 Part of the production is converted on site into high performance drop-in bio-gasoline



## IBN-One Schedule, funding and partnerships



### ► Public funding:

- €9m reimbursable advances from the French Governmental *Investissements d'Avenir* program shared between IBN-One and Global Bioenergies over 2016-2019
- Partnership with Cristal Union and L'Oréal



- Decisions regarding the financing of Phase B and C will be made in light of the results obtained on the Leuna Demo plant

1. Technology

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4. R&D pipeline

5. Financials

6. Perspectives

## First market: chemistry and materials

### Applications

<b>Butyl rubber</b> 1.0 Mt	
<b>Lubricants and additives</b> 0.8 Mt	
<b>Organic glass (Plexiglass®)</b> 0.4 Mt	
<b>Specialty chemicals (paints, cosmetics...)</b> 0.3 Mt	

Mt: million tons

### High purity Isobutene price



- ▶ A vast panel of applications from rubbers to cosmetics
- ▶ Market growth: +4% CAGR expected between 2015 and 2020

Sources: Argus DeWitt, IHS, SRI, Global Bioenergies

## Second market: renewable gasoline

- ▶ First wave of biofuels since 2000 in the USA and Europe:
  - Construction of 300 plants producing a total of 50 million tons of ethanol
  - 10% maximum blending in gasoline (« blending wall »)
- ▶ Second wave of biofuels expected to increase blending from 10% to 20%
- ▶ Requirement for a « drop-in » biofuel
- ▶ Only two technologies:
  - Isobutene → Isooctane (Global Bioenergies)
  - Isobutanol (Butamax/Gevo)
- ▶ The perspective for numerous plants



- ▶ Audi aims to produce renewable low impact gasoline ('e-gasoline')
- ▶ Audi will be the first car manufacturer to offer its clients the possibility to drive 100% on an alternative fuel
- ▶ A system of offsets:
  - Audi's client purchases standard oil-derived gasoline at a petrol station
  - The client's car sends a signal to Audi's headquarters
  - Audi produces the equivalent amount of e-gasoline and delivers it to a fuel depot where it can be used by other consumers
  - Audi's client has thereby indirectly consumed e-gasoline
- ▶ This requires a 'drop-in', ready-to-blend fuel which explains Audi's choice of Global Bioenergies' isooctane

