

ADVANCEMENTS IN CCS COSTS TRENDS AND STRATEGIES FOR COST REDUCTION

**HUGH BARLOW
SENIOR CARBON CAPTURE TECHNOLOGY LEAD
16TH SEPTEMBER 2025**



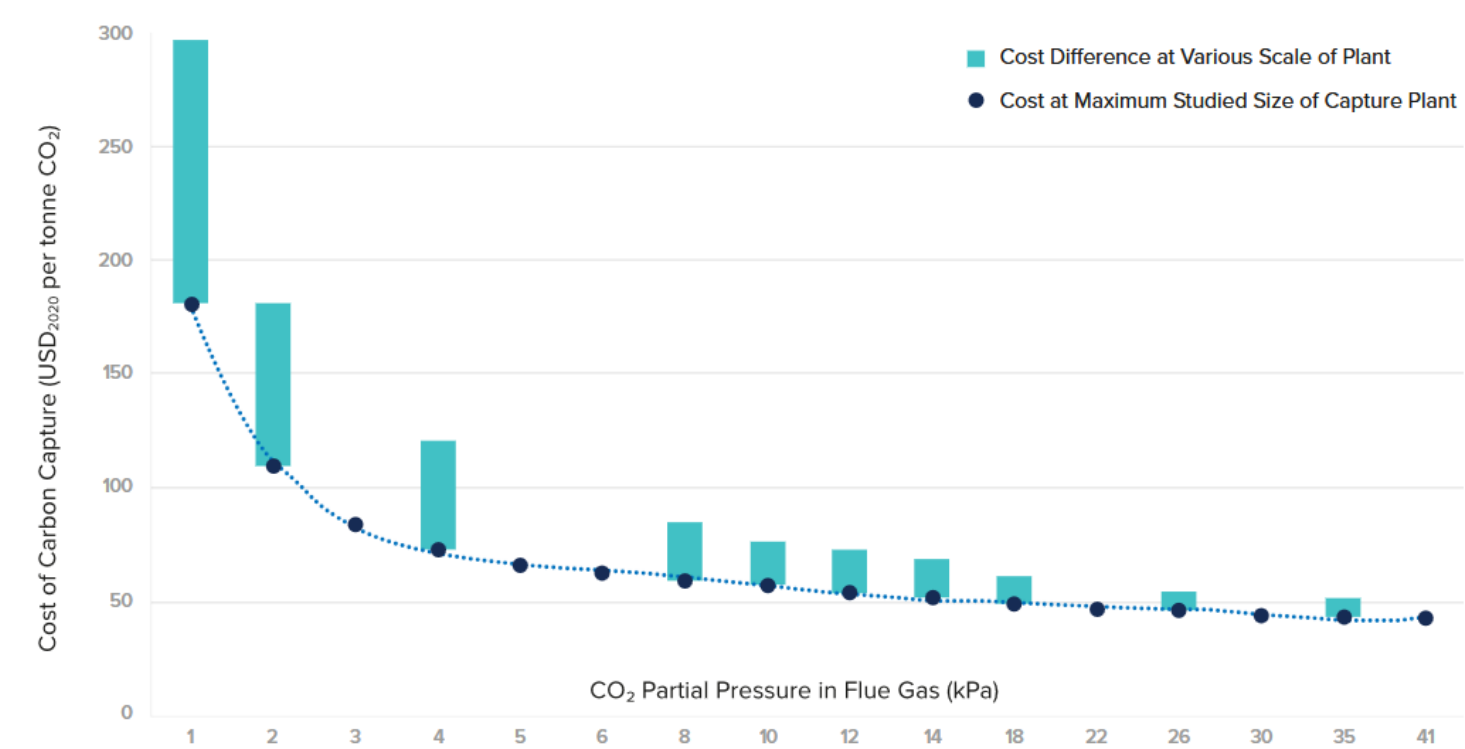
**GLOBAL CCS
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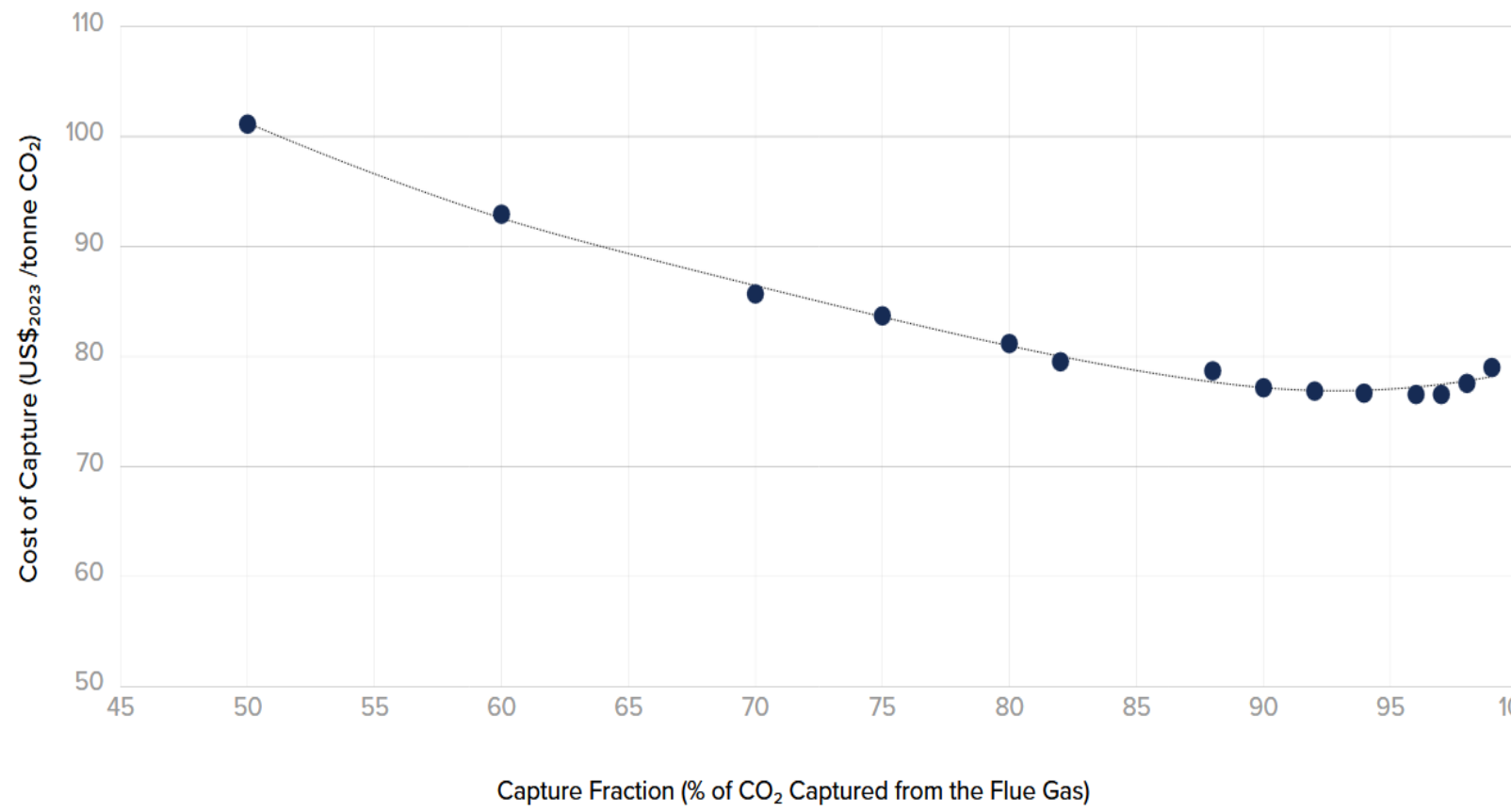
PARTIAL PRESSURE AND CAPTURE FRACTION

