XODUS

Advancements in Australian CCS and the Strategic Partnership with Japan

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Xodus CCS experience

- 17 years' CCUS experience
- 30 major projects
- Projects in Australia, Timor-Leste, Malaysia, Indonesia, Abu Dhabi, Netherlands, Egypt
- Industry experts in all steps of CCUS value chain and project lifecycle
- Integrated surface, subsurface & commercial disciplines
- Trusted advisors to Governments and developers

Chevron · bp · Harbour Energy · nationalgrid · Ørsted · Shell · PETRONAS · NEPTUNE ENERGY · Hydrogen East · ervia · MITSUI & CO. · JX · JOGMEC · energy institute · OGTC · Porthos CO₂ TRANSPORT & STORAGE · road CCS · WHITE ROSE CARBON CAPTURE & STORAGE PROJECT · Oil & Gas Authority · Ministerie van Financiën

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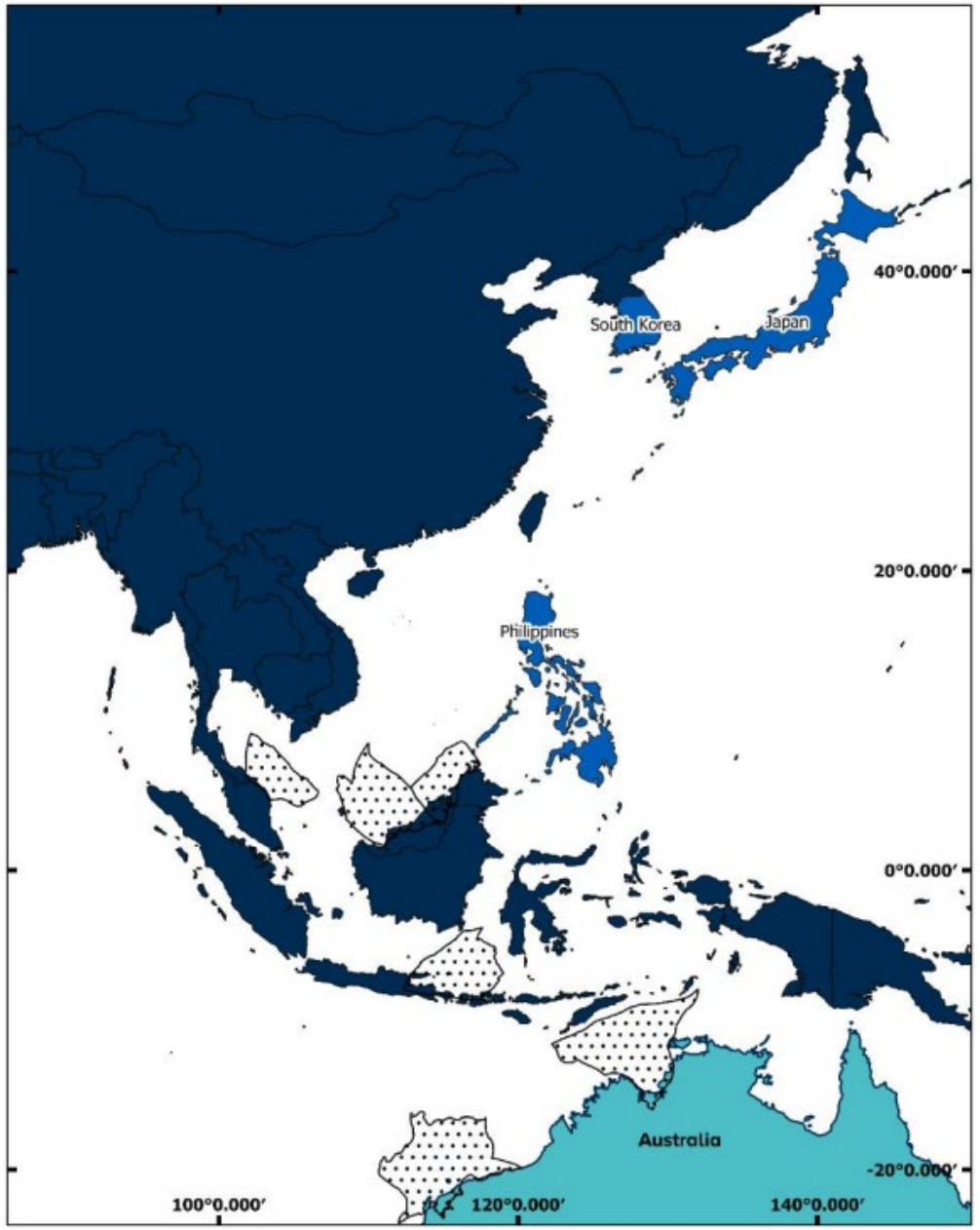
INTRODUCTION

What makes Australia a suitable CCS location?

- Need to deploy CCS capacity of ~ 175 Mt per annum by 2035 to achieve NZ by 2050
- CCS is 1/7 Priority Areas in Federal Government Emissions Reduction Plan
- World class geological storage basins, close to industry producing GHG
- CCS can offset emissions from Safeguard Mechanism Facilities
- Existing GHG inventory reporting scheme includes information on fugitive emission with CCS
- Government typically ultimately takes liability 15 years after “Site Closing Certificate’ declared

