



Presents

International Conference on
GREEN & SUSTAINABLE IRON MAKING

January 17 – 18, 2024

LanzaTech



Harness the capabilities of biology to transform carbon-rich waste gases into ethanol and valuable chemicals

ICGSI
January 17, 2024

LanzaTech

Nasdaq: LNZA

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LanzaTech

POWER
CAN BE CARBON FREE

LanzaTech

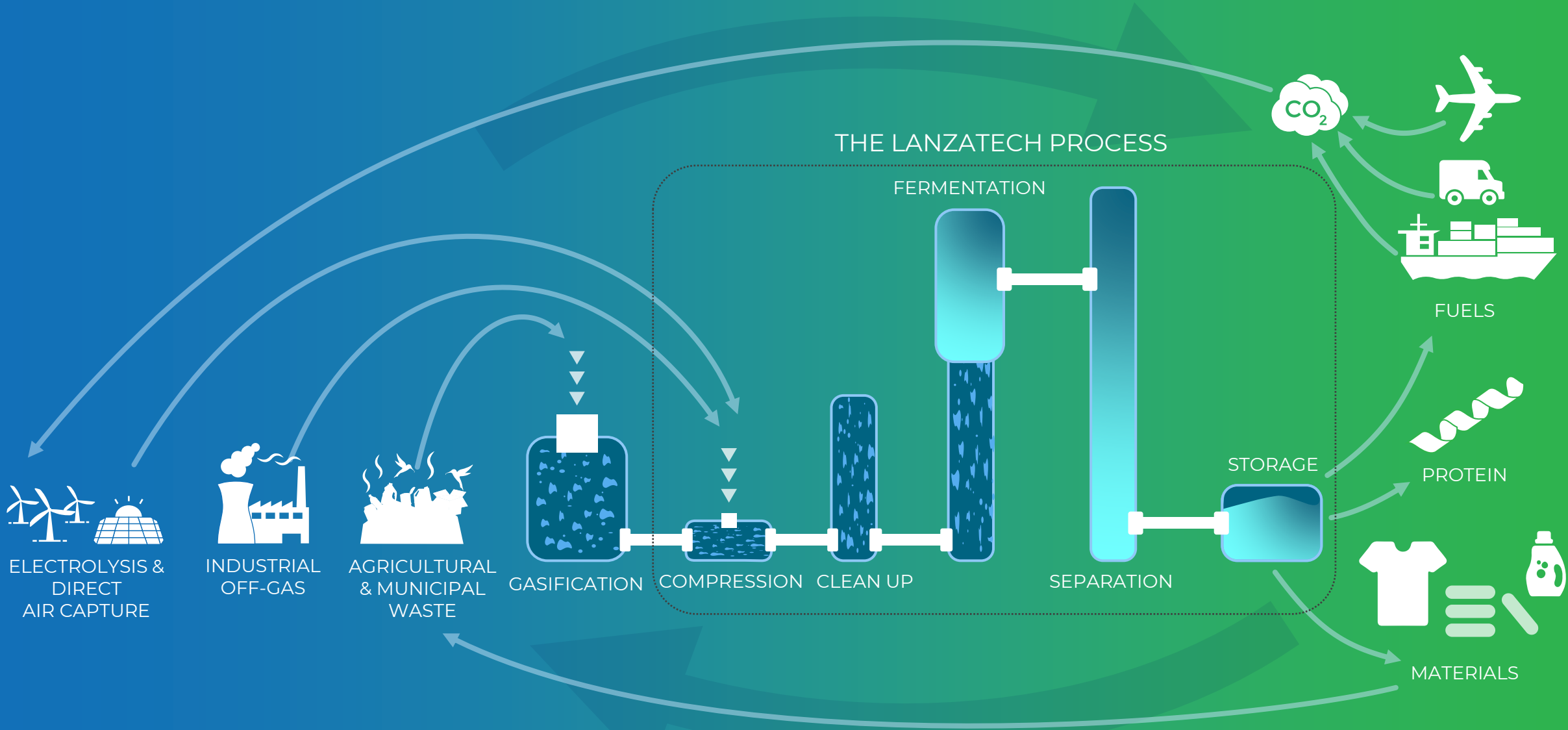
FUELS NEED CARBON



CHEMICALS FOR EVERYDAY PRODUCTS NEED CARBON

Lanzatech

A NOVEL CIRCULAR SOLUTION, RECYCLING WASTE CARBON INTO VALUABLE PRODUCTS



GLOBALLY LICENSED & COMMERCIALY OPERATIONAL TODAY



2018
Production Volume:
46,000 Tons per Year Ethanol
Carbon Source:
Steel Mill Emissions

RSB
ISCC
International Sustainability & Carbon Certification

ISCC **ISCC**
Certified Sustainability ISCC CORSA Certified Sustainability ISCC PLUS



