

Small things – great impact.  
Key aspects of Low Carbon Fuel production efficiency

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# Johnson Matthey: strong credentials supporting our strategy

Strong brand  
**208 year  
history**

Technology  
leadership  
**#1 or 2**  
in chosen markets

2023/24 sales<sup>1</sup>  
**£3,904  
million**

**11,600  
employees**  
worldwide<sup>2</sup>



# Aviation and shipping will start to see a carbon price adopted for many regions in 2025

## United States

US to increase SAF production to 9Mt/y by 2030



Renewable Fuels Standard ,  
Blenders  
Tax Credit, State Level  
incentives

## South America

Brazil SAF mandate requires airlines to reduce GHG emissions by 1% in 2027, increasing to 10% by 2037



Chile Flight Clean government program

## United Kingdom



UK SAF mandate 2% in 2025, 10% in 2030



UK maritime decarbonisation strategy: 30% GHG reduction by 2030, 80% by 2040

## Europe



ReFuelEU: 2% in 2025, 6% by 2030  
France SAF mandate 5% by 2030



FuelEU Maritime: 2% GHG reduction in 2025, 6% in 2030 and 14.5% to 2035 ; EU ETS

## Asia



China financial incentives for ships adopting low-carbon technologies

China SAF 2% in 2025, 15% by 2030

Indonesia SAF mandate by 5% by 2030

Japan SAF mandate 10% by 2030

Singapore SAF mandate 1% by 2026, 3-5% by 2030

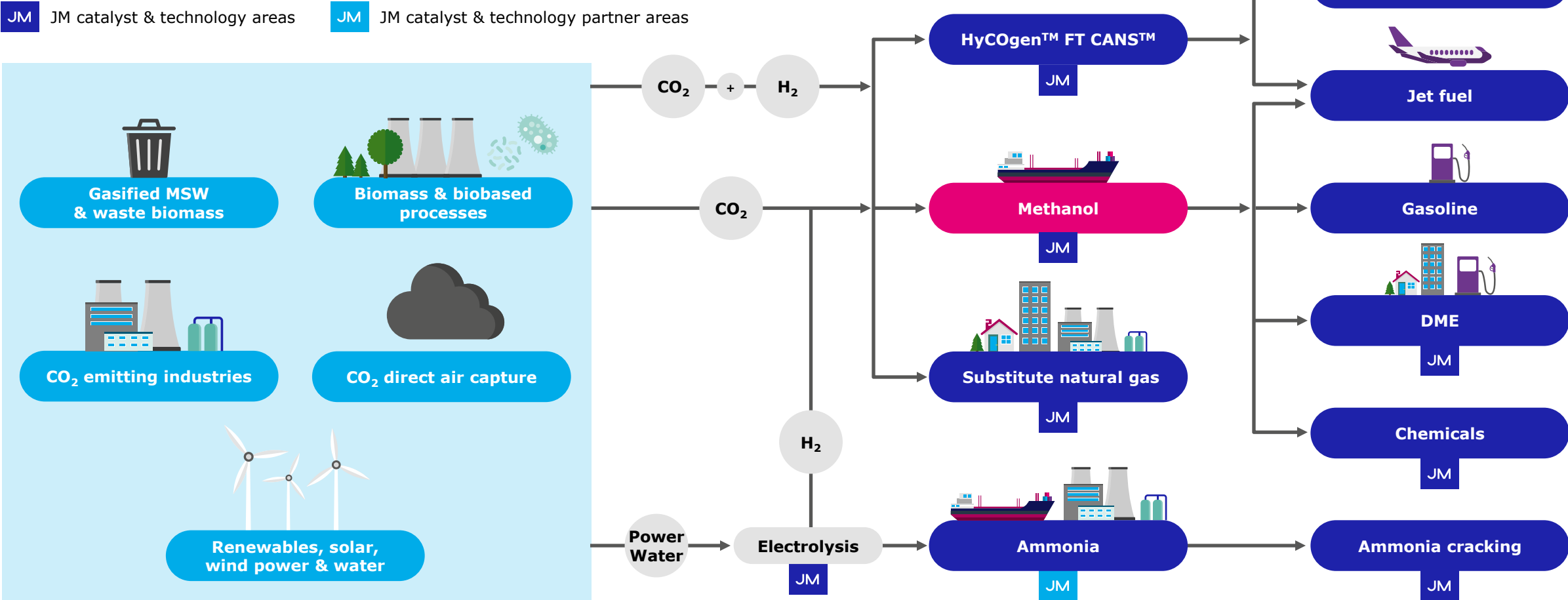


## Global



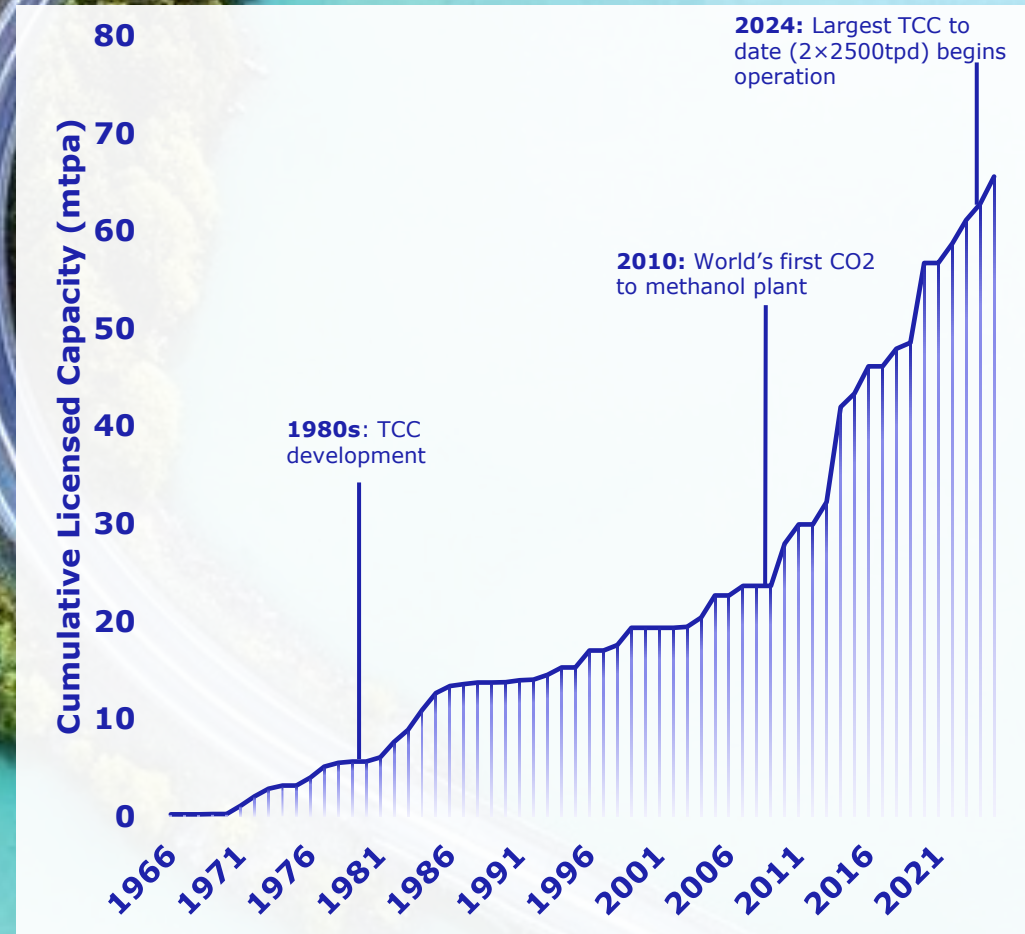
IMO Strategy on Reduction of GHG emissions: 20% by 2030 and 70% by 2040

# JM is enabling sustainable and efficient Power-to-X transformations by leveraging its core expertise in the syngas value chain



# JM: The world's leading methanol technology and catalyst supplier, spearheading low-carbon methanol technology deployment

- ▶ We are **passionate** about **methanol** and are proud to offer the **most efficient** and **reliable** flowsheets in the market.
- ▶ **1<sup>st</sup> CO<sub>2</sub> to methanol plant in 2011-** Leading the transition to **sustainable (green) methanol**
- ▶ We supply the **next-generation** catalysts, with **high activity** and **extended life**
- ▶ We have unique **insights** into the global methanol **market**
- ▶ We maintain strong, **long-standing partnerships** with the world's largest methanol producers



