

Energy spotlight

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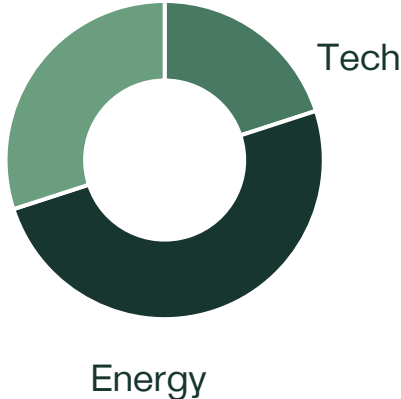
December 18th, 2024

Energy overview

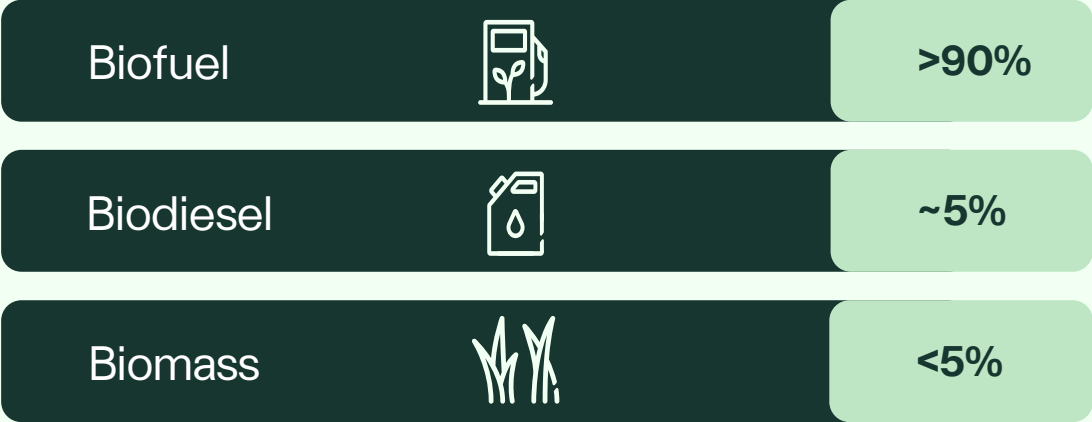
Part of Agriculture,
Energy & Tech

Net revenue¹: 1,337.8
EUR million

Agriculture



Share of
Energy sales



Fundamental growth drivers



Increasing fuel
demand



Decarbonization
agenda

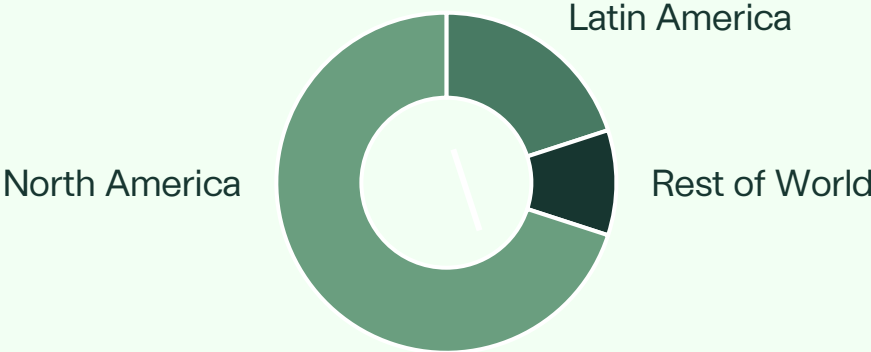


Chemical
replacement



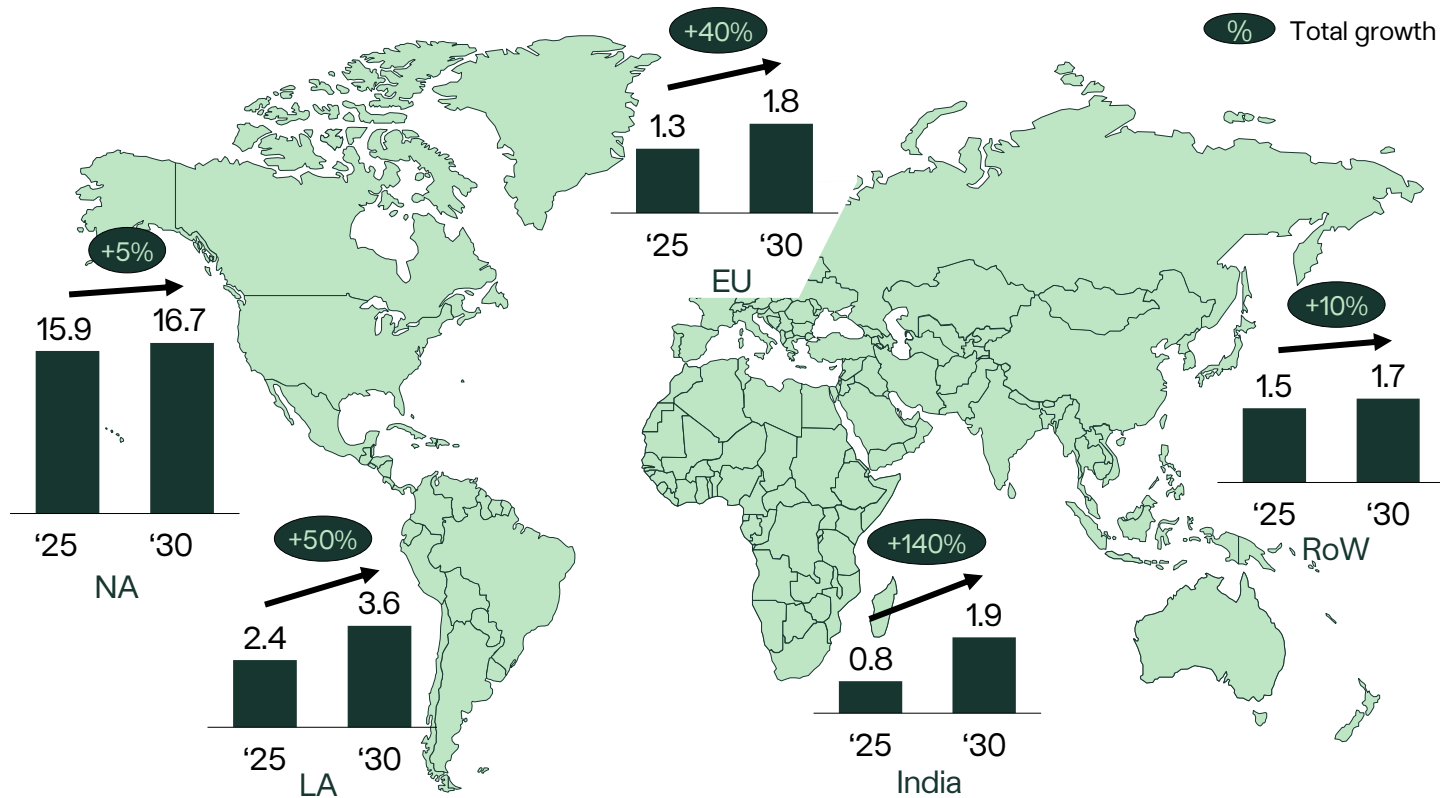
Energy
independence

Approximate geographical distribution of Energy sales



Biofuel market volumes expected to increase and geographically diversify

Regional starch-based fuel ethanol production volume estimates, BGY



Regional drivers

North America

- Well-established policies for ethanol blending with bi-partisan support
- Flat to low single digit domestic volume growth
- Growing exports
- Innovation for productivity & product diversification

