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Inspiring science, enhancing life



Catalyst Technologies seminar: Enabling the net zero transition

27th June 2023

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01. Introduction

Liam Condon
Chief Executive



Catalysing the net zero transition

Our aspiration
is to lead across
our four businesses

Clean Air

Leading in
autocatalyst
markets

Catalyst Technologies

#1 in
syngas-based
chemicals and
fuels technology

Hydrogen Technologies

Market leader
in performance
components for
fuel cells and
electrolysers

PGM Services (Platinum Group Metals Services)

#1 recycler of PGMs¹

Portfolio transitioning and growing over time

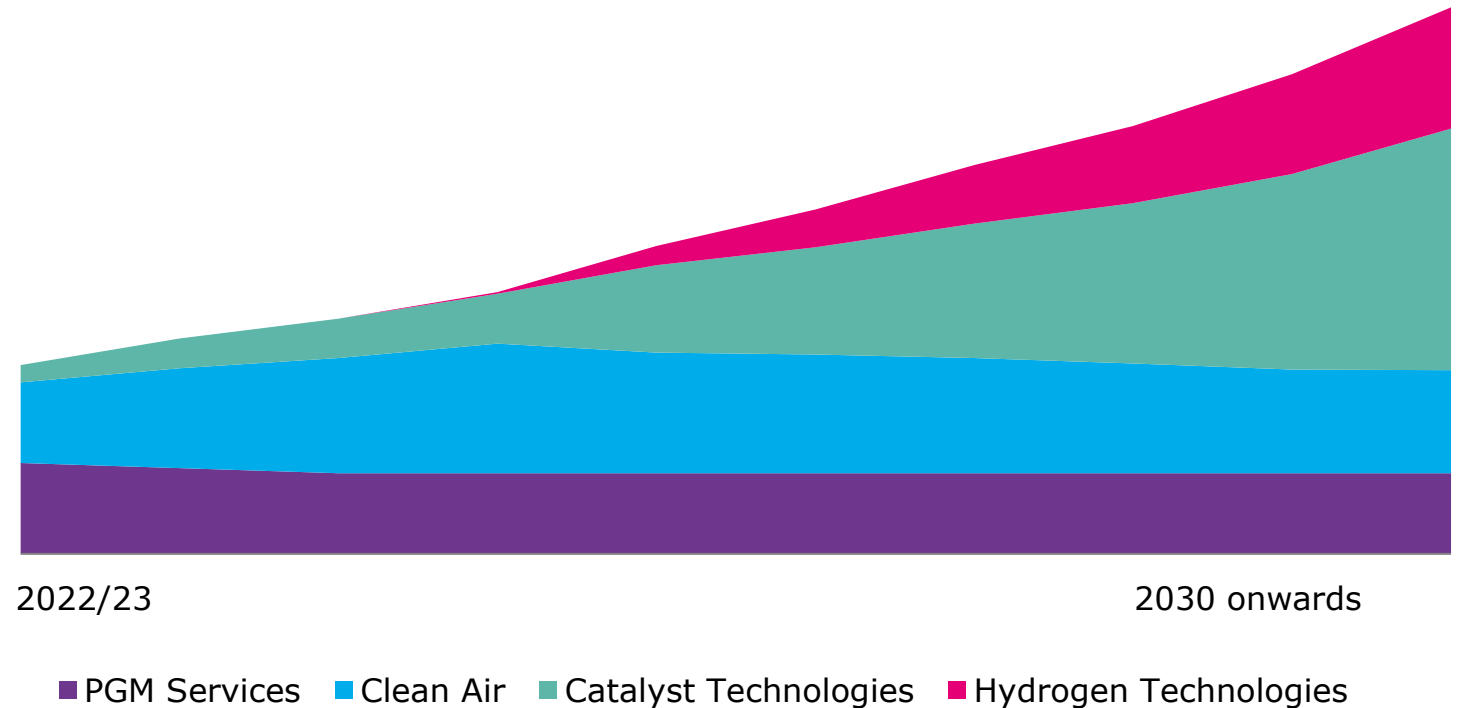
Accelerating to high single digit growth¹ over the medium term, and strong long-term growth

Beyond 2030, growth businesses expected to be **bigger than the size of JM today...**

Illustrative chart

Development of underlying operating profit

Structural growth markets accelerating and opportunities are larger than previously expected



Catalyst Technologies is a key pillar of our strategy



Key pillar of our strategy – key growth driver as we catalyse the net zero transition

1

Catalyst Technologies and Hydrogen Technologies span the hydrogen value chain and underpin the transition to sustainable fuels

2

Shared expertise in metal catalysis, leveraging capabilities and assets in our R&D centres

3

Increasingly important connectivity with PGM Services as the world transitions to net zero