Partial pressure determines size of the process equipment, the energy requirements, and applicable capture technologies.

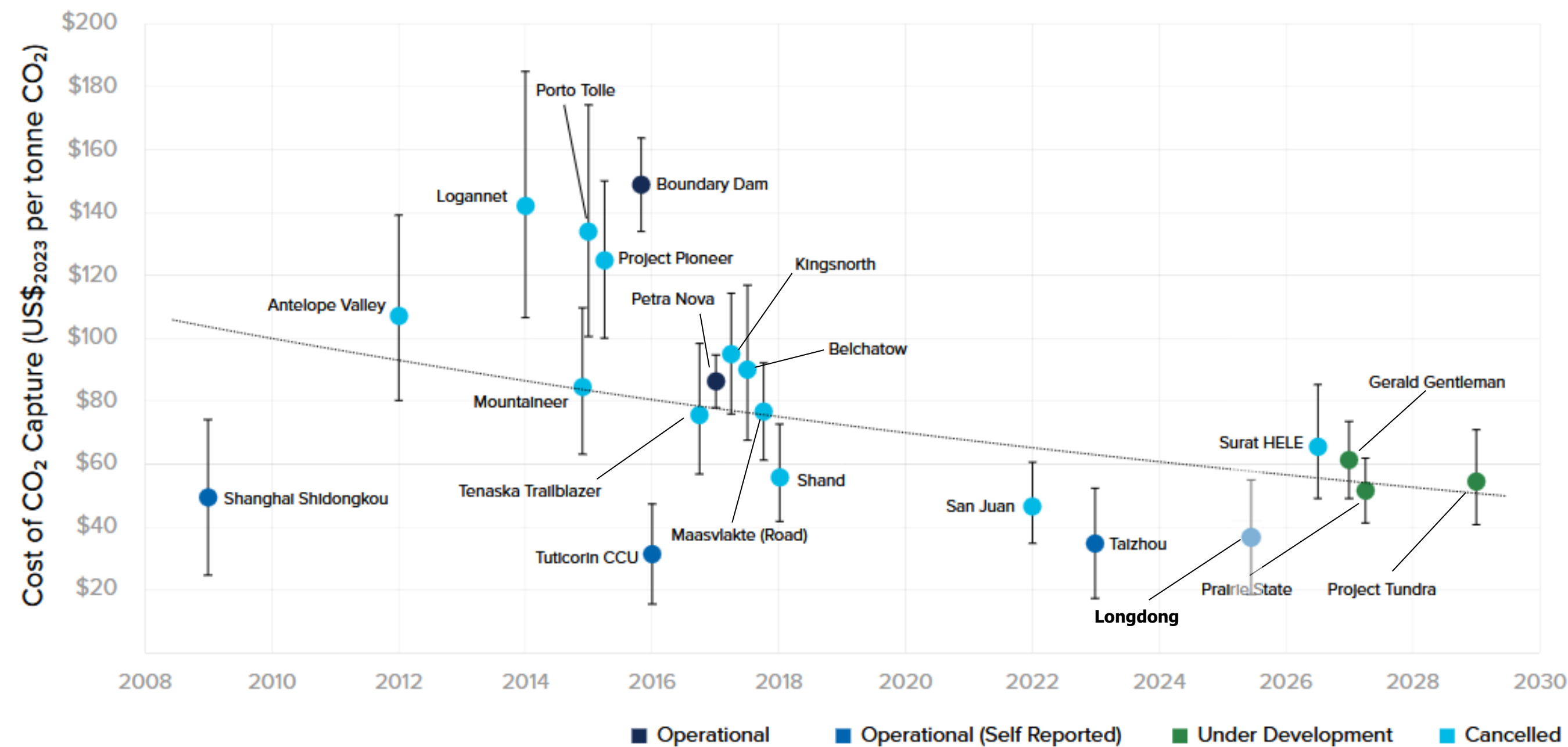


A capture fraction of 90% is a benchmark, not a technical limitation.