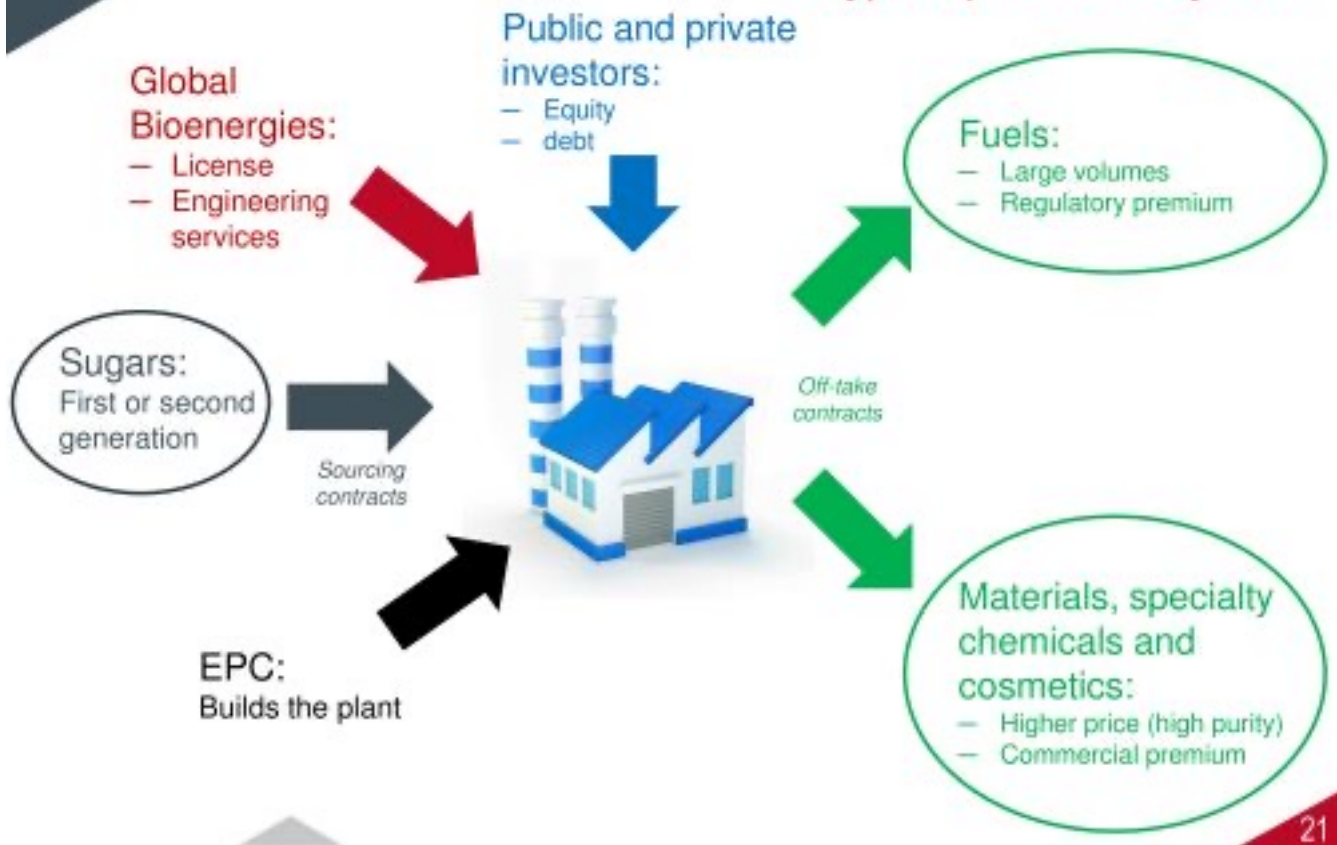
## Third market: bio jetfuel

- ▶ Global jetfuel market: 120 million tons
- ▶ Bio-jetfuel not existing commercially at present
- ▶ High technical and regulatory constraints
- ▶ Limited competition:
  - Isobutene → Jetfuel (Global Bioenergies)
  - Palm oil hydrogenation (Neste)
  - Farnesane (Amyris)
  - Alcohol to Jet (Gevo)
  - Fischer-Tropsch (Fulcrum)
- ▶ Strong will from the aviation industry → mandates associated to tax incentives expected in the mid-term





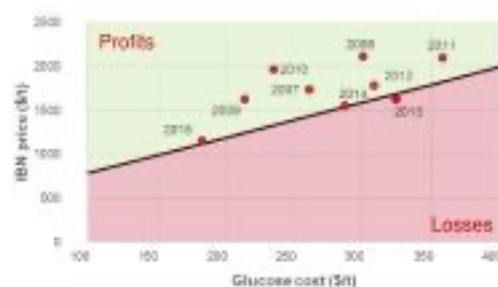
## A typical plant's ecosystem



## Economic model of a US chemicals plant

Costs	m\$/yr	Sales	m\$/yr
<b>Feedstock</b> 384Kt industrial grade sugar <sup>1</sup>	108	<b>High purity isobutene<sup>2</sup></b> 100Kt per year	182
<b>Capex</b> 206M\$ linear amortization over 15 years	13.7		
<b>Opex</b> Wages, consumables, utilities...	23.7		
<b>License</b> (5% of sales)	9.1		
<b>Total</b>	<b>154.5</b>	<b>Total</b>	<b>182</b>