Anchor & Opportunity Nations

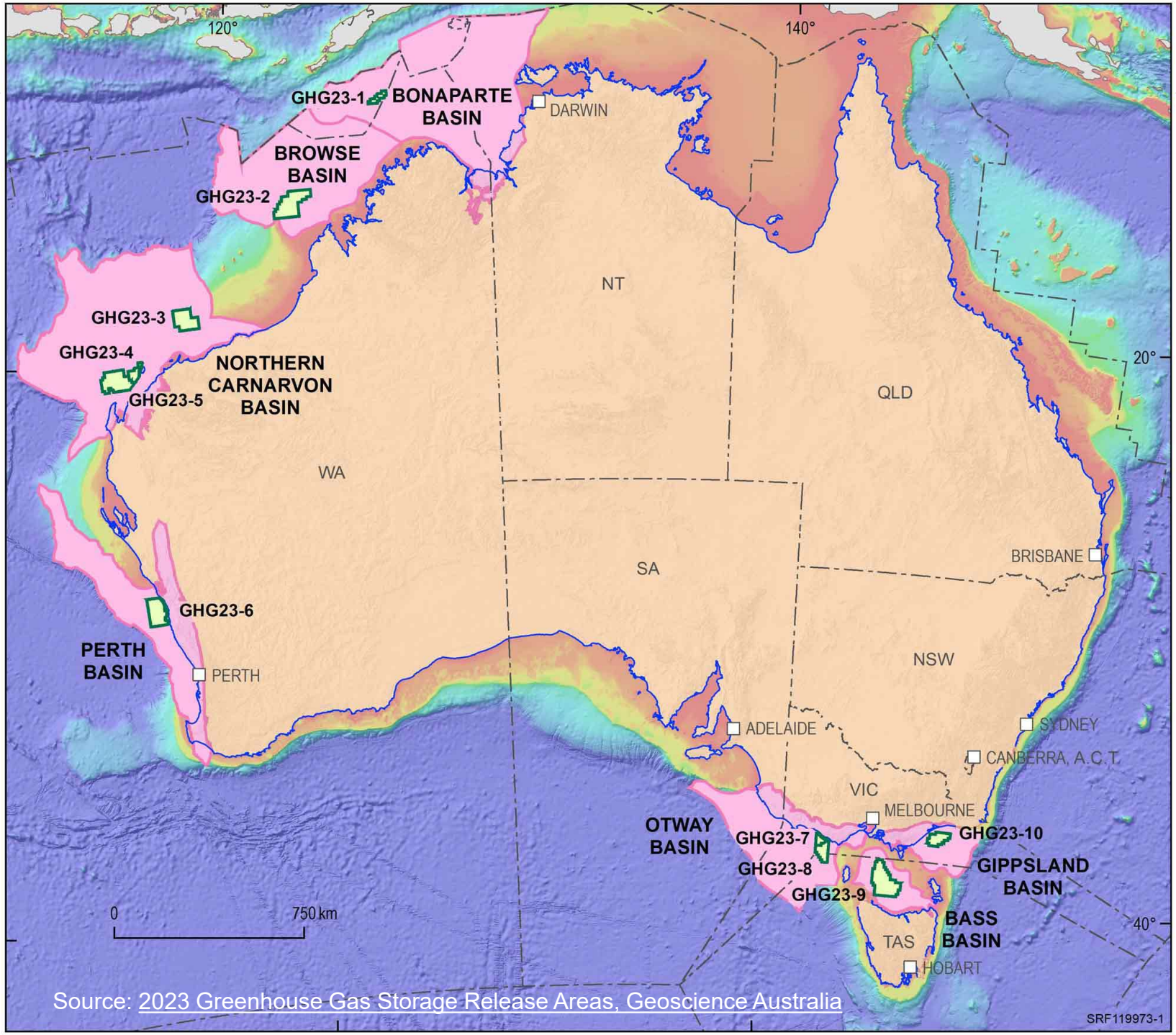
- Australia is “Anchor Nation”:
  - Renewed domestic commitments to technology’s deployment
  - Excellent storage resources
  - Strong historical support for technology’s inclusion in London Protocol
  - Identified by neighbours as CO2 export destination
- Japan, South Korea & Philippines “Opportunity Nations”:
  - Limited storage potential
  - Limited accessible storage resources of total emissions
  - Limited knowledge of offshore geology



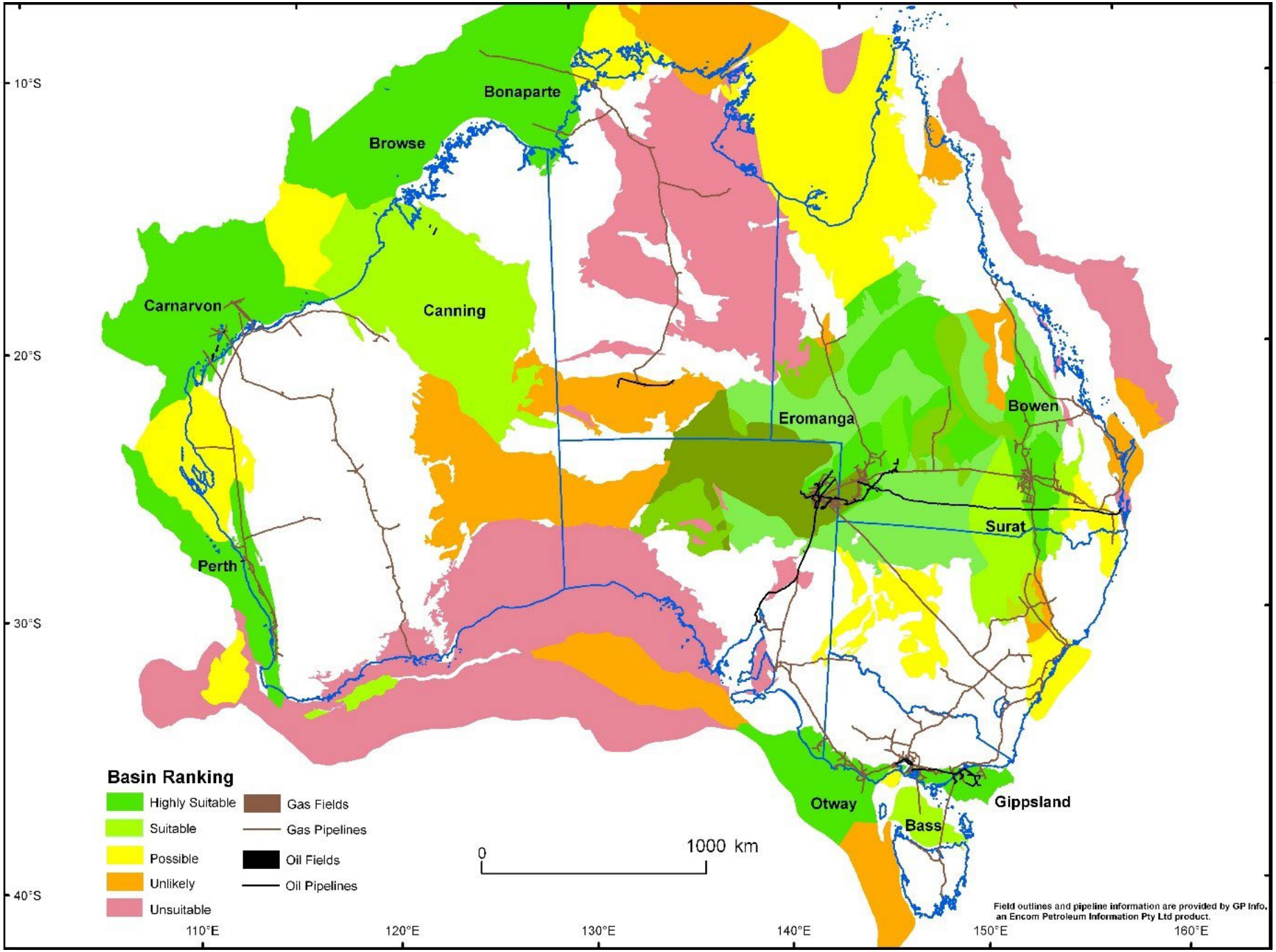
What are the challenges with CCS in Australia?