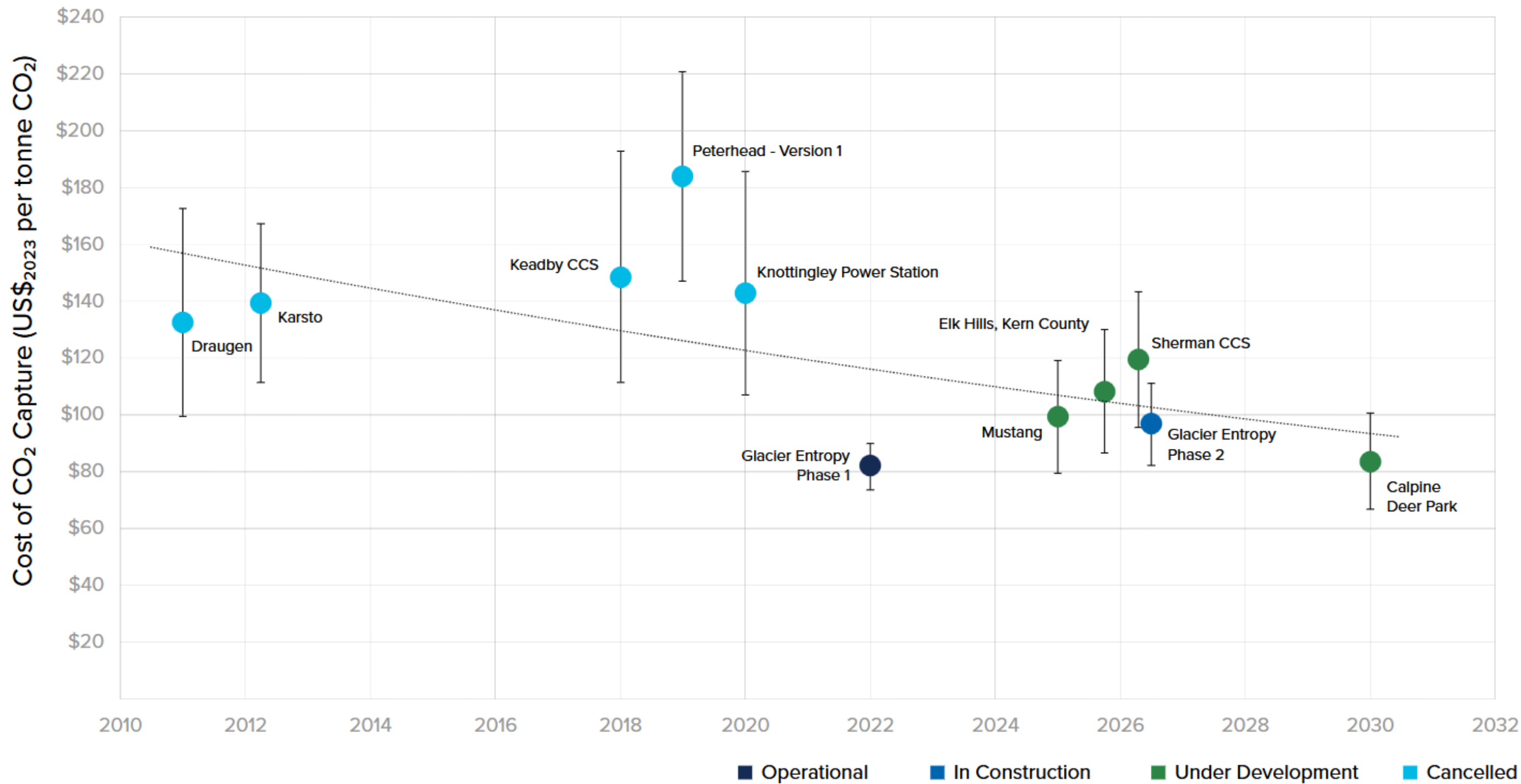
Capture fraction can rise to near 100% - Marginal costs tend to rise above 97%.



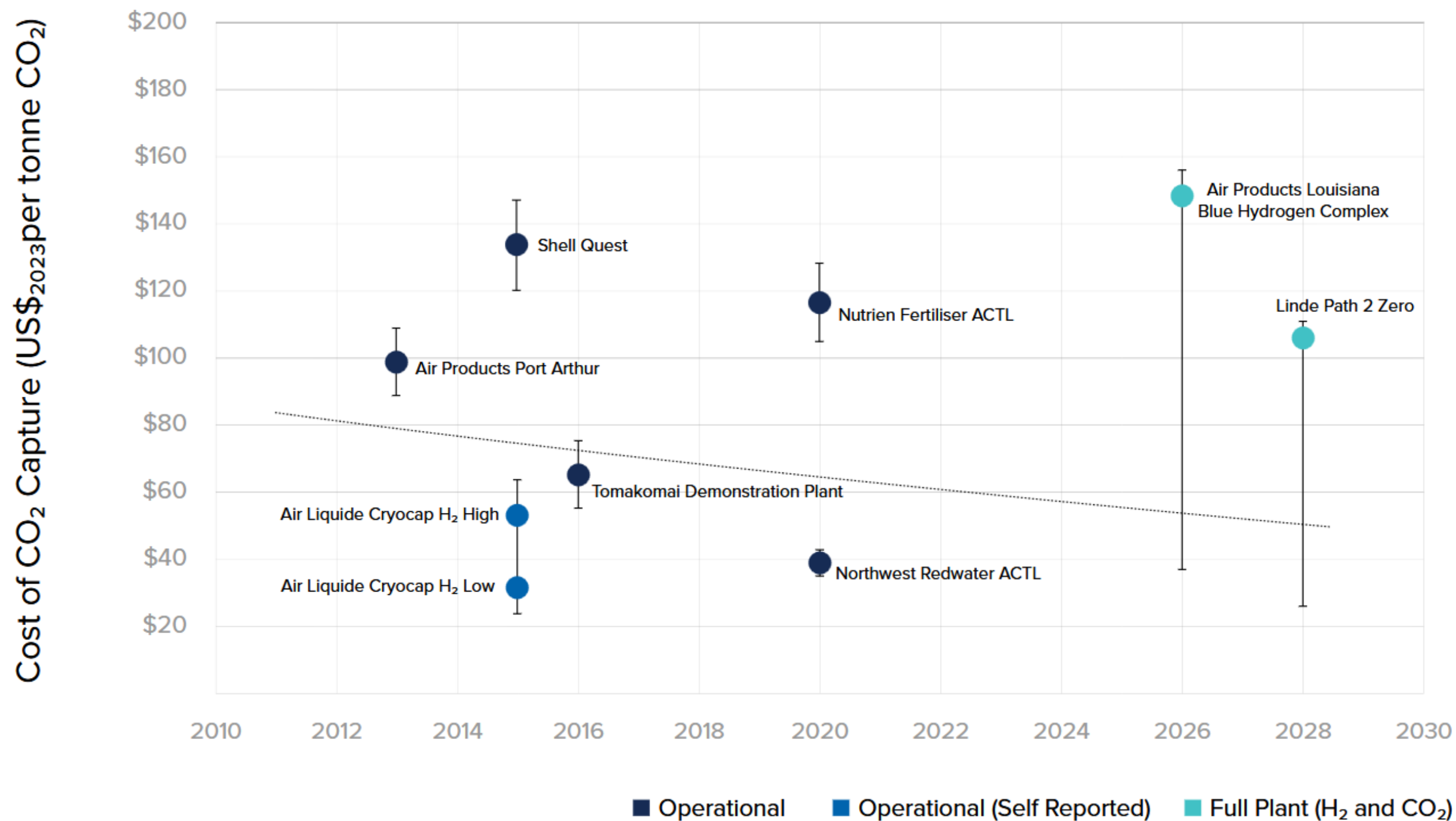
TRENDS IN COSTS – COAL



TRENDS IN COSTS – NATURAL GAS



TRENDS IN COSTS – HYDROGEN



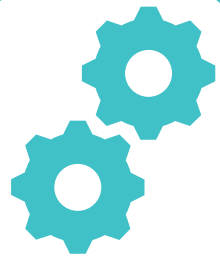
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COST REDUCTION STRATEGIES

