



Carbon Capture, Utilization and Storage (CCUS): The Current Status and Role towards Carbon Neutrality of Thailand

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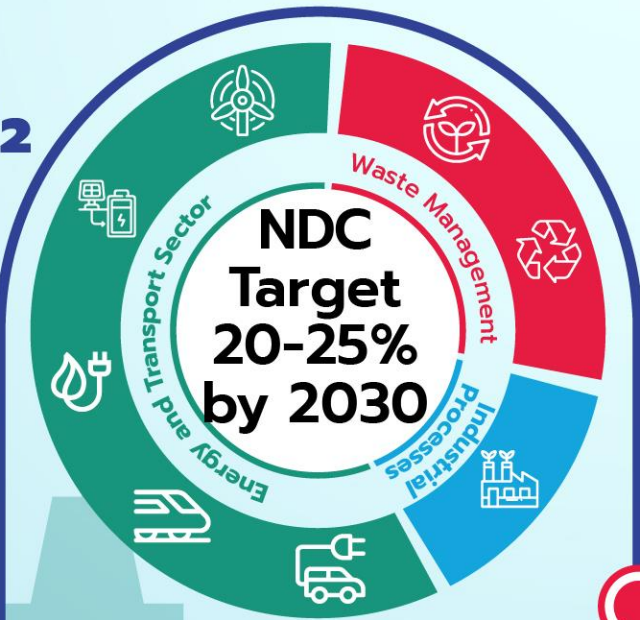


TNChe Asia 2023 Conference

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การลดก๊าซ CO₂ ของประเทศ ด้วยวิจัย และนวัตกรรม



Aims to Reduce GHG by 40% with International Support



ประเทศไทยจะเป็นกลางทางคาร์บอน ปี 2050

ปล่อยก๊าซเรือนกระจกสุทธิเป็นศูนย์ ปี 2065

2030

2050

Carbon Neutrality



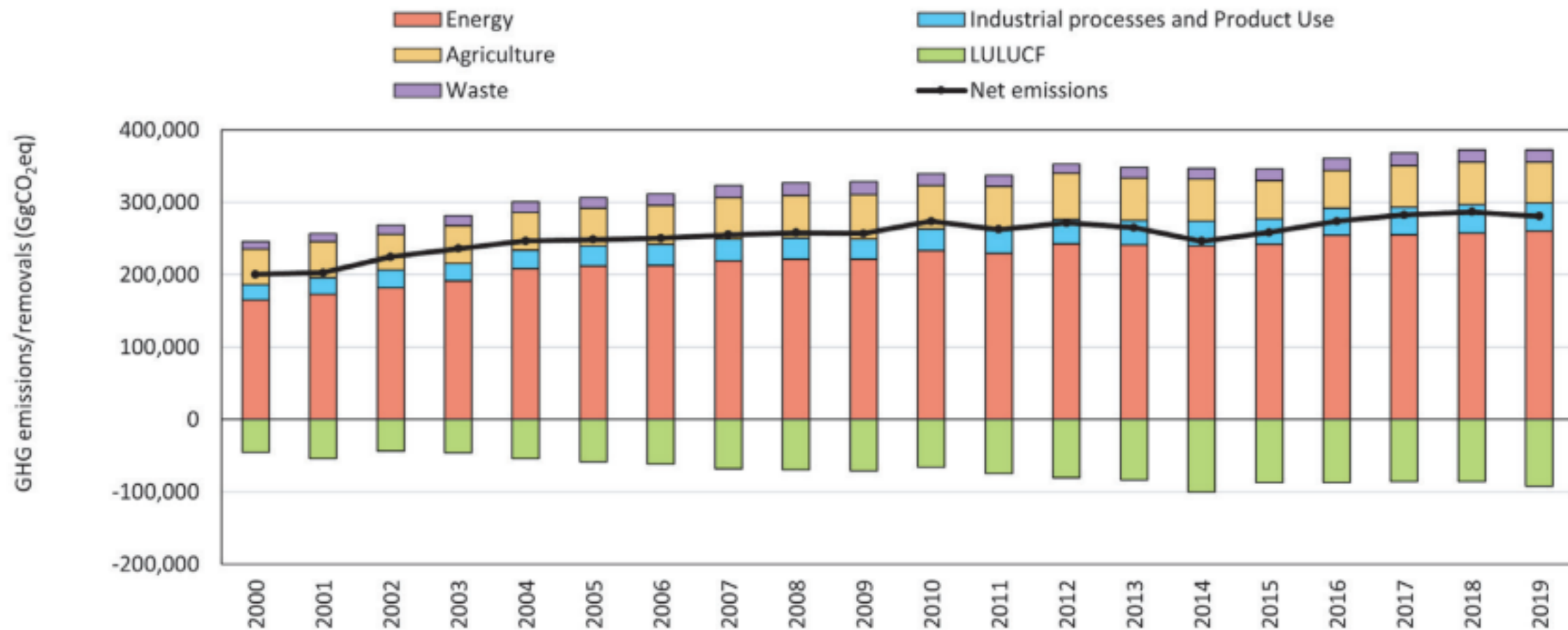
2065 NET-ZERO GHG Emission

COP26 (November 2021 in Glasgow)