- Cost
  - No long-term subsidy support
  - ARENA funds for small-scale, pre-operational projects
  - “Powering the Regions” fund “Safeguard Transformation Stream” and “Critical Inputs to Clean Energy Industries” may apply
  - Projects awarded under “CCUS Hubs and Technologies Program”
- Community
  - Hesitation regarding technology being proven
  - Perception that CCS is for O&G sector only
  - Lack of consultation with stakeholders can lead to legal challenges
- Despite this, Australia is “open for business”

UPDATE 1: ACREAGE RELEASES & CURRENT PROJECTS

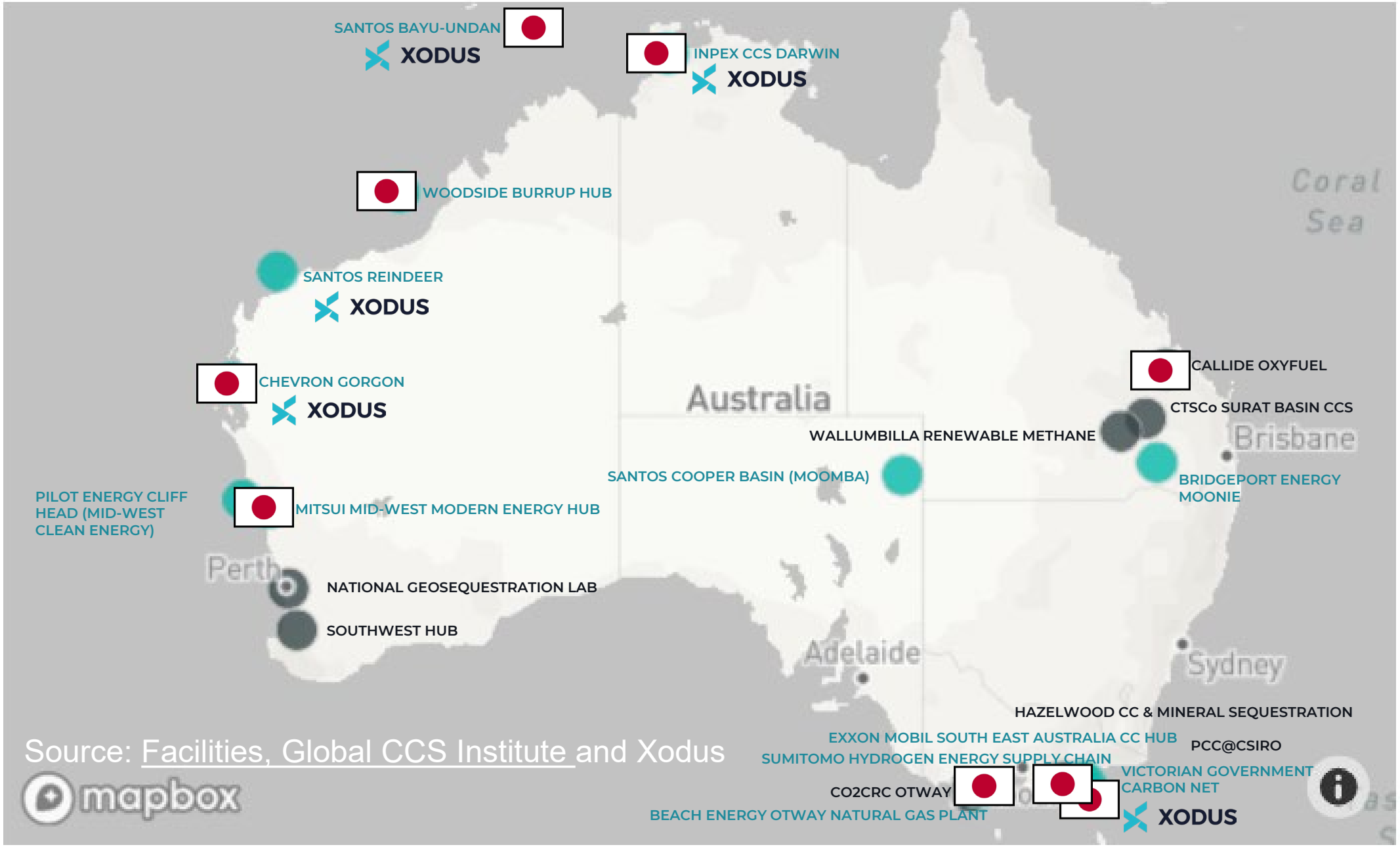


Source: 2023 Greenhouse Gas Storage Release Areas, Geoscience Australia



Source: Australia's basins ranked for CO2 storage potential, National Carbon Mapping and Infrastructure Plan

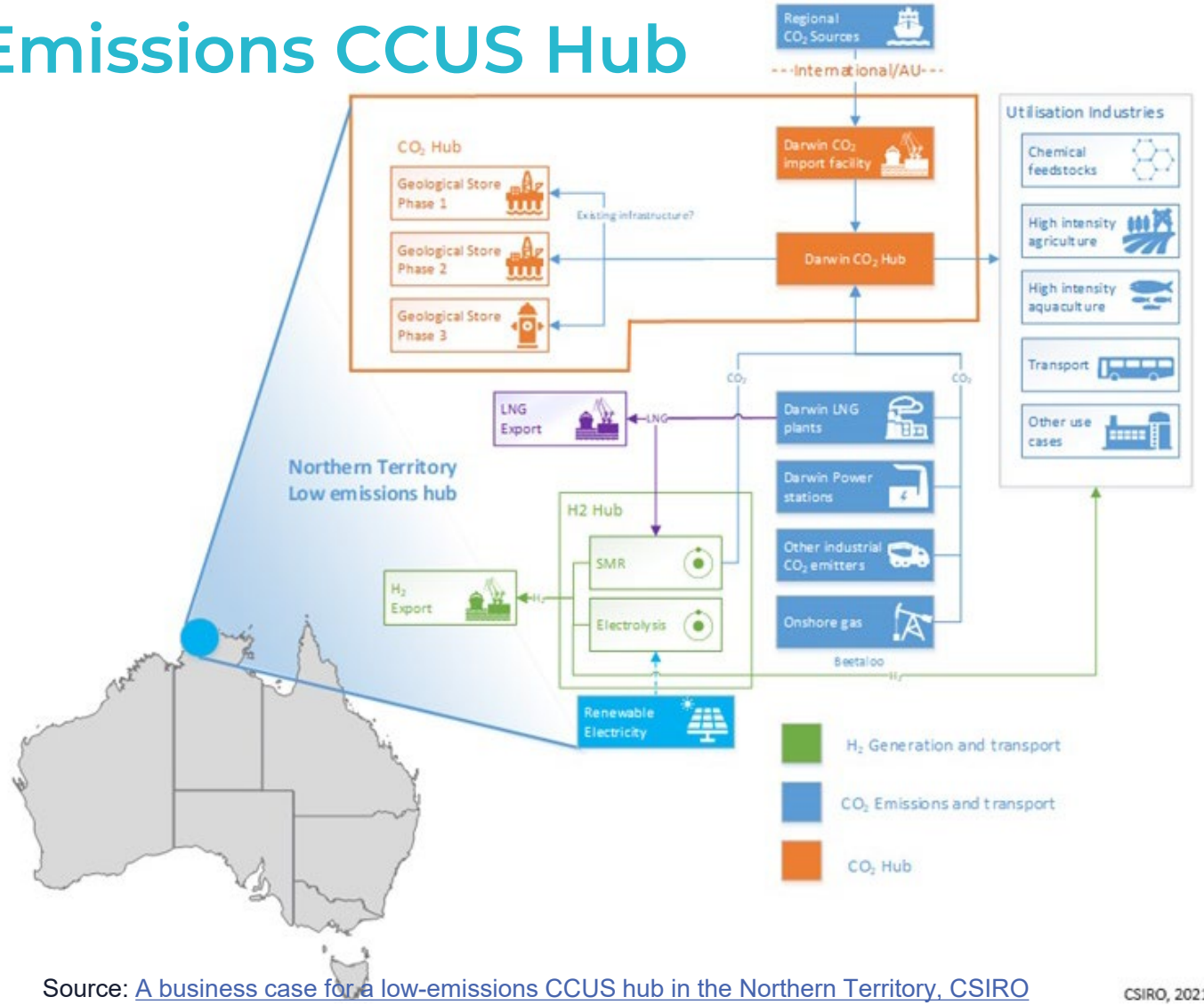
Facility Category Commercial CCS Pilot/Demonstration