Average values 2007-2014

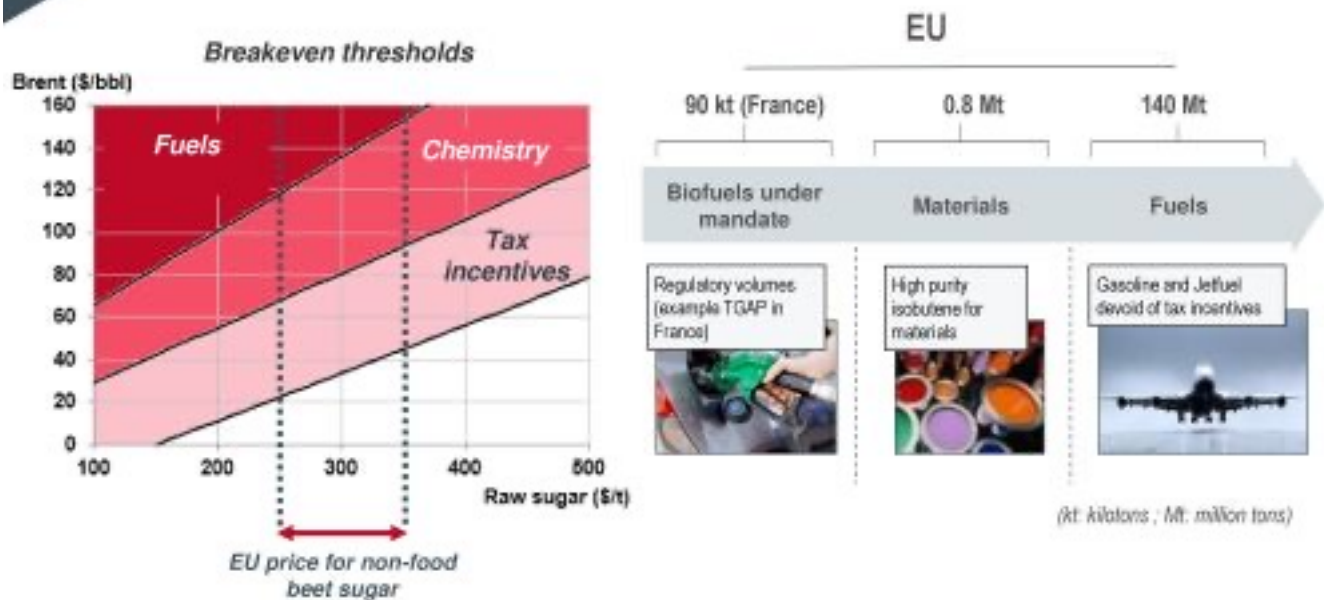


<b>Raw margin</b> (5% license included)	15%
<b>IRR*</b> (Internal Rate of Return)	18%
<b>NPV*</b> (Net Present Value)	170M\$

\* 10% discount rate, 2% inflation,  
30 Years duration, no terminal value

<sup>1</sup>: 280 \$/t – US fermentable sugar cost derived from ethanol prices – 2007-2014 average – Bloomberg and GBE calculations  
<sup>2</sup>: 1820 \$/t – Argus DelWitt - 2007-2014 average

## Generic EU plant - profitability study



- ▶ Drop-in biofuels (EU mandate) + high purity isobutene
- ▶ Profitable in the 60-80\$/barrel range, depending on sugar price hypothesis and country specific tax incentives

## Business development targets

- ▶ **European sugar producers**  
Additional outlets to compensate the predicted overproduction resulting from the end of quotas
- ▶ **US starch producers**  
Additional outlets to compensate the contraction in glucose demand resulting from global move to low-carb diet
- ▶ **Scandinavian and North American pulp and paper producers**  
Additional outlets to compensate the collapse in paper demand
- ▶ **Chemical manufacturers and brand owners**  
Renewable materials to obtain a « green premium »
- ▶ **Fuel distributors**  
Drop-in solutions to overcome the 10% ethanol blend wall

## Collaborations with industrialists

Since 2011



France's #2 sugar and ethanol producer

Shareholder and Partner in IBN-One JV

Since 2012



Audi

Leading German car manufacturer

Collaboration on "e-gasoline" development

Since 2013



France's #1 chemicals company

Collaboration on methacrylic acid

Since 2016



World's #1 cosmetics company

Collaboration on cosmetic applications of Isobutene

Since 2016



Leader in specialty fuels

Collaboration on isooctane

Since 2016



Swedish #1 forestry company



Swedish #1 oil company



Swedish Biorefinery

Collaboration on wood-derived biofuels

Test samples shipped to numerous industrialists



World's #1 Butyl rubber manufacturer



Clariant, European leader in specialty chemicals



France's LPG industry consortium, gathering Butagaz, Primagaz...