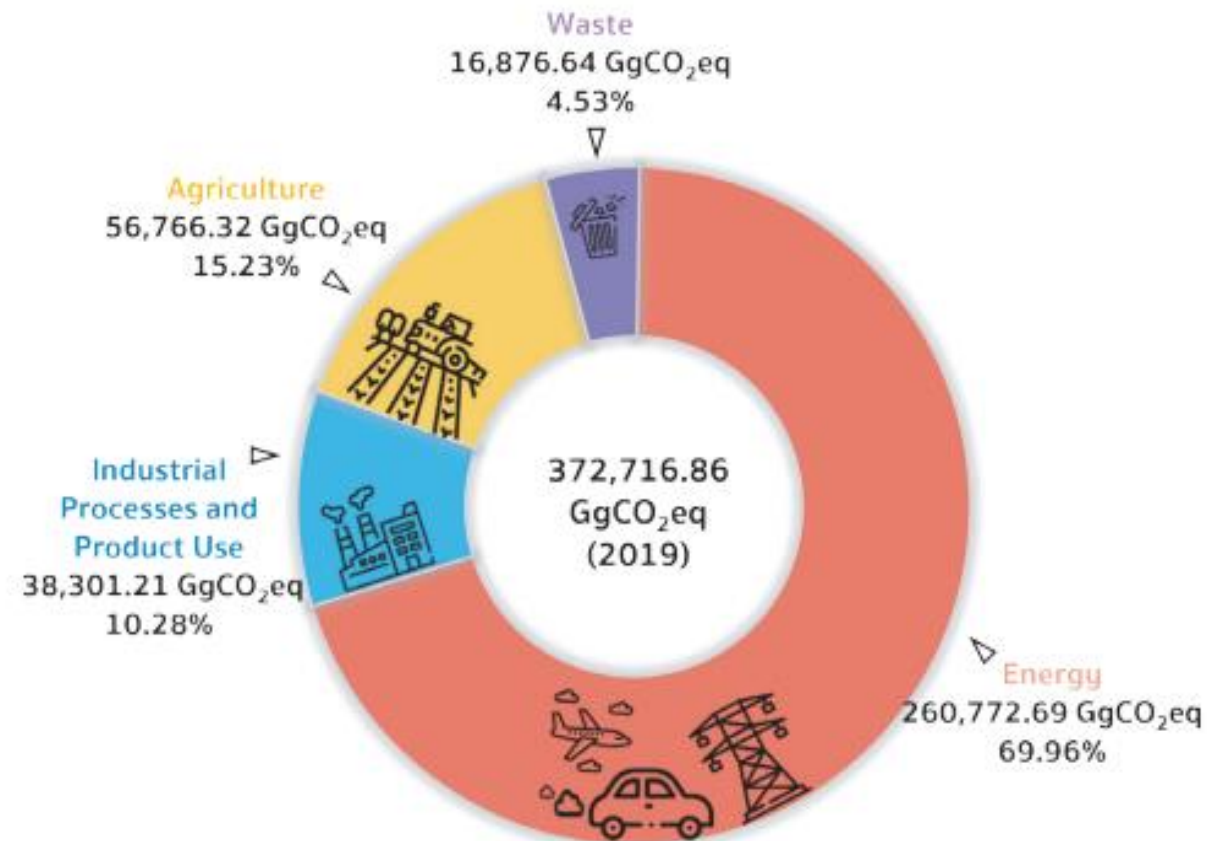
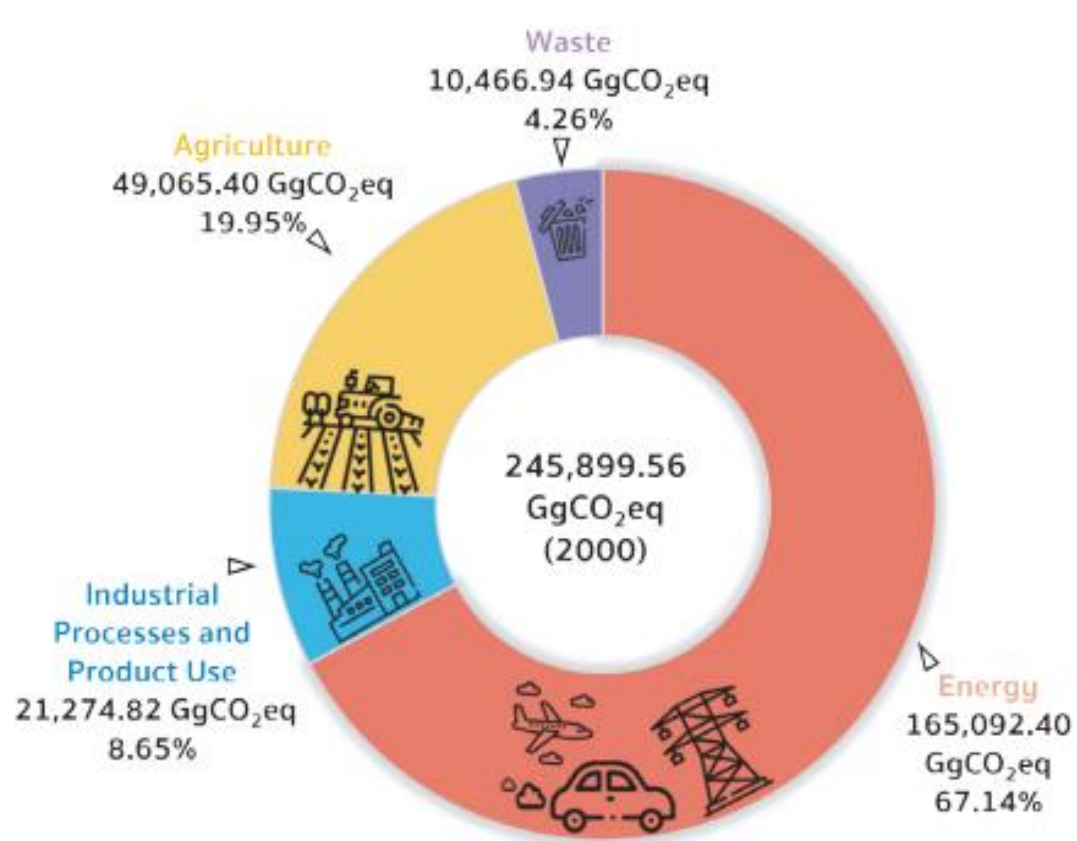
<https://mgonline.com/greeninnovation/detail/9640000108692>

Ref: Thailand's Long-term Greenhouse Gas Emission Development Strategy

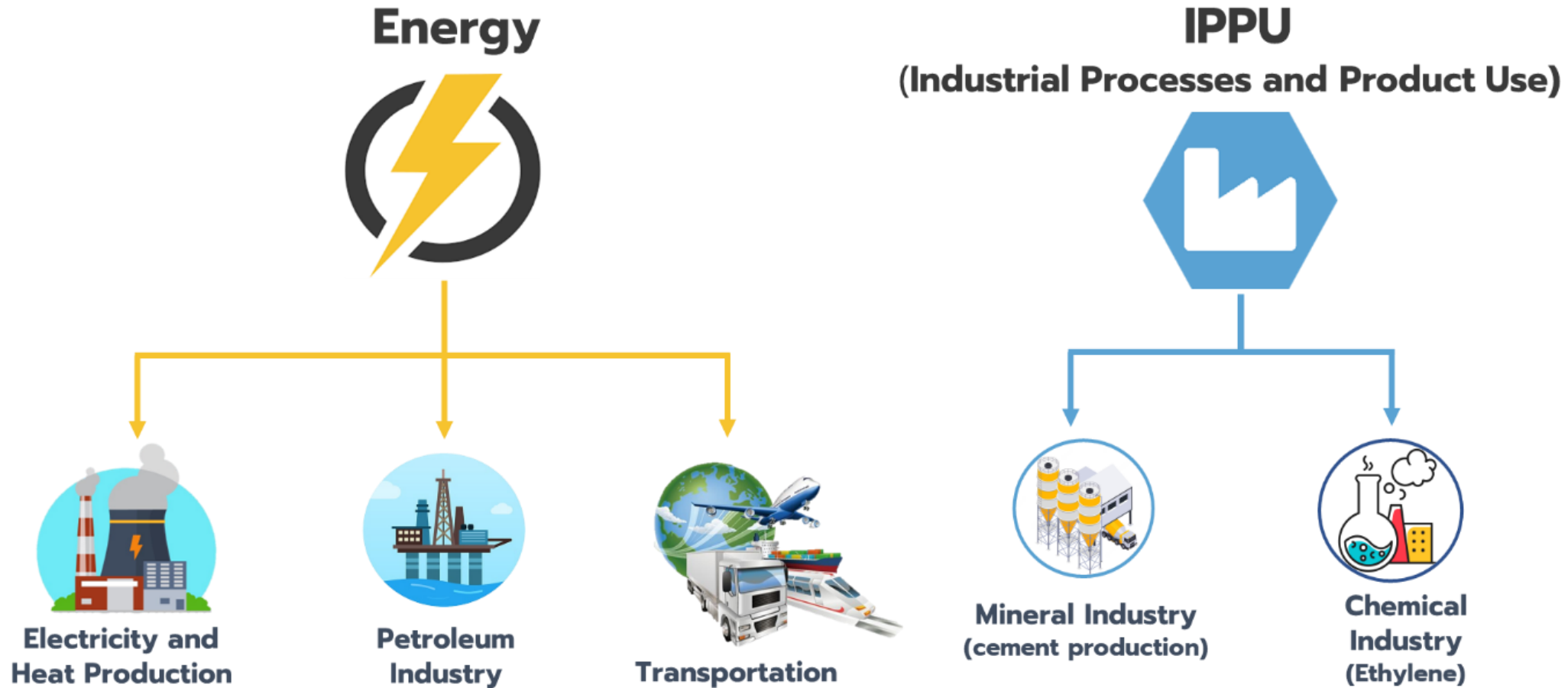
National GHG emissions/removals by sector: 2000-2019



