Braskem:
New ways to look at the world

Workshop for Sustainable Production of Biopolymers
and other bio-based products
July, 2012

Braskem

Agenda

- ✓ Introduction: Braskem
- ✓ Innovation and Technology
- ✓ Braskem Green Ethylene and Propylene
- ✓ NEXT STEPS: Synthetic Biology
- ✓ Open Innovation

Odebrecht Group

PETROBRAS

ODEBRECHT

ODEBRECHT Engenharia e Construção	*Engineering & Construction*	
ODEBRECHT TRANSPORT	*Investment in Transport, Logistics and Airport in Brazi*	
ODEBRECHT	*Investment in Energy and Infrastructure*	
ODEBRECHT Oil & Gas	*Services in Oil & Gas*	
foz	*Investments in Water and Sewage and Waste Treatment*	
OR	*Real State*	
ETH	*Ethanol, Sugar and Bioenergy*	
Braskem	*Chemical and Petrochemical*	

BRAZILIAN PETROCHEMICAL INDUSTRY

INTEGRADO NA CADEIA

NAFTA CONDENSED GAS

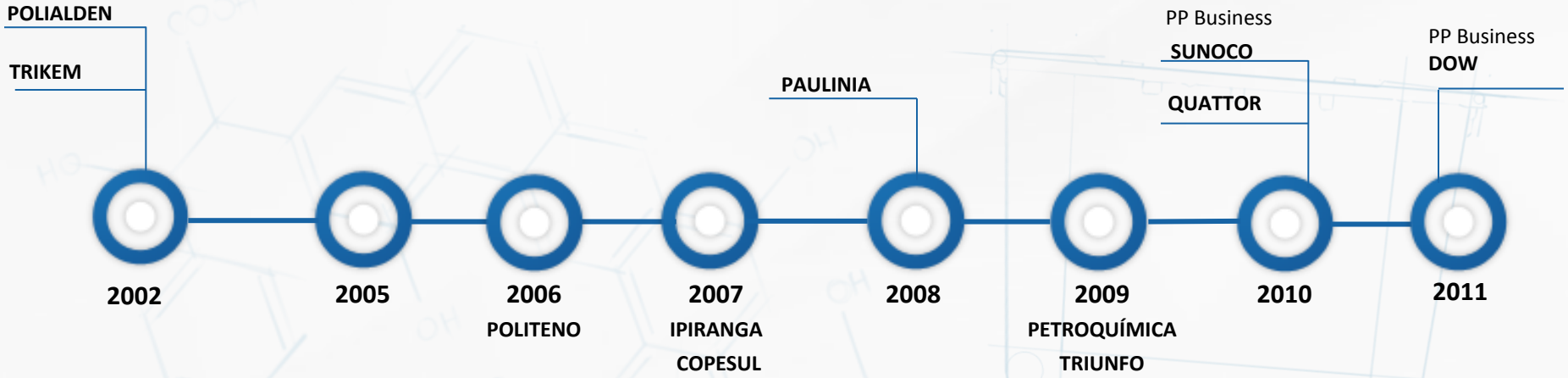
ADDED VALUE COMPETITIVINESS

EXTRACTION Raw Material	**1ª GENERATION** Basic Petrochemicals	**2ª GENERATION** Thermoplastics resins	**3ª GENERATION** Plastic Converters