Xodus Case Study 1:

Northern Territory Low Emissions CCUS Hub

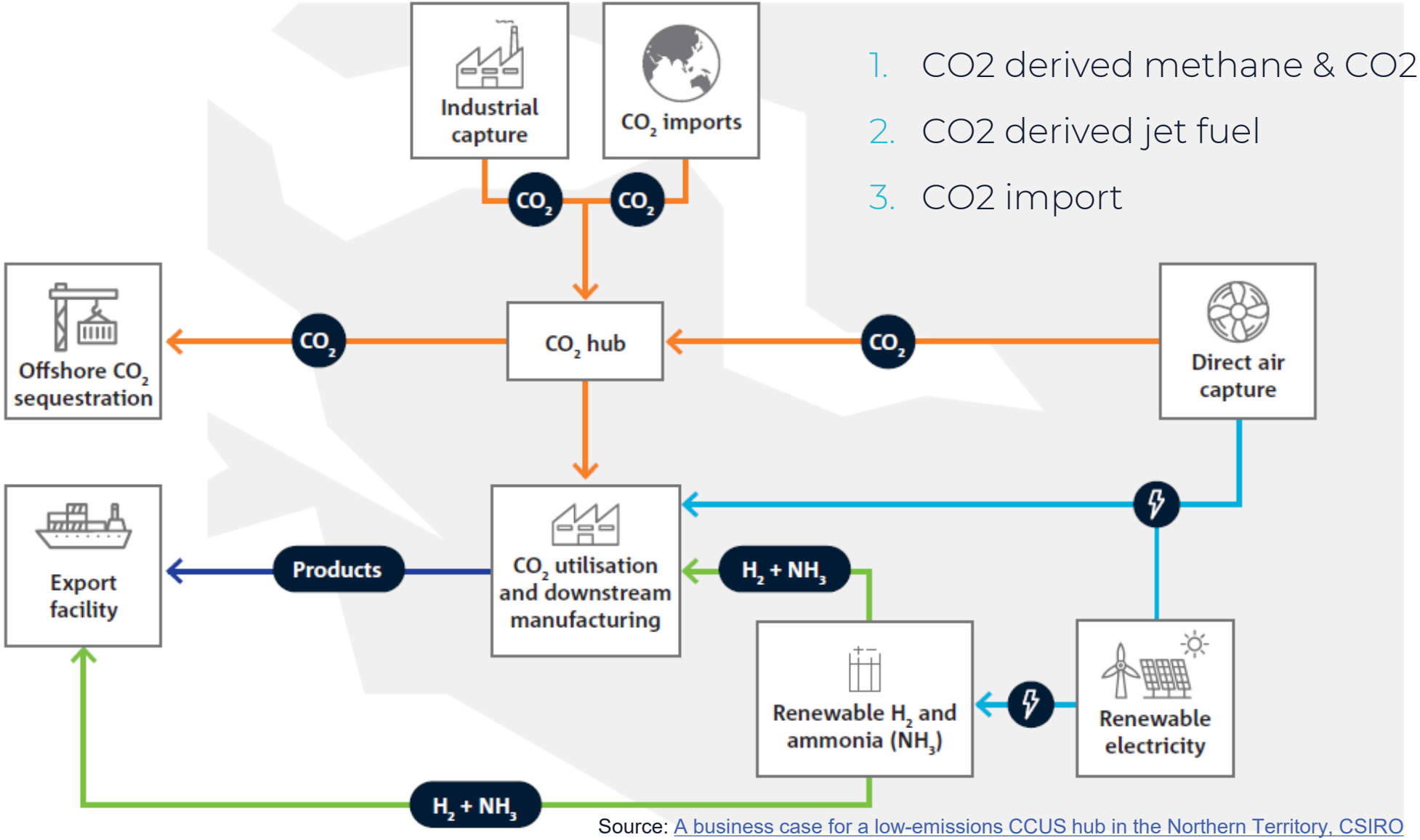
- Xodus partnered with NT Government, CSIRO, Inpex, Santos, Woodside, Eni & Origin Energy
- Completed assessment of viability of large-scale, low-emissions CCS Hub
- Aim to reduce existing emissions by acting as catalyst to new NZ industries; and enable development of interconnected H2 industry and used of carbon capture in other industrial processes
- We explored methanol, jet fuel, methane, urea, mineral carbonates



Source: A business case for a low-emissions CCUS hub in the Northern Territory, CSIRO

CSIRO, 2021

Opportunities identified for Japan



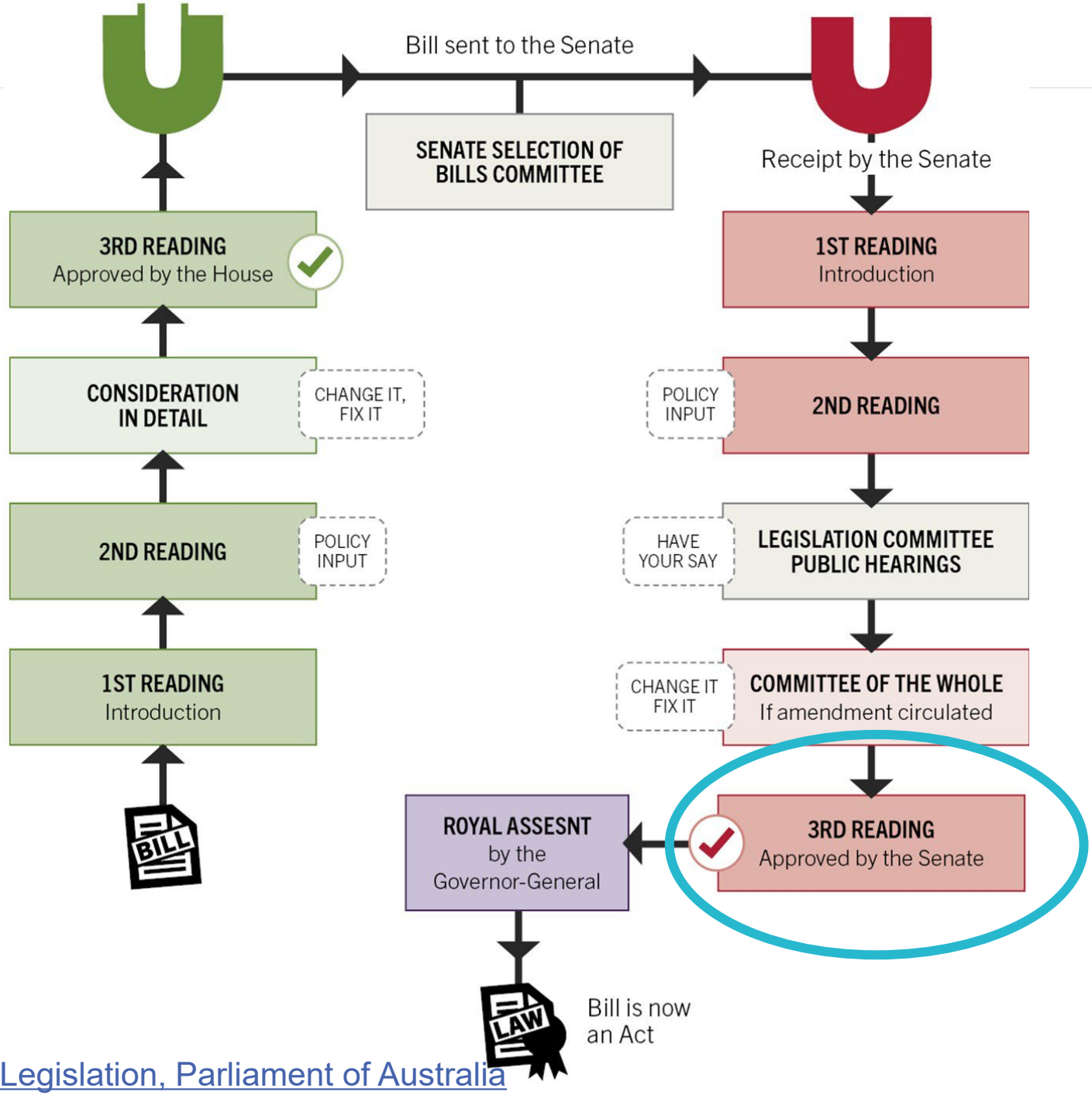
1. CO2 derived methane & CO2 recycling
2. CO2 derived jet fuel
3. CO2 import