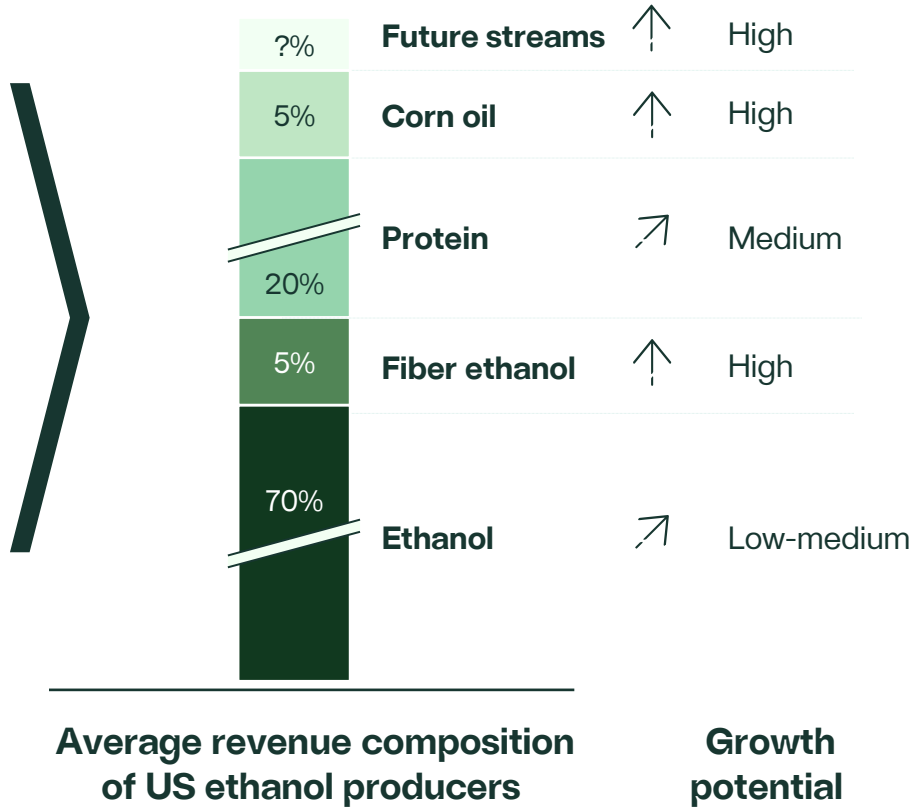
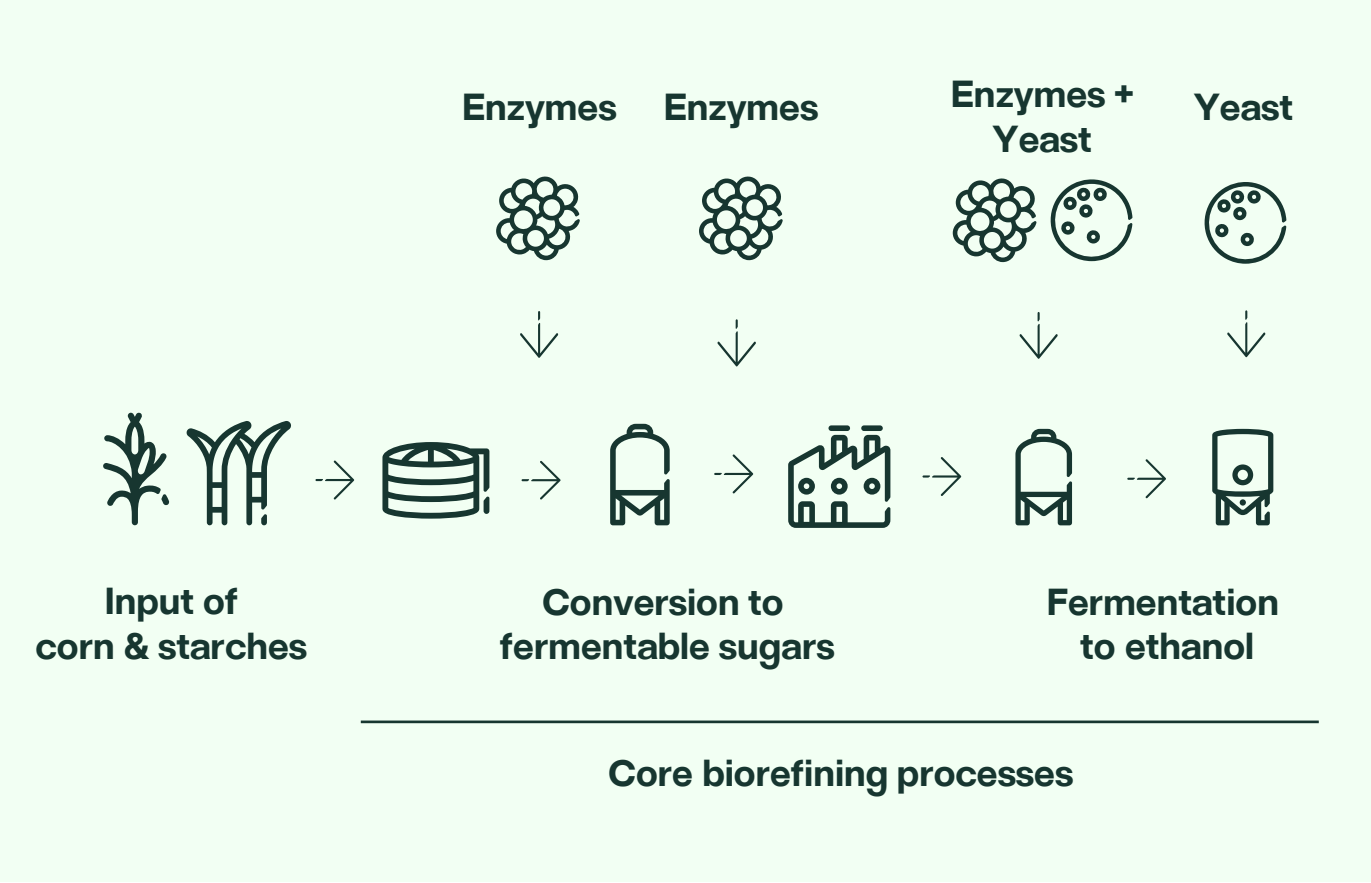
Latin America & India

- Progressive policies supporting growth
- Double digit volume growth
- Industry expansion (1G)
- Biomass emerging
- Innovation for productivity