Braskem

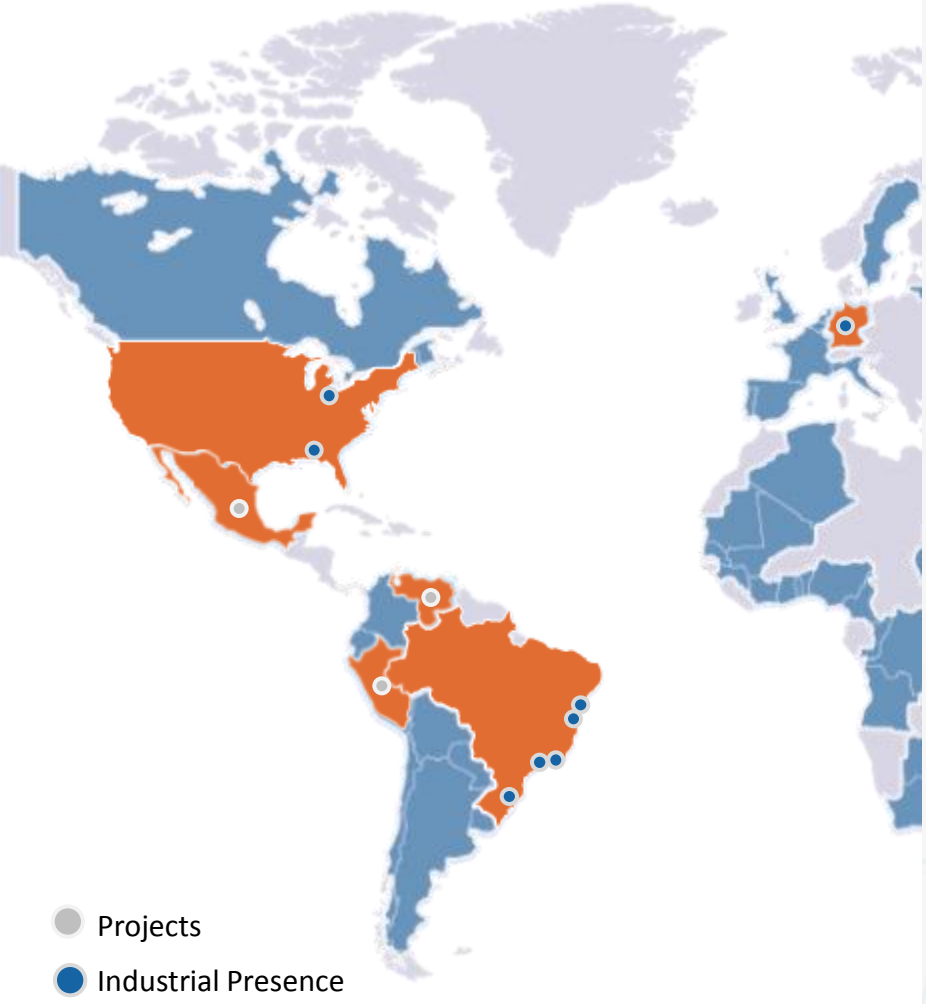
Vision 2020

To be the world leader in **sustainable chemistry**, **innovating** to **serve people** better.



Braskem

35 industrial Units



Bahia - Brazil

1 UNIB

4 PE

1 PP

1 PVC

1 Chlorine Soda

Alagoas - Brazil

1 PVC

1 Chlorine Soda

São Paulo - Brazil

2 UNIB

2 PE

2 PP

Rio de Janeiro - Brazil

1 UNIB

1 PE

1 PP

Rio Grande do Sul - Brazil

2 UNIB

5 PE

2 PP

United States

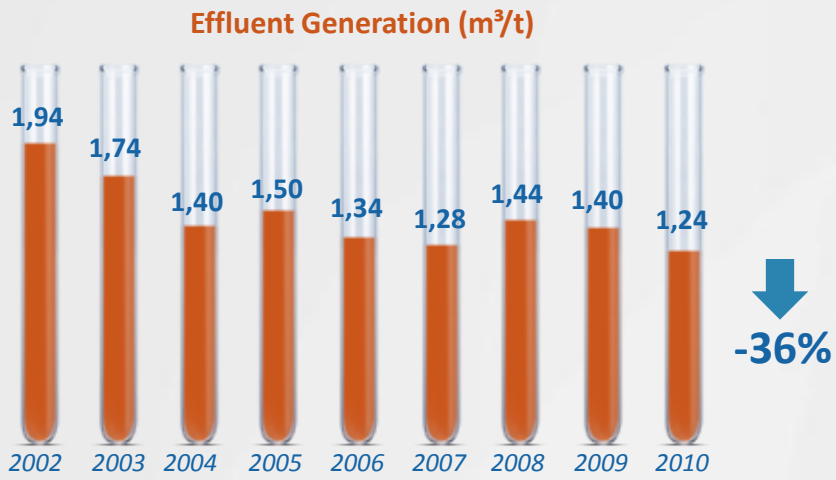
5 PP Neal | La Porte | Marcus Hook | Freeport | Seadrift

