

FROM AMBITION TO ACTION

Japan CCS Forum 2022

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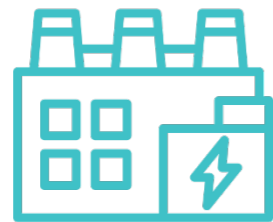
CCS IS AN ESSENTIAL TOOL FOR REACHING NET-ZERO, ALONGSIDE OTHER TOOLS



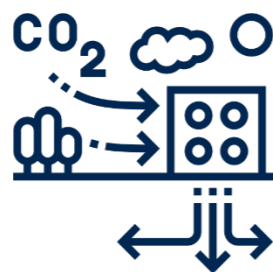
Achieving deep decarbonisation in hard-to-abate industry.



Enabling the production of low-carbon hydrogen at scale.

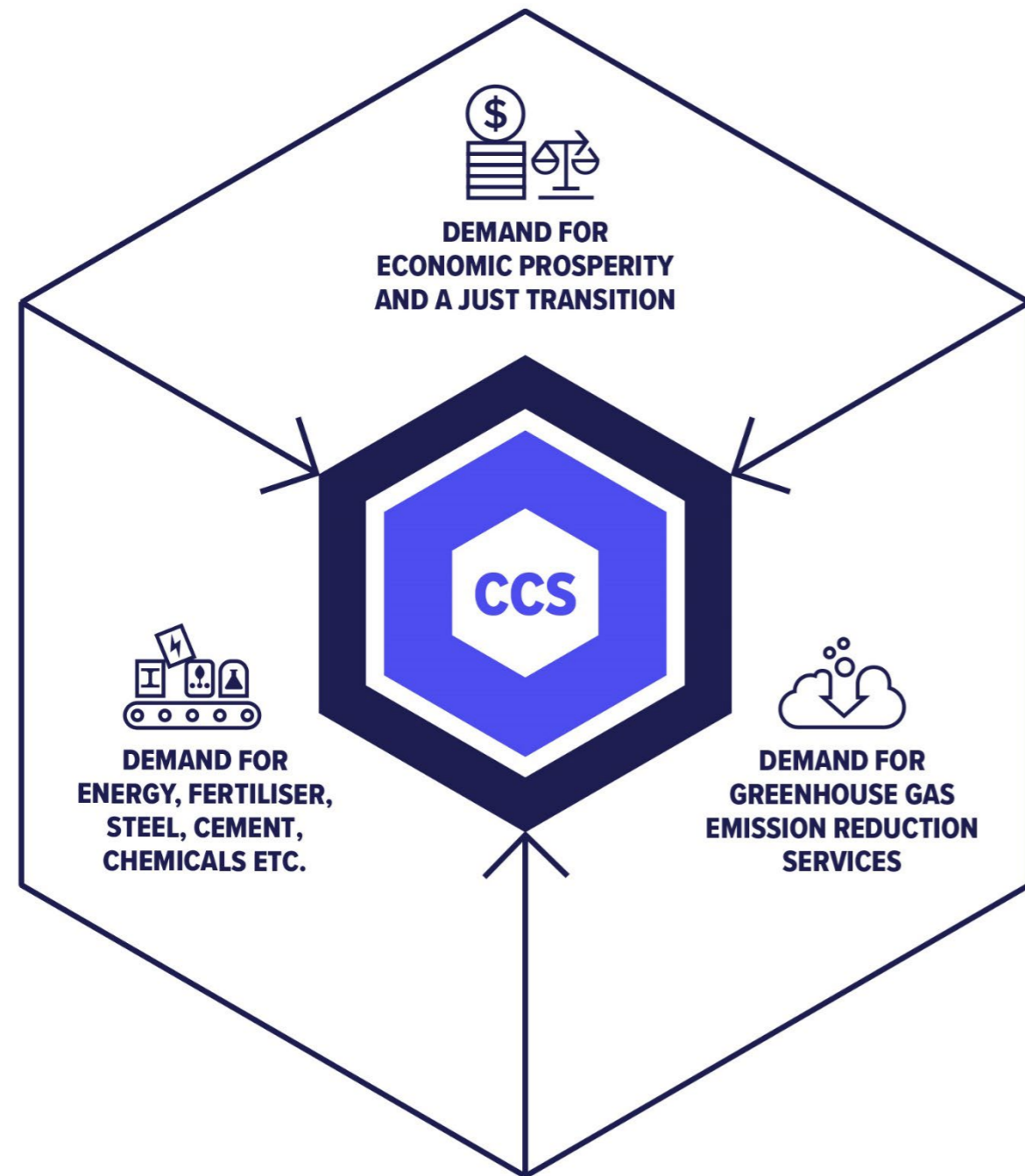


Providing low carbon dispatchable power.



Delivering negative emissions.

