JM

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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 PGMs[1]

1. Iridium, palladium, platinum, rhodium and ruthenium.

Portfolio transitioning and growing over time

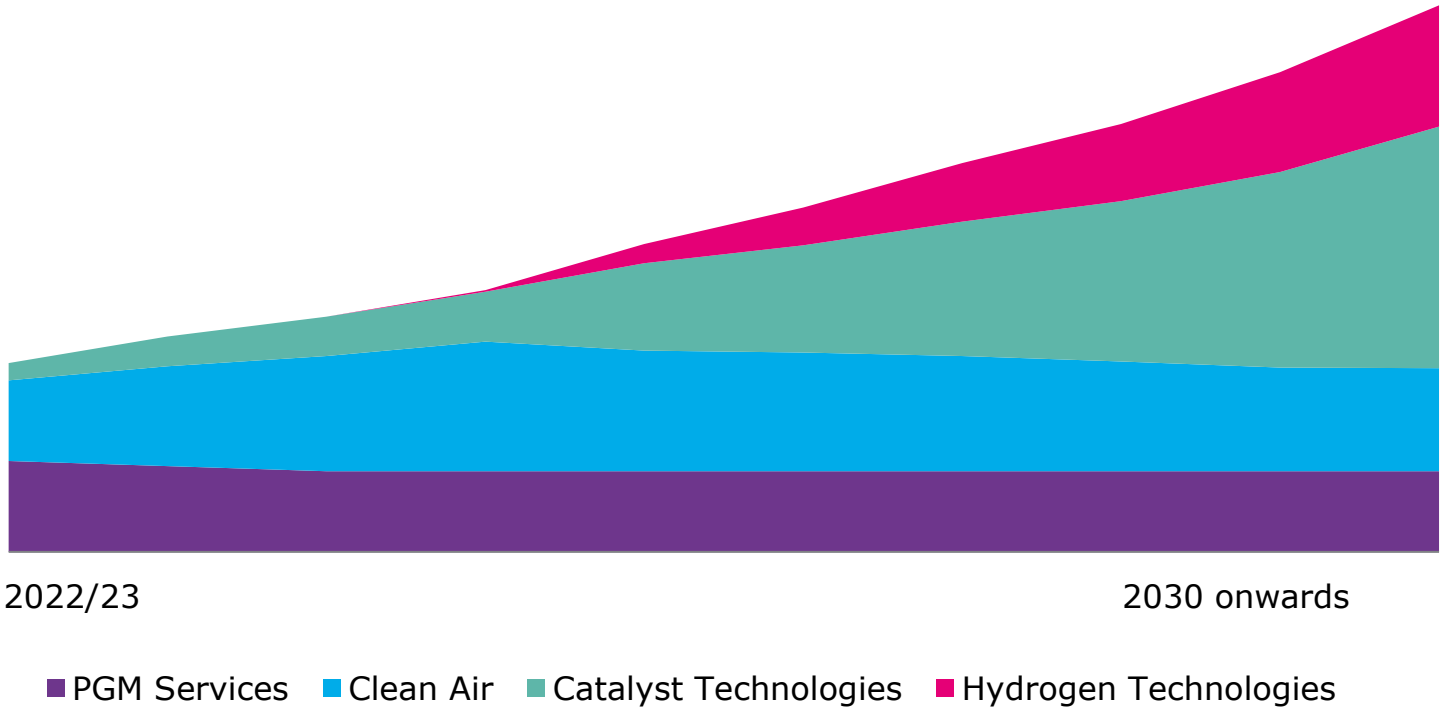
Accelerating to high single digit growth[1] over the medium term, and strong long-term growth

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



1. At constant precious metal prices and FX rates (2021/22 average). Note: Illustration excludes Value Businesses and Corporate.

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

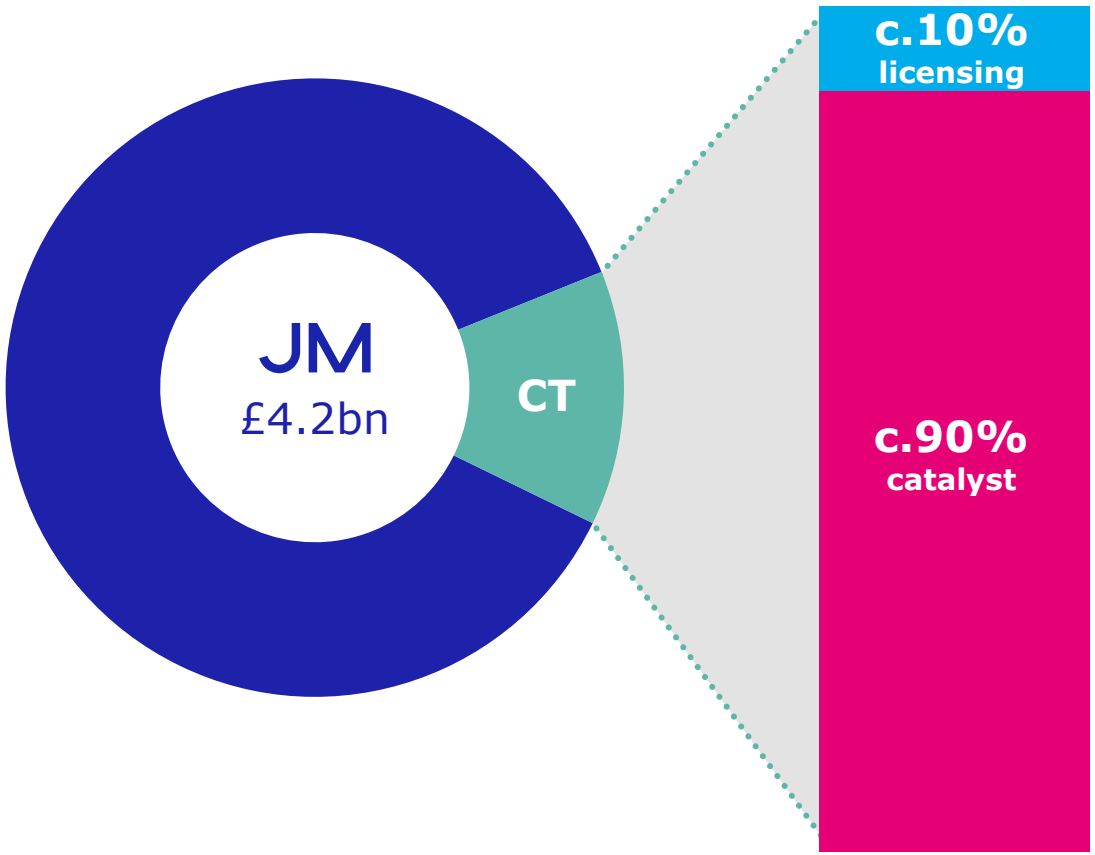
03 Syngas is a key gateway to growth opportunities