2021
Production Volume:
46,000 Tons per Year Ethanol
Carbon Source:
Ferroalloy Emissions



2022
Production Volume:
60,000 Tons per Year Ethanol
Carbon Source:
Ferroalloy Emissions

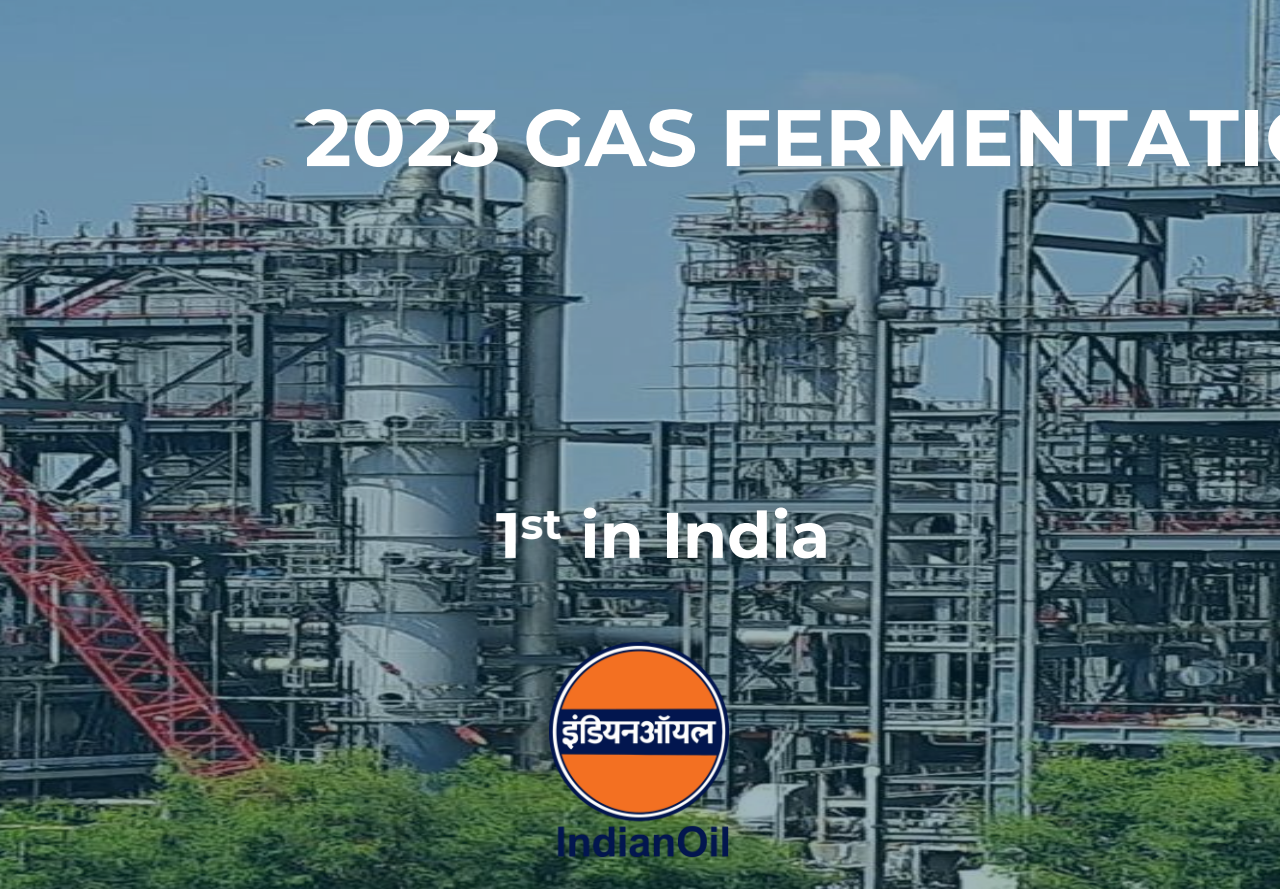
ISCC
International Sustainability & Carbon Certification

ISCC **ISCC**
Certified Sustainability ISCC CORSA Certified Sustainability ISCC PLUS



2023
Production Volume:
60,000 Tons per Year Ethanol
Carbon Source:
Ferroalloy Emissions

2023 GAS FERMENTATION PLANT START UPS



1st in India



IndianOil



1st in Europe



Project/Partner	Carbon Source	Actual or Anticipated Start Date	Ethanol Production Volume (tons/year)	CO ₂ Abated (tons/year)	Location
IndianOil	Refinery Off Gas	3Q 2023	33,500	~60,000	India
ArcelorMittal	Steel Off Gas	4Q 2023	64,000	~125,000	Belgium

Total of **6** commercial-scale gas fermentation facilities online at end of 2023 with cumulative **nameplate capacity of +300,000 tonnes per year**

Steelmanol



Pinakin Chaubal, Chief Technology Officer, ArcelorMittal:

“We have worked with LanzaTech for several years, know their leadership team well and understand the potential of their technology and the role it can play in not only helping us to **decarbonise**, but also in producing **valuable products** from our carbon bearing gases which can help the **decarbonisation of other sectors**. “