THE DEMAND DRIVERS FOR CCS



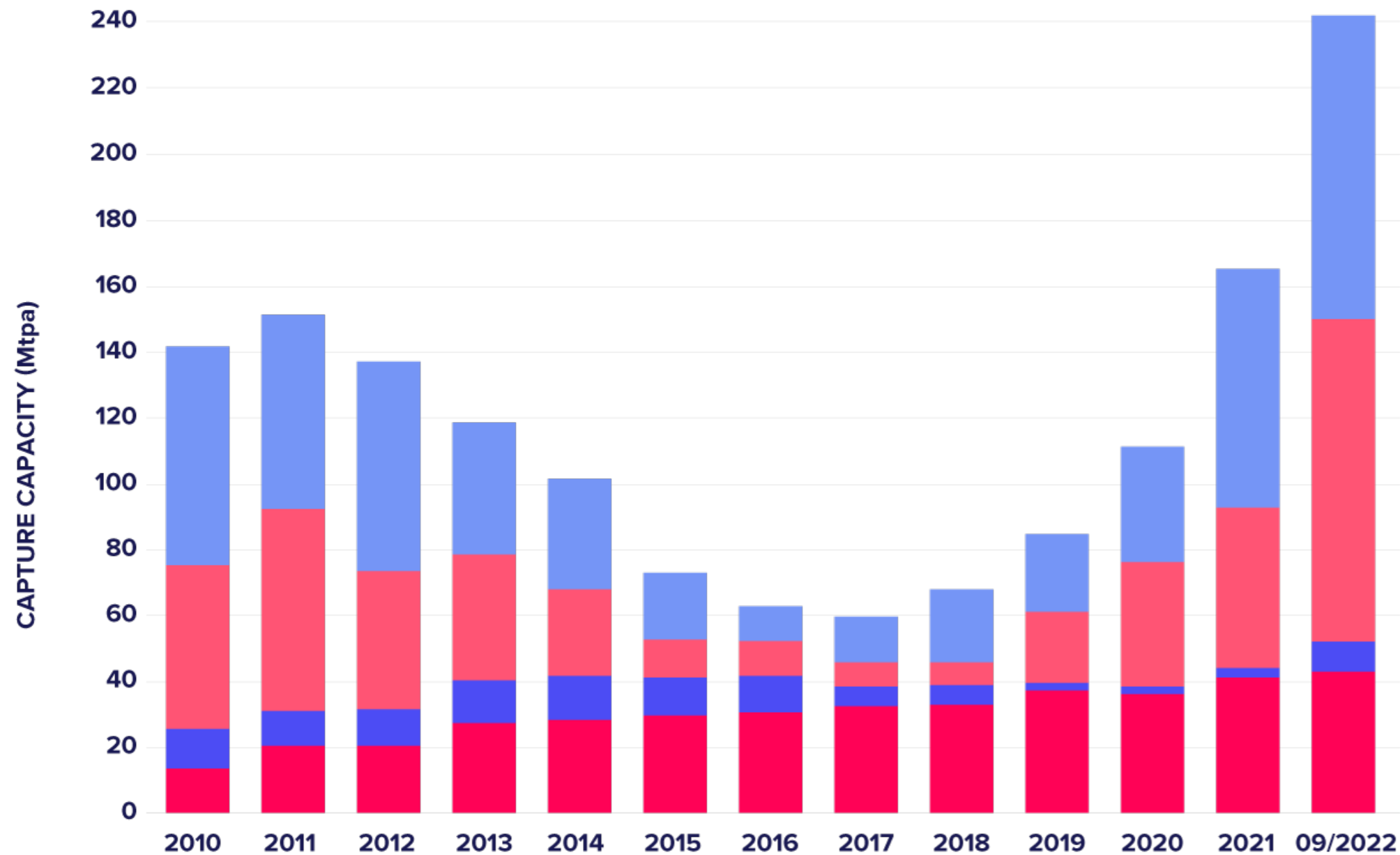
Demand for CCS is being driven by:

- Net-zero commitments from governments and businesses driving emission reductions and removals.
- Need for low-carbon footprint commodities and energy.
- Economic drivers including growth, prosperity and a just transition.

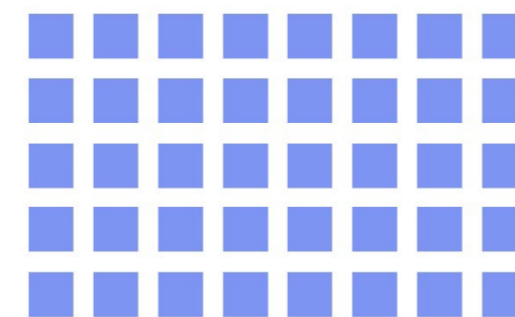
CCS: AMBITION TO ACTION

- In 2022, the pipeline of operational and under development commercial CCS facilities continued to grow for the 5th year in a row.
- The capture capacity of CCS projects in the project pipeline is 244 million tonnes per annum (mtpa) – a 44% increase from 2021.
- Policy and funding support for CCS continued its momentum, predominantly in North America and Europe, whilst project progress was notable in the APAC region.
- Despite the progress in 2022, to achieve net-zero emissions CCS capacity must increase more than a hundredfold by 2050.

