

WHERE IN THE WORLD IS CARBON CAPTURE HEADING?

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CARBON MANAGEMENT TECHNOLOGY FORUM, JULY 17, 2019



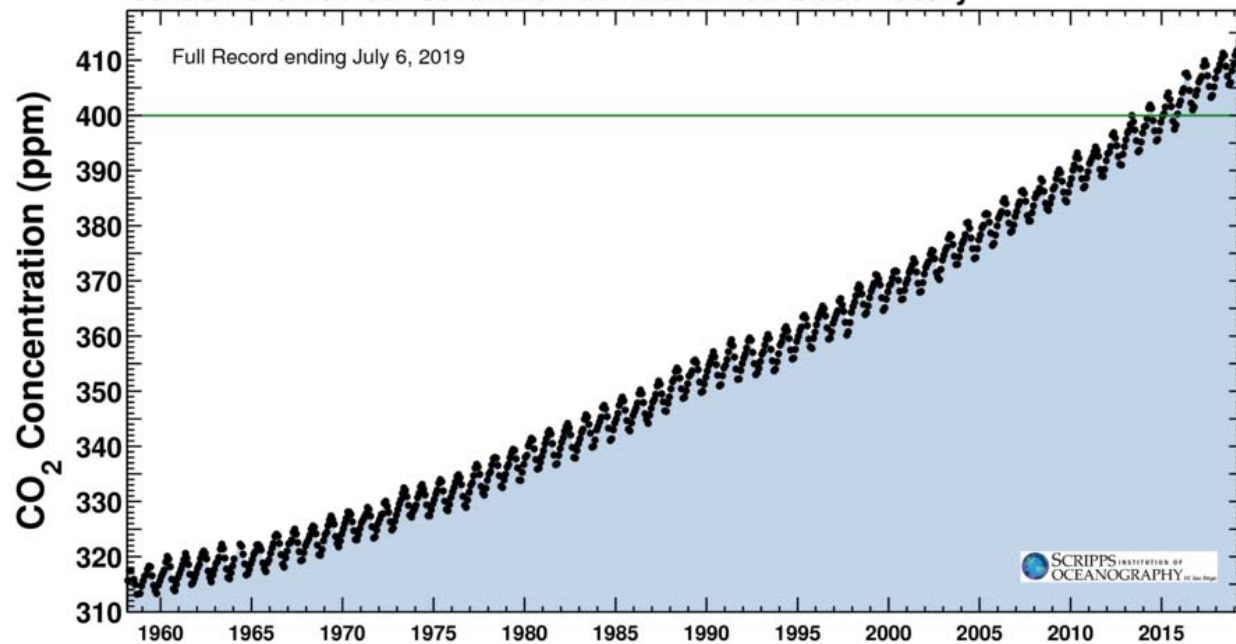
GLOBAL CCS
INSTITUTE

CO₂ CONCENTRATIONS CONTINUE TO RISE