**#1**  
in licensed capacity and installed catalyst

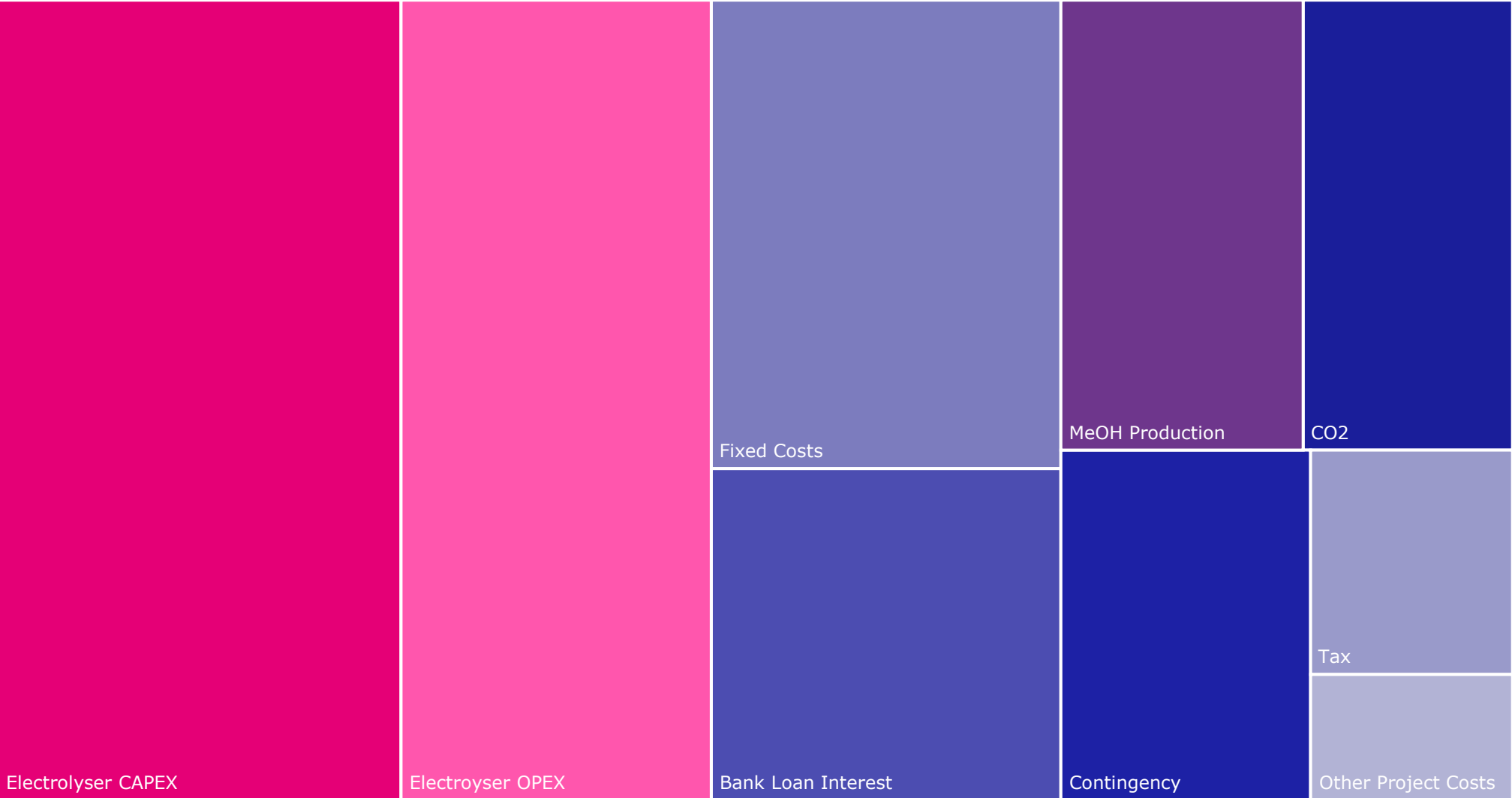
**100+**  
licenses in

**35**  
countries

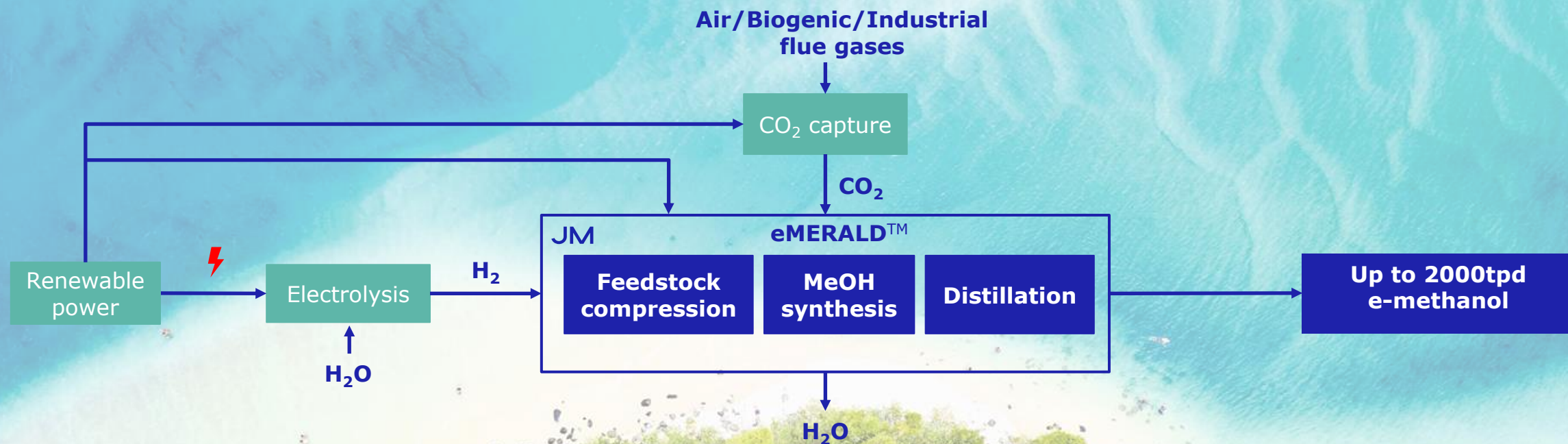
**65M**  
t/y licensed methanol production



# Hydrogen efficiency is a key to reducing e-methanol