



**avantium**

# Investor Presentation

## Annual results 2022

Q2 2023



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# Today's speakers



**Tom van Aken**

CEO

 Since 2002

25y of industry experience

*Selected previous experience:*



**Boudewijn van Schaik**

CFO

 Since 2023

20y of finance experience

*Selected previous experience:*



## 2022 Results:

From Ambition  
to Execution



# 2022 was a transformative year

## Evolving from a R&D company into a large-scale commercial organisation

2022

2023



FDCA / PEF

✓ Start construction FDCA Flagship Plant, construction progressing well.

✓ Nine new offtake agreements PEF/FDCA Flagship Plant signed, incl Carlsberg, LVMH, AmBev, Kvadrat and Henkel

✓ First technology license agreement signed with Origin Materials



plantMEG

✓ Operations Ray pilot plant successfully restarted

✓ Preparations to scale up to a commercial facility for plantMEG™ and plantMPG™ have begun



Volta

✓ Awarded a €3 million grant for participation in Waterproof programme

✓ Two demonstration units have been trialled at industrial sites in Germany and Greece



R&D Solutions

✓ New growth strategy focusing on R&D solutions for sustainable chemistry

✓ Proven revenue stream, with €11.3 million revenues in 2022

✓ Solid backlog for Systems and Products



Company

✓ Avantium secures €90 million debt financing from consortium of banks

✓ Avantium successfully raised €45 million through a public equity offering

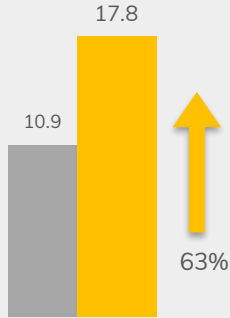
✓ Avantium awarded Gold Sustainability Medal by EcoVadis

✓ Workforce increased by 16.3% to 264 employees

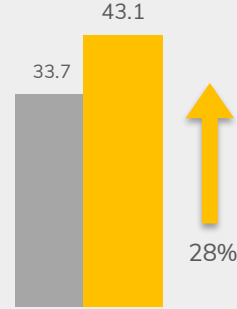


# Financial Highlights 2022

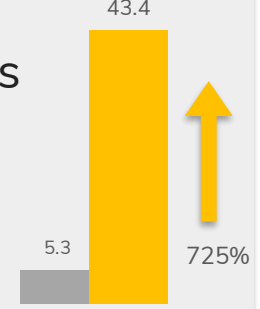
## Revenue (in € million)



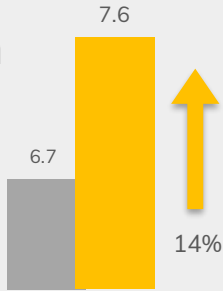
## Operating Expenses (in € million)



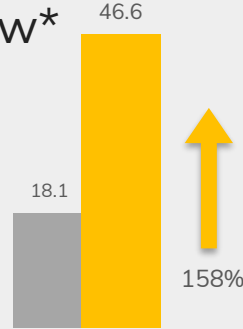
## Capex Investments (in € million)



## Grant Recognition (in € million)

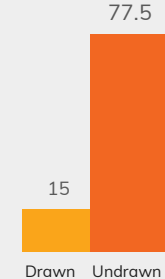


## Cash Outflow\* (in € million)



\* Excludes debt and equity fundraising

## Borrowings (in € million)



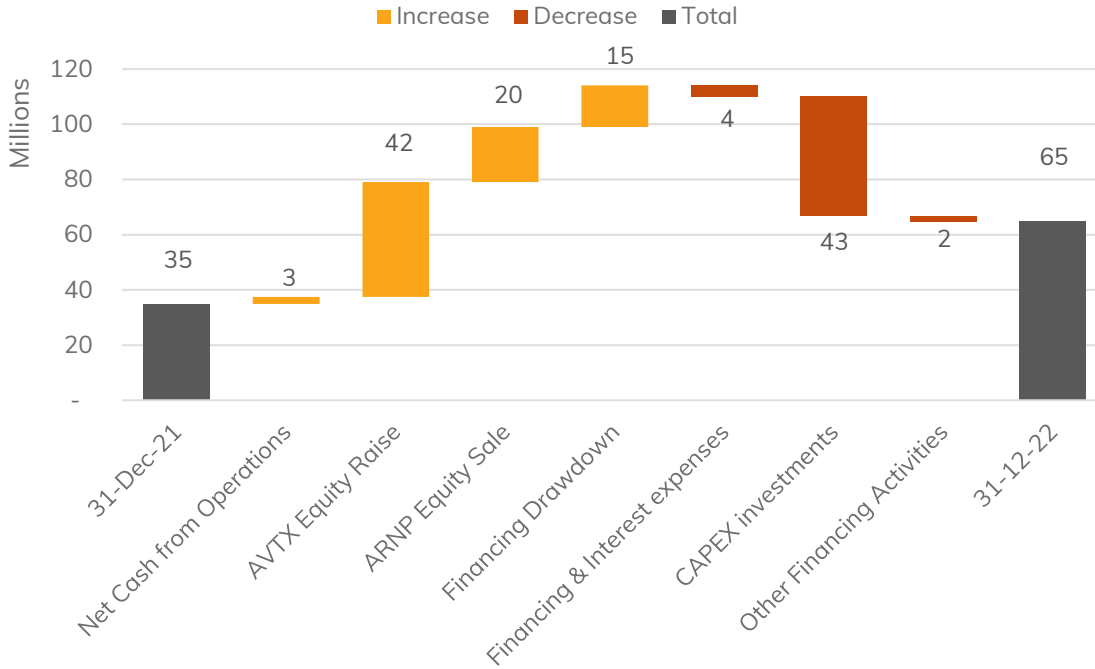
Debt matures in 2025 and includes extension options

2021

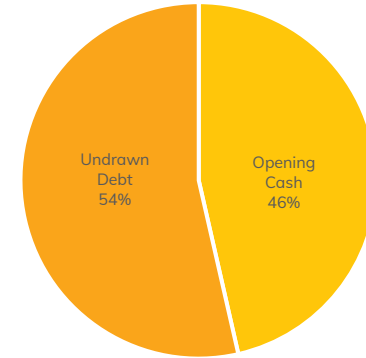
2022



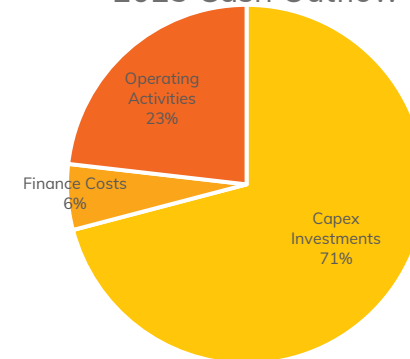
# Cash and funding



2023 Liquidity



2023 Cash Outflow

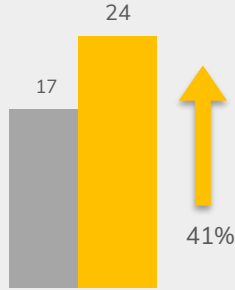


Figures are an initial management assessment



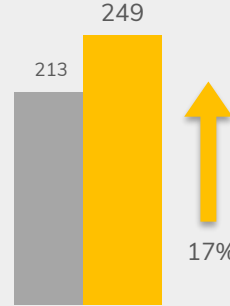
# Non-Financial Highlights 2022

Newly  
Granted  
Patents



41%

Number of  
FTEs



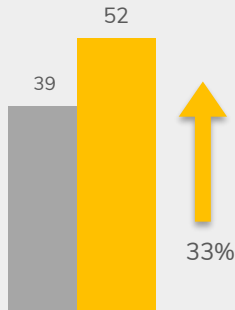
17%

Scope 1  
Emissions  
(in tonnes CO<sub>2</sub>e)



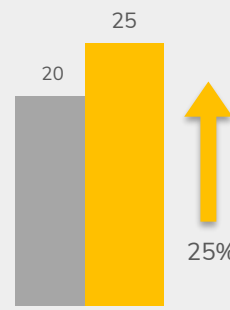
0.436

Newly  
Reported  
Inventions



33%

Nationalities  
Employed



25%

Scope 2  
Emissions  
(in tonnes CO<sub>2</sub>e)



649

2021

2022





# Chain Reaction 2030 – At a glance

## Our Technologies

We will accelerate innovation to deliver products that use renewable carbon and support the circular economy.