## The 'commercial phase' is starting now

- ▶ Increase in industrial credibility resulting from Leuna and IBN-One
- ▶ Numerous incoming calls from prospects in various locations
- ▶ 5 concrete business opportunities in North America. 2017 objectives:
  - First term sheet on a plant construction project
  - Intentions from potential off-takers
  - Progresses with government bodies on the financing (loan guarantees...)



1. Technology
2. Markets and business model
- 3. Team**
4. R&D pipeline
5. Financials
6. Perspectives

## Management team

### Coordination Committee



**Marc Delcourt**  
Chief Executive Officer



**François-Henri Reynaud**  
Chief Financial Officer



**Macha Anissimova**  
Chief Scientific Officer



**Frédéric Pâques**  
Chief Operations Officer



**Thomas Buhl**  
Head of Business Development



**Bernard Chaud**  
Head of Industrial Strategy



**Jean-Baptiste Barbaroux**  
Head of Corporate Development

### Vice presidents



**Dr. Richard E. Bockrath**  
VP Chemical engineering  
Former Technical Director at DuPont



**Dr. Charles E. Nakamura**  
VP Metabolic engineering  
25 years at DuPont.  
Received ACS award in 2007



**Claudia Erning**  
VP Investor Relations  
Former Head of ECM-Origination at Berenberg Bank



**James Iademarco**  
VP Business Development  
Former VP Bio-based chemicals at Royal DSM

## Board of Directors

### Board of Directors



**John Pierce** – Chairman of the Board

*Leading American figure of the industrial biology sector, former Chief Bioscientist of BP*



**Marc Delcourt** – Co-founder and CEO

*Entrepreneur with a scientific background. Has founded and managed industrial biotechs since 1997*



**Philippe Marlière** – Co-founder and President of the SAB

*Visionary scientist. Has pioneered the translation of biology into industrial applications*



**Sébastien Groyer** – Partner at Seventure Partners

*Has participated in the investment, administration, market launch or takeover of about 20 innovative companies*