production cost



# JM's **eMERALD** technology: delivering unprecedented efficiency with proven technology



Converter and loop design **tailored for e-methanol plants**

**Highly stable**  
catalyst

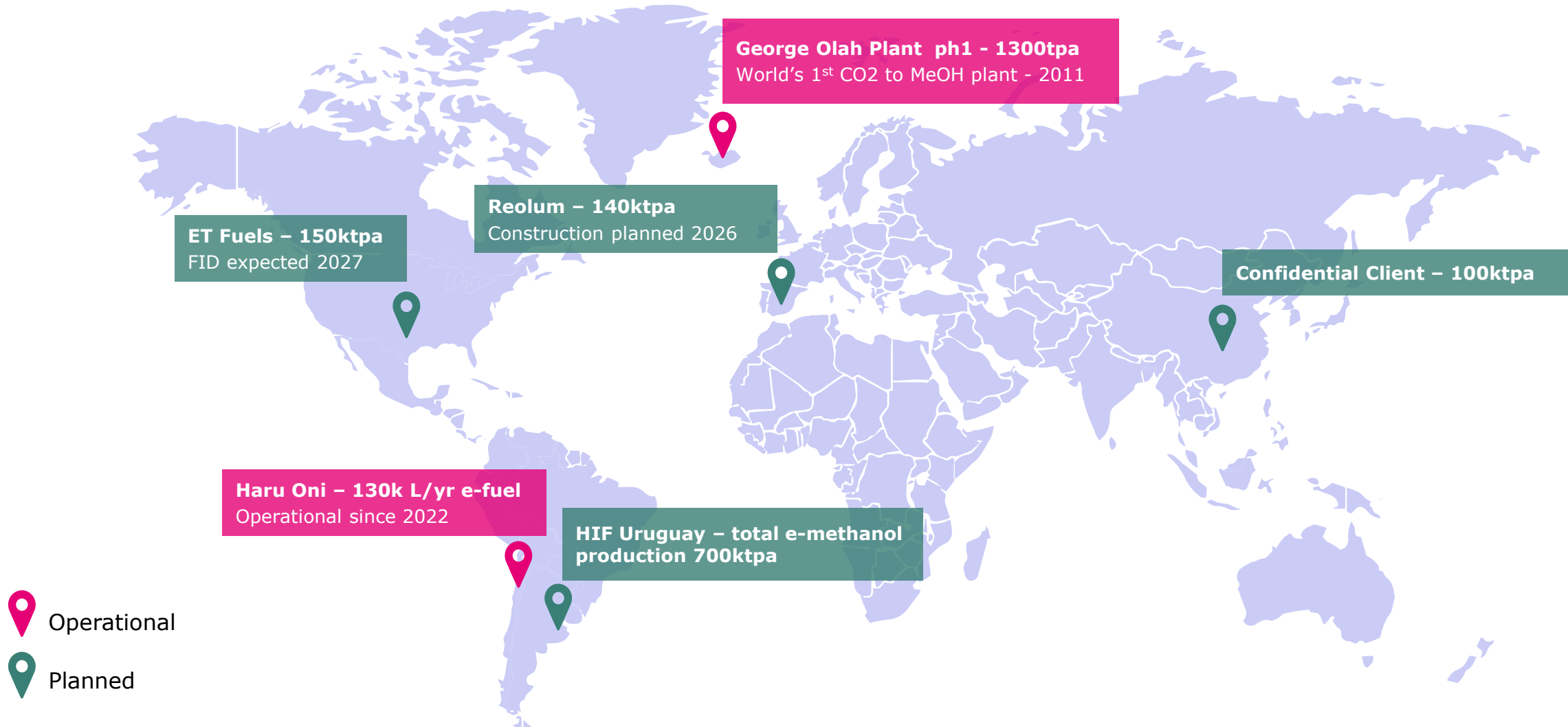
**60+**  
years experience  
across methanol