DRIVERS OF COST

 **[CO₂] CO₂ Partial Pressure**

Capture Fraction 



Technology Selection

Plant Scale



Energy Costs

Flue Gas Treatment

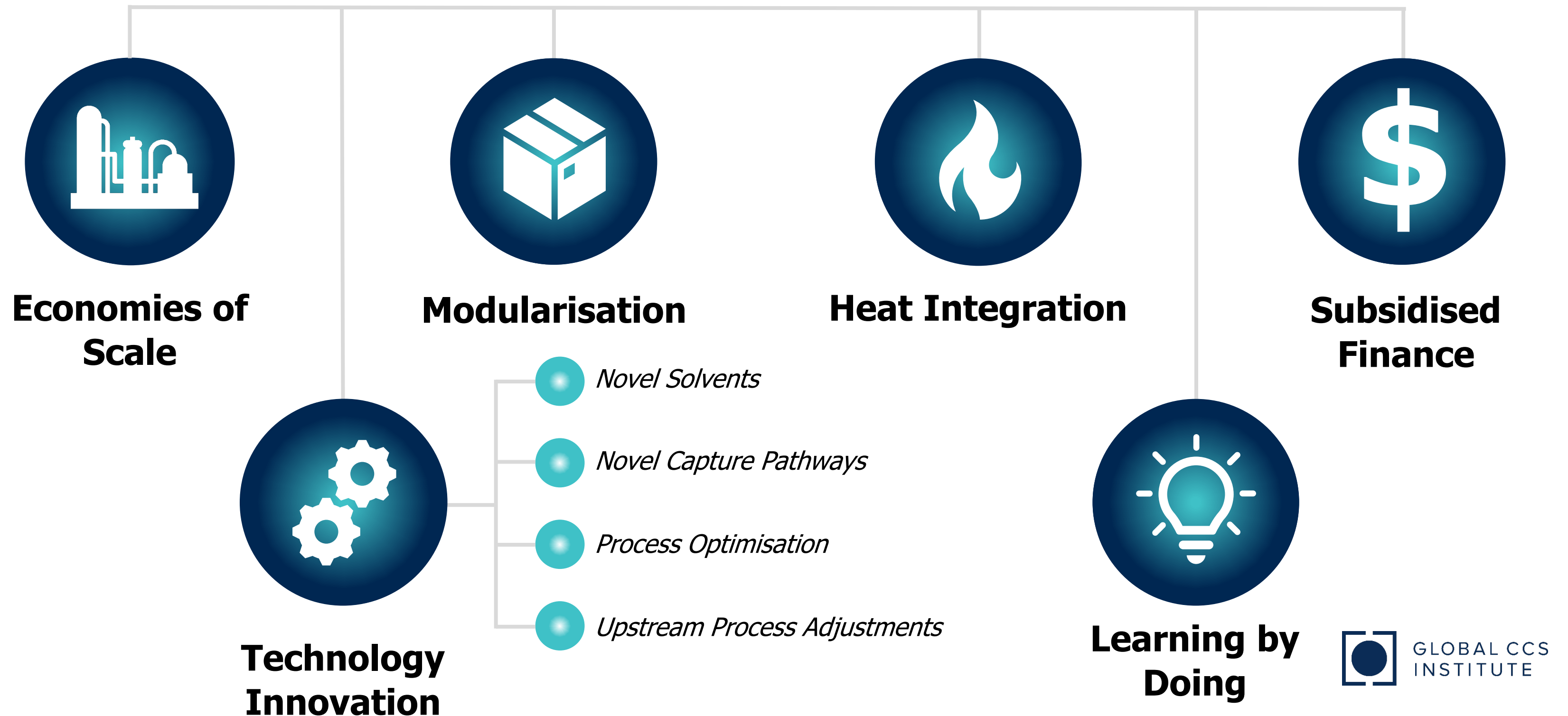


Location

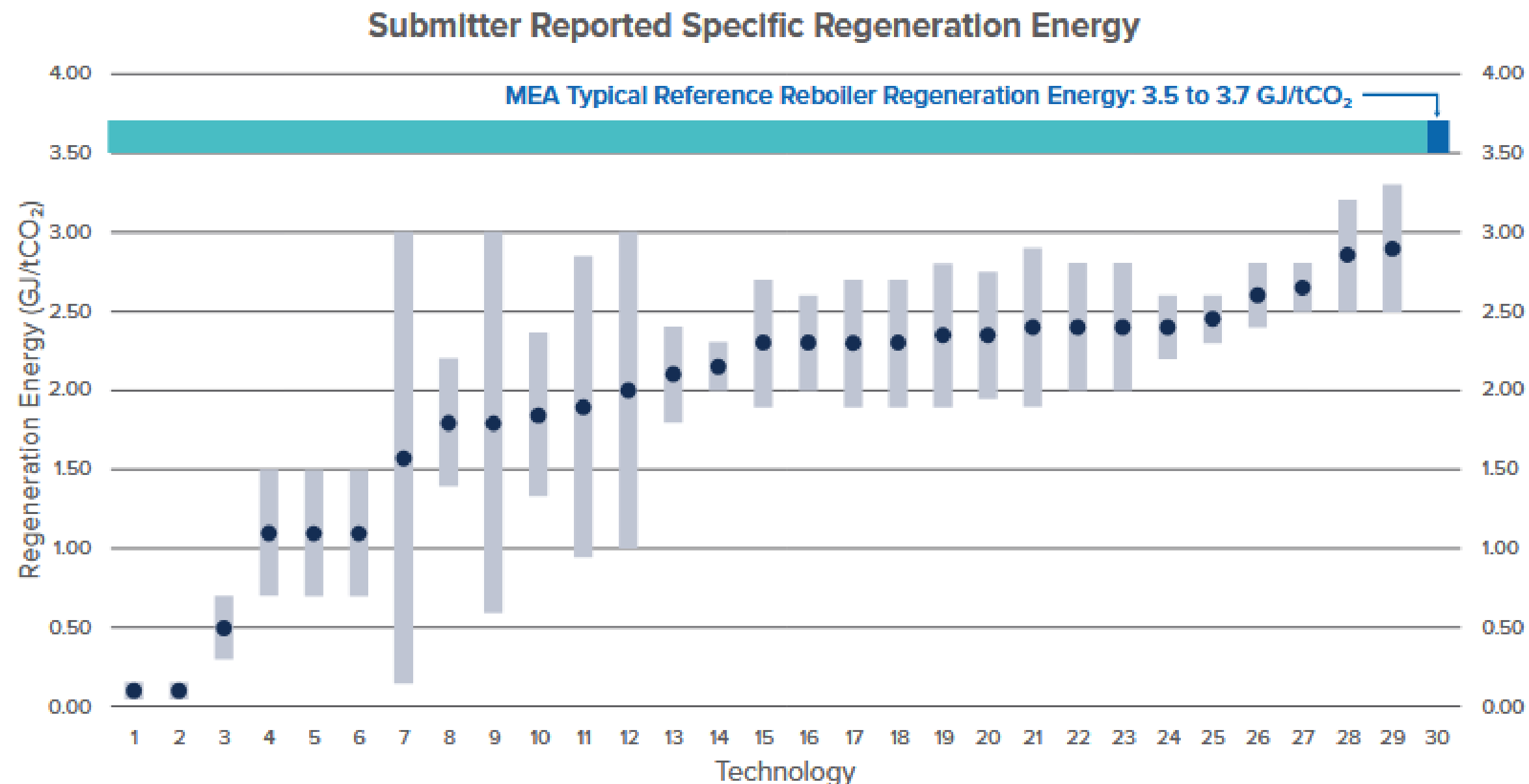
Retrofit v New Build



STRATEGIES FOR COST REDUCTION



1. NOVEL & IMPROVED SOLVENTS AND CAPTURE TECHNOLOGY



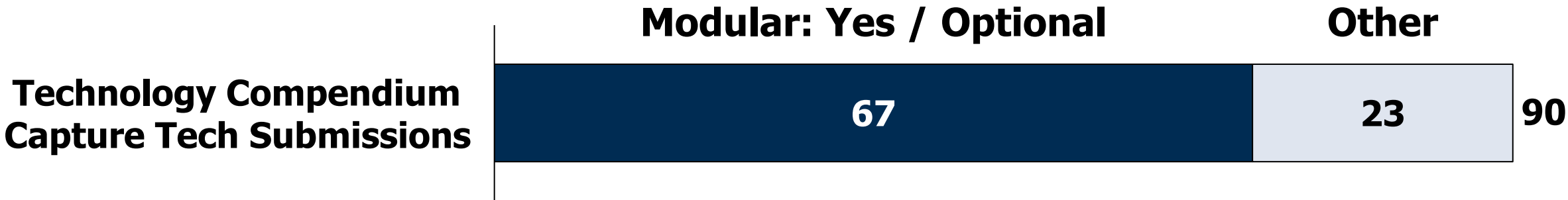
NB: Technologies 1 and 2 are physical solvents that operate in high-pressure environments and so are expected to have relatively lower regeneration energies.

From the 2025 Technology Compendium.