COMMERCIALLY PRODUCING

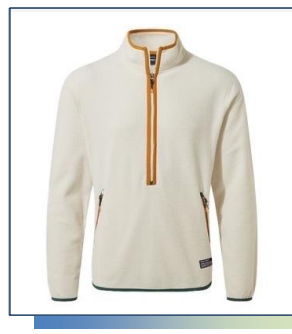
DRESSES



YOGA PANTS



FLEECE JACKETS



SHOE SOLES



PACKAGING



ATHLETIC SHORTS



FRAGRANCES



CLEANING PRODUCTS



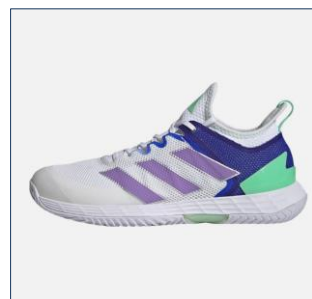
SHIRTS



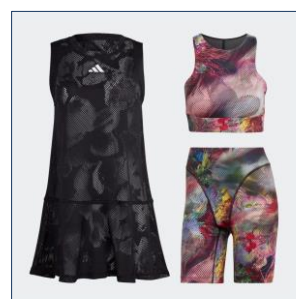
SAF



TENNIS SHOES



ATHLETIC DRESSES



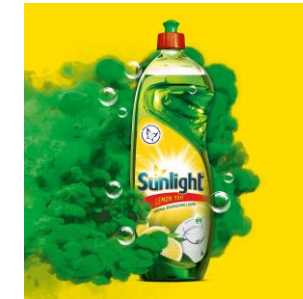
DETERGENTS



CONTAINERS



SURFACTANTS



LANZATECH ENABLES CARBON NEGATIVE PRODUCTS TODAY WITH FORESEEABLE IMPROVEMENT OVER TIME

Renewable Energy

Further reduces carbon intensity of LanzaTech process and products

Carbon Negative Feedstocks

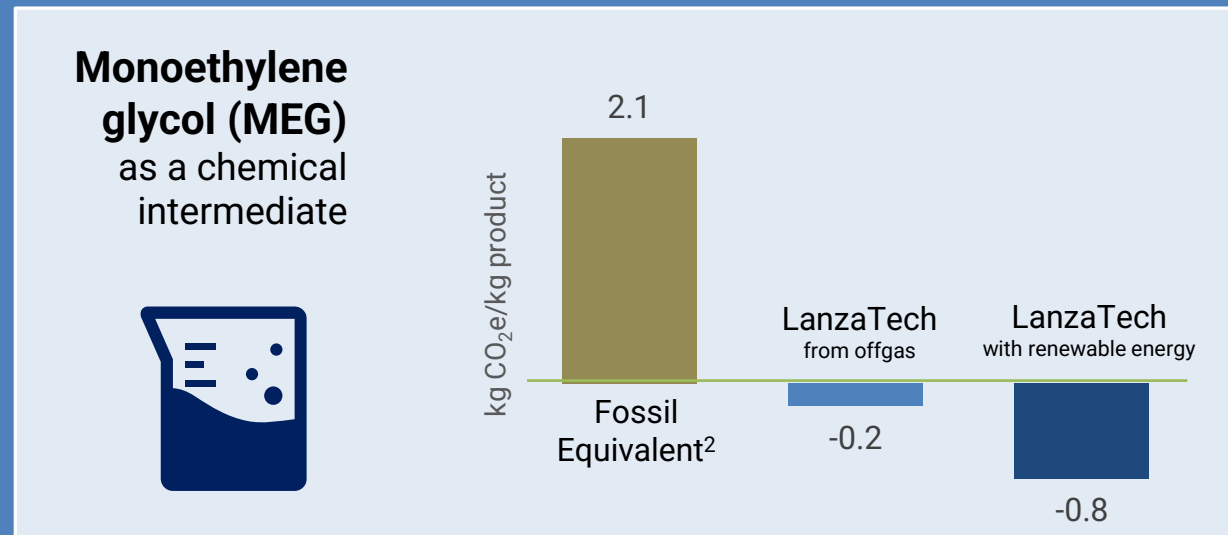
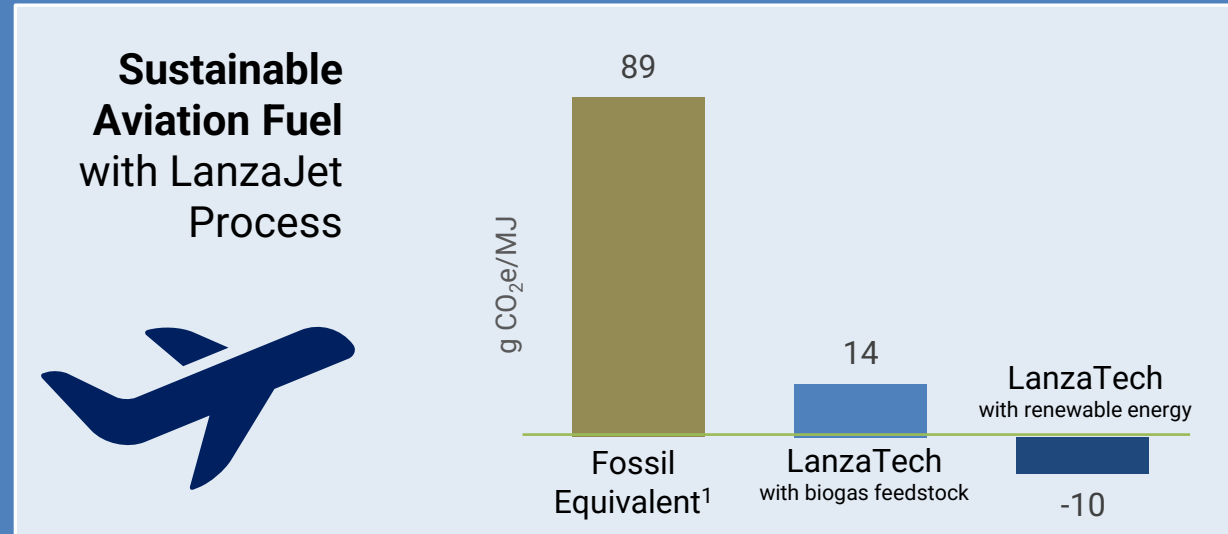
Enable increasingly negative product carbon intensity