GROWTH IN 2022



- OPERATIONAL
- IN CONSTRUCTION
- ADVANCED DEVELOPMENT
- EARLY DEVELOPMENT

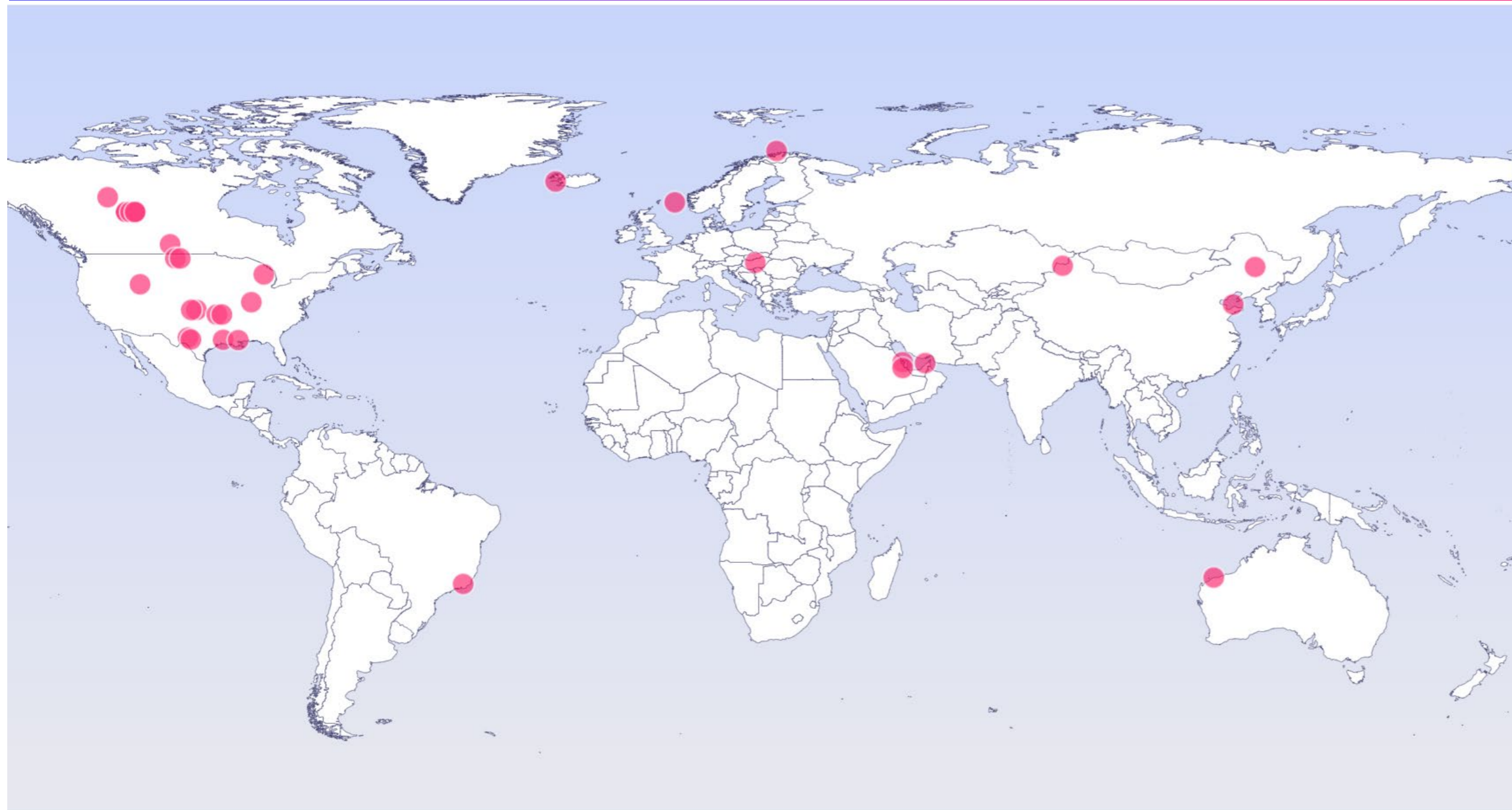


**244 MT
CAPTURE
CAPACITY**

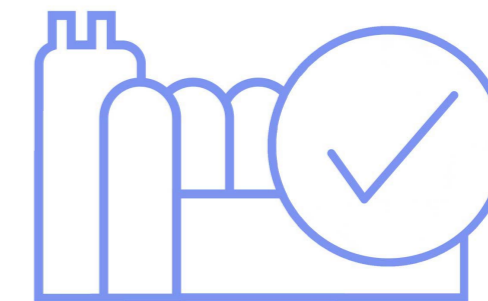


**196 CCS
FACILITIES
WORLDWIDE**

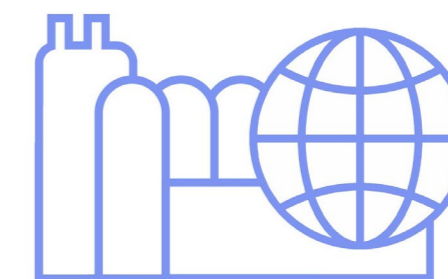
CCS FACILITIES - OPERATING



● Operational

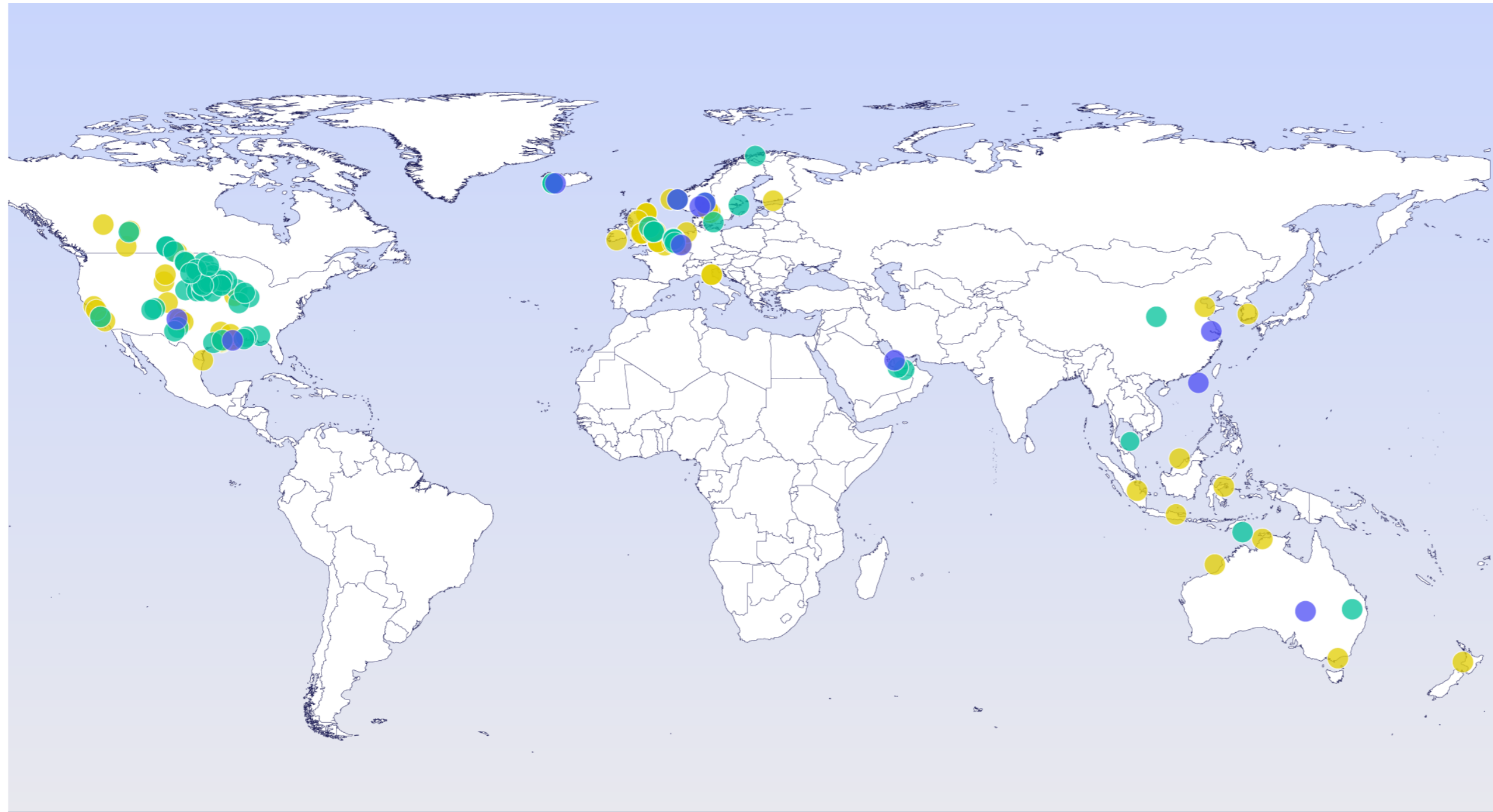


**30 CCS FACILITIES
OPERATIONAL**

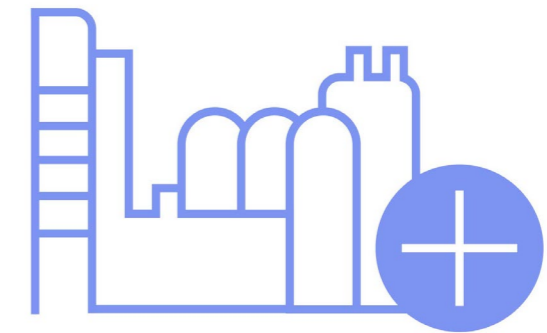


**20+ COUNTRIES WITH
COMMERCIAL CCS &
