

sunliquid® technology for state-of-the-art cellulosic ethanol production

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Greater chemistry

Clariant – a global leader in specialty chemicals focused on innovation and adding value with sustainability

COMPANY GLOBAL FOOTPRINT ¹ (2022)

11 148

Total staff (FTE)

5 198

Sales 2022¹ (CHF m)

810

EBITDA 2022¹ (CHF m)

15.6%

EBITDA margin 2022¹

SUSTAINABILITY COMMITMENTS (2020)

2030

Ambitious environmental targets set with absolute GHG emission reduction targets from 2019-2030

-40%

Scope 1+2



-14%

Scope 3

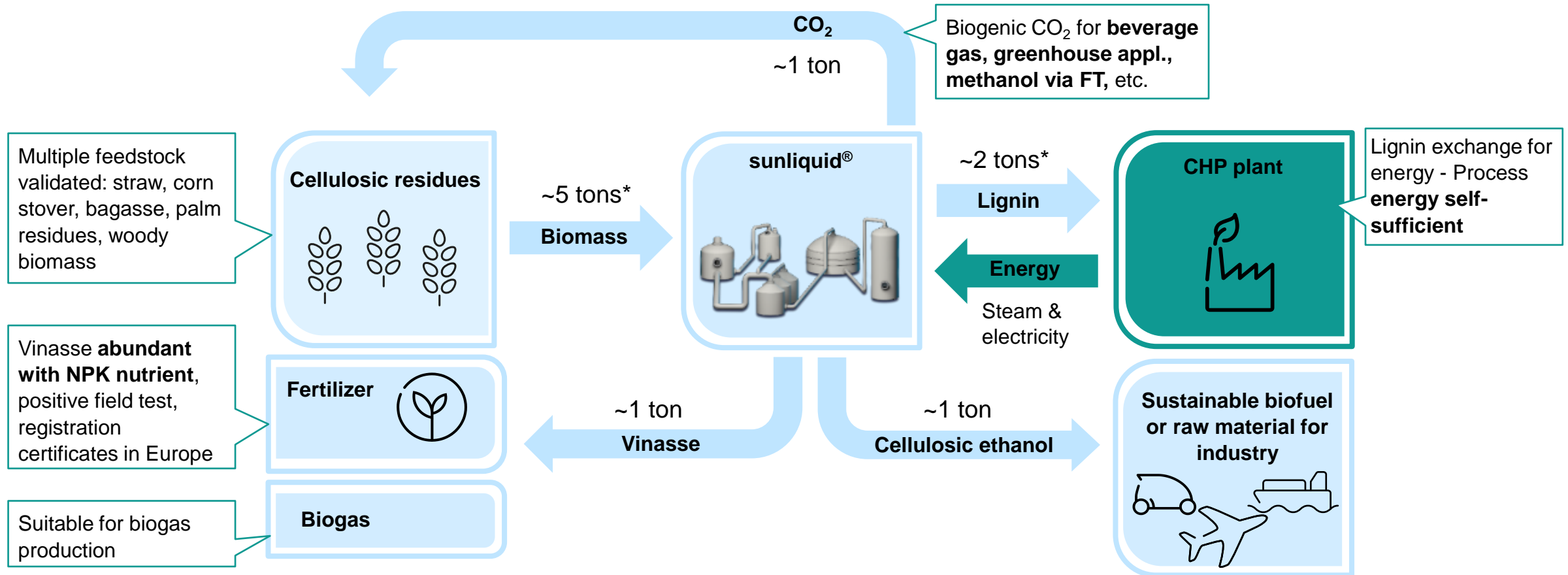
MEMBER OF



¹Continuing operations

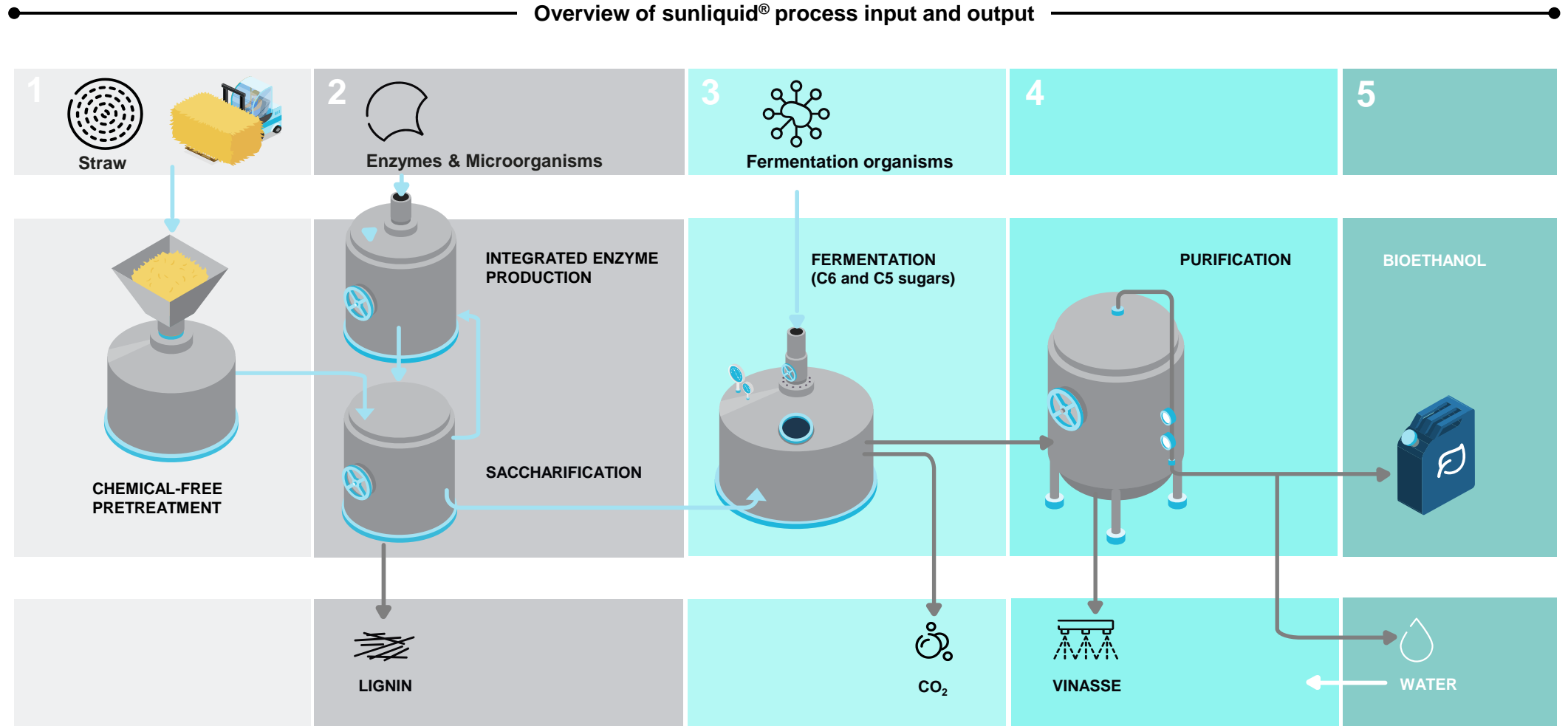
Clariant's sunliquid® technology provides carbon neutral biofuels & is a prime example for a circular economy solution