Europe & Rest of World

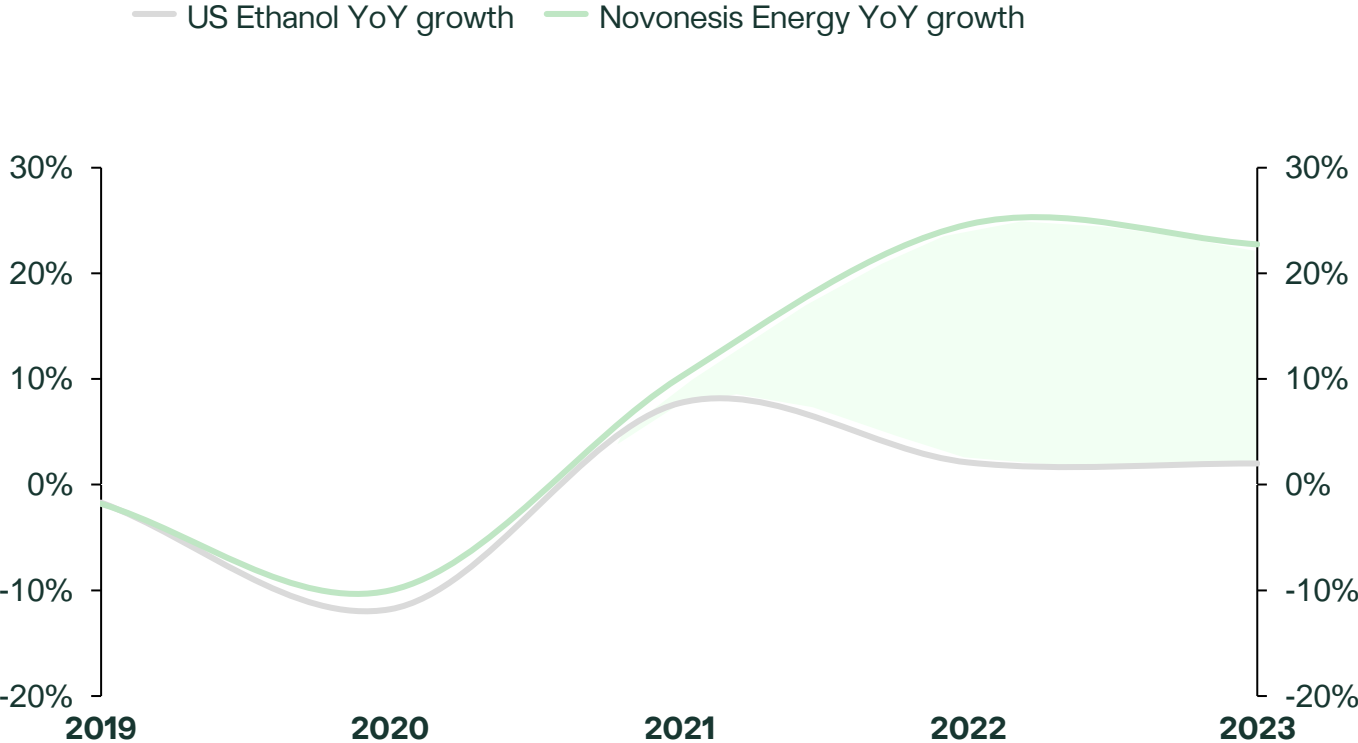
- Well-established policies for ethanol blending
- Mid single digit volume growth
- Innovation for productivity

Enabling customers to diversify and unlock value streams for additional end markets from cracking corn

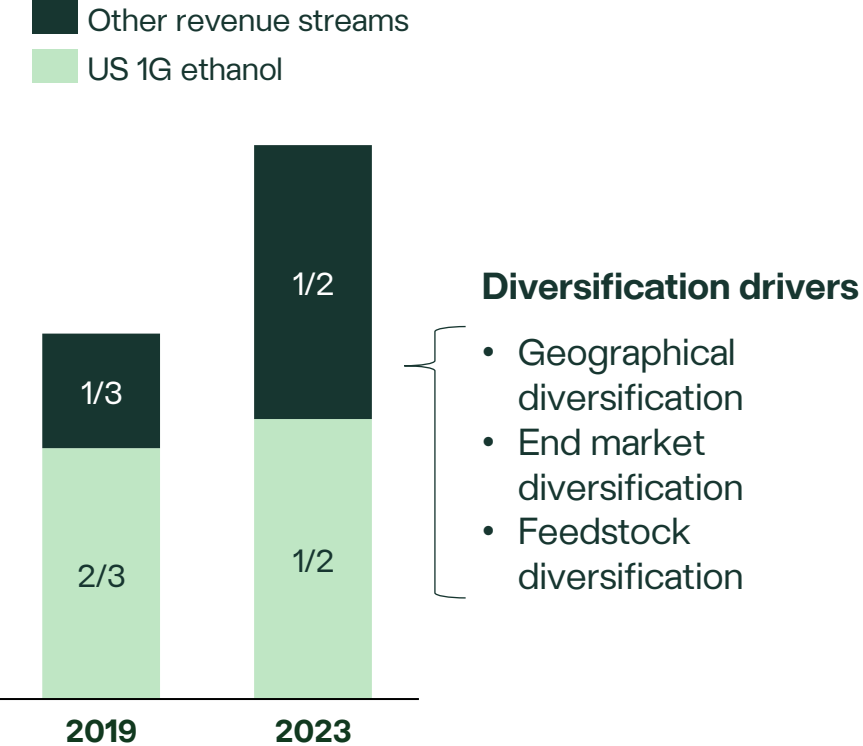


Energy expected to continue to outgrow underlying US ethanol volume growth through innovation and diversification

