



**Plant-based cosmetic  
ingredients to replace  
hydrocarbons and silicones**

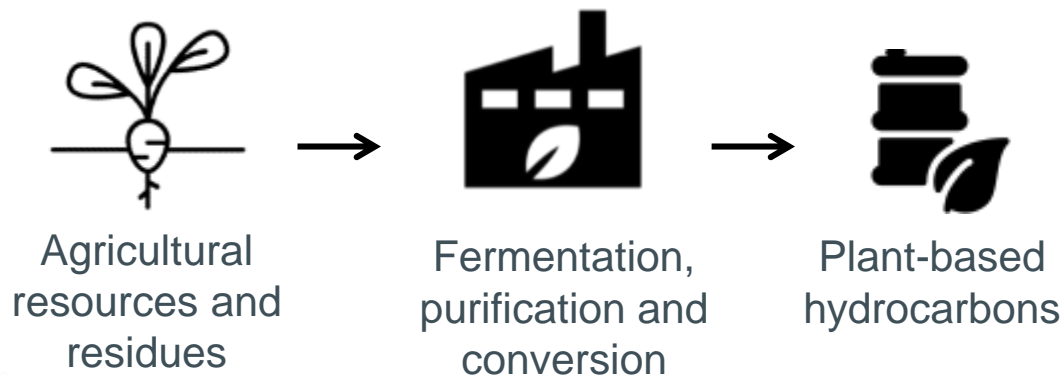
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## Making sustainability an easier choice

- A large part of today's products, fuels, plastics and cosmetics are made from petroleum, whose production and consumption contribute to global warming.
- Some alternatives exist, but their properties do not match current products.
- Using disruptive biotechnology, Global Bioenergies is proposing to different industries the products they use today (same INCI = same properties), but from plants instead of petroleum.



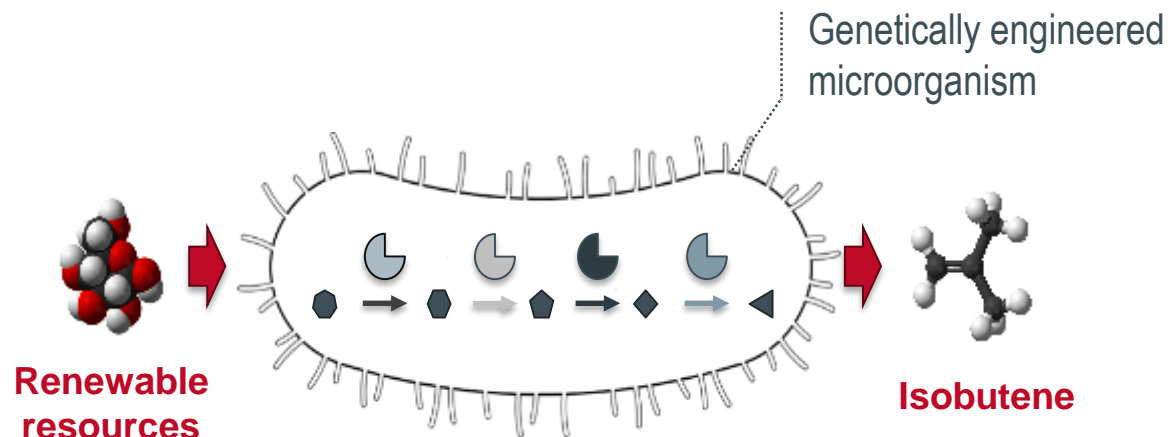
## Bringing a sustainable version of today's products



- Renewable materials
- Plant-based cosmetic ingredients

# How can it be produced renewably?

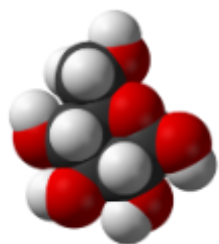
- ▶ **Synthetic biology** has enabled Global Bioenergies to create “**Microbial factories**”



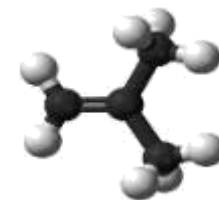
- ▶ This **breakthrough innovation**:
  - Opens up a new domain: the direct production of gaseous hydrocarbons
  - Is protected by 32 patent families