Net Zero Economy

Supported by LanzaTech products

Certifications

RSB & ISCC certifications for value chain integrity

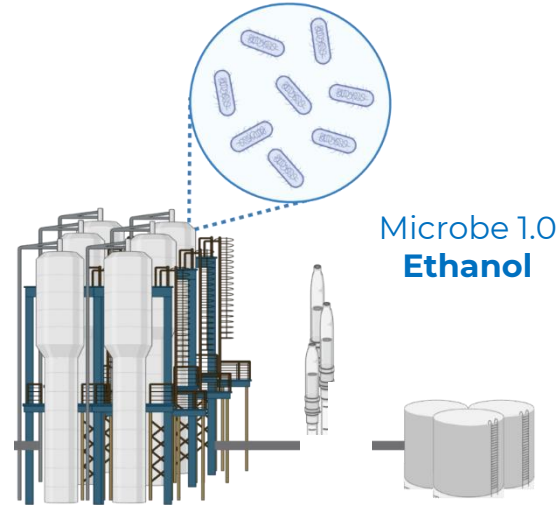


¹ ICAO Sustainable Aviation Fuels Guide, Version 2, December 2018, Page 6; ² The ecoinvent database, version 3

WHERE WE'RE HEADED: DIRECT PRODUCTION OF BULK COMMODITY CHEMICALS ON A DISTRIBUTED SCALE

“Hardware”

Existing Commercial Plants



Microbe 1.0
Ethanol



“Software”

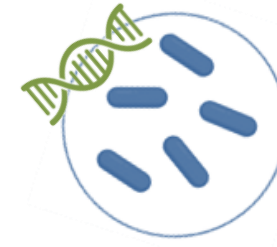
New Strains To Expand Product Portfolio & Efficiency



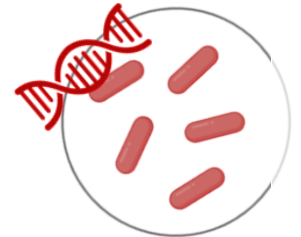
Microbe 2.0
Isopropanol



Microbe 3.0
Acetone



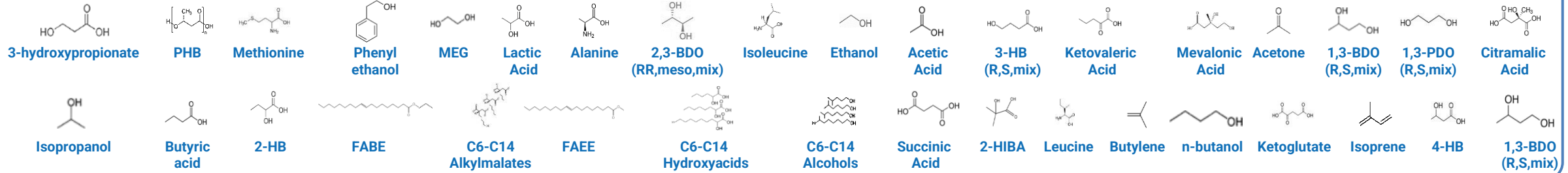
Microbe 4.0
MEG



Microbe ...