US ethanol production growth & Novonesis Energy sales growth



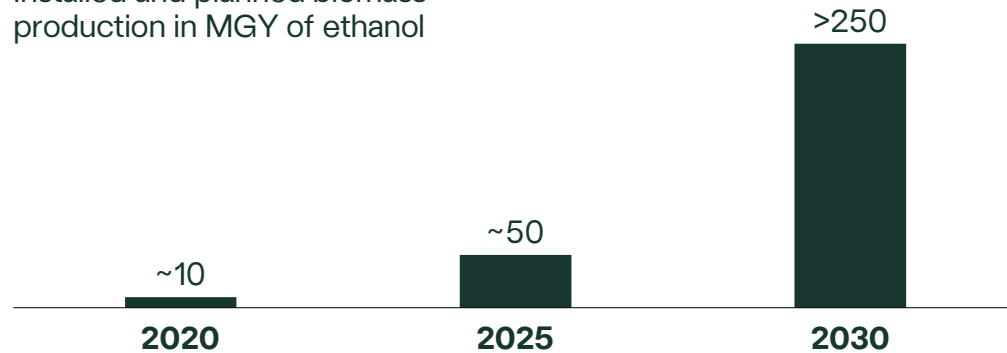
Novonesis Energy sales diversification



Feedstock diversification materializing with substantial upside potential

Market volumes accelerating in biomass ethanol

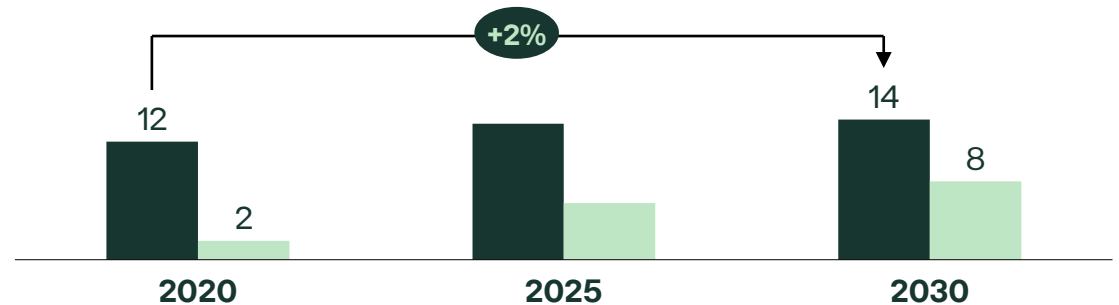
Installed and planned biomass production in MGY of ethanol



- Near-term expansion opportunity centered in Brazil and India
- With strong offtake policy support in several markets
- If scaling is successful and repeatable, then it could expand more significantly

Growing opportunity space in diesel

Expected volumes of bio- and renewable diesel in BGY



- Current biodiesel market less than 10% penetrated with enzyme solutions
- Biodiesel continues growth, based on established mandates in several key emerging markets
- Significant benefit of enzymes in biodiesel processing (capex, opex, and feedstock flexibility)
- Increasing opportunity for enzymatic pretreatment in renewable diesel

Understanding individual customer needs from extensive field expertise and application knowledge

Leveraging strong field-based insights...



Deepest and broadest portfolio of Biosolutions in the market



Largest number of field team scientists in key markets



Direct connection between Application R&D experts and customers



Strong policy advocacy alongside customers to drive new market opportunities



Unparalleled predictive laboratory-scale assay capabilities

... to create tailored solutions to customer-specific needs...

Example of our application capabilities

Throughput-specific yeast

Enabling customers to operate customized processes without losing performance

- Top speed with unmatched robustness
- Unparalleled yields in non-GM markets

... with high customer satisfaction

NPS in 2023

77

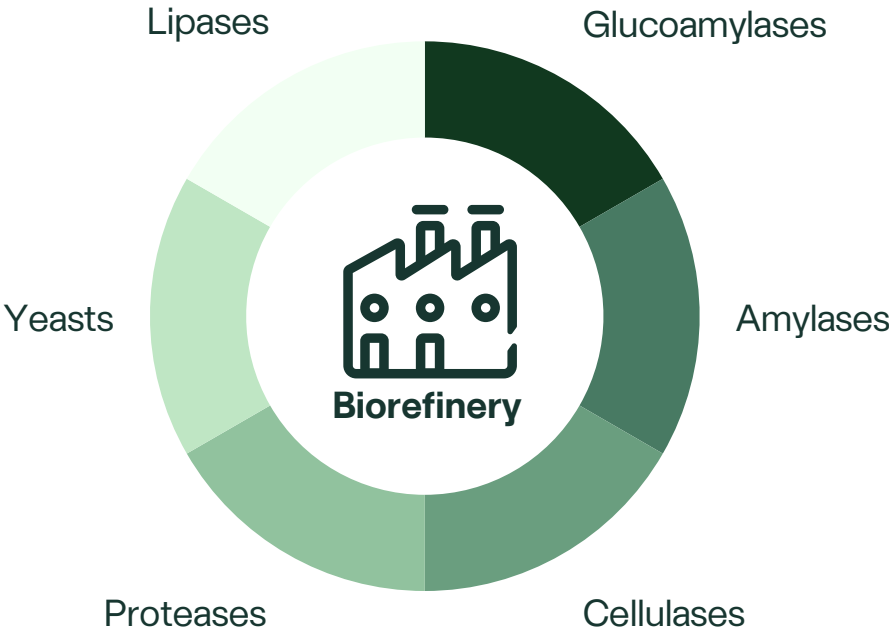
Position

#1

Our expanding toolbox of synergistic Biosolutions continues to drive unparalleled value creation for customers