4

02. Catalyst Technologies

Jane Toogood



Today's agenda

01 Catalyst Technologies overview

02 Energy transition and regulatory drivers

03 Syngas is a key gateway to growth opportunities

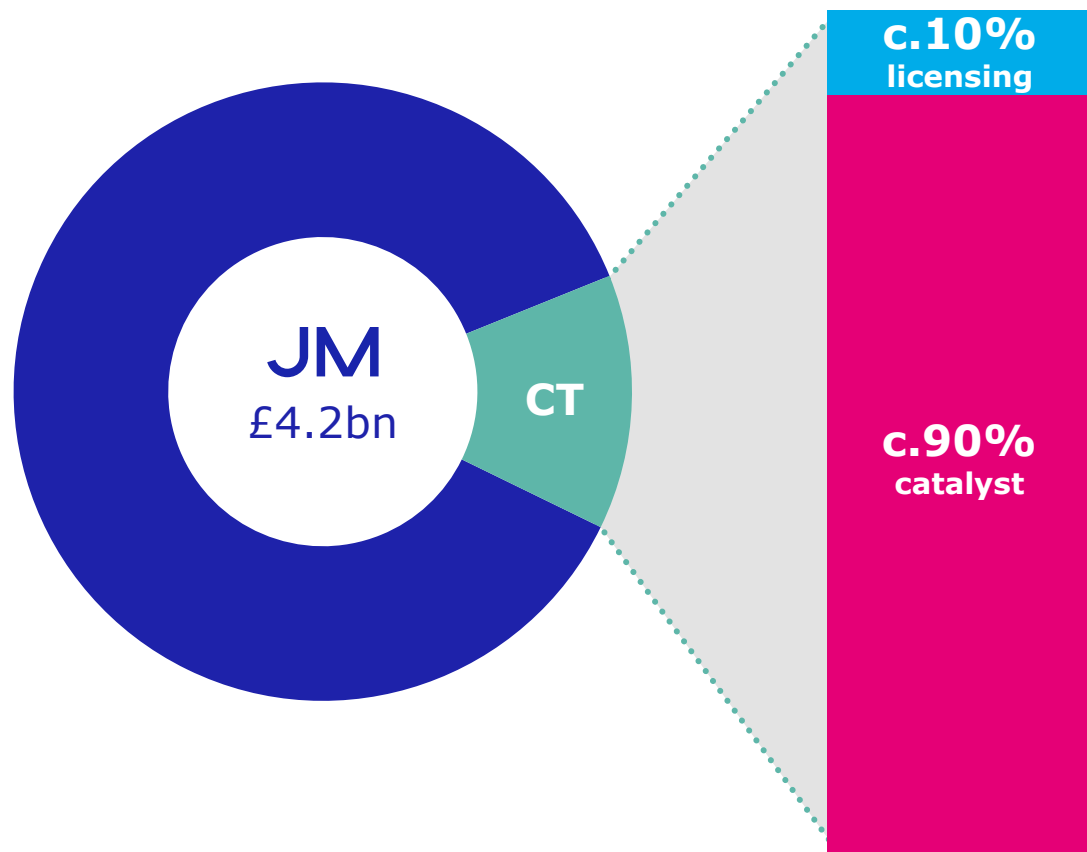
04 Sustainable fuels

05 Low carbon hydrogen (blue hydrogen)

Catalyst Technologies is a global leader in licensing process technology and supply of catalysts

2022/23 sales

£560m



Leading provider of **process technology**, which CT licences to customers, and **catalysts**¹

Leading market position in **syngas**

Trusted **20+ year customer and partner** relationships

Driving **significant shift towards licensing** over time

Sustainable solutions driving growth and value creation

The energy transition creates significant new opportunities

- 1 There is an urgent need for the world to decarbonise...
- 2 Driving strong demand for hydrogen and sustainable fuels
- 3 Hydrogen is essential for:

Decarbonising hard to abate industrial processes



Building blocks for **sustainable fuels** and **chemicals**



Balancing power grids in an increasingly renewable world



Focus of today's seminar

Shift from chemicals to energy markets creates significantly larger value pools for Catalyst Technologies

End market value today¹

15x bigger

Chemicals market

Energy

Regulatory environment and incentives support low carbon hydrogen demand

US

Inflation Reduction Act – c.US\$370bn clean energy incentives

Tax credits for low carbon hydrogen projects



EU

Legislation puts **renewable and low carbon hydrogen on equal footing** in terms of CO₂ reduction required



China

First long-term plan for hydrogen promoting hydrogen production, infrastructure development and use



UK

10GW of low carbon and electrolytic hydrogen production capacity by 2030



Middle East

Kingdom of Saudi Arabia: 2.9 million tonnes of low carbon and electrolytic hydrogen by 2030, **4 million tonnes** by 2035



Japan

Target of **12 mtpa hydrogen supply by 2040** (6x today) supported by c.\$110bn investment



Regulatory environment, incentives and customer commitments support sustainable fuels demand

Policy drivers

US



- **Inflation Reduction Act**
– c.US\$370bn clean energy incentives
- **Grand SAF Challenge:**
3bn gallons/yr (c. 10% SAF) by 2030, 100% by 2050