National GHG emissions by sector (excluding LULUCF), 2000 and 2019

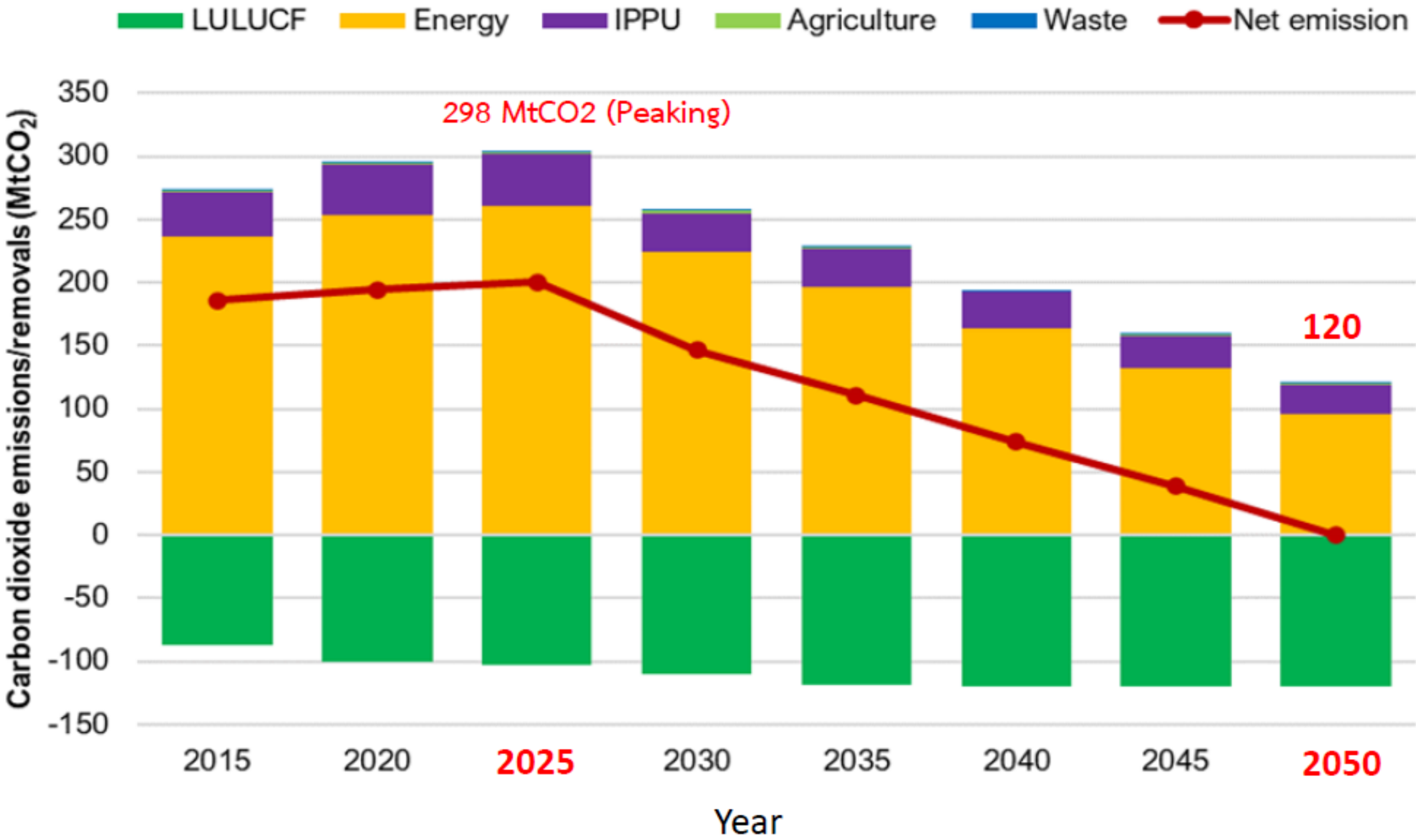


National GHG emissions by sector (excluding LULUCF), 2000 and 2019



CBAM – Iron&Steel; Cement; Aluminium, Fertilizer; Electricity; Hydrogen
CBAM certificate is required from 1 January 2026

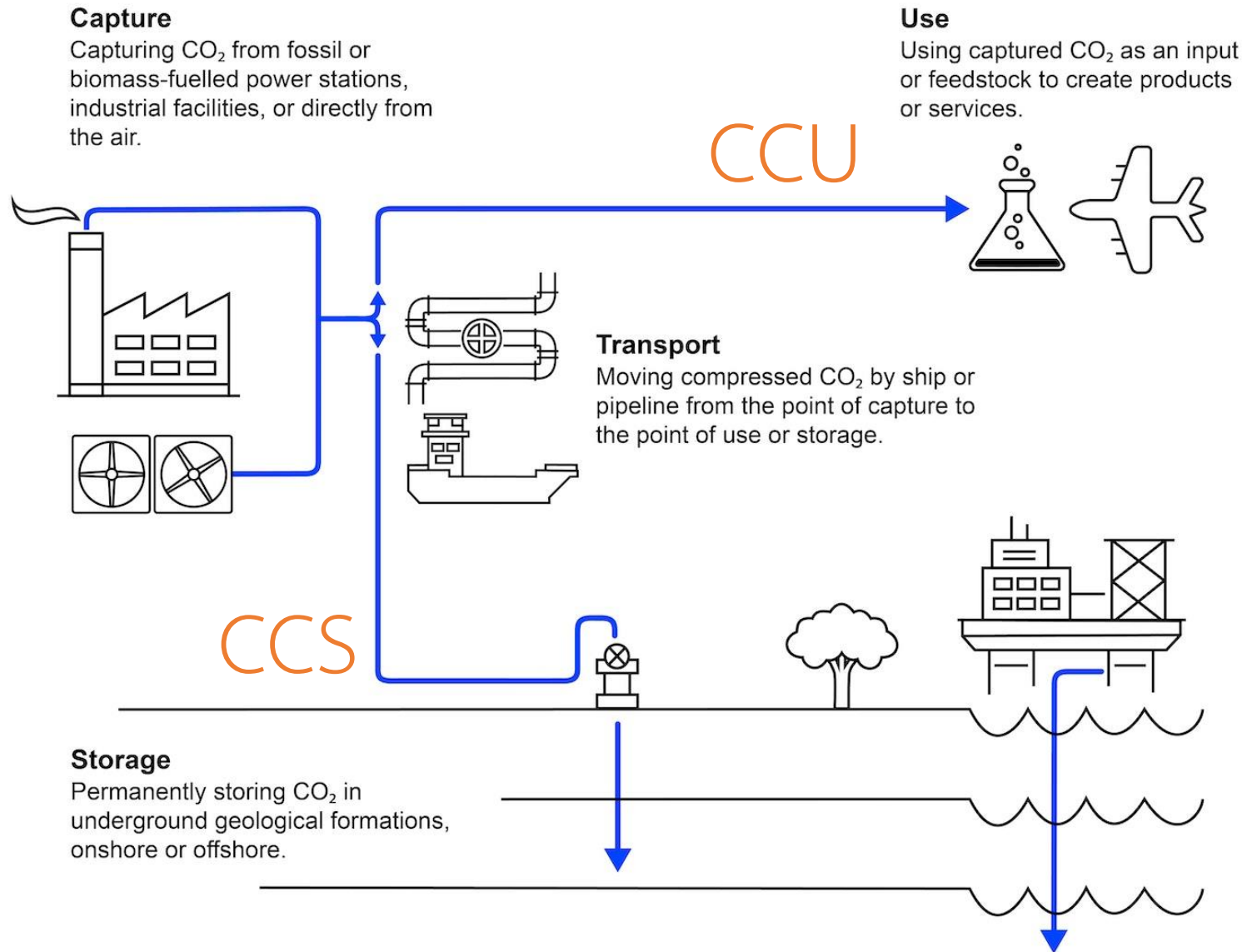
Thailand's Carbon Neutrality Pathway 2020