Of the 29 technologies that reported regen. energy, all were reported with a midpoint <3 GJ/tCO₂.

MEA (Tech 30) – Excellent 1st Gen. reference but outclassed today.

2. MODULARISATION



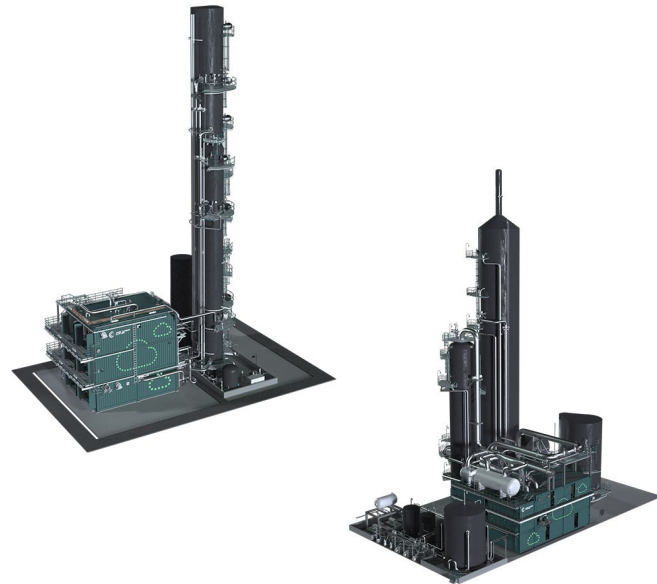
Continued push towards modularised systems.

In effect for relatively smaller systems – Plug and play.

Stacking capacity in certain cases.

Comes sizes at which these systems must switch to bespoke.

Examples



SLB Capturi
Just Catch (40 to 400 ktpa)



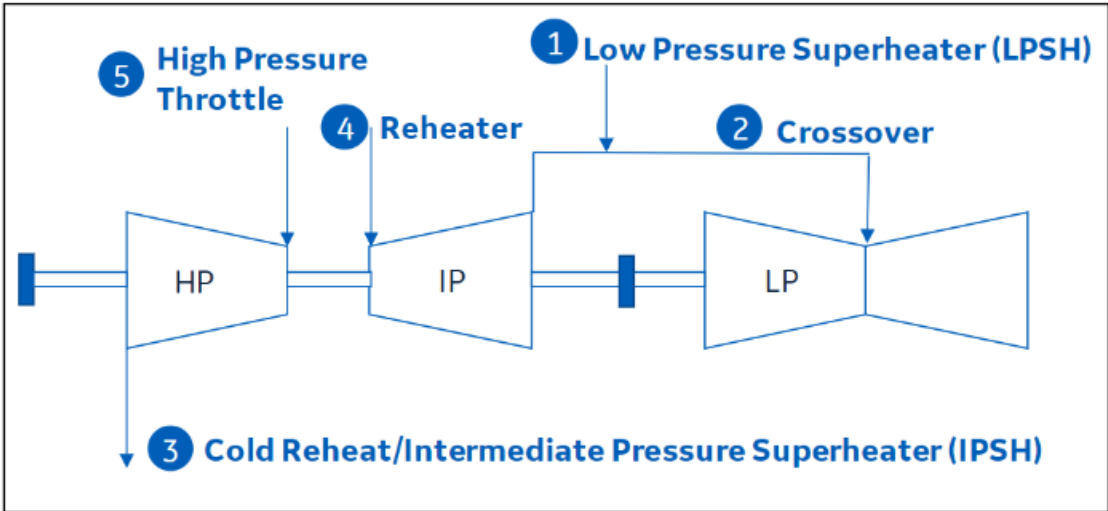
Technip Energies (Shell CANSOLV)
The Canopy by T.EN Range
(10 to 200 ktpa)