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**



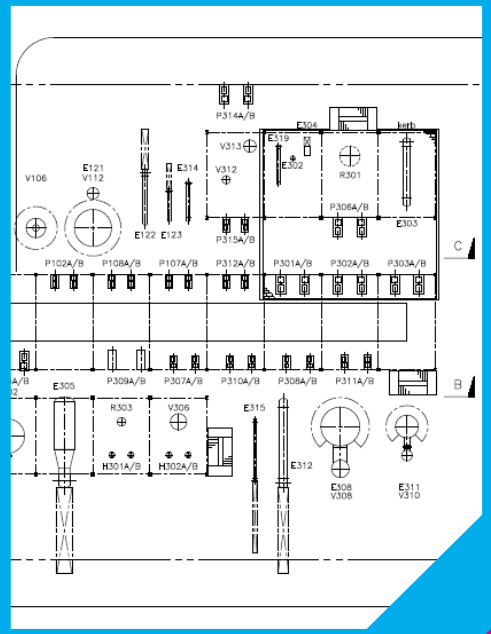
- Leading provider of **process technology,** which CT licences to customers, and **catalysts**[1]
- Leading market position in **syngas**
- Trusted **20+ year customer and partner** relationships
- Driving **significant shift towards licensing** over time
- **Sustainable solutions** driving growth and value creation

Note: CT – Catalyst Technologies. Syngas is predominantly carbon monoxide (CO), carbon dioxide (CO_2) and hydrogen (H_2).
1. As well as licensing, CT may also provide proprietary equipment to customers which complements our proprietary technologies.

JM offers an attractive combination of licensing and catalysts to optimise our customers' performance

Licensing

Process technology and engineering services to **enable efficient, sustainable chemical processes**



Catalysts

Fundamental to chemical processes, **increasing plant efficiency, product yield and sustainability**

A differentiated customer offering

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**

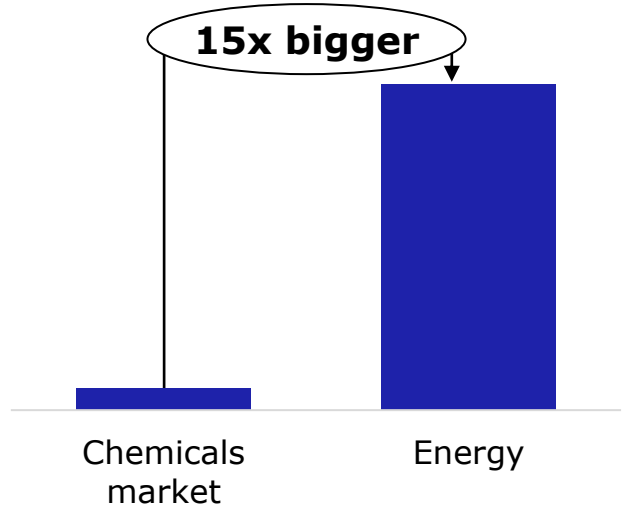
3 **Hydrogen is essential for:**

- **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 today[1]



1. Chemicals – end market size for JM relevant chemicals (various market reports).
Energy – revenue of top 250 oil and gas players (excluding utilities).

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 CO_2 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

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Source: US National Hydrogen Strategy Report, UK Hydrogen Strategy Report, Argus Media October 2021, Reuters June 2023; EU Renewable Energy Directive, Mercator Institute for China Studies.
Note: Low carbon hydrogen refers to CCS-enabled hydrogen / blue hydrogen.