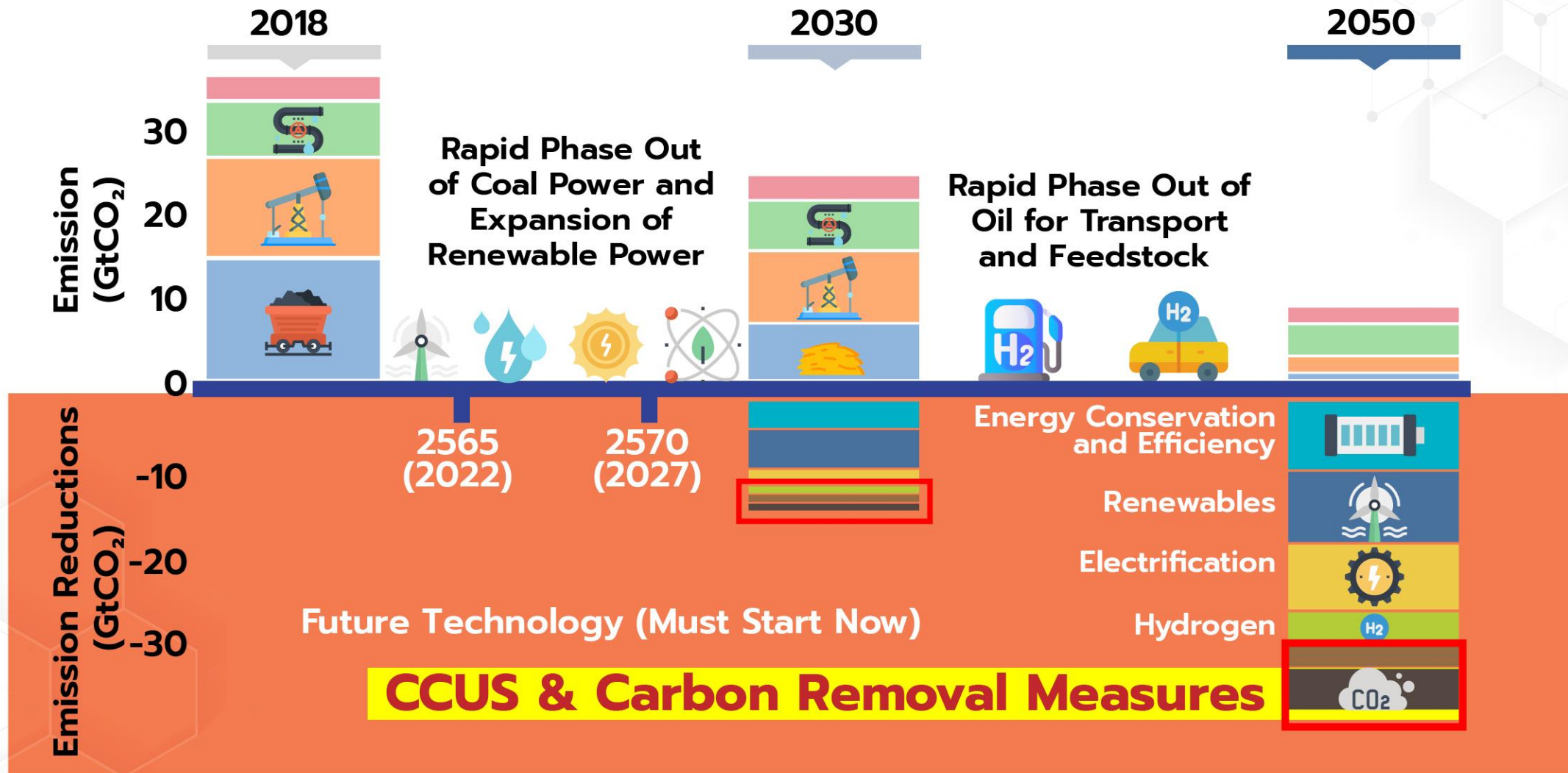
- Renewable Energy 50% by 2050
- EV 69% by 2035
- LULUCF 120 MtCO₂ by 2037-2050
- CCUS

Ref.: <https://climate.onep.go.th/th/>

Ref.: คุณนาวิรัตน์ พันธุ์มณี สผ. การประชุมวิชาการ ทปอ. "Thailand's Carbon Neutrality & Net Zero GHG Emission" วันพุธที่ 17 ธันวาคม 2565 ณ มหาวิทยาลัยเกษตรศาสตร์