Source: A business case for a low-emissions CCUS hub in the Northern Territory, CSIRO

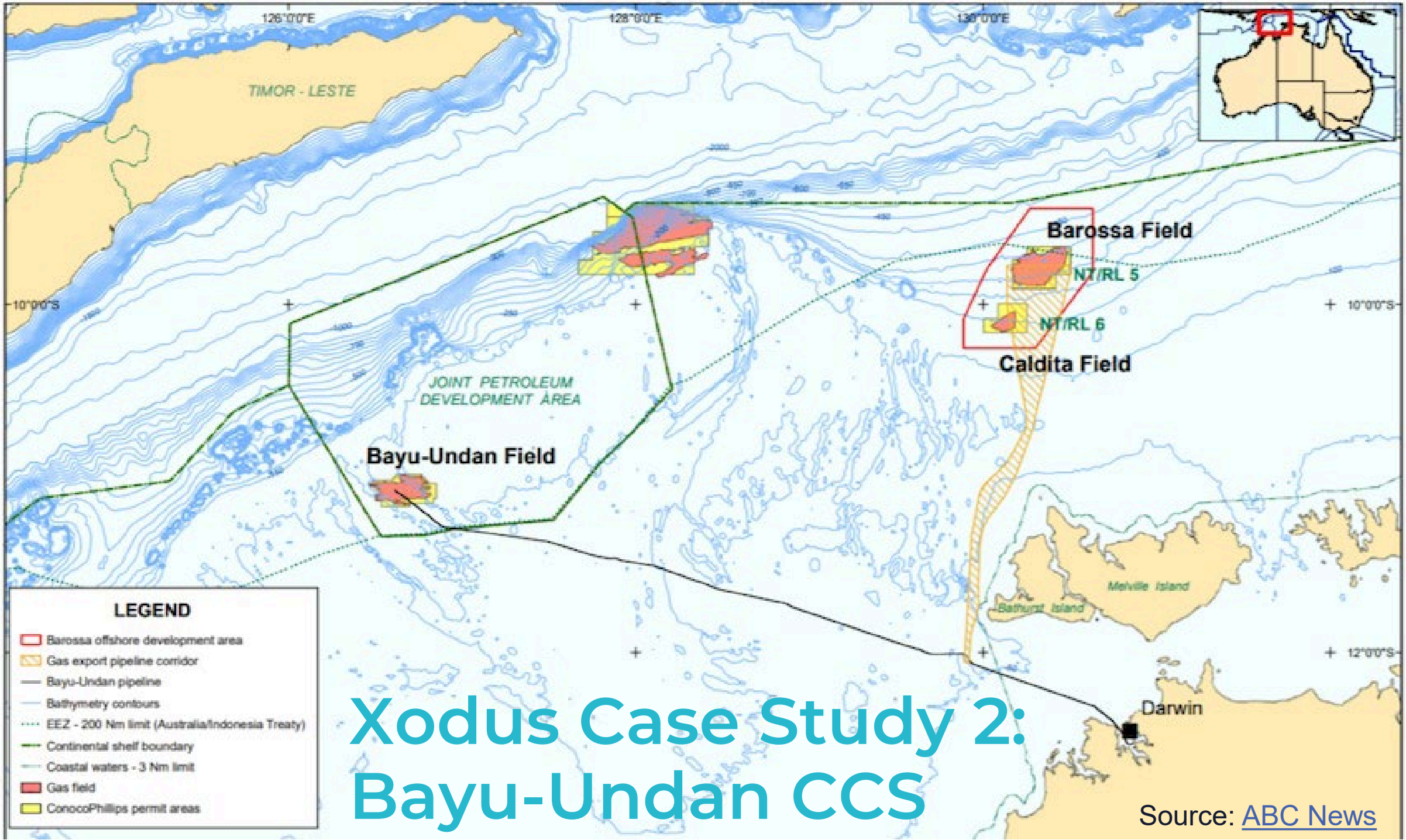
UPDATE 2: RATIFICATION OF LONDON PROTOCOL

Australia & London Protocol

- London Protocol implies that all dumping is prohibited unless expressly permitted
- 2006 Amendment allows CO2 storage in subseabed geological formations, subject to certain criteria
- 2009 Amendment allows CO2 export for storage, subject to “agreement or arrangement” between Contracting Parties / Contacting Party + Non-Contracting-Party
- *Environment Protection (Sea Dumping) Amendment (Using New Technologies to Fight Climate Change) Bill 2023* was passed in the Senate on 13 November 2023 to give effect



Source: [The Senate and Legislation, Parliament of Australia]