### Targets



By 2030, our technologies will deliver 1.5 million tonnes of CO<sub>2</sub> savings across the chemical industry.



By 2030, we will become a circular business.



By 2030, 100% of our plant-based feedstock for Renewable Polymers and Renewable Chemistries will come from sustainable sources.

## Our Leadership

We will be the leading advocate for greater action by the chemical industry to address the climate emergency.

### Targets



By 2030, 100% of our advocacy will focus on transforming the chemical industry to becoming circular and fossil-free.

## Our Operations

We will minimise the impact of our own operations and have net-zero carbon emissions.

### Targets



By 2030, our own operations will achieve net-zero carbon emissions.



By 2025, we will send zero non-hazardous waste to incineration and landfill.



By 2023, all our plants will achieve an ISO45001 certification (healthy and safe working environment).

## Our People

We will mobilise our colleagues and the next generation of scientists to help solve the climate's most pressing problems.

### Targets



By 2030, Avantium will be one of the 10 best companies to work for in the Netherlands.



By 2030, we will have engaged 100,000 students about using chemistry to create a fossil-free world.



By 2025, we will improve upon our baseline of being an inclusive and diverse company, ensuring that we are representative of the societies and communities we operate within.



# Introduction

AVANTIUM AT A GLANCE



# Avantium at a glance: a leader in renewable chemistry

Who we are

A leader in the high-growth industry of renewable chemistry within the ecosystem of the polyester value chain

Our mission

Develop and commercialize disruptive technologies and products to accelerate the transition from fossil-based to renewable and circular plastics

Our ambition

Leading the transition to a fossil-free chemical industry by 2050

Our strategy

Monetize our proprietary technologies by applying them in our commercial production plants through partnerships or joint ventures; or by licensing them to third parties



# Avantium: innovation-driven chemical technologies

Producing chemicals from renewable sources for a wide range of consumer goods

- Two lead products:



FDCA: the chemical building block for PEF



plantMEG: sustainable and competitive plant-based alternative for fossil-MEG

- A pipeline of proprietary chemical technology programmes:



Volta: Conversion of CO<sub>2</sub> to chemicals and polyesters via electrochemistry



Dawn: Biorefinery process for industrial sugars and lignin from forestry residues

- Supported by a revenue-generating R&D Solutions business
- HQ in Amsterdam - listed on Euronext Amsterdam, Brussels (AVTX)

PEF = polyethylene furanoate  
PET = polyethylene terephthalate  
FDCA = furandicarboxylic acid  
MEG = mono-ethylene glycol

FDCA Pilot Plant  
(since 2011)



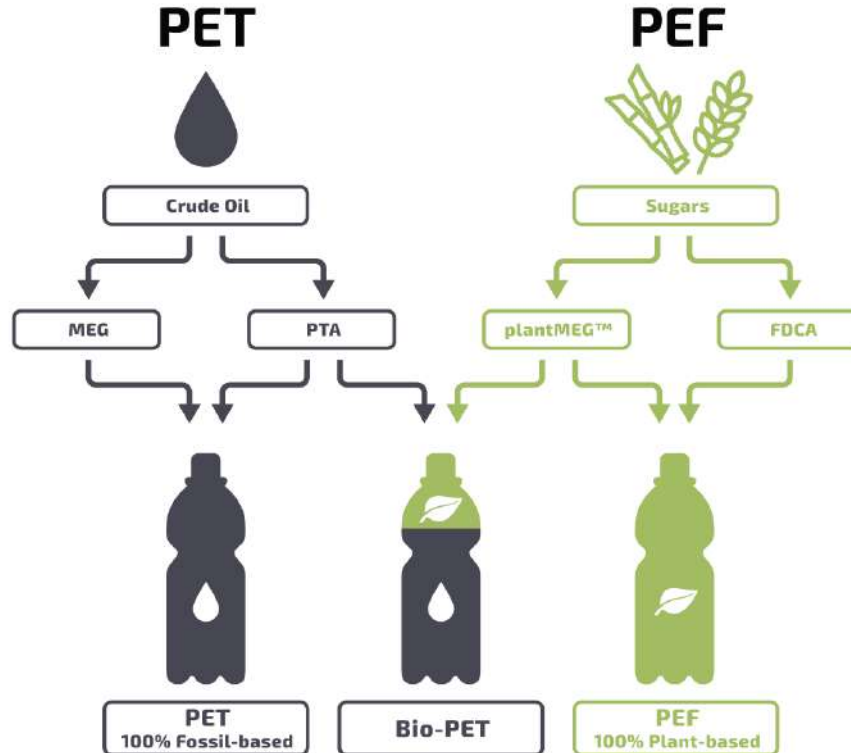
PlantMEG Pilot Plant  
(since 2019)



Pilot Biorefinery  
(since 2018)

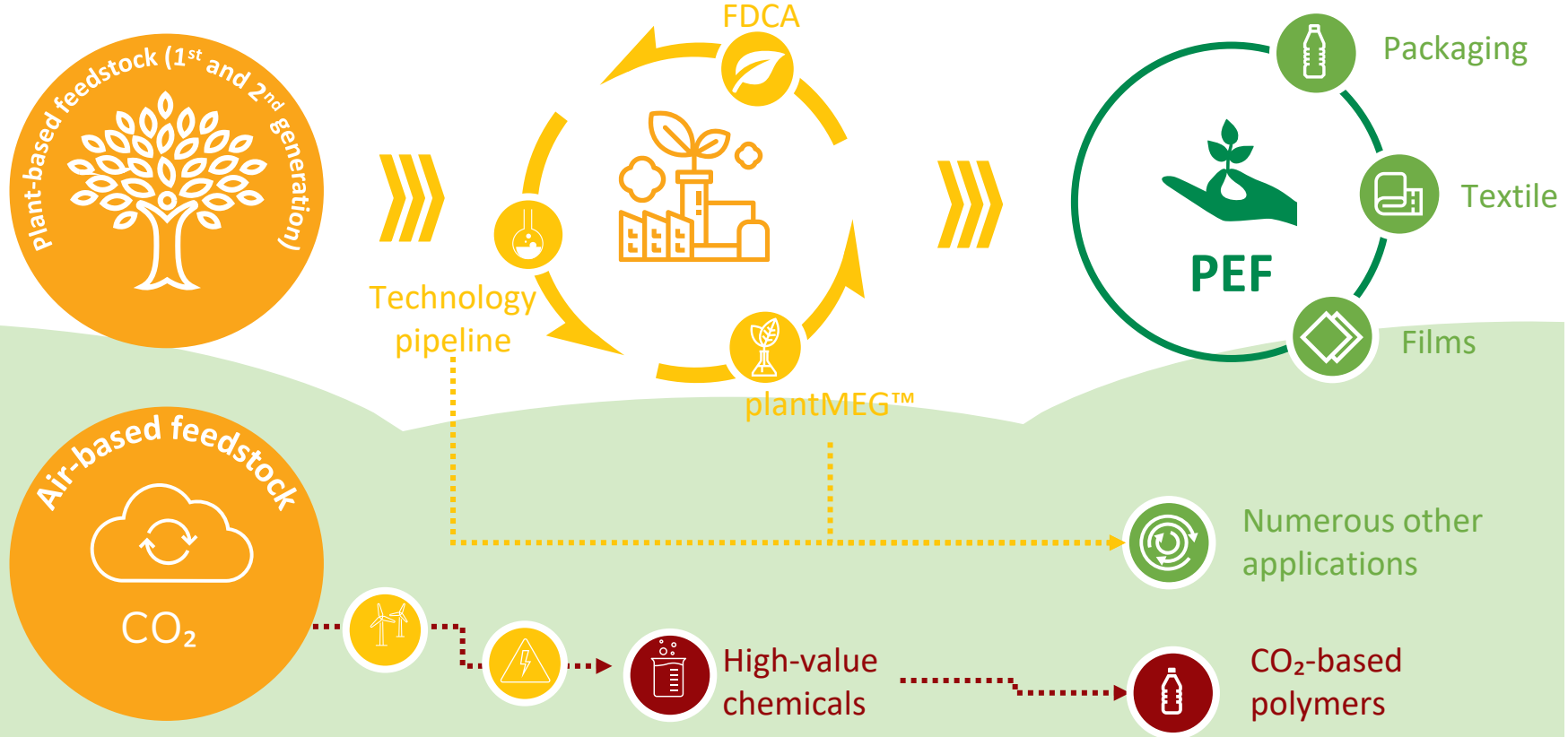


PEF is a 100% plant-based plastic made from our two core products FDCA and plantMEG™