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

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

UK

- **SAF mandate** of minimum 10% SAF 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, Quantas, Japan Airlines

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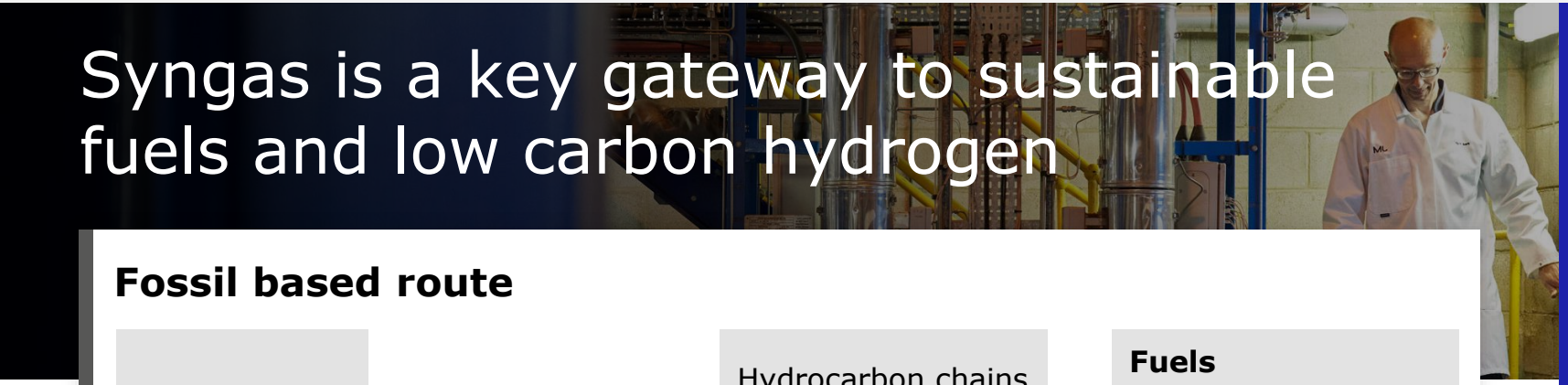
Source: US Department of Energy, European Commission, UK Department for Transport, IATA, Nikkei Asia, company websites.

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



Fossil based route

Oil → Hydrocarbon chains (H-C) → **Fuels** diesel, gasoline, kerosene

Sustainable route

Electrolytic hydrogen →

Sustainable carbon (biomass, waste, captured CO_2) →

Gas →

JM **Syngas** H_2 CO CO_2

→ Hydrocarbon chains (H-C) → **Drop-in sustainable fuels** diesel, gasoline, kerosene

→ CO_2 capture and storage

→ **Future sustainable fuels** Low carbon hydrogen, methanol, ammonia

We are moving from breaking down long hydrocarbon chains….

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

Note: Syngas is predominantly carbon monoxide (CO), carbon dioxide (CO_2) and hydrogen (H_2).

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

thyssenkrupp

methanex the power of agility

CF

bp

DOW

KBR

Honeywell

VIRENT

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

Note: Segment position refers to JM position in catalyst. Based on JM's market database.

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

Key players in syngas[1]

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

1. Not exhaustive. Includes hydrogen, methanol, ammonia, formaldehyde.

Winning early projects and a large pipeline

Won five projects worth c.£120m sales[1]

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 projects[2]
(compared to 70 projects a year ago)

1. Revenue over 5 years relating to low carbon hydrogen and sustainable fuel project wins from 1st April 2022 to date, assuming project completion.
2. Sustainable solutions pipeline includes low carbon hydrogen, sustainable fuels and low carbon solutions projects.

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

Today's pathway

1

Oil and fat derivatives (HVO and HEFA[1])