DACCS FACILITIES
IN OPERATION OR UNDER DEVELOPMENT**

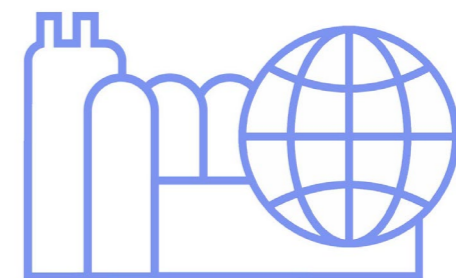
CCS FACILITIES – IN DEVELOPMENT



● EARLY DEVELOPMENT ● ADVANCED DEVELOPMENT ● IN CONSTRUCTION



61 NEW CCS FACILITIES ADDED



20+ COUNTRIES WITH COMMERCIAL CCS & DACCS FACILITIES IN OPERATION OR UNDER DEVELOPMENT

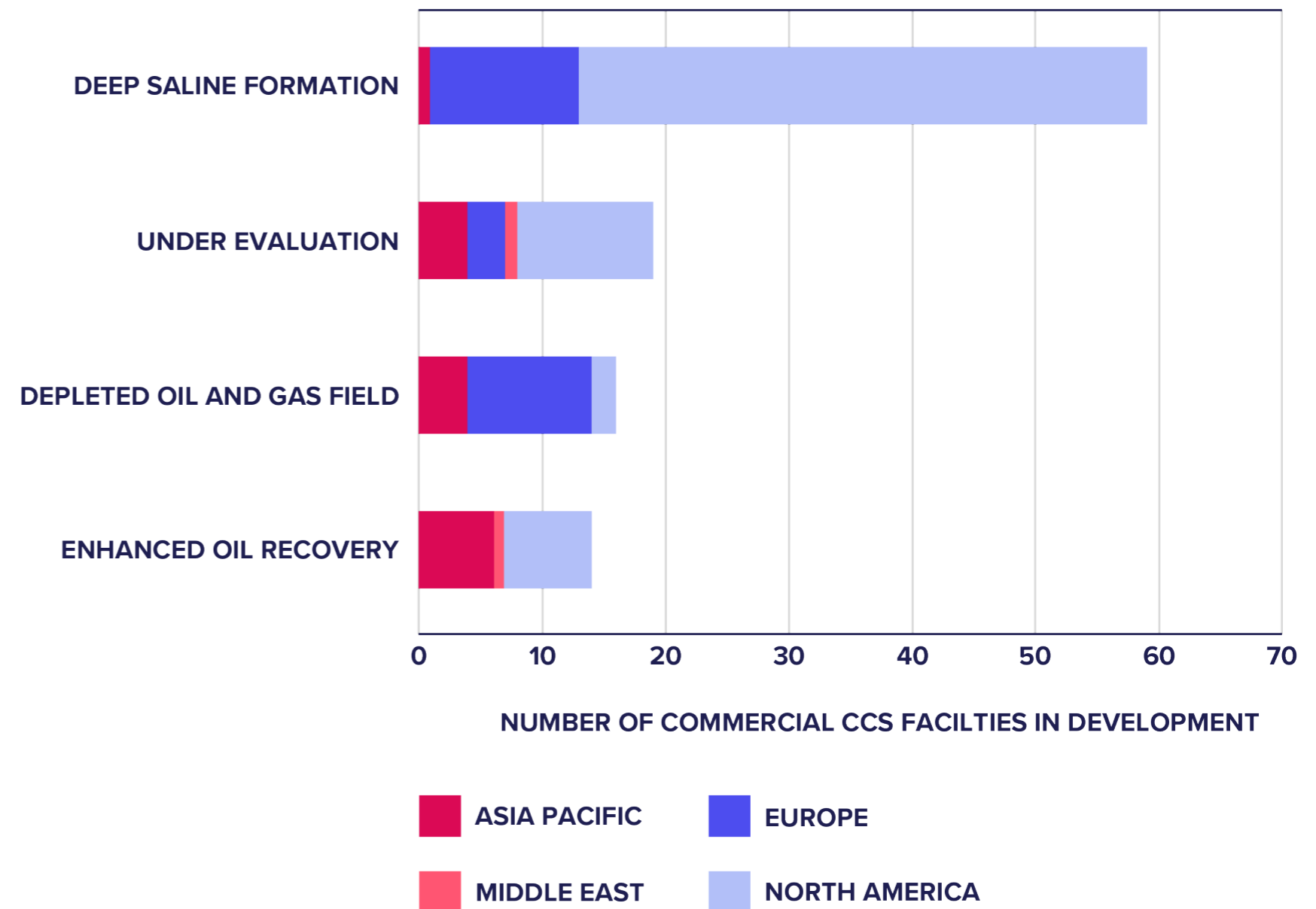
THE GLOBAL STATUS OF CCS

SIGNIFICANT DEVELOPMENTS IN THE PAST 12 MONTHS

- 4 new facilities in operation.
 - Including first commercial DACCS and post-combustion gas facilities.
 - New operational facilities are in Canada, China, Iceland, US.
- 11 new facilities in construction.
- 75 mtpa of new capacity added to the pipeline.
- Major policy progress: Canada, Denmark, US.
- Major new project progress : Australia, Iceland, Indonesia, Malaysia, UK.
- Additional countries with new CCS facilities in development for the first time: Germany (trans-shipment hub), Finland, France, and Timor-Leste.