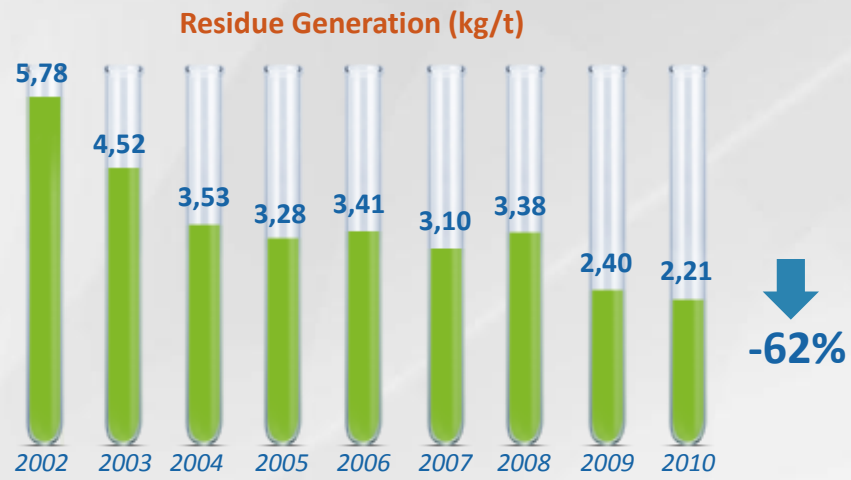
Germany

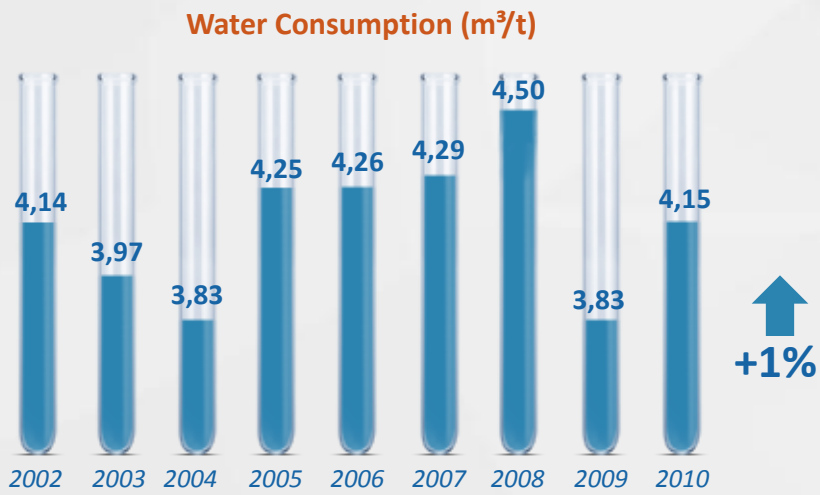
2 PP Wesseling | Schkopau

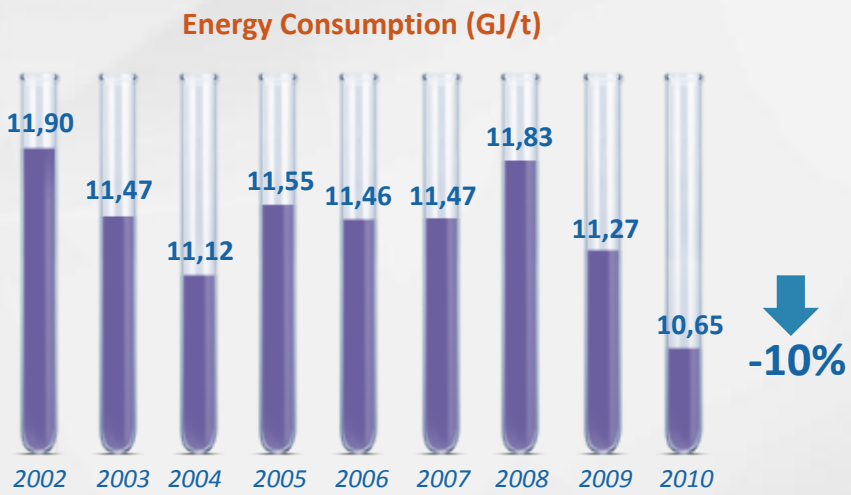
Source: Braskem

CONSISTENT EVOLUTION OF ECO-EFFICIENCY INDICATORS









Braskem pro forma for 2002

GROWTH WITH IMPROVED COMPETITIVENESS

New Projects

Projects with Petrobras

BRAZIL

PVC Alagoas

Expansion of capacity to **200 kt/year of PVC in Alagoas**

Investments of around **US$ 500 million**, and operational startup expected in the **2nd half of 2012**

Butadiene Rio Grande do Sul

Expansion of capacity to **100 kt/year** at an investment of R$ 300 million

Partnership with Petrobras for new projects (under appraisal)

Comperj: production and sale of resins and basic petrochemical products. Located in **Rio de Janeiro state**

Source: Braskem

GROWTH WITH IMPROVED PRODUCTIVITY

New Projects

Projects with Petrobras

VENEZUELA

JVs WITH PEQUIVEN THROUGH FINANCING OF PROJECT WITH NET EQUITY OF JUST 30% (UNDER ANALYSIS)

Polipropileno del Sur – Propilsur
~350 kt/year of PP

Polietilenos de America – Polimerica
1.3 Mt of ethylene and 1.1 Mt/year of PE

PERU

Braskem, Petrobras and PetroPerú concluded studies for the technical and economic pre-feasibility of an integrated project to produce between **600 kt and 1,000 kt/year** of ethane and polyethylene using the natural gas available in Peru as raw material

Source: Braskem

GROWTH WITH IMPROVED PRODUCTIVITY

New Projects

Projects with Petrobras

MEXICO

ETHYLENE XXI PROJECT: Startup in 2015

Partnership with the Mexican group IDESA **(65% Braskem, 35% IDESA)** to build an integrated petrochemical complex to produce **1 Mt/year ethylene and 1 Mt/year of PE** using raw material (ethane) supplied by PEMEX

Investments estimated at **US$ 3 billion** over **5 years**

Source: Braskem

Innovation and Technology

298 people (16% PhD, 30% of researchers MSc and Post – Graduate)

Innovation Pipeline: **US$ 1.6 bi** (RANPV)