Feedstock

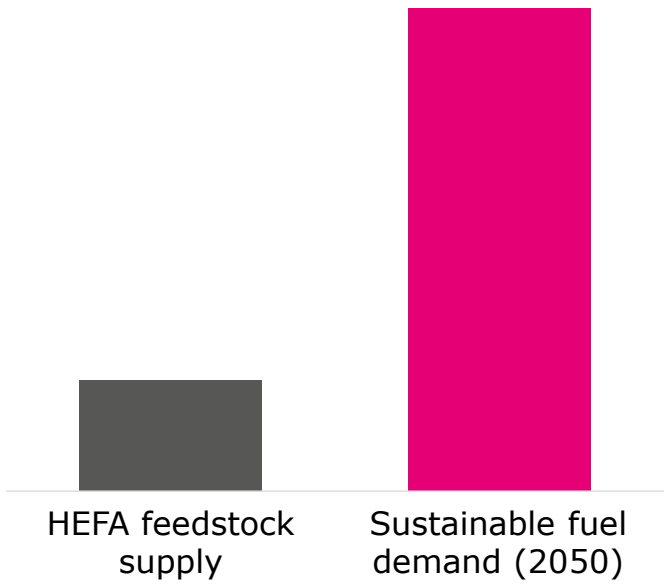
2

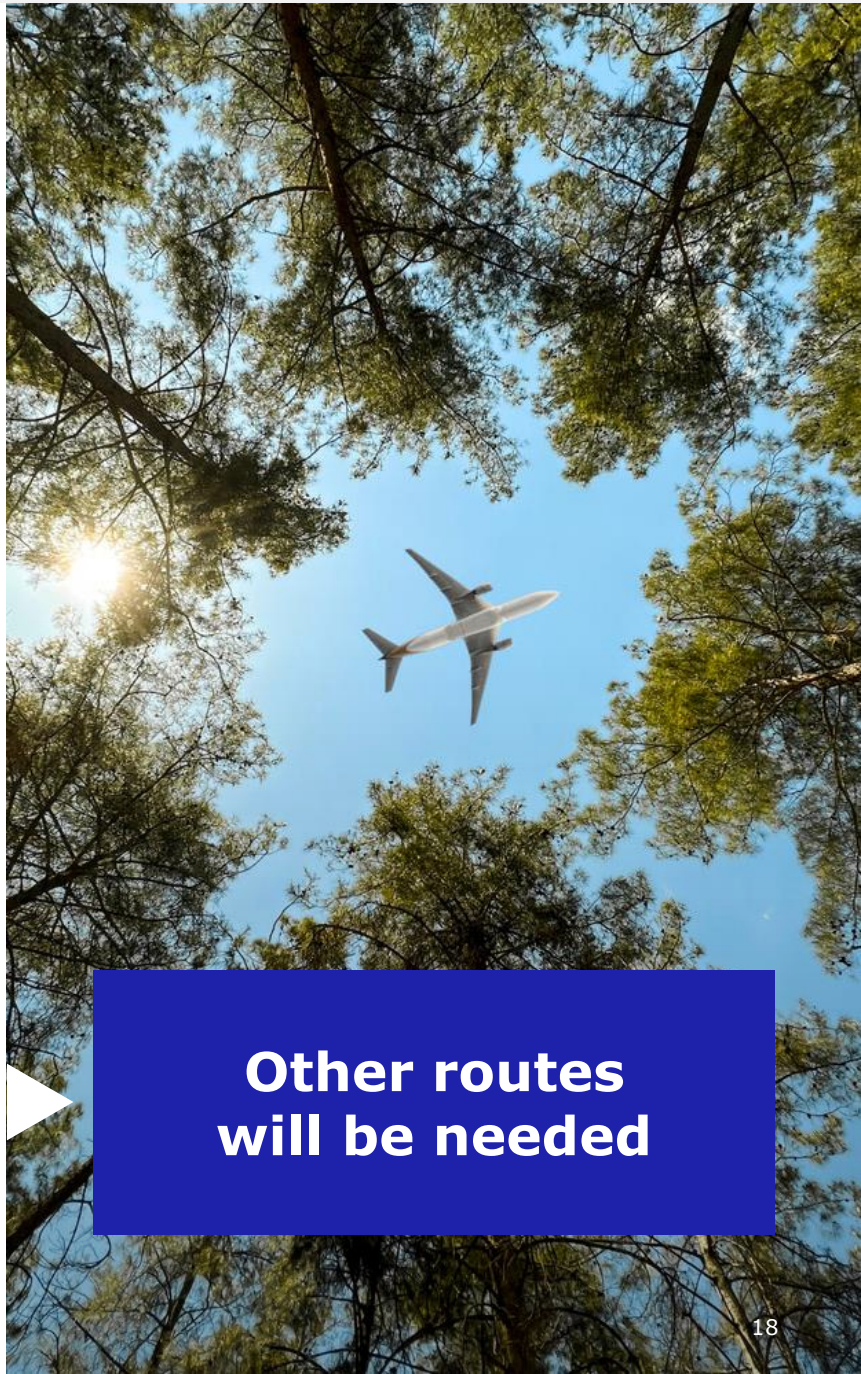
Plant and animal fats, oils and greases (e.g. waste cooking oil), oils from specially grown crops

But HEFA/HVO is feedstock limited long term…

3

HEFA/HVO limited by feedstock availability[2]





1. HEFA – Hydroprocessed Esters and Fatty Acids; HVO – Hydrogenated Vegetable Oil.
2. World Economic Forum – Clean Skies for Tomorrow 2020; IATA.

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 CO_2	Sugars from biomass
Partner	bp JM	bp JM JM / bp collaboration on FT route only	VIRENT JM wholly owned subsidiary of Marathon

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Note: Fischer-Tropsch FT CANS™ technology is proprietary to JM and bp.

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)

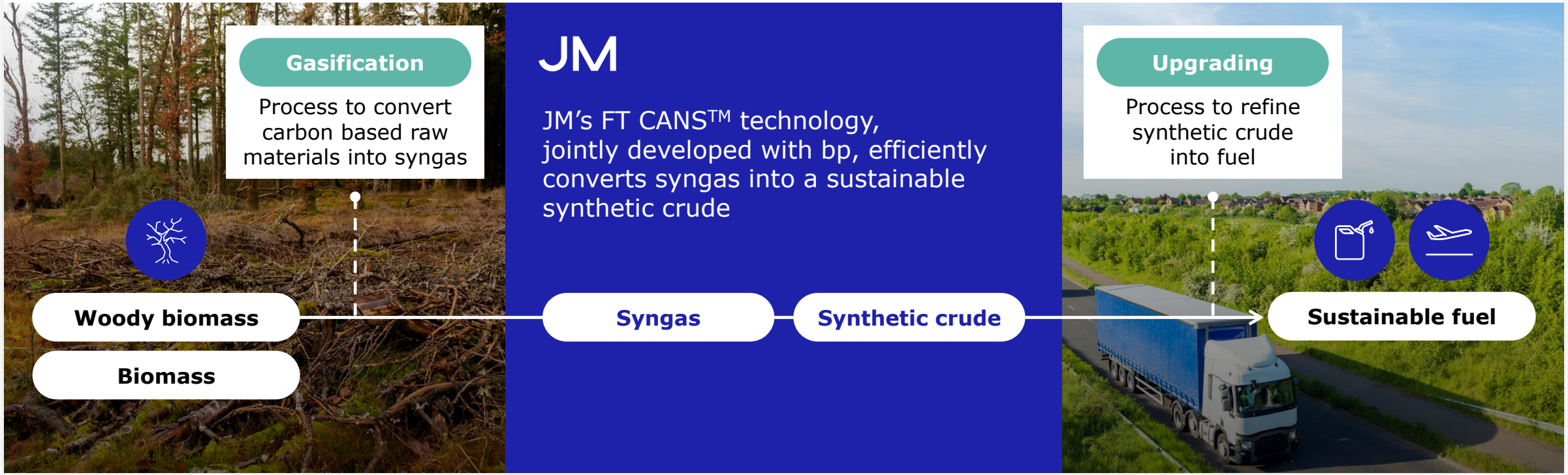
- **FT CANS™:** 50% reduction in capex[1], modular development
- **E-fuels:** technology provider for world's first climate neutral e-methanol plant – Haru Oni
- **BioForming™:** enabled first flight using 100% SAF