EVOLUTION OF STORAGE

- 9 of the 30 facilities currently operating use dedicated geological storage with the remainder using EOR.
- 70% of the commercial CCS projects in development aim to use dedicated geological storage (deep saline formations, depleted oil and gas fields).
- Operational facilities, on average, can inject around 1 mtpa CO₂. That average could more than double within a decade. Many storage sites associated with the development of CCS networks generally have rates of around 5 Mtpa.



* Analysis of 108 facilities in development with dedicated storage sites

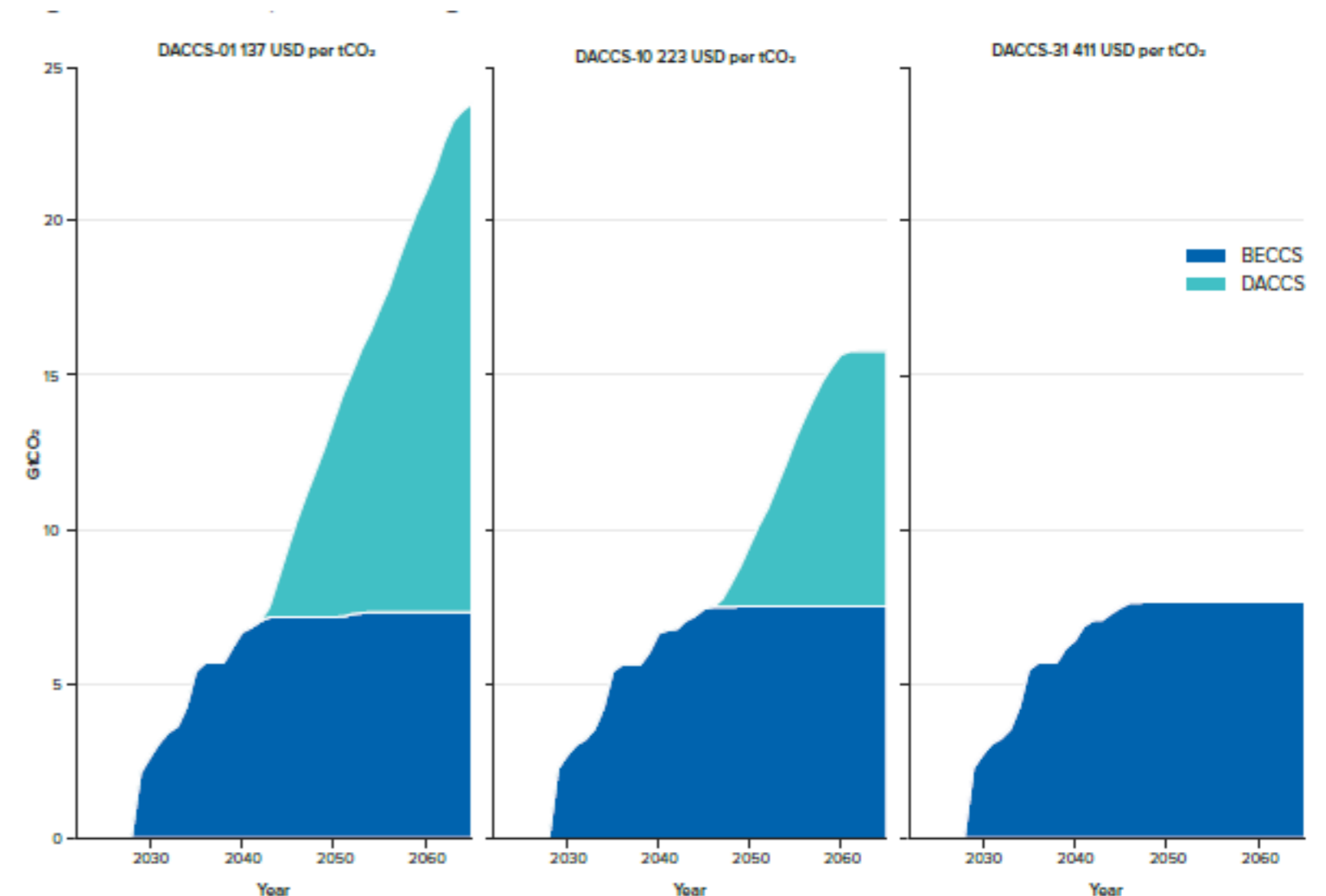
INFRASTRUCTURE DEVELOPMENT

- Networks continue to be a predominant model of development.
- For the Longship project, two dedicated 7,500 m³ CO₂ carrier ships under construction.
- Subsea pipelines in Europe under assessment (from Belgium and Germany to Norwegian North Sea).
- In Iceland, storage in basalt rock formations being further developed.
- Storage licensing rounds: Australia, Canada, Denmark, UK.
- The Hydrogen Energy Supply Chain (HESC) pilot project demonstrated the transport of liquid hydrogen from Victoria in Australia to Kobe in Japan in February 2022.