Xodus Case Study 2: Bayu-Undan CCS

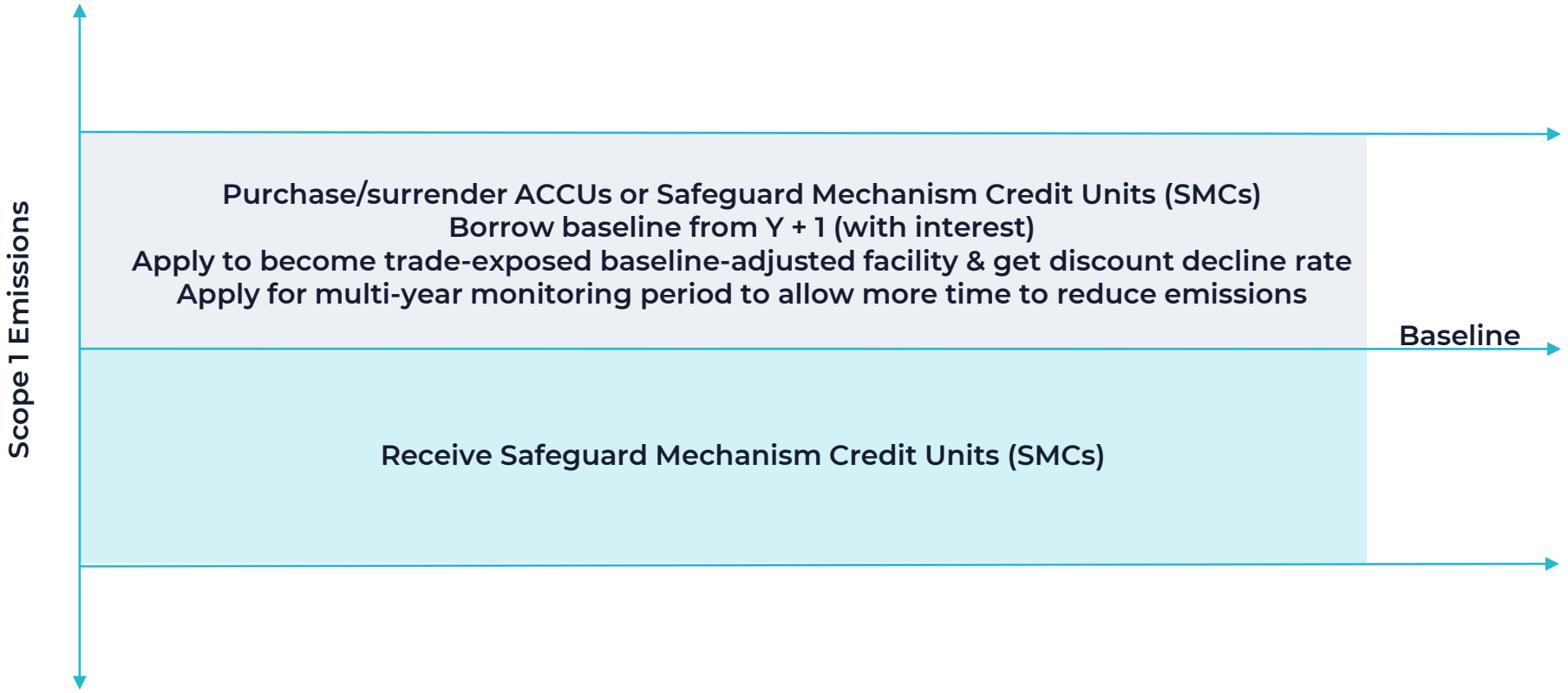
Source: ABC News

UPDATE 3: SAFEGUARD MECHANISM & CCS PROJECTS

What is the Safeguard Mechanism and its impact on Japan?

- Applies to industrial facilities that emit > 100,000 t/year of CO2-e
- Facilities need to cut net emissions annually from 1 July 2030
- New facilities including gas fields expected to be NZ from start of operations
- CCS and purchase of ACCUs is expected for LNG
- Australia supplies 42.7% (2022) of Japan's LNG
- Minister Nishimura requested "flexible" measures including Barossa LNG (Bayu-Undan CCS Project)

Safeguard Mechanism & ACCUs



Special rules for CCS ACCUs

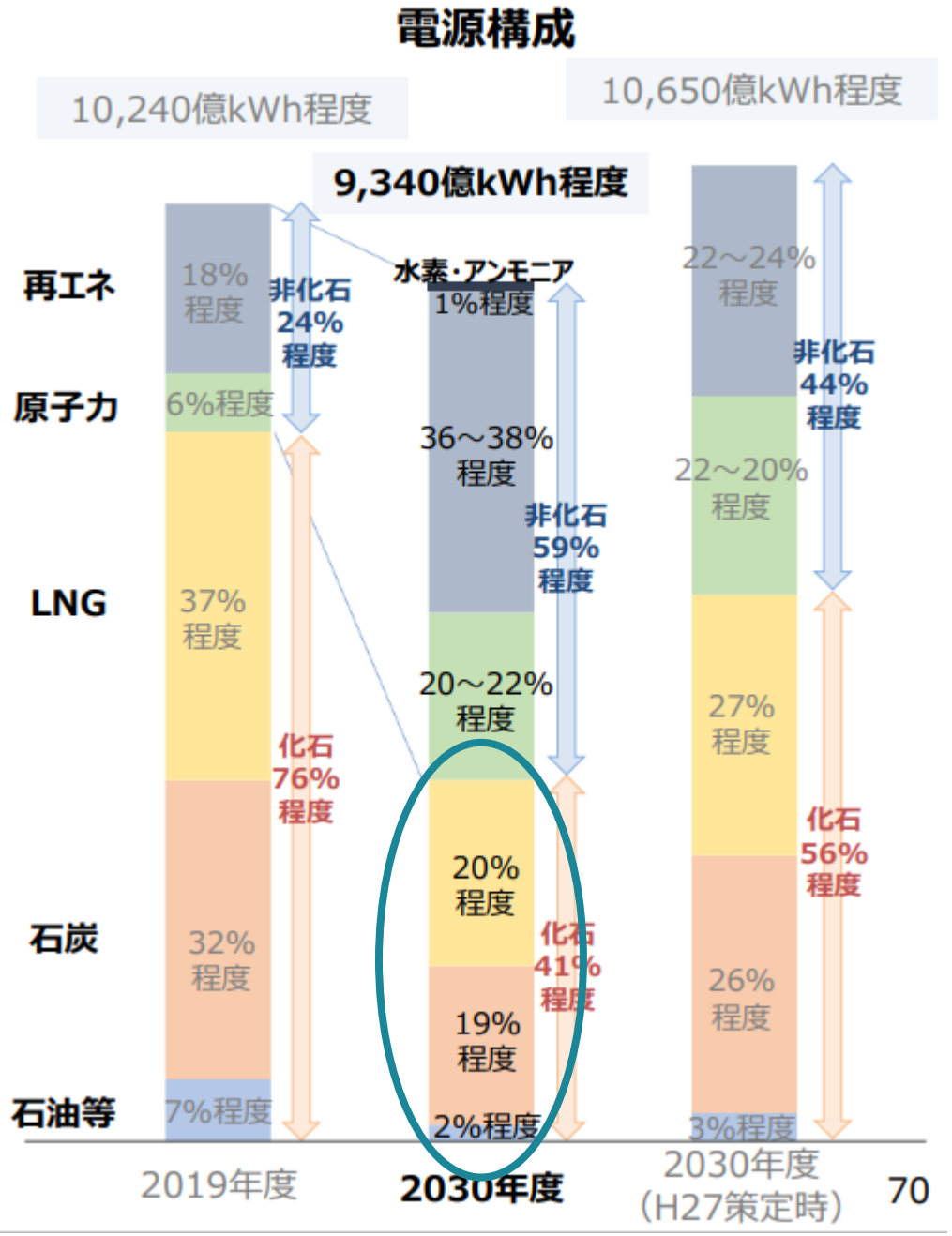
- CCS is eligible
- CCUS is not eligible as “enhanced oil recovery, enhanced gas recovery and enhanced hydrocarbon recovery”
- DAC is not eligible
- Project must be carried out entirely “within” Australia
- Project must comply with tenure laws including Native Title
- Need to consider long-term reversal risk
- Project is “new”