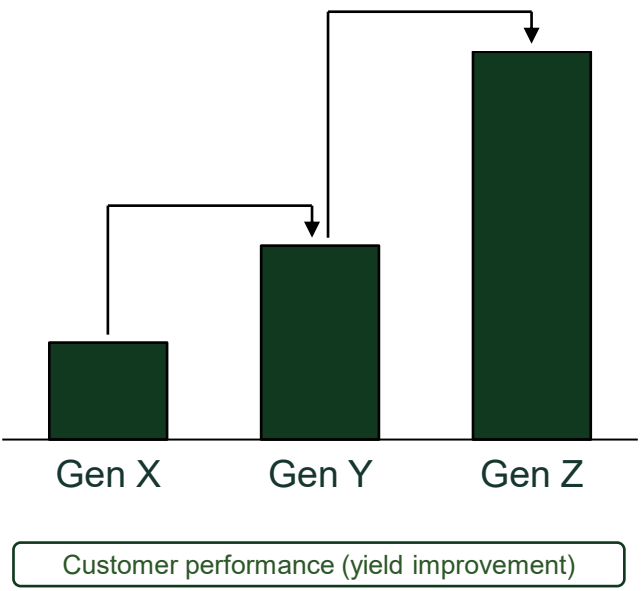
Toolbox continues to expand...

- New enzyme classes and new yeast traits opening new value streams
- Expanding use of enzyme classes in growing regions/segments