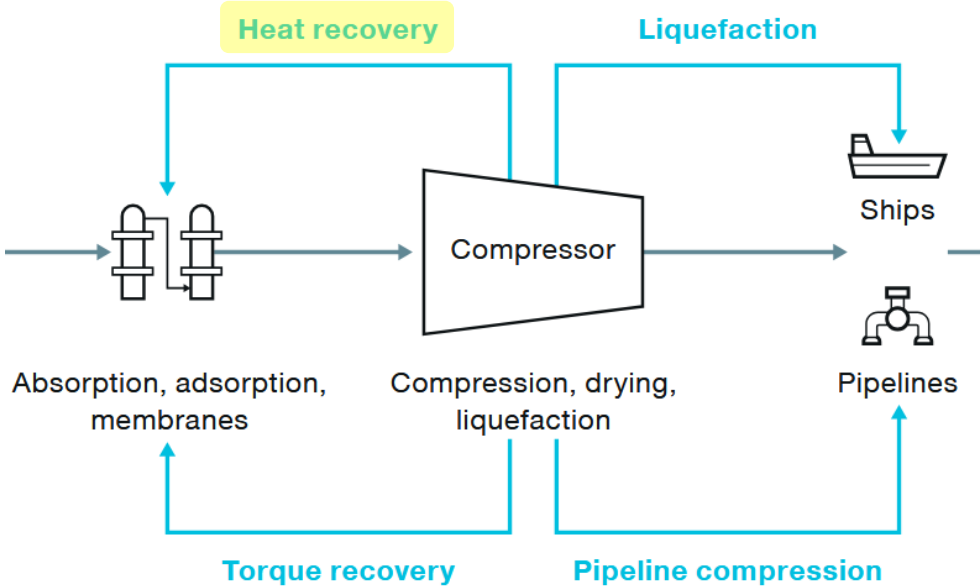
Carbon Clean
CycloneCC C1
(up to 100 ktpa)

3. HEAT INTEGRATION

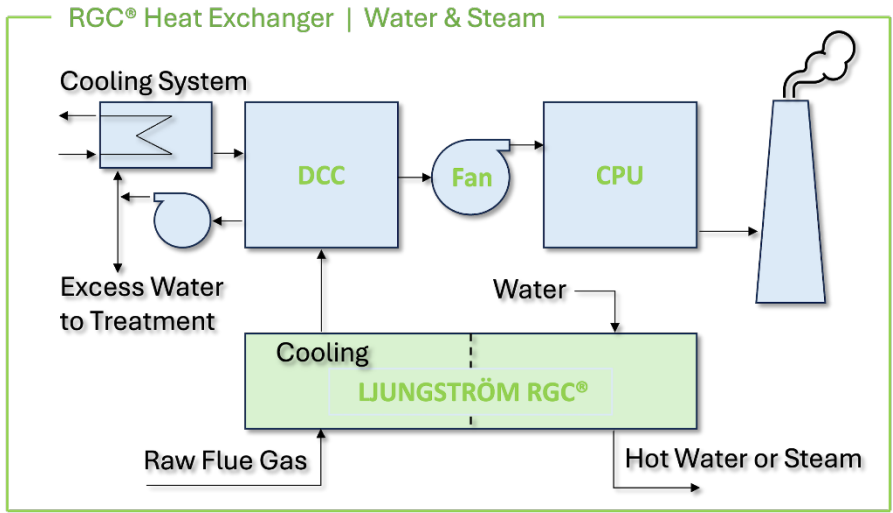
Using the heat that is available onsite and introduced through new systems.



Typical Steam Extraction from PCC systems [1]



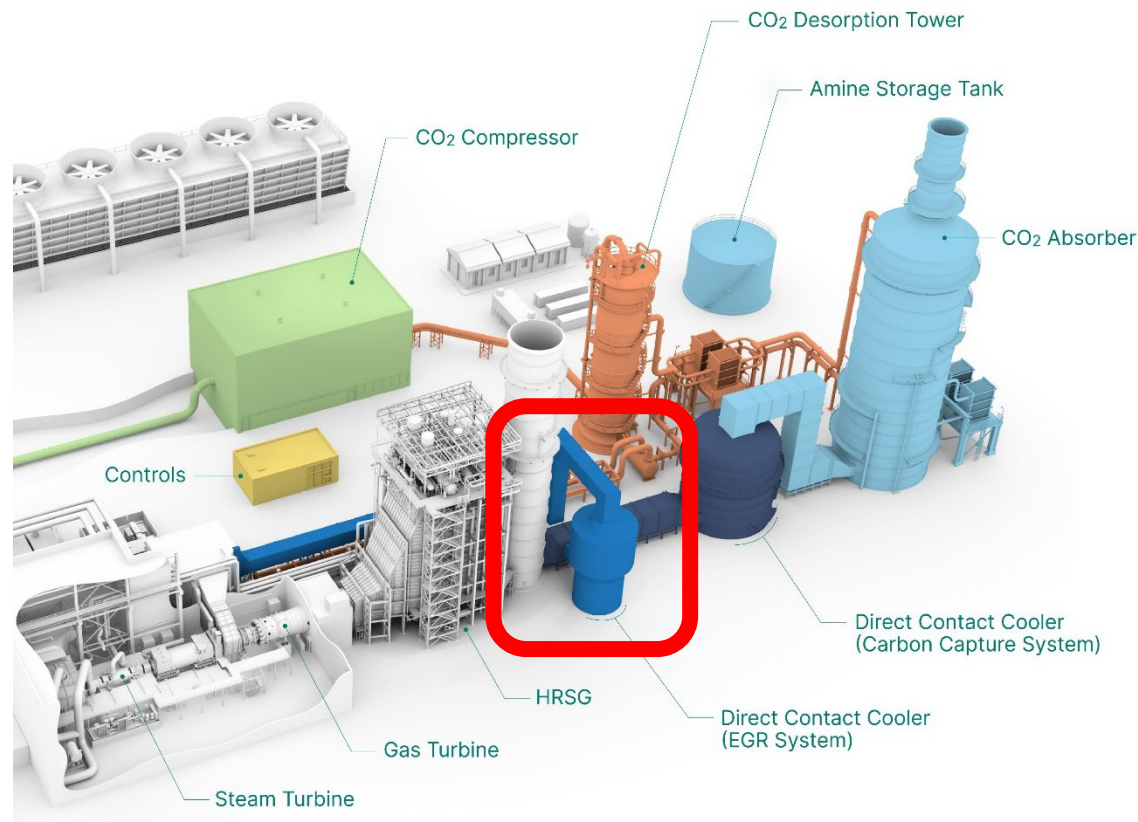
CO₂ Compressor Heat Integration [2]