UPDATE 4: JAPAN-AUSTRALIA INTERGOVERNMENTAL COLLABORATION

Japan Energy Supply Outlook

[百万kl]	2013年度		2030年度	
石油等	233	43%	130	31%
石炭	137	25%	80	19%
天然ガス	127	23%	80	18%
原子力	2	0%	40	9~10%
再エネ	46	8%	100	22~23%
水素・アンモニア	0	0%	2	1%
合計	544	100%	430	100%

※2030年度の数値は概数であり、合計は四捨五入の関係で一致しない場合がある

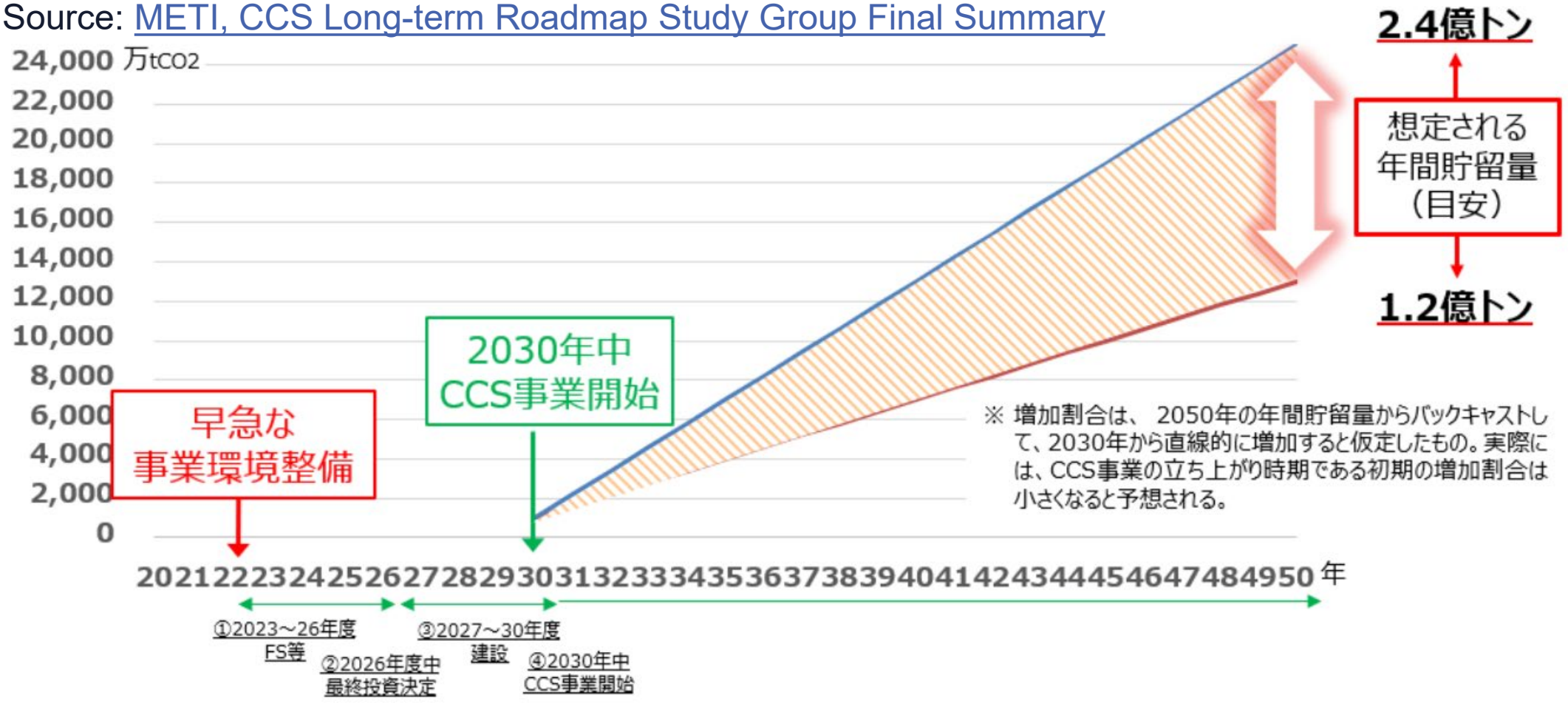


- According to the “Outlook for Energy Demand and Supply 2030”, oil, coal and gas will continue to have a role, coupled with **maximum use of CCS**

Source: [METI, Strategic Energy Plan]

Japan CCS Targets

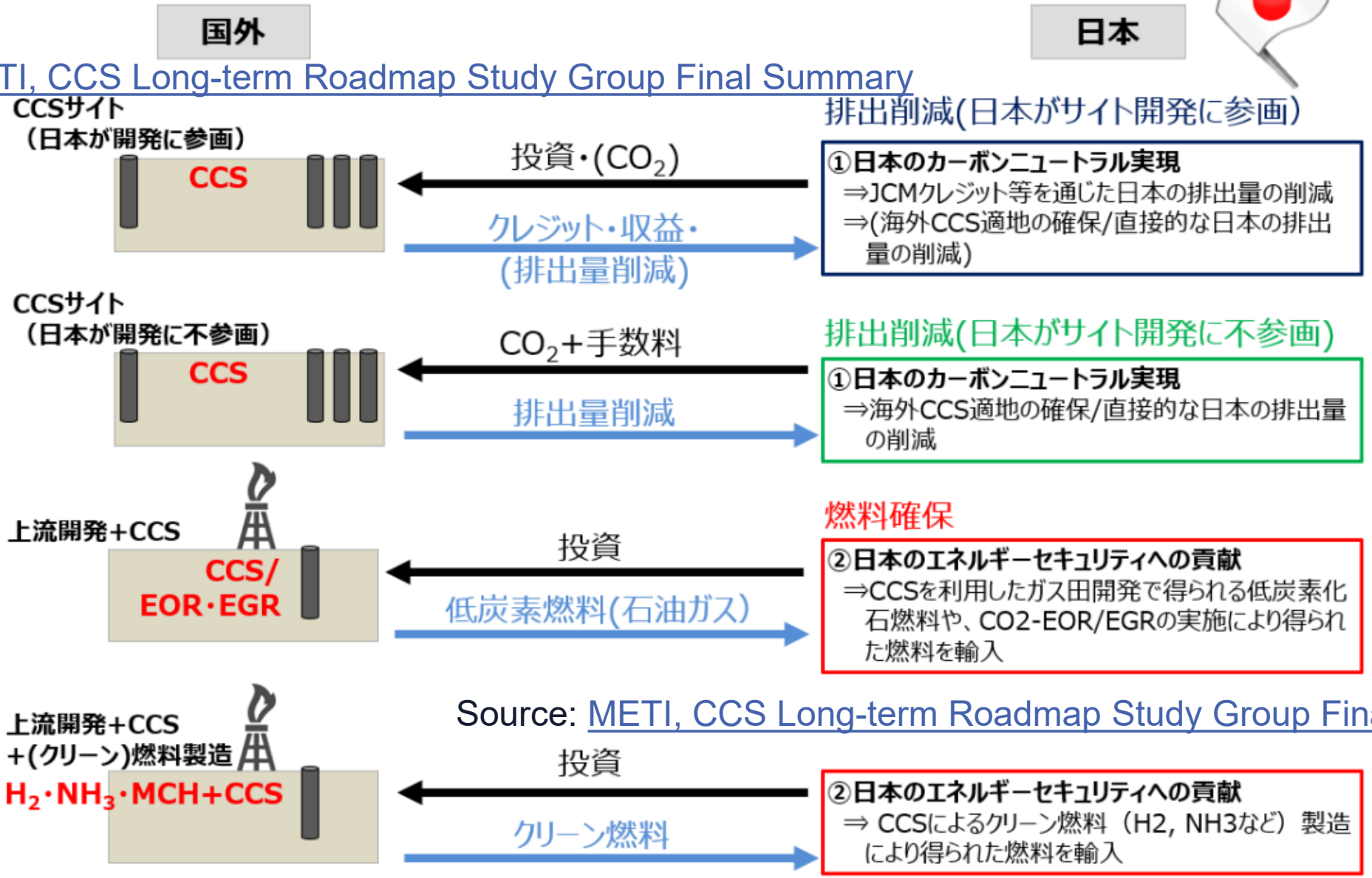
Source: METI, CCS Long-term Roadmap Study Group Final Summary