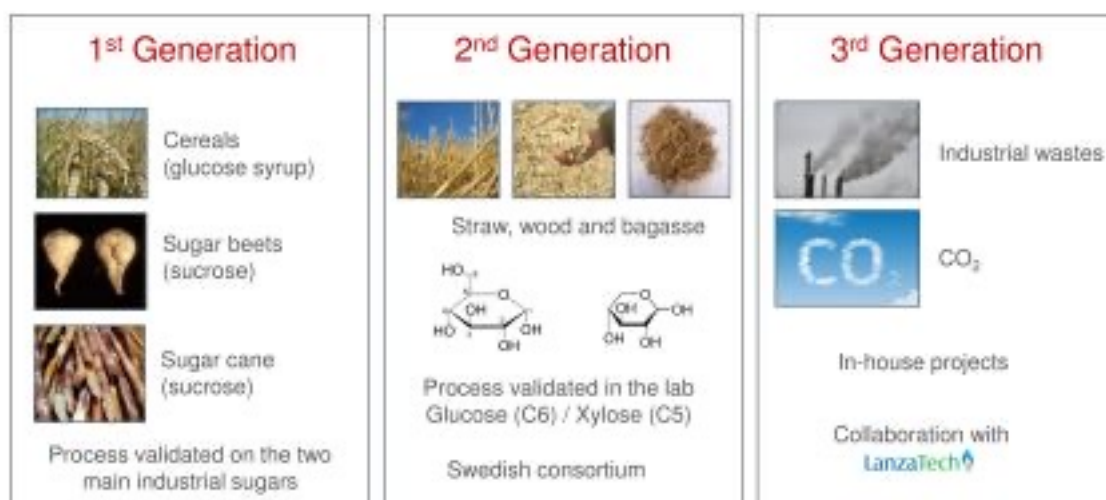


**Karine Lignel** – Director at CM-CIC Investissement

*A trained engineer active in Venture Capital since 2000*

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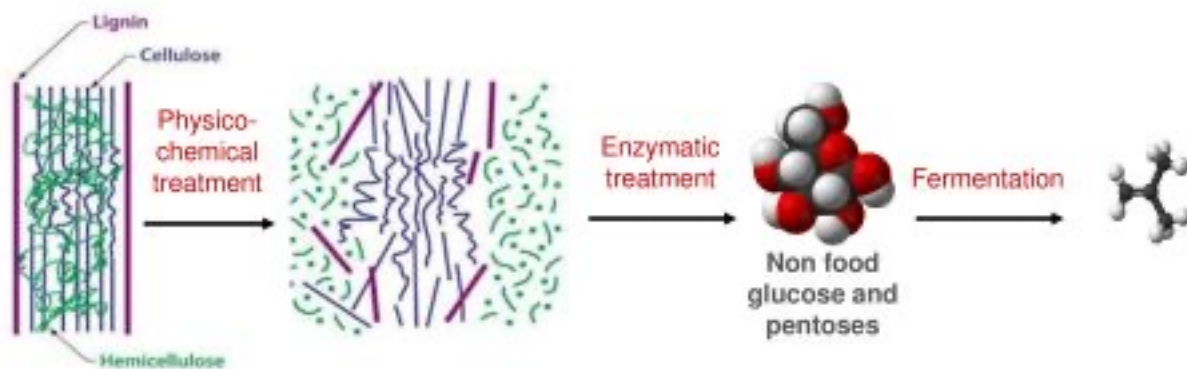
## R&D first axis: diversification of resources



Cost of resource:

Economic and environmental potential:

## Second Generation (1/3)



► Separate technologies to manage different feedstocks:

- Agricultural wastes (wheat straw, corn stover...)
- Forestry wastes (wood chips, branches...)





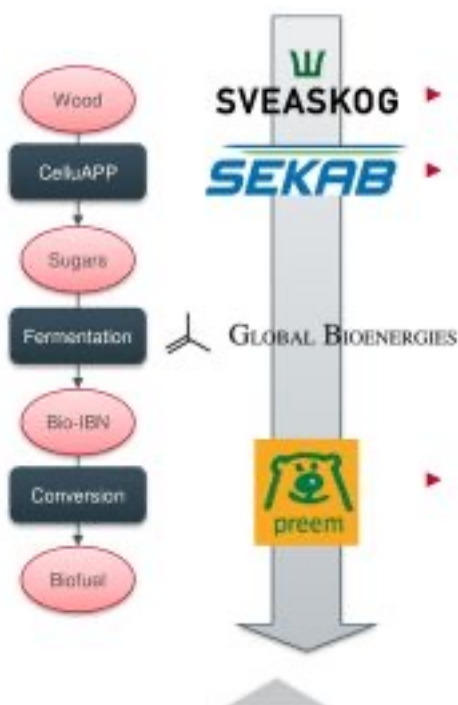
## Second Generation (2/3): agricultural wastes - Germany

- ▶ Numerous trials since 2015 using 2G sugar batches:
  - Collaboration with 9 companies specialized in 2G sugars derived from various types of agricultural wastes
  - Lab-scale testings
- ▶ First success in scale-up
  - 2G sugars provided by Clariant (formerly Süd Chemie, Germany) a leader in the field
  - Production of « Second generation Isobutene » on Global Bioenergies' pilot plant located in Pomacle (France)



## Second Generation (3/3): Forestry valorization in Sweden

**Objective:** Study various plant scenarios to convert forestry residues into biofuels



► **SVEASKOG:** Swedish leader of the forestry industry. 690 employees, € 650m turnover.