**>98% efficiency**  
for hydrogen and  
carbon conversion

**Flexible and wider operating range** to meet  
feedstock intermittency  
requirements

Technology **proven at scale**

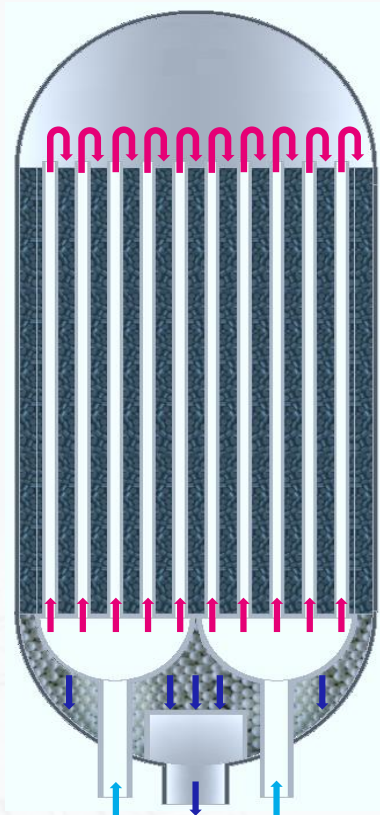
# JM's CO<sub>2</sub>-to-Methanol technology is picking up the pace worldwide