✓ **Same reactor** ✓ **Same feedstock** ✓ **Same process**

100+ Potential Chemicals Identified



New product development and direct production of high value chemicals if achieved, can expand TAM and increases demand for Biorefining CCT licensing

Iron & Steel Decarbonization - Technologies

Direct Reduced Iron & EAF

- + Quick fix (NG / Ore)
- + Potential to deep cut with H2-DRI?
- Capex and Opex intensive
- Significant disruption
- Resources challenge

Carbon capture utilization

- + Value Creation
- + Feedstock to produce fuels and chemicals
- + Retrofit
- + Definitive Payback
- Policy recognition
- Scale-up

Near zero enabling technologies

Emerging technologies (mostly at low TRL)

Boston Metals (MOE)
Volteron™ (ArcelorMittal)
Electra
Hydrogen production
Syngas
Use of Biomass

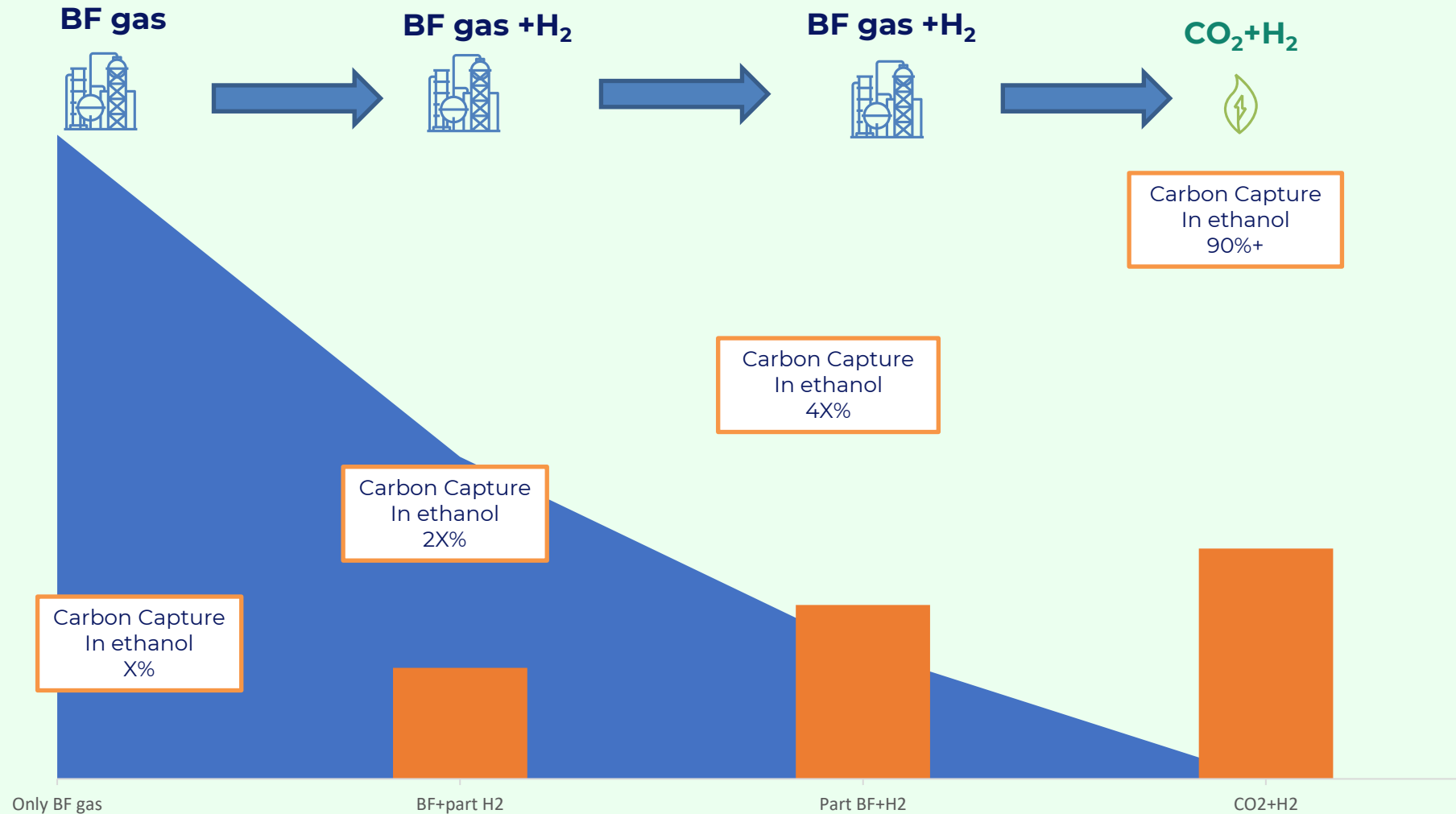
Carbon Capture storage

- + Potentially a quick-fix too?
- + Retrofit
- + Cost avoidance
- infrastructure;
- recurring cost year on year.