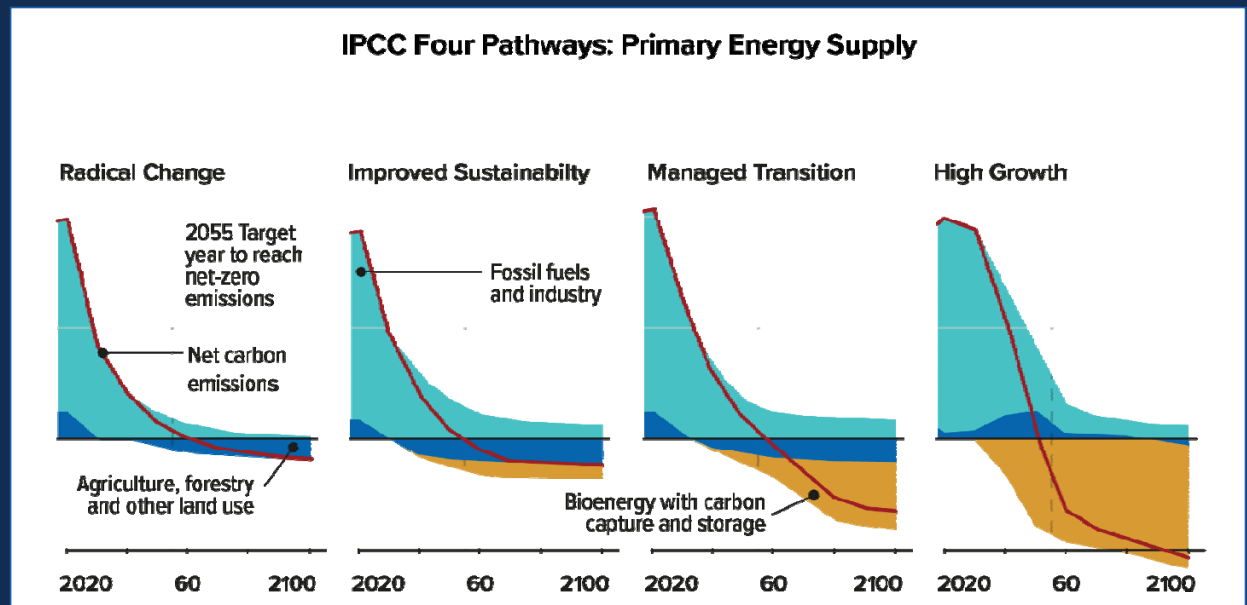
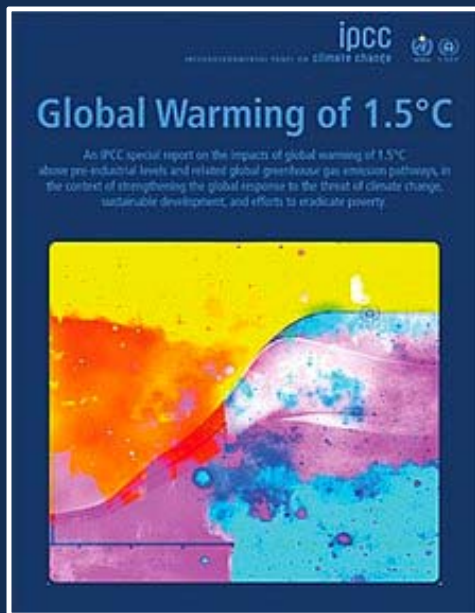
Latest CO₂ reading
July 01, 2019

413.76 ppm

Carbon dioxide concentration at Mauna Loa Observatory



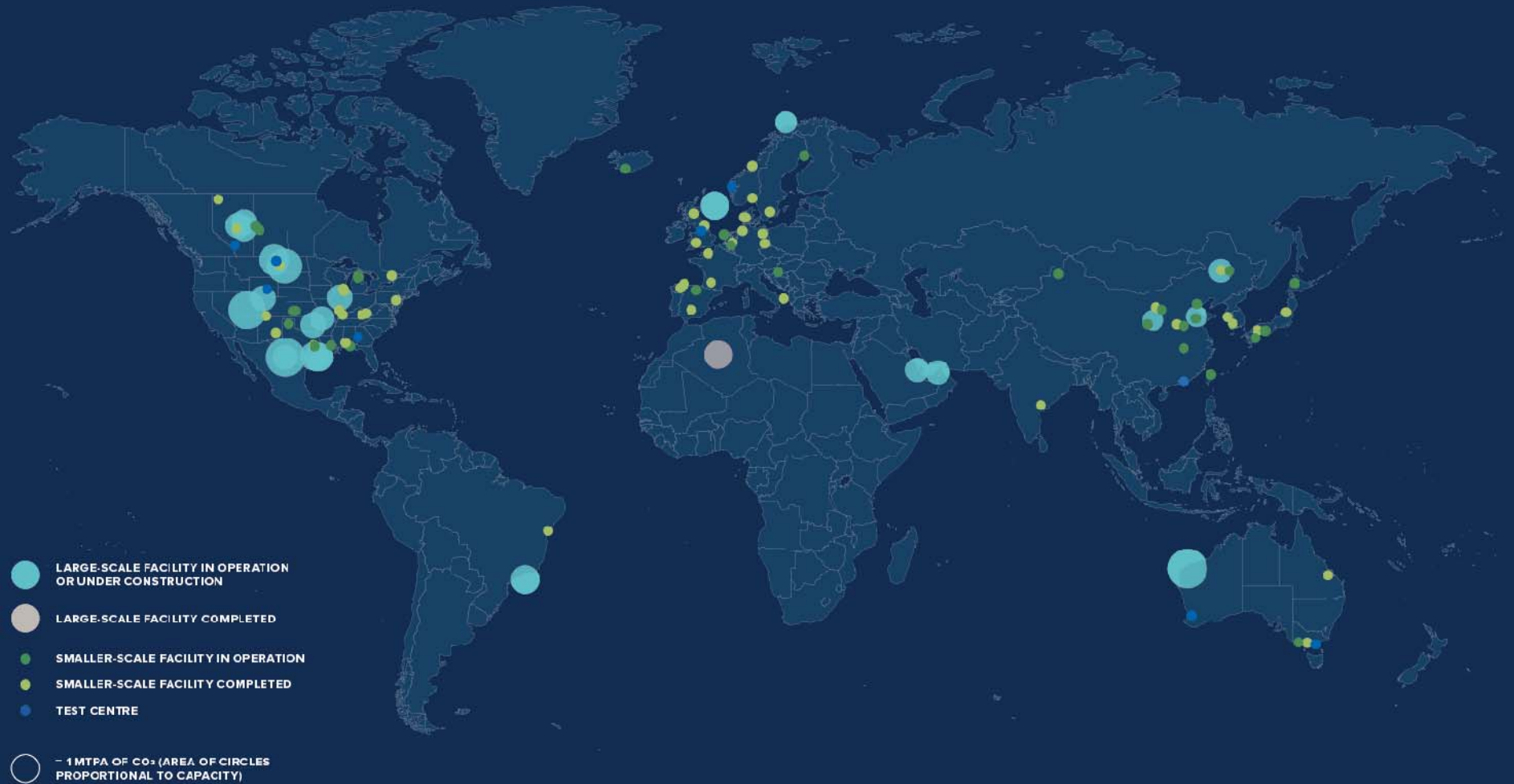
IPCC REPORT HAS RAISED AWARENESS AND URGENCY



