JM

Johnson Matthey
Inspiring science, enhancing life

Americas hydrogen and syngas technical training seminar

Company introduction

Diane Dierking

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

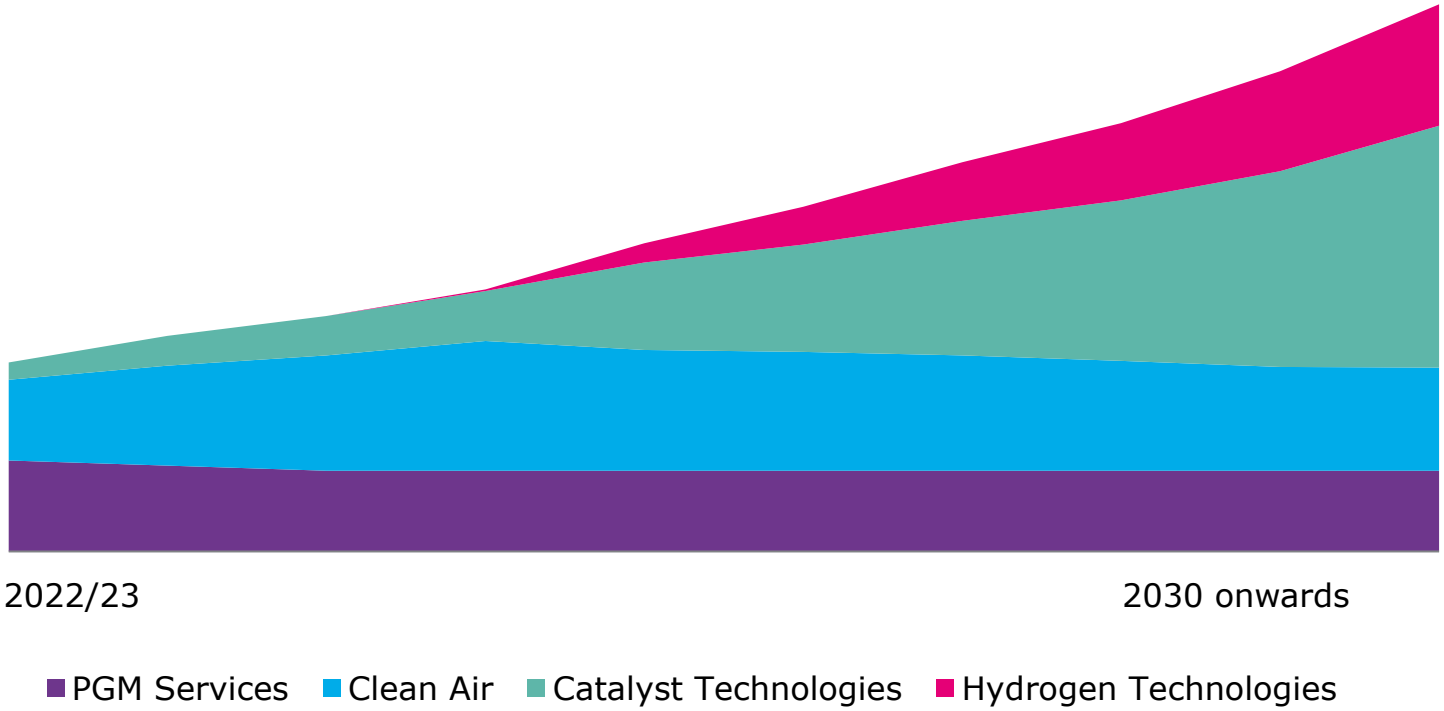
Accelerating to high single digit growth[1] over the medium term, and strong long-term growth

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.