# Low risk and proven technology, supporting project bankability

## Tube Cooled Converter (TCC)

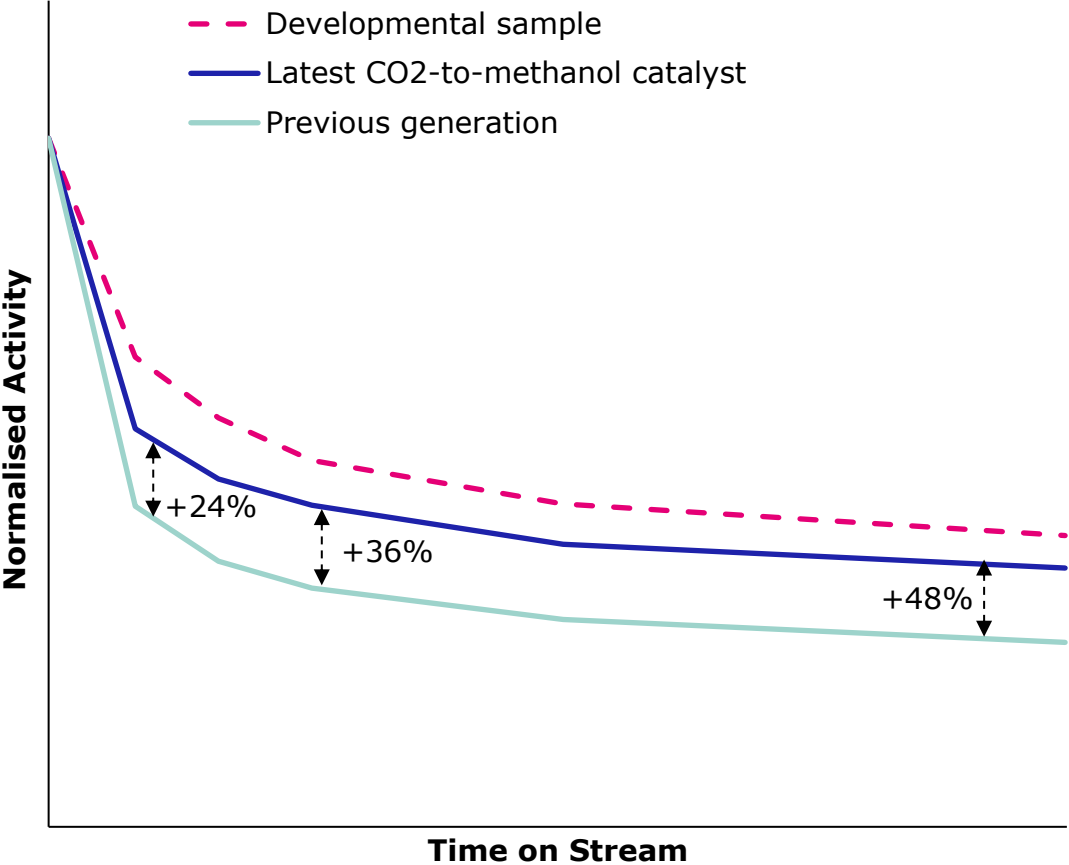


- Catalyst on shell-side
- High catalyst **capacity**, low catalyst volume
- **Low cost** and **high reliability**
- No steam system – flowsheet **CAPEX savings**
- High circulation and low pressure drop
- High feedstock **efficiency**
- High **scalability** – 2000 MTPD in a single converter




## TCC References

Capacity	Start-Up
5,000 MTPD	2024
3 MTPD	2022
2,030 MTPD	2014
2,030 MTPD	2013
3,600 MTPD	2011
10 MTPD	2010
1,650 MTPD	1998
1,650 MTPD	1996
165 MTPD	1994
1,500 MTPD	1993
200 STPD	1992