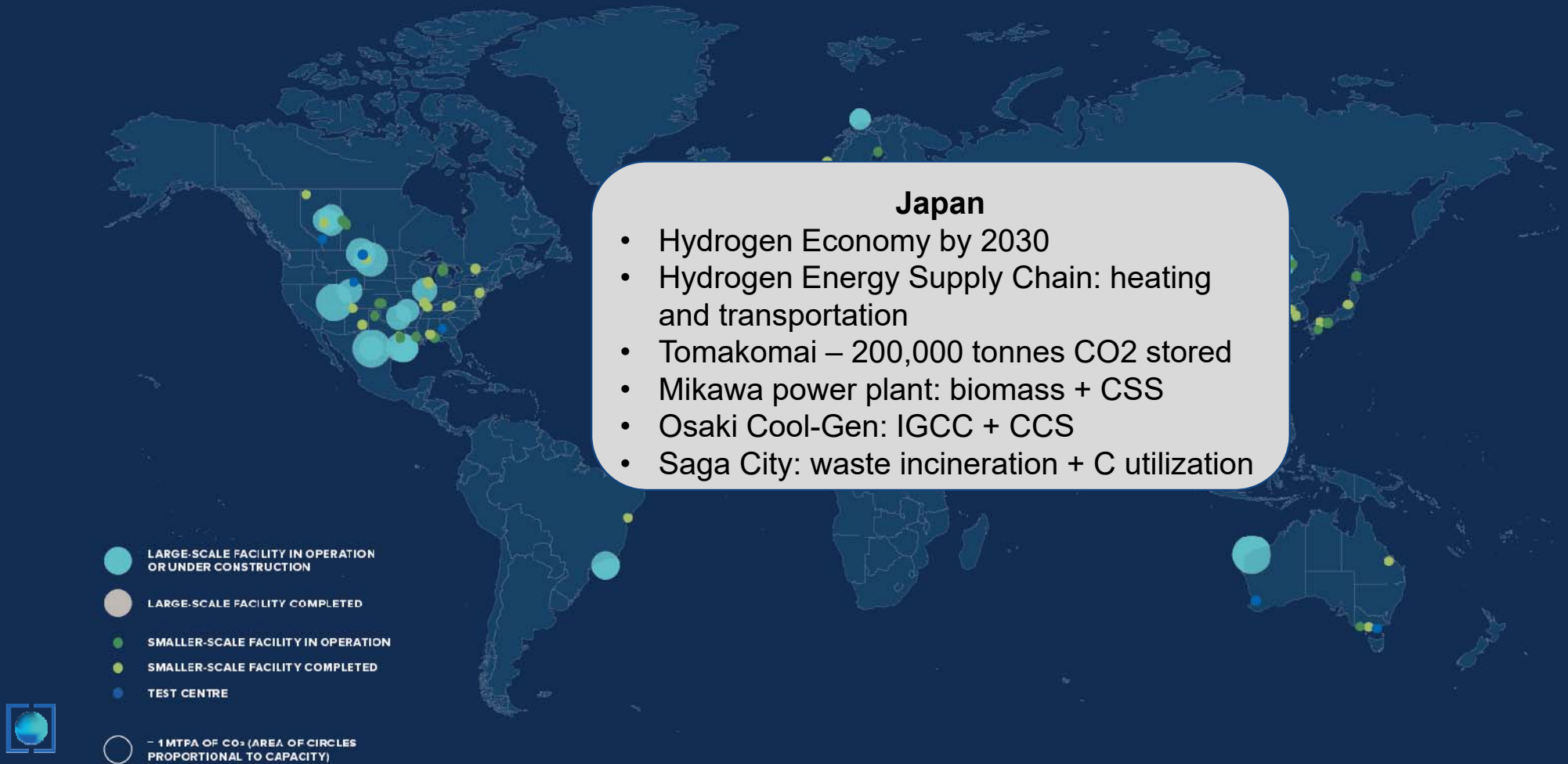
ZERO NET EMISSIONS AND HYDROGEN ARE PROMINENT