# Avantium's leading technologies in renewable chemistry

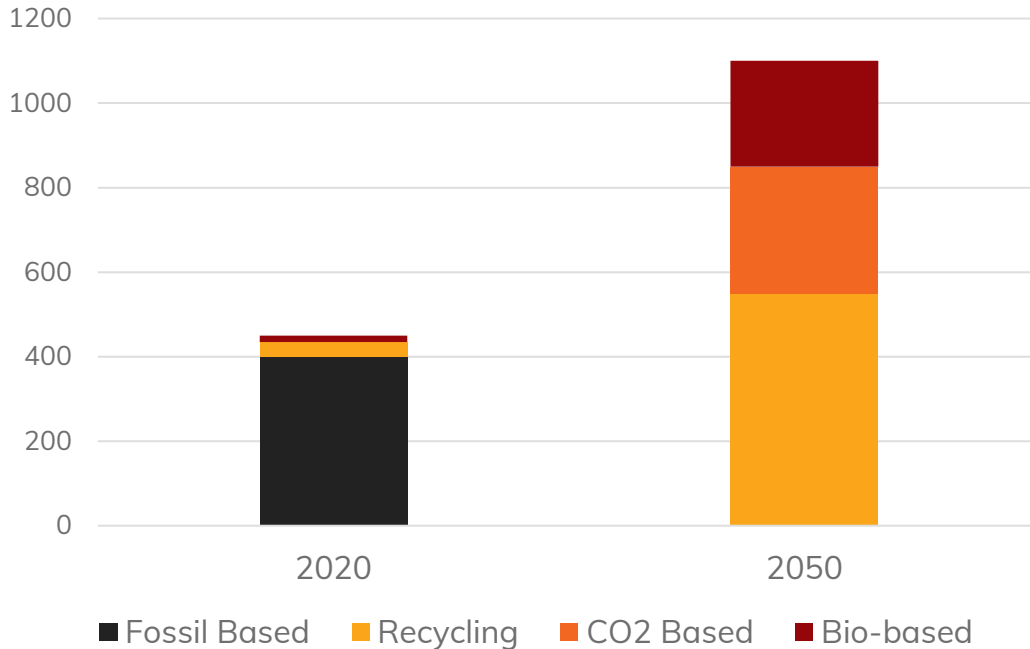
Focused on plant-based & air-based plastics and chemicals



# Challenges cannot be solved by recycling only



Global Carbon Demand for Chemicals and Derived Materials in 2020 and Scenario for 2050 (in million on tonnes of embedded carbon)



Source: Nova Institute, 2020

“ America simply **does not have enough recycled PET supply or processing capacity to satisfy commitments being made by brand owners to increase recaptured resin content in their bottles.** ”

NAPCOR<sup>(1)</sup>

“ We won't recycle or dispose our way out of plastic pollution... Future scenarios focused on collection, recycling, and disposal alone have been shown to fall short, with high ocean leakage and GHG emissions... **Upstream innovation offers opportunities to rethink how products can be delivered to users without the need for single-use packaging.** ”

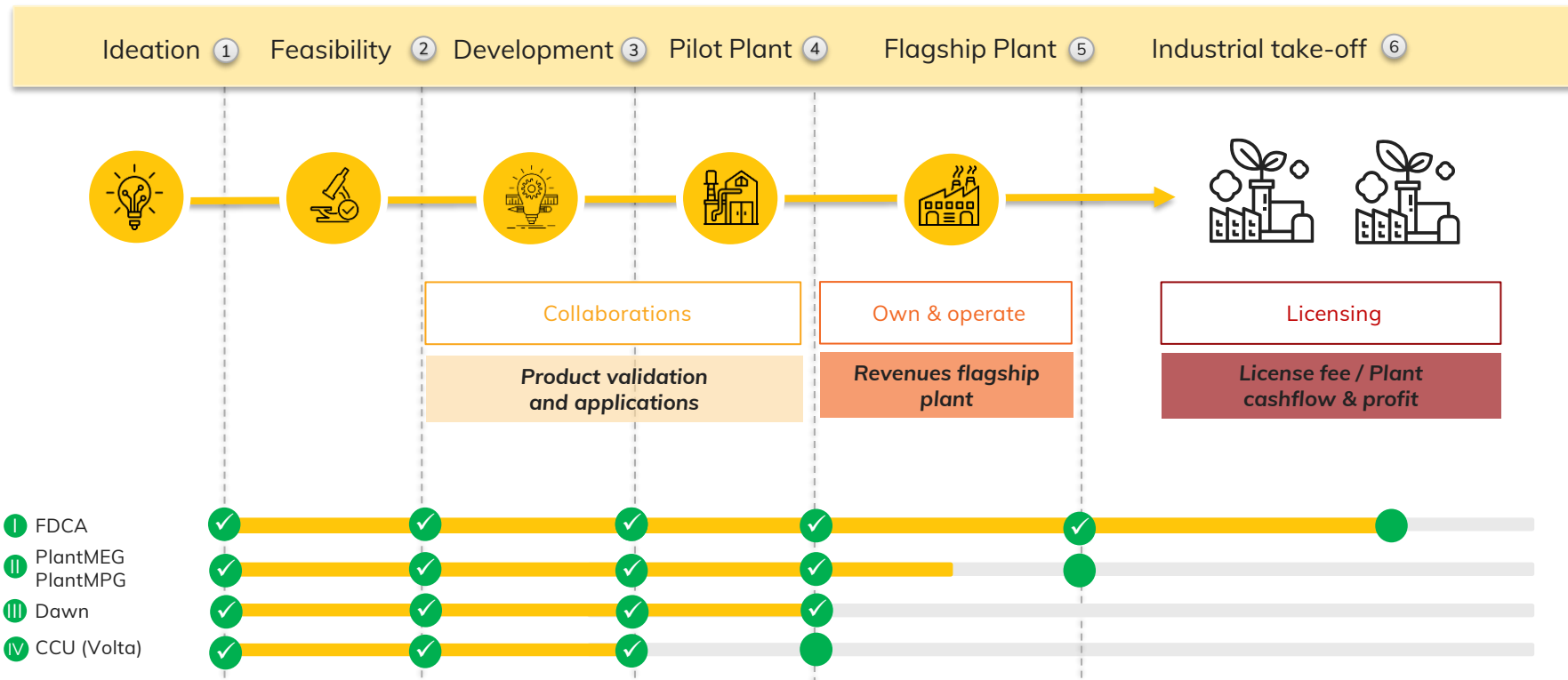
The global commitment 2021 Progress Report



Note (1) National Association for PET Container Resources

# Avantium's business model

## From ideation to large-scale industrial take-off





# FDCA & PEF

SUCCESSFUL EXECUTION OF  
STRATEGY





# Avantium Renewable Polymers is ready to deliver

## Strong market momentum



## Strategy execution



# Construction of FDCA Flagship Plant commenced in 2022

The world's first plant producing FDCA on a commercial scale



Location:

- Chemie Park Delfzijl (NL)
- Environmental permit in place



Progress:

- Completed and Operational in 2024
- 80% procurement secured



Objective:

- Prove technology at 5 kta scale
- Sale of PEF & FDCA
- Unlock licensing business



Avantium RMP Flagship Plant - Delfzijl

# PEF bottles

## Avantium value proposition



- Lower carbon footprint



- Circular: recyclable alternative to non-recyclable packaging formats



- Longer shelf life for fresh products, beer, etc



- Visually attractive bottles



- Monolayer PEF and combination with other materials possible

## Main markets



- Beverages (soft drinks, waters, juices, beer, alcoholic, RTD)

- Volume: 100 million ton/year

- Competing materials: glass, aluminum, paper, PET and multi-layer

## Offtake agreements



# PEF fibers

## Avantium value proposition



Lower carbon footprint



Circular: recyclable alternative to non-recyclable packaging formats



Stronger properties

## Main markets

- Textiles, upholstery, car tires, industrial fibers
- Volume: >50 million ton/year
- Competing materials: PET, nylon, cotton



## Offtake agreements



**kvadrat**

## PEF textile community

**ANTEX**

**SALOMON**



**CHAMATEX**  
textile expertise



# PEF films and other applications

## Avantium value proposition



Lower carbon footprint



Circular: recyclable alternative to non-recyclable packaging formats



Longer shelf life for fresh products

## Main markets



- Packaging of food and non-food products
- Volume: >5 million ton per year
- Competing materials: glass, aluminum, paper, PET and multi-layer