428 Patent applications

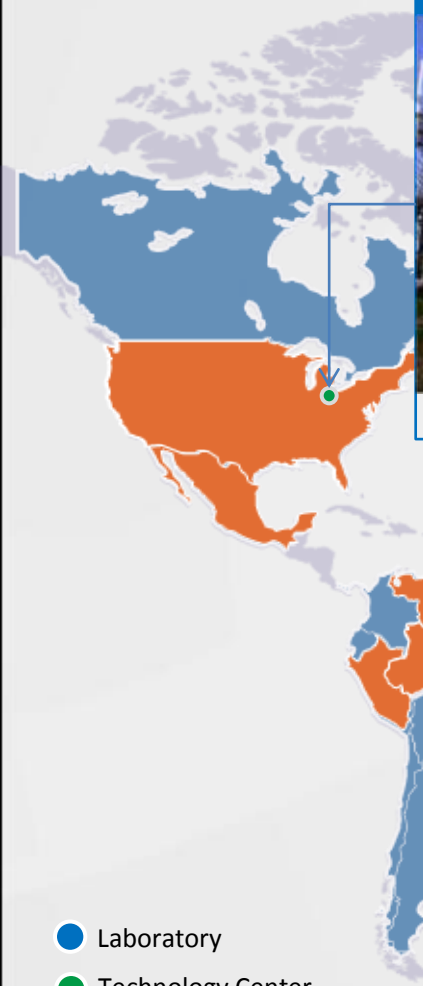
24 Laboratories + **8** pilot plants

Global Agreements in Technology

I&T Assets: **US$ 240 MM** (2011)

INNOVATION AND TECHNOLOGY

Technology center and laboratories



BRASKEM TECHNOLOGY CENTER – PITTSBURGH (EUA)

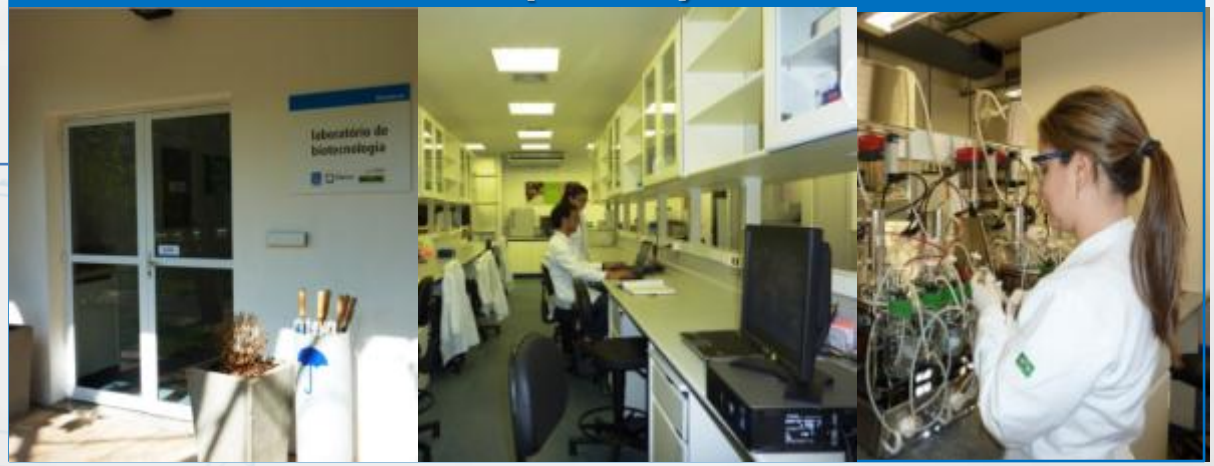
BRASKEM TECHNOLOGY CENTER – TRIUNFO/RS (BRAZIL)

INNOVATION AND TECHNOLOGY

Technology center and laboratories

UHMWPE FIBER LABORATORY BRASKEM– CAMAÇARI/BAHIA (BRAZIL)

BIOTECNOLOGY LABORATORY BRASKEM – CAMPINAS/SP (BRAZIL)



Braskem Green Polyethylene

- Startup **Sept 24, 2010**
- Volume **200kton/year**
- Investment **US$ 290 MM**