Current pipeline of >65 projects

1. Compared to conventional fixed-bed Fischer-Tropsch technology.

Strategic Biofuels Louisiana Green Fuels project: sustainable fuels

Converting forestry waste into renewable diesel with negative carbon footprint



Note: Syngas is predominantly carbon monoxide (CO), carbon dioxide (CO_2) and hydrogen (H_2). Synthetic crude is a mixture of hydrocarbons produced in the Fischer-Tropsch process.

Main pathways to low carbon hydrogen production

Traditional method of producing hydrogen from natural gas

Mature technology

High capital cost to capture required CO_2

Steam methane reforming (SMR)

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JM's LCH™ technology

Mature technology

Higher CO_2 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 efficiency[1]

Lower carbon intensity[1]

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

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

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1. Compared to ATR technology. Based on JM data.

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% CO_2 capture[1]
- 12% lower capex and 7% lower feedstock usage[2]

Current pipeline of >35 projects

1. Based on JM data.
2. Compared to conventional ATR technology. Based on JM data.

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

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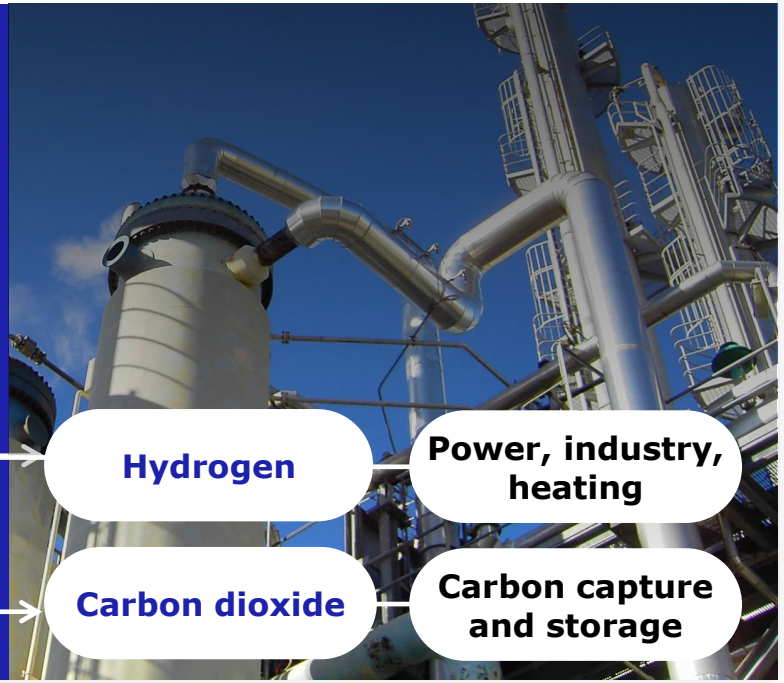
LCH™

JM's LCH™ technology efficiently converts natural gas into hydrogen, with the by-product CO_2 captured and safely stored, reducing CO_2 emissions by more than 95%