## Offtake Agreements:

- Films



- Additive and color masterbatches



- Adhesives for electronics



- Other



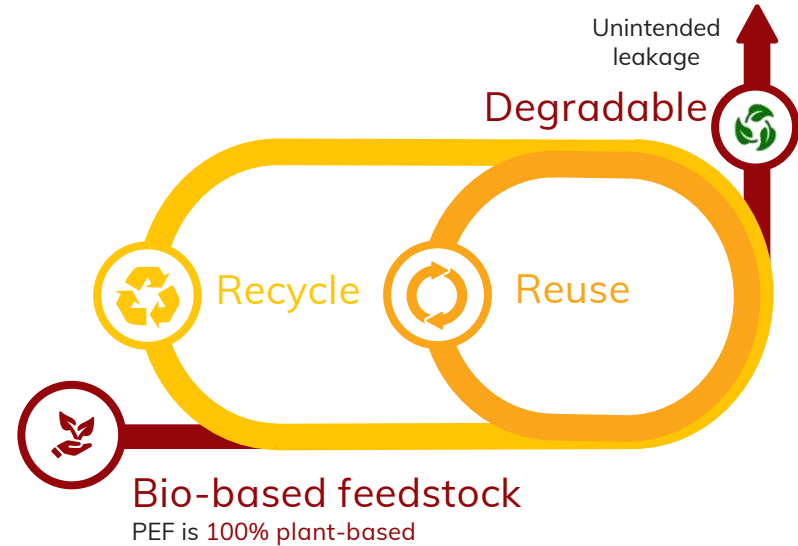
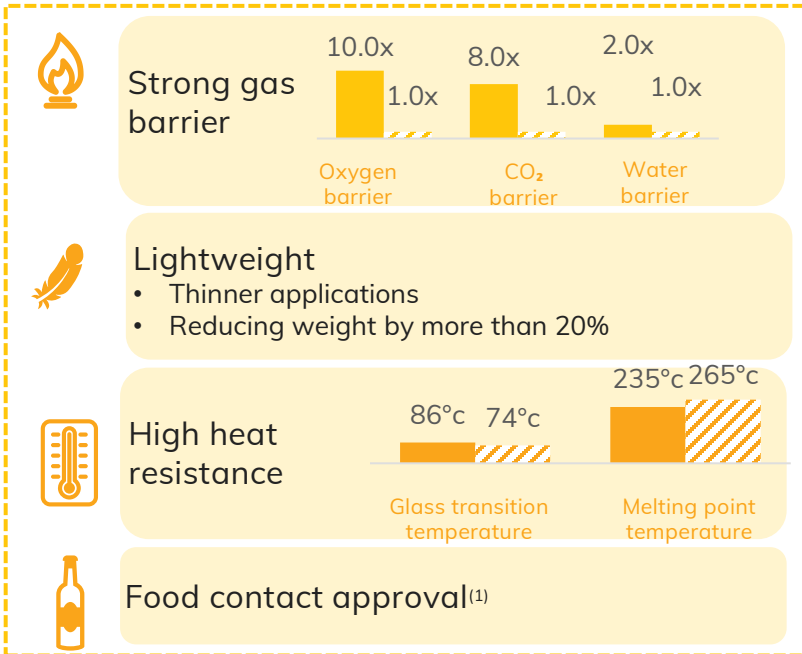
Brand owner



# PEF's sustainability and performance profile resulting in strong commercial traction

## Enhanced product properties

■ PEF ■ PET

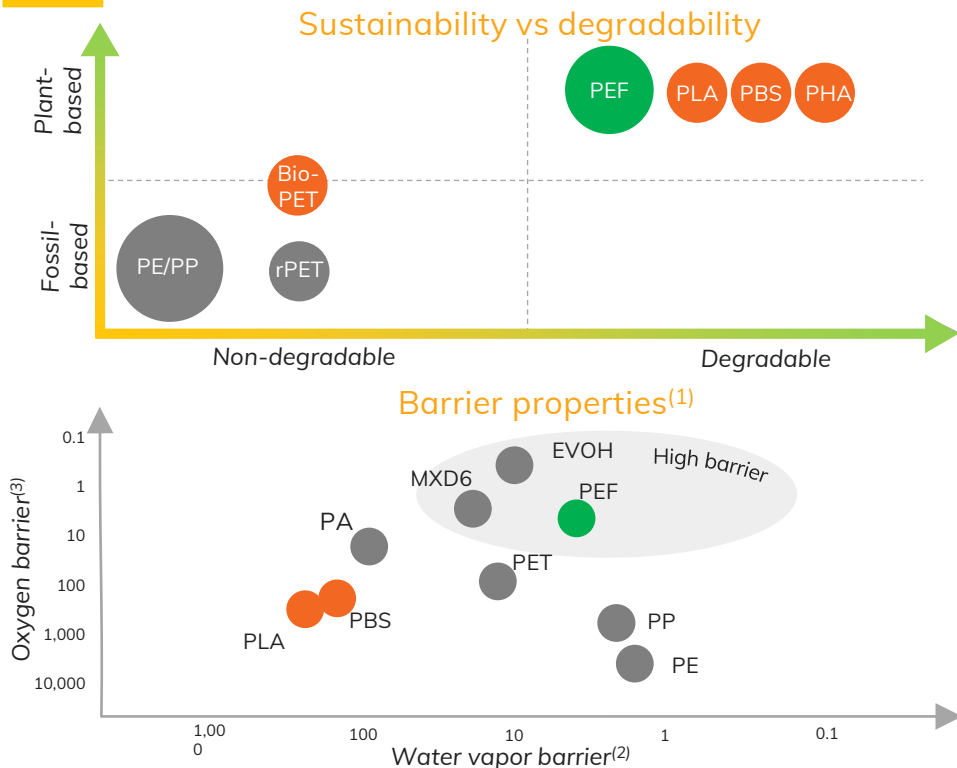


Note (1) In 2015, FDCA was adopted by the European Food Safety Authority (EFSA). In August 2016, FDCA was included in the Plastics Regulation as a food contact material. And in 2021, Avantium released PEF food contact grade, RP90Nx, that complies with the required regulations of food contact materials, which would allow the use of the PEF resin in direct contact with acetic foods and alcoholic drinks with an alcoholic strength less than 20% as well as with clear and cloudy drinks in the EU & UK.





# PEF has enhanced product performance vs other plastics

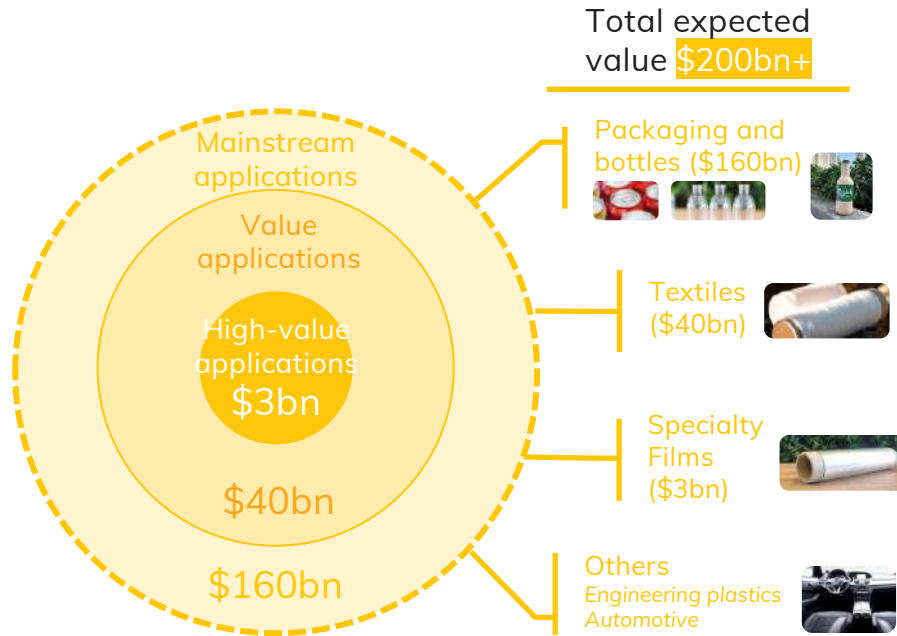


Selected companies	
PEF	Most mature PEF player 
PLA	
PHA	
PBS	
BioPET	
rPET	

Source: European Bioplastics; Company Assessment based on: Markus Schmidt et al, Properties of Whey-Protein-Coated Films and Laminates as Novel Recyclable Food Packaging Materials with Excellent Barrier Properties (International Journal of Polymer Science, Volume 2012), <https://www.mgc.co.jp/eng/products/ac/nmx66/barrier.html>, <http://asuka-platech.com/wp/wp-content/uploads/2013/12/BIOPBS.pdf>  
 Note: (1) Barrier properties for 50µm film; (2) Water vapor barrier: WTR at (39 dC 85 %RH) [mL/(m<sup>2</sup> · day)]; (3) Oxygen barrier: OTR (23, 0%RH) [mL/(m<sup>2</sup> · day · atm)]