A Pathway to Lower Emissions

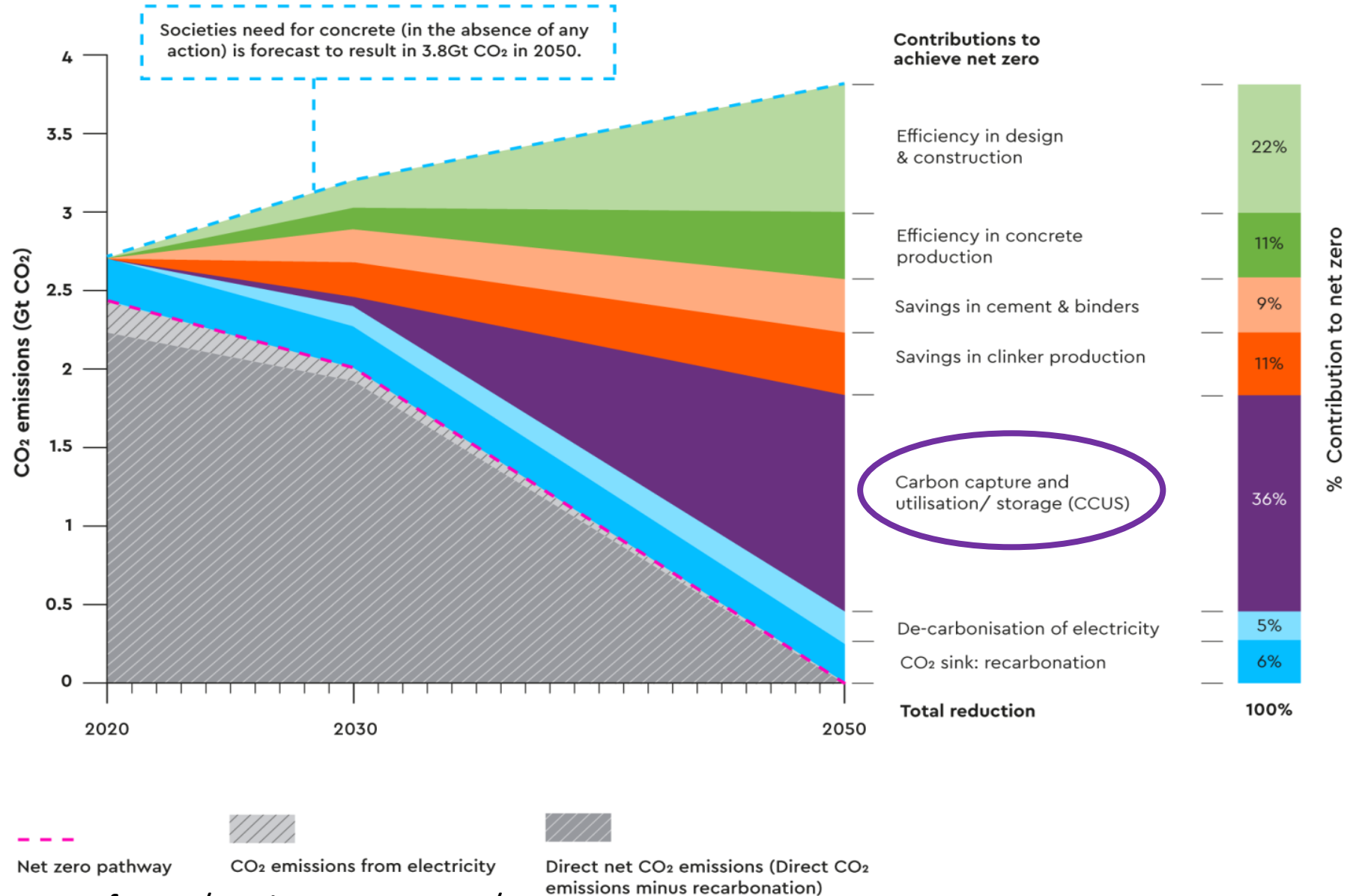




GETTING TO NET ZERO



Global Cement and Concrete Association





Carbon Capture Utilization and Storage Technology Roadmap (THAILAND CCUS TRM)

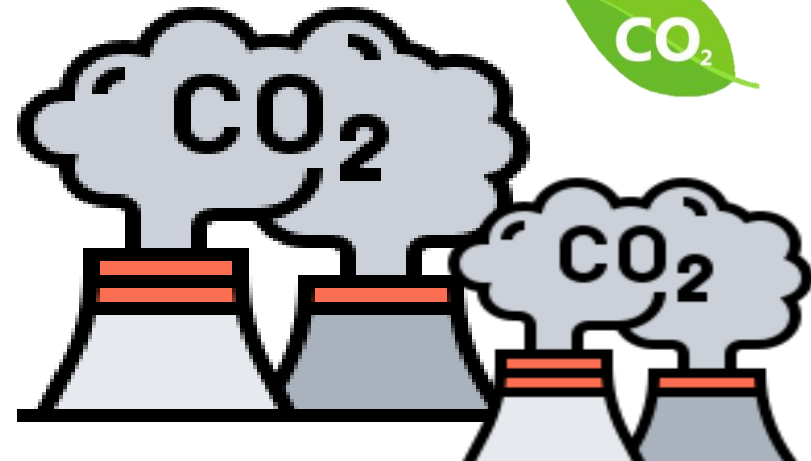


CCUS TRM: NAVIGATING THAILAND TOWARDS CARBON NEUTRALITY in 2050

Goals

CCUS TRM synchronizing strategic targets, driving mechanisms, policy recommendations and pilot projects towards Thailand's carbon neutrality

Current status of CCUS technology and technologist in Thailand



Focus group Meeting

1st Workshop & 2nd Workshop

1

Setting the Stage

- แนะนำโครงการ
- อธิบายวัตถุประสงค์
- อธิบายแนวทางจัดทำแผนที่นำทาง
- **หารือเป้าหมายเชิงกลยุทธ์ (strategic target)**



Strategic Target

2

Application Needs Assessment

- **ระบุความต้องการสำคัญในแต่ละช่วงเวลา**
- ประเมินความต้องการโดยพิจารณาความพร้อม (readiness) และความน่าสนใจ (attractiveness)



Required Applications

3

Identifying Key Technology & Enablers

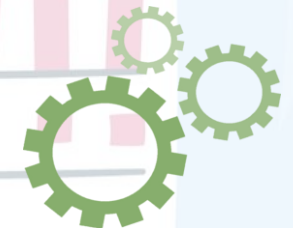
ระบุปัจจัยสนับสนุนที่สำคัญเพื่อให้ได้นวัตกรรมที่ระบุ ในด้านต่างๆ เช่น เทคโนโลยี นโยบาย มาตรการจูงใจ วิจัย การถ่ายทอดเทคโนโลยี โครงสร้างพื้นฐาน ฯลฯ

Key Technology & Enablers

4

Designing Driving Mechanism

ออกแบบกลไกขับเคลื่อนในด้านที่สำคัญสู่เป้าหมายเชิงกลยุทธ์



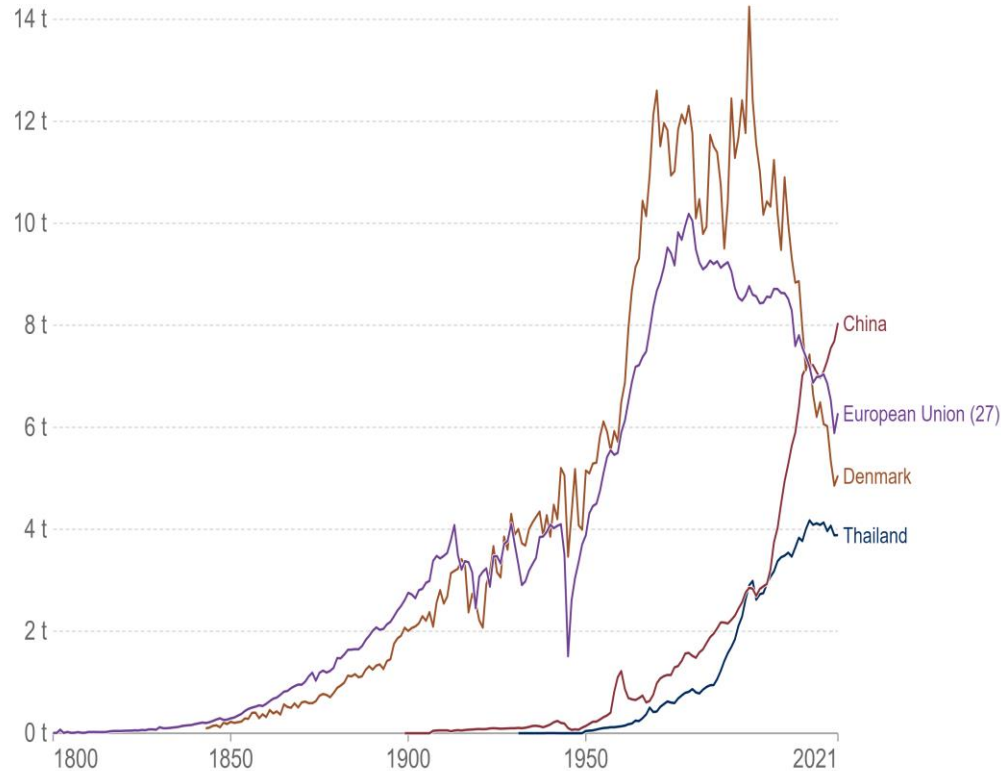
Driving Mechanisms

CCUS Data: Global Status & Comparison



Per capita CO₂ emissions

Carbon dioxide (CO₂) emissions from fossil fuels and industry¹. Land use change is not included.