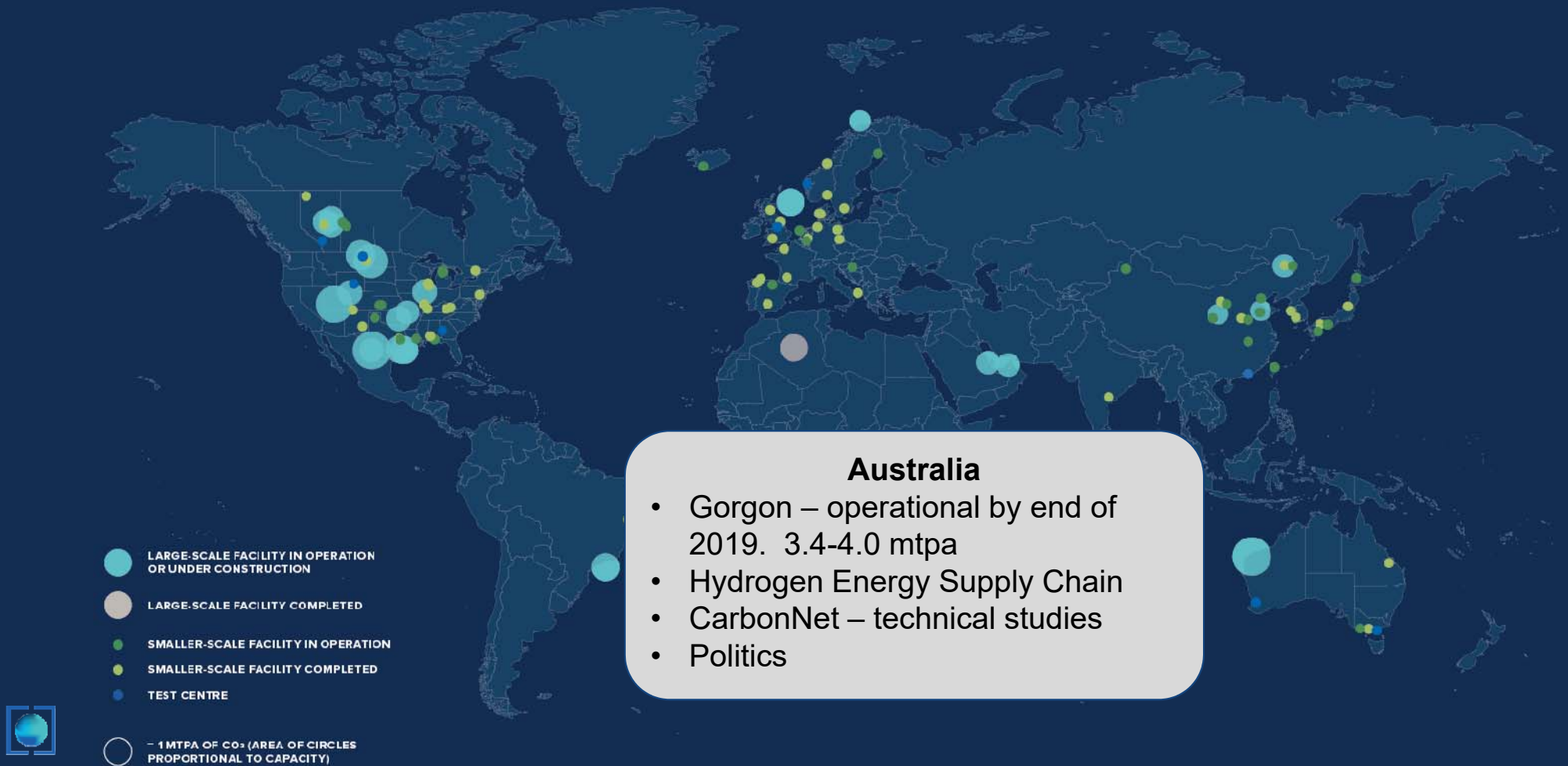
43 LARGE-SCALE FACILITIES IN OPERATION, CONSTRUCTION, DEVELOPMENT



POLICIES AND PROJECTS AROUND THE WORLD



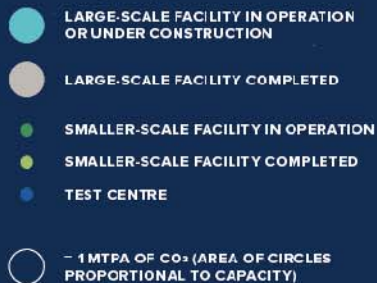
POLICIES AND PROJECTS AROUND THE WORLD



POLICIES AND PROJECTS AROUND THE WORLD

China

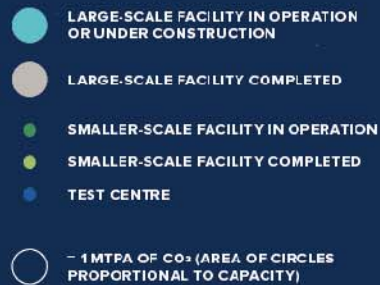
- Ministry of Ecology & Environment
- National carbon market in electricity sector
- Industrial and EOR
- Operating:
 - CNPC Jilin gas processing plant – 0.6 mtpa
- Construction:
 - Sinopec Qilu Petrochemical – 0.4 mtpa
 - Yanchang coal-to-chemicals – 0.4 mtpa
- 30 CCS projects in development



POLICIES AND PROJECTS AROUND THE WORLD

UAE

- Al Reyadah steel plant/EOR – 0.8 mtpa
- Several more facilities in early planning



POLICIES AND PROJECTS AROUND THE WORLD

Europe

UK

- Clean Growth Strategy, CCUS Council, Cost Challenge Task Force
- Hydrogen projects: H21, Hynet North West, Ervia Cork, HyDeploy, Acorn
- Drax – pilot biomass + CCS = negative emissions
- Caledonia Clean Energy Project, Scotland