Braskem is the leading global supplier of biopolymers

Green Polyethylene
An alternative to traditional PE

Traditional

Sustainable

Oil

Gas

Polyethylene

Ethanol

Green Polyethylene
An alternative to traditional PE

Traditional

Sustainable

Oil

Gas

Polyethylene

Ethanol

Braskem green Polyethylene
Unique product characteristics

Oil

Fully identical characteristics

Sugar Cane

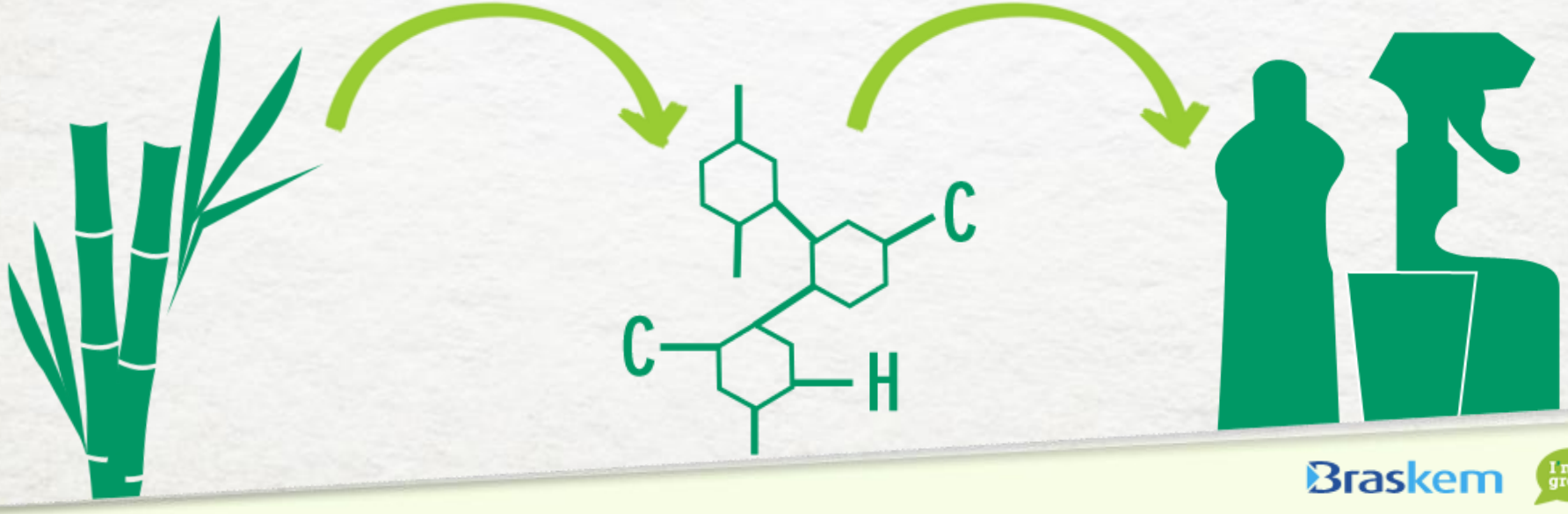
Petrochemical Polyethylene

Green Polyethylene

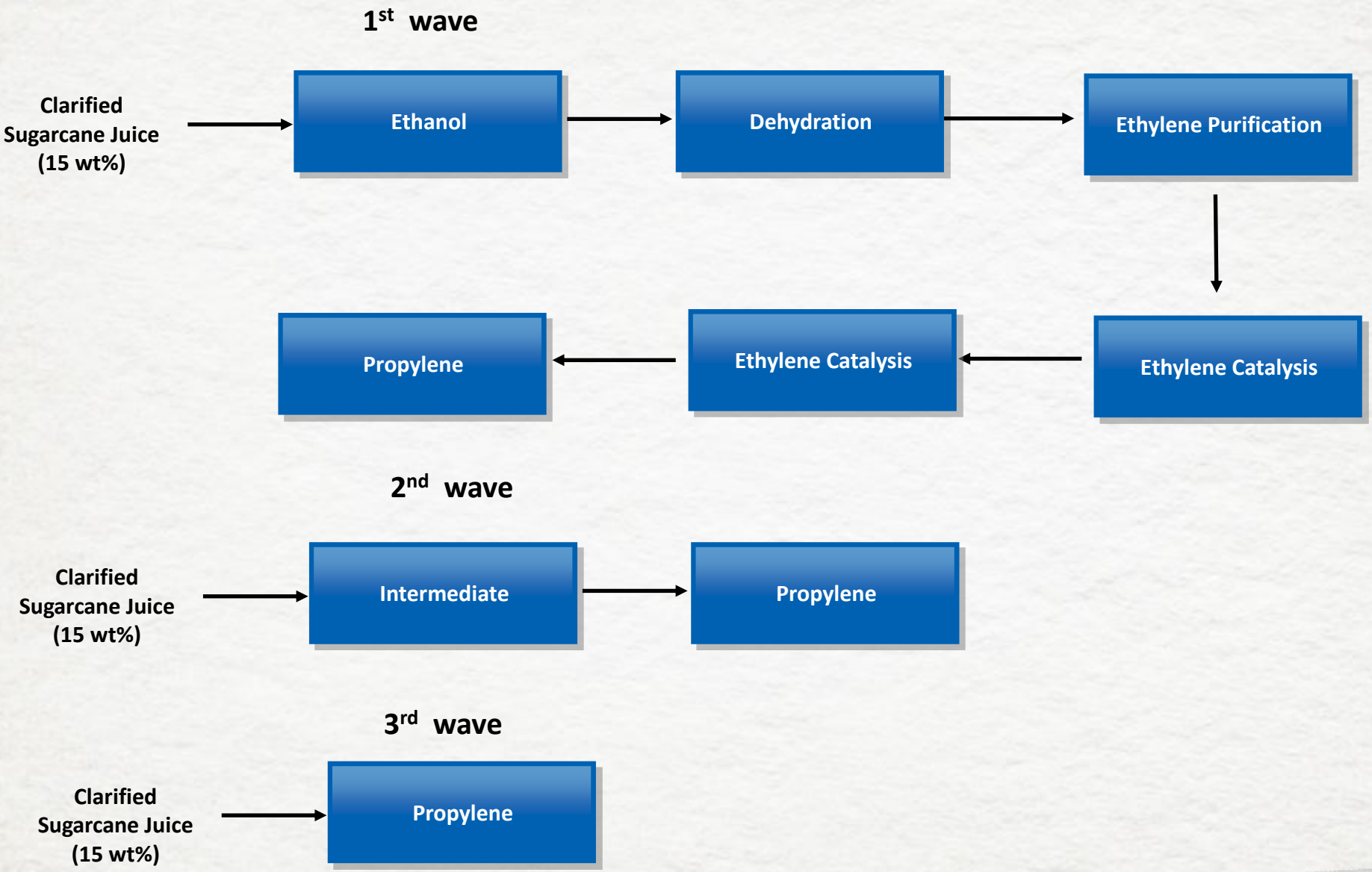
- Green PE **can be recycled in the same stream already** established for the petrochemical PE
- Green PE can also be **incorporated in the current converter's production systems**