Source: Our World in Data based on the Global Carbon Project (2022) [OurWorldInData.org/co2-and-other-greenhouse-gas-emissions/](https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions/) • CC BY

1. Fossil emissions: Fossil emissions measure the quantity of carbon dioxide (CO₂) emitted from the burning of fossil fuels, and directly from industrial processes such as cement and steel production. Fossil CO₂ includes emissions from coal, oil, gas, flaring, cement, steel, and other industrial processes. Fossil emissions do not include land use change, deforestation, soils, or vegetation.

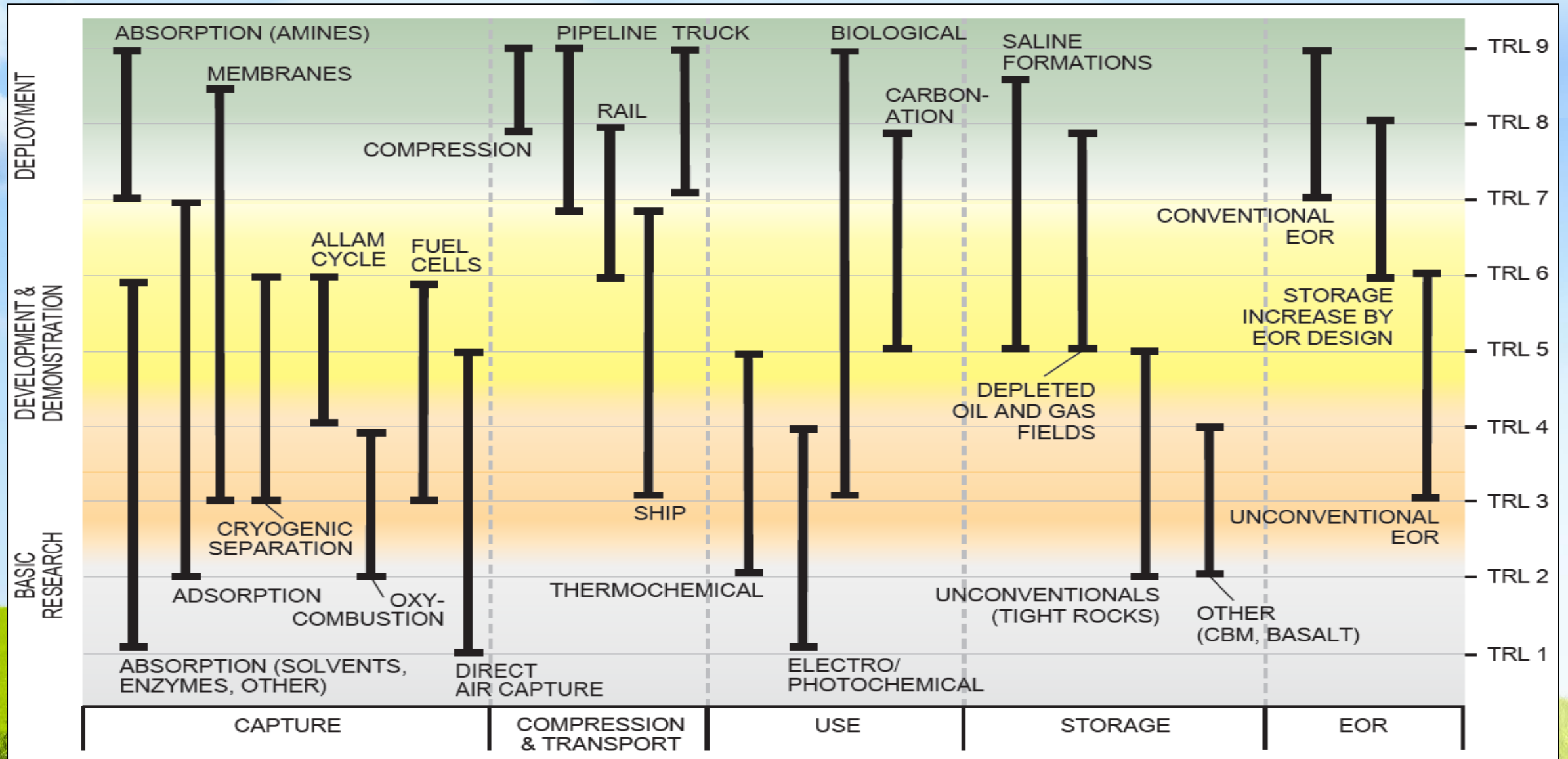
Our World in Data

Data in 2021	Thailand	EU	Denmark	China
Population	69.9M	446.9M	5.8M	1.41B
GDP (GDP/capita)	\$506B (\$7.2k)	\$17.09T (\$38.2k)	\$397.1B (\$67.8k)	\$17.73T (\$12.5k)
Emission (ton/capita)	278.5 Mt (3.8)	2.79 Bt (6.28)	29.58 Mt (5.1)	11.47 Bt (8.05)
Forrest area	38.9%	39.8%	15.7%	23.3%
Electricity from renewable (-hydro)	5.9% (2015)	18% (2015)	65.4% (2015)	4.9% (2015)
GHG reduction by 2030	-40% relative to BAU = emit 137.3 Mtpa	-55% compared tp 1990	-70% compared to 1990 (already at -40% by 2019, can achieve -55% without CCUS)	Peak emission before 2030
Net zero	2065	2050	2050	2060
Expected CCUS contribution /target	CCUS 40 Mtpa by 2050 60 Mtpa by 2065	5 Gt CCS, 7 Gt CCU by 2050	4-9 Mtpa by 2030 20-50 Mtpa by 2050	2050 – CCU 420-560 Mtpa, CCS 540-1430 Mtpa