sunliquid®: TECHNOLOGY & PROCESS



* based on dry matter

sunliquid® 2G ethanol production: a fully integrated process



Clariant's first sunliquid® plant in Podari, Romania is completed, all units operational and first commercial cellulosic ethanol produced



Key Facts (Podari, 10ha Area)



Nominal plant capacity: **50,000 TPY** of **cellulosic ethanol** by processing **250,000 TPY** of **straw** (locally sourced)



Mechanical construction and commissioning finished, **ramp-up** proceeding:

- Enzyme & yeast production
- Mechanical pre-treatment
- Hydrolysis, filtration, fermentation
- Distillation



Greenfield combined heat & power (CHP) plant for energy independence by GETEC



Process by-products lignin & vinasse can be utilized for **energy generation and fertilizer usage** under evaluation



Opening Ceremony took place on May 31st '22 introducing the plant to key stakeholders.

First commercial cellulosic ethanol (first shipped June '22).



Clariant's sunliquid® cellulosic ethanol plant in Podari: From Groundbreaking to Opening

sunliquid® technology converts a broad range of lignocellulosic feedstock



sunliquid®: Wide range of lignocellulosic biomass



sunliquid® technology



Wheat Straw



Forestry Residues



Rice Straw



Cane Bagasse



Corn Stover



Cane Tops & Leaves



MSW & Others¹







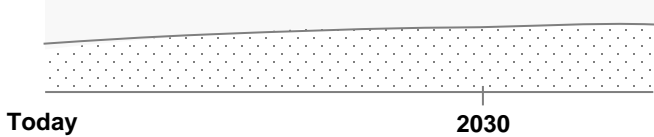


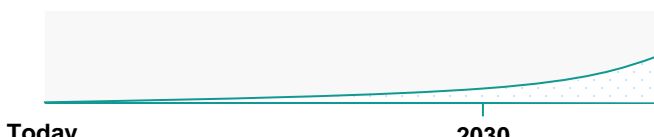



Empty Fruits Bunches

The sunliquid® process shows a flexibility on a broad range of feedstock. Process conditions & biocatalysts were developed & performance runs executed in our pre-commercial plant in Straubing

In addition, about 30 residues were tested in lab & pilot scale, including rice husks, sorghum, coffee ground, seaweed, grapeseed straw, corn fiber.

¹Other feedstocks including oat hulls, barley straw, miscanthus/energy crop

Bioethanol is primarily used in the mobility sector – significant upside potential from sustainable aviation fuels & bio-based chemicals exists

 Primary applications	 Market drivers	 Market outlook (indicative)	
 <p>Mobility sector (cars)</p>	<ul style="list-style-type: none"> - Fueled by increasing blending rates as result of strong regulations - Conventional vehicles as primary usage in mobility sector (>80% for 2030 estimated) 	<p><i>„Large application field with growth rates in 2G sector“</i></p>  <p>Today 2030</p>	 <p>Today's focus</p>
 <p>Sustainable aviation fuels (SAF)</p>	<ul style="list-style-type: none"> - Tighter regulation for CO₂ emissions in aviation - Technological advancements (e.g., Alcohol-to-Jet) enabling strong growth rates 	<p><i>„Future market with accelerating growth especially from 2030 onwards“</i></p>  <p>Today 2030</p>	 <p>Future upside potential (>2025)</p>
 <p>Bio-based chemicals</p>	<ul style="list-style-type: none"> - Increasing demand for sustainable products from renewable sources - Opportunity to achieve significant greenhouse gas reductions (i.e., for Scope 3) 	<p><i>„Future market with steady & slightly increasing growth“</i></p>  <p>Today 2030</p>	

Thank you!