# A simple and robust two-steps technology



Glucose  
Sucrose



Isobutene

1

## Fermentation

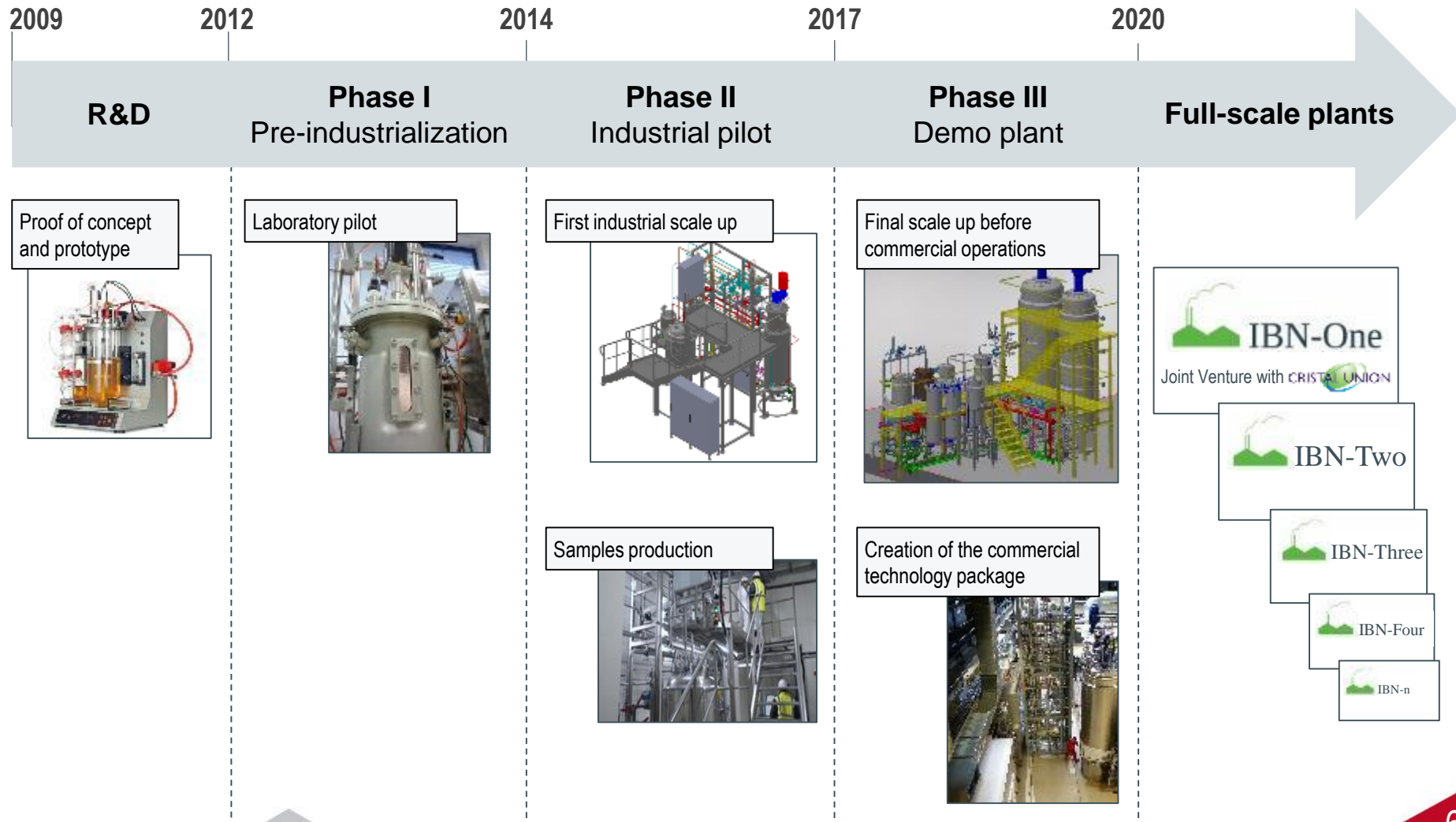
Breakthrough technology:  
direct fermentation to a gas