CARBON DIOXIDE REMOVAL

- CDR continues to gain momentum and is viewed as critical to net-zero.
- Engineered-CDR costs, specifically of DACCS, are currently relatively high but projected to fall over time.
- The extent to which costs fall will determine deployment.
- CDR can play an important role in drawing down historical emissions even after we reach net-zero and provides a safety net.

CAUTION – ECONOMIC MODELLING



Source: Williams, Eric 2022, Global CCS Institute Thought Leadership Report. The Economics of Direct Air Carbon Capture & Storage.

FINANCE AND INVESTMENT

- Corporate financing model has traditionally been CCS financing approach, but unsustainable if CCS is to be deployed at scale – private finance with government incentivization is key.
- Taxonomies emerging in various jurisdictions – efforts to adopt common principles key to a consistent approach.
- Carbon Markets – compliance and voluntary – becoming increasingly important. Convergence expected.
- ESG-related reporting remains important to commercial activity:
 - Demand for detailed disclosure remains critical for investors.
 - Companies with significant emissions under pressure to report.
 - Although CCS not excluded, a clearer reporting pathway would be beneficial.

CCS DEVELOPMENTS IN NORTH AMERICA

THE UNITED STATES

- Inflation Reduction Act (IRA)
 - Significant enhancements to 45Q
 - Multiple early analyses suggested the IRA could increase the deployment of CCS by 13-fold, or well over 110 Mtpa, by 2030 compared to existing policy.
- CHIPS and Science Act: \$1bn for CO₂ removal R&D.
- Bipartisan Infrastructure Law: \$12bn for carbon management approaches.

CANADA

- CCUS Strategy under development.
- 2022 Federal Budget included CCUS investment tax credit (2022 – 2030).
- Move to mandatory climate-related financial disclosures across broad spectrum of the economy as part of net-zero 2050 strategy based on TCFD framework.

CCS DEVELOPMENTS IN EUROPE

- More than 70 commercial facilities in various stages of development across Europe – almost doubling from 2021.
- **THE EU** through the Innovation Fund to invest in 11 CCS and CCU projects, supplemented by individual member state policies.
- **NETHERLANDS** allocated €2bn SDE++ subsidy to capture facilities in the Port of Rotterdam network.
- **DENMARK** allocated €5bn for CCS projects over 10 years under Energy Technology Development and Demonstration Project.
- **The UK** aims to establish 4 CCUS networks by 2030 capturing 20-30 mtpa, with £1 billion allocated to support CCUS development. First two recipient clusters announced in late 2021.

CCS DEVELOPMENTS IN THE MENA REGION

- 3 facilities in operation in the region, capturing 3.7 Mtpa CO₂, equivalent to ~10% of global capture capacity.
- CCUS in MENA region being driven by high-level policy and international market expectations:
 - NDCs and net-zero commitments
 - Potential to take a significant share of low-carbon hydrogen market
 - Low-carbon industrialization plans
- Kingdom of Saudi Arabia, United Arab Emirates, and Egypt have announced VCMs and carbon trading schemes.

CCS DEVELOPMENTS IN ASIA PACIFIC

CHINA

Great need for CCS. High-level policy support through inclusion in “1+N”. Energy SOEs driving development yet require enhanced policy and technology support.

JAPAN

Strong support, limited domestic storage, reliant on imports of low-carbon energy and export of captured CO₂. Looking for strong regulatory regimes in countries for storage.

INDONESIA

Focus remains on economic development as a priority. CCUS regulatory framework is in development and the anticipated carbon pricing mechanism will launch its first phase later this year.

MALAYSIA

Ambitions to become a regional storage hub for CCS. Announced a carbon tax and development of a regulatory framework in late 2021.

AUSTRALIA

CCS projects now eligible to generate financial returns through the Emissions Reduction Fund. Regulatory frameworks being developed at the state level (WA, NT). Oil and gas continue to drive deployment.

INTERNATIONAL POLICY AND REGULATION

- Publication of IPCC Working Group III Report: 'Mitigation of Climate Change' highlights the effectiveness and viability of CCS.
- 21 countries included CCS in their Nationally Determined Contributions (NDCs) with more expected.
- More than 80% of countries that submitted Long-Term Low-Emission Development Strategies (LT-LEDs) included CCS.
- Trend toward closer regional cooperation, particularly surrounding transboundary storage activities (e.g., North Sea, Southeast Asia).