UK



- **SAF mandate** of minimum 10% SAF by 2030

EU



- **REFuelEU Aviation SAF mandates** minimum 6% SAF in 2030 and 70% by 2050
- **RED III target** for 5.5% advanced biofuels plus renewable fuels of non-biological origin by 2030

Asia



- **Japan:** target of 10% SAF by 2030

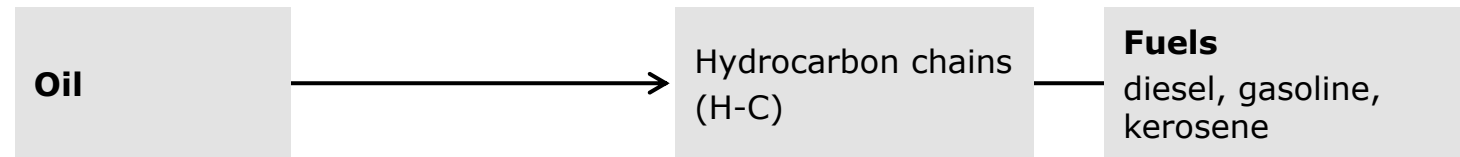
End customer drivers

25 airlines covering 35% of global traffic have committed to SAF blend by 2030 – including KLM, Air France, American Airlines, Delta, DHL, Qantas, Japan Airlines

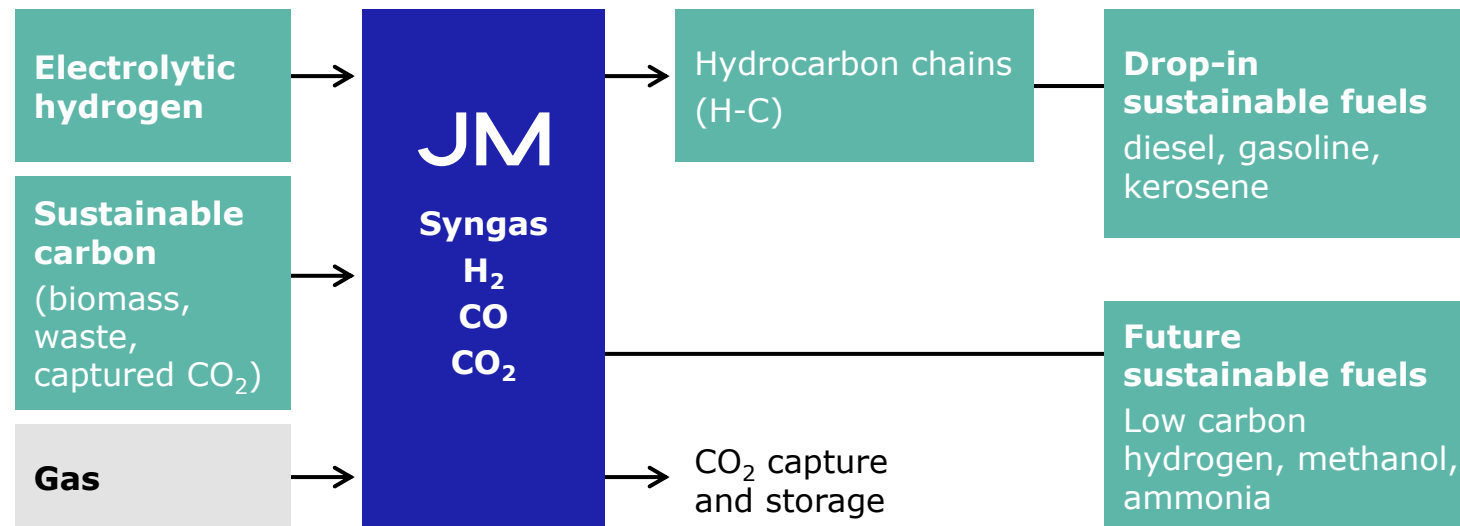


Syngas is a key gateway to sustainable fuels and low carbon hydrogen

Fossil based route



Sustainable route



We are moving from breaking down long hydrocarbon chains....

...to building up short hydrocarbon chains through syngas to create sustainable fuels

Leading market positions in syngas and building partnerships for the future

Syngas processes	Global segment position
Methanol	#1
Hydrogen	#1
Formaldehyde	#1
Ammonia	Top 3

Example customers and partners



Building alliances and partnerships are increasingly important for go-to-market

JM is one of the few players in syngas with an integrated offer

Key players in syngas¹



JM's integrated catalyst and licensing offer delivers:

Strong value proposition through combination of process design and catalyst

Security of catalyst supply in a growing market

Long lasting customer relationships

Strong recurring sales

Fast route to market for new technologies

Winning early projects and a large pipeline

Won five projects worth c.£120m sales¹

Low carbon hydrogen

1 Equinor and Linde for H2H Saltend – one of the UK's largest low carbon hydrogen projects

2 A large scale low carbon hydrogen project in North America

Sustainable fuels

3 Strategic Biofuels project in North America – carbon negative renewable diesel

4 Waste-to-fuels project in North America

5 Waste-to-fuels project in Europe

**Pipeline of more than 100 sustainable solution projects²
(compared to 70 projects a year ago)**



Today's main pathway to sustainable aviation fuel is feedstock limited

Today's pathway

Oil and fat derivatives
(HVO and HEFA¹)

1

Feedstock

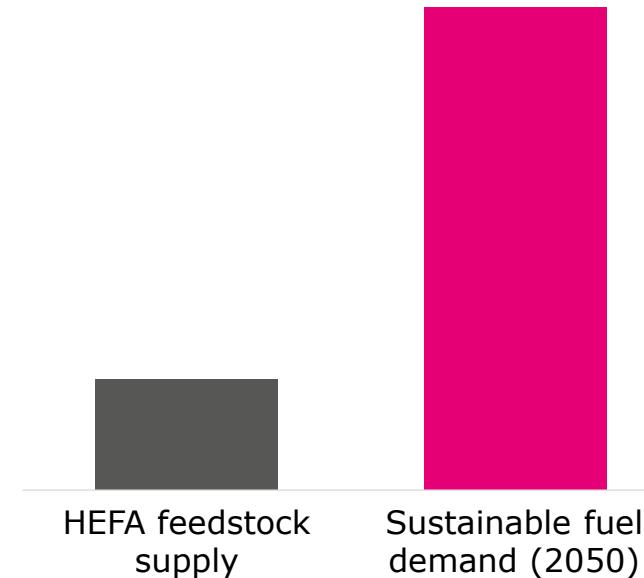
Plant and animal fats, oils
and greases (e.g. waste
cooking oil), oils from
specially grown crops

2

But HEFA/HVO is feedstock limited long term...

3

HEFA/HVO limited by feedstock
availability²



**Other routes
will be needed**

JM plays in three of the main growth pathways for sustainable aviation fuel production

Growth pathways

Fischer-Tropsch (FT CANS™)

E-fuels (via Fischer-Tropsch or methanol)

BioForming™ (pathway to 100% SAF blend)

Feedstock

Syngas produced from
waste or biomass

Green hydrogen
with captured CO₂

Sugars
from biomass

Partner



JM



JM



wholly owned
subsidiary of Marathon

JM

Sustainable aviation fuel: strong competitive advantage

Market leader in syngas

First mover advantage

Proven technologies, **existing** customers

Expertise in **deploying** world scale plants

Technologies offer access to broad range of feedstocks
(waste, biomass, hydrogen)

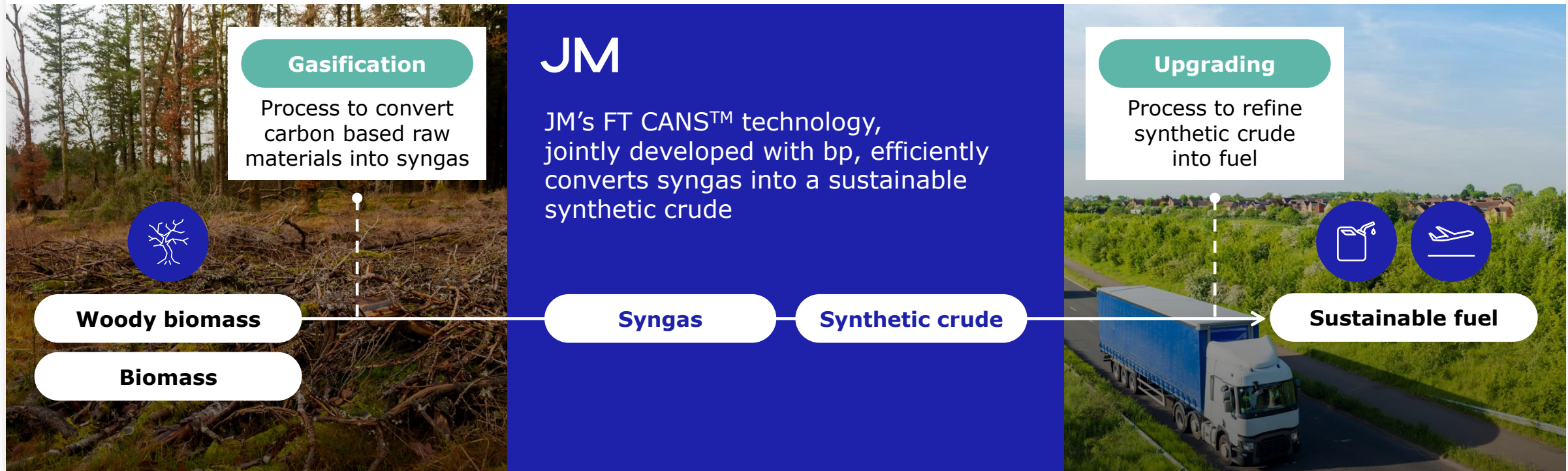
- **FT CANS™**: 50% reduction in capex¹, modular development
- **E-fuels**: technology provider for world's first climate neutral e-methanol plant – Haru Oni
- **BioForming™**: enabled first flight using 100% SAF