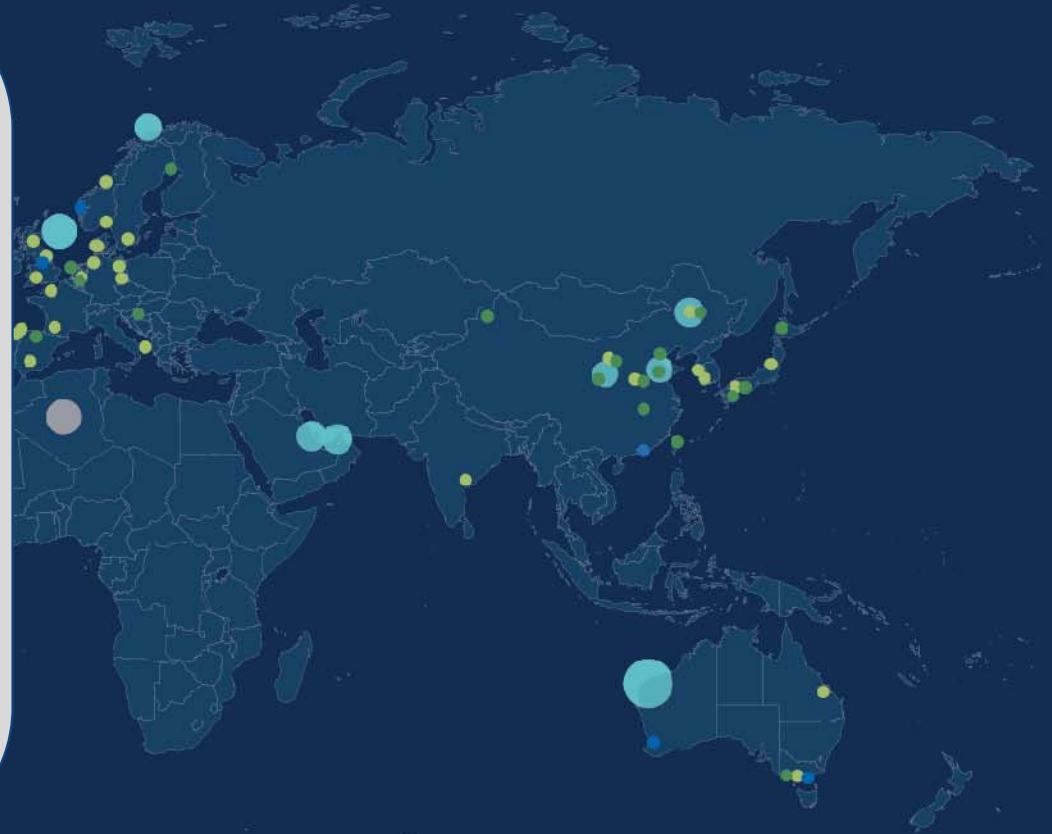
Norway

- Full Chain Project – WTE + cement
- Northern Lights

Netherlands

- Hydrogen 2 Magnum
- PORTOS

Germany – CCS necessary



TEST CENTRE

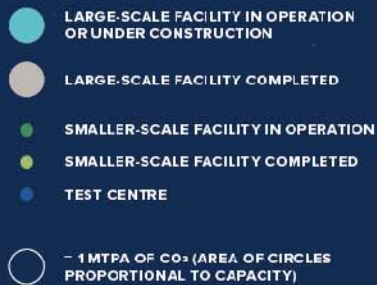


1 MTPA OF CO₂ (AREA OF CIRCLES PROPORTIONAL TO CAPACITY)

POLICIES AND PROJECTS AROUND THE WORLD

Canada

- Clean Growth and Climate Action Plan
 - Carbon price: \$10-\$50/tonne CO₂
- Quest: 4 million tonnes stored (May)
- Boundary Dam: 2.6 million tonnes stored (May)
- Alberta Carbon Trunk Line – 2019 completion
- CO₂ utilization and Direct Air Capture