# Avantium targets large and diverse PEF markets



## PEF addressable market – 100mt+










Top 20 Plastic users	Total weight*	Top 20 Plastic users	Total weight
	2.961		230
	2.350		225
	1.267		190
	716		179
	690		138
	348		67
	288		42

\* Total weight of plastic packaging in metric tonnes in 2021





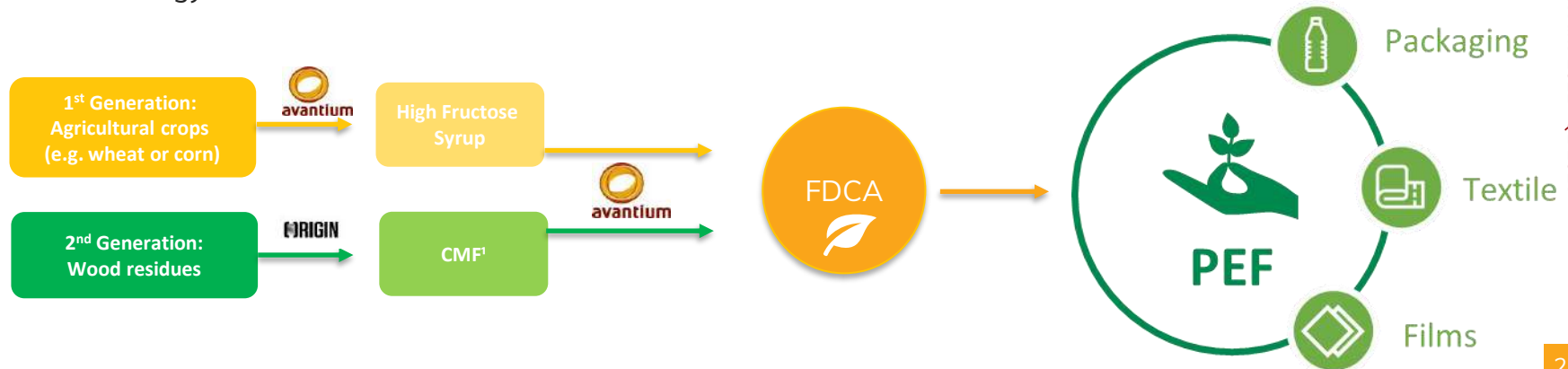
# Avantium has a well-defined and scalable go-to-market strategy for PEF/FDCA

 <p>Product characteristics</p>	<p>Pilot Plant (10t/a) </p> <hr/> <p>Inhouse production</p> <hr/> <p>Collaborations</p>	<p>Flagship Plant(5kt/a) </p> <hr/> <p>Inhouse production</p> <hr/> <p>Own &amp; Operate</p> <hr/> <p>€ 8-10/kg</p>	<p>Industrial (100kt/a) </p> <hr/> <p>External production</p> <hr/> <p>Licensing / JV</p> <hr/> <p>€ 4-5/kg</p>	<p>Industrial (&gt;250kt/a) </p> <hr/> <p>External production</p> <hr/> <p>Licensing</p> <hr/> <p>€ 1.5-2.5/kg</p>
<b>Today</b>		<b>Tomorrow</b>		<b>Longer-term</b>
 <p>Competitive positioning</p>	<p>FDCA &amp; PEF for testing and application development purposes</p>	<p>High-value applications</p> <hr/>  <hr/> <p>Competition: multi-layer barrier materials</p>	<p>Value applications</p> <hr/>  <p>0.5l 0.5l</p> <hr/> <p>Competition: glass bottles, alumina cans</p>	<p>Mainstream applications</p> <hr/>  <p>1.0l 1.0l</p> <hr/> <p>Competition: PET, other polymers</p>

Initial focus on high-value applications with further volume growth to result in cost reduction, leading to a competitive offering across high volume end-markets

# Avantium and Origin Materials to accelerate mass production of FDCA and PEF for advanced chemicals and plastics

- Avantium entered into a non-exclusive technology license agreement, granting Origin a license to use certain parts of Avantium's YXY process technology to enable the conversion of Origin-produced CMF derivatives into FDCA at a 100 kilotonnes per annum scale facility
- Origin also signed a conditional offtake agreement under which Origin Materials will acquire FDCA and PEF from Avantium's pilot plant in Geleen and Flagship Plant in Delfzijl to accelerate market development
- The partnership aims to bring the technology platforms of both companies together in order to produce FDCA from sustainable wood residues on an industrial scale. This complements the feedstock options for our technology



(1) And derivatives such as MF, or methyl furfural, and others.



# PlantMEG

CLEAR PATH TO GROWTH



# plantMEG is a key drop-in ingredient for large end-markets

## Avantium value proposition

plantMEG will provide brands with a sustainable & innovative ingredient



Note (1) The 2022 ISO-certified LCA shows a greenhouse gas (GHG) emission reduction of up to 83% over the life cycle when Avantium's plantMEG™ is compared with MEG based on naphtha, shale gas, natural gas or coal. European LCA standards and methods do not allow carbon discounting based on temporary storage

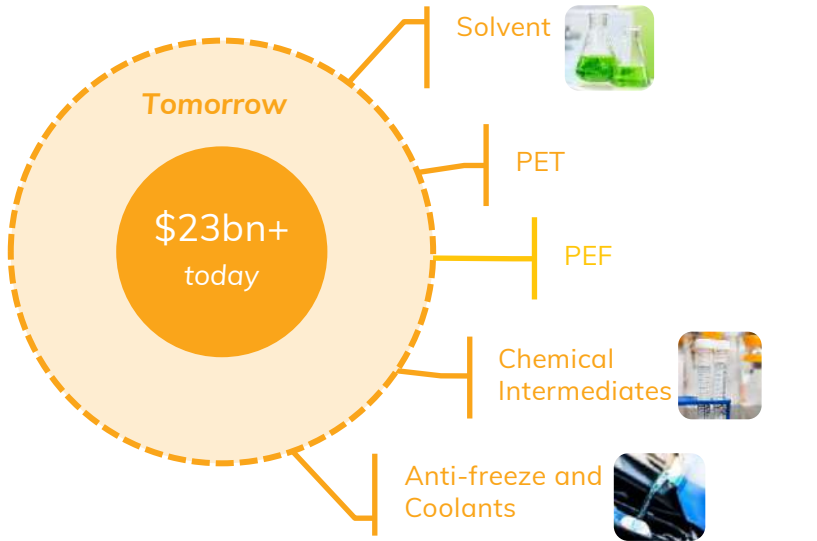




# Addressable markets for plantMEG and plantMPG

## plantMEG addressable market

Total value today  
**\$23bn+**



## plantMPG addressable market



Total value today  
**\$3bn+**



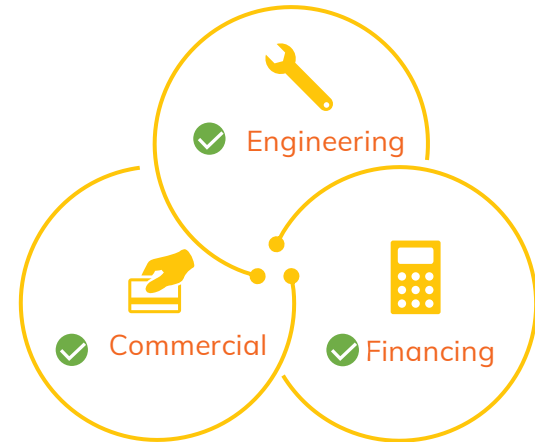
Sources: IHS Chemicals (2020), Wood Mackenzie (2021), Nexant (2020) and Tecnon Orbichem (2022)