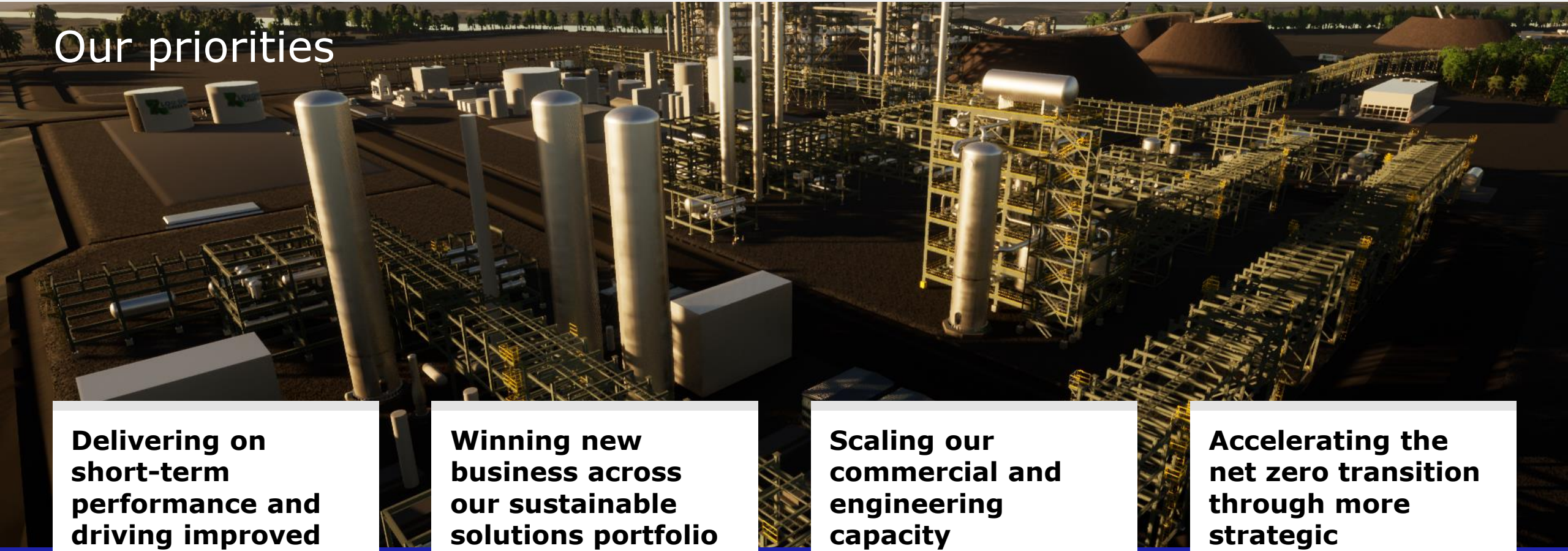
Natural gas → **Syngas** → **Hydrogen** → **Power, industry, heating**

Syngas → **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

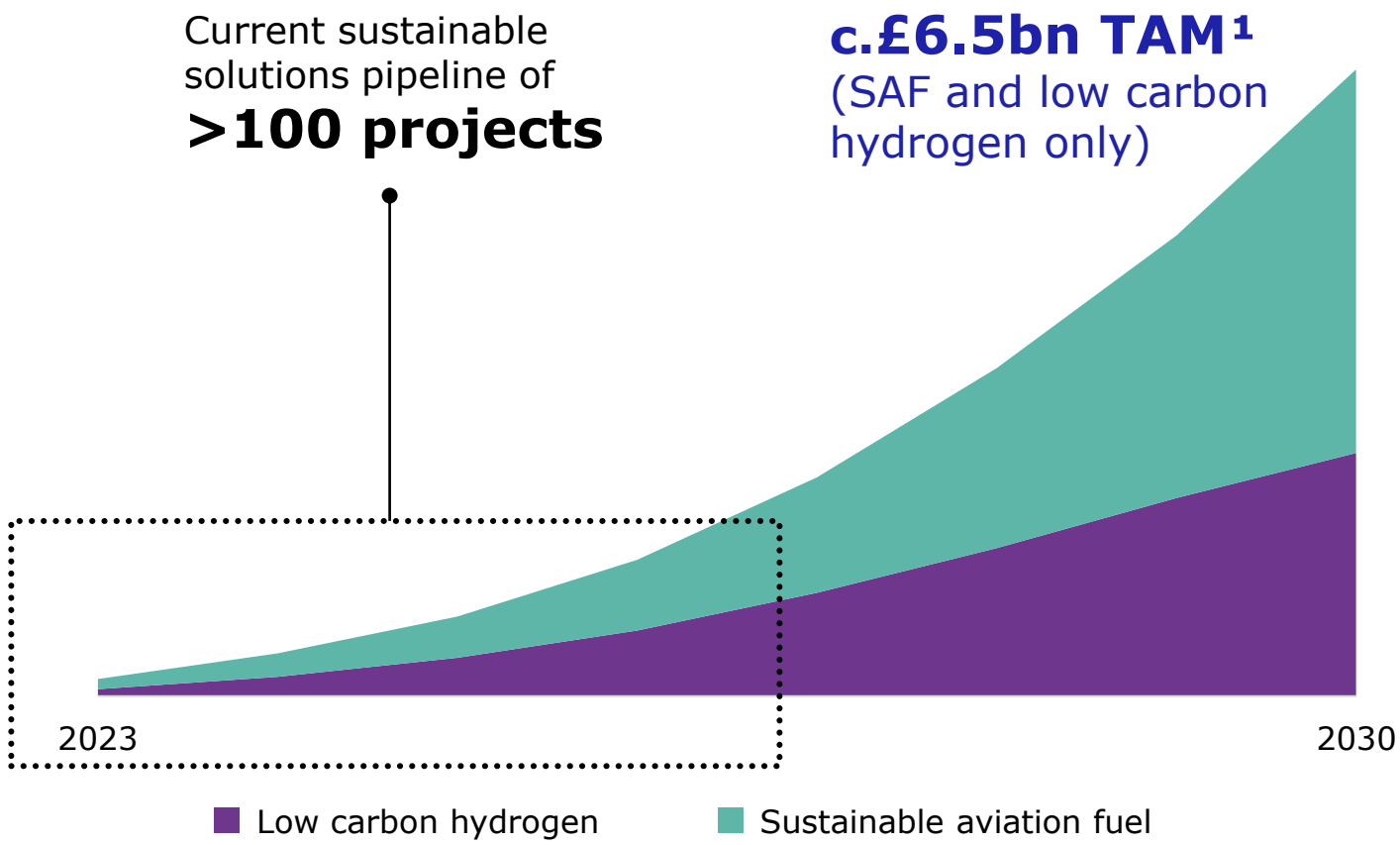
- **Cumulative 2030 TAM:** c.£4bn[2]
- **Projects required by 2030 to meet market demand[3]:** c.145