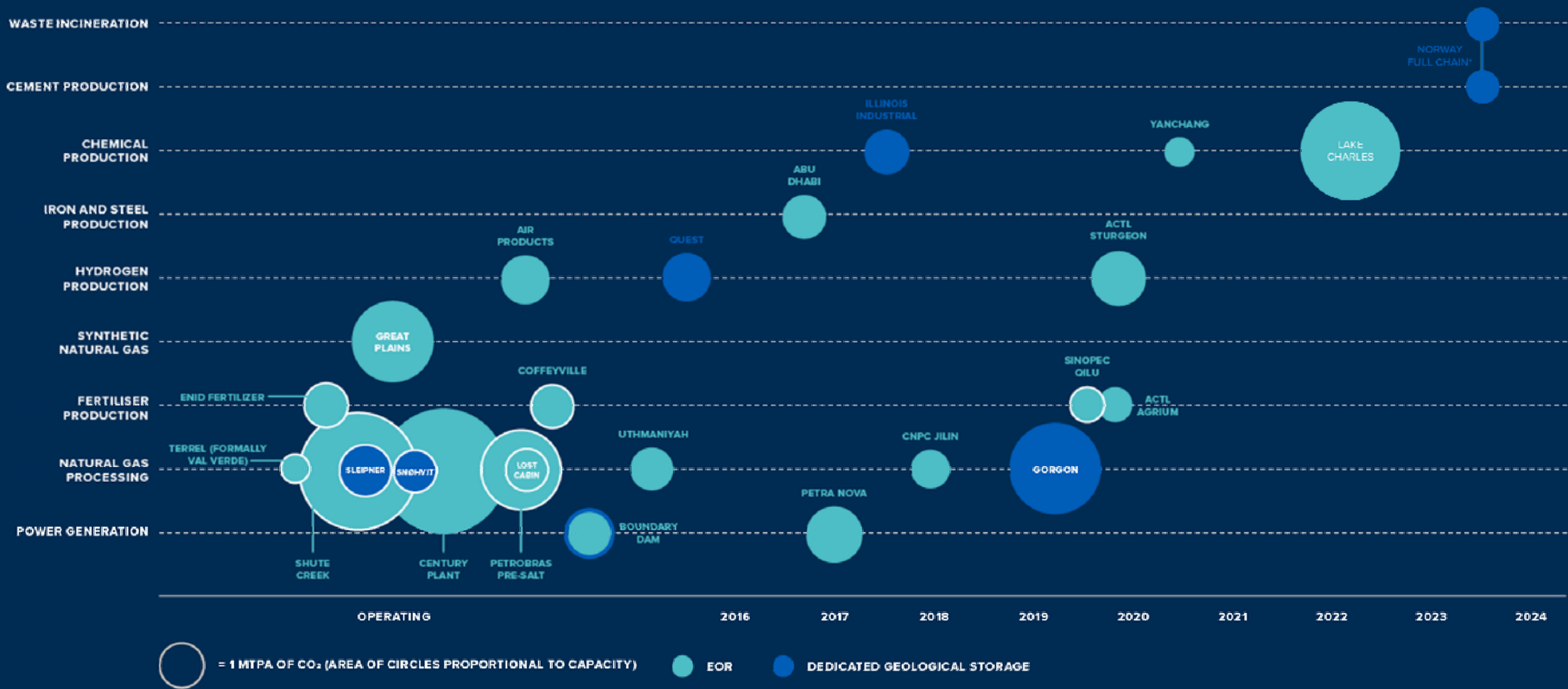
POLICIES AND PROJECTS AROUND THE WORLD

USA

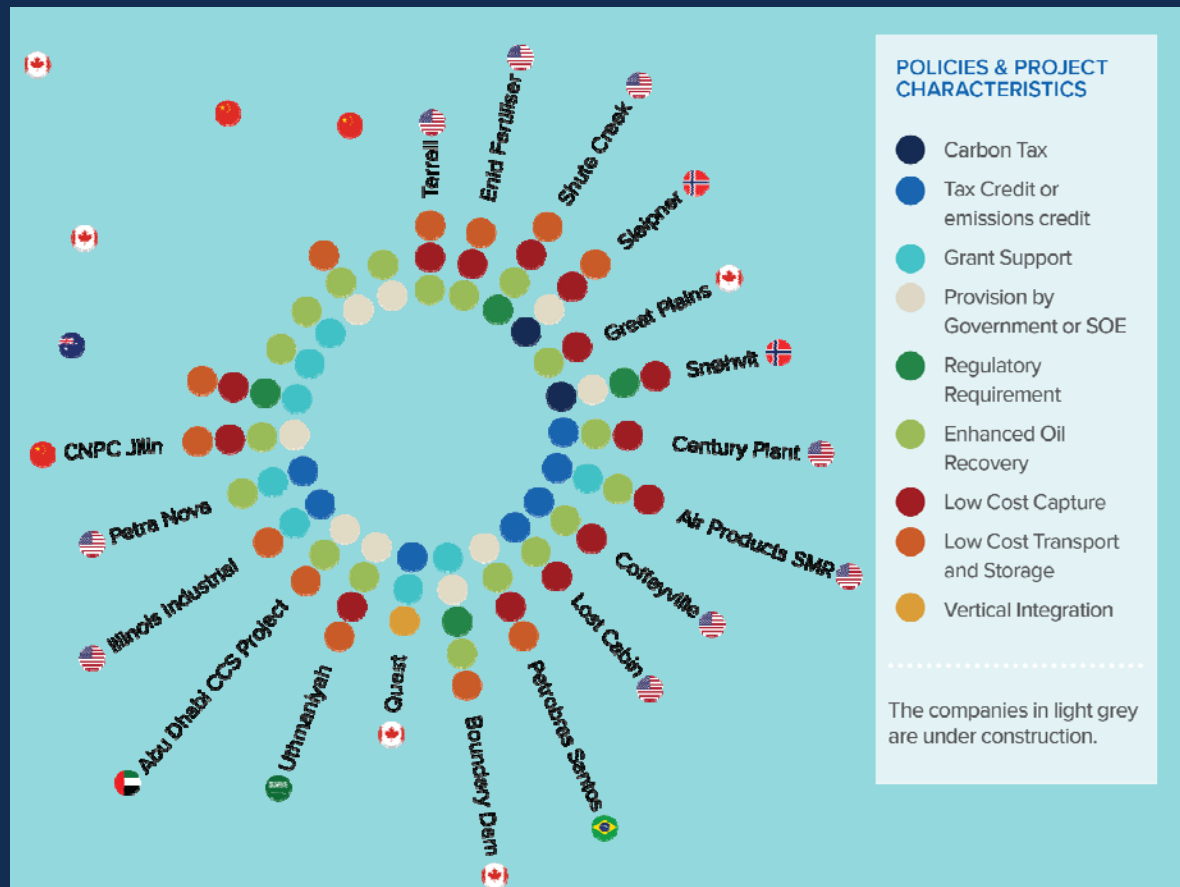
- Politics: Republicans accepting reality; Democrats making climate change election issue
- 45Q: \$35 and \$50 per tonne stored
- California: LCFS and CCS Protocol
- Growing Project Pipeline:
 - Oxy/White Energy – ethanol
 - Oxy/Carbon Engineering – DAC
 - OGCI – Wabash
 - Project Tundra
 - Project ECO2S
 - Integrated Mid-Continent
 - Dry Fork