Current pipeline of >65 projects



Strategic Biofuels Louisiana Green Fuels project: sustainable fuels

Converting forestry waste into renewable diesel with negative carbon footprint



Main pathways to low carbon hydrogen production

Traditional method of producing hydrogen from natural gas

Mature technology

High capital cost to capture required CO₂

Steam methane reforming (SMR)

JM

JM's LCH™ technology

Mature technology

Higher CO₂ capture at lower capex compared to SMR

Exceeds current standards for carbon intensity to be classified as low carbon hydrogen

Autothermal reforming (ATR)

JM

Higher feedstock efficiency¹

Lower carbon intensity¹

Exceeds current standards for carbon intensity to be classified as low carbon hydrogen

Autothermal reforming (ATR) and gas heated reforming (GHR)

JM

Low carbon hydrogen: strong competitive advantage

Market leader in syngas

Expertise in deploying world scale plants

Existing customers

Portfolio of proven **technologies to meet different customer needs**

ATR: world-class uptimes

ATR-GHR:

- Up to 99% CO₂ capture¹
- 12% lower capex and 7% lower feedstock usage²

Current pipeline of >35 projects



H2H Saltend: low carbon hydrogen project

JM signed low carbon hydrogen technology licence with Equinor and Linde Engineering for H2H Saltend, one of the UK's largest low carbon hydrogen projects

JM
LCH™

JM's LCH™ technology efficiently converts natural gas into hydrogen, with the by-product CO₂ captured and safely stored, reducing CO₂ emissions by more than 95%