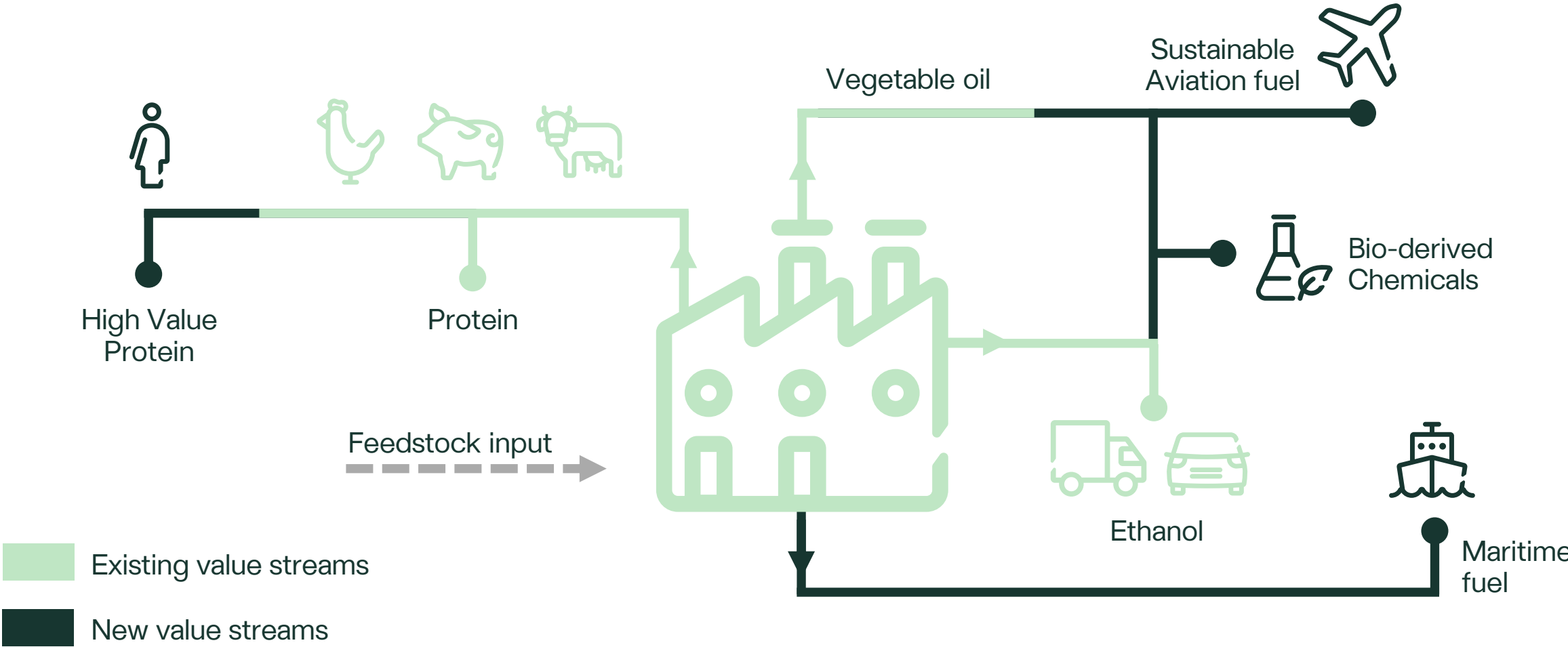


... driving enhanced performance & performance

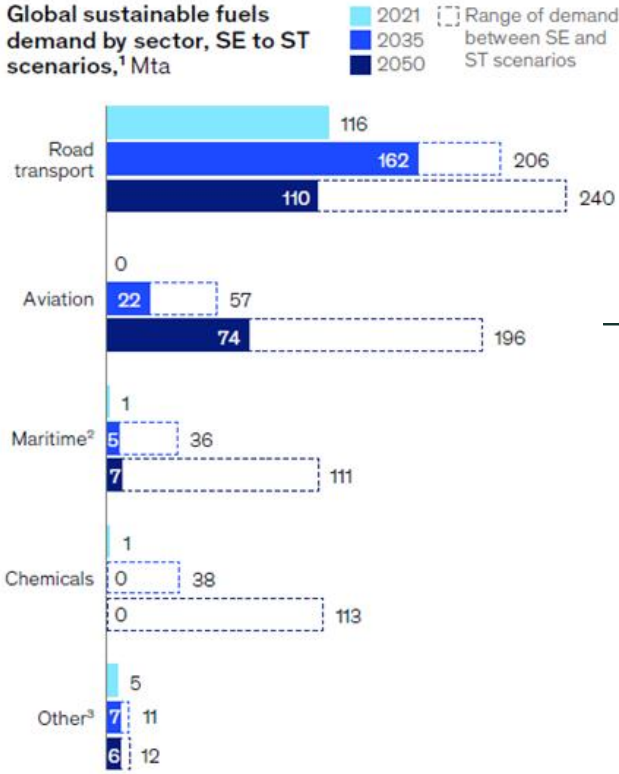
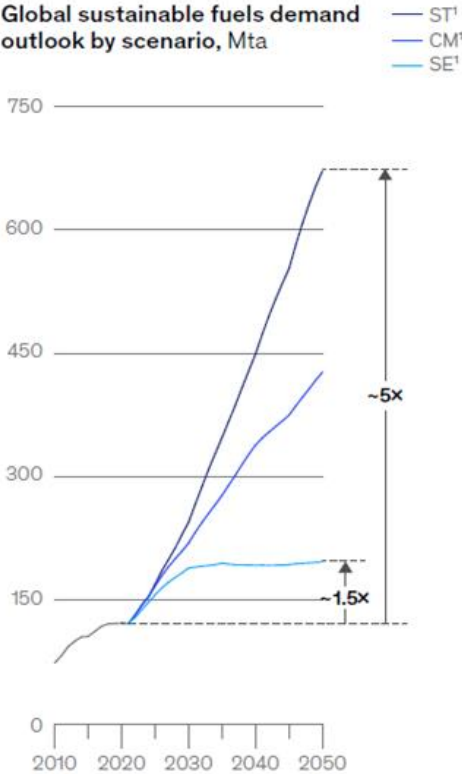
- Continuously lifting the performance bar in the industry
- Supporting new output levels on existing and new customer's asset base



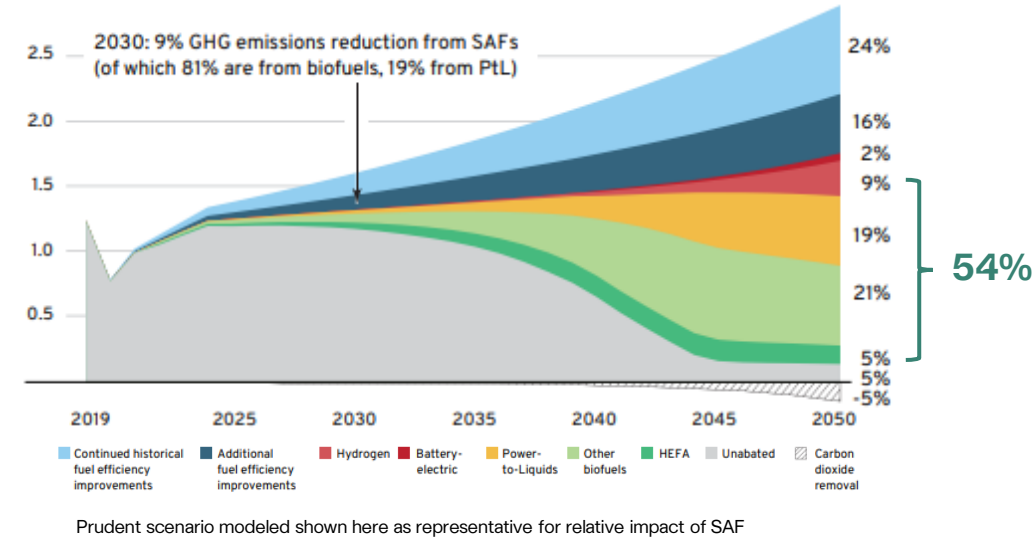
Biosolutions is key to drive value in today's biorefineries as well as the platform for opening new value streams



Liquid sustainable fuels are critical across all decarbonization scenarios, with significant untapped opportunity in aviation



Aviation decarbonization will largely depend on efficiency improvements and sustainable liquid fuels...