# Construction of plantMEG Commercial Plant

Leveraging on the successful experience in FDCA

 <b>Location</b> Northwestern Europe	 <b>Joint venture</b> Jointly owned by Cosun Beet Co & Avantium	 <b>Size</b> >100kt per annum (expected)
 <b>Applications</b> Wide range: packaging, fibers & other		 <b>Timing</b> FID 2025 Operational in 2027
 <b>Technology</b> plantMEG license sale from Avantium to JV	 <b>Feedstock</b> Beet sugar from Cosun Beet Co.	 <b>Objective</b> Commercial launch plantMEG

Success of FDCA strategy execution will accelerate plantMEG execution





# Volta

NEW CUTTING-EDGE  
TECHNOLOGIES





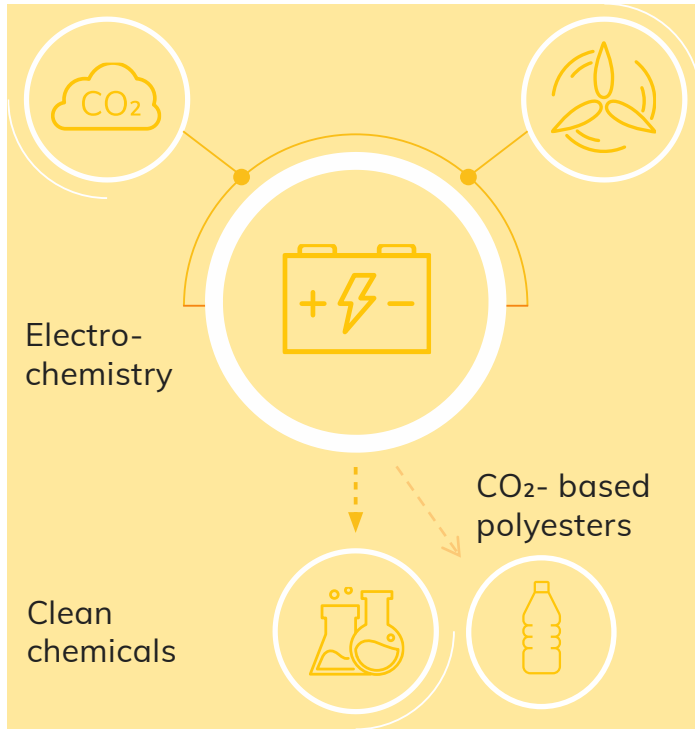
# Volta: using electrochemistry to harness the power of CO<sub>2</sub>

## Avantium value proposition

Unique patented CO<sub>2</sub> technology to address tomorrow's global carbon supply



# Utilizing CO<sub>2</sub> as source for chemicals and polyesters



“

We use electricity as a renewable energy source.  
We use electrons as a reagent.  
This makes it the cleanest of technologies.

We use CO<sub>2</sub> as a feedstock.  
We turn waste carbon into valuable chemicals.  
This opens the way to carbon negative products.

”

2012

Volta founded



2016

Acquisition of  
Princeton start-up  
  
with > \$30m  
already invested



2023

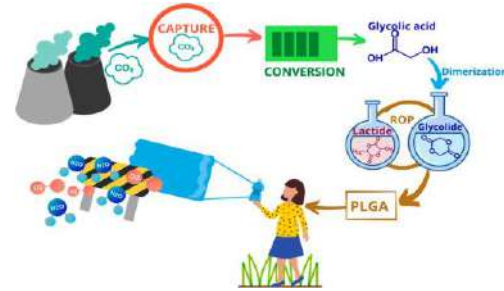
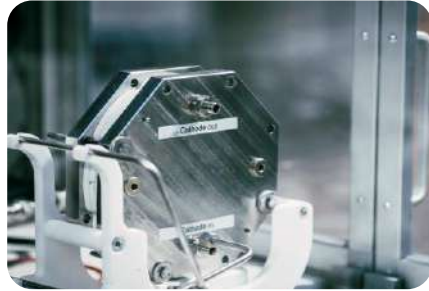
Technology  
frontrunner TRL 6  
and IP portfolio



# Volta scale-up status: advancing to pilot stage

2022: Successful deployment CCU demo units in real-world conditions

- A first mobile Volta demo unit operated with the world's largest **CO<sub>2</sub> conversion cell** at an **RWE power plant** (Germany), converting CO<sub>2</sub> into formate
- A second demo unit was deployed at a Titan **cement plant** (Greece), using waste CO<sub>2</sub> to make formic acid



- A third Volta demo unit converts CO<sub>2</sub> into oxalic acid which can then be turned into glycolic acid
- With glycolic acid and lactic acid, Avantium can produce the **carbon-negative polymer** polylactic co-glycolic acid (**PLGA**)
- PLGA has an **excellent barrier** against oxygen and moisture, has good **mechanical properties** and is both **home compostable** and **marine degradable**

2023: Exploring industrial partnerships and advancing to a stage-gate decision to construct a pilot plant





## R&D Solutions

OUR FOUNDATION



# R&D Solutions - driving sustainable innovation within the chemical industry

## Avantium value proposition

Serving Growing Demand for R&D Solutions in Sustainable Chemistry



# Avantium R&D Solutions

## Aligned with Avantium's sustainability & circular solutions

- Capture opportunity in growing demand for R&D in sustainable chemistry solutions
- Profitably supply tailored R&D units in four markets for R&D into sustainable chemistry that offer:
  - Existing demand from known customers
  - Technological proximity
  - Progress to scalable technology platforms
  - Develop technology for Products and Contract R&D when these platforms emerge



Green  
Hydrogen



Chemical  
Plastic  
Recycling



Adsorption



Sustainable  
Chemical  
Building  
Blocks





# CONCLUSION

FROM AMBITION TO  
EXECUTION



# In Summary: From Ambition to Execution





# Q&A



A photograph of a sunlit forest path with a yellow overlay box. The path is paved and leads into a dense forest of tall trees with green foliage. Sunlight filters through the trees, creating a dappled light effect on the path. A large yellow rectangular box is overlaid on the left side of the image, containing the word "Appendix" in black text.

# Appendix





# Avantium: experienced leadership team

## Management Team



Tom van Aken  
CEO  
(@Avantium since 2002)

Education:  
Chemistry (Utrecht) and Economics  
(Amsterdam)

Selected previous / other positions:

- Now: several advisory positions, such as Top Team Chemie
- 1999-2002: Director Business development at DSM
- 1997-1999: Sales manager at DSM



Boudewijn van Schaik  
CFO  
(@Avantium since 2023)

Education:  
Business Science (Accounting and  
Corporate Finance) (Cape Town)

Selected previous / other positions:

- 2013-2022: Head of Corporate Finance at SBM Offshore
- 2007-2013: NIBC Bank
- 2005-2007: ABN AMRO Bank



Gert-Jan Gruter  
CTO  
(@Avantium since 2000)



Carmen Portocarero  
General Counsel  
(@Avantium since 2012)



Bas Blom  
Managing Director Renewable  
Polymers  
(@Avantium since 2021)



Yap Chie Cheung  
Managing Director Renewable  
Chemistries  
(@Avantium since 2023)



Steven Olivier  
Managing Director  
Catalysis  
(@Avantium since 2015)

## Supervisory Board

- Edwin Moses (Chair)
- Margret Kleinsman
- Michelle Jou

Former CEO Ablynx NV and Oxford Assymetry International  
CFO Agrifirm  
CEO Castrol

- Nils Björkman
- Dirk Van Meirvenne (nominee)
- Peter Williams (nominee)

Worked for 33 years in various senior management positions at Tetra Pak Group  
Head of the Advanced Industrial Intermediates business unit at Lanxess  
Group Technology Director and Head Of Investor Relations at INEOS

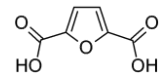


# Avantium tomorrow: Successfully delivering the next biochemicals from disruptive technologies



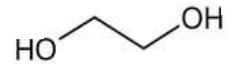
## PEF Building blocks

### FDCA



Catalytic conversion of plant-based sugars into FDCA

### plantMEG



Conversion of sugars into plantMEG

## CO2 based polymers



Conversion of CO2 into high-value chemicals & polymers

## Biorefinery



Conversion of biomass via a biorefinery into industrial sugars

Avantium value proposition

- ✓ 100% renewable & recyclable
- ✓ Superior performance
- ✓ Feedstock flexibility
- ✓ Initially serving value applications then volume