Natural gas

Syngas

Hydrogen

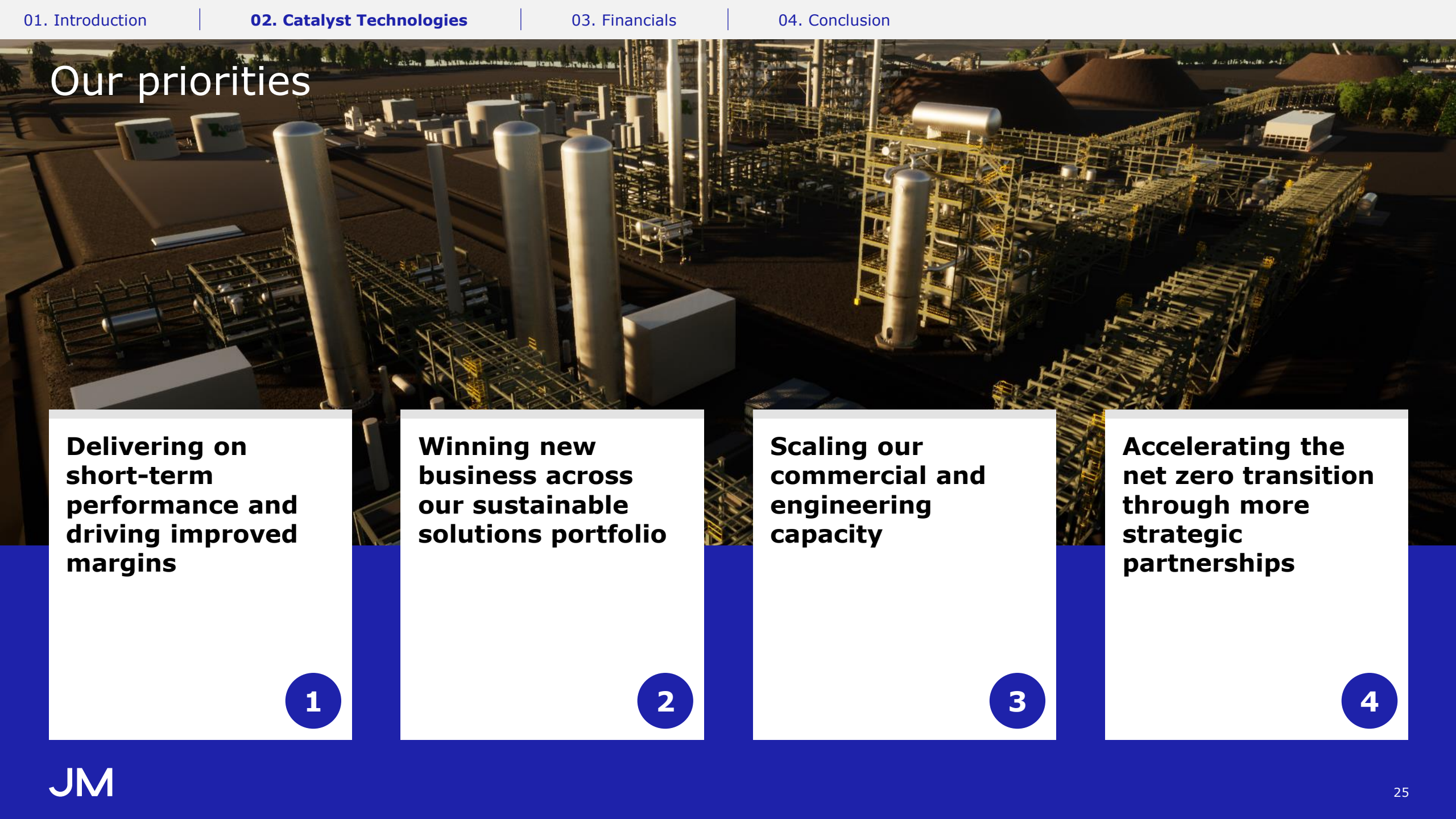
**Power, industry,
heating**

Carbon dioxide

**Carbon capture
and storage**

**Decarbonising chemicals and electricity production in the Humber region –
the UK's most carbon intensive industrial region**

Our priorities



Delivering on short-term performance and driving improved margins

1

Winning new business across our sustainable solutions portfolio

2

Scaling our commercial and engineering capacity

3

Accelerating the net zero transition through more strategic partnerships

4

03. Financials

Stephen Oxley



Significant incremental revenue pool from two growth opportunities

Sustainable aviation fuel

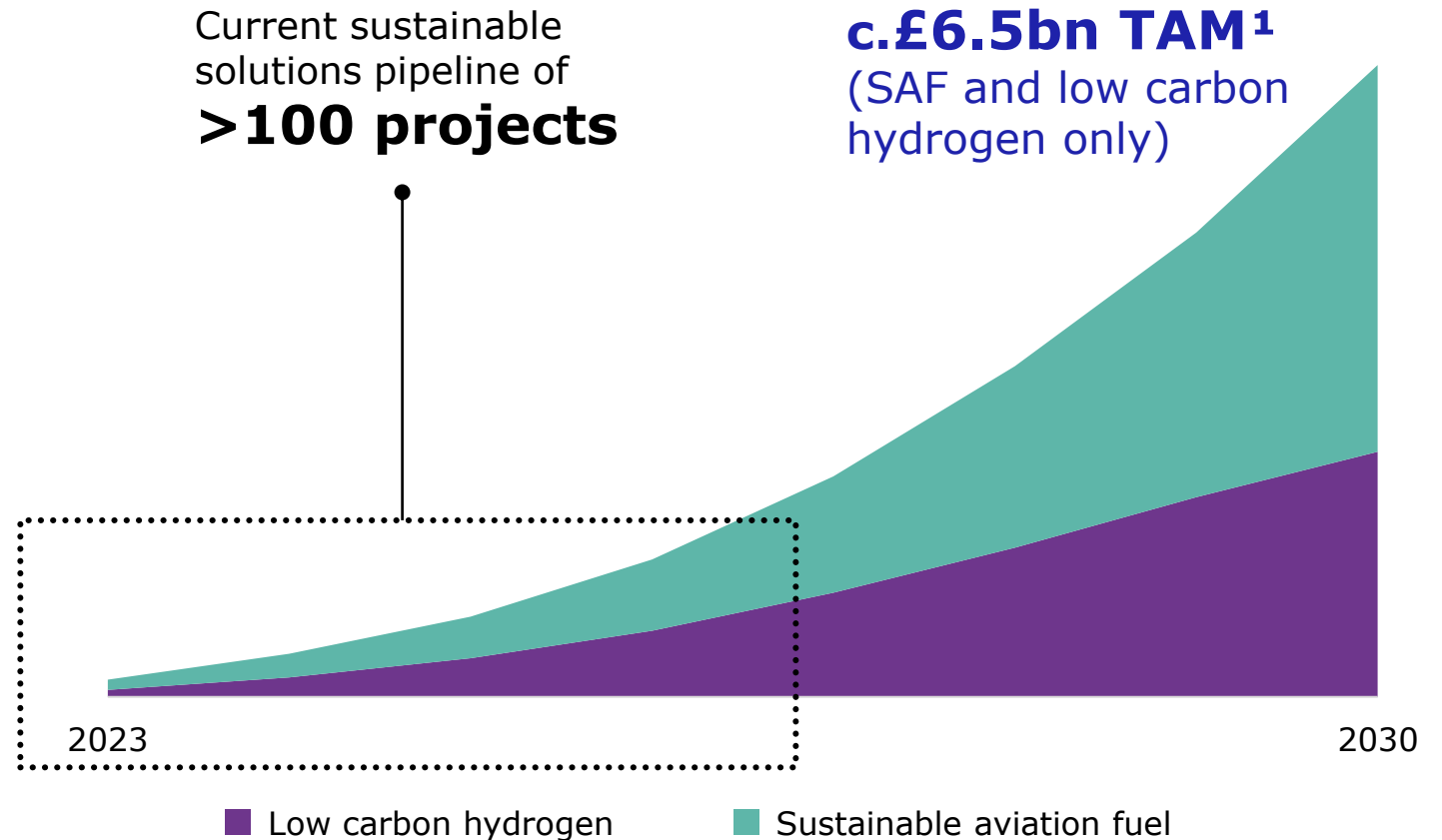
- **Cumulative 2030 TAM:** c.£4bn²
- **Projects required by 2030 to meet market demand³:** c.145