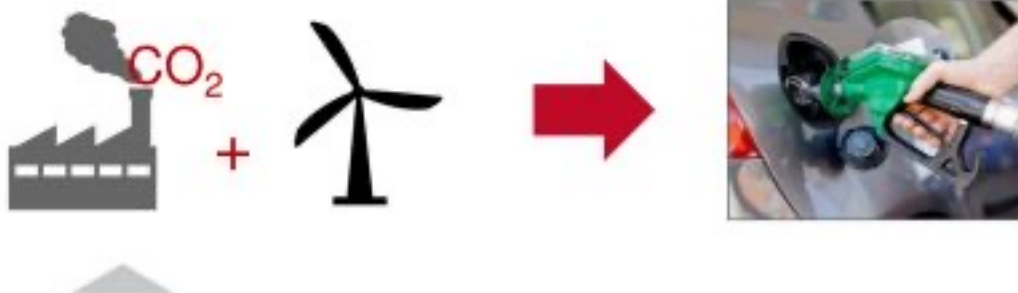
► **SEKAB:** Swedish leader the conversion of the conversion of wood into fermentable sugars (CelluAPP® technology).

Project supported by the  
 **Swedish Energy Agency**

► **PREEM:** Sweden's largest oil company. € 8bn turnover in 2015, a network of 570 filling stations

## Third Generation: Industrial CO<sub>2</sub> becomes a resource

- ▶ Industrial CO<sub>2</sub>, present at high concentrations in a gaseous effluents of numerous industries (concrete plants, power stations...) contributes to global warming.
- ▶ Using CO<sub>2</sub> as a resource is possible: it must be combined with an energy source (renewable electricity, or hydrogen derived from it).
- ▶ Global Bioenergies: 5 years experience in the field (collaboration with LanzaTech).
- ▶ Numerous academic proofs of concepts on new approaches. These approaches could be combined with the Isobutene process.
- ▶ Global Bioenergies positions itself as a technology integrator and developer.
- ▶ Economic equation and environmental balance improved when compared to first and second generation.



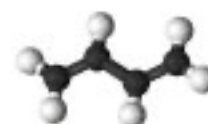
## R&D second axis: diversification of products

### Butadiene

In collaboration with



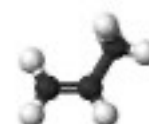
<b>Tires</b> 5.0 Mt 	<b>Plastics</b> 2.0 Mt 
<b>Rubber (non-tires)</b> 2.0 Mt 	<b>Nylon &amp; others</b> 1.5 Mt 



10Mt market  
+3% CAGR

### Propylene

<b>Plastics</b> 58 Mt 	<b>Foams</b> 6 Mt 
<b>Solvents</b> 7 Mt 	<b>Others</b> 19 Mt 



90Mt market  
+5% CAGR

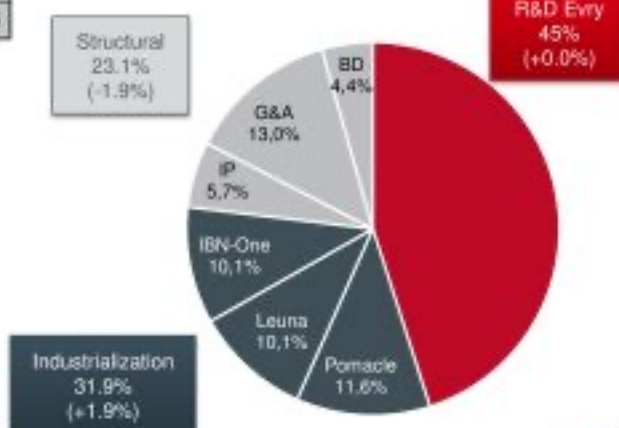
Sources: Argus DeWitt, Company, IHS, SRI, ICIS

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## Group P&L

In € thousand - audited	du 01/01/16 au 30/06/16 6 mois	01/01/15 to 31/12/15 12 months
Operating income	757	2 228
Operating expenses	7 200	14 240
Operating profit (loss)	-6 433	-12 013
Financial income	-245	-258
Exceptional profit (loss)	-32	-109
Income tax	NA	- 1 985
<b>Net profit (loss)</b>	<b>-6 709</b>	<b>-10 395</b>