Next Steps

- **New Green PE Plants**
- **New product:**
  Green Polypropylene
  - First green PP
  - Lab scale production and Biobased Verification
  - Ongoing research to develop competitive go to market strategy
  - Medium term commercialization



Next Steps – PP new technologies



Green propylene

New biotech laboratory in Campinas

+ 25 researchers

Cooperation projects with

CNPEM
Centro Nacional de Pesquisa em Energia e Materiais

LNBIO
Laboratório Nacional de Biociências

UNICAMP

FAPESP

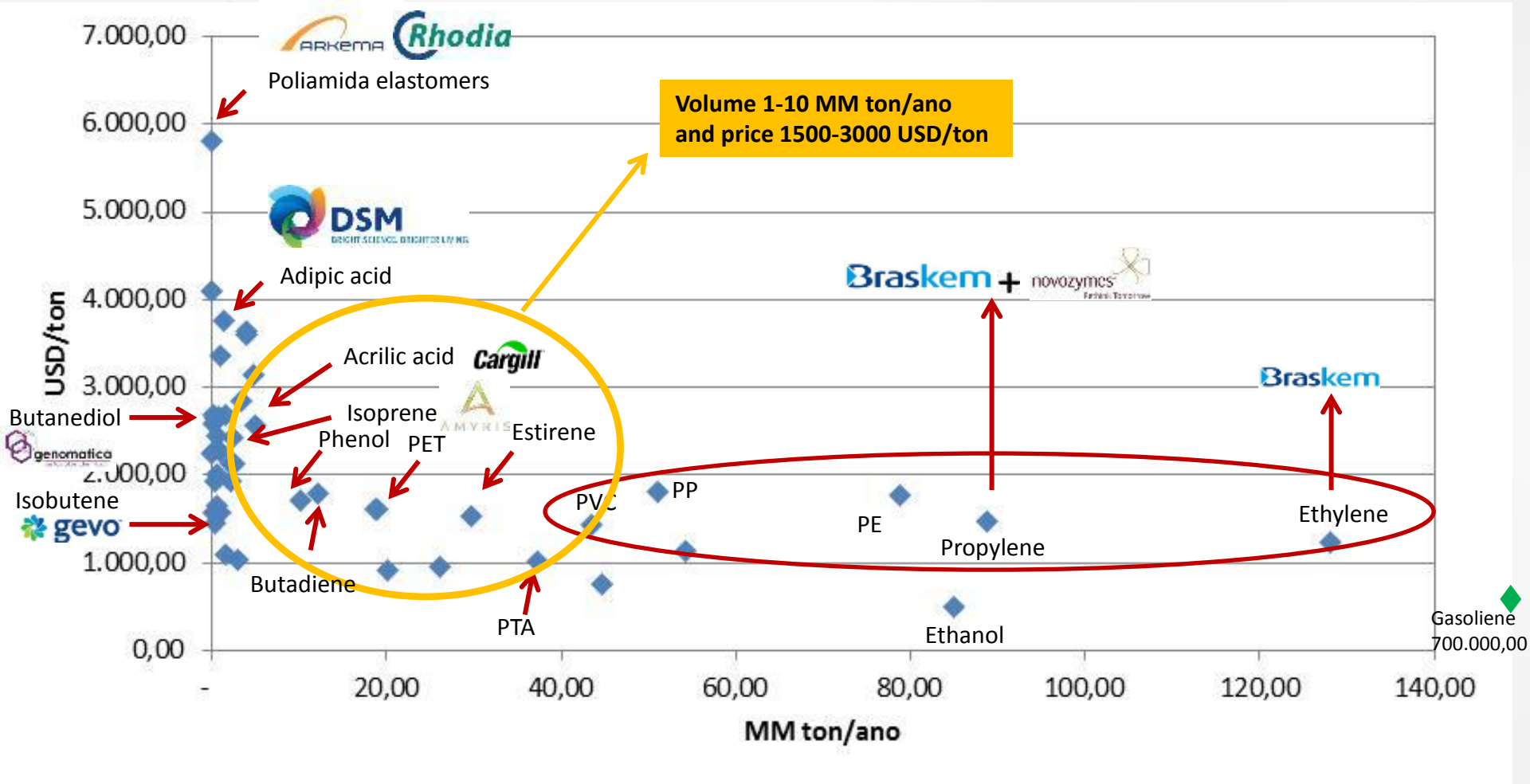
novozymes
Rethink Tomorrow

Braskem

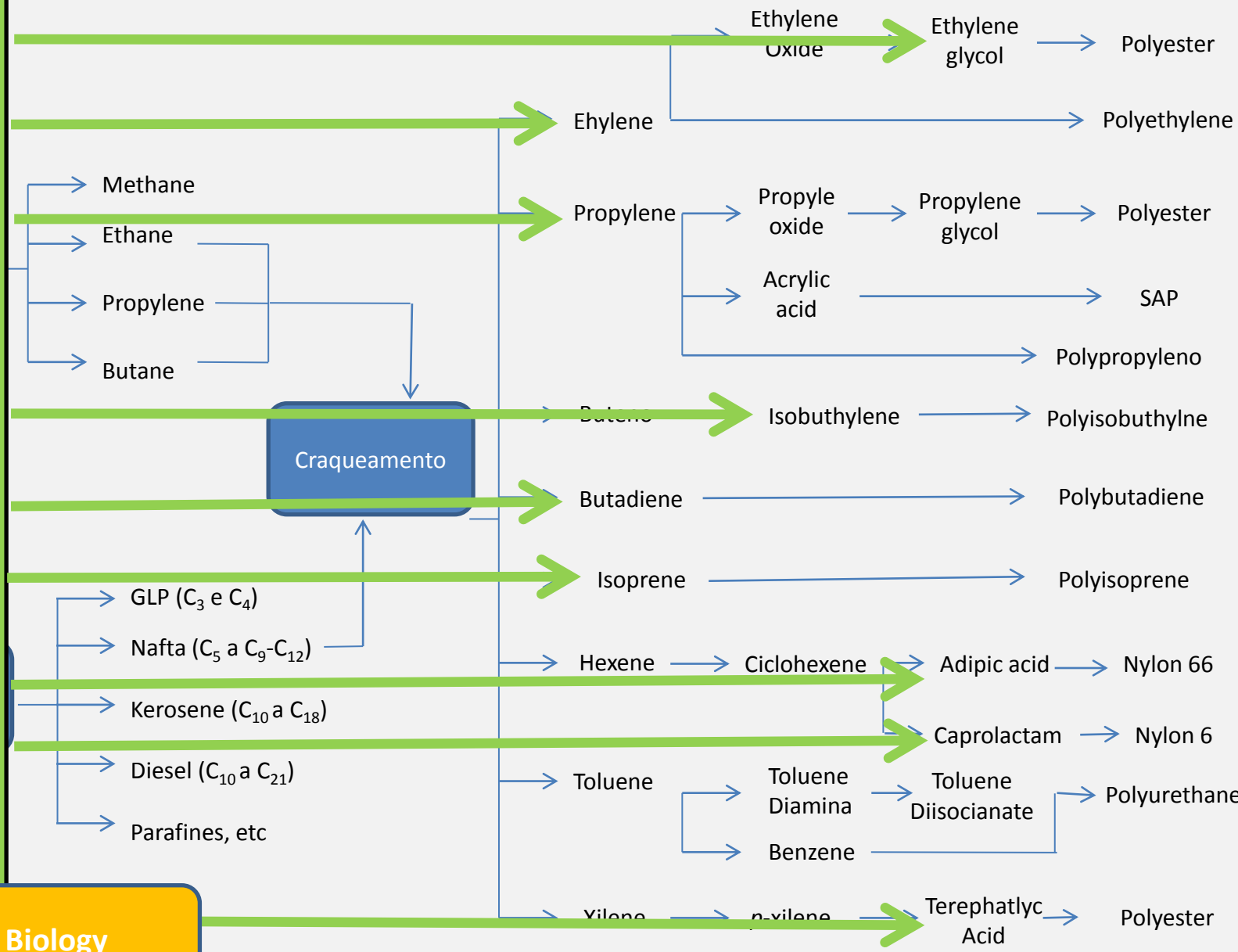
Bioplastic estrategy

Phases	1st wave To know the market 2010-2014	2nd wave To growth 2015-2019	3rd wave To consolidate 2020 - beyond
Capacity			
Green PE	**200 kta Green PE** (Triunfo RS)	New Capacities Green PE	Additional Capacities Green PE
Green PP	**30 kta** Green PP Existing Technology	New Capacity Green PP **(Improved Tech)**	Higher Capacityies Green PP **(Biotech Route)**
Total Capacity	**230 kta**	**TBD**	**TBD**

Price versus volume



Carbohydrates



Synthetic Biology

Open Innovation

- **Request for research projects**
  - FAPESP (The State of São Paulo Research Foundation) – USD ~15 MM BRASKEM + ~15 MM FAPESP for joint projects with Braskem and Universities from the State of São Paulo – results for the second call will be published soon
  - FAPESB (The State of Bahia Research Foundation) – USD ~950 M BRASKEM + ~950 M FAPESB for joint projects with Braskem and Universities from the State of Bahia – submission open

- **Focus**
  - Biobased chemicals and polymers
  - Capture, storage or conversion of CO_2
  - PE, PP, PVC

Open Innovation

- **Braskem's Msc and PhD scholarships**
  - A total of 10 masters scholarships and 10 doctorate scholarships will be funded by Braskem.
  - Topics of interest:
    1. Chemical products from renewable raw materials;
    2. Post-consumption solutions for plastic;
    3. Development in the area of processes, products and catalysts for the petrochemical industry.