Low carbon hydrogen

- **Cumulative 2030 TAM:** c.£2.5bn²
- **Projects required by 2030 to meet market demand³:** c.125

Sustainable aviation fuel and low carbon hydrogen

Illustrative total addressable market (TAM) demand to 2030¹

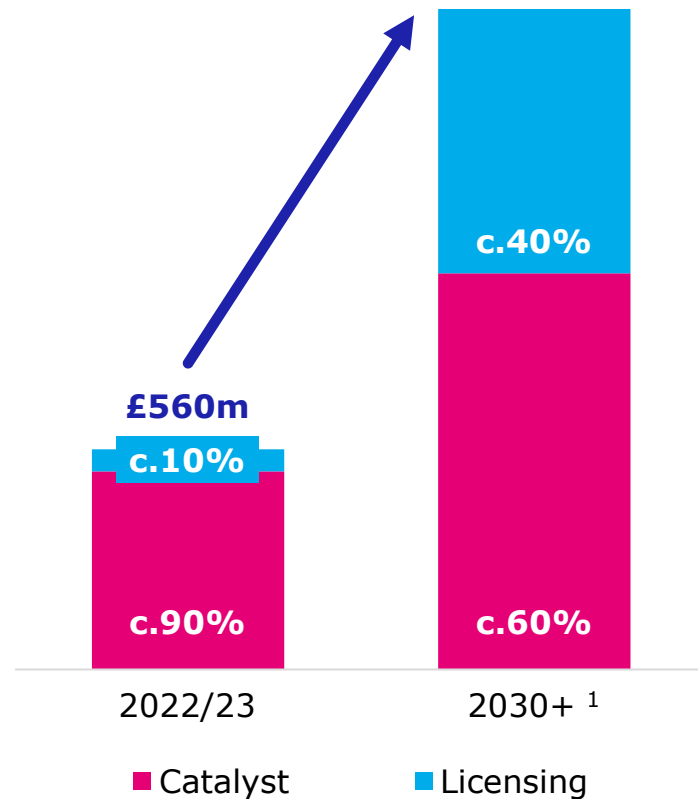


1. Value of total addressable market calculated as the first 5 years of revenue from the cumulative number of projects needed to meet the market demand. Excludes other sustainable fuel opportunities such as BioForming, e-methanol and ammonia cracking.

2. Addressable market for Sustainable Fuels based on IATA data for Sustainable Aviation Fuels (SAF) with an assumption of 25% of SAF demand via FT-based routes by 2034. Addressable market for Low Carbon Hydrogen based on demand according to IEA APS (blue hydrogen).

3. Based on the cumulative number of projects needed to meet addressable demand by 2034 (following an average 4 years to plant start up). Sustainable aviation fuel: 15mTpa (120m barrels p.a.). Low Carbon Hydrogen: 20mTpa (70k MW p.a.).

Driving sales towards licensing



Licensing / catalyst mix expected to change materially

- Net zero transition driving long-term investment cycle
- Significant investment in new plants driving licensing income
- JM has a licensing led business model

Revenue spread over a number of years

Average JM revenue per existing project within first 5 years (£20-30m)