Incoming Gas Heat Extraction [3]

[1] Figure 6 of Sholes, John. "Retrofittable Advanced Combined Cycle Integration for Flexible Decarbonized Generation.", Jun. 2024. <https://doi.org/10.2172/2377996>
[2] Norcem MAN CCS Reference, https://www.man-es.com/docs/default-source/document-sync/norcem-man-ccs-reference-case-eng.pdf?sfvrsn=1306dcf5_5
[3] LJUNGSTRÖM Submission to the 2025 Technology Compendium

4. NOVEL PROCESS ARRANGEMENTS

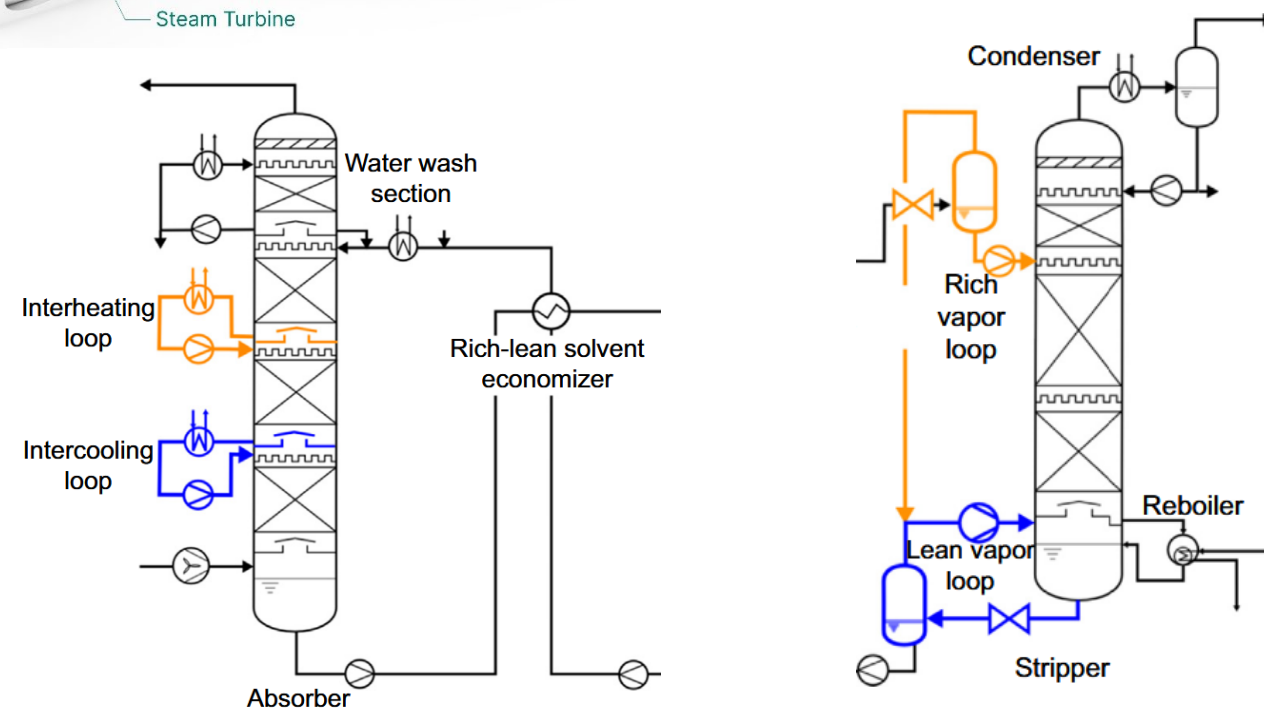


Exhaust Gas Recirculation
(GE Vernova, [1])

Rearranging the typical plant to address key parameters.

Cost saving vs complexity trade-off to consider.

Both CCS unit changes and upstream point source changes are in play.



Examples of Process Modifications [2]

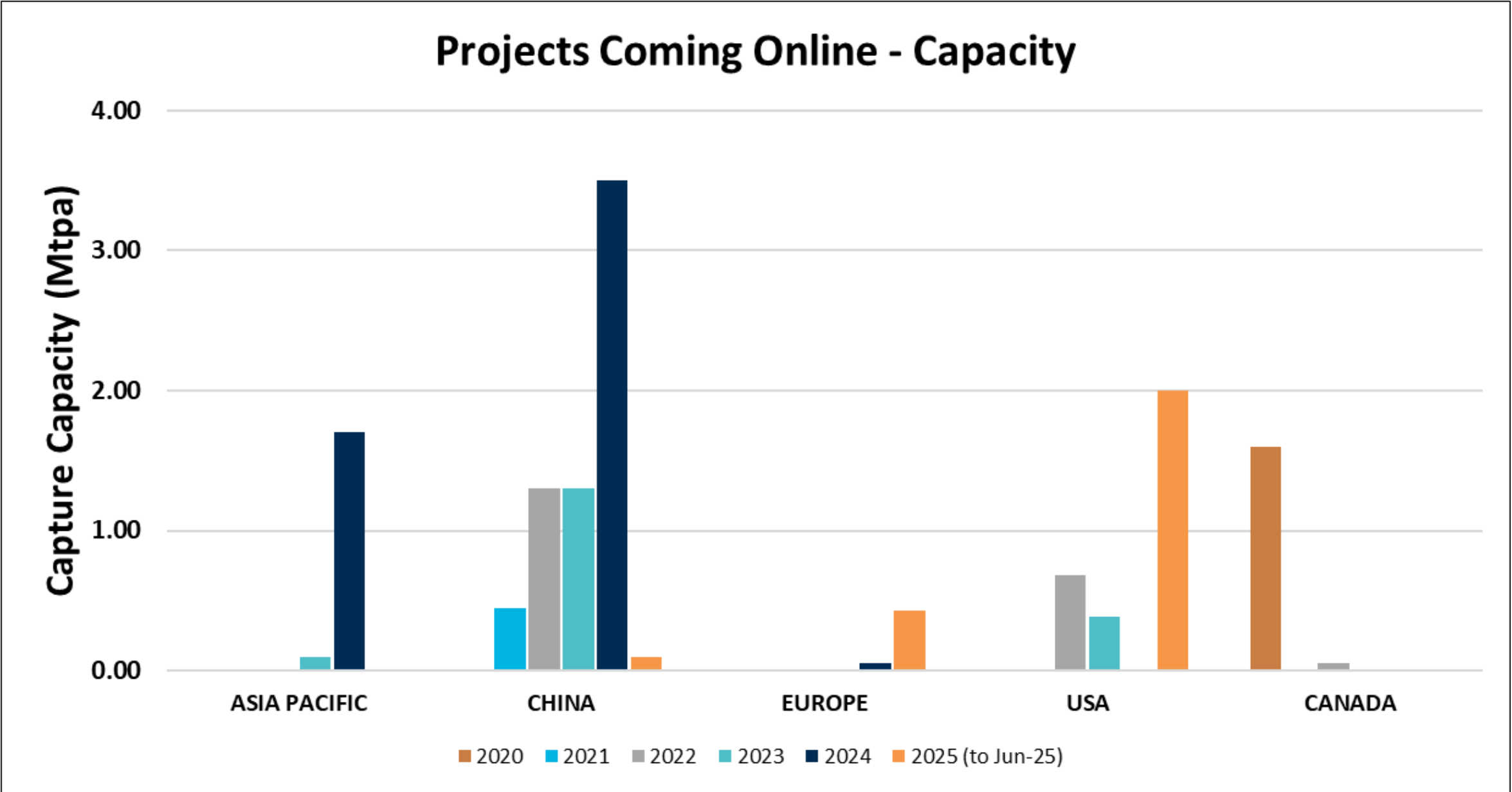
[1] GE Vernova Submission to the 2025 Technology Compendium