Open Innovation

SynBERC

ng Research Center

Braskem is looking for researchers in this area: synthetic biology, protein engineering, molecular biology, chemistry and biochemistry.

UCSF University of California San Francisco

Massachus Institute of Technology

VE RI TAS HARVARD

BRASKEM- RENEWABLE ROADMAP

Market - DRIVERS

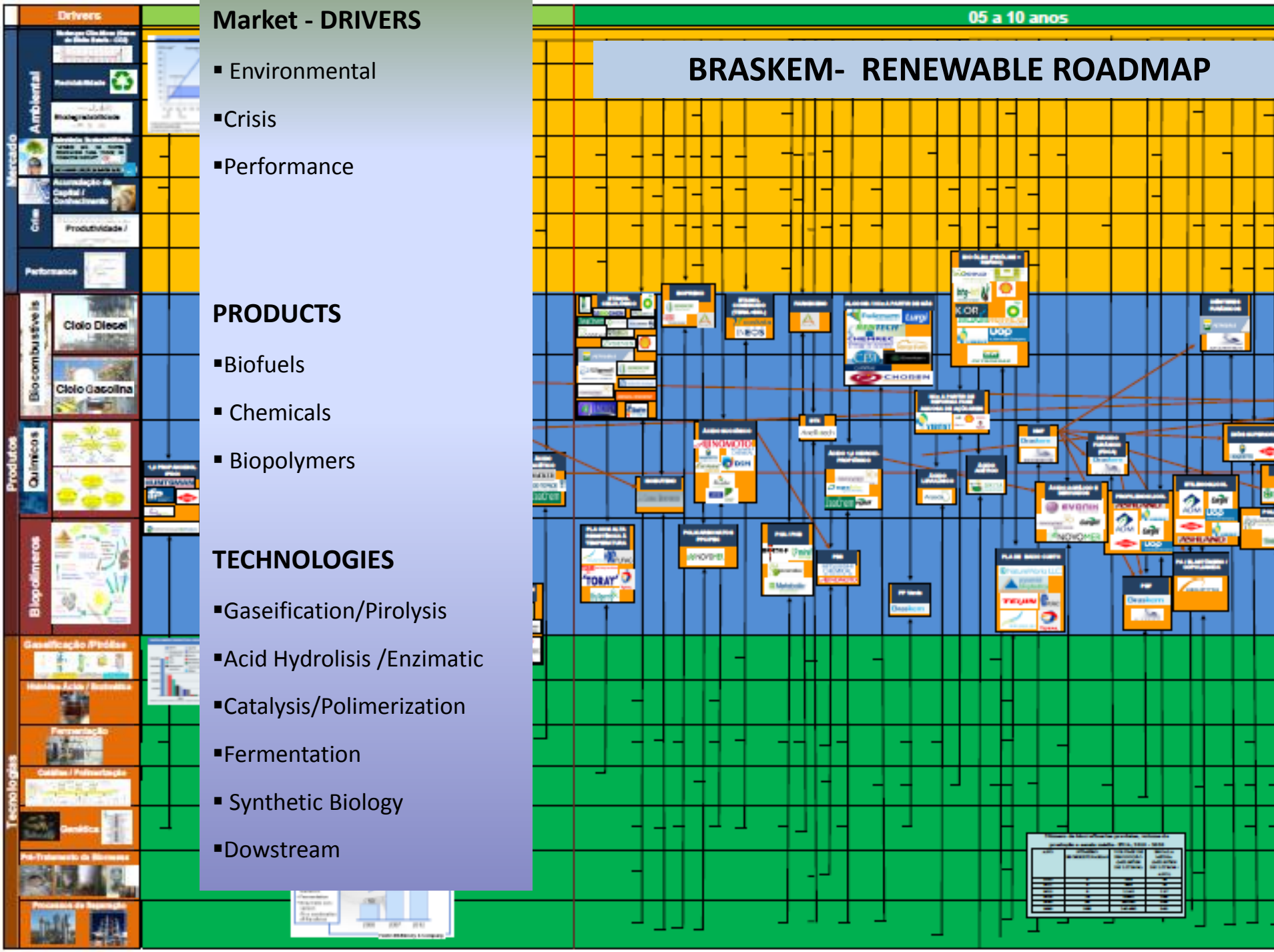
- Environmental
- Crisis
- Performance

PRODUCTS

- Biofuels
- Chemicals
- Biopolymers

TECHNOLOGIES

- Gaseification/Pirolysis
- Acid Hydrolisis /Enzimatic
- Catalysis/Polimerization
- Fermentation
- Synthetic Biology
- Dowstream



I'm green™

Plastic

Renewable source
Carbon reduction

Braskem

Mateus Lopes

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THANK YOU!