INDUSTRIAL APPLICATIONS AND EOR CONTINUE TO DOMINATE



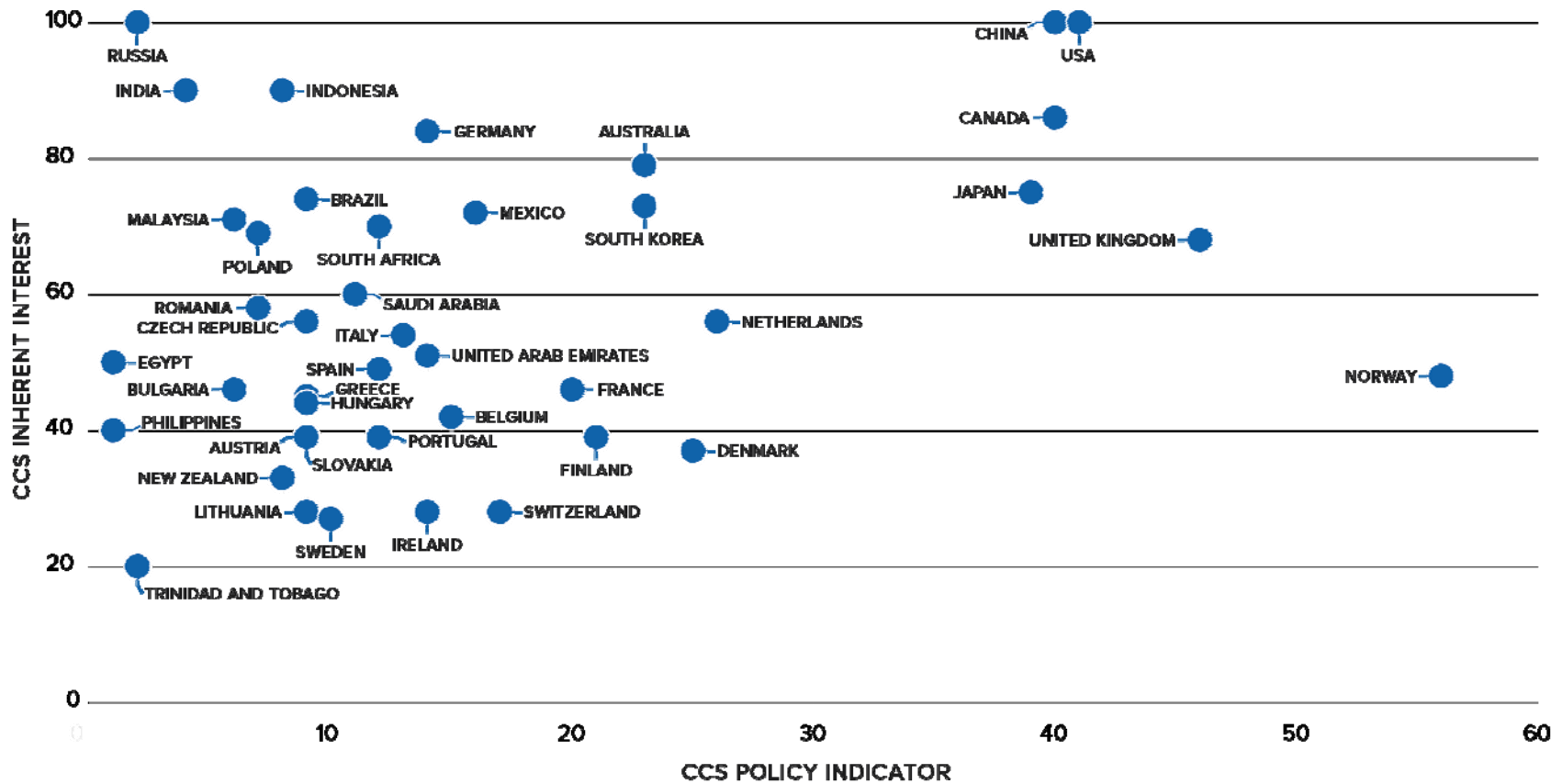
POLICY INCENTIVES DRIVE RECENT FACILITIES



- Multiple incentives on every facility
- Early facilities had positive commercial conditions: EOR, low capital cost, nearby storage
- Recent facilities driven by government incentives: taxes, credits, grants, ownership



GCCSI POLICY INDICATOR REFLECT POLICY LEADERS



COMMUNICATION REMAINS KEY



Proven
Affordable
Versatile
Essential

1

Lead with an emphasis on using **CCS as an effective tool to address climate change** and achieve our goal of reduced carbon emissions. Policy influencers continue to believe America's energy future will rely on all forms of cleaner energy, including fossil fuels with carbon capture.

2

Follow-up by **addressing concerns over costs**. Show that supporting CCS is a good use of taxpayer dollars and is an investment that will pay for itself. Be specific about the economic and energy security benefits to the U.S.

3

Highlight **increased commercial interest** and investment in carbon utilization and the use of direct air capture to increase support for CCS; recognize carbon utilization is more popular with Republicans.

4

Address the **lingering concerns over safety** with liberals and environmentalists - it has the potential to eliminate the other assets of using CCS. Point to the low risk of common concerns in contrast to the benefits of advancing meaningful reductions in carbon emissions.



THANK YOU

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