Status

- Operational Pilot Plant
- Flagship Plant operational by 2024

- ✓ Improved sustainability credentials
- ✓ Market competitive
- ✓ Drop-in

- Operational Pilot Plant
- Commercial Plant expected to be operational by 2027

- ✓ Valorizes waste carbon
- ✓ Clean conversion process using renewable energy
- ✓ Proprietary electrochemistry platform for carbon capture and utilization (CCU)

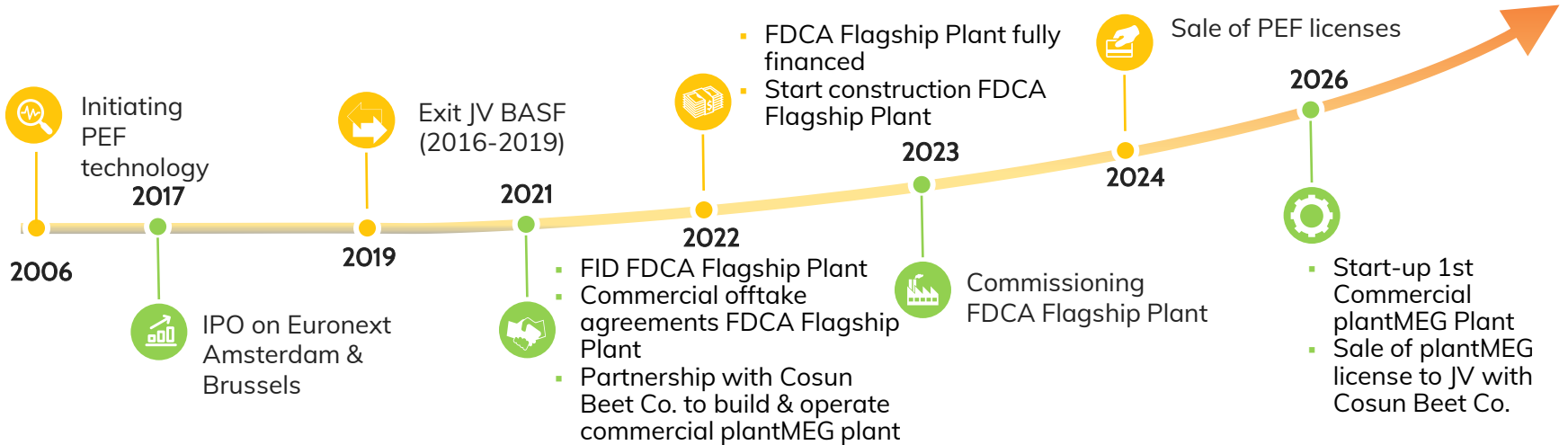
- Mobile pre-pilot units being tested at industrial sites in Europe

- ✓ Valorizes biomass into valuable feedstock
- ✓ Clean and efficient conversion technology
- ✓ Significantly lower energy

- Operational Pilot Plant

Avantium's expertise in catalysis processes as development platform of disrupting biochemical technologies

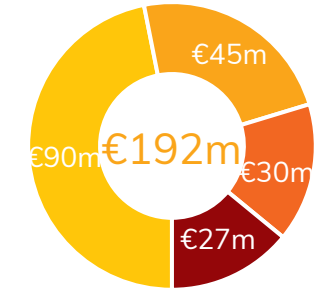
# Avantium's successful trajectory towards growth



# FDCA Flagship Plant financing fully secured

Financial Close reached on 31 March 2022

## Funding sources



## Funding uses

- 🔧 CAPEX: €115m
- ⚙️ Running cost (OPEX): €65m
- 📄 Interest, other: €12m

### Grants (€27m):

- €20m PEFerence grant<sup>(1)</sup>
- €7.5m grant from the National Programme Groningen



### Third Party Equity (€30m):

- €20m equity from Bio Plastics Investment Groningen consortium (BPIG)
- €10m million equity from Worley
- Represents 22.6% of the Renewable Business equity



### Avantium Equity (€45m):

- €45m investment by Avantium (increased from €35m)
- Represents 77.4% of the Renewable Business equity



### Debt Financing (€90m):

- Each bank has committed €15m
- Invest-NL, government backed Dutch impact investment fund, has committed €30m
- Interest consists of three components: cash interest, accrued interest and warrants



Note: (1) This project has received funding from the Bio-based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation program under grant agreement No744409. The JU receives support from the European Union's Horizon 2020 research and innovation program and the Bio-based Industries Consortium.



# Numerous strategic collaborations & offtake agreements

**avantium**

High performance

Fully sustainable

Cost competitive

**R&D collaborations**

Development of PEF for beverage applications



PEference<sup>(1)</sup> aims to establish an innovative supply chain for FDCA & PEF



The PEF Textile Community aims to develop PEF yarn applications



**Long-term offtake agreements**

Bottles		
Film		
Fibre		
Other		



# Illustrative revenue and profitability model

## Illustrative market targeting

	PEF	MEG
<b>1</b>	Estimated market sizes	
	PEF: 5-10mt Value applications	MEG: +35mt
<b>2</b>	Illustrative market share	
	5% market share	5% market share
<b>3</b>	Implied target market volume	
	500 kta	1,750 kta



## Revenue & profitability mechanics

### Avantium R&D Solutions

Continued organic growth in line with historical levels

### FDCA Flagship

Capacity      Average selling price      Turnover  
5kta            x            ~€9/kg            =    ~€45m

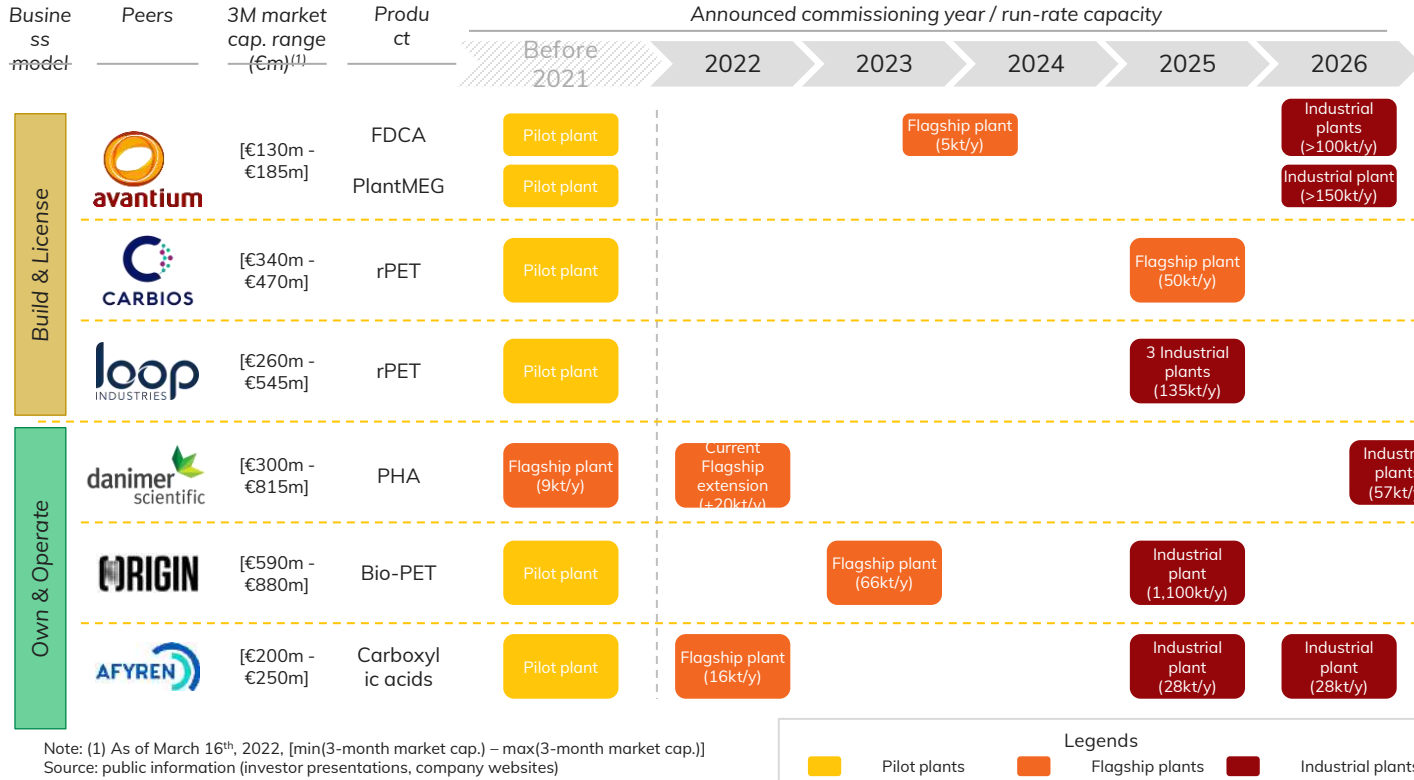
### Illustrative licensing revenues

	FDCA	PlantMEG
Implied capacity	500 kta	1,750 kta
x	x	x
Average selling price	~€4.5/kg	~€1.2/kg
=	=	=
Illustrative gross sales	€2.25bn	€2.1bn
x	x	x
Illustrative royalty range	3%-6%	3%-6%
=	=	=
Illustrative annual turnover	€67.5m- €135m	€63m- €126m