2

## Purification


Combination of proven  
petrochemical modules




# Approaching commercial maturity



# IBN-One: first commercial plant project

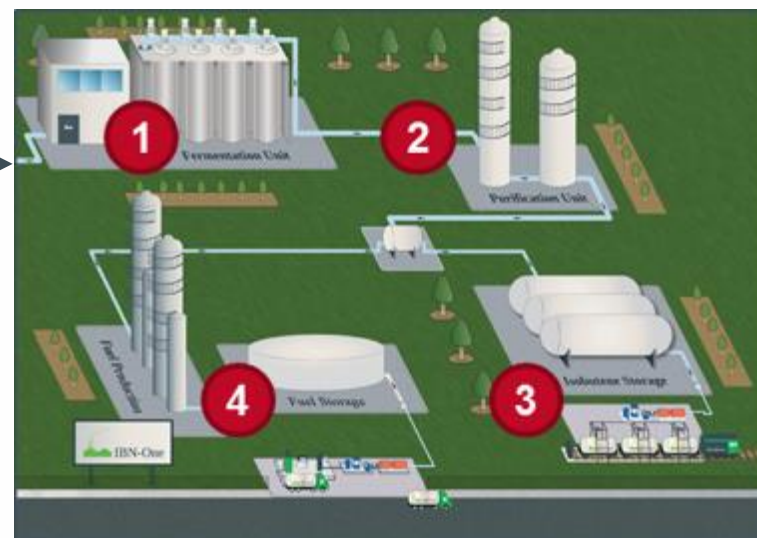
- ▶ Supported by the ADEME *Investissements d'Avenir* program
 




- ▶ Estimated CAPEX: €115 million to be funded by
  - Cristal Union
  - Public & Private infrastructure funds
  - Banking debt
- ▶ Engineering studies:  **TechnipFMC**  
 **IPSB**  
Ingénierie des Procédés Industriels  
Génie des Procédés Industriels
- ▶ Commercial operations to start in 2021
- ▶ LOIs to support investment decisions

- 1 Production** – 120-200Kt industrial sucrose are converted into 30-50Kt gaseous, low purity isobutene
- 2 Purification** – isobutene is isolated from surrounding fermentation gases
- 3 Shipping** – Liquid high purity isobutene (99.7%) is stored and shipped for chemical applications
- 4 Conversion** – Part of the production is converted on site into oligomers (cosmetic ingredients, biofuels)

Sugar mill



# Plant-based cosmetic ingredients



- Isododecane (2,2,4,6,6-pentamethylheptane)
  - Volatile emollient
  - High spreadability
- Isohexadecane (2,2,4,4,6,8,8-heptamethylnonane)
  - Emollient
- Derivatives of isobutene:
  - Polyisobutenes
  - Isononyl isononanoate
  - Fragrances (citral, citronellol, linalool, menthol)





## Substitution of silicones and mineral oil

- Silicones have been demonstrated to be harmful for the environment, with evidence of bioaccumulation in the marine ecosystem.



- Silicones in cosmetics are becoming a concern for customers → in 2016, in Germany, 12% of new skin care products launched had the “**free from silicones**” claim.
  - Isododecane is a volatile emollient which can replace cyclomethicone (cyclopentasiloxane).
  - Isohexadecane can replace dimethicone
- Plant-based ingredient can also replace mineral oil and isoparaffinic solvents derived from petroleum.



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# OPTISOCHEM

OPTimized conversion of residual wheat straw  
to bio-ISObutene for bio based CHEMicals

The beneficiaries must — during the action and afterwards — ensure the visibility of EU funding for any communication activity related to the action (including in electronic form, via social media, etc.) and on any infrastructure, equipment or major result including prototypes) funded by the grant, by:

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And this sentence:

*“This project has received funding from the Bio Based Industries Joint Undertaking (BBI JU) under the European Union’s Horizon 2020 research and innovation programme under grant agreement No 744330. This publication reflects the views only of the author, and the BBI JU cannot be held responsible for any use which may be made of the information contained therein.”*





# Overview on methodology and activity