# Highly stable **eMERALD 201** catalyst – JM’s 17<sup>th</sup> generation of methanol synthesis catalyst

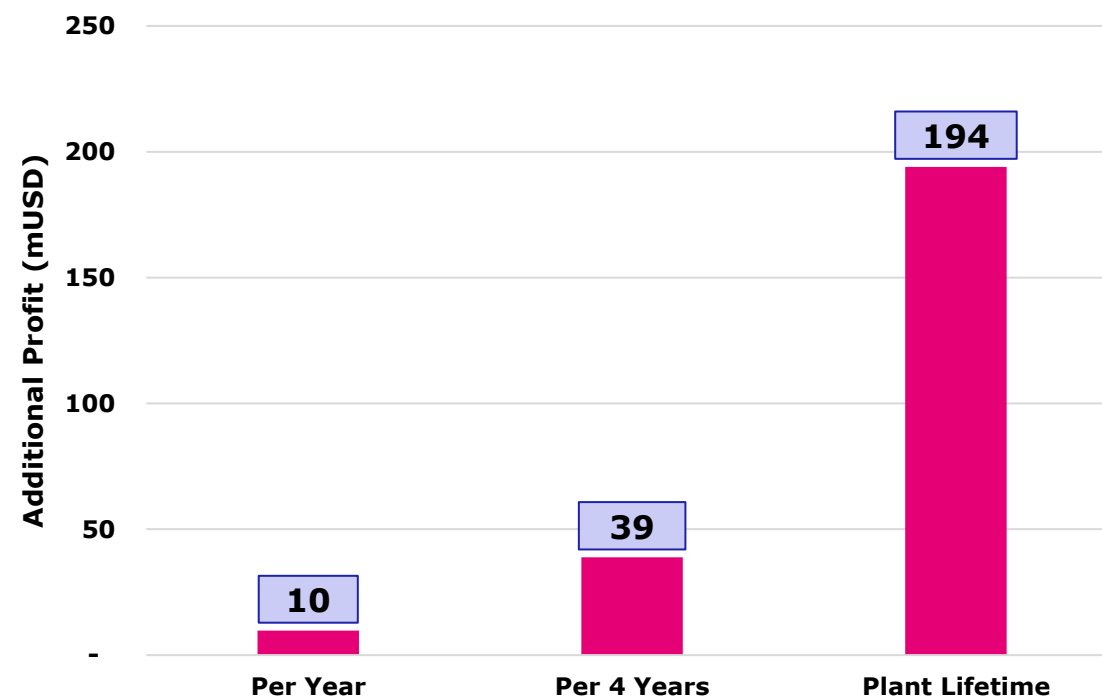
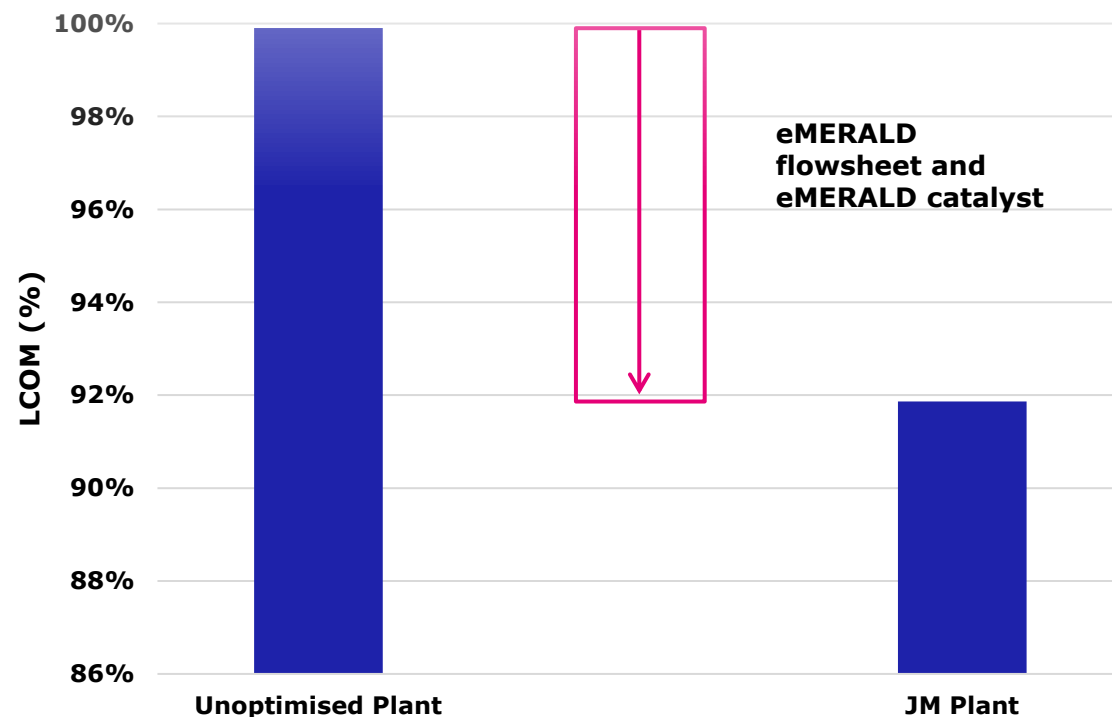


JM’s latest commercially available catalyst offers **sustained methanol production**

<p>Increased catalytic activity</p> 	<p>Superior hydrothermal stability</p> 
<p>Robust manufacturing and supply chain</p> 	<p>Ongoing R&amp;D commitment</p> 



# JM's **eMERALD** technology reduces the levelized cost of methanol production by 8%



\*Based on a 100ktpa plant



# Two industry leaders partnering to deliver an enhanced solution

## A global strategic alliance combining market leading technologies

A **powerful union**  
delivering a **joint solution**  
to reduce  
operating costs  
and accelerate  
project  
deployment

# JM

**50+ years** supplying leading  
methanol technology & catalyst  
**> 100+ methanol plants** licensed  
**> 60 million TPA** licensed capacity

**eMERALD** Methanol technology

Maximising H<sub>2</sub> and CO<sub>2</sub> conversion to  
**minimize OPEX**  
**Minimising DEVEX** & schedule with  
partners during feasibility stage



# Honeywell

## UOP

Trusted licensor with **44 years of**  
experience in MTO and olefins to fuels  
7 operating MTO plants  
**> 915 KBPD** licensed olig. capacity