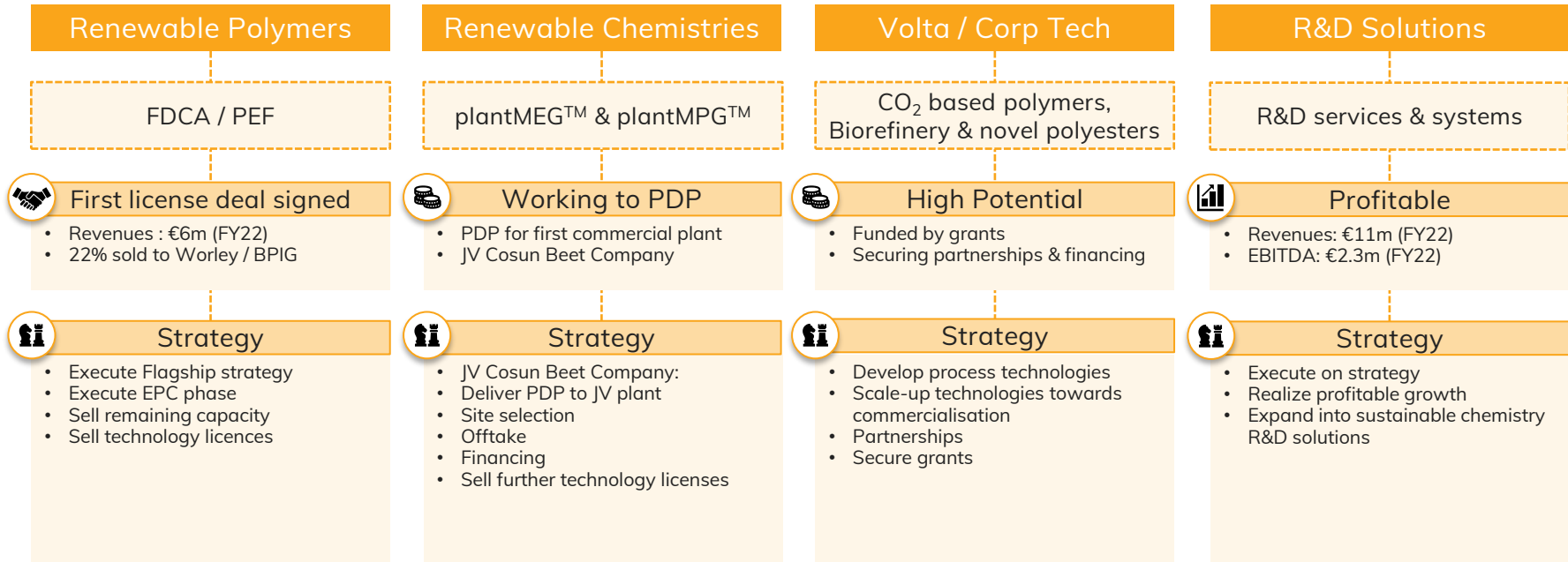
# Our industrial strategy compares favorably to our core peers

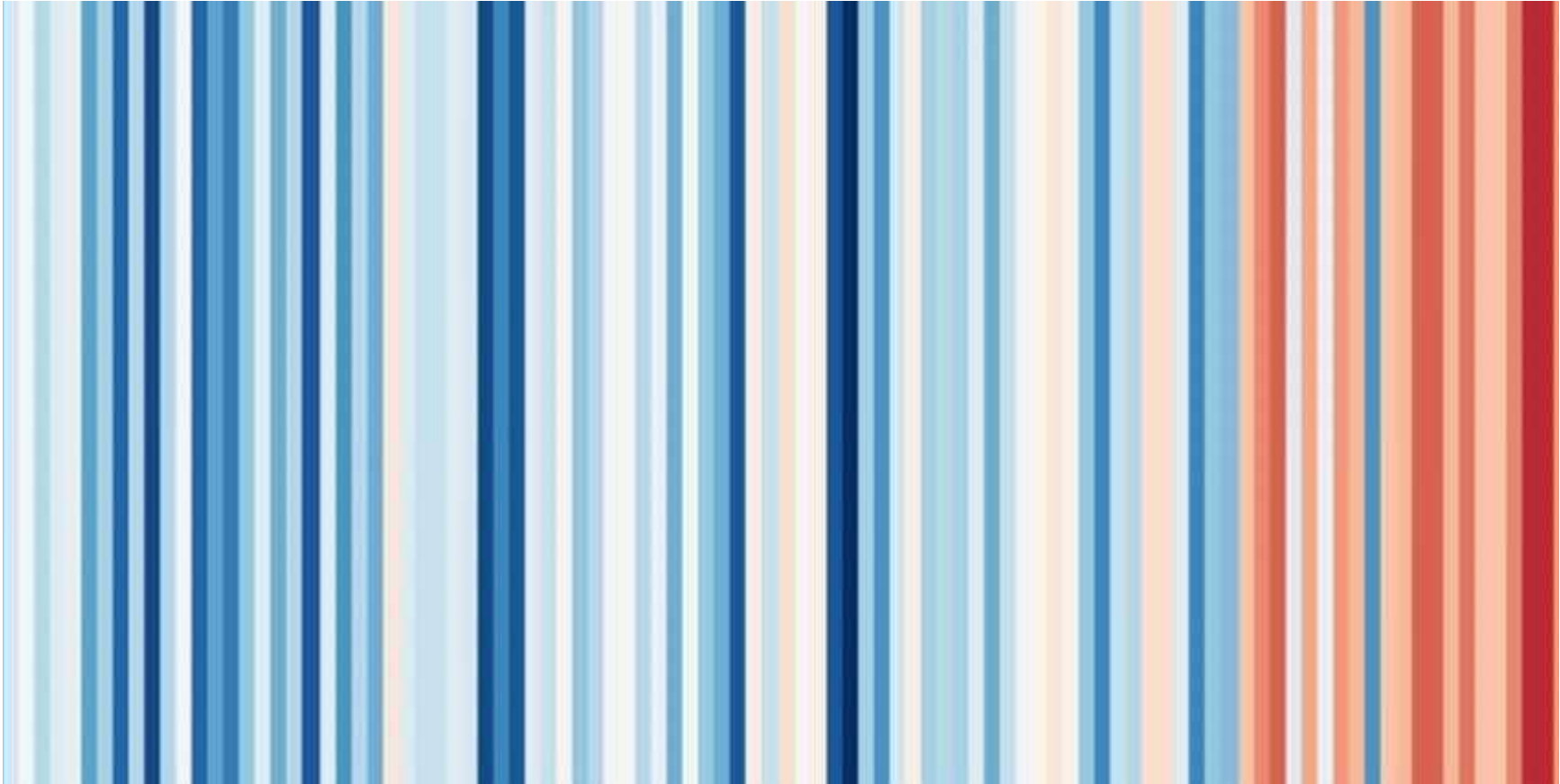


- ✓ Avantium's industrial strategy is not an exception - Exact same industrial scale-up pattern observed across all innovative industrial peers (Pilot / Flagship / Industrial)
- ✓ Avantium is actually benefiting from an industrial maturity that compares favorably to other Build & License models
- ✓ Avantium industrial phasing designed to mitigate scale-up risks by building a first 5kt FDCA capacity unit as a blueprint for further capacity increase (no scale-up risk associated with larger catalysis units)

Note: (1) As of March 16<sup>th</sup>, 2022, [min(3-month market cap.) - max(3-month market cap.)]  
 Source: public information (investor presentations, company websites)

# From Ambition to Execution





Global warming stripes by climate scientist Ed Hawkins