REALISING CCS AT SCALE GLOBALLY



Define the role of CCS and CDR in meeting national climate strategies and plans, set and communicate targets.



Create a long-term, high value on the storage of CO₂.



Support the identification and appraisal of geological storage resources.



Develop specific CCS laws and regulations.



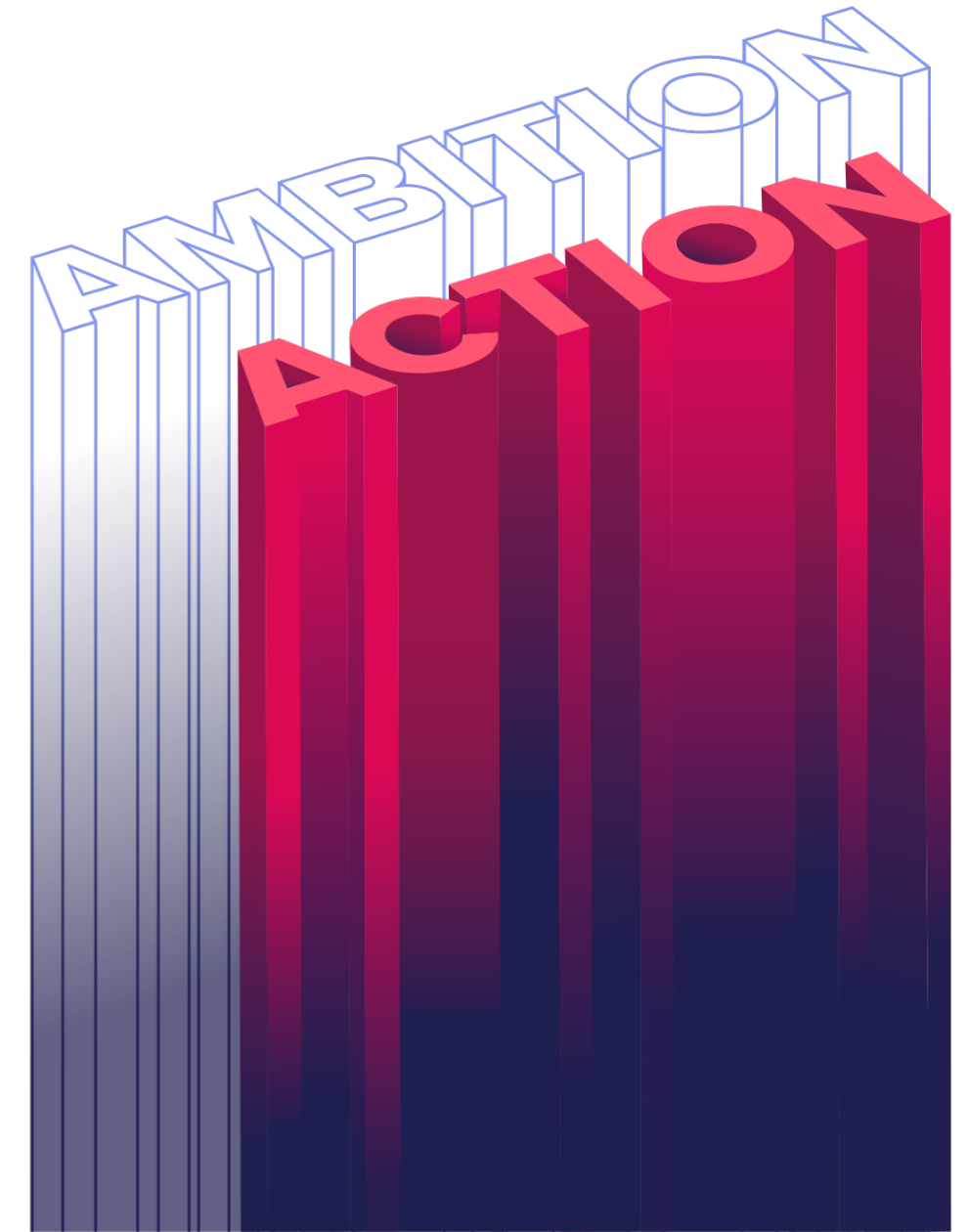
Identify opportunities for CCS networks and facilitate the establishment of transport and storage infrastructure.



Enable investment in CCS through appropriate policy and market mechanisms.

NET-ZERO BY 2050 REQUIRES STRONG ACTION BY 2030

- Although the increasing deployment of CCS is encouraging, we are far short of the scale required to achieve net-zero.
- The installed capacity of CCS needs to increase by at least 100-fold by 2050 to meet our climate targets.
- Reaching the required scale for CCS will require us all to work together: Governments to put in place supportive policy; private sector to build, own and operate; and financial sector to provide capital.



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THANK YOU

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