<https://data.worldbank.org>

<https://ourworldindata.org/co2-emissions>

Technology Readiness Level, TRL of CCUS at Global Level



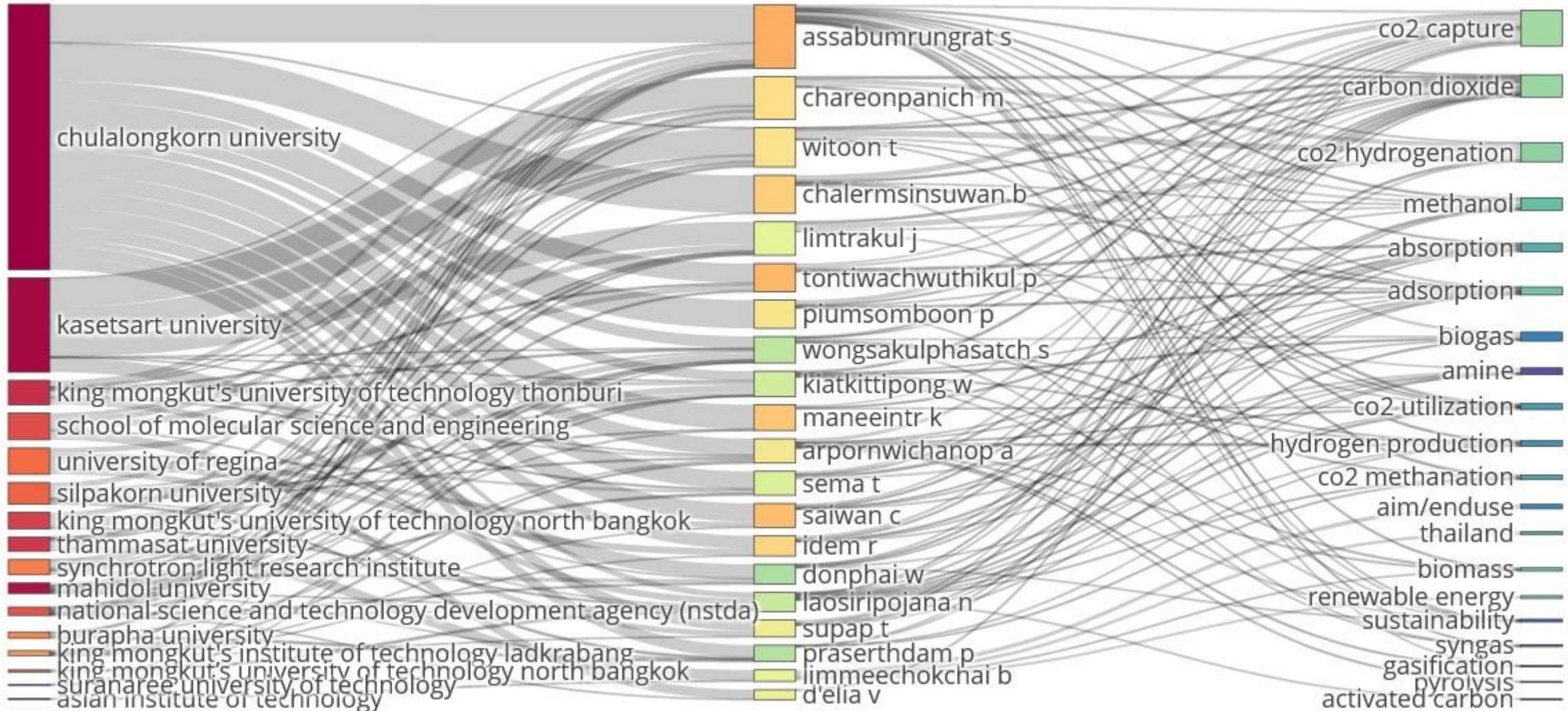
Bibliometric analysis (CCS, CCU, CCUS in Thailand)



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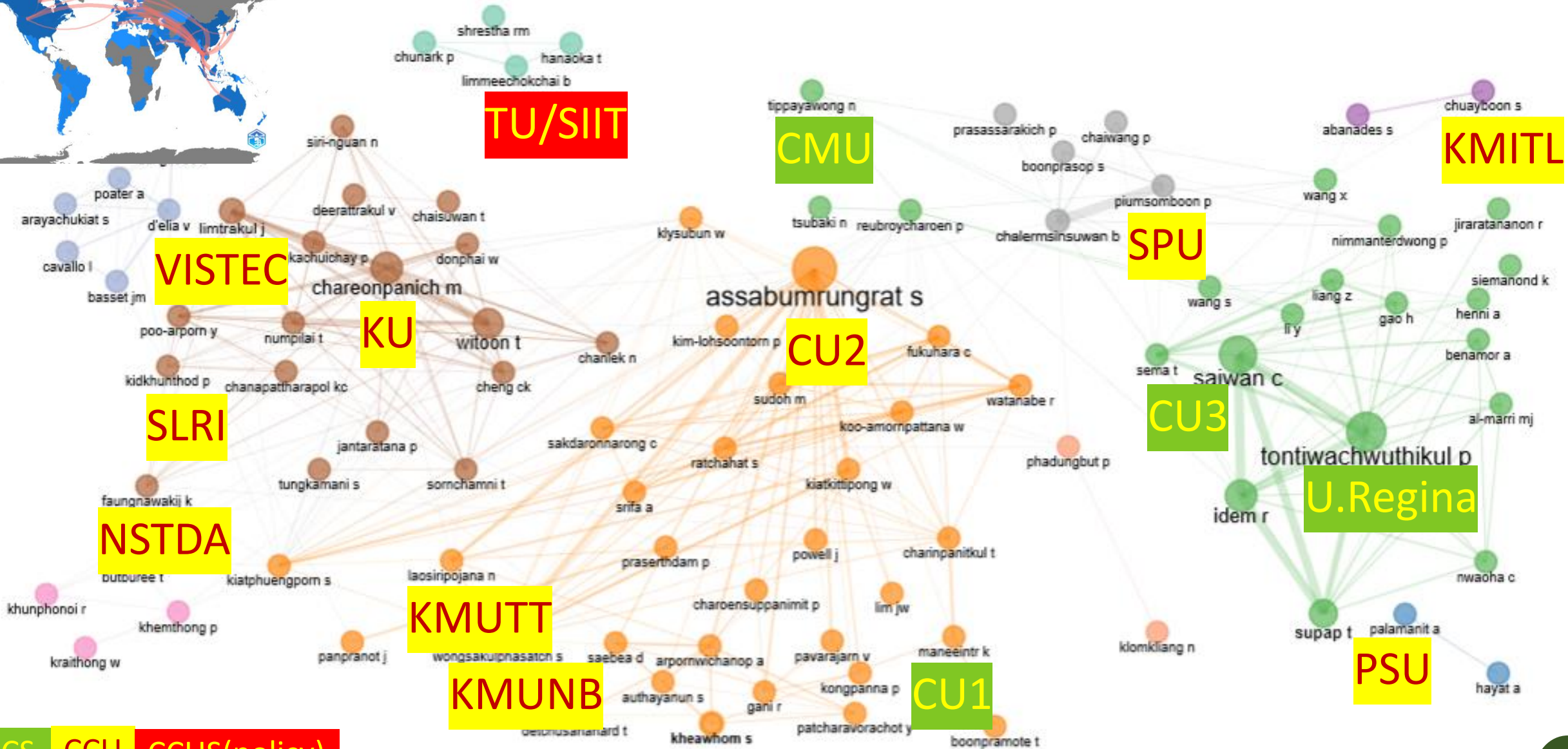
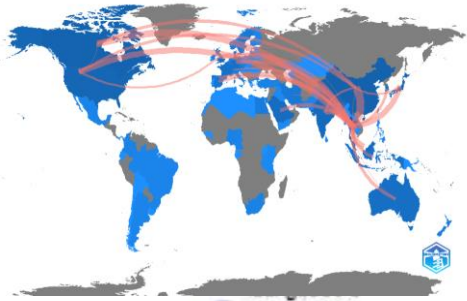


Affiliation

Author

Keyword

Bibliometric analysis (CCS, CCU, CCUS in Thailand)




CCS CCU CCUS(policy)

CCUS Projects in Thailand




1




- EGAT (Mae Moh Coal-fired Power Plant) (CCU) Artificial carbonate
- EGAT, DMF and PTTEP (Mae Moh Basin) (CCS)
- EGAT, DMF and PTTEP (Lampang Basin) (CCS)



2 **3**



- S1 Project (CCS)
- SCG (CCU) Syngas and hydrocarbon Chemicals



- PTTEP (Phu Horm Project) (CCS)
- EGAT (Nam Phong Power Plant) (CCS)

4



- North Gulf of Thailand (CCS)
- BLCP (CCU)
 - Methanol Production
 - Ammonia Co-firing
- PTT Group Industry Carbon Capture and Purification.