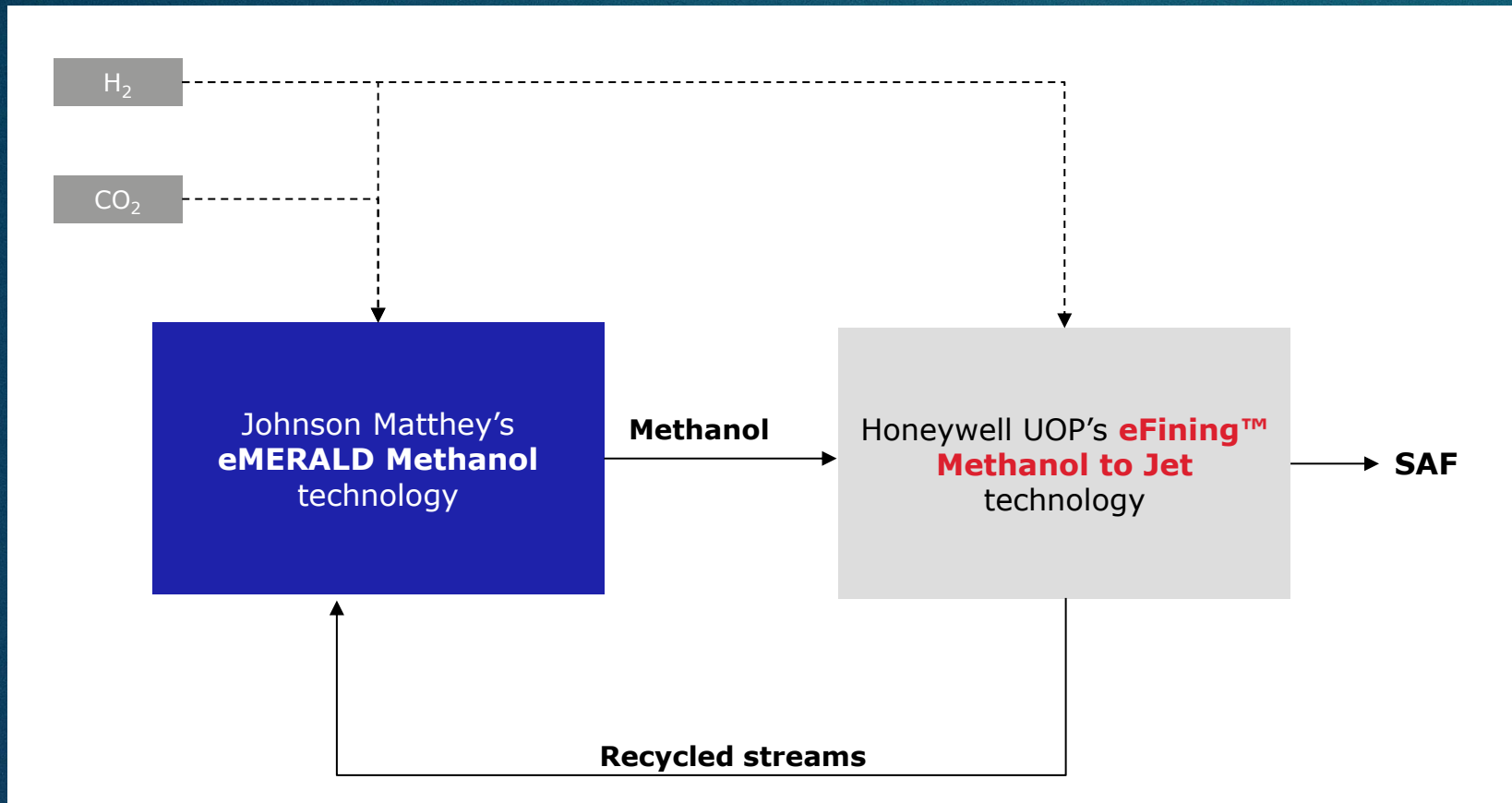
**UOP eFinishing™** methanol to jet  
technology

**High SAF yield** and selectivity,  
maximising carbon utilisation  
One of the **first** with MtJ technology in  
the market



# Ground-breaking methanol & methanol to jet process

Using the synergies between the two technologies to maximize savings



## KEY BENEFITS



**>30% saving** in overall utility consumption



**>2% additional SAF** production from the same feedstock



**>3 %** of further reduction of SAF cost



Unlocking additional annual revenues of **15.7 million USD** for a typical plant<sup>1</sup>

An aerial photograph of a two-lane asphalt road that curves through a dense forest. A dark-colored car is visible on the road, moving away from the viewer. The surrounding trees are lush green, and the road surface is light grey with white lane markings.

# Catalysing the net zero transition for our customers, and for society

*Let's talk:*

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