Licensing

Process technology and engineering

c.£10m

Average revenue per licence²

First fill catalysts

Catalyst fills for new build plants

c.£10-20m

Average revenue per first fill²

Every 3-4 years

Refill catalysts

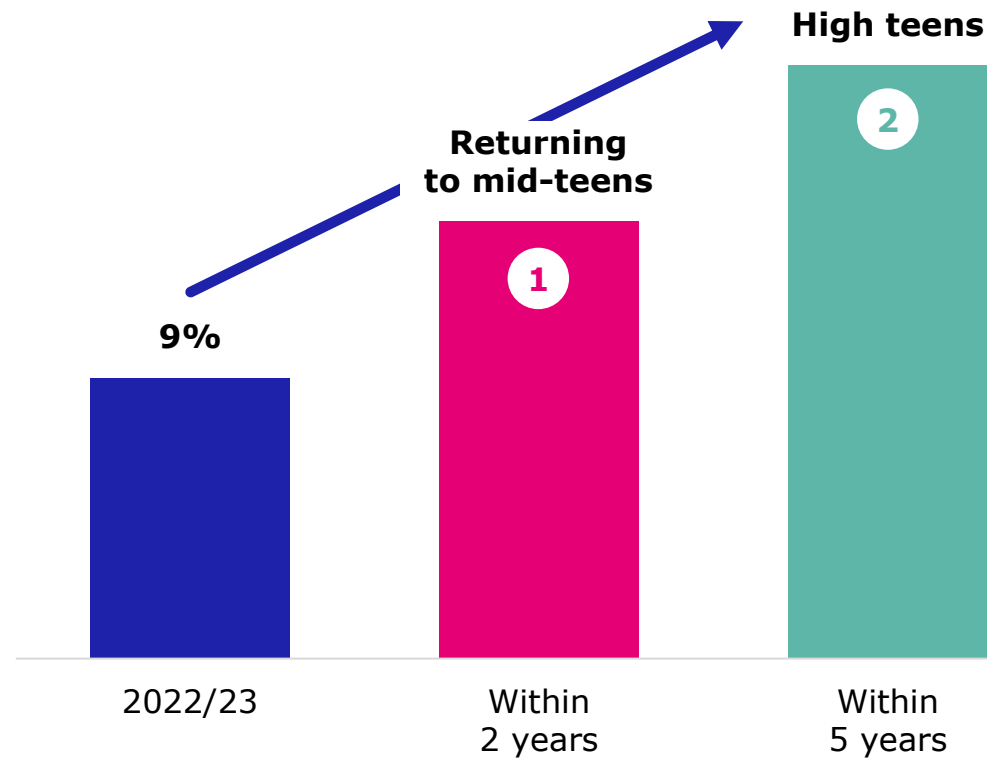
Catalyst refills for existing plants

c.£10-20m

Average revenue per refill³

Creating a stronger platform for growth

Improving operating margin



Pricing initiatives

1

- Surcharges to recover cost inflation
- Driving value-based pricing in key segments
- Focus on strengthening pricing capabilities

Procurement

- Reducing number of suppliers by one third
- Reducing reliance on single source items
- Introducing alternative raw materials

Manufacturing efficiency

- Manufacturing excellence initiatives
- Increasing capacity in key sites

Licensing / catalyst mix

2

- Licensing is a higher margin, low capex business model
- Sustainable solutions growth shifts mix towards licensing, driving margin accretion



Financial guidance

Delivering **high single digit sales growth** in the **short-term**, accelerating to **mid teens sales growth** over the **medium to long-term**

Margin accretion driven by value creation programme and mix shift towards licensing

- **Mid teens** margin within **two years** (by end of 2024/25)
- **High teens** margin within **five years** (by end of 2027/28)
- **Continued margin accretion** over the long-term driven by licensing shift

Depreciation and amortisation – c.5% of sales

Capex

- High single digit capex to sales in 2022/23
- Decreasing capital intensity over time with increased licensing in the mix

Working capital requirements

Improves as the business shifts more towards licensing

04. Conclusion

Liam Condon
Chief Executive



We have clear milestones in Catalyst Technologies

Strategic	Status	
Financial	• Win at least 4 large scale projects in 2023/24¹	●
	• Deliver targeted capacity expansion (formaldehyde catalyst) by end of 2023/24	●
	• Delivering high single digit sales growth in the short-term, accelerating to mid teens sales growth over the medium to long-term	●
	• Mid-teens margin within the next two years (by end of 2024/25) • High teens margin within the next five years (by end of 2027/28) • Continued margin accretion over the long-term driven by licensing shift	●

● On track



Catalyst Technologies is enabling the net zero transition

01

Deliver on financial commitments

02

Achieve all strategic milestones

03

Accelerate the net zero transition through more strategic partnerships

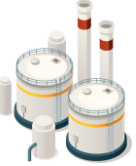



Q&A



APPENDIX

Total addressable market (TAM) demand to 2030

Growth markets	Number of projects required by 2030 to meet market demand ¹	Data sources and assumptions	JM revenue per project ⁴ £m	Cumulative 2030 TAM ⁵ £bn	Number of current projects in JM pipeline
Low carbon (blue) hydrogen² 	May 2022 70-430	<ul style="list-style-type: none"> Scenario range: IEA SDS to IEA NZE Average project size: 160kT/600MW p.a 3 years from project signing to plant start up Addressable demand taken from 2033 	15-20	1-8	>35
	June 2023 c.125	<ul style="list-style-type: none"> Scenario: IEA APS (Announced Pledges) Average project size: 160kT/ 600MW p.a 4 years from project signing to plant start up Addressable demand taken from 2034 	15-25	2.5	>35
Sustainable aviation fuels³ 	May 2022 30-60	<ul style="list-style-type: none"> Scenario: IATA for SAF with 32% via FT-route Average project size: 3k bpd (3k bpd with 75% of plant output = SAF) 3 years from project signing to plant start up Addressable demand taken from 2033 	20-35	1-2	>25
	June 2023 c.145	<ul style="list-style-type: none"> Scenario: IATA for SAF with 25% via FT-route Average project size: 2.25k bpd (3k bpd with 75% of plant output = SAF) 4 years from project signing to plant start up Addressable demand taken from 2034 	20-40	4	>65