5



- Arthit Project (CCS)
- A18 Project (MTJA) (CCS)

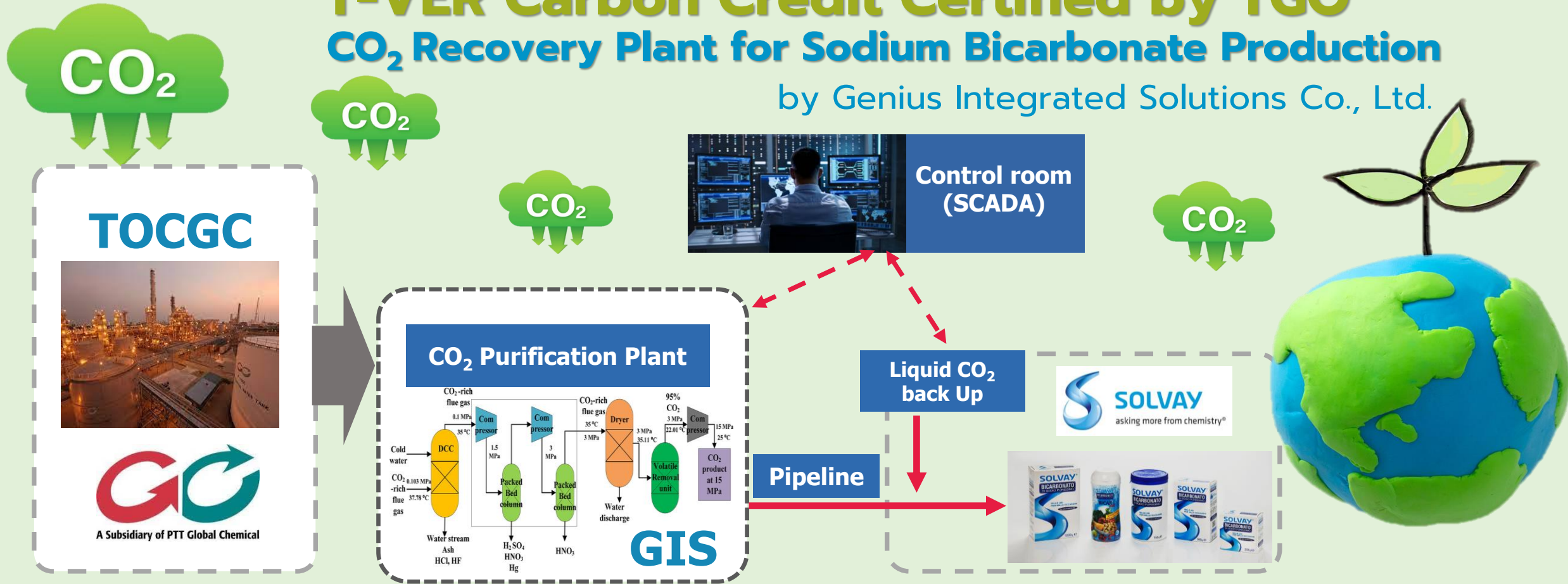


Mae Moh Coal-fired Power Plant



T-VER Carbon Credit Certified by TGO CO₂ Recovery Plant for Sodium Bicarbonate Production

by Genius Integrated Solutions Co., Ltd.



Ref : <https://ghgreduction.tgo.or.th/th/tver-database-and-statistics/t-ver-registered-project/item/838-co2-recovery-plant-for-sodium-bicarbonate-production-by-genius-integrated-solutions-co-ltd-co2.html>

CCS Projects in Thailand



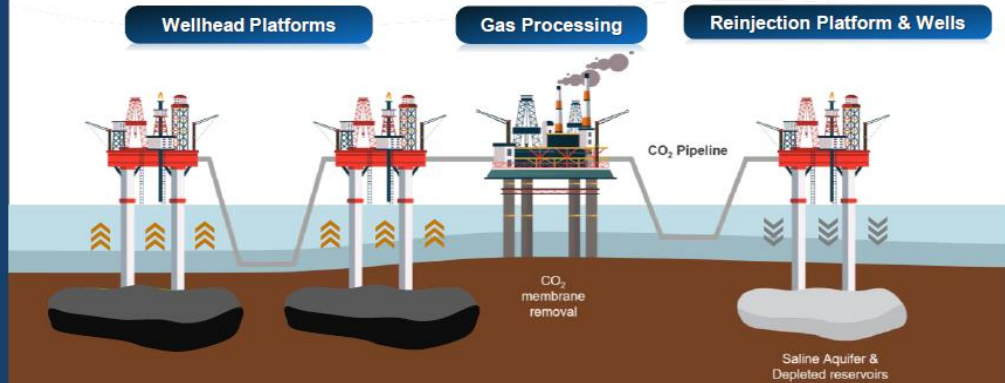
PTTEP's commitment to help the country

What do we do?



EP NET ZERO

ARTHIT Upstream CCS Project



OBJECTIVES



- Reducing emissions from upstream activities at Arthit gas field (Gulf of Thailand)
- 1st demonstration of CCS feasibility in Thailand and prove Gulf of Thailand's CCS potential

Eastern Thailand Carbon Capture and Storage (CCS) Hub Initiative



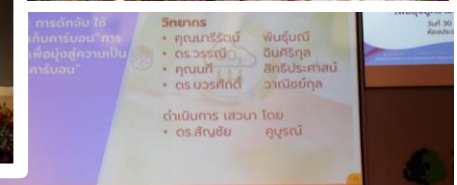


Focus group Meeting

Bangkok, 10 February 2023

The total number of **63 participants** divided into the **private and public stakeholders are 40 (63%)** from **25 organizations/companies** and the **partnership working group of CCUS TRM are 23 (37%)** respectively.

Site visit and Sharing



All gatherings with **200 participants** from in attendance, including private and public sector

In NAC2023, Thailand Science Park, 30 March 2023

Mae Moh PP - Electricity Generating Authority of Thailand 13 March 2023

CCUS 1st Workshop



The total number of **119 participants** from **40 organizations/companies**.

- Private sector = 29 participants
- Public enterprise = 13 participants
- Public sector = 41 participants
- Partnership working group of CCUS TRM = 36 participants



Bangkok, 11 May 2023



ศ.ดร.วรงค์ ปจราชาร์ย
ประธานคณะทำงาน
CCUS Consortium
Faculty of Engineering
Chulalongkorn University



คุณพงษ์กิตติ ลักขมมีพิเชษฐ
ผู้จัดการอาวุโส ฝ่าย Carbon capture and utilization (CCU)
และ Hydrogen

PTT Exploration and Production Public Company Limited



คุณสุรชัย วัชรตันชัย
CCUS Director SCG Cement

SCG CEMENT COMPANY LIMITED

Concluding Remarks



- **CCUS, Renewable energy, LULUCF and EV, are four key contributors to GHG reduction to reach carbon neutrality by 2050. CCUS in energy and industrial sectors especially those related to CBAM will be first implemented.**
- **Large-scale CCS mature technology shows great potential to be implemented in Thailand since there are some potential areas both onshore and offshore. CCS addressing a large amount of CO2 reduction becomes a strategic pathway. As CCS cost is still high, challenging attempts gear towards making CCS fully effective or economically viable.**
- **TRL of CCU technology depends heavily on processes or products of CO2 utilization. CCU appears attractive by its technological and economic potential.**
- **Drivers and enablers such as incentives, safety issues, law and regulation, strategic target, etc., must be identified in order to practically drive CCUS TRM.**

CO₂



Thank you



Dr. Supak Yothaisong, NANOTEC