The energy transition creates significant new opportunities

1 **There is an urgent need for the world to decarbonize…**

2 **Driving strong demand for hydrogen and sustainable fuels**

3 **Hydrogen is essential for:**

Decarbonizing hard to abate industrial processes

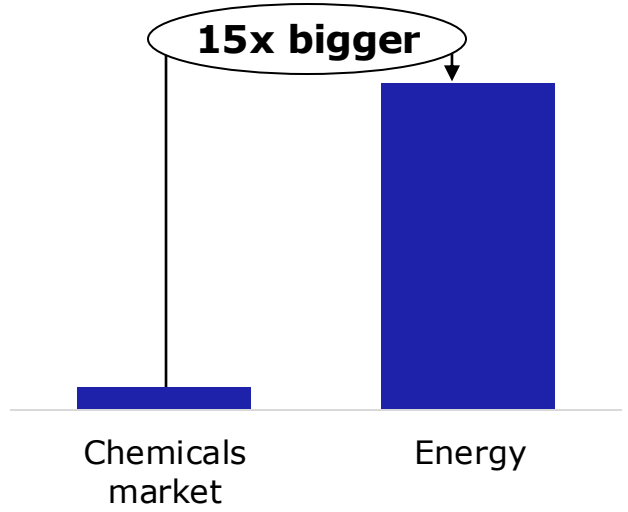
Building blocks for **sustainable fuels** and **chemicals**

Balancing power grids in an increasingly renewable world

JM is well-positioned

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

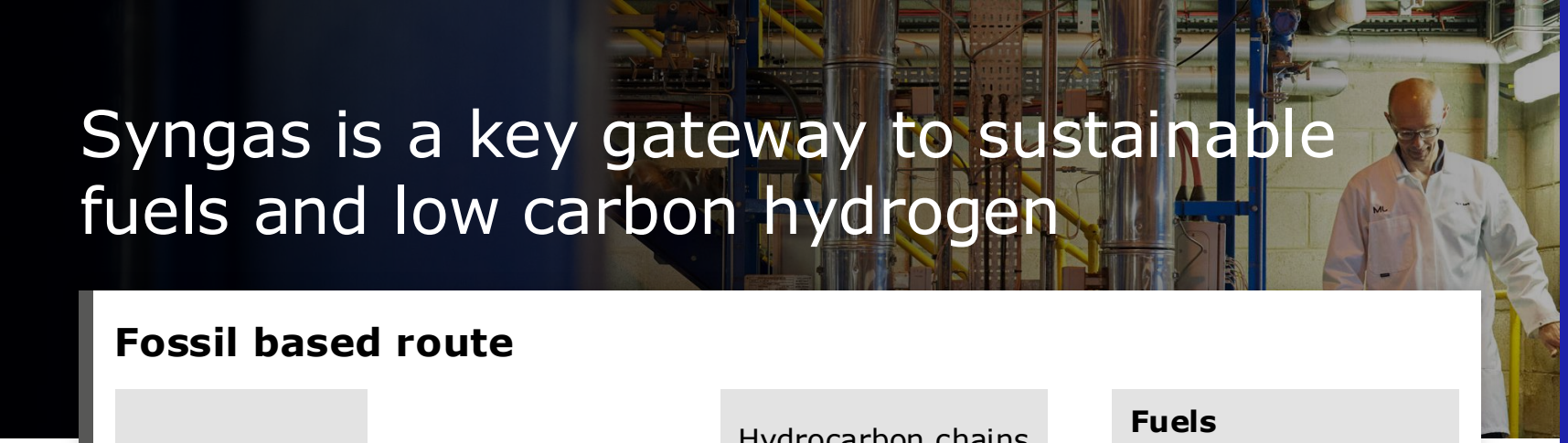
Kingdom of Saudi Arabia: 2.9 million tons of low carbon and electrolytic hydrogen by 2030, **4 million** tons by 2035

Japan

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

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.

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
- **Future sustainable fuels** Low carbon hydrogen, methanol, ammonia
- CO_2 capture and storage

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.

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)

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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.

JM is here for you!

While we are very excited to be part of energy transition...

We are very committed to supporting the plants in operation today and to the people who run them – you!

The purpose of our training this week…

Share knowledge you need to run your plant efficiently & reliably

Our priorities for our time together…

JM is the best for technical expertise.

1

JM products help solve any issues you encounter

2

JM invited great guest speakers to increase your contacts beyond catalyst needs.

3

You learned a lot and had fun doing it!

4

Q&A