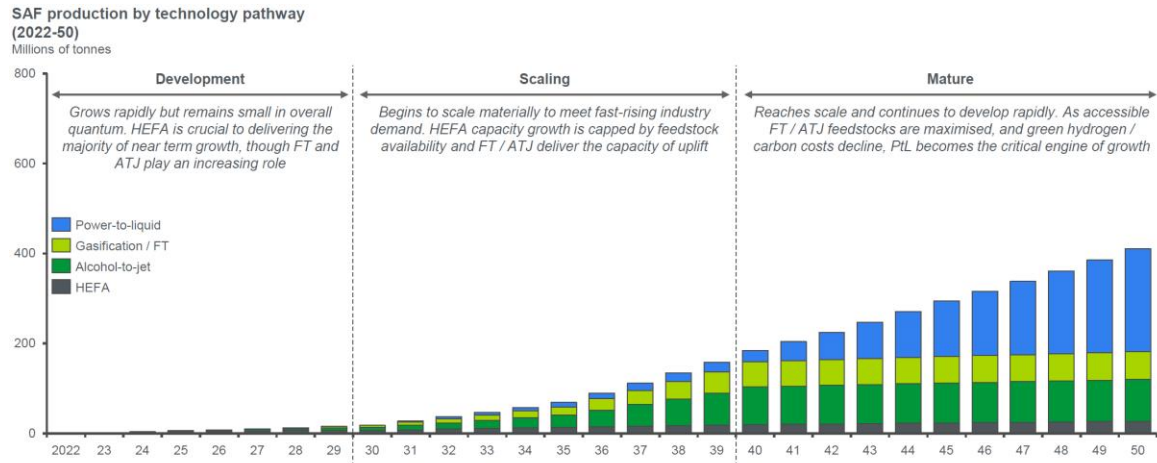


... with **Sustainable Aviation Fuels (SAF)** projected as the key driver to reduce emissions of aviation by **+50%**

Significant opportunity for biosolutions in SAF across technologies

Multiple pathways are likely for the transition to SAF, and different regions are likely to play on their regional strengths...

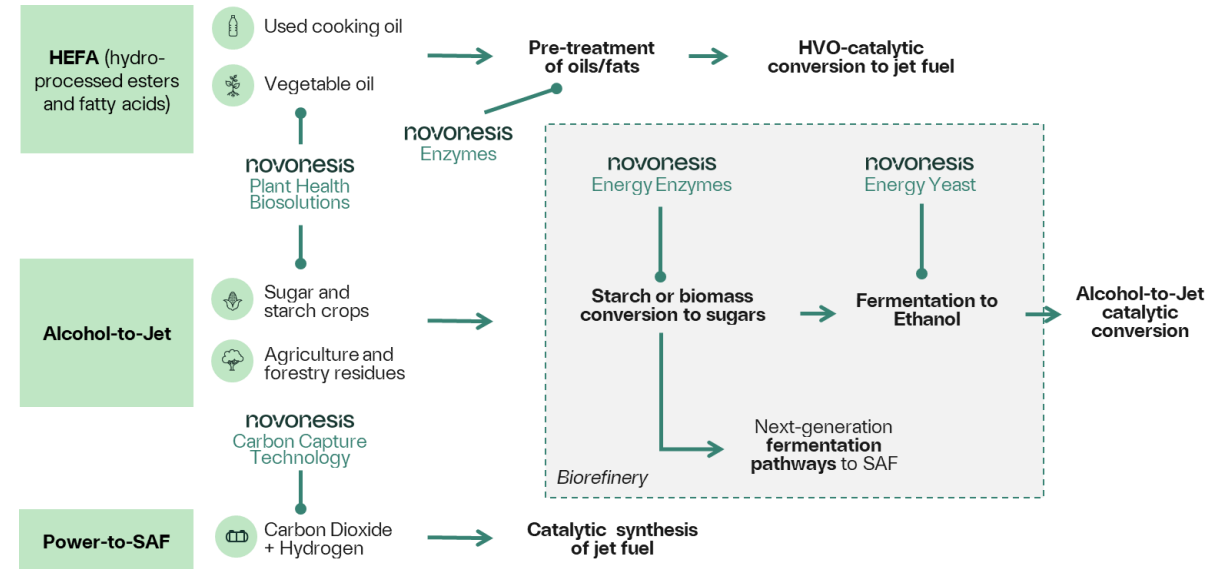
... with increasing relevance for Novonesis technologies



Source: BERGERO et al. (2023); IATA; ATAG (2020); WEF (2021)

9 | Fuelling the Future of Aviation

LEK™



- ➔ **HEFA pathway from oils/fats** (a catalytic process is similar to Renewable Diesel)
- ➔ **Alcohol-to-Jet** (catalytic conversion of Ethanol to kerosene)
- ➔ **Biomass conversion** (e.g. via Biomass-based ATJ or Gasification)
- ➔ **e-SAF** (= Power-to-SAF or e-fuels) from CO₂ and H₂

Successful developments of AtJ in SAF market can substantially expand global ethanol production in 2040 timeframe...

Total aviation fuel market today:



Assuming 30% SAF market:



Assumed AtJ share:



Ethanol expansion in 2040, at current fuel demand



... But several steps are needed for AtJ SAF to be a winner and drive expansion of 1G and 2G ethanol

Regulation

- Long-term incentives
- Clarity on LCA models
- Alternatively, future relaxation of current frameworks

Technology

- Low CI solutions at reasonable abatement costs
- Deployment of cellulosic biorefining
- Continued investments in new technology targeting cost and CI reductions

Commercial

- Successful deployment of first technologies
- Cost-in-use proved at commercial scale

Biosolutions unlocks growth opportunities across markets and technologies

- Fundamental growth drivers support continued pull for liquid biofuels
- Unmatched application expertise, innovation toolbox and scale within Biosolutions drives ability to outgrow underlying market
- Increased diversification from geographies, feedstocks, and end markets reduces volatility
- Optionality from biomass, SAF, bio-chemicals, and more...