Low carbon hydrogen

- **Cumulative 2030 TAM:** c.£2.5bn[2]
- **Projects required by 2030 to meet market demand[3]:** c.125

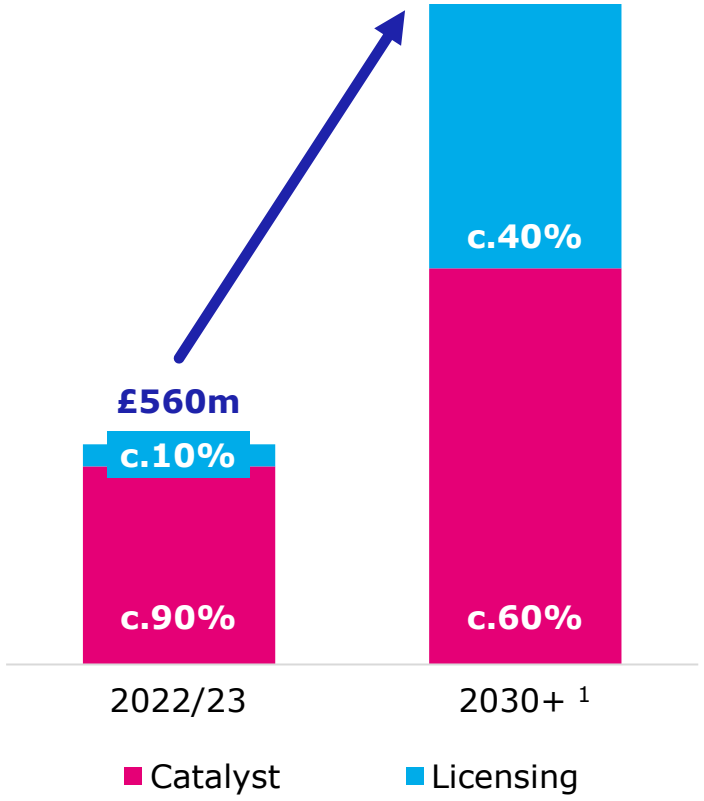
Sustainable aviation fuel and low carbon hydrogen

Illustrative total addressable market (TAM) demand to 2030[1]



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 licence[2]

First fill catalysts
Catalyst fills for new build plants

c.£10-20m
Average revenue per first fill[2]

Every 3-4 years

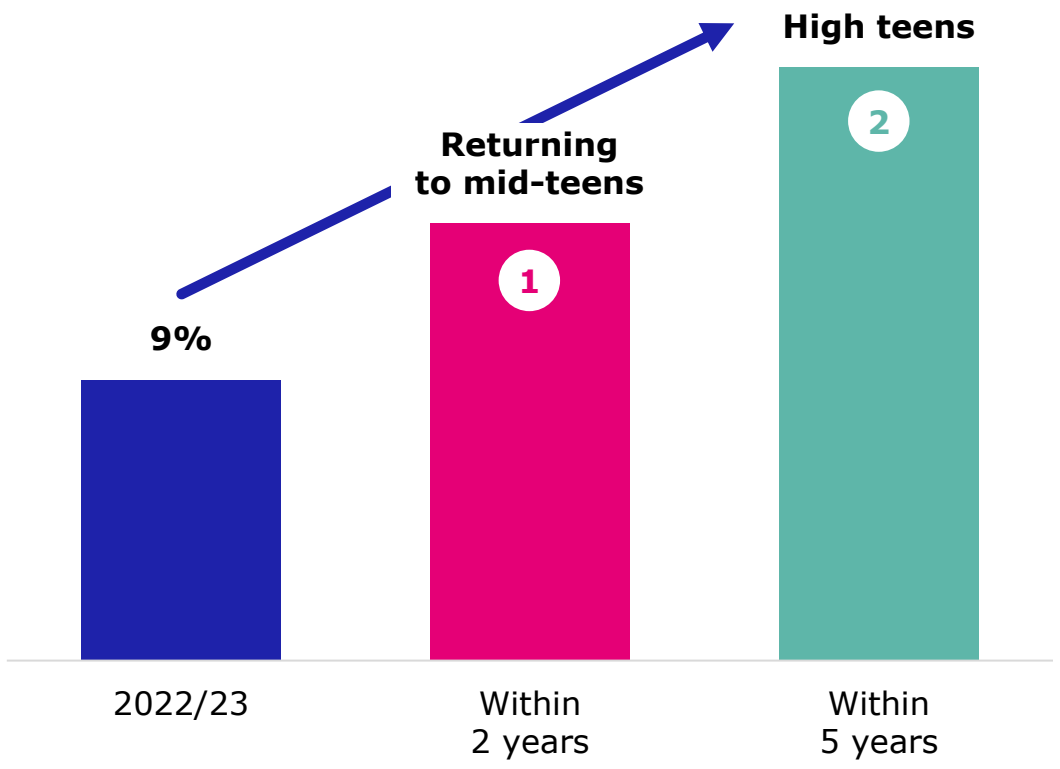
Refill catalysts
Catalyst refills for existing plants

c.£10-20m
Average revenue per refill[3]

1. 2030+ total sales and split is illustrative. Licensing includes engineering and licence of process technologies and associated revenues.
2. Average revenue for licensing, engineering and first fill catalysts over the first 5 years for a typical sized project.
3. Average revenue for each refill catalyst beyond the first 5 years. Based on an assumed 3-4 year refill cycle.