Details of operating  
charges as at 30/06/2016





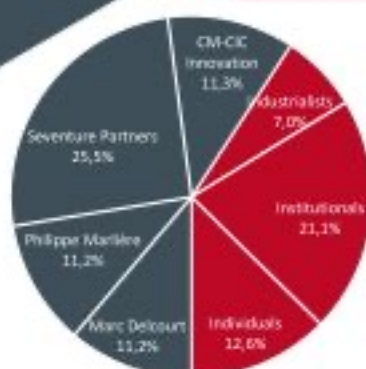
## Group Balance Sheet

Assets (€ thousand)	30/06/16	31/12/15	Liabilities (€ thousands)	30/06/16	31/12/15
Intangible assets	91	106	Capital	159	142
Assets	10,202	7,230	Share Premium	45,541	37,817
Financial assets	144	142	Retained earnings	(30,066)	(19,665)
			Profit (loss)	(6,709)	(10,395)
			Equipment subsidies	156	0
<b>NON-CURRENT ASSETS</b>	<b>10,437</b>	<b>7,478</b>	<b>EQUITY</b>	<b>9,081</b>	<b>7,899</b>
			<b>PROVISIONS</b>	<b>40</b>	<b>30</b>
Inventories, receivables, prepaid expenses	2,376	4,313	Conditional advances and loans	9,830	10,440
Cash	9,107	10,418	Trade payables and related accounts	2,497	3,181
<b>CURRENT ASSETS</b>	<b>11,483</b>	<b>14,731</b>	Other debts	473	660
<b>TOTAL ASSETS</b>	<b>21,920</b>	<b>22,209</b>	<b>PAYABLES</b>	<b>12,799</b>	<b>14,281</b>
			<b>TOTAL LIABILITIES</b>	<b>21,920</b>	<b>22,209</b>

Cash in hand as of 30/06/16: €9.1m (audited)

The company has a mid-term financial visibility through a structured equity agreement with the Dubai-based Bracknor fund

## Equity



Total free-float: 41,3%

Existing shares as at 16/09/16: 3 200 128  
 Dilutive instruments (stock-options, Paced...): 340 760  
 Fully diluted: 3 540 888

Financial analysts	
Gilbert Dupont (Paris)	Edison (Londres)
ODDO (Paris)	Baader (Munich)
Invest Securities (Paris)	

ALGBE  
 LISTED  
 NYSE  
 ALTERNEXT

FR 0011052257



Average daily liquidity	
2012	€16 K
2013	€32 K
2014	€77 K
2015	€96 K
2016 YTD	€82 K



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## Summary

- ▶ Global Bioenergies intends to become a pillar of the energy and environmental transition
- ▶ Renewable hydrocarbons: a mature technology supported by top-level industrialists and facing surprisingly small competition
- ▶ Drivers:
  - Environmental: reduction of CO<sub>2</sub> emissions
  - Energetic: preparation of the “after-oil” in a timely rebalancing market
  - Strategic: energy independence
  - Economic: re-industrialization of rural areas
- ▶ The 2013-16 phase mostly focused at scaling-up the process
- ▶ Next 2017-19 phase mostly dedicated to commercialization of the process

## An intense newsflow expected in the coming year

- 1 Leuna
  - Start-up of production
  - Production of a first large batch of e-gasoline for Audi, first cars on the roads
  - Off-take from various industrialists
- 2 IBN-One
  - Decision on financing to run the basic engineering phase
  - First off-take agreements
- 3 Emergence of a commercial project in North America
- 4 Numerous agreements with industrial leaders

## Contact

**Jean-Baptiste Barbaroux**  
Head of Corporate Development

[jean-baptiste.barbaroux@global-bioenergies.com](mailto:jean-baptiste.barbaroux@global-bioenergies.com)

**Tel: +33 (0)1 64 98 20 50**

[www.global-bioenergies.com](http://www.global-bioenergies.com)