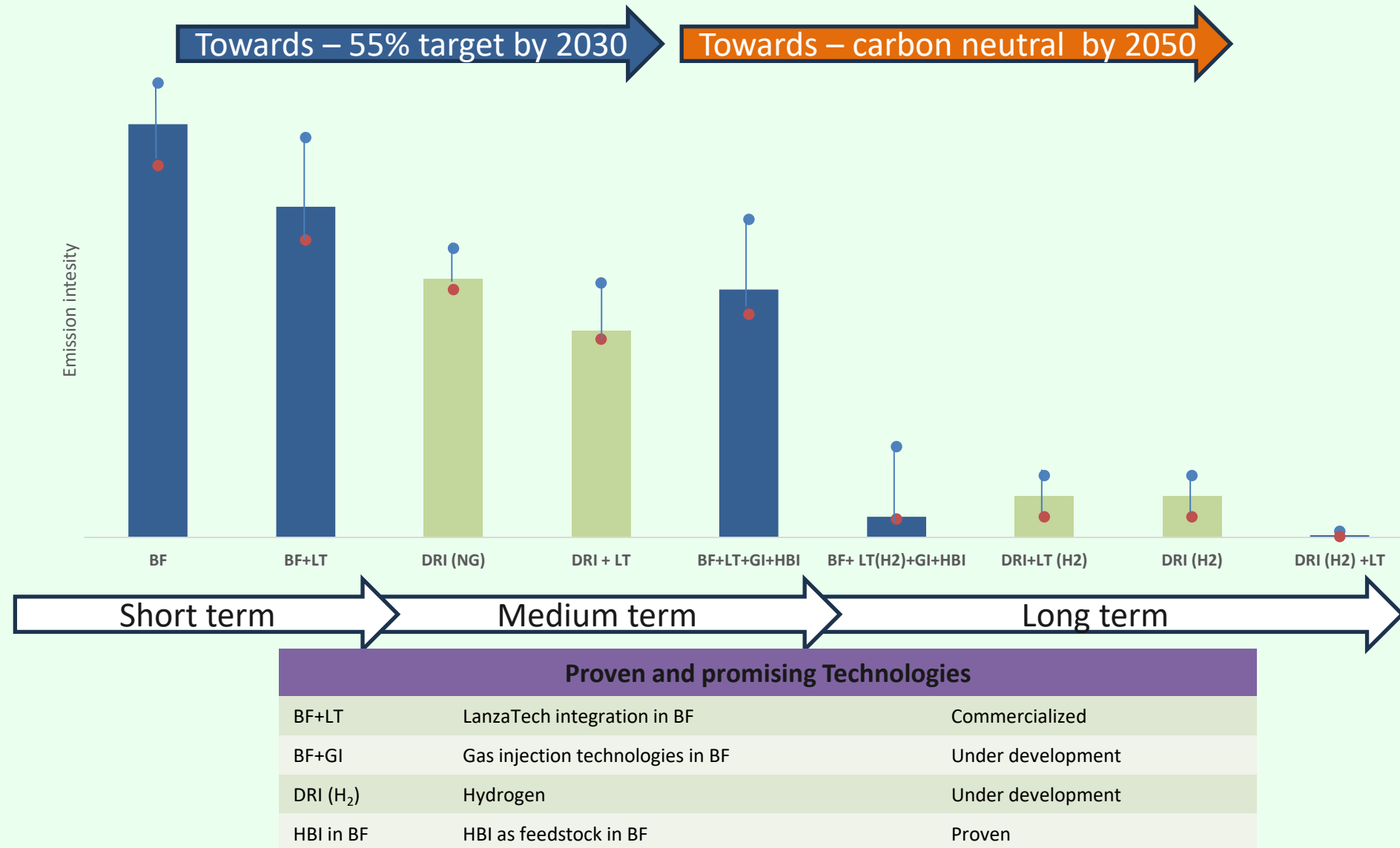
TOWARDS CARBON NEUTRAL WITH LANZATECH:

Transition from BF to CO₂ rich gases & increase in carbon capture rate with H₂

Case study : 100kt Ethanol production tons per year



TOWARDS CARBON NEUTRAL WITH LANZATECH



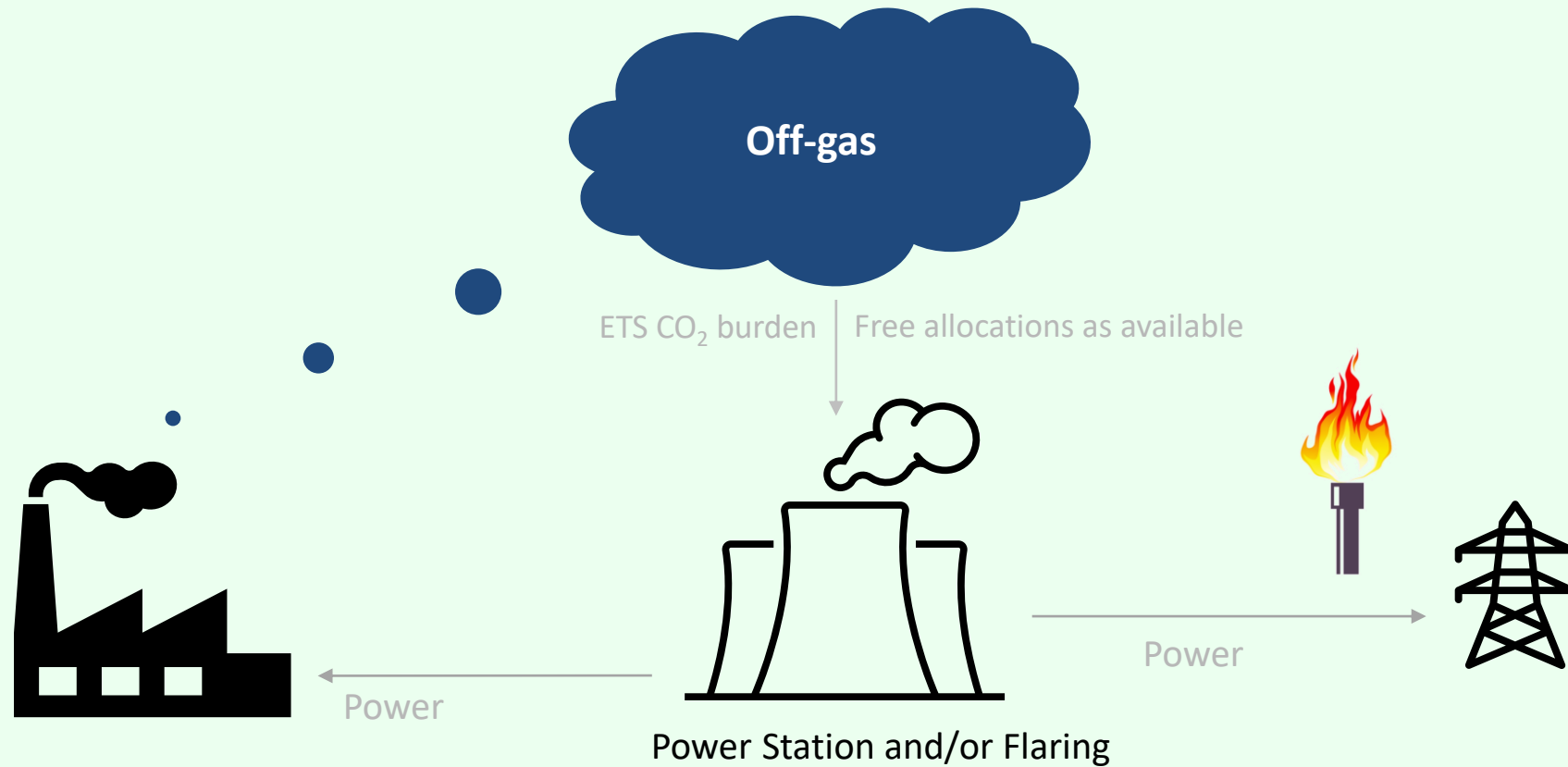
ADDED HYDROGEN INCREASES CARBON CAPTURE

		H ₂ :CO Ratio	Carbon Efficiency
CO	$6 \text{ CO} + 3 \text{ H}_2\text{O} \rightarrow \text{C}_2\text{H}_5\text{OH} + 4 \text{ CO}_2$	0:1	33.3%
CO + H ₂	$3 \text{ H}_2 + 3 \text{ CO} \rightarrow \text{C}_2\text{H}_5\text{OH} + \text{CO}_2$	1:1	66.7%
CO + H ₂	$4 \text{ H}_2 + 2 \text{ CO} \rightarrow \text{C}_2\text{H}_5\text{OH} + \text{H}_2\text{O}$	2:1	100%
CO + H ₂ + CO ₂	$5 \text{ H}_2 + 1 \text{ CO} + 1 \text{ CO}_2 \rightarrow \text{C}_2\text{H}_5\text{OH} + 2 \text{ H}_2\text{O}$	5:1	100%
H ₂ + CO ₂	$6 \text{ H}_2 + 2 \text{ CO}_2 \rightarrow \text{C}_2\text{H}_5\text{OH} + 3 \text{ H}_2\text{O}$	1:0	100%