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

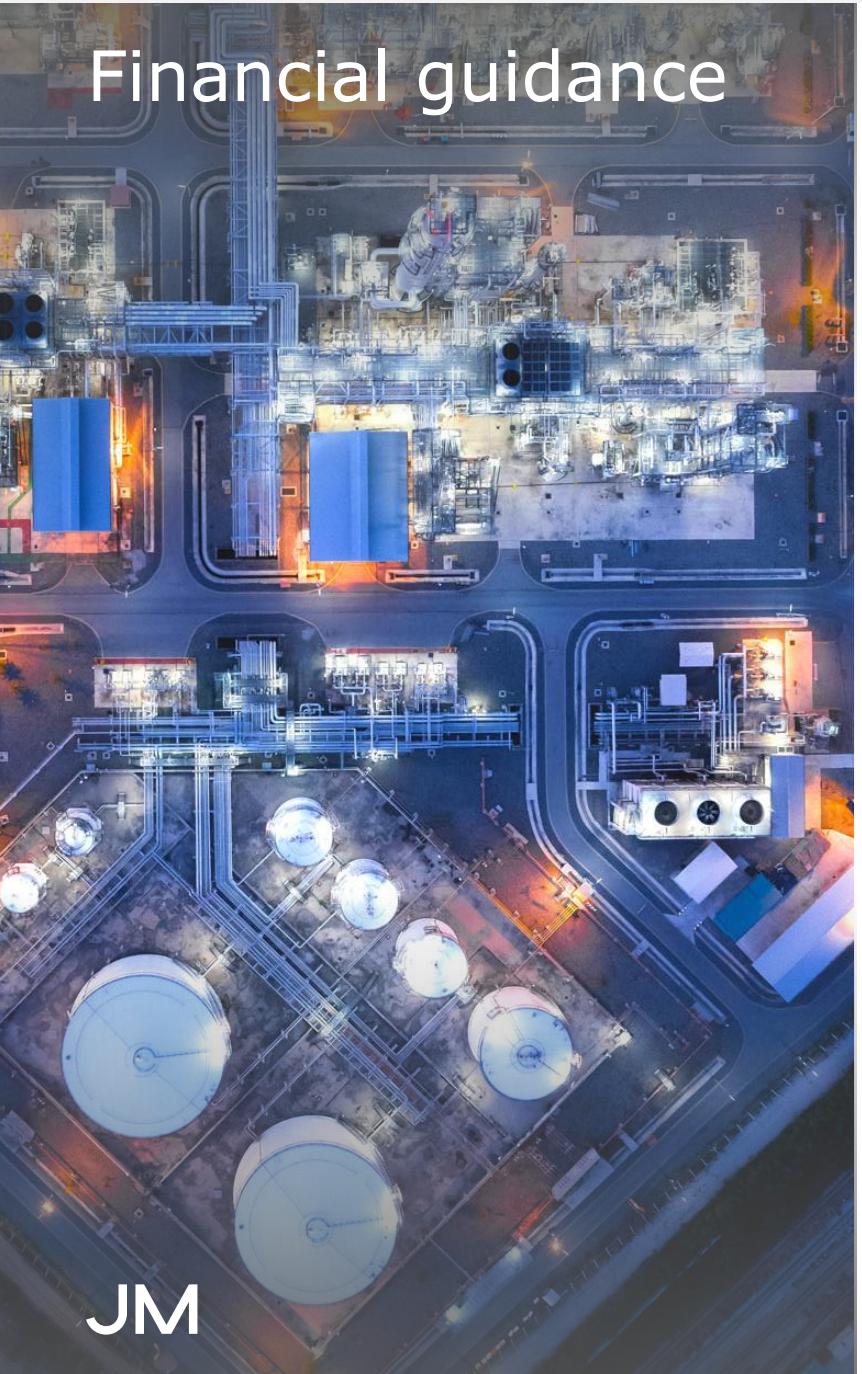
- Manufacturing excellence initiatives
- Increasing capacity in key sites

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

		Status
Strategic	• **Win at least 4 large scale projects in 2023/24[1]**	●
	• **Deliver targeted capacity expansion** (formaldehyde catalyst) by end of 2023/24	●
Financial	• **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

1. Won one sustainable fuels project so far in 2023/24.

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) hydrogen[2] 	May 2022 **70-430**	• 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**	• 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 fuels[3] 	May 2022 **30-60**	• 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**	• 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**

1. Based on number projects needed to meet addressable demand by 2034 (following an average 4 years to plant start up). Sustainable aviation fuels: 15m tons p.a or 120m barrels p.a. Low Carbon Hydrogen: 20m tons p.a or 70k MW p.a.
2. Only natural gas-based blue hydrogen.
3. Only FT-based routes for SAF (excludes alternative technology routes).
4. Includes engineering, licensing and first catalyst fill.
5. Value of total addressable market calculated as the first 5 years of revenue (average of range shown) from the number of projects needed to meet the market demand. Excludes other sustainable fuel opportunities such as Virent (Bioforming), e-methanol and ammonia cracking.