[2] Y. L. Moullec and T. Neveux, "Process modifications for CO2 capture," in Elsevier eBooks, 2016, pp. 305–340. Absorption-Based Post-combustion Capture of Carbon Dioxide, doi: 10.1016/b978-0-08-100514-9.00013-5.

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WHERE DOES THAT TAKE US?

GOING OPERATIONAL



July 2025 Data

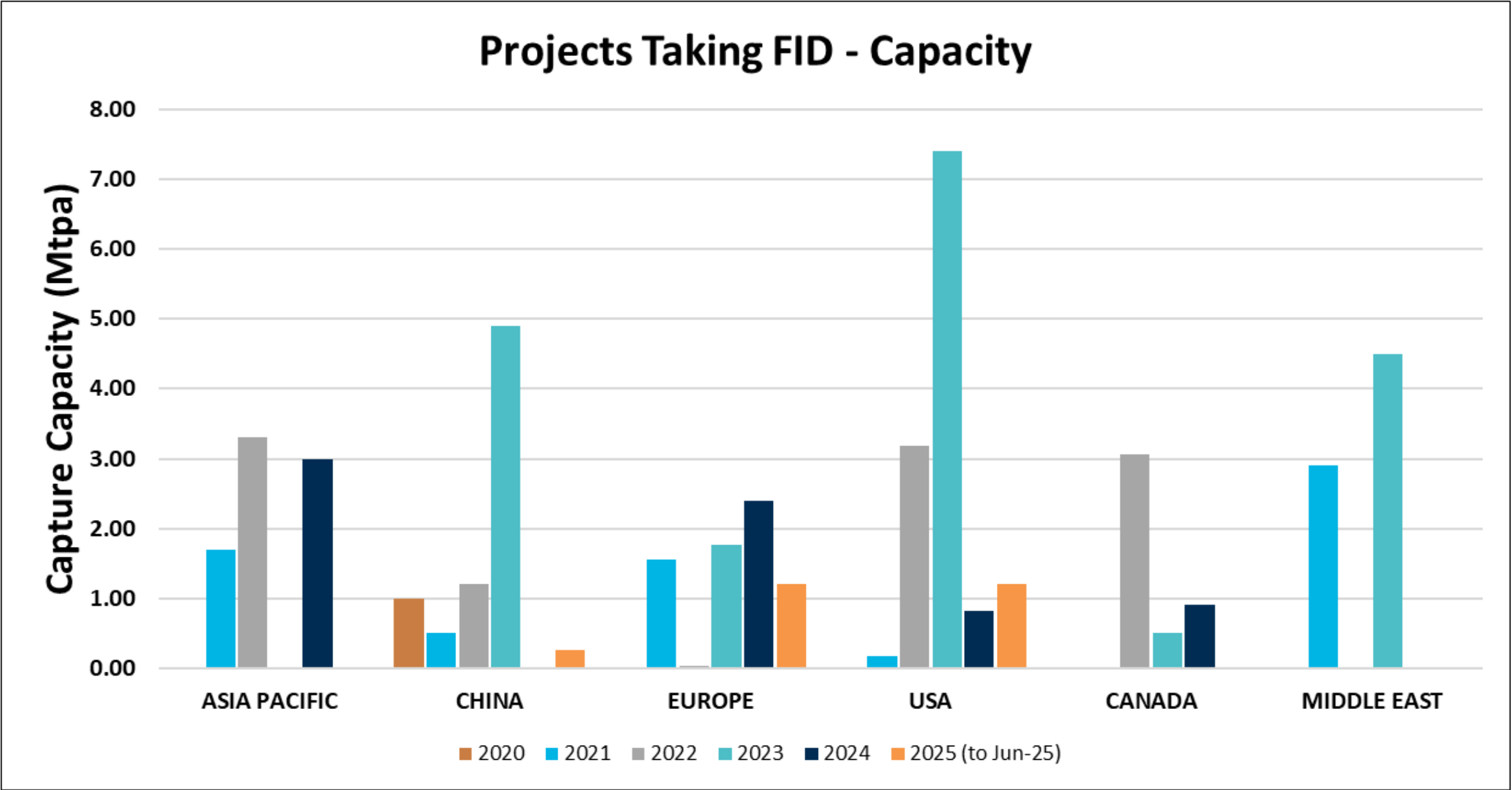
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CF Donaldsonville – 2 Mtpa (USA, 2025)

Santos Moomba – 1.7 Mtpa (APAC, 2024)

TAKING FID



July 2025 Data

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BP Tangguh LNG – 3 Mtpa (APAC, 2022)

Does not include:
PTTEP Arthit – 1 Mtpa (APAC, FID 2025/9)

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