Multiple avenues to reach 100% carbon capture

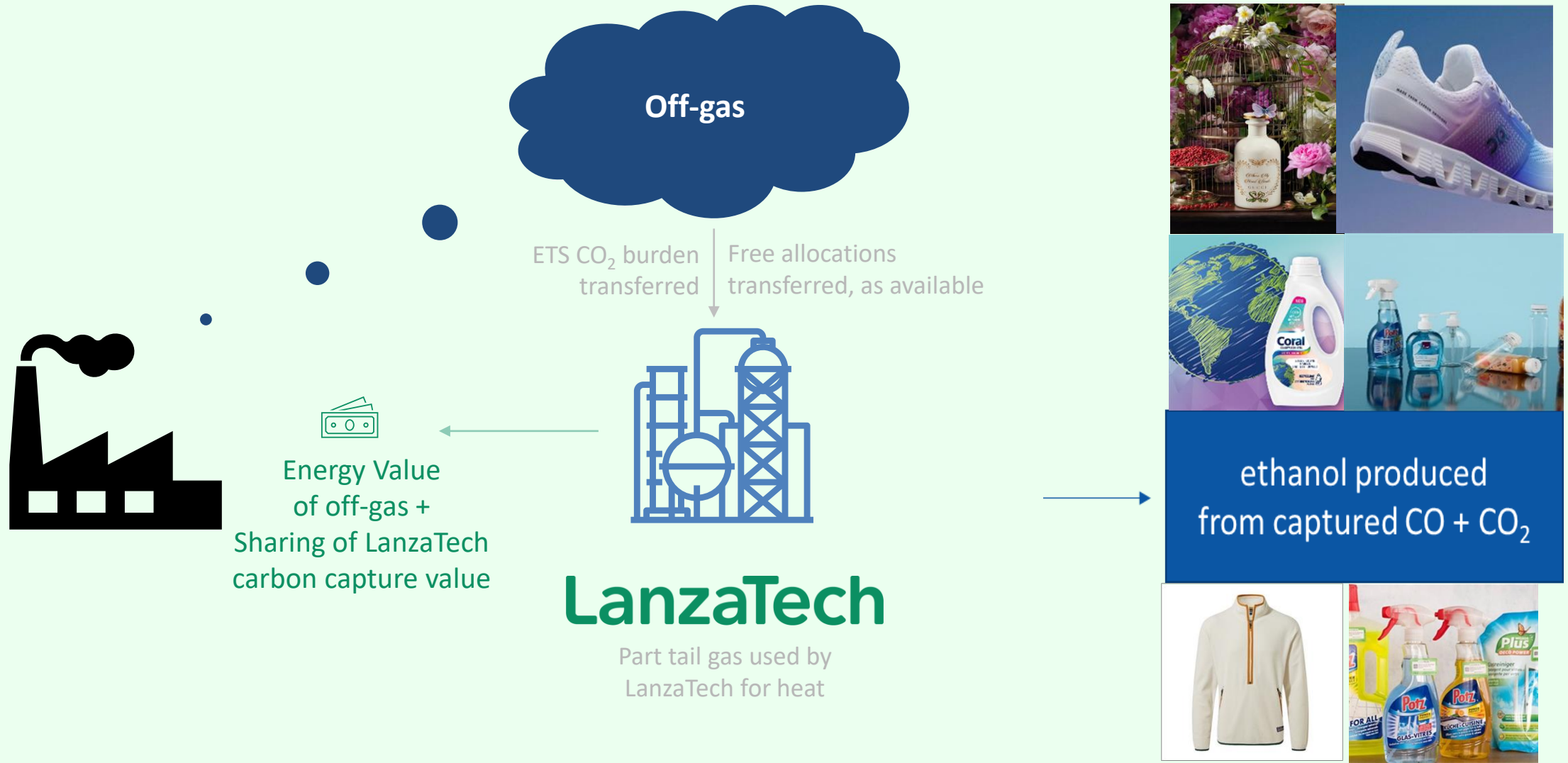
Gas fermentation can flexibly add green H2 to tailor carbon capture

TYPICAL USE OF WASTE GASES



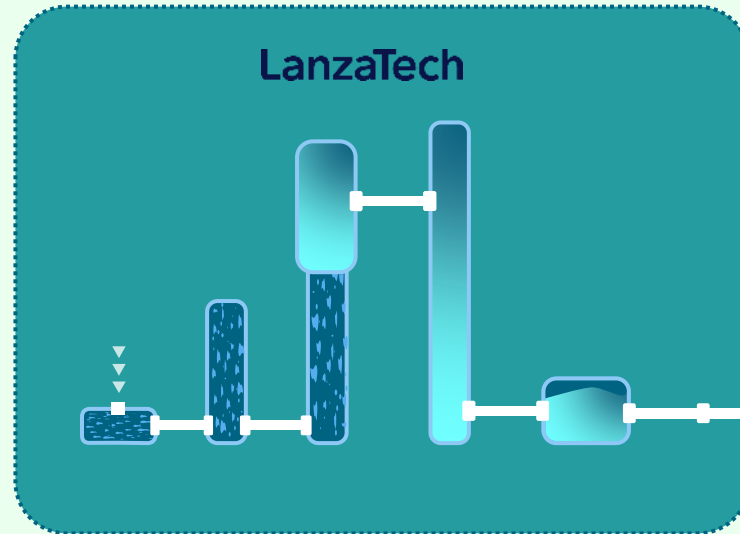
Value of the steel mill off gas decreases over time as the ETS free allocations decrease in the 2026+ time frame

VALUE CREATION POTENTIAL



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THE NEW CARBON ECONOMY IS DISTRIBUTED AND CIRCULAR



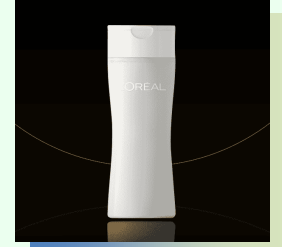
TEXTILES



SHOE SOLES



PACKAGING



CLEANING



FRAGRANCES



AVIATION FUEL



DETERGENTS



CONTAINERS



SURFACTANTS



LanzaTech



THE WORLD HAS
ENOUGH CARBON ABOVE
GROUND TO MAKE
EVERYTHING WE NEED

WE CREATE VALUE
WHERE OTHERS
SEE WASTE

JOIN US ON THIS JOURNEY

LanzaTech

Nasdaq: LNZA

RECYCLING CARBON WITH BIOLOGY