- Japan aims to ramp up annual CCS capacity to as much as 12 Mtpa by 2030 and 240 Mtpa by 2050

Japan-International CCS Targets

Source: METI, CCS Long-term Roadmap Study Group Final Summary



Source: METI, CCS Long-term Roadmap Study Group Final Summary

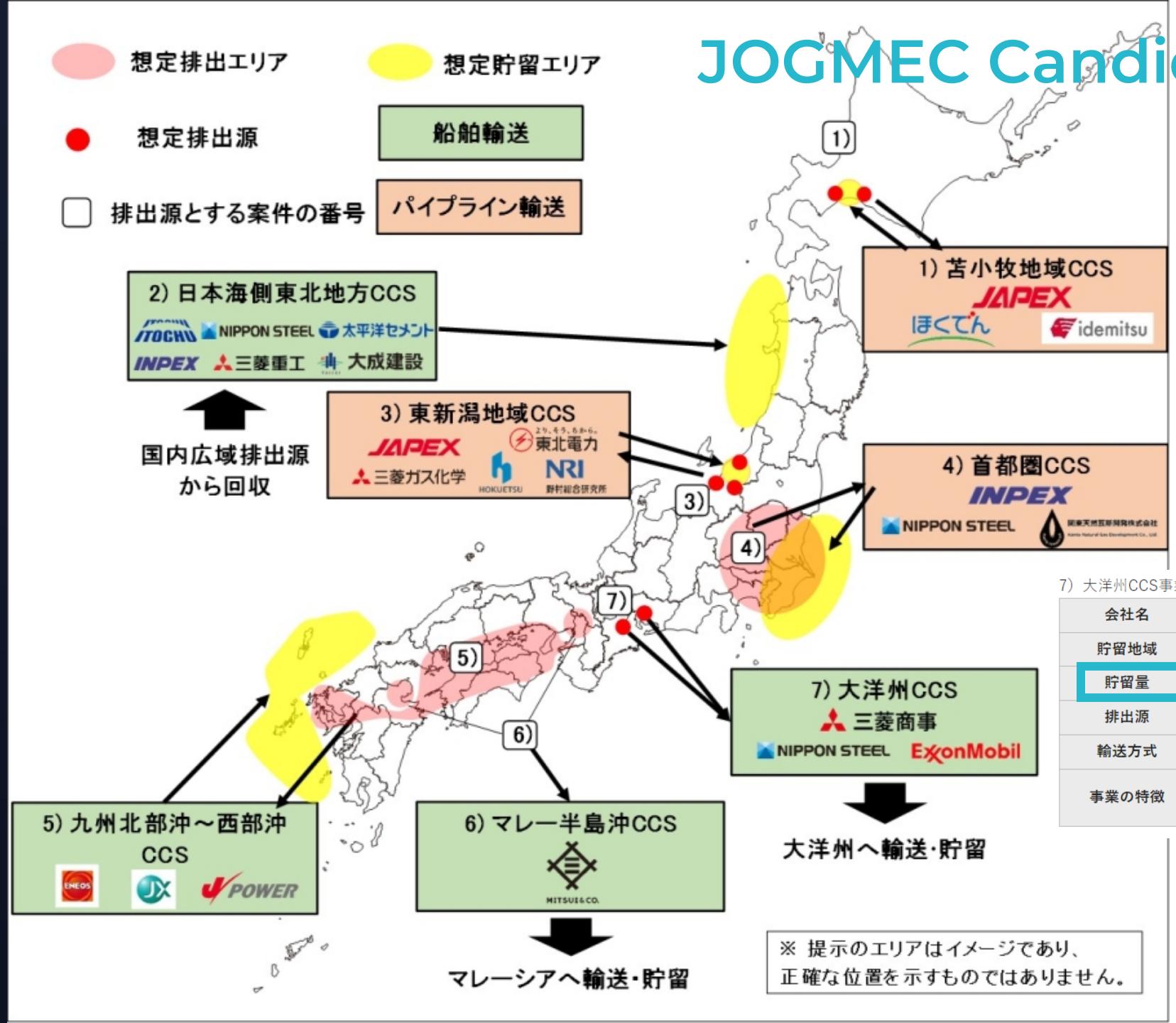
Japan-Australia CCS Engagement

- Australia-Japan Partnership on Decarbonisation through Technology
  - Australia-Japan Ministerial Economic Dialogue
  - MoC on Carbon Recycling
  - London Protocol Correspondence Group
  - Engagement through Asia CCUS Network (hosted by Japan)
  - MoU between Japan CCS and Victorian Government
  - Asia Zero Emission Community (AZEC) Ministerial Meeting and AZEC Public-Private Investment Forum
  - Discussion on cross-border CO2 policy
  - Technical exchange of low-emissions technologies


ASIA CCUS NETWORK
The Third Asia CCUS Network Forum
第３回アジア CCUS ネットワークフォーラム
METI
ERIA

UPDATE 5: JAPAN-AUSTRALIA TRANSBOUNDARY PROJECTS

JOGMEC Candidate CCS Projects



7）大洋州CCS事業

会社名	三菱商事株式会社、日本製鉄株式会社、ExxonMobil Asia Pacific Pte. Ltd.
貯留地域	大洋州（海域減退油ガス田、帯水層）
貯留量	約200万トン／年
排出源	中部（名古屋、四日市）の製鉄所を含む複数産業
輸送方式	船舶及びパイプライン
事業の特徴	名古屋港、四日市港の幅広い産業を対象に、大洋州の海域での貯留事業を推進する。

Source: JOGMEC, 国内初のCCS事業化の取り組み, ～2030年度までのCO2貯留開始に向け、調査7案件を候補として選